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Demand Elasticities in International Trade

Are They Really Low?

Arvind Panagariya
Shekhar Shah
Deepak Mishra

For the first time in the economics literature, Panagariya, Shah, and Mishra obtain import demand elasticities for a "small country" (Bangladesh) that are very large. The elasticities are based on parameters of a utility function that are systematically of the correct sign and statistically significant. Using highly disaggregated data, both own-price and cross-price elasticities are estimated.

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Summary findings

Most economists are comfortable with the assumption that import demand elasticities facing small countries such as Austria, Belgium, and Denmark are *approximately infinite. Yet the actual estimates of import* demand elasticities for these and other countries are disturbingly low. Typical estimates range from 1–2, and in rare cases rise to 3.

Such estimates seriously undermine the case for unilateral liberalization since they suggest considerable market power on the part of even small economies. They also raise doubts about the ability of exports to serve as an engine of growth. With import demand elasticities lying between 1 and 3, a 20 percent annual expansion in exports would, for example, lead to a substantial deterioration in the terms of trade.

Panagariya, Shah, and Mishra analyze the U.S. demand for imports from Bangladesh for the products restricted under the Multifiber Arrangement. Because Bangladesh is only a small supplier of these products and close substitutes are available from many Asian and Latin American countries, they expected the elasticity of demand for Bangladeshi imports to be high. Their estimates of own-price elasticity are consistently high, exceeding 65 in all cases.

This finding accords with trade theorists' prejudice that small countries can essentially behave as price takers but conflicts with the view in the empirical literature that *demand elasticities rarely exceed 3 and are generally* between 1 and 2.

The authors' analysis differs from the existing literature in three ways. First, contrary to the general practice of postulating an ad hoc equation that violates trade theory, they derive a set of estimation equations from an explicit, utility-maximization model. They estimate these equations as a system and use the estimated parameters of the utility function to obtain the Marshallian own-price and cross-price elasticities as well as the income elasticity of demand. Second, they take explicit account of U.S. imports from competitors of Bangladesh. Rather than proxy competitors' prices by the prices prevailing in the export market, they rely directly on competitors' prices. Finally, they use highly disaggregated data that make the unit value of exports a far better proxy for price than is the case with the aggregate export data that are commonly used in this literature.

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Demand Elasticities in International Trade:

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Arvind Panagariya
Shekhar Shah
Deepak Mishra*

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If asked to guess the demand elasticities facing small countries such as Austria, Belgium and Denmark in the world market, most trade economists will pick very large numbers and, for purposes of deriving policy prescriptions, show no hesitation in relying on the small-country assumption. Yet, the actual estimates of demand elasticities in international trade for these as well as other countries are disturbingly low. Thus, in Table 1, taken from Goldstein and Khan's (1985) detailed survey, the highest estimate of demand elasticity across Austria, Belgium and Denmark is 1.56. Many of the estimates are less than 1.

If we believe these estimates, the case for unilateral trade liberalization is seriously undermined. The estimates imply a considerable market power on the part of even small countries and, beyond a point, make unilateral liberalization by them a welfare-reducing proposition. The estimates also raise doubts about exports serving as the engine of growth. For, even after we take into account the expansion of world demand due to growth in income, if price elasticities are as low as those shown in Table 1, a 20% per annum expansion of a country's exports is bound to worsen substantially her terms of trade. Alternatively, given these elasticities, it is difficult to reconcile the fast growth in the exports of several East Asian countries with relatively stable terms of trade during the last three decades.

To our knowledge, Riedel (1988) is the only author who seriously questions the low elasticity estimates on the ground that they suffer from a simultaneity bias. He notes that researchers commonly assume, incorrectly, that the elasticity of supply of exports is infinity which makes the price exogenous and allows them to estimate the demand equation independently of supply. Riedel drops this assumption, models the supply equation explicitly and then estimates the elasticity of demand for Hong Kong's exports. He reaches the dramatic conclusion that the elasticity of demand for Hong Kong's exports is infinity.

While agreeing with Riedel's (1988) conclusion that the literature greatly underestimates import demand elasticities, we feel that the manner in which he reaches this conclusion is far from satisfactory. With supply side explicitly modeled, the price of Hong Kong's exports becomes endogenous in his analysis. He is then able to write price in the demand equation as the dependent variable. In this setup, writing the demand equation in the log-linear form, the elasticity of demand is given by the reciprocal of the coefficient associated with the quantity of Hong Kong's exports. Therefore, infinite elasticity can result from either a statistically significant and near-zero coefficient of import quantity or a statistically insignificant coefficient regardless of its value. Riedel finds the latter to be the case.

Nguyen (1989), who offers a detailed critique of Riedel's work, is unpersuaded by his analysis.[1] In our view, Riedel's conclusion is the artefact of the particular null hypothesis he chooses to test. He chooses the traditional null hypothesis that the coefficient associated with quantity is zero with the concomitant alternative hypothesis that it is not zero. His data accept the null hypothesis, leading him to conclude that the coefficient is zero and the demand elasticity infinity. But one could equally well postulate the null hypothesis that the coefficient is -.5 or -.75 which are both accepted by his data at 10% or higher level of significance and yield demand elasticities of -2 or -1.33 as in the traditional literature.

Riedel's contention that previous studies produced low demand elasticities because they ignored the supply side is also unfounded. Goldstein and Khan (1978) who offered the first systematic investigation of demand elasticities in international trade in a simultaneous equations framework found elasticities (see column 2 of Table 1) which were statistically

[1]Riedel (1989) disagrees with Nguyen's critique, however.

significant and similar in magnitude to those obtained from single-equation models.[2]

In this paper, we offer a case in which elasticity estimates are consistent with trade economists' intuition. Unlike Riedel (1988), parameters of the utility function which we estimate and from which our demand elasticities are derived are statistically significant and robust. We estimate the U.S. demand for imports from Bangladesh of products restricted under the Multi-Fibre Arrangement (MFA).[3] Because Bangladesh is only a small supplier of these products and close substitutes are available from many countries in Asia and Latin America, we will expect the elasticity of demand for her imports to be large. We find this to be the case: our estimates of the own-price elasticity exceed 65 in all cases, approximating the small-country assumption.

Our analysis departs from much of the literature on international trade elasticities in four important respects. First, contrary to the general practice of postulating an *ad hoc* equation which violates theory, we derive a set of estimation equations from an explicit, utility-maximization model.[4] We estimate these equations as a system and obtain the relevant

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[2]Ironically, it is Goldstein and Khan to whom Riedel appeals for his contention that the prior literature had erred in treating the price as exogenous. Thus, Riedel quotes Goldstein and Khan (1985) as stating, "the bulk of the time series work on import and export equations has addressed the supply side only by assumption."

[3]The reason for choosing Bangladesh for the present exercise was simple: the project was originally sponsored by the Bangladesh Country Operations division of the World Bank. As we discuss later, MFA products account for more than half of Bangladesh's total exports which makes the demand elasticities for these products an important factor in policy matters. At the same time, Bangladesh has a very small share in the U.S. and European Union markets which makes her a good candidate for testing the presumption that small countries face high elasticities in the world market.

[4]The general practice in the literature is to estimate a log-linear equation with quantity as the dependent variable and prices and income as explanatory variable. Such an equation cannot be derived from a plausible utility maximization model.

parameters of the utility function. We then use the estimates to obtain the Marshallian own-price and cross-price elasticities as well as the income elasticity of demand. Thus, there is a tight link among our theoretical model, estimated equations and elasticities.[5]

Second, related to the first, our estimation exploits the fact that imports of MFA products are subject to country-specific quotas. Because the quotas are binding, we can treat the quantities as exogenous and prices as endogenous.[6] Thus, we have a natural reason for treating prices as the endogenous variable and quantities as exogenous. Moreover, even though we do not incorporate the supply side into the model, our estimates are likely to suffer minimally from simultaneity bias.

Third, based on our theory, we take explicit account of imports from competitors of Bangladesh. The common practice in the literature is to estimate the demand for a country's (total) exports as a function of that country's price relative to an index of the prices prevailing in importing countries. This approach misses the important feature of reality that competitors of a country's exports are not necessarily the importing countries. Thus, for exports of a developing country, though importing countries are typically OECD (Organization for Economic Cooperation and Development) countries, the competitors are other developing countries. In our specific case, the competitors of MFA products exported by Bangladesh are primarily exporters of similar products located in Asia and Latin America. It is critical to take

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[5]See Winters (1984) for a detailed discussion of specifications of foreign trade functions and their theoretical foundations.

[6]The assumption that all MFA quotas are binding at all times is rather strong. But as we will show later, on balance, at least for Asian countries, the evidence is in favor of the assumption. Quota utilization rates for the Asian countries in our sample have been extremely high, frequently reaching 100%.

into account the supplies of these countries while estimating the demand for imports from Bangladesh.

Finally, the bulk of the literature estimates import demand functions using highly aggregated data. We use disaggregated data by exploiting the information available on MFA imports into the United States. These data are readily available from the International Trade Commission (ITC) publications by the country of origin. A major advantage of using the disaggregated data is that unit-value indices which must inevitably be used to represent prices are far more meaningful in these data than in aggregated data.[7] Compositional changes are far less likely to pollute unit values when data are highly disaggregated. To highlight the level of disaggregation, we note that there were as many as 148 MFA product categories in the United States in 1994. Cotton shirts alone are divided into four separate categories: cotton knit shirts for men & boys, cotton knit shirts for women & girls, cotton nonknit shirts for men & boys and cotton nonknit shirts for women & girls.[8] Additionally, since quotas are closely monitored, these data are also more reliable than aggregate trade data used by most investigators.

Having laid out our claims in strong terms, we must also note some of the limitations of our analysis. First, like other investigators, we make use of separability in the utility function. Without this assumption, it is not possible to estimate a demand equation unless we

[7]Even Ghose and Kharas (1993) who take into account the prices of competitors work with very aggregated data.

[8]The very intent of the MFA being to protect domestic producers, there has been a great temptation to define product categories tightly and to multiply them. Detailed specifications are provided, for example, to define what constitutes a cotton knit shirt for men and boys.

have information on the entire economy. Precise form in which we introduce separability will be made clear in our theoretical section.

Second, MFA products are rather special. For each MFA category, there is a detailed definition of the product which makes the latter relatively homogeneous. Therefore, it may not be possible to replicate our results in other sectors.

Third, due to the existence of quotas, we are able to abstract from supply-side variables and also treat prices as endogenous. There are few other products for which this assumption will hold.

Fourth, though, as we will show, the assumption of binding MFA quotas is broadly justified for our data, we cannot claim that it holds for all countries for all time periods. Therefore, we cannot justifiably claim that simultaneity bias is altogether absent in our results.

Fifth, because the supply side is entirely absent from our analysis, considerations such as spillover effects and sunk costs, emphasized in the recent important work of Roberts, Sullivan and Tybout (1995), play no role in our analysis.

Finally, based on our high elasticity estimates, we cannot conclude that at present Bangladesh can expand its exports of MFA products by reducing its prices through, say, a devaluation of its currency. Given the binding nature of the quotas, room for such expansion is rather limited. Nevertheless, our results do indicate that once MFA is phased out as agreed under the Uruguay Round Agreement of the General Agreement on Tariffs and Trade (GATT), export expansion in the garment sector through price competition will be a serious option.

The paper is organized as follows. In Section 1, we outline a theoretical model to derive the equations we estimate. Because the estimated equations do not yield the conventional, Marshallian demand elasticities directly, we also explain how they can be obtained from the parameters of the utility function we estimate and what assumptions must be made for to complete this exercise. An appendix at the end of the paper provides further details in this regard. In Section 2, we make a preliminary determination of who Bangladesh's competitors are. Here we look at shares of different countries in total U.S. imports of MFA products that are important for Bangladesh. We also compare the prices of exports from Bangladesh and other countries. In Section 3, we estimate the demand equation derived in Section 1 and derive the price and income elasticities facing Bangladesh. In Section 4, we conclude the paper.

1. The Theoretical Framework

We begin by presenting a simple theoretical framework for the estimation of the demand for Bangladesh's exports in the U.S. market. We take an entirely new approach which is tailor made to exploits the fact that MFA imports are subject to binding quotas.[9] The derivation of Marshallian own-price and cross-price elasticities and the income elasticity involves two steps. In the first step, we estimate the parameters of the relevant part of the utility function. In the second step, we use these estimates to obtain the Marshallian price elasticities and the income elasticity.

1.1 Deriving the Equations to be Estimated

Because we want to treat the imports coming from different countries as imperfect substitutes, commodities must be distinguished by type as well as the country of origin. The particular product on which we wish to focus, for example, ready-made garments, is to be denoted X with subscript i indicating the source country. Thus, x_i denotes the quantity of product X imported from country i. The key point to remember is that the x_i are differentiated and, therefore, command different prices. Quantities of all other products consumed are lumped together into a single row vector denoted y. The utility function of a representative consumer in the United States is then written

(1) $$u = u(g(x_0, x_1, ..., x_n);\ h(y))$$

[9]To our knowledge, Lucas (1988) is the only author who proceeds along the lines we do in order to estimate demand elasticities of India's manufactures. But, as explained later, he falls far short of what we do in terms of theoretical development of the model and eventual retrieval of Marshallian demand elasticities. Moreover, because export quantities in his data are not subject to quotas, he is in error in treating them as exogenous variables.

where n+1 is the number of countries from which X is imported. We will let subscript 0 represent Bangladesh and the others her competitors such as China, Hong Kong, Korea, etc. We will also refer to $g(\cdot)$ and $h(\cdot)$ as subutility function.

As Winters (1984) has reminded us, the separability between vectors x and y has serious limitations. Perhaps the most serious one of those in the present context is that some of the products which compete directly with the x_i are included in y. For example, varieties of product X supplied by U.S. producers are included in vector y rather than vector x. But this problem is common to virtually all of the relevant literature and there is no simple solution to it.[10]

Letting E be the total expenditure, p_i the price of x_i and p_y the row vector of prices associated with y, the utility maximization problem can be written as

$$(2) \qquad Max.Z = u\left(g(x_0, x_1, ..., x_n);\ h(y)\right) + \lambda\left[E - \left(\sum_{i=1}^{n} p_i x_i + p_y \cdot y'\right)\right]$$

Note that y' is the column vector of all goods other than the x_i. The first-order conditions with respect to x_0 and x_i can be combined to obtain

$$(3) \qquad \frac{g_0(\cdot)}{g_i(\cdot)} = \frac{p_0}{p_i} \qquad i = 1, 2, ..., n$$

where $g_i(\cdot)$ denotes the partial derivative of the sub-utility function $g(\cdot)$ with respect to the ith argument. The separability between vectors x and y ensures that none of the y variables enter

[10]Authors who use aggregate data on imports assume that the conditions of the Hicks aggregation theorem are satisfied. These conditions are stronger than what we assume.

(3). To operationalize (3), we assume the following form for the sub-utility function g(·).

$$(4) \qquad g(\cdot) = \left[\sum_{i=0}^{n} \alpha_i x_i^{\beta_i} \right]^{\beta}$$

where $1 \geq \beta_i \geq -\infty$ and $\beta\beta_i > 0$ for all i. The latter assumption is needed to ensure that the marginal utility of each product is positive. There are both virtues and limitations of this particular form of g(·). On the positive side, it admits nonhomotheticity; the CES utility function, employed extensively in trade-theoretic literature on differentiated products and Computable General Equilibrium (CGE) models, can be obtained as a special case by setting $\beta_i = \beta$ for all i.[11] On the negative side, (4) introduces separability between the x_i.

Taking advantage of (4), (3) can be rewritten as

$$(5) \qquad \frac{\alpha_0 \beta_0 x_0^{\beta_0 - 1}}{\alpha_i \beta_i x_i^{\beta_i - 1}} = \frac{p_0}{p_i} \qquad i = 1, \ldots, n$$

Observe that separability between the x_i leads to the property that the relative price of goods 0 and i is a function of x_0 and x_i only. But also note that due to the nonhomotheticity just noted, the relative price is not sufficient to determine the *ratio* of the two quantities. The latter ratio can change even if relative prices are held fixed but the expenditure is allowed to change.

Taking ln on both sides of (5) and rearranging, we have

[11]For example, Dixit and Norman (1977) and Krugman (1980).

$$(5') \qquad \ln \frac{p_0}{p_i} = \ln \frac{\alpha_i \beta_i}{\alpha_0 \beta_0} - (1-\beta_0)\ln x_0 + (1-\beta_i)\ln x_i \qquad i = 1, \ldots, n$$

In (5′), we have n equations. These equations look like an inverse demand function except that, on the right-hand side, instead of income, we have the quantity of exports of the competitor whose price appears in the denominator on the left-hand side. If MFA quotas are binding, we can treat x_0 and x_i as exogenous variables and the relative price as the endogenous variable. we can then estimate the n equations with the cross-equation restriction that the coefficient of ln x_0 be the same across all j.[12] If preferences are homothetic, we will have $\beta_i = \beta_0$. Therefore, in principle, (5′) can also be used to test for homotheticity.

An important advantage of the present approach is that it requires minimal information. As long as quotas are binding, (5′) can be estimated for any pair of countries without any information on other countries. We also do not require information on the supply side variables.

Figure 1 illustrates equation (5′). Taking the exports of x_i as fixed, DD′ represents the price of good 0 relative to that of good i as a function of x_0. Because the variables are measured in ln, the demand curve is linear with a constant negative slope of $(1-\beta_0)$ and positive intercept on the vertical axis. Holding x_i fixed, an expansion of x_0 leads to a reduction in p_0/p_i. An increase in the quota of country i, x_i, by 1% raises the price of good 0 relative to j by $(1-\beta_i)$ percent. Or, a unit increase in ln x_i shifts DD up by $(1-\beta_i)$.

By drawing a supply curve (not shown) in Figure 1, it is easy to show that regardless

[12]Theoretically, we should also add the system of equations for other exporting countries and include them in the system with appropriate cross-equation restrictions. But the estimation of such an elaborate system is likely to yield estimates which will not be robust.

of whether the import quota is binding or not, the observations we have must fall on the demand curve. If the quota is to the left of the intersection of the demand and supply curve (i.e., the quota is binding), the quota determines the quantity and the demand curve the price. If the quota is to the right of the intersection of the two curves, the price-quantity combination is on the intersection. In either case, we are on the demand curve. The main difference is that the quantity is endogenous in the second case and a single equation estimation will fail to correct for the simultaneity bias.

It is tempting to think of $1/(1-\beta_0)$ as the Marshallian own-price elasticity of demand for imports as Lucas (1988) seems to do.[13] But this is not quite right. In defining the Marashallian own-price elasticity, we take the total expenditure and the prices of other goods as given. But $1/(1-\beta_0)$ is the own-price elasticity, given taking the quantity of competitors as given. As explained below, deriving the Marshallian elasticities and the income elasticity from the estimated parameters of the utility function is a more complicated exercise.

1.2 Deriving the Own-Price, Cross-Price and Income Elasticities

If we could invoke two-stage budgeting, our task of obtaining the Marshallian and income elasticities will be easy. For we could then divide the consumer's problem into two stages: in the first stage, he would decide how to allocate the total expenditure between $g(\cdot)$ and $h(\cdot)$ and, in the second stage, allocate the expenditure on $g(\cdot)$, say E_x, among the x_i. In effect, the demand for the x_i would depend exclusively on the second stage variables p_i and E_x

[13]The demand function as we understand it is derived below in equation (5). Like other investigators, Lucas also fails to recognize that India's competitors are other developing countries rather than an aggregate of "other exporters" whose price is approximated by the U.S. wholesale price indices.

and the information on parameters of $g(\cdot)$ and E_x would be sufficient to derive the elasticities. But as has been noted by Deaton and Muellbauer (1980), two-stage budgeting requires the further assumption that sub-utility functions, $g(\cdot)$ and $h(\cdot)$, be homothetic. But having allowed $g(\cdot)$ to admit nonhomotheticity, we have violated this assumption and two-stage budgeting cannot be invoked.[14]

This important point has been ignored in a large body of the empirical literature on import demand elasticities. As Winters (1984) notes, invoking just separability, researchers have gone on to estimate the import demand for a product as a function of second-stage prices and expenditure. But this demand function is valid only if the second-stage utility (i.e., sub-utility) functions are homothetic. But in that case, the income elasticity is necessarily unity, eliminating the need for estimating it.

Because this point is important and has not been fully appreciated in the literature, it is useful to explain it in some detail. By definition, we have

$$(6) \qquad \sum_{i=0}^{n} p_i x_i = E_x$$

Equations (5) and (6) contain $n+1$ equations in $n+1$ x_i's. Solving them, we can obtain the demand functions for the $n+1$ x_i as a function of the p_i and E_x:

$$(7) \qquad x_i = x_i(p_0, p_1, \ldots, p_n; E_x) \qquad i = 0,1,\ldots,n.$$

These demand functions have all the properties of a standard demand function in the p_i and E_x. Therefore, it may seem that the conventional literature is right afterall in estimating the

[14]Deaton and Muellbauer (1980) also note an alternative set of conditions which permit two-stage budgeting. But these are inapplicable to our utility function.

demand as a function of the second-stage variables. The problem, however, is that unless the sub-utility functions are homothetic, E_x is itself a function of all prices including those of the goods in vector y. Thus, it is incorrect to estimate the demand as a function of second-stage variables unless one is willing to assume homotheticity of sub-utility functions. If the latter is done, however, the income elasticity must be restricted to unity! One cannot have homotheticity of sub-utility functions *and* estimate the income elasticity.

From our present viewpoint, the dependence of E_x on the p_i implies that we cannot use equations (5) and (3) to derive the import demand elasticities from the parameters of the sub-utility function $g(\cdot)$. For example, to derive the own-price and cross-price elasticities with respect to, say, p_0, we hold the *total* expenditure constant. But that does not ensure the constancy of E_x. In fact, we know that without the homotheticity of sub-utility functions, E_x changes when one or more prices change. Yet, because we do not know the exact manner in which E_x changes, we cannot employ (5) and (3) to calculate the price elasticities.

This fact leads to the inevitable conclusion that the knowledge of the subutility function $g(\cdot)$ is not sufficient to derive various elasticities relating to the x_i. We must restrict the form of the utility function in equation (1) further. Because our objective is not to emphasize specific *values* of the own- and cross-price elasticities of MFA products facing Bangladesh but to merely demonstrate that these elasticities are large, we will proceed in a simple but plausible manner.

Thus, we will now aggregate all products in vector y into a single product. Henceforth, y denotes the quantity of a single product and p_y its price. Making the further simplifying assumption that $\beta = 1$, which is fully consistent with our estimation, we let the consumer's complete utility function be represented by

$$(8) \qquad u = \left[\left[\sum_{i=0}^{n} \alpha_i x_i^{\beta_i} \right]^{\gamma} + y^{\gamma} \right]^{\frac{1}{\gamma}}$$

where $1 \geq \gamma \geq -\infty$. The income constraint is written

$$(9) \qquad \sum_{i=0}^{n} p_i x_i + p_y y = E$$

where E is the total income or expenditure and is exogenously given. We now maximize (8) with respect to the x_i and y. Dividing the first-order condition with respect to x_0 by that with respect to x_i, we obtain equations (5). Thus, as already noted, our estimation equations (5′) continue to hold as before. The first-order conditions associated with x_0 and y can be combined to yield the further condition

$$(10) \qquad \alpha_0 \beta_0 g^{\gamma-1} \frac{x_0^{\beta_0 - 1}}{y^{\gamma-1}} = \frac{p_0}{p_y}$$

where g represents the right-hand side of (4) with $\beta = 1$. In (5), (9) and (10), we have $n+2$ equations which can be solved for the $n+1$ x_i and y as functions of the p_i, p_y and E. Thus, in principle, (5), (9) and (10) allow us to determine the demand functions for all goods. More to the point, allowing p_0 (or p_i) to change exogenously, we can differentiate these equations and solve for the relevant own-price and cross-price elasticities. Similarly, differentiating with respect to E, we can solve for the income elasticities. Because the derivations are tedious, we relegate them to an appendix. Here we report the final expressions for the elasticities facing

Bangladesh. The own-price elasticity is given by

(11) $$\eta_{00} = \sigma_0 \frac{\theta_0 + \sum_{i=1}^{n} \sigma_i \theta_i + \sigma_y \theta_y + \theta_y \frac{\sum_{i=1}^{n} \sigma_i \theta_i}{\sum_{i=0}^{n} \frac{\theta_i}{\beta_i}}}{\sum_{i=0}^{n} \sigma_i \theta_i + \sigma_y \theta_y + \theta_y \frac{\sum_{i=0}^{n} \sigma_i \theta_i}{\sum_{i=0}^{n} \frac{\theta_i}{\beta_i}}}$$

where $\sigma_i \equiv 1/(1-\beta_i)$, $\sigma_y \equiv 1/(1-\gamma)$, $\theta_i \equiv p_i x_i/E$ and $\theta_y \equiv p_y x_y/E$ ($i = 0, 1,..., n$). The θ_i and θ_y are shares of the x_i and y in *total* expenditure. We estimate the σ_i ($i = 0,...n$) while θ_i and θ_y are available from data. Therefore (11) can be simulated for different values of σ_y.

The cross-price elasticity facing Bangladesh with respect to the price of the kth competitor is given by

(12) $$\eta_{0k} = \sigma_0 \frac{\theta_k(\sigma_k - 1) + \theta_y \frac{\sigma_k \theta_k}{\sum_{i=0}^{n} \frac{\theta_i}{\beta_i}}}{\sum_{i=0}^{n} \sigma_i \theta_i + \sigma_y \theta_y + \theta_y \frac{\sum_{i=0}^{n} \sigma_i \theta_i}{\sum_{i=0}^{n} \frac{\theta_i}{\beta_i}}}$$

Finally, the income elasticity is

$$(13)\qquad \epsilon_0 = \frac{\sigma_0}{\sum_{i=0}^{n} \sigma_i\theta_i + \sigma_y\theta_y + \theta_y \dfrac{\sum_{i=0}^{n} \sigma_i\theta_i}{\sum_{i=0}^{n} \dfrac{\theta_i}{\beta_i}}}$$

Observe that the denominator of (11)-(13) is the same. Therefore, the relative magnitudes of these elasticities depend on the numerators.

2. Bangladesh and Her Competitors in MFA Products in the U.S. Market

According to the GATT secretariat, textiles and clothing exports in 1994 constituted the largest export category in nonfuel industrial exports in 88 developing countries. In Bangladesh, readymade garments account for more than 60% of its total exports.[15]

A bulk of the world trade in textiles and clothing is regulated by the Multi-Fibre Arrangement which was first brought into existence in 1974 by placing under a single umbrella a number of separate agreements existing at the time. The agreement itself is highly complex and consists of 69 clauses and 20,000 annexes. In all, there are approximately 3,000 bilateral quotas distinguished by countries and products. The agreement is to be phased out under the Uruguay Round agreement in four different stages by the end of 2004.

Countries which impose MFA quotas include the United States, Canada, Norway and the European Union (EU). Bangladesh faces MFA quotas in the United States and Canada only. Because MFA exports began to show significant quantities beginning in 1984 only, we

[15]See Reza, Rashid and Rahman (1996).

chose to focus on years 1984 to 1994.[16]

We began by narrowing down products to those in which Bangladesh had a presence in every year in the sample period. Though Bangladesh had a presence in 82 out of 148 categories in 1994, she had a continuous presence in 26 MFA categories only. These latter categories are listed in Table 2 with their MFA codes and shares of Bangladesh in total U.S. imports for years 1984, 1989 and 1994. From these 26 categories, we chose four largest cotton exports (MFA categories 340, 341, 347, 348) and two largest noncotton exports (MFA 634 and 635) of Bangladesh for detailed analysis. In addition, we selected a sample of fourteen largest exports of Bangladesh to estimate a pooled equation as explained later. The share of each of these categories in the total MFA exports of Bangladesh was 1.74% or more in 1994.

The number of potential competitors to be included in our analysis is very large. To limit this number, we selected top eight exporters of MFA products to the United States in the year 1994: China, Hong Kong, Taiwan, China, South Korea, Mexico, Dominican Republic, India and the Philippines in that order. Table 3 shows the shares of these eight countries and Bangladesh in total MFA exports in years 1984, 1989 and 1994. Table 4 shows the shares of the same countries in the fourteen MFA categories chosen for the estimation of the pooled equation.

Table 5 focuses more directly on the six categories chosen for a detailed analysis. As already noted, these six categories include four most important categories among cotton exports and two among noncotton exports. The Table shows markets shares of the nine

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[16]For more details on MFA and its phase out, see Panagariya and Rao (1996) and Panagariya, Quibria and Rao (1996).

countries included in our sample. Though the share of Bangladesh does not exceed 10% for any year in any product--not a surprising fact given her size--, it has grown almost uniformly at a rapid pace. What is striking is that except in category 341 (cotton nonknit shirts for women and girls) India's share in these products in 1994 was less than that of Bangladesh. Even more surprisingly, in three out of the six products shown, the share of India who is viewed as a principal competitors of Bangladesh was less than 1% in 1994. The only country which accounts for more than 10% of total U.S. imports in every category for every year shown in Table 7 is Hong Kong. Other two countries which are significant across the board are Taiwan, China and China. Korea appears as an important exporter in only two categories, 634 and 635, and even in these categories her share has been declining rapidly.

Some further idea of Bangladesh's competitors can be gained by examining prices (unit values) of exports of the countries in our sample. In Table 6, we show these prices for the nine countries for years 1984, 1989 and 1994 for the same six MFA categories as in Table 5. The most striking fact which emerges from this Table is that the price received by Bangladesh is the lowest for every product in every year shown. Korea and Hong Kong are almost consistently at the top end of the distribution. In the first four products -- all of them cotton based -- Taiwan, China's prices are also at the top end. India, Dominican Republic, Mexico and the Philippines are broadly in the middle, though in some categories their prices approach those of Taiwan, China and Hong Kong. China used to be in the middle group but seems to have caught up with Korea and Hong Kong in almost all categories in 1994.

In Table 7, we report simple, pairwise correlations between prices of different countries in the sample for the 14 MFA categories listed in Table 2 over the entire sample period. A common mean across all 14 categories and years has been used to calculate the correlations. Not surprisingly, the correlations are remarkably high. Despite large differences in the level of prices across countries and products, they move together. The lowest correlations are those of Mexico's prices and even in that case, with one exception, they exceed .6. For Bangladesh, all correlations except that with Mexico, are larger than .83.

Finally, we need to confront the issue of whether or not quotas are binding. It will be too much to expect that quotas are binding in all years for all categories for all countries in our sample. All we can offer here is broad evidence in favor of the assumption. Several points may be noted. First, as a minimal defense, we note that a large body of the recent literature on the evaluation of the future impact of the MFA phase out under the Uruguay Round, based on Computable general Equilibrium models, uniformly assumes binding quotas (e.g., Whalley 1996). Second and more directly, Table 8 shows detailed data on quota utilization rates for 1993, the latest year for which we could obtain reliable data. We report quota utilization rates for the various products for all countries in our sample except Hong Kong.[17] These rates are remarkably high for virtually all countries in the majority of categories suggesting binding or near-binding quotas. Third, quota rents in most countries have been found to be positive even when the utilization rate is below 100%. Partly due to group quotas (see the next paragraph) and partly due to the manner in which quotas are administered, quotas seem to bind even when the utilization rate is below 100%. Finally, Dean (1991) has tested econometrically for whether the quotas are binding and concluded in

[17]The reporting year for quota utilization is from April 1, 1992 to March 31, 1993. Data for Hong Kong were not available but utlization rates for Hong Kong are known to be very high.

the affirmative.

It is important to remember that as Whalley (1996) points out, a less than 100% utilization rate need not indicate nonbinding quotas. This is because quotas on individual MFA categories can be accompanied by group quotas. For example, in addition to individual limits, categories 340 and 341 may be subject to a group limit. Because group limit is tighter than the sum of individual limits, the quota can become binding even before individual quota utilization rates reach 100%. Whalley quotes Chaudhry and Hamid (1988) who found that in 1983, "the overall United States quota for Pakistan was less than the aggregate of category-wide quotas by 13.4 percent."

Though we do not have the detailed information shown in Table 8 for all years, we can offer some additional information on quota utilization rates. According to Whalley who has studied various aspects of MFA extensively, quotas have been generally binding in Asia (including South Asia) though not in Latin and Central America. For example, for the year 1989, Whalley reports aggregate quota utilization rates of 89.9% for Bangladesh, 92.6% for China, 87.9% for Hong Kong, 72.8% for India, 95.1% for Indonesia, 84.7% for South Korea and 83.1% for the Philippines. For 1982, Trela and Whalley (1990) report quota-utilization rates of 100% for Hong Kong, 96.2% for South Korea, 106.5% for Taiwan, China, 75.3% for India, 75.4% for China, 70.0% for the Philippines and 88.9% for Dominican Republic. The rates for Mexico have been well below these rates: only 38.6% in 1982 and 41.3% in 1989.

3. Estimation and Results

Equation (5′) is the first-order condition which gives, for commodity X, the price of the variety imported from Bangladesh relative to that imported from country i. We can think of X as one of the MFA products such as 340 or 341. Because we will be estimating (5′) by pooling the data for fourteen products over a period of 11 years (1984-94), it is useful to rewrite the estimating equation with time and product superscripts t and r, respectively.

$$(14) \qquad \ln \frac{p_0^{rt}}{p_i^{rt}} = \lambda_i^r + (\beta_0^r - 1)\ln x_0^{rt} + (1-\beta_i^r)\ln x_i^{rt} + \mu_i^{rt} \qquad i = 1,\ldots,n; \qquad r \in \text{"MFA"}$$

where "MFA" denotes the set of the fourteen MFA products in our sample. The error term is subject to the following assumptions

$$(15) \qquad E[\mu_j^{rt}\mu_k^{rs}] = \begin{cases} \sigma_{jk}^r & \text{if } t = s, \qquad j \neq k, \\ 0 & \text{otherwise} \end{cases}$$

For a given MFA product r, we have as many estimating equations as the number of competitors Bangladesh faces. In our sample, this latter number is eight. According to our theoretical model, the coefficient associated with the quantity of imports from Bangladesh must be the same across all j. Given this cross-equation restriction, the natural procedure for estimation is SURE. Given the likely contemporaneous correlation in error terms across equations, Ordinary Least Squares estimates, though consistent, will be inefficient. SURE, on the other hand, are both consistent and efficient.

We have eight equations to estimate and our sample period spans 11 years from 1984 to 1994. This yields 88 (= 11x8) observations for each MFA category, r. Pooling the equations for all 14 categories, the total number of observations rises to 1232 (= 11x8x14). In the absence of product- and time-specific effects, there are 17 coefficients to be estimated: eight intercepts, eight elasticities with respect to imports from the eight competitors and one elasticity with respect to own imports. Thus, there are enough degree of freedom for this case as well as those involving product- and time-fixed effects.[18]

To estimate the pooled equation, we must assume that the slope coefficients across our fourteen MFA categories are identical; i.e., $\beta_i^r = \beta_i$ for all r. In addition, we assume that the assumption stated in equation (15) holds for all r. Table 9 reports the results of our estimation. The first column in this table shows $1-\beta_i$ along with their t-ratios in parentheses when no fixed effects are allowed. The second column allows for product specific fixed effects and the third for both product- and time-specific fixed effects.[19]

In the light of the low t-ratios or wrong signs for price coefficients encountered frequently in the literature, the results in Table 9 can be viewed as impressive. All of our coefficients are of the right sign. Moreover, with just one exception in each column (Dominican Republic in the first and Taiwan, China in second and third), these estimates are statistically significant at 10% or higher level of significance (using a two-tail test).[20] Even the t-ratio associated with the coefficient for Dominican Republic in the first column is 1.5 and that for Taiwan, China in the third column is 1.4. These are statistically significant at 10% level of significance using a *one-tail* test which is entirely justified in the present case.

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[18]In principle, with 88 observations per product and 17 coefficients, we have enough degrees of freedom to estimate the system of equations for each MFA product category in which we are interested. But we have been advised by Econometrician Ingmar Prucha that 11 observations per equation are, nevertheless, too few to yield robust estimates.

[19]There are 14 dummy variables representing product-specific fixed effects and 11 dummies representing time-specific fixed effects with no intercept term for each equation. This yields 25x8 = 200 additional coefficients.

[20]Recall that the coefficients in the first column are the result of eight regression equations each involving Bangladesh and one competing country. Associated with these regressions are eight intercept coefficients which, though not reported in Table 11, are also statistically significant at 5% or higher significance level.

The more remarkable point to note is that the values of the coefficients are uniformly small. Remembering that $\sigma_i = 1/(1-\beta_i)$, the σ_i are uniformly large, yielding a large response to a change in the relative price, holding the quantity of the competitor constant. For example, a coefficient of .02 implies a σ_i of 50.

As explained in the previous section, we can use the information on expenditure shares and the σ_i to derive the Marshallian price elasticities and the income elasticity of demand. This is done in Table 10. Because expenditure shares vary across years, these elasticities will also vary across years. For illustration, we have done our calculations for the year 1994. Moreover, the elasticities depend on σ_y, the elasticity of substitution between $g(\cdot)$ and other products. We have reported our calculations for $\sigma_y = .5$ and 5 but have done calculations for several values of σ_y ranging from 0 to 20. The estimates are not particularly sensitive to variations in this elasticity as is illustrated by the two cases shown in Table 10.[21] Though we do not wish to make much of any specific values of the elasticities, two broad points are worth emphasizing: (i) both own- and cross-price elasticities are large when compared to those found in the literature, and (ii) income elasticities are similar to those obtained by other investigators.

Given the paucity of cross-price effects, we are unable to compare our estimates to those of others, though we believe that they too are on the high side.[22] The major difference between our results and those of other investigators is in the own-price elasticity. As we noted

[21]This is perhaps because "within MFA" substitution is very large due to consistently large values of th σ_i and even a value of $\sigma_y = 20$ is not sufficient to outweigh that effect.

[22]Cross-price elasticities are unlikely to be higher than own-price elasticities and, as already noted, the latter are almost always less than 3 in the existing literature.

in the introduction, most investigators obtain estimates of this parameter that are less than 2, often less than 1; ours range from 60 to 136!

Three factors may have contributed to the high values obtained by us for this parameter. First, they may be the result of the particular estimation technique we have employed. We do not know why and in what way but this is a likely factor.[23] Second, the high estimates may be the result of the high degree of disaggregation in our data. When we take account of competitors at a highly disaggregated level, price responses are likely to be larger. Finally, measurement errors may have biased our coefficients downward which, in turn, lead to an upward bias in the elasticities. We hasten to add, however, that measurement error necessarily lead to a downward bias only when just one explanatory variable is subject to such error.[24] But when two or more explanatory variables are subject measurement errors, in general, the direction of bias is unknown and extremely complicated to calculate (Greene 1993, p. 279-284). In our specific case, it is entirely unlikely that only one of the explanatory variables is subject to measurement errors. Besides, if measurement error was a serious problem, the estimates would have been unstable across the three columns in Table 9. But that is not the case; specially, the estimates in the second and third columns are quite similar and t-ratios are uniformly high.

We believe that our results lend some support to the general presumption among trade

[23]Alan Winters has suggested that when the error term is attached to price rather than quantity, larger elasticity estimates may obtain. It is not clear why this should be so, however. In any case, for our context where MFA quotas make the quantity exogenous, there is a natural reason to attach the error term to the price.

[24]Even then, only the coefficient of the variable subject to measurement errors is necessarily biased downward. Other coefficients may be biased in either direction.

economists that in the presence of close substitutes, import demand elasticities should be high and certainly higher than the typical estimates obtained by empiricists in the literature.

4. Conclusions

In this paper, we have offered a detailed analysis of MFA exports from Bangladesh to the United States. We have focused on estimating the United States' demand for MFA imports from Bangladesh. Our analysis differs from the existing studies on the subject in four important ways. First, we use a new methodology which exploits the fact that MFA exports are subject to binding quotas. Second, there is a tight connection between out theoretical model and econometric estimation. Third, we take explicit account of competitors of Bangladesh. Finally, we use highly disaggregated data which makes unit values a more reliable measure of prices than when aggregate data are used.

The results of our estimation are relatively robust to the inclusion of commodity- and time-fixed effects. The most surprising finding is the consistently high value of the own-price elasticity. Though this high value accords with trade theorists' prejudice that small countries can essentially behave as price takers, it is in conflict with the consensus view that demand elasticities rarely exceed 3 and are usually less than 2 in the literature.

An exception to the consensus view is Riedel (1988, 1989) who finds that the elasticity of demand for Hong Kong's exports of manufactures is infinity. But Riedel reaches this conclusion by estimating an equation with price on the left-hand side and quantity on the right-hand side and finding that the coefficient of the quantity is not statistically different from 0. We have argued that this is not persuasive evidence. Moreover, like other researchers, Riedel also uses aggregate data and proxies the competitors' prices by the prices prevailing in the export markets rather than relying directly on the competitors' prices. By contrast, we use disaggregated data and rely on the prices of actual competitors. Most important, our high elasticities are based on statistically significant coefficients.

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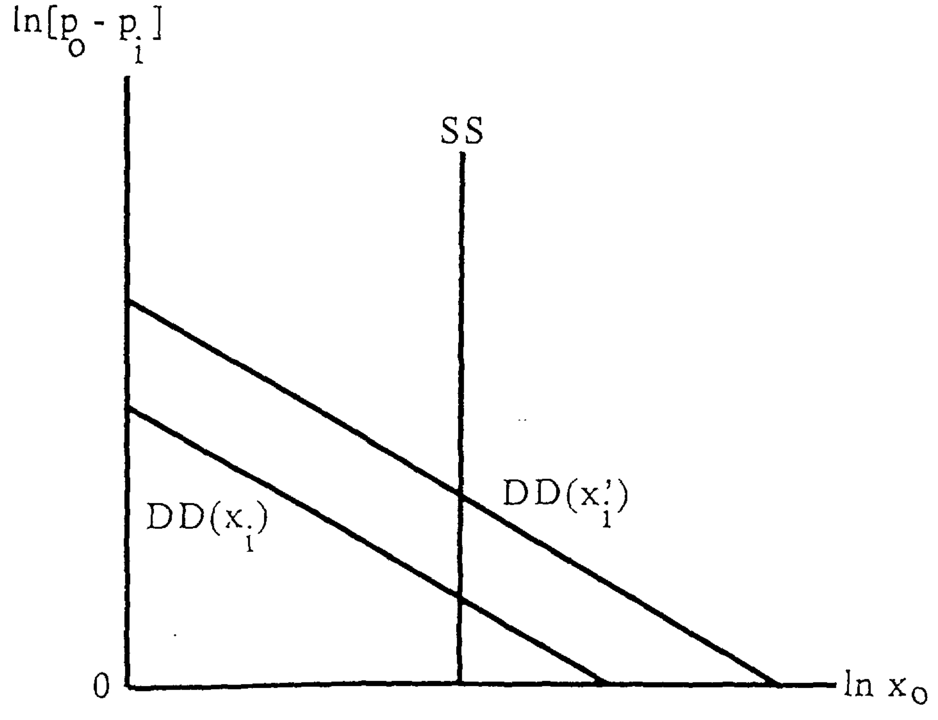

FIGURE # 1

Table 1

Long-Run Price Elasticities of Demand for Total Exports and Imports:
Representative Estimates from Previous Studies

	Total Exports									
Country	Houthakker-Magee (1969)	Goldstein-Khan (1978)	Hickman-Lan (1973)	Beenstock-Minford (1976)	Amano et al. (1981)	Basevi (1973)	Samuelson (1973)	Adams et al. (1969)	Gylfason (1978)	Stern et al. (1976)
Austria	n.a.	n.a.	-0.93	n.a.	n.a.	n.a.	-1.21	n.a.	...	-0.93
Belgium	...	-1.57	-1.02	-0.84	n.a.	n.a.	-1.14	...	...	-1.02
Canada	-0.59	n.a.	-0.84	-1.00	-0.33	-0.59	-1.10	-0.23	...	-0.79
Denmark	-0.56	n.a.	-1.28	n.a.	n.a.	n.a.	-1.06	n.a.	n.a.	-1.28
France	-2.27	-1.33	-1.09	-1.59	-0.34	n.a.	-1.28	-1.06	...	-1.11
Germany	-1.25	-0.83	-1.04	-1.90	-0.29	-1.68	-1.12	-0.65	-0.38	-1.11
Italy	-1.12	-3.29	-0.93	-1.91	-0.30	-0.72	-1.29	-0.25	-1.91	-0.93
Japan	-0.80	...	-0.50	-3.00	-0.81	-2.38	-1.04	-0.71	-2.13	1.25
Netherlands	...	-2.72	-0.95	-2.10	n.a.	-2.39	-1.07	-0.59	-0.88	-0.95
Norway	...	n.a.	-0.80	n.a.	n.a.	n.a.	-1.16	n.a.	n.a.	-0.81
Sweden	-0.47	n.a.	-1.99	n.a.	n.a.	-1.92	n.a.	n.a.	n.a.	-1.96
Switzerland	-0.58	n.a.	-1.01	n.a.	n.a.	n.a.	-1.51	n.a.	n.a.	-1.01
United Kingdom	-1.24	-1.32	-1.27	-1.47	-0.08	-0.71	-1.28	-0.48	-0.32	-0.48
United States	-1.51	-2.32	-1.38	n.a.	-0.32	-1.44	-1.13	-0.60	-0.62	-1.41

TABLE # 2

SHARE OF IMPORTANT CATEGORIES IN TOTAL MFA EXPORTS OF BANGLADESH FOR YEARS 1984, 1989, 1994

mfa code	DESCRIPTION	1984	1989	1994
331	*Cotton gloves*	0.11	0.30	0.13
334	*Other cotton coats mb*	5.53	2.34	1.30
335	*Cotton coats wgi*	5.61	2.36	2.20
336	*Cotton dresses*	1.94	1.16	0.79
338	*Cotton knit shirts mb*	1.75	2.50	2.77
339	*Cotton knit shirts wgi*	0.21	4.64	1.42
340	*Cotton nonknit shirts mb*	18.09	21.40	15.34
341	*Cotton nonknit shirts wgi*	25.53	10.63	9.49
342	*Cotton skirts*	0.92	1.11	0.52
345	*Cotton sweaters*	0.05	0.09	0.02
347	*Cotton trousers mb*	7.54	5.81	7.19
348	*Cotton trousers wgi*	9.79	8.04	4.62
351	*Cotton underwear*	0.11	3.06	2.80
359	*Other cotton apparel*	0.72	1.32	4.09
363	*Cotton pile towel*	0.66	0.83	1.13
369	*Other cotton manufactures*	0.19	0.14	1.57
634	*Other MMF coats mb*	2.53	2.11	4.58
635	*MMF coats wgi*	6.85	2.15	3.26
638	*MMF knit shirts mb*	0.27	1.12	1.74
639	*MMF knit shirts wgi*	0.30	1.13	1.52
640	*MMF nonknit shirts mb*	1.63	0.79	0.21
641	*MMF nonknit shirts wgi*	5.37	2.98	2.94
645	*MMF sweaters mb*	0.61	0.40	0.28
646	*MMF sweaters mgi*	0.00	1.10	0.65
647	*MMF trousers mb*	0.30	4.18	2.91
648	*MMF trousers wgi*	0.12	3.20	1.94
	TOTAL	96.73	84.89	75.41

Source : ITC's Published Annual Reports on MFA Trade

TABLE # 3

VALUE OF MFA EXPORTS AND SHARES IN TOTAL US IMPORTS
(in thousand dollars)

COUNTRY	1984	1989	1994
BANGLADESH	36064.0	328293.0	927394.0
	0.2	1.2	2.3
CHINA	1110584.0	3127057.0	4930599.0
	7.5	11.7	12.3
DOM. REPUBLIC	176433.0	666630.0	1618031.0
	1.2	2.5	4.0
HONG KONG	2091677.0	3686289.0	4405426.0
	14.2	13.8	11.0
INDIA	392006.0	742626.0	1520315.0
	2.7	2.8	3.8
MEXICO	265257.0	646854.0	1897351.0
	1.8	2.4	4.7
PHILIPPINES	375209.0	897637.0	1457012.0
	2.5	3.4	3.6
S KOREA	1872037.0	2938714.0	2448814.0
	12.7	11.0	6.1
TAIWAN,CHINA	2445754.0	3241722.0	2829705.0
	16.6	12.1	7.1
TOTAL BY 9 CTRIES	8765021.0	16275822.0	22034647.0
	59.5	60.8	55.1
USA MFA IMPORTS	14729000.0	26748795.0	39987821.0
	100.0	100.0	100.0

Source : ITC's Published Annual Reports on MFA Trade

TABLE # 4

VALUE OF EXPORTS AND MARKETS SHARES FOR 14 MFA PRODUCTS
(in thousand dollars)

COUNTRY	1984	1989	1994
BANGLADESH	30500.00	232613.00	610613.00
	0.58	2.40	3.88
CHINA	395440.00	875420.00	1289945.00
	7.57	9.04	8.21
DOMNIC REPUBLIC	84807.00	358924.00	837558.00
	1.62	3.71	5.33
HONG KONG	1289704.00	1714317.00	2068578.00
	24.69	17.71	13.14
INDIA	194422.00	333056.00	682175.00
	3.72	3.44	4.34
MEXICO	125588.00	318468.00	938011.00
	2.40	3.29	5.97
PHILIPPINES	163973.00	352430.00	621143.00
	3.14	3.64	3.95
S KOREA	601482.00	812229.00	791942.00
	11.51	8.39	5.04
TAIWAN,CHINA	884685.00	1211574.00	1057735.00
	16.93	12.52	6.73
TOT BY 9 CTRIES	3770601.00	6209031.00	8897700.00
	72.19	64.14	56.60
USA TOTAL	5223283.00	9680738.00	15719047.00

Source : ITC's Published Annual Reports on MFA Trades

TABLE # 5

MARKET SHARES FOR 6 SELECTED CATEGORIES

	code 340			code 341			code 347		
COUNTRY	**1984**	**1989**	**1994**	**1984**	**1989**	**1994**	**1984**	**1989**	**1994**
BANGLADESH	1.44	6.87	6.75	2.00	5.48	9.13	0.66	1.63	3.02
INDIA	9.24	6.94	6.35	20.61	21.65	22.27	0.38	0.45	0.44
DOM. REPUBLIC	0.98	2.72	1.77	1.25	0.97	0.41	3.44	11.68	16.75
PHILIPPINES	2.32	3.49	3.85	1.22	1.07	2.01	3.99	6.31	3.18
MEXICO	0.84	1.48	1.17	0.94	1.63	0.87	4.54	9.35	16.94
CHINA	6.36	3.88	3.18	3.89	4.08	5.09	8.94	9.43	4.61
S. KOREA	2.43	2.74	2.04	2.04	2.87	0.62	2.80	1.68	0.48
TAIWAN,CHINA	8.61	8.04	5.95	5.43	3.88	0.61	6.45	4.41	2.04
HONG KONG	36.03	22.09	14.24	35.13	28.28	22.66	30.66	17.27	10.61

	code 348			code 634			code 635		
COUNTRY	**1984**	**1989**	**1994**	**1984**	**1989**	**1994**	**1984**	**1989**	**1994**
BANGLADESH	0.47	1.82	2.09	_	1.42	4.30	0.61	1.28	3.07
INDIA	1.52	1.26	0.90	_	_	_	0.05	0.43	1.73
DOM. REPUBLIC	1.07	2.76	5.97	_	_	_	1.56	2.15	4.68
PHILIPPINES	2.61	2.16	3.30	4.18	5.19	5.58	3.36	3.56	6.14
MEXICO	3.28	4.67	11.17	_	_	_	0.98	1.27	1.76
CHINA	7.20	6.19	3.77	7.12	11.69	12.47	7.92	11.44	11.77
S. KOREA	1.75	1.82	1.41	31.88	26.74	22.79	23.23	20.07	10.28
TAIWAN,CHINA	5.58	4.86	2.42	24.83	21.30	16.16	24.67	18.35	9.40
HONG KONG	40.14	29.32	19.34	11.59	10.98	11.37	17.19	16.54	12.76

Source : ITC's Published Annual Reports on MFA Trade

_ : Indicates a market share of less than 0.01%.

TABLE # 6

UNIT PRICES FOR 6 SELECTED CATEGORIES

	code 340			code 341			code347		
COUNTRY	1984	1989	1994	1984	1989	1994	1984	1989	1994
BANGLADESH	1.07	1.82	2.77	2.26	2.43	3.89	1.49	2.81	4.19
INDIA	1.62	3.18	4.13	2.42	3.91	5.4	3.27	5.23	4.57
DOM. REPUBLIC	1.42	2.76	2.86	3.44	3.35	3.85	2.5	4.45	4.88
PHILIPPINES	1.32	2.89	4.21	2.39	4.65	4.84	3.56	5.44	4.8
MEXICO	2.57	3.6	4.01	3.4	3.41	4.6	2.95	4.15	5.23
CHINA	1.78	3.15	4.02	2.57	5.27	6.64	2.82	5.43	5.2
S. KOREA	2.36	4.14	4.46	4.7	8.2	9.51	5.16	7.34	6.94
TAIWAN,CHINA	2.34	3.94	4.54	4.8	6.24	5.67	4.26	6.18	4.91
HONG KONG	2.63	4.22	5.67	4.35	6.57	7.25	4.37	6.6	6.31

	code 348			code 634			code 635		
COUNTRY									
	1984	1989	1994	1984	1989	1994	1984	1989	1994
BANGLADESH									
INDIA	1.54	2.97	3.66	1.54	2.2	3.83	1.5	2.12	3.02
DOM. REPUBLIC	2.9	4.94	4.86	3.33	3.02	4.73	1.69	2.57	3.22
PHILIPPINES	2.94	3.4	4.16	2.33	2.3	1.73	2.86	3.5	4.68
MEXICO	2.29	4.98	4.77	1.72	2.8	3.87	1.1	2.72	4.78
CHINA	2.73	4.07	4.72	2.53	3.86	4.51	2.5	3.62	3.26
S. KOREA	2.66	5.48	5.87	1.64	3.6	6.35	1.77	3.81	6.13
TAIWAN,CHINA	4.39	7.58	6.33	3.45	5.28	6.84	3.79	6.55	9.12
HONG KONG	3.84	6.98	5.31	2.7	4.09	4.54	3.24	4.84	3.93
HKG	3.96	6.94	5.98	2.62	5.25	6.85	2.65	4.9	5.03

Source : ITC's Published Annual Reports on MFA Trade

TABLE # 7

Correlation Analysis of the Unit Prices for 14 categories(1984-1994)

	Bangladesh	China	Drp. Rep.	Hong Kong	India	Philippines	S. Korea	Mexico	Twn,China
Bangladesh	1								
China	0.891	1							
Drp. Rep.	0.834	0.785	1						
Hong Kong	0.929	0.941	0.849	1					
India	0.834	0.812	0.767	0.857	1				
Philippines	0.936	0.927	0.849	0.973	0.851	1			
S. Korea	0.891	0.947	0.832	0.949	0.774	0.937	1		
Mexico	0.747	0.734	0.762	0.733	0.702	0.708	0.692	1	
Twn,China	0.869	0.885	0.818	0.964	0.811	0.949	0.932	0.635	1

Source: ITC's Published Annual Reports on MFA Trade

TABLE - 8
PRODUCT-WISE QUOTA UTILIZATION RATE IN SOME OF
FOR YEAR 1992-93 AND 1993-94

COUNTRY	1992.93	1993.94
BANGLADESH		
334 OTH COATS M&B	100.00	89.56
335 COATS, W.G.I.	100.00	91.11
338/339	100.00	100.00
340/640 COMB CATS	100.00	100.00
341 BLOUSE,NK, W.G.I	100.00	99.96
347/348 COMB CATS	100.00	100.00
351/651	100.00	100.00
634 O/COATS M&B	100.19	100.00
635 COATS, W.G.I	100.00	100.00
638/639 COMB CATS	100.00	92.93
641 BLOUSE,NK,WGI	100.00	100.00
647/648 COMB CATS	100.00	93.46
CHINA		
334	100.00	
335 COATS WGI	100.00	
338/339	100.00	
340 M&B SHIRTS	100.00	
341 W&G SHIRTS NKNIT	85.30	
347/348	100.00	
351 NIGHTWEAR	100.00	
634 OTHER M&B COATS	100.00	
638/639	100.00	
641 W&G SHIRTS	90.15	
647 M&B TROUSERS	100.00	
648 WG TROUSERS	100.00	
TAIWAN,CHINA		
333/334/335	87.10	76.92
(335) COATS W&G	75.92	75.71
338/339	99.63	99.40
340 M&B SHIRTS NK	98.73	93.98
341 W&G SHIRTS NK	66.91	58.45
347/348	94.44	98.03
351 NIGHTWEAR/PJ'S	87.78	99.20
633/634/635	92.27	87.18
(633/634)	75.85	83.69
(635) COATS W&G	86.82	72.38
638/639	92.98	98.56
641 BL/SH NK W&G	55.75	33.16
647/648	96.46	98.60

DOMN. REPUBLIC		
338/638	96.16	93.58
339/639	93.66	100.00
340/640	95.48	99.30
342/642	55.84	44.65
347/348/647/648	83.60	95.31
(347/348) SUBLEVEL	90.41	84.43
351/651 COMB CATS	99.67	93.24
(647/648) SUBLEVEL	26.85	27.03
INDIA		
335/635	100.00	97.74
340/640	100.00	100.00
341 - W&G NK BLOUSES	100.00	100.00
347/348 COMBINED	100.00	100.00
641 - W&G NK SHIRTS	100.00	100.00
647/648 COMB. CAT.	100.00	100.00
334/634	75.61	91.58
351/651	76.28	88.30
S. KOREA		
333/334/335 COMBINED	93.82	83.58
338/339 COMBINED	97.46	98.83
340 - M&B NK SHIRTS	98.87	97.44
341 - W&G NK SHIRT	81.89	53.61
347/348 COMB CATS	99.82	82.84
351/651	93.60	94.51
633/634/635	99.23	98.03
638/639 COMBINED	69.41	72.80
640-D* LEVEL	68.20	59.33
641 - W&G SHIRTS	66.21	81.61
647/648 COMBINED	78.45	71.76
MEXICO		
334/634	39.70	56.23
(335)NON-SR	23.62	17.70
335/SR/LIMIT	14.09	6.45
(338/9/638/9)NON-SR	30.35	51.92
338/9/638/9/SR/LIMIT	70.55	59.48
(340/640)NON-SR	81.28	62.88
340/640/SR/LIMIT	61.16	67.34
341/641	74.04	81.83
347/8/647/8NON-SR	99.46	93.62
347/8/647/8/SR/LIMIT	97.20	80.42
351/651NON-SR	89.78	70.44
351/651/SR/LIMIT	91.57	91.93
PHILIPPINES		
333/334	69.11	78.55
335 W&G COATS	83.12	100.00
338/339	100.00	85.02

340/640	95.66	99.18
341/641	89.42	86.03
347/348	85.66	100.00
351/651	95.58	87.45
634 OTHER M&B COATS	100.00	100.00
635 W&G COATS	97.29	100.00
638/639	94.18	82.90
647/648	98.28	99.09

TABLE # 9

Estimation of the System of Equations for 14 important categories using different Estimation Procedures

	SUR ESTIMATES	SUR ESTIMATES WITH PRODUCT FIXED EFFECTS	SUR ESTIMATES WITH BOTH FIXED EFFECTS
Country Equations	Estimated Coefficient (t-statistic)	Estimated Coefficient (t-statistic)	Estimated Coefficient (t-statistic)
Bangladesh	-0.0207 (-1.88)	-0.017 (-1.66)	-0.034 (-2.26)
Bangladesh China	0.076 (3.44)	0.094 (2.88)	0.037 (2.61)
Bangladesh Dom. Rep.	0.024 (1.5)	0.04 (2.61)	0.064 (3.93)
Bangladesh HongKong	0.082 (6.64)	0.063 (2.24)	0.07 (2.71)
Bangladesh India	0.039 (4.55)	0.07 (6.88)	0.067 (5.62)
Bangladesh S. Korea	0.077 (6.4)	0.16 (7.02)	0.15 (7.6)
Bangladesh Philippin.	0.093 (4.18)	0.11 (4.16)	0.14 (4.66)
Bangladesh Mexico	0.064 (4.22)	0.097 (4.7)	0.07 (3.1)
Bangladesh Taiwan,China	0.077 (6.03)	0.005 (0.14)	0.044 (1.4)

Notes:
#- In the estimation of the t-statistic, the Standard Errors are computed from heteroscedastic-consistent covariance-variance matrix (White's Procedure).

TABLE#10

Price and Income Elasticities of Bangladesh
for the 14 MFA Categories

	Using SUR Estimates		Using SUR Estimates With product fixed effects		Using SUR Estimates With both fixed effects	
Elasticities	σ_y=0.5	σ_y=5	σ_y=0.5	σ_y=5	σ_y=0.5	σ_y=5
Bangladesh	-136.79	-123.05	-127.6	-121.55	-67.28	-60.65
China	4.03	3.40	2.09	1.91	5.86	4.85
Drp. Rep.	8.3	7.01	3.19	2.91	2.2	1.81
Hong Kong	5.99	5.06	5.01	4.57	4.96	4.09
India	4.16	3.51	1.48	1.35	1.71	1.41
Philipinnes	1.58	1.34	0.86	0.78	0.74	0.61
S Korea	4.15	3.51	1.48	1.35	1.71	1.41
Mexico	3.48	2.94	1.47	1.34	2.25	1.85
Taiwan,China	3.26	2.75	32.3	29.47	4.04	3.33
Income Elasticity	1.97	1.66	1.26	1.15	1.39	1.14

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