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INTERNAL QUOTA ALLOCATION SCHEMES AND THE COSTS OF THE MFA

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ABSTRACT

This paper suggests that schemes used within developing countries to allocate textile export quota among domestic producers typically have more severe negative effects on developing country economic performance than the MFA export quotas themselves. We summarize allocation schemes in 17 countries, highlighting common 'lock-in' and 'rent dissipation' effects of such schemes. We then use a global general equilibrium model to evaluate the effects of MFA removal with and without these additional effects. Results indicate that estimates of gains to developing countries from an MFA removal are larger and by significant orders of magnitude (we suggest a factor of 8) when internal quota allocation schemes are also included. Removing the negative effects of quota allocation schemes thus seems to clearly dominate traditional access benefits to developing countries from MFA removal.

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I. Introduction and Summary

A number of recent studies have estimated the effects on developing countries of restrictions on their textile and apparel exports under the Multi-Fibre Arrangement (MFA). Impacts on individual countries reflect the relative importance of foregone exports on the one hand, and acquired rents from export quotas on the other.[1] However, little attention has been given to the further effects on exporting countries of their own internal quota allocation procedures. These procedures allocate individual developing country quota in industrial country export markets among domestic producers. Quotas are typically allocated to established rather than new and more efficient producers, and remaining quota rents are also partially dissipated by various quota allocation rules, such as those which require shipments to non-quota restricted markets in order to receive export quota in restricted markets.

This paper analyzes the effects such schemes can have on estimates of costs to developing countries of the MFA. We use a global general equilibrium model to analyze the effects of the MFA with and without an explicit modelling of these quota allocation schemes. As in earlier joint modelling work (Trela and Whalley (1990a, 1990b)) we analyze MFA quotas negotiated between three major developed importing countries (the U.S., Canada, and the EC) and 34 supplying developing countries under the terms of the MFA applying in mid-1980's (MFA III) and base our analysis on 1986 data. Due to the lack of reliable data on cost differentials between new and established producers, we make assumptions on key parameters, and explore the robustness of the main themes of our results through sensitivity analysis.

In the central case estimates we report gains to developing countries from MFA elimination are $26 billion per year compared to a comparable estimate of $3 billion in the model without internal quota allocation schemes, an increase by a factor of 8. Gains to developed countries from a removal of trade restrictions in the textile and apparel area increase

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[1]See, for example UNCTAD (1986) and Kirmani et al. (1984); and Trela, Whalley (1990a, 1990b).

to around $22 billion per year, around a one-and-a-half-fold increase.

We suggest the reasons for these large differences lie in the ways in which internal quota allocation schemes compound with MFA export quotas as traditionally analyzed. Quota allocation schemes tend to exclude new producers, creating an inefficiency which adds to that conventionally analyzed when MFA quotas alone are examined. Hence, the MFA quota premium and the cost differential between new and existing producers compound to yield a single differential between developed country consumer prices and the lowest cost developing country supply price. This combined differential is one of the key determinants of the cost of the combined system of restrictions. Since the cost of trade restrictions increases with the square of the differential (Harberger's triangle rule), costs to developing countries increase sharply when internal quota allocation schemes are analyzed alongside MFA quotas. In addition, the further deadweight losses from cost differentials between new and established producers and rents dissipated by quota allocation rules have to be factored in, yielding the larger effects we report.

II. The MFA and Internal Quota Allocation Schemes

The Multi Fibre Arrangement (MFA) contains a series of bilaterally negotiated quota restrictions covering trade in textiles and apparel between individual developed and developing countries.[2] It is renegotiated every few years under the auspices of the GATT Committee on Textiles.[3] Its origins lie in the Short-Term Arrangement Regarding International Trade in Cotton Textiles (STA) negotiated between the U.S. and Japan in 1961. This grew into a Long-Term Arrangement (LTA) in 1962, lasting (with extensions) until the beginning of the MFA in 1974. Through three successive renegotiations, the MFA has grown to encompass a successively wider range of products and countries. The spread of these restrictions has been part of a wider growth in product-specific trade measures used by developed countries against

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[2]Since its inception, the MFA has dealt almost exclusively with exports from developing countries. Over the period, however, restraints have been applied to Japanese and some East European exports as well.

[3]MFA I lasted from January 1974 to December 1977; MFA II from January 1978 to December 1981; MFA III from January 1982 to July 1986; MFA IV was adopted in August 1986 and runs until July 1991.

developing countries in the 1970s and 1980s.[4]

There are currently nine developed country participants in the MFA: the U.S., Canada, the EC, Austria, Finland, Norway, Sweden, Japan and Switzerland, although the latter two do not currently apply MFA restrictions on imports.[5] Developing country participants in the MFA are more numerous, currently numbering thirty-two.[6] The GATT incompatibility of the MFA has never been tested through the dispute settlement procedures of the GATT, but it is almost certainly inconsistent with several GATT articles (including Article 1 (non-discrimination) and Article 24 (bilateral trade agreements)) to name but two.

During the period in which MFA restrictions have operated, various quota allocation schemes have evolved within exporting countries. These reflect how country export quotas are allocated within the country among actual or potential exporters. These schemes change over time, but they all involve various eligibility criteria which govern how existing quotas are allocated, whether or not producers retain them from one year to the next, how new quotas are allocated among producers, how large the new quota pool is, and which quotas (if any) may be traded.

Table 1 summarizes how these schemes operate in a sample of developing countries, with more detail provided in Appendix A.[7] Quota allocation schemes from seventeen

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[4]Other restricted manufactured products include steel and steel products, machine tools, cutlery, footwear, automobiles, consumer electronics and some agricultural commodities.

[5]Other developed countries, including Australia and New Zealand, and, for a period of time, Norway, have chosen to rely on GATT compatible global import quotas (Article 19 measures) to restrict their imports of textiles and apparel. Australia participated in the earlier Long-Term Agreement (LTA) and in the MFA I until December 1974, when the Australian government imposed global "tariff quotas" outside the MFA. New Zealand has never participated in these special arrangements, although throughout the period since 1961, imports of textiles and apparel have been subject to import licensing arrangements, the majority of which involve global quotas. Norway participated in the LTA and MFA I, but did not participate in MFA II. In 1979, Norway introduced global quotas, but these were phased out within one year after Norway accepted the 1981 Protocol of Extension to the MFA in July 1984.

[6]As of June 1990, these were Argentina, Bangladesh, Brazil, China, Colombia, Costa Rica, Czechoslovakia, Dominican Republic, Egypt, El Salvador, Guatemala, Hong Kong, Hungary, India, Indonesia, Jamaica, South Korea, Macau, Malaysia, Mexico, Netherlands Antilles, Pakistan, Peru, Phillipines, Poland, Romania, Singapore, Sri Lanka, Thailand, Turkey, Uruguay, and Yugoslavia. Japan is also a member of the MFA as an exporting country. (U.S. Department of Commerce (1990)).

[7]The quota allocation schemes described for the Dominican Republic, Haiti, Costa Rica, and Jamaica reflect the allocation of quota resulting from bilateral trade agreements with the U.S.

Table 1

Main Features of Quota Allocation Schemes in a Sample of Developing Countries

	Transferability	Allocation Criteria for Basic/ Closed/Permanent Quota	Allocation Criteria for Increases, Surrendered, New and Residual/ Open/Temporary Quota	Penalty for Unfilled Quota	Entry
A) NICs					
Korea	Some portion of basic quotas are tradeable. Open quota are non-tradeable.	Quota allocation based on two-tier system: basic allocation and open allocation. Basic quotas comprise 80-85% of total quota and are distributed on basis of past export performance.	Open quota comprises 15-20% of total quota, increases in total quota and surrendered quota. Open quota are open to all exporting firms and are distributed according to explicit criteria.	Penalty for non-fulfilment of basic quotas is a 50-100% deduction of unfilled quotas for the following year. For non-fulfilment of open quotas, the penalty is a 200% deduction.	15-20% of total quota available to new producers.
Taiwan	Trade allowed through Taiwan Textile Federation.	Available quota divided into two parts: temporary quota, valid for the present year only, and permanent quota, valid for all future periods.	n.a.	n.a.	n.a.
Hong Kong	Two types of transfers are permitted: temporary and permanent.	Quotas distributed on basis of past export performance. Quota holders using at least 95% of their allocation will receive full allocation the following year plus any growth in quota.	Residual quotas are placed in a 'free quota pool' from which all firms can apply. Only producers utilizing at least 95% of their quota are eligible for free increases.	The penalty for utilizing only 50-95% of quota allocation is a 100% deduction of unfilled quotas for the following year. The penalty for utilizing less than 50% is a loss in all quota rights for the following year. The penalty for not fully utilizing free quota from the pool is a loss in future access to the pool. The penalty for transferring more than 50% of your total quota allotment over two consecutive years is a 25% deduction of the amount transferred out in the two years for the third year.	n.a.

Table I (cont'd)

	Transferability	Allocation Criteria for Basic/ Closed/Permanent Quota	Allocation Criteria for Increases, Surrendered, New and Residual/ Open/Temporary Quota	Penalty for Unfilled Quota	Entry
B) ASEAN					
Malaysia[1]	No trade allowed.	Past export performance based on one of two formula approaches.	Only producers utilizing at least 80% of their quota are eligible for free increases in quota volumes; further export volumes are allocated to existing producers according to specific criteria.	Unused quota must be surrendered; otherwise quota for following year will be cut by 30% of unfulfilled quota.	Newcomers allowed entry only when existing quota holders consistently utilize only 70% or less of their allocated quotas.
Thailand[1]	No trade allowed.	Quotas divided into two parts: principle and residual. Principle quotas distributed on basis of past export performance.	Producers using at least 50% of principle quotas are eligible for residual quotas. Residual quotas distributed monthly, with 20% allocated to international trading firms and 80% to producers with or without principle quotas according to explicit criteria.	Unused principle quota must be surrendered; otherwise quota for following year will be cut. At least 90% of residual quotas must be used; otherwise producers not allowed additional residual quotas for 1 to 4 months.	Residual quotas available to new producers.
Philippines[1]	Trade allowed only under supervised transfer scheme.	Quota allocation based on two-tier system: basic allocation and residual allocation. Under basic allocation, quota holders utilizing at least 90% of their allocation receive full allocation the following year.	In the allocation of residual quotas, performers given preference over non-performers in heavy demand (critical) categories; a first-come first-served basis is used for allocating quota for semi-critical categories; for non-critical categories, priority given to non-performers. Quota increases are allocated only to producers using at least 90% of basic quota.	Unused quotas must be surrendered. Those utilizing 65-90% of their allocation lose automatic restoration rights, but after paying a fine are given preference in allocation of residual quota. A quota holder using less than 50% loses privileged access to additional residual quotas.	New producers enter by sub-contracting of production from quota recipients.
Indonesia	Trade allowed only through Indonesian Commodity Exchange under supervised scheme.	Quota divided into three types: permanent, temporary and borrowed. Permanent quotas distributed on basis of past export performance.	Temporary quotas allocated 3 times in a quota period to producer exporters satisfying explicit requirements. Borrowed quotas allocated only to exporters who hold enough quota, and must be returned in the following year. New quotas allocated as permanent quotas: 70% to permanent and temporary exporters on basis of past export performance; 17.5% to	Penalty for non-fulfillment of permanent, borrowed and transferred quotas is a deduction of unfilled quota the following year. Penalty for non-fulfillment of permanent quota within specified time frame is a 50% deduction of unfilled quota the following year. Exporters not fulfilling temporary quotas will not be permitted to reapply for tem	12.5% of new quotas and 40% of quotas from growth allocated to newcomers.

Table 1 (cont'd)

	Transferability	Allocation Criteria for Basic/ Closed/Permanent Quota	Allocation Criteria for Increases, Surrendered, New and Residual/ Open/Temporary Quota	Penalty for Unfilled Quota	Entry
			small permanent exporters; and 12.5% to newcomers (permanent exporters). Quotas from growth allocated as permanent quotas: 60% to small permanent exporters and co-operatives; and 40% to newcomers (permanent exporters).	porary quota for that category.	
C) SOUTH ASIA					
India	Trade is allowed, but third-party exports are not.	Quotas allocated on a closed and open system. Under closed system, 65% of total quota allocated on basis of past performance, 10% are distributed to manufacturer exporters, another 2% to central/ state corporations, while 3% are given to those who develop exports to non-quota countries.	20% of total quota given under open system according to rationing criteria based on 'cut-off' price.	n.a.	20% of total quota available to new producers.
D) LATIN AMERICA					
Brazil	n.a.	Quota divided into two parts. 90% allocated to existing exporting companies according to past performance.	10 percent of total quota allocated to newcomers and to those who need additional quota.	Penalty for non-fulfilment is a reduction in allocation in the subsequent period.	10% of total quota available to new producers.
Mexico	n.a.	Quota allocated according to explicit criteria.	Same as allocation criteria for basic quota.	n.a.	n.a.
Peru	n.a.	Quotas allocated by producers themselves on basis of past export performance and effective utilization of quota.	Residual quotas allocated to newcomers and to those who need additional quota.	Unused quota must be surrendered.	Residual quotas available to new producers.
Uruguay	n.a.	Quota allocation does not pose a problem as quota is bigger than export capacity.	Same as allocation criteria for basic quota.	n.a.	n.a.

Table 1 (cont'd)

	Transferability	Allocation Criteria for Basic/ Closed/Permanent Quota	Allocation Criteria for Increases, Surrendered, New and Residual/ Open/Temporary Quota	Penalty for Unfilled Quota	Entry
E) CENTRAL AMERICA & CARIBBEAN					
El Salvador	n.a.	Quotas allocated according to requirements of enterprises.	Same as allocation criteria for basic quota.	n.a.	n.a.
Dominican Republic	Quota remains the property of state, but sale of allocations occur.	Quotas distributed on basis of average exports in the three previous years plus 25%.	New entrants allocated residual quotas according to capability. Growth allowed in second and subsequent years according to specific rates for individual categories. Further export volumes are allocated, weighted by reference to value-added generated in the country. Companies performing above average granted an additional 10%, while those performing below average have theirs reduced by 5%.	Penalty for non-fulfilment is a deduction of unfilled quota for the following year.	Residual quotas available to new producers.
Haiti	In theory, no trade allowed, but in practice, third-party exports occur.	Quotas distributed on basis of historic performance, but weighted for smaller companies.	Same as allocation criteria for basic quota.	n.a.	n.a.
Costa Rica	n.a.	Quotas distributed on basis of past performance.	Same as allocation criteria for basic quota.	n.a.	n.a.
Jamaica	n.a.	Quotas distributed on basis of past performance.	Further export volumes are allocated, weighted by reference to explicit criteria.	n.a.	n.a.

n.a. - not available/applicable

Notes: [1] This is the quota allocation scheme as described in Hamilton (1986b).

Source: Siamwalla (1989), Suphachalasai (1989), Bark (1989), Morkre (1979), Law (1981), Business India (1987), Kumar et al. (1988), Hamilton (1986b, 1988), Kumar and Khanna (1990), and private communication with Sanjoy Bagchi of the ITCB, and the Indonesian Delegation to the GATT.

countries are reported; the three Asian NICs who account for around 60% of developing country exports of apparel; four major ASEAN countries (Thailand, Malaysia, Philippines, and Indonesia); and a series of other countries in South Asia and Latin and Central America. Obtaining information such as this is surprisingly difficult, and our choice of countries for this purpose largely reflects the availability of information to us.

As can be seen, the majority of quotas are nontradeable. In seven out of the seventeen countries in Table 1, some degree of trading in quotas is allowed; but in all such cases, except Hong Kong, it is quite limited in scope. Quotas are largely allocated to established producers if they fill a specified fraction of the quota allocated to them in the previous year. Some degree of reallocation of quotas to new producers occurs in nine out of the seventeen countries, but again such reallocations are quite limited.

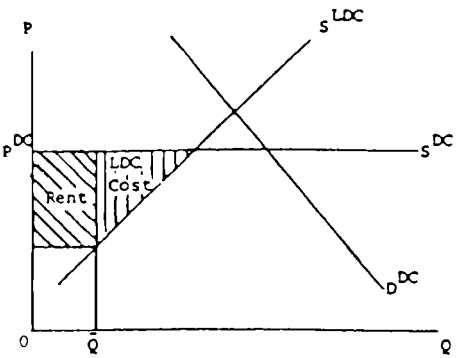
These quota allocation schemes also result in rent dissipation, with quota retention being dependent on quota utilization and new quota allocation being dependent on meeting specified criteria, such as shipment to third country (non-quota restricted) markets. Hence, internal quota allocation schemes have effects beyond those encountered in traditional analysis of MFA restrictions (rent transfers and limits on market access). Entry restrictions apply under which established producers are allocated most of the quota and new producers, even if they are more efficient, are denied access to export markets. In addition, eligibility criteria have the effect of causing some of the rents derivable from ownership of quota to be dissipated.

What we analyze here is how these two additional effects interact with the traditional effects of the MFA as conventionally analyzed. For this purpose, we use a global numerical general equilibrium model, but some initial intuition as to how these effects might work themselves out can be drawn from simple demand-supply analysis. In Figure 1, we consider a small apparel exporting country facing MFA quota restrictions on its exports to a large developed country market. Panel (a) considers the case considered by previous literature, i.e. where the developing country gains rents from quotas, but bears a cost from foregone exports through restricted market access. Panel (b) considers the case where there are two types of producers; low cost and high cost suppliers and export quotas are allocated to high cost

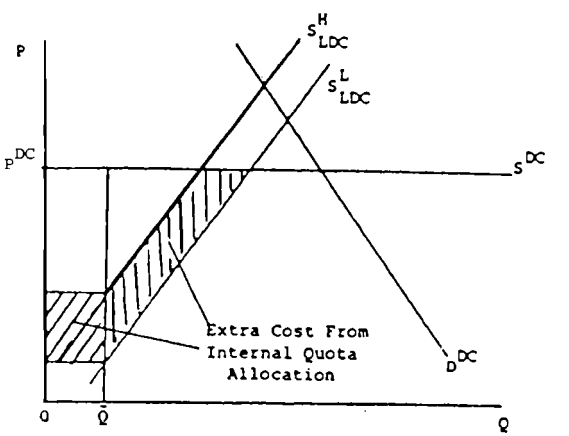
Figure 1

The Effects of Internal Quota Allocation Schemes on Costs of Textile Restraints to Developing Country Exporters

(a) No cost differentiation across suppliers



(b) With cost differentiation across suppliers



suppliers (through quota reallocation to established producers).

This simple demand-supply analysis clearly suggests that there are added costs created by internal quota allocation procedures. The two schemes (MFA and internal quota allocation) compound one with another. The added costs of the internal quota allocation scheme are directly related to the size of the quota premia from the MFA quotas in the ways suggested above. The diagrams also suggest that the export expansion effects accompanying any elimination of the MFA will be considerably larger when quota allocation schemes are taken into account, and that the costs to developing countries of the combined MFA/internal quota allocation scheme will be larger. How large these effects are, and indeed how applicable this simple intuition is to present day trade restrictions on textiles and apparel is the motivation for our use of the more complex general equilibrium model to which we now turn.

IV. A General Equilibrium Model for Analyzing the Joint Effects of Bilateral Restrictions Under the MFA and Internal Quota Allocation Schemes

To quantify the joint effects of MFA quotas and internal quota allocation schemes, we use a global general equilibrium model (see Trela and Whalley 1990b)) which includes internal quota allocation schemes in exporting countries. This model also allows results for elimination of trade restrictions on textiles and apparel to be compared with and without internal quota allocation schemes.

The model covers three major developed country importers, the U.S., Canada, and the EC, thirty-four developing country exporters,[8] fourteen specific textile and apparel product

[8]These are: Bangladesh, Brazil, Bulgaria, China, Columbia, Czechoslovakia, Cost Rica, Dominican Republic, Egypt, Guatemala, Haiti, Hong Kong, Hungary, India, Indonesia, Republic of Korea, Macau, Malaysia, Mauritius, Mexico, Nepal, Pakistan, Panama, Peru, Philippines, Poland, Romania, Singapore, Sri Lanka, Taiwan, Thailand, Turkey, Uruguay, and Yugoslavia.

categories,[9] and one composite other good.[10] The fourteen product categories reflect the constraints implied by generating a cross country data set covering trade under the different MFA quota categories used by the major importing countries (the U.S., Canada, and the EC).[11]

Production in each country involves nested constant elasticity of transformation (CET) production possibilities frontiers involving the fourteen textile and apparel products and composite other good (residual GDP). Consumer demands reflect utility maximizing behaviour, with a single demand side agent assumed in each country; nested constant elasticity of substitution (CES) functions are used. More details, including an algebraic statement of the model, are given in Appendix B.

In the model, all developed countries are treated as net importers of textiles and apparel (and exporters of the other good), while all developing countries are modelled as exporters of textiles and apparel (and importers of the other good). Interdeveloped country trade is quota (although not tariff) free. Thus, the model captures trade diversion effects between developed countries due to their joint bilateral quotas on exports by developing countries. Domestic prices in the various developed countries in the model therefore depend on the quota policies of all developed countries, not only their own. Trade in textiles and apparel among developing countries is assumed away ; otherwise differences in supply prices in the model between these countries would be arbitraged away.

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[9]The fourteen textile and apparel products in the model involve seven restricted and seven comparable unrestricted products. This approach is employed because despite the MFA, significant volumes of trade in textiles and apparel take place in unrestricted quota categories. If products in unrestricted categories are treated as perfect substitutes for quota restricted products, then in a competitive model countries would substitute costlessly into products not subject to quota. In practice, there are differences below the level of aggregation in what is restricted and what is unrestricted and, in addition, a number of bilateral agreements include provisions for consultations that can result in unrestricted products being brought under restraint. An assumption of qualitative differences between comparable restricted and unrestricted categories is the way we treat this difficulty in the model.

[10]We define the composite other good to be residual GDP.

[11]We were unable to include all the MFA quota categories in each country since they include products which belong to more than one of the fourteen specific product categories we identify in our model. The categories not included are: handkerchiefs (categories 330 and 630), gloves (331, 431 and 631) and other apparel (359, 459, 659) in the U.S.; work gloves (31) and swimwear (44) in Canada; and handkerchiefs (19), knitted gloves (10), swimwear (72), shawls and scarves (84), woven ties (85), and other clothing accessories (88) in the EC.

Importantly, the model treats goods as homogeneous between countries, rather than heterogeneous (the Armington assumption) as is commonly done in other applied general equilibrium trade models (see the discussion of the Armington assumption in Shoven and Whalley (1984)). The reason for using this assumption is that it greatly reduces the dimensionality of the equilibrium problem to be solved relative to an Armington type approach, as well as the difficulties in separating out data by country so as to incorporate product quality differences across countries. Also, the need to deal with cross hauling (countries both importing and exporting the same product), which in part motivates the use of the Armington assumption in other models, does not arise here in the same way since little two way trade between developed and developing countries occurs in textiles and apparel. In addition, the Armington assumption is well known for the strong and often artificial terms of trade effects it induces in numerical results (Brown (1987)).

The model also incorporates the internal quota allocation schemes which are the focus of this paper. Lock-in effects of entry restrictions against lower cost producers due to quota allocation schemes are captured by assuming that there are two types of producers for quota restricted textile and apparel items in each exporting developing country; low and high cost. Only high cost producers supply the export market (because export quotas are allocated only to established producers), while new and more efficient producers supply the domestic market. Under this treatment, quota allocation procedures have the effect of partially dissipating potential rents from export quotas negotiated with developed countries. These dissipated rents represent a resource loss for each of the developing countries in the model, and are captured in the model by having each exporting country operate interior to their production possibilities frontier in the base case solution of the model (where quota allocation schemes are present). Removal of both MFA restrictions and quota allocation procedures shifts production to the frontier. The magnitude of these shifts equals the product of the cost differential between the two producer classes in each developing country, and the value (at domestic prices) of exports of restricted textile and apparel items.

Once specified, the model is calibrated to a 1986 microconsistent data set representing

production, consumption, and trade in the fourteen textile and apparel product categories and one other good (residual GDP) represented in the model, for each of the thirty-seven countries captured. This provides the benchmark equilibrium around which counterfactual equilibrium analysis is performed in the model for various policy changes. In equilibrium in the model, all markets clear and external sector balance conditions by country hold. Export quotas have the effect of segmenting national from global markets, so that in the presence of MFA quotas separate market clearing prices for each quota restricted product in each country are determined in the model. In counterfactual equilibria (where MFA restrictions and quota allocation procedures are removed) producer prices in developing countries increase, stimulating both production and exports, while consumption increases and production falls in developed countries. Comparing counterfactual and benchmark equilibria provides the basis for policy evaluation with the model. Separate model analysis can be performed with and without internal quota allocation schemes in the base case of the model.

Constructing the benchmark data set for these model analyses requires information on supply prices by product by country, and estimates of key elasticity parameters, both of which affect model results. The data available for estimating supply prices is not free of problems. For example, while there is some (albeit limited) quota price data for Hong Kong, there is little direct information on supply prices for other supplying countries, and an indirect method, related to that used by Hamilton (1988), is employed. Also, because of incompatibilities among the various MFA quota categories used in the major developed country MFA participants (the U.S., Canada, and the EC), capturing effects of quotas on interdeveloped country trade in textiles and apparel is difficult. Details of how these and other problems have been accommodated, and more generally on data sources and the calibration procedures used are given in Appendix C.

We use alternative ranges of cost differentials between established and new producers involved with internal quota allocation schemes in solving the model. One of these we adopt as our central case, around which sensitivity analyses are later performed. In Hong Kong, we assume the cost differential to be zero. We justify this by the fact that export licenses in

Hong Kong are traded, and typically sold to the highest bidders who are the low cost suppliers. For other newly industrialized countries--South Korea and Taiwan--we assume the cost differential to be 20 percent. We justify this on the grounds that these countries were affected the earliest by export quota restrictions and, hence, have a protected market niche against new and more efficient producers within the country, which is greater than in other developing countries. A cost differential of 10 percent is assumed for the ASEAN countries--Indonesia, Malaysia, Philippines, Thailand and Singapore--while a zero cost differential is assumed for all other developing countries, many of whom in practice have only a few items with binding quotas.

We assume that all developing countries incur a 10 percent dissipation of transferred rents as a result of their quota allocation schemes. Sensitivity analyses are then performed around this value. Rent dissipation effects from quota allocation schemes reflect common rules in these schemes. One is the requirement that firms ship to non-quota restricted markets as a condition for receiving export quota for restricted markets. This has the effect of partially dissipating rents transferred from the developed world, since export firms may be forced to produce a level of output that is beyond their profit maximizing level. Another is penalties are applied to firms who underutilize their quotas, which can cause firms to ship above marginal cost to receive future year quota allocation.

V. Results

We have used the model described above, and in more detail in Appendix B, to evaluate the impacts of an elimination of the MFA on both developed and developing countries, and to do this with and without the additional affects of internal quota allocation schemes. In the tables which follow, 'no internal quota model' refers to the model without any modelling of internal quota allocation schemes, while 'full model' refers to the model including the lock-in and rent dissipation effects of internal quota allocation schemes described above.

We have used the model to analyze counterfactual situations, including the elimination of only the MFA, and both the MFA and developed country tariffs on textiles and apparel. We compute a new equilibrium for the model under a variety of hypothesized policy changes, and make comparisons between the new and counterfactual equilibrium in each case. We then report various summary statistics and other information based on these comparisons.

In Table 2, we report our estimates of country welfare effects accompanying removal of MFA trade restrictions in both models. We conduct our analyses under the central case assumptions as set out above; namely, an assumption of zero cost differentials in Hong Kong, cost differentials between new and established producers of 20 percent in South Korea and Taiwan, 10 percent in ASEAN countries, and zero in all other developing countries. The rent dissipation factor assumed in this case is set equal to 10 percent in all developing countries. The welfare measures we report are Hicksian equivalent variation measures in billions of dollars in 1986 prices. Case 1 reports results of the removal of MFA quotas with tariffs left in place, while Case 2 considers the simultaneous elimination of MFA quotas and tariffs.

The striking feature of results in both Cases 1 and 2 in Table 2 is that the benefits to developing countries from an elimination of MFA trade restrictions increase substantially between the 'no internal quota' model and the 'full' model. Under a removal of MFA quotas alone (Case 1), the 'no internal quota' model shows gains to developing countries of approximately $3 billion per year. This increases to $25.7 billion in the 'full' model, an increase of nearly eight-fold. The welfare gain for developed countries from MFA removal increases somewhat, reflecting their increased gains from trade, but as Figure 1 earlier suggested, the majority of the increased gains accrue to developing countries. This increase is large enough to suggest that analyses of the effects of the MFA which do not take into account internal quota allocation schemes within developing countries will likely be misleading.

In addition, for those countries who are both larger exporters and have large cost differentials (Korea and Taiwan), gains are in the region of $6.5 billion. There are, however, some large increases for other countries, including those for whom no cost differentials are

Table 2

Country Welfare Effects from MFA Removal in Models With and Without Internal Quota Allocation Schemes
(Hicksian EV's in $bill, 1986)

	Case 1		Case 2	
	No Internal Quota Model	Full Model	No Internal Quota Model	Full Model
United States	15.257	20.116	12.259	17.022
Canada	0.372	0.712	0.295	0.606
EC	3.540	5.501	2.313	4.098
Exporting Countries				
Bangladesh	0.187	0.290	0.238	0.332
Brazil	0.963	1.742	1.157	1.920
Bulgaria	-0.001	0.066	0.006	0.071
China	0.940	1.129	1.950	1.850
Colombia	0.371	0.302	0.495	0.397
Czechoslovakia	0.020	0.054	0.097	0.101
Costa Rica	0.001	-0.006	0.012	0.000
Dominican Republic	-0.020	-0.015	-0.008	-0.006
Egypt	0.006	0.006	0.027	0.019
Guatemala	0.002	0.001	0.005	0.003
Haiti	-0.011	0.047	-0.002	0.055
Hong Kong	-1.058	0.766	-0.489	1.277
Hungary	0.059	0.134	0.113	0.181
India	-0.073	0.128	0.049	0.223
Indonesia	0.345	1.376	0.589	1.620
Korea	0.788	6.492	1.670	7.735
Macau	-0.089	0.300	-0.032	0.385
Malaysia	0.138	0.766	0.222	0.864
Mauritius	0.005	0.116	0.023	0.134
Mexico	0.039	0.148	0.107	0.196
Nepal	0.016	0.024	0.028	0.033
Pakistan	-0.036	0.181	-0.003	0.210
Panama	0.000	-0.003	0.003	-0.001
Peru	0.031	0.030	0.062	0.051
Philippines	0.000	1.123	0.131	1.277
Poland	0.070	0.103	0.191	0.181
Romania	0.078	0.503	0.201	0.600
Singapore	-0.086	1.002	-0.015	1.096
Sri Lanka	-0.017	0.327	0.044	0.388
Taiwan	0.328	6.661	1.218	7.925
Thailand	-0.048	1.698	0.021	1.790
Turkey	0.026	0.076	0.092	0.128
Uruguay	-0.002	0.025	0.009	0.033
Yugoslavia	-0.057	0.095	0.031	0.169
All Developing Countries	2.921	25.699	8.251	31.252
All Countries	22.091	52.030	23.119	52.980

Case 1: Removal of bilateral MFA quotas, but not tariffs.

Case 2: Removal of bilateral MFA quotas and tariffs.

assumed. Brazil, for instance, increases its gains from $0.9 billion to $1.7 billion between the two models; and Thailand's loss of $0.04 billion changes to a gain of $1.7 billion. Only three countries remain as losers under an elimination of the MFA in both models, Costa Rica, the Dominican Republic, and Panama, whereas under the 'no internal quota' model some twelve countries lose under a removal of the MFA.

Case 2 of Table 2 reports model results from a simultaneous elimination of MFA quotas and tariffs. In this case, gains to developing countries are larger under the 'no internal quota' model as compared to Case 1, increasing from $2.9 to $8.2 billion, and gains to developed countries fall because of the terms-of-trade improvement they obtain under the tariff. There is a large increase in the gains to developing countries in the 'full' model, which rise from $8.2 billion to $31.2 billion. Gains to developed countries also increase, but on a smaller proportional basis. Significant numbers of previous losers become gainers, including Hong Kong, Haiti, Macau, Pakistan and Singapore. Again, the picture which emerges is that analysis of the joint effects of the MFA and developed country tariffs can be misleading if the effects of internal quota allocation schemes are not taken into account.

Table 3 reports country welfare effects from MFA removal using the 'full' model, but for a series of sensitivity analyses on assumptions made on cost differentials and rent dissipation factors. The first column reports the same central case results as in Table 2. In Case 2, the cost differential in Hong Kong is set equal to 5 percent and that in Korea and Taiwan is reduced to 10 percent. The effect of this on the aggregate gain for all developing countries is relatively small; it increases slightly to $31.8 billion, but with significant gains now in the case of Hong Kong. The effect on the measured gains to Korea and Taiwan are relatively modest, even with this reduction in the assumed cost differential.

In Case 3, the cost differential assumed is 10 percent uniformly across all developing countries, and in Case 4, it is set uniformly equal to 20 percent. As one might expect, the estimate of gains to developing countries increases under a higher assumed cost differential, but in both cases, the estimated gains to developing countries from an elimination of the MFA

Table 3

Country Welfare Effects from MFA Removal; Sensitivity to Cost Differentials and Rent Dissipation Factors in the 'Full' Models
(Hicksian EV's in $bill, 1986)

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
United States	20.116	22.562	21.423	26.174	21.394	19.515
Canada	0.712	0.888	0.805	1.150	0.801	0.668
EC	5.501	6.770	6.245	8.617	5.998	5.151
Exporting Countries						
Bangladesh	0.290	0.345	0.355	0.379	0.419	0.290
Brazil	1.742	2.325	2.371	2.768	2.590	1.814
Bulgaria	0.066	0.186	0.188	0.276	0.136	0.066
China	1.129	2.605	2.815	3.810	1.878	1.236
Colombia	0.302	0.412	0.434	0.484	0.311	0.323
Czechoslovakia	0.054	0.329	0.343	0.552	0.120	0.065
Costa Rica	-0.006	-0.004	-0.002	-0.003	-0.009	-0.006
Dominican Republic	-0.015	0.002	0.003	0.014	-0.004	-0.015
Egypt	0.006	0.054	0.059	0.099	0.015	0.012
Guatemala	0.001	0.004	0.004	0.006	0.001	0.001
Haiti	0.047	0.086	0.088	0.114	0.107	0.047
Hong Kong	0.766	2.228	3.883	5.860	2.798	0.794
Hungary	0.134	0.284	0.295	0.395	0.238	0.148
India	0.128	0.422	0.449	0.647	0.402	0.140
Indonesia	1.376	1.285	1.337	1.644	1.893	1.301
Korea	6.492	5.845	3.930	5.081	7.953	4.936
Macau	0.300	0.704	0.729	0.998	0.709	0.301
Malaysia	0.766	0.703	0.724	0.898	1.086	0.669
Mauritius	0.116	0.195	0.200	0.252	0.226	0.117
Mexico	0.148	0.269	0.276	0.353	0.292	0.148
Nepal	0.024	0.041	0.044	0.054	0.040	0.025
Pakistan	0.181	0.641	0.650	0.972	0.410	0.189
Panama	-0.003	-0.002	-0.002	-0.002	-0.003	-0.003
Peru	0.030	0.106	0.112	0.166	0.046	0.035
Philippines	1.123	1.054	1.082	1.549	1.525	1.091
Poland	0.103	0.388	0.412	0.623	0.194	0.120
Romania	0.503	1.263	1.289	1.822	0.974	0.506
Singapore	1.002	0.967	0.986	1.307	1.483	1.000
Sri Lanka	0.327	0.603	0.621	0.799	0.661	0.328
Taiwan	6.661	6.192	4.111	5.541	8.182	5.692
Thailand	1.698	1.659	1.679	2.339	2.313	1.357
Turkey	0.076	0.125	0.135	0.152	0.168	0.082
Uruguay	0.025	0.121	0.123	0.193	0.057	0.027
Yugoslavia	0.095	0.375	0.393	0.579	0.299	0.106
All Developing Countries	25.699	31.826	30.131	40.736	37.522	22.959
All Countries	52.030	62.048	58.605	76.678	65.717	48.295

Case 1: As Case 1 in Table 1.

Case 2: As Case 1 in Table 1, but with the cost differential in Hong Kong set equal to 0.05 and the cost differential in the other developing countries, except South Korea, Taiwan and the ASEAN countries, set equal to 0.10.

Case 3: As Case 1 in Table 1, but with the cost differential in all developing countries set equal to 0.10.

Case 4: As Case 1 in Table 1, but with the cost differential in all developing countries set equal to 0.20.

Case 5: As Case 1 in Table 1, but with the rent dissipation factor set equal to 0.20 in all developing countries.

Case 6: As Case 1 in Table 1, but with the cost differential for textile products set equal to zero in all developing countries.

are still large. Case 5 increases the rent dissipation factor to 20 percent, once again increasing gains. In Case 6, the cost differential across textile (but not apparel) producers is set equal to zero in all developing countries, reflecting the fact that textile quotas are less restrictive than quotas on apparel. The effect of this is to decrease the gains to developing countries, but the overall gains from MFA removal are still large.

Again, the picture that emerges from the results in Table 3 is that analysis of the effects of the MFA which does not take into account internal quota allocation schemes within developing countries may be misleading. In turn, while results are sensitive at an individual country level to the precise cost differentials and rent dissipation factors assumed, the broad picture across developing countries is little affected. The implication is that unless these factors are taken into account, the potential gains to developing countries from an MFA removal will be underestimated, perhaps by large orders of magnitude.

Table 4 reports the production and trade effects occurring with MFA removal. They confirm that the incorporation of internal quota allocation schemes into model analyses tends to magnify production and trade effects. In the first two columns, changes in the value of production of textiles and apparel are reported from the 'no internal quota' and 'full' models for an elimination of the MFA. Not surprisingly, there is a larger fall in production in developed countries and a larger increase in production in developing countries in the 'full' model, especially so in the larger countries, and particulary in Korea and Taiwan where increases in production of over 80 percent occur.

In the second two columns of Table 4, the effects of MFA removal on trade volumes are reported. As can be seen, the incorporation of quota allocation schemes has the effect of substantially increasing the change in import volumes in developed countries and export volumes by developing countries. Thus, in addition to the projected larger gain fordeveloping countries from an elimination of the MFA, studies which take no account of internal quota allocation schemes in developing countries will tend to understate the size of the adjustments which will be required in developed countries under an MFA elimination. They also understate the export potential which exists for developing countries from MFA removal.

Table 4

Production and Trade Effects of MFA Removal; Central Case Analysis for Both 'No Internal Quota Model' and 'Full' Models

	Change in value of production of textiles and apparel at benchmark prices %		Change in value of imports or exports of textiles and apparel at benchmark prices %	
	No Internal Quota Model	Full Model	No Internal Quota Model	Full Model
United States	-19.73	-24.32	232.41	297.06
Canada	-5.21	-10.59	53.53	108.62
EC	-7.21	-10.62	119.84	182.32
Exporting Countries				
Bangladesh	30.67	31.28	92.06	77.94
Brazil	68.77	73.63	383.71	399.20
Bulgaria	0.48	-1.90	-15.08	-44.13
China	5.99	3.84	194.06	92.61
Colombia	31.37	26.20	769.82	640.58
Czechoslovakia	5.83	2.19	194.42	60.88
Costa Rica	-2.16	-6.65	-14.21	-29.14
Dominican Republic	-6.22	-8.70	-21.00	-30.34
Egypt	4.31	1.41	226.16	65.24
Guatemala	1.27	-1.69	5.41	-41.62
Haiti	4.64	12.54	5.18	14.25
Hong Kong	9.85	20.56	42.76	55.96
Hungary	14.42	13.90	113.31	99.83
India	1.74	0.62	23.73	-13.50
Indonesia	41.05	61.83	336.20	445.80
Korea	27.93	77.46	246.94	525.19
Macau	2.08	48.41	24.77	107.61
Malaysia	43.87	78.08	212.06	343.21
Mauritius	18.19	45.53	68.29	131.78
Mexico	2.26	0.45	57.82	-25.20
Nepal	6.56	5.37	64.41	30.44
Pakistan	6.29	9.28	10.15	12.91
Panama	8.88	0.29	42.76	12.52
Peru	5.86	2.85	127.28	45.48
Philippines	16.83	40.61	113.07	213.17
Poland	5.96	2.51	184.71	54.41
Romania	15.71	15.39	82.60	66.37
Singapore	26.35	82.75	85.79	214.49
Sri Lanka	32.76	59.00	77.36	122.01
Taiwan	20.48	70.92	173.05	407.55
Thailand	15.66	63.93	33.98	121.88
Turkey	-0.15	-1.77	-5.59	-15.77
Uruguay	5.00	4.04	29.40	12.30
Yugoslavia	4.54	3.97	22.23	14.33

Table 5 reports on elasticity sensitivity analyses for MFA removal for the central case of the 'full' model. Estimates reported are once again welfare effects in Hicksian equivalent variations in 1986 dollars, as in Tables 2 and 3. The cases reported involve variations on the central case analyses reported in Table 2, but with different specifications in the model of substitution elasticities in production and preferences. In these variations, there is relatively little change in the aggregate measure of gain for developing countries, but there is larger variation across the cases for individual countries. The same theme is preserved in the results; a larger gain for developing countries when internal quota allocation schemes are taken into account.

VI. Concluding Remarks

In this paper, we report calculations of the effects of trade restrictions on developing country textile and apparel exports under the MFA that incorporate additional effects associated with internal quota allocation schemes commonly used. These schemes make it difficult for new producers to enter export markets, what we refer to as their 'lock in' effect. They also cause 'rent dissipation', reflecting various criteria which are applied before quota allocation occurs. We document how these schemes operate in a number of countries. This information is presented both in tabular form in the text and in an accompanying appendix.

We present results from a global general equilibrium model of intercountry trade in textiles and apparel also incorporating these lock-in and rent dissipation effects. What emerges is that gains to developing countries from an elimination of MFA quotas from the model which captures these internal quota allocation schemes are substantially larger than in a similar model in which they are absent. In addition, several countries who are losers from an MFA removal in a model without internal quotas, emerge from these calculations as gainers in a model which incorporates them. Hence, the presence of internal quota allocation schemes seems to transform removal of the MFA from something which appears on balance beneficial to developing countries, to something which is substantially so.

Table 5

Elasticity Sensitivity of MFA Removal, Central Case, 'Full' Model
Welfare Results in Hicksian EV's in $bill, 1986

	Case 1	Case 2	Case 3	Case 4
United States	20.116	21.422	16.633	22.603
Canada	0.712	0.611	0.485	0.830
EC	5.501	5.064	4.301	7.283
Exporting Countries				
Bangladesh	0.290	0.325	0.334	0.497
Brazil	1.742	1.829	2.012	2.154
Bulgaria	0.066	0.069	0.106	0.067
China	1.129	1.526	1.332	1.346
Colombia	0.302	0.373	0.310	0.391
Czechoslovakia	0.054	0.070	0.076	0.056
Costa Rica	-0.006	0.000	0.000	-0.002
Dominican Republic	-0.015	-0.006	-0.003	-0.016
Egypt	0.006	0.009	0.011	0.009
Guatemala	0.001	0.002	0.002	0.002
Haiti	0.047	0.055	0.066	0.054
Hong Kong	0.766	1.121	1.058	0.727
Hungary	0.134	0.156	0.167	0.177
India	0.128	0.187	0.245	0.144
Indonesia	1.376	1.563	1.724	1.533
Korea	6.492	7.134	6.262	7.200
Macau	0.300	0.364	0.321	0.319
Malaysia	0.766	0.820	0.837	0.872
Mauritius	0.116	0.130	0.134	0.128
Mexico	0.148	0.187	0.187	0.171
Nepal	0.024	0.030	0.029	0.030
Pakistan	0.181	0.200	0.238	0.184
Panama	-0.003	-0.001	-0.001	-0.002
Peru	0.030	0.042	0.039	0.038
Philippines	1.123	1.203	1.312	1.216
Poland	0.103	0.132	0.139	0.126
Romania	0.503	0.555	0.626	0.530
Singapore	1.002	1.077	1.286	1.055
Sri Lanka	0.327	0.370	0.374	0.341
Taiwan	6.661	7.537	6.618	7.186
Thailand	1.698	1.760	2.425	1.750
Turkey	0.076	0.124	0.138	0.373
Uruguay	0.025	0.029	0.028	0.026
Yugoslavia	0.095	0.147	0.155	0.106
All Developing Countries	25.699	29.132	28.600	28.802
All Countries	52.030	56.231	50.019	59.519

Case 1: As Case 1 in Table 1.

Case 2: As Case 1 in Table 1, but with Cobb-Douglas specifications used at the top two levels of nesting of transformation and preference functions in all developed countries.

Case 3: As Case 1 in Table 1, but with both transformation and substitution elasticities set equal to 0.61 in the top two levels of nesting in all developing countries in the model.

Case 4: As Case 1 in Table 1, but with transformation and substitution elasticities set equal to -2.5 and 7.0 in the bottom level of nesting in all countries in the model.

One reaction to our results might be to suggest that many of the gains that we discuss could be achieved by developing countries unilaterally removing their internal quota allocation schemes by moving to auctioning of quotas. While it is true that a portion of these additional gains that we highlight in our paper might be obtained by developing countries in this way, not all of them would be realized. This is because the value of the MFA quota premia within developing countries would tend to rise with the entry of new producers under a removal of lock-in and rent dissipation effects, but no new access to developed country markets would result from such unilateral actions. A portion of the gains which we identify in our diagrammatic analysis would still not be captured. The only way is for the removal of the MFA itself to occur.

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APPENDIX A: INTERNAL QUOTA ALLOCATION SCHEMES USED FOR MFA QUOTAS IN A SAMPLE OF DEVELOPING COUNTRIES[12]

This appendix documents the internal quota allocation rules used in the sample of seventeen developing countries listed in Table 1.

Malaysia

In Malaysia, quotas are distributed free of charge by the Ministry of Trade and Industry (MTI) to Malaysian textile manufacturing companies only and are not allowed to be traded. The criterion for distribution is past export performance, based on one of two formulas:

(A) $q_t = [\alpha_{t-1} + \frac{1}{k}(1-\alpha_{t-1})]q_{t-1}$; or

(B) $q_t = [\alpha_{t-1} + \frac{1}{k}\left[1 - \frac{\alpha_{t-1} + \alpha_{t-2}}{2}\right]]q_{t-1}$

Where q_t and q_{t-1} are export quotas allocated in years t and t-1, and α_{t-1} and α_{t-2} are the quota utilization proportions in the two preceding years. k represents a degree of penalty for utilizing less than 80 percent of the allocated quotas, and takes on the following values depending on α_{t-1}:

α_{t-1}	k
≥ 0.80	1.00
(0.70, 0.79)	1.25
(0.60, 0.69)	1.50
(0.50, 0.59)	1.75
(0.40, 0.49)	2.00
≥ 0.39	2.50

In addition, a firm that fails to export its entire quota must return any unused portion to the

[12]Sources for this section include: Siamwalla (1989), Suphachalasai (1989), Bark (1989), Morkre (1979), Law (1981), Business India (1986), Kumar et al. (1988), Hamilton (1986b, 1988), Kumar and Khanna (1990), and private communication with Sanjoy Bagchi of the ITCB and the Indonesian Delegation to the GATT. The quota allocation schemes described for the Dominican Republic, Haiti, Costa Rica, and Jamaica arise from export quota awarded under bilateral agreements with the U.S.

MTI for reallocation before the last day of the seventh month of the quota year; otherwise its quota for the following year will be cut by the amount equal to 30 percent of unsurrendered quota volume.

Producers utilizing at least 80 percent of their quota are eligible to receive an extra amount determined by an appropriate growth factor provided for in the underlying bilateral agreement. However, a producer who takes more than 40 percent of Malaysia's total growth in that particular category will receive only half of the growth factor.

Further export volumes are available to all existing producers, and are distributed according to six criteria: (1) higher export value of product; (2) diversification of export volume into non-quota restricted countries; (3) diversification into non-quota restricted categories; (4) amounts to assist in covering an order; (5) confirmed orders; and (6) ceteris paribus, first come, first served.

Newcomers must belong to the group of already established producers of other commodity categories, and are allowed entry only when existing quota holders consistently achieve only a 70 percent quota utilization rate.

Thailand

In Thailand, quotas are distributed free of charge by the Department of Foreign Trade and are not allowed to be traded. Two quota systems are used, one for yarns and fabrics and one for ready-made garments. In each case, the available quotas are divided into two parts: 'principle' or 'basic' quotas and 'residual' quotas.

Principle quotas are distributed annually to exporting firms on the basis of past export performance. Firms that fail to export at least 90 percent of their quota must return any unused portion to the Department of Foreign Trade for reallocation within 3 months before the end of the year; otherwise their quota for the following year will be cut. During the year, those exporters who have already exported at least 50 percent of their principal quotas are eligible to apply for additional residual quotas.

Residual quotas are made up of the pool of quotas remaining in the total quota for the year, the annual increase in the total quota and unfilled principal quotas. These quotas are

distributed monthly to international trading firms and producers with or without principal quotas. The former group, which is mainly exporting for large firms, is guaranteed 20 percent of the residual quota. The remaining 80 percent is allocated according to five main criteria: (1) utilization of domestic raw materials; (2) domestic value added; (3) price per unit; (4) utilization of principal quotas; and (5) time duration between order and delivery dates. Residual quota holders acquire the past performance right to apply for principal quotas the following year based on the preceding years' export volume. An exporter who fails to fulfill at least 90 percent of its residual quota will be penalized by not being able to participate in the monthly allocation of free residual quotas for a further 1 to 4 months.

Philippines

In the Philippines, quotas are allocated free of charge to manufacturers only and are transferable only under a supervised transfer scheme. Subcontracting is permitted, thus allowing newcomers to enter the export market.

The utilization rate of quota for one year affects the subsequent year's allocation. A utilization rate of 95 percent or more entitles a quota holder to receive another full allocation the following year, including an extra amount equal to the overall rate of growth in quota volume in that particular category. A firm which uses between 65 and 95 percent (adjusted for any surrender) fails to obtain automatic restoration rights to free quota allocations. However, after paying a fine the quota holder will be given preference in the allocation of residual free quotas. A firm which does not use even 65 percent of his quota and does not surrender is regarded as a non-performer and loses privileged access to free quotas.

Commodities are classified into three categories according to demand: critical, semicritical and noncritical. Performers are given preference over non-performers in the allocation of residual quotas for the critical categories. Applications for quota in the semicritical categories are treated on a first come, first served basis. For noncritical categories, priority is given to non-performers.

Indonesia

In Indonesia, quotas are managed by the Ministry of Trade. Quotas are allocated free of charge to registered permanent exporters only and are transferable only through the Indonesian Commodity Exchange under supervised schemes. Under a quota transfer, the transferee secures the right to obtain future quota in the amount equal to the quota transferred, while the initial holder's quota entitlement is reduced by the amount of quota transferred. If the transferee does not fully utilize his transferred quota, in the following year his quota will be reduced by the amount equal to his unfilled transferred quota.

There are two broad types of exporters-temporary and permanent--each of which are further subdivided into producer and non-producer exporters. Temporary exporters can only export to non-quota countries and to quota countries for non-quota categories. In contrast, permanent exporters are able to export to quota countries for quota categories. Temporary exporters can become permanent exporters if their exports to non-quota countries amount to US$200,000 in one quota period.

Quotas are divided into three groups: permanent, temporary and borrowed quota. Permanent quotas are distributed on the basis of past export performance. At least 30 percent of the allocated quota must be utilized in the first 6 months of the quota period, and at least 80 percent by the nineth month. Exporters who do not fully utilize their quotas within these specified time frames are penalized by having their quota allocation in the following year reduced by 50 percent of the balance between required and actual export volume. If after the sixth month or at the end of the quota period the quota is returned to the Ministry of Trade, in the following year the quota will be reduced by the amount of unused quota.

Temporary quotas are allocated 3 times in a quota period and are distributed for one quota period only to producer exporters who fulfill several different requirements: (1) had to have exported to non-quota countries an amount equal to US $200,000 in one quota period but not less than that of the previous quota period; (2) have L/C or sales contract; (3) the quota price per unit is higher than the national quota price per unit; (4) must fulfill the obligation to export the required quantity within the specified time frame and "pay" the sanction for unused

quota; (5) have not transferred the permanent quota in the last quota period or during the present quota period; and (6) hold permanent quota less than 10 percent of the national quota for certain categories unless no other exporter applies for any quota in that category. If the quota allocated for certain categories is not used, then in the following year that exporter will not be permitted to apply for temporary quota in that category.

Borrowed quotas are allocated only to exporters who hold enough quota, and must be returned in the following year. If at the end of a quota period the utilization of quota for certain categories is less than 100 percent, then borrowed quotas can be changed to temporary quotas. Exporters who do not fill the amount of borrowed quota allocated are penalized by having their allocations reduced by the amount of unused quota in the following year.

New quotas are allocated as permanent quotas. 70 percent of the quotas are allocated proportionally to permanent and temporary exporters based on export performance during the 12 months up to the date of call. 17.5 percent are allocated to small permanent exporters and to cooperatives, and 12.5 percent are allocated to newcomers (permanent exporters).

Quota increases from annual growth are allocated as permanent quotas only for permanent exporters; 80 percent is distributed to small exporters and cooperatives, and 40 percent to newcomers. The following requirements will qualify exporters for quotas from growth: (1) had to have exported to non-quota countries an amount equal to US $200,000 in one quota period; (2) currently not a quota holder of the underlying category; (3) did not transfer the quota of the underlying category in the last quota period or in the present quota period; and (4) does not hold quotas for more than 5 categories in a certain quota country.

Korea

In Korea, the exporter's association or the industry association for the restricted product is designated by the Ministry of Trade and Industry (MTI) to distribute export quota licenses among individual firms based on MTI's quota allocation rules. These rules are based on a two-tier system: a 'basic' quota allocation and an 'open' quota allocation. Some portion of basic quotas are tradeable while open quotas are not tradeable.

Basic quotas, which comprise 80 to 85 percent of the total quota, are distributed on the

basis of the preceding year's exports volumes to restricted markets. Exporters who do not fill their share of quota are penalized by having their next year's quota allocation reduced by 50 to 100 percent of their unfilled quotas.

The open quota comprises 15 to 20 percent of the total quota, the annual growth in the total quota and unfilled basic quotas. Open quotas are distributed according to three different criteria: (1) previous year's average unit export value; (2) previous year's export volume to non-quota restricted countries; and (3) previous year's export volume of non-quota restricted commodities.

Unlike the basic quota allocation, the open quota allocation system is open to all exporting firms. The rational for this system is to help newly emerging efficient firms get a share of the restricted markets. Firms that fail to fill their open quotas are more severely penalized than those failing to fill their basic quotas. The penalty is a 200 percent deduction of unfilled open quota for the following year.

Taiwan

In Taiwan, quotas are allocated free of charge and are allowed to be traded. Available quotas are divided into two parts: 'temporary' and 'permanent' quotas. Temporary quotas are valid for the present year only, while permanent quotas are valid for all future periods.

Hong Kong

In Hong Kong, quotas are administered by the Trade, Industry and Customs Department (TICD). Quotas are allocated free of charge and quota transfers are permitted. There are two broad types of quota transfers: temporary and permanent. Under a temporary transfer, a quota holder is allowed to transfer part of his quota to another firm who, in turn, exports on his behalf. Consequently, the initial holder retains his quota entitlement for future periods. In contrast under a permanent transfer, the transferee secures the right to obtain future quota.

Quotas are distributed annually to existing firms according to past export performance. If the bilateral restraint agreement for a particular category is less than past shipment performance, then each firm secures a quota amount corresponding to its proportion in total

shipments. In the event the restraint agreement is more than past performance, the excess is placed in a 'free quota pool' from which all firms can apply. Each firm secures an amount of free quota corresponding to its proportion in total applications.

Exporters who utilized at least 95 percent of their quota allocation during the preceding year will receive another full allocation the following year plus an extra amount equal to the growth in quota volume provided in the underlying bilateral agreement. Exporters who utilized 50 to 95 percent of their allocation will be penalized by having their quota allotment in the following year reduced by the amount of their unfilled quotas. An exporter utilizing less than 50 percent will be denied quota allocations the following year.

At least 50 percent of total quota allocation over two consecutive years must be used by the quota holder himself to avoid penalty for nonfulfillment. The penalty is a reduction in quota allocation in the third year by an amount equal to 25 percent of the amount transferred out in the two years. Any unfilled or forfeited quotas are placed in the free quota pool.

Recipients of free quota acquire the past performance right to obtain a quota allocation in the following year if their free quota is fully utilized. However, those who fail to fulfill their free quotas can be penalized by not being able to have future access to the free quota pool.

India

In India, garment quotas are administered by the Apparel Export Promotion Council (AEPC). Quotas are allocated on a 'closed' and an 'open' quota system.

Under the closed system, 65 percent of the total quota in India is distributed on the basis of past export performance. The total amount of quota allocated to each firm is a pro rata share of value of exports in the preceding two years.

Transfer of past performance quota is permitted by the AEPC. However, 'third-party export' transactions are not. These transactions involve a past performance quota (PPQ) holder selling to a willing buyer who has a confirmed export order but does not possess the required quota. The buyer agrees to ship the consignment in the name of the original PPQ holder. Consequently, the original PPQ holder retains his quota entitlement for future periods while

also earning a rent on his sales of the quota. The premium on third party quota transfers is generally lower than that on legal sales.

10 percent of the total quota is distributed to manufacturer exporters, another 2 percent to central/state corporations, while 3 percent are given to those who develop exports to non-quota countries.

20 percent of the total quota is given under the open tender system. This system gives new producers and small exporters valuable opportunities to participate in the restricted export markets. For the most sought after categories, demand for these quotas is always higher than the volume of quotas available. The rationing criteria used to allocate quota allotments is the 'cut-off' price. This price is determined after an examination of firms' applications submitted for available quota. The cut-off price is calculated to balance supply of quotas with demand by firms quoting at higher unit values. Exporters, therefore, register several 'paper firms' under different names so that they can submit multiple applications quoting different unit prices. Exporters also inflate their unit prices artificially while submitting their applications to anticipate the cut-off price.

Brazil

In Brazil, available quota is divided into two parts: 90 percent to existing exporting companies and 10 percent for new entrants and for those existing exporters who need additional quota. Quotas under the former are distributed on the basis of past export performance.

Enterprises who fail to utilize their entire quota must return any unfilled portions in advance, before the end of the period, to the Ministry of Economy for redistribution. Exporters who do not fill the amount of quota allocated are penalized by having their allocations reduced in the subsequent period.

Mexico

Since 1984, the Mexican Government instituted through the Secretaria de Comercio y Fomento Industrial (SECOFI) the Policy for Textile Quota Allocation. This policy is aimed at

the promotion of quota utilization, particularly of those categories underutilized and of high revenue generating categories.

The criteria for quota allocation is based on factors such as: (1) the exported volume by the company in the last two years; (2) the degree of utilization of domestic inputs in the process of fabrication of the product; and (3) the value added generated in Mexico. Another factor is based on the promotion of regional development. Enterprises located in new industrial zones are favored for quota allocation.

Peru

In Peru, textile quota allocation is directly regulated by the producers through the internal rules of the Textile Committee and the Apparel Committee. Quotas are allocated by the producers themselves, basically in accordance to past performance of the enterprises and to the effective utilization of the quota. A basket of residual quota is formed for distribution to new entrants and to those who need additional increases during the period. The companies are also under the obligation to return with anticipation, that is before the end of the period, the non-utilized portions of the allocated quotas.

The textile and apparel committees present to the Government every year the list of the amounts allocated by companies which is published in the Peruvian Official Journal.

Uruguay

In Uruguay, the private sector through the Chamber of Industry allocates directly the quota among the producers. The mechanism of allocation is simple as quota is bigger than the export capacity. Therefore, quota allocation does not pose a problem.

El Salvador

In El Salvador, the designated consultation level (DCL) established under the bilateral agreement with the U.S. is allocated by the producers through the Union de Industrias Textiles (UNITEX). The DCL, which so far has been sufficient for the export capacity of the sector, is allocated according to the requirements of the enterprises.

Dominican Republic

In the Dominican Republic, allocation of apparel quotas is managed by the Council of the Free Zones. Specific limits and designated consultation limits are distributed on the basis of average exports of the category concerned in the three previous years plus 25 percent.

New entrants and companies trying to expand get smaller allocations based upon their requests, modified by consideration of the volumes not already allocated to existing exporters and an assessment of their capability. Growth is allowed in second and subsequent years according to rates for the particular category concerned laid down in the agreement with the U.S.A.

Allocation is also weighted by reference to the value added generated in the Dominican Republic. Companies performing above average are granted an additional 10 percent on top of their basic allocations while those performing below average have theirs reduced by 5 percent.

Quota performance is monitored every six months (this is intended to increase to every three months). Companies shipping below 89 per cent of their capacity on an annual basis (allowing for seasonal factors) are usually deprived of the portion unfilled, which is then redistributed.

The quota remains the property of the State. Despite this, cases of sale of allocations occur. The usual procedure is for underperforming companies to agree with others to manufacture the unfilled portions, with the resulting product to be shipped under their name. In practice, allocatees are rarely deprived of their quotas.

Haiti

In Haiti, the allocation of apparel quotas is the responsibility of the Foreign Trade Division of the the Ministry of Commerce and Industry, although the routine administration of the allocation is the responsibility of a joint ministry and industry committee. The present system came into force in 1987, at the same time as the new agreement with the U.S.A.

Only specific limits and designated consultation levels are allocated; it is considered unnecessary to allocate guaranteed access levels as these can be increased merely on request.

Applications for quota allocations are received in December of each year and the initial

distribution is made in February. Performance is monitored on a regular basis with a view to adjusting the allocation in May and again in December. Allocation is largely on the basis of each company's historic performance, but it is the practice to weight the initial distribution towards smaller companies, knowing that the larger companies will be able to take up the deficits later on in the year.

In theory, only the Foreign Trade Division may dispose of quotas, but it is understood that in practice companies often sell part of their allocations, although the export record remains with the sellers. This is advantageous for the latter as they retain some benefit from their original allocation and do not suffer in subsequent annual distributions. The Ministry of Commerce and Industry frowns on the practice as tending to undermine efforts to ensure that allocation is carried out fairly on the basis of actual performance and that the process of reallocations rewards the deserving.

Costa Rica

In Costa Rica, administration of quotas is carried by the Quota Allocation Council, a private sector body run by the industry itself along broad lines laid down by the Costa Rican government. This is in line with the government's policy of involving the industry at every stage in the negotiation and administration of quotas.

The quotas have been allocated on the basis of the companies' past performance. The allocation of quotas seems to have been carried out equitably enough. Procedures have been implemented for monitoring performance and for reallocating in cases of failure.

Jamaica

The Jamaican quotas are allocated broadly in proportion to historical export performance. They are also weighted, however, in an attempt to influence investment and export behavior. For instance, the following actions will qualify companies for an addition to the basic allocation: (1) sending a proportion of goods to non-U.S. markets; (2) for producers in the free zones, subcontracting to others outside the zones; (3) giving higher local value added and employment; (4) including non-restricted items in the export mix; (5) use of U.S.

capital and other material and equipment; and (6) location outside the Kingston Corporate Area.

These criteria illustrate two areas of broad concern to the Jamaican government. One is to assuage U.S. hostility to Jamaican imports by increasing the benefits to the U.S. textile industry and textile machinery producers and by giving more attention to non-sensitive items. The other is to attempt to spread the knowhow of the free zone companies and the benefits of their export prowess to the smaller operators in the customs territory and to encourage the development of the industry outside Kingston.

APPENDIX B: STRUCTURE OF THE GENERAL EQUILIBRIUM MODEL USED[13]

1. Level of Aggregation in the Model

The fourteen textile and apparel products in the model involve seven restricted and seven comparable unrestricted products. The fourteen-commodity level of aggregation used is shown in Table B-1.

a) Production

Each of thirty-seven countries in the model is assumed to have a nested constant elasticity of transformation production possibilities frontier involving the fourteen textile and apparel products[14] and one composite other good,

$$(1) \qquad \bar{F}^j = \left[a^j A^j \frac{\sigma_1^j - 1}{\sigma_1^j} + (1-a^j) T^j \frac{\sigma_1^j - 1}{\sigma_1^j} \right]^{\frac{\sigma_1^j}{\sigma_1^j - 1}}, \qquad j=1,...,37^{15}$$

where

$$(2) \qquad T^j = \delta^j \left[\sum_{i=1}^{7} b_i^j C_i^j \frac{\sigma_2^j - 1}{\sigma_2^j} \right]^{\frac{\sigma_2^j}{\sigma_2^j - 1}}, \qquad j=1,...,37$$

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[13]For simplicity here we present the model without internal quota allocation schemes incorporated. Details on how these are incorporated are given in the text.

[14]The index i runs from 1,...7 for the restricted products and for the unrestricted products from 8,...14.

[15]The index j runs from 1,...3 for developed countries and for developing countries from 4,...7.

Table B-1

Commodity Aggregation For Textiles and Apparel Used in the Model[1]

1.	Winter outerwear; rainwear; sleepwear, bathrobes and dressing gowns; outer jackets, coats and shopcoats; dresses, skirts, suits, sets and co-ordinates; sportscoats, blazers and fine suits
2.	Pants, shorts and overalls
3.	Foundation garments
4.	Underwear
5.	Blouses, shirts, T-shirts and sweatshirts; tailored collar shirts; sweaters, pull-overs and cardigans
6.	Hosiery
7.	Textiles
8-14.	Unrestricted categories comparable to categories 1-7.

[1]This level of aggregation reflects the constraints implied by generating as close as comparable cross-country data set as possible to cover trade under the different MFA quota categories used by the U.S., Canada, and the EC. Such a data set is currently unavailable from any other source.

and

$$(3) \qquad C_i^j = \lambda_i^j \left[d_i^j X_i^j \frac{\sigma_{3i}^j - 1}{\sigma_{3i}^j} + (1-d_i^j) X_\ell^j \frac{\sigma_{3i}^j - 1}{\sigma_{3i}^j} \right]^{\frac{\sigma_{3i}^j}{\sigma_{3i}^j - 1}}, \qquad i=1,...,7;\ \ell=i+7;\ j=1,...,37$$

This treatment implies that in production in each country j, there is first substitution between individual restricted textile and apparel products (X_i^j) and comparable unrestricted products (X_ℓ^j), yielding composites of the products (C_i^j), then between the composites (C_i^j), yielding a composite textile and apparel product (T^j); and finally between the composite (T^j) and other goods (A^j). σ_1^j, σ_2^j, and σ_{3i}^j are substitution elasticity parameters for country j in this three level nesting structure, and the a^j's, b_i^j's and d_i^j's are share parameters, with $\Sigma b_i^j = 1$. δ^j and λ_i^j are constants which define units for the composites appearing in the nesting hierarchy. The nesting hierarchy used in each country's production is shown in Figure B-1.

The composite other good is assumed to be freely traded. We use this as a numeraire, and set its price equal to unity in all countries. Hence, assuming profit maximizing behaviour, producers in each country choose quantities X_i^j for each of the 14 product categories to maximize

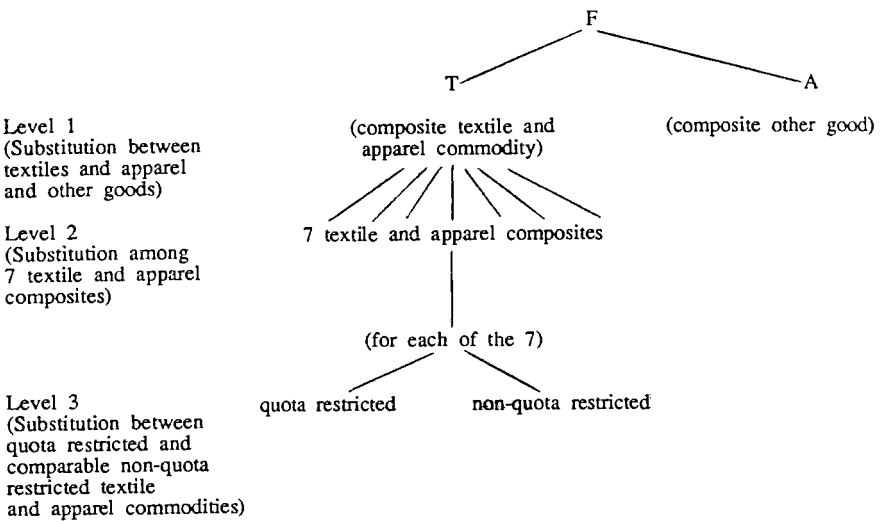
$$(4) \qquad \sum_{i=1}^{14} P_{Xi}^j X_i^j + A^j \qquad j=1,...,37$$

subject to (1), (2) and (3), where P_{Xi}^j are the prices prevailing in country j for the fourteen textile and apparel commodities X_i^j.

This yields output supply functions

Figure B-1

Nesting Structure Used to Represent Production in Each Country



$$(5)\quad T^j = \frac{\bar{F}^j}{\left[a^j D^{j\,\frac{\sigma_1^j - 1}{\sigma_1^j}} + (1-a^j) \right]^{\frac{\sigma_1^j}{\sigma_1^j - 1}}}, \qquad j=1,\ldots,37$$

$$(6)\quad A^j = \left[\frac{\bar{F}^{j\,\frac{\sigma_1^j - 1}{\sigma_1^j}} - (1-a^j)T^{j\,\frac{\sigma_1^j - 1}{\sigma_1^j}}}{a^j} \right]^{\frac{\sigma_1^j}{\sigma_1^j - 1}}, \qquad j=1,\ldots,37$$

$$(7)\quad C_i^j = \frac{b_i^{j\,\sigma_2^j} T^j}{P_{Ci}^{j\,\sigma_2^j} \delta^j \left[\sum_{\ell=1}^{7} b_\ell^{j\,\sigma_2^j} P_{C\ell}^{j\,1-\sigma_2^j} \right]^{\frac{\sigma_2^j}{\sigma_2^j - 1}}}, \qquad i=1,\ldots7;\ j=1,\ldots37$$

and

$$(8)\quad X_i^j = \frac{d_i^{j\,\sigma_{3i}^j} C_i^j}{P_{Xi}^{j\,\sigma_{3i}^j} \lambda_i^j \left[d_i^{j\,\sigma_{3i}^j} P_{Xi}^{j\,1-\sigma_{3i}^j} + (1-d_i^j)^{\sigma_{3i}^j} P_{X\ell}^{j\,1-\sigma_{3i}^j} \right]^{\frac{\sigma_{3i}^j}{\sigma_{3i}^j - 1}}}, \quad i=1,\ldots7;\ell=i+7;j=1,\ldots37$$

where

$$(9)\quad D = \left(\frac{P_T^j a^j}{1-a^j} \right)^{\sigma_1^j}, \qquad j=1,\ldots37$$

P_T^j is the producer price in country j for the composite textile product T^j,

$$(10)\quad P_T^j = \frac{\left[\sum_{i=1}^{7} b_i^j \left(P_{Ci}^j\right)^{1-\sigma_2^j}\right]^{\frac{1}{1-\sigma_2^j}}}{\delta^j}, \qquad j=1,...37$$

and P_{Ci}^j are the producer prices in country j for the 7 textile and apparel composites C_i^j,

$$(11)\quad P_{Ci}^j = \frac{\left[d_i^j \left(P_{Xi}^j\right)^{1-\sigma_{3i}^j} + (1-d_i^j)\left(P_{X\ell}^j\right)^{1-\sigma_{3i}^j}\right]^{\frac{1}{1-\sigma_{3i}^j}}}{\lambda_i^j}, \qquad i=1,...7;\ell=i+7;j=1,...37$$

b) Consumption

Consumer demands are generated from utility maximizing behaviour, with a single demand side agent assumed in each country. Each agents' utility function is of nested CES form, with a structure similar to that on the production side, i.e.,

$$(12)\quad U^j = \left[\hat{a}^j \hat{A}^{j\,\frac{\hat{\sigma}_1^j - 1}{\hat{\sigma}_1^j}} + (1-\hat{a}^j)\hat{T}^{j\,\frac{\hat{\sigma}_1^j - 1}{\hat{\sigma}_1^j}}\right]^{\frac{\hat{\sigma}_1^j}{\hat{\sigma}_1^j - 1}}, \qquad j=1,...37$$

$$(13)\quad \hat{T}^j = \left[\sum_{i=1}^{7} \hat{b}_i^j \hat{C}_i^{j\,\frac{\hat{\sigma}_2^j - 1}{\hat{\sigma}_2^j}}\right]^{\frac{\hat{\sigma}_2^j}{\hat{\sigma}_2^j - 1}}, \qquad j=1,...37$$

$$(14)\quad \hat{C}_i^j = \left[\hat{d}_i^j \hat{X}_i^{j\,\frac{\hat{\sigma}_{3i}^j - 1}{\hat{\sigma}_{3i}^j}} + (1-\hat{d}_i^j)\hat{X}_\ell^{j\,\frac{\hat{\sigma}_{3i}^j - 1}{\hat{\sigma}_{3i}^j}} \right]^{\frac{\hat{\sigma}_{3i}^j}{\hat{\sigma}_{3i}^j - 1}}, \qquad i=1,...7;\ \ell=i+7;\ j=1,...37$$

where $\hat{\sigma}_1^j$, $\hat{\sigma}_2^j$ and $\hat{\sigma}_{3i}^j$ are elasticity parameters in country j, and the $\hat{a}^j$'s, $\hat{b}_i^j$'s, and $\hat{d}_i^j$'s are share parameters, with $\Sigma \hat{b}_i^j = 1$.

The budget constraint for the single agent in each country is

$$(15)\quad \sum_{i=1}^{14} P_{Xi}^j \hat{X}_i^j + \hat{A}^j = \sum_{i=1}^{14} P_{Xi}^j X_i^j + A^j + R^j + Q^j, \qquad j=1,...37$$

where R^j are tariff revenues[16] collected in country j, and Q^j is the value of quota premia received on exports by country j, reflecting transfers of quota rents from developed countries.[17] Tariff rates t_i^j apply to imports of product category i by developed country j.

Maximizing (12) subject to (13), (14) and (15) yields the demand functions

$$(16)\quad \hat{T}^j = \frac{I^j}{Z^j + \hat{P}_T^j}, \qquad j=1,...37$$

$$(17)\quad \hat{A}^j = I^j - \hat{P}_T^j \hat{T}^j, \qquad j=1,...37$$

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[16]In numerically solving the model, we also introduce non-distorting production taxes in the developed countries on all products. Without these taxes, government revenue arise only from tariffs and tend to be highly sensitive to changes in prices since they depend on the value of net trades. These taxes are non-distorting, do not alter relative prices of outputs, and have no effect on the equilibrium solution produced by the model.

[17]In our model revenue and quota rents are separately identified, since for developed countries revenues are positive and quota rents are zero, and for developing countries the opposite is true.

$$(18)\quad \hat{C}_i^j = \frac{\hat{b}_i^{j\,\hat{\sigma}_2^j}\,(I^j - \hat{A}^j)}{\hat{P}_{Ci}^{j\,\hat{\sigma}_2^j}\left[\sum_{\ell=1}^{7} \hat{b}_\ell^{j\,\hat{\sigma}_2^j}\,\hat{P}_{C\ell}^{j\,1-\hat{\sigma}_2^j}\right]}, \qquad i=1,...7;\ j=1,...37$$

and

$$(19)\quad \hat{X}_i^j = \frac{\hat{d}_i^{j\,\hat{\sigma}_{3i}^j}\,(I^j - \hat{A}^j - \sum_{m\neq i} \hat{P}_{Cm}^j \hat{C}_m^j)}{\hat{P}_{Xi}^{j\,\hat{\sigma}_{3i}^j}\left[\hat{d}_i^{j\,\hat{\sigma}_{3i}^j}\,P_{Xi}^{j\,1-\hat{\sigma}_{3i}^j} + (1-\hat{d}_i^j)^{\hat{\sigma}_{3i}^j}\,P_{X\ell}^{j\,1-\hat{\sigma}_{3i}^j}\right]},$$

$$i=1,...7;\ell=i+7;m=1,...7;j=1,...37$$

where

$$(20)\quad I^j = \sum_{i=1}^{14} P_{Xi}^j X_i^j + A^j + R^j + Q^j, \qquad j=1,...37$$

$$(21)\quad Z^j = \left[\frac{\hat{P}_T^j \hat{a}_i^j}{1-\hat{a}_i^j}\right]^{\hat{\sigma}_1^j}, \qquad j=1,...37$$

$\hat{P}_T^j$ is the consumer price in country j for the composite textile and apparel product $\hat{T}^j$,

$$(22)\quad \hat{P}_T^j = \left[\sum_{i=1}^{7} \hat{b}_i^{j\,\hat{\sigma}_2^j}\,\hat{P}_{Ci}^{j\,1-\hat{\sigma}_2^j}\right]^{\frac{1}{1-\hat{\sigma}_2^j}}, \qquad j=1,...37$$

and $\hat{P}_{Ci}^j$ are the consumer prices in country j for the 7 textile and apparel composites $\hat{C}_i^j$,

$$(23)\quad \hat{P}^{j}_{Ci} = \left[\hat{d}^{j}_{i} \, P^{j}_{Xi}{}^{\frac{\hat{\sigma}^{j}_{3i}}{1-\hat{\sigma}^{j}_{3i}}} + (1-\hat{d}^{j}_{i}) \, P^{j}_{X\ell}{}^{\frac{\hat{\sigma}^{j}_{3i}}{1-\hat{\sigma}^{j}_{3i}}} \right]^{\frac{1}{1-\hat{\sigma}^{j}_{3i}}}, \qquad i=1,...7;\ \ell=i+7;\ j=1,...37$$

c) Trade

Each country's trade in the fourteen product categories, and in the composite other good is given by the difference between production and consumption. Thus, for each of the fourteen product categories, imports under product category i by developed country k from country j, M_i^{kj}, summed over supplying countries minus exports under product category i by k to developed country n, E_i^{kn}, summed over developed countries, are given by

$$(24)\quad \sum_{j=1}^{37} M_i^{kj} - \sum_{n=1}^{3} E_i^{kn} = \hat{X}_i^k - X_i^k, \qquad i=1,...14;\ k=1,...3$$

and exports by developing country j to developed country k, $E_i^{jk}(= M_i^{kj})$ summed over developed countries are

$$(25)\quad \sum_{k=1}^{3} E_i^{jk} = X_i^j - \hat{X}_i^j, \qquad i=1,...14;\ j=4,...37$$

Exports by developed country k to developing country j of the composite other good, E_A^{kj}, summed over developing countries, equal the difference between production and consumption in the developed country, i.e.

$$(26)\quad \sum_{j=4}^{37} E_A^{kj} = A^k - \hat{A}^k, \qquad k=1,...3$$

and imports by developing country j from developed country k, M_A^{jk} $(= E_A^{kj})$, summed over developed countries, equal desired imports by country j, i.e.

$$(27) \quad \sum_{k=1}^{3} M_A^{jk} = \hat{A}^j - A^j, \qquad j=4,...37$$

In equilibrium net trades in all products sum to zero across all countries.

Imports of the fourteen textile and apparel products by the developed countries also have to satisfy the constraints implied by their bilateral quotas, i.e.

$$(28) \quad M_i^{kj} \leq \bar{B}_i^{kj}, \qquad i=1,...7; \; j=4,...37; \; k=1,...3$$

where $\bar{B}_i^{kj}$ are the quotas on imports of products in category i by developed country k from developing country j. These bilateral quotas have the effect of segmenting national markets in restricted exporting countries such that different domestic prices will apply for each of the seven restricted product categories. In applying the model, we calibrate it to a data set in which developed country quotas are assumed to be binding, and then examine alternative counterfactual situations in which quotas are removed.

d) Equilibrium

Equilibrium in the model is given by a set of country prices for the fourteen product categories relative to the price of the composite other good, and revenue and quota rents for each country (P_{Xi}^{*j}, R^{*j}, Q^{*j}) such that

(i) Markets clear for the fourteen product categories.

$$(29) \quad \sum_{j=1}^{37} \hat{X}_i^j = \sum_{j=1}^{37} X_i^j, \qquad i=1,...14$$

(ii) Markets clear for the composite other good.

$$(30) \quad \sum_{j=1}^{37} \hat{A}^j = \sum_{j=1}^{37} A^j$$

(iii) The government budget is balanced in each developed country (i.e. tariff revenues collected on imports equal revenues disbursed on the demand side of the economy).

$$(31) \qquad R^{*j} = \sum_{i=1}^{14} t_i^j p_{Xi}^j \max(0, \dot{X}_i^j - X_i^j), \qquad j=1,...3$$

where t_i^j is the ad valorem tariff rate on imports of product category i by country j.

(iv) Quotas are binding.

$$(32) \qquad M_i^{kj} \leq \bar{B}_i^{kj}, \qquad i=1,...14;\ j=4,...37;\ k=1,...3$$

and

(v) Income from quota rents assumed when evaluating demands equals that transferred by the developed countries to each exporting country.

$$(33) \qquad Q^{*j} = \sum_{k=1}^{3} \sum_{i=1}^{14} q_i^{kj} p_{Xi}^j \bar{B}_i^{kj}, \qquad j=4,...37$$

where q_i^{kj} is the quota premia rate on imports of product category i by developed country k from country j.

In solving the model for counterfactual equilibria associated with changes in or removal of bilateral quotas in the developed countries, a Newton method is used (see Whalley (1985)). The size and direction of the Newton steps are determined by a Jacobian matrix containing the derivatives of commodity excess demand functions and government budget and quota rent imbalances with respect to prices, revenues, and quota premia. This method uses successive linear approximations to the excess demand functions which are solved each time for a zero of the functions, until a true equilibrium solution is obtained.

APPENDIX C: DATA, MODEL PARAMETERIZATION, AND ELASTICITY PARAMETER VALUES

To determine parameter values for the demand and production functions in this model, we use calibration procedures similar to those used in other applied general equilibrium models (see Mansur and Whalley (1984)). We use a multi-country microconsistent equilibrium data set we have constructed for 1986, which we augment by values of elasticities of transformation and substitution.

A number of data sources are used in assembling the microconsistent data set for 1986 on which model calibration is based. Data on the value of imports, by MFA product category and country of origin, are from the U.S. Department of Commerce (1987a, 1987b, 1987c), Canadian Department of External Affairs (unpublished data, 1987), and the European Commission (1987).[18] The major problem with this data is that it is difficult to make comparisons across countries because of the different textile and apparel categories used in administering quotas in each country or region. Since no such cross country data set currently exists, we have constructed as close as comparable 14-good cross-country data set as possible to produce trade data under the different aggregated MFA quota categories used in the model.[19]

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[18]In using this data we assume that all bilateral quotas were fully binding in the year in question. Whether textile quotas are or are not binding has been a source of controversy for some time. For some exporting countries not all the allocated (category-specific) quotas are fully utilized in any given year (see GATT (1984) and USITC (1987)). Thus it appears, at first sight, that the cost to the U.S. of imposing these restraints may be overestimated by the model. However, there are many reasons why data for export countries can seem to indicate non-binding quotas and yet in fact be binding. Quotas assigned to firms within an exporting country may not be fully utilized due to capacity constraints within firms and the unwillingness of firms to reassign or reallocate quota (or sell if there are legal markets) for fear of losing their quota allocation in future years. Other reasons can lie in the way quota is allocated among importers. Textile quotas in the EC, for instance, are often allocated between importing countries on the basis of historical market shares with no trading of quota across countries, so that quotas for, say, coats can be binding in Northern Europe but not in Southern Europe. Also subaggregate quotas, say for types of shirts, may be greater than an aggregate quota for shirts and hence not appear to be binding at the subaggregate level while be binding at the aggregate level.

[19]In order to capture trade diversion effects between developed countries due to their joint bilateral quotas on exports by developing countries we had to allocate interdeveloped country trade between quota restricted and unrestricted products. Otherwise, based on the level of aggregation used in our model, all interdeveloped country trade would be unrestricted products, and trade diversion effects would not be property captured by the model. We assume that for each developed country the distribution between quota restricted and unrestricted products in interdeveloped country trade is the same as the distribution of the developed country's trade with the developing countries in these products.

Data on the value of production in the U.S. for textiles and apparel in separate aggregate categories are taken from the U.S. Department of Commerce (1987d), while data in Canada, the EC and the developing countries are from the United Nations (1986).[20] This data is disaggregated in order to provide estimates of production for the fourteen product categories in the model using the ratios of trade in the individual categories to total trade in the corresponding broad category (textiles or apparel) by country. For each model product in each country, the value of consumption is determined as the residual between value of production and imports, on the one hand, and value of exports on the other.

As noted in the introduction, data on unit costs of production of individual textile and apparel products (supply prices) in the various developing countries are not currently available. While the unit costs of quota unrestricted products can be approximated by the U.S. price minus the tariff, the problem with data arises when we try to estimate supply prices of quota restricted products. These are central to any calculation of the impacts of developed country textile quotas, since they affect estimates of rent transfer per unit export.

Although quotas are freely traded in several exporting countries, comprehensive quota price data is only readily available for Hong Kong, and only limited quota price data is available for Taiwan. Hence, quota price data in a range of countries cannot be used. Also quotas are not necessarily allocated to the most efficient producers within countries, and so even if actual costs of current producers were known, the minimum potential unit cost for each textile and apparel product in the various countries remains unknown. We, therefore, use an indirect method of estimating supply prices of quota restricted items in developing countries closely related to that used by Hamilton (1988).

We take a simple average of Hong Kong quota prices in 1983 and the first five months of 1984, for each of fifteen apparel product categories exported by Hong Kong to the U.S., based on calculations made by Hamilton (1986a), and assume them to reflect the quota prices

[20]We were unable to obtain production data for some of the developing countries. In these cases trade data, along with estimates of mill consumption to export ratios obtained from FAO (1985) were used to calculate the value of production of each of the fourteen product categories in each country.

for the fifteen categories in 1984; 1982 quota prices, also from Hamilton (1986a), are used in model sensitivity analyses reported on later. Both of these sets of price data are given in Table C-1. Hong Kong quota prices of the other MFA apparel products exported to the U.S. are calculated on the basis of an average of the quota prices given in Table C-1. In aggregating the MFA apparel products in the U.S. into the six restricted apparel product categories used in the model, new quota prices are calculated by taking trade weighted averages of quota prices using the Hamilton data that fall within the categories used in the model.

Quota prices for textile products from Hong Kong would appear to be significantly lower than for apparel, as quota restrictions are less severe. Since no data is available, we assume quota prices on textile products to be one-half the average of quota prices for apparel products given in Table C-1.[21]

The calculated quota prices, expressed as export tax equivalents, are then converted into import tariff equivalents[22] and used, along with data on tariff rates on U.S. imports of textiles and apparel obtained from GATT (1984), to calculate unit production costs in Hong Kong of each of the seven restricted product categories used in the model.

Our method of calculating production costs of quota restricted items in other supplying countries is to assume that for each product category, the unit cost can be approximated by the unit cost in Hong Kong multiplied by the ratio of the supplying country's relative wage rate in textiles and apparel compared to Hong Kong. We apply a further correction for the relative efficiency of labour and product quality across countries by also multiplying by each country's relative value of gross output per worker in textiles and apparel compared to Kong Kong. This

[21]This is consistent with Cline (1987) who assumes that the tariff-equivalent of textile quotas has averaged 15 percent increment beyond tariff protection since 1981, and some 25 percent on apparel.

[22]U.S. export tax equivalents are converted into import tariff equivalents by multiplying by the ratio of f.o.b. and c.i.f. values of clothing imported from Hong Kong. (The f.o.b./c.i.f. ratio is approximately 0.39.) See Hamilton (1986a).

Table C-1

Hong Kong Quota Prices[1] for Selected Apparel Items Exported to the U.S. from Hamilton (1986a)

Category Description	Category Number	1982	1984[2]
		percent	
Men's cotton jacket	333/334	10	19
Ladies' cotton jacket	335	20	27
Cotton Knit shirt and blouse	338/339	49	50
Men's cotton woven shirt	340	6	38
Ladies cotton woven shirt	341	11	36
Ladies cotton woven skirt	342	n.a.	37
Cotton knit sweater	345	n.a.	59[4]
Men's cotton pant	347	8	50
Ladies cotton pant	348	10	63
Ladies wool knit blouse	438	1	19
Wool knit sweater	445/446	21	120
Men's MMF jacket[3]	633/634	n.a.	23[4]
Ladies' MMF shirt[3]	635	n.a.	15[4]
MMF Knit shirt and blouse[3]	638/639	2	27
Men's MMF woven shirt[3]	640	n.a.	64[4]
Ladies' MMF woven blouse[3]	641	6	58[5]
Ladies' MMF pant	648	8	34[5]
Average[6]		10	42

n.a. not available

[1]As a percent of export price.

[2]Average over the period January 1983 to May 1984.

[3]MMF = man made fibres

[4]January to May 1984 only

[5]January to December 1983 only

[6]From the proportion of total rent to total export value inclusive of total rent.

makes a large difference to estimated supply prices.[23] Value of gross output per worker is given by dividing wages per employee by wages in value added, and then dividing by value added in gross output. Data on wages per employee, value added in gross output and wages in value added, for textiles and apparel are from UNIDO (1985). The resulting average supply prices of quota restricted products by country, both adjusted and unadjusted for differences in labour productivity and product quality, for both 1982 and 1984, are presented in Table C-2. As can be seen the correction for labour productivity and product quality makes a very large difference to these estimates; as large as a factor of ten in some cases. The value of quota rents received by each of the developing countries is calculated by using the supply prices of quota restricted products by country and the trade data by model product category by country.[24]

The value of production of other goods in all countries is given by subtracting the value of production of textile and apparel products from GDP in each country. Data on GDP by country are from the World Bank (1986) and from Europe (1987). External sector balance conditions are then used to calculate the value of trade in other goods in each country.

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[23]Hamilton (1988) analyzes these differences between Hong Kong, Taiwan, and South Korea and concludes they are small and can be ignored. Here, with thirty-four supplying countries, these factors become considerably more important.

[24]Our estimate of quota rents accruing to developing countries from textile trade restrictions in developed countries is about $8.7 billion. In a recent related general equilibrium model, Tarr (1989) estimates that quota rents transferred just from the U.S. to developing countries are about $7.1 billion. Moreover, Tarr also uses Hamilton's quota price data. These differences in estimates are explained mainly by two factors. First, by differences in supply prices used. For example, in calculating supply prices of quota restricted items in developing countries we incorporate the bilateralism in the quotas, whereas Tarr treats the rest of the world as a single supplying region and calculates a single quota premium on textiles and apparel equal to the weighted average of Hamilton's average quota premium rate for Hong Kong apparel products in the U.S. in the first five months of 1984 of 47 percent and an assumed quota premium rate of textiles of 5 percent. On this score, Tarr's estimate of quota rents will be downward-biased.

Second, and perhaps dominant, there are important differences in the trade data used for calculating quota rents. For example, in calculating our quota rents we use data on quota restricted imports of MFA categories. On the other hand, Tarr uses data on U.S. imports of all textile and apparel categories, ignoring the fact that not all categories are MFA categories, and that due to bilateralism in the quotas, not all imports of MFA categories are quota restrained. This procedure will apply a quota premium to imports from other developed countries, which are not quota restrained. Consequently, on this score, Tarr's quota rent estimate will overstate the true quota rents involved.

Table C-2

Calculated Average Supply Prices of Quota Restricted Textiles and Apparel by Country, 1982 and 1984

(All prices are expressed relative to U.S. supply prices of unity)

	Adjusted for differences in labour productivity and product quality		Unadjusted for differences in labour productivity and product quality	
Exporting Country	1982	1984	1982	1984
Bangladesh	0.41	0.31	0.05	0.04
Brazil	0.35	0.25	0.34	0.25
Bulgaria	0.76	0.55	0.42	0.31
China	0.62	0.46	0.12	0.09
Columbia	0.53	0.39	0.35	0.26
Czechoslovakia	0.76	0.56	0.42	0.31
Costa Rica	0.70	0.51	0.60	0.44
Dominican Republic	0.76	0.56	0.36	0.26
Egypt	0.67	0.49	0.18	0.13
Guatemala	0.67	0.49	0.34	0.25
Haiti	0.62	0.46	0.15	0.11
Hong Kong	0.76	0.56	0.76	0.56
Hungary	0.60	0.44	0.23	0.17
India	0.62	0.46	0.10	0.07
Indonesia	0.58	0.42	0.09	0.07
Korea	0.55	0.41	0.43	0.32
Macau	0.67	0.49	0.68	0.50
Malaysia	0.52	0.38	0.22	0.16
Mauritius	0.58	0.42	0.18	0.13
Mexico	0.67	0.49	0.71	0.52
Nepal	0.62	0.46	0.60	0.04
Pakistan	0.62	0.46	0.12	0.09
Panama	0.76	0.56	0.53	0.39
Peru	0.67	0.49	0.34	0.25
Philippines	0.69	0.51	0.14	0.10
Poland	0.76	0.55	0.42	0.31
Romania	0.67	0.49	0.76	0.55
Singapore	0.70	0.52	0.62	0.45
Sri Lanka	0.62	0.46	0.13	0.10
Taiwan	0.67	0.49	0.67	0.49
Thailand	0.67	0.49	0.22	0.16
Turkey	0.36	0.27	0.40	0.30
Uruguay	0.71	0.52	0.73	0.53
Yugoslavia	0.65	0.48	0.52	0.38

Source: Based on data from Hamilton (1986a) and methods described in the text.

The model also requires elasticity values for transformation surfaces and preferences in each country. For the bottom level of nesting, assumed values of -0.50 and 5.0 are used for all pairwise nests between comparable restricted and unrestricted commodities and in all countries. Given there are no literature estimates to guide the choice of these values we justify our specification as follows. An assumption of smooth substitutability in production between comparable restricted and unrestricted commodities would not be appropriate, since there would be no effect of the quotas. Therefore, a low elasticity value is used for all countries, implying a limited ability to substitute products on the supply side. In contrast, a high degree of substitutability is assumed on the demand side of the model. This has some claim to plausibility since from the consumers point of view the relative difference in product characteristics is small.

Elasticity values at the top two levels are calculated as follows. For the developed countries, we base our selection of these values on estimates of U.S. total demand elasticities and assumed supply elasticities of 1.0. For the developing countries, we assume a Cobb-Douglas specification for both transformation and preference functions, which is equivalent to setting all these elasticities to unity.[25] Because of the potentially crucial nature of these elasticity values for model behavior, we use a central set of elasticity values around which sensitivity analyses are performed.

The U.S. total demand elasticity of -.060 is based on estimates of this elasticity for textiles and apparel, reported in Cline (1987). Since no comparable information on supply elasticities is available we use a value of 1.0, which is an assumed value used by other researchers (see, for instance, Cline (1989), Jenkins (1980), and Hufbauer et al. (1986)). We calculate implied elasticities of transformation and substitution for the top two levels of nesting in the developed countries[26] consistent with these estimates. These values are, however, not necessarily consistent with literature estimates of import demand elasticities for textiles and

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[25]The reason for making this assumption is because there are currently no estimates of import or export demand elasticities for the developing countries from which implied transformation and substitution elasticities can be calculated.

[26]We assume common values across nests.

apparel,[27] reflecting the well known incompatibilities between literature estimates of demand and supply elasticities on the one hand, and import demand elasticities on the other.

The calibration procedures used to generate the parameter values for the model involve first decomposing the data represented in value terms into separate price and quantity data. This is done through a units convention which defines physical units for all commodities as those amounts which in equilibrium, sell in the U.S. for $1. Hence domestic prices in developing countries for quota restricted items are less than one, and domestic prices in Canada and the EC are less than, greater than, or equal to one, depending upon the direction of trade. Once elasticity values have been selected, share parameters for the CES and CET functions in the model are given from the price and quantity data and the assumption of agent optimization in each country (see Mansur and Whalley (1984)).

[27]Hufbauer et al. (1986) believe a conservative estimate of import elasticity of demand for imported textiles and apparel in the U.S. to be about -1.8. We estimate import elasticity of demand in the U.S. at -6.4.