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The World Bank
September 1993
WPS 1191

Rent-Sharing in the Multi-Fibre Arrangement

The Case of Mexico

Geoffrey J. Bannister

Market power affects the distribution of quota rents in the market for Mexico's exports of apparel and textiles to the United States under the Multi-Fibre Arrangement. Although rents from quotas on apparel are probably small in the case of Mexico, a significant share goes to U.S. importers for such product groups as underwear and woven shirts.

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This paper — a product of the International Trade Division, International Economics Department — is part of a larger effort in the department to analyze the effects of the Multi-Fibre Arrangement on developing countries. The study was funded by the Bank's Research Support Budget under research project "Licence Prices and Rent Sharing in the Multi-Fibre Arrangement" (RPO 676-69). Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Aban Daruwala room S7-042, extension 33713 (September 1993, 35 pages).

Bannister investigates market power and the distribution of rents in the market for Mexico's exports of apparel to the United States under the Multi-Fibre Arrangement (MFA).

Conventional wisdom holds that voluntary export restraints, such as those under the MFA, are superior to other kinds of trade barriers because they allow developing countries to receive the scarcity rents from quantity restrictions. Recently a number of studies have questioned this orthodoxy.

Erzan, Krishna, and Tan (1991), in particular, have pointed out that if market power exists only on the side of the importers, they can acquire some of the fixed rents resulting from quotas, in a form of "rent-sharing."

In Mexico's case, rents resulting from MFA restrictions are probably small, since few of the quotas imposed are binding. And other institutional arrangements — such as production-sharing under HTS 9802 and a liberal quota regime for goods made with U.S. inputs — further mitigate the MFA's restrictiveness.

Mexican exporters probably receive only a fraction of available rents, says Bannister. The welfare implications of MFA restrictions, and of market imperfections that might lead to rent-sharing, are thus not as significant in Mexico as they might be in countries for which conditions are more restrictive. But even for the few rents generated in Mexico's case, some rent-sharing is taking place.

Bannister tests the existence of perfect markets and rent-sharing for six groups of Mexican apparel exports to the United States between 1981 and 1990: sweaters, trousers, men's coats, women's coats, woven shirts, and underwear.

There are consistent differences between the unit value of U.S. production and the Mexico export f.o.b. price of apparel in the U.S. market adjusted for tariffs and transport costs. The adjusted price of Mexican exports is consistently below the price for U.S. production, which suggests that rent-sharing may be taking place.

Using modifications of the methods of Erzan, Krishna, and Tan (1991), Bannister tests alternative explanations for the price difference — differences in the composition of Mexican exports and U.S. production, and differences in the quality of Mexican exports and U.S. products.

The existence of differences in composition between Mexican exports and U.S. production is rejected for three of the six groups. Bannister also controls for the existence of significant quality differences.

The results indicate that rent-sharing may exist for woven shirts and underwear (two of the three groups in the sample that are consistently quota-bound). U.S. importers may receive up to 49 percent of available rents.

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Rent Sharing in the Multi-Fibre Arrangement: The Case of Mexico

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Rent Sharing in the Multi-Fibre Arrangement: The Case of Mexico

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*This is part of a larger project at the World Bank to examine the effects of quota restriction in the MFA on developing countries. I would like to thank Kala Krishna and Will Martin for helpful comments on an earlier draft.

Introduction

Voluntary export restraints (VERs) are widespread in world trade in textiles and apparel. About 80 percent of world trade in textile and clothing, chiefly from developing to developed countries, is restricted by voluntary export restraints through various bilateral agreements which constitute the Multi-Fibre Arrangement (MFA). The MFA allows industrialized countries to negotiate quantitative restrictions on specific textile and clothing items with individual developing country exporters. Exporting countries administer the quantitative restrictions, and, according to the conventional wisdom, reap the benefits of restricted supply in the importing countries through higher prices.

A number of studies have recently questioned whether such benefits are really forthcoming. One approach points out the considerable welfare costs for exporters that may arise from the imposition of VERs.[1] A second approach, followed in this paper, looks at the implications of imposing VERs in imperfectly competitive markets. The customary view of VERs assumes perfect competition in both the exporter's market for quota licenses, and the importer's market for each developing country's export product, with monopoly power existing only at the level of the country as a whole. The main result of these assumptions is that prices are set by the market, both for export licenses and for VER-restricted products, but are exogenous to the exporters and importers. With perfect competition in the quota license market, the level of the rent (the quota premium), is also given exogenously to economic agents. The assumption of perfect competition thus simplifies the analysis considerably by ignoring the institutional details of market structure and quota administration

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[1]De Melo and Winters (1990), for example, point out that there are considerable welfare costs for exporters that arise from the imposition of VERs. The first cost is the efficiency loss due to government intervention in quota allocation rather than allowing for a straight auction of export rights. Even more significant, however, is the loss from the misallocation of resources that results in production and factor markets, even in the absence of government intervention in the quota allocation mechanism. The contractionary pressure on the industry subject to a VER can force factors out of industries in which they are most productive, and hence lead to significant efficiency losses for exporters. These losses must be balanced against the rent transfers from abroad. An empirical evaluation of VERs on Taiwan exports of footwear to the US. by Hamilton, De Melo and Winters (1992) indicates that they result in a net welfare loss for exporters in spite of the rent transfer. Martin and Suphachalasai (1990) also point to potential losses from depressed prices in residual markets in the context of the MFA.

that affect the market price under imperfect competition. When we allow for imperfect competition, however, the institutional details of price setting become essential to any investigation of the quota restrictions. Allowing for the possibility of market power, either in the market for export licenses on the supply side or on the part of US. retailers on the demand side, has implications for the existence and distribution of rents that accrue from the MFA between exporters and importers.

The theoretical aspects of imperfect markets in quota allocation and the effects of VERs in imperfectly competitive markets have been studied by Krishna (1990, 1992), Krugman and Helpman (1989), and empirically investigated in Aw (1992), Erzan, Krishna and Tan (1991, 1992) and Krishna and Tan (1992). Erzan, Krishna and Tan describe the implications of imperfect competition for the distribution of rents under the MFA. They make the crucial distinction between "rent-appropriation" and "rent-sharing." When exporters have market power, they can set product prices to appropriate scarcity rents that accrue from quota restrictions. In this case, the size of the quota premium, (equal to the value of a license to export one unit of the quota restricted good) is determined by the exporter. Erzan, Krishna and Tan call this rent-appropriation. In contrast, when market power is on the buyer's side, the quota premium is a result of conditions in the quota restricted market, and is exogenous for both the exporter and the importer. The importer can then use market power only to extract some share of the fixed quota rent. When this occurs, the value of a license to export one unit of the quota constrained good will fall short of the quota premium, and hence only a fraction of the possible quota rent will accrue to the exporter. This is referred to as rent-sharing. Erzan, Krishna and Tan (1991) devise econometric tests for the presence of rent-sharing under imperfect competition, and apply them to Hong Kong exports of clothing to the US. restricted under the MFA. They estimate the extent of rent-sharing, and find the potential rent was split unevenly between the U.S. and Hong Kong, with the U.S. share ranging from 48 per cent for skirts to 94 per cent for play suits.

This paper investigates the case of Mexico's exports of apparel to the U.S. under the MFA. As the fifth most important exporter of apparel into the U.S. market, Mexico should be part of any study that measures the distribution of rents accruing from the MFA. Because of the institutional arrangements that govern trade between the U.S. and Mexico, however, Mexico presents a particular

challenge. First, there is no organized market for export licenses in Mexico, and hence no explicit export license price.[2] Quota constrained exports are allocated to potential exporters on a historical basis. The implication of this arrangement is that there may be a high degree of concentration in the quota allocation for those products in which the quota is binding. Second, Mexican exports of apparel to the U.S. are influenced by market sharing arrangements that allow assembly of apparel in Mexico using U.S. inputs for re-export to the U.S. This trade may be within the same firm with operations in both the U.S. and Mexico, or may be the result of subcontracting arrangements between U.S. firms and Mexican assembly operations. Either of these arrangements has implications for export pricing strategies and market power relationships that affect rent-sharing. Third, even the quotas negotiated under the MFA have liberal provisions under an arrangement which essentially eliminates the restrictiveness of the MFA for Mexican exports produced with U.S. inputs. This arrangement, known as the Special Regime, went into effect in 1989, and clearly has some influence on whether quotas are binding and whether rents exist. Finally, it should also be noted that very few of the quotas imposed on Mexican exports are actually binding, so that even excluding the effects of the institutional arrangements described above, the potential rents accruing from MFA export restraints are probably very small. Thus, the welfare effects of quota restrictions on Mexican exports, and of market imperfections that might lead to rent sharing, are probably not large. Nevertheless, this case provides a suitable test for the existence of perfect markets and rent-sharing, with some bearing for a more sober assessment of the effects of MFA restrictions on developing countries.

The first section of this paper contains a description of the institutional arrangements that affect Mexican exports of apparel to the United States under the MFA and their implications for the existence and distribution of rents. The second section investigates the existence of rent-sharing more directly by comparing the price of Mexican apparel exports to the United States under the MFA with U.S. prices for similar goods. Under the assumption of perfectly competitive output markets, arbitrage in the importer's market (i.e. in the U.S.) will lead to these two prices being equal

[2]The transfer of export rights is illegal, and there is no evidence of informal markets for these.

(assuming that imports are sufficiently close substitutes for home production), since the Mexican price of exports includes the implicit valu of a license to export the quota restricted product. Any difference between the two prices could be an indication of rent-sharing. The data indicate that Mexican export prices are consistently below the price of U.S. production. However, there are alternative explanations for these price differences. Chief among these is the difference in the composition of the groups of Mexican exports and U.S. production, or differences in the quality of the two products. Subsequent sections test for these differences and find that only in three of the six groups of apparel tested can differences in composition be definitively ruled out. Rent sharing estimates for two remaining groups that are quota bound indicate that, when differences in quality are accounted for, U.S. retailers may have received up to 49 cents of every dollar in rents.

1. Institutional Arrangements

1.1 Export Licensing

Textile and apparel exports from Mexico to the U.S. under the MFA are restricted by visas which allow Mexico exports to pass through U.S. customs. They are not restricted at the point of exit by Mexican customs officials. The export visas are distributed by Mexican officials according to the amount of quota negotiated under the MFA. First priority to fill the quota is given to firms that exported in the previous year. Any left over quota is distributed to new entrants in the market. After the initial allocation, firms can increase their share of quota when there is unused quota quantity available, and when the firm can show that it has already exported 70 percent of its initial allocation. Visas are specific to a particular consignment, and are valid from the date of issuance until December 31 of the same year.

What are the implications of this arrangement? The fact that the initial allocation of export permits (visas) does not take place through an auction mechanism means that any rent created by the export restrictions benefits the exporter rather than the government. Further, since visas are distributed on a historical basis it is probable that significant concentration exists in the distribution of these rents. Although there is no market for export permits, there is an unobservable implicit valuation the exporter confers on the export visa, which is equal to the amount he/she would be willing to pay for the right to export. To the extent that quotas are binding, this shadow price is positive, although it will vary from firm to firm. If quotas are not binding, the implicit price is zero. For a binding quota, this implicit price will be equal to the quota premium or the unit rent created by the quantity restrictions, and will be included in the F.O.B. price of Mexican exports to the U.S. that are restricted under the MFA.

1.2 Trade Regimes

Two different institutional arrangements operate to diminish the trade barriers to Mexican apparel exports entering the U.S. The first of these is the provision under chapter 9802.00 of the harmonized tariff schedule (HTS 9802.00) that allows for special treatment of goods assembled in

Mexico from U.S. components. This provision allows American apparel firms to export cut cloth for assembly in Mexico's in-bond industry (the *maquiladora* industry) and re-import the final goods, paying tariffs only on the value added in Mexico. In most cases, the facilities in Mexico used for assembly are owned by U.S. firms, so that Mexican apparel exports entering the U.S. under HTS 9802.00 constitute movements of goods within the same firm, even though they are registered as imports into the U.S. under the MFA (USITC, 1991). HTS 9802.00 is essentially a tariff provision, but it has implications for rent sharing. If rents exist, then U.S. firms with assembly operations in Mexico owning a large share of the quota will be the principal beneficiaries of the quota restrictions.[3] The evidence in Table 1 shows that for Mexican apparel exports to the U.S. this is probably the case. From 1988 to 1991 between 85 and 90 percent of all Mexican apparel exports under the MFA entered the U.S. under HTS 9802.00 provisions, with between 60 and 70 percent of their value added in the U.S.

Table 1. Percentage of MFA Exports from Mexico to the U.S. Entering Under HTS 9802.00

	1988		1989		1990		1991	
	9802.00	U.S. Value Added	9802.00	U.S. Value Added	9802.00	U.S. Value Added	9802.00	U.S. Value Added
All MFA	72.2	69.3	76.87	61.5	73.2	65.7	75.5	66.2
Apparel	84.9	69.4	90.68	61.5	88.32	66.3	89.52	66.3
Other	28.3	68.9	30.08	61.5	28.01	63.5	29.27	66.01

Source: U.S. Department of Commerce, Office of Textiles.

The second institutional arrangement affecting Mexican exports of apparel into the U.S. is a special provision of the MFA known as the Special Regime. It effectively eliminates quotas under the MFA for apparel assembled in Mexico from fabric cut and formed in the U.S. The test for eligibility for the Special Regime quota treatment is more stringent than that for HTS 9802.00 tariff provisions

[3]This is not a case particular to Mexico. Large U.S. importers that also manufacture and assemble apparel overseas, such as Liz Claiborne, often have claims to large fractions of available quota in developing countries.

since the former requires that fabric be formed and cut in the U.S. while the latter only requires the cutting to take place in the U.S. Although Special Regime quotas are often filled, they are administered in such a way that utilization rates have been allowed to exceed 100 percent. Thus it may appear that rents exist for those exports that enter the U.S. under the Special regime when, in fact, no rents are being generated. The special regime was instituted in 1988, although it only became effective in 1989. In 1990, 43.5 percent of apparel exports from Mexico into the U.S. under the MFA entered under the Special Regime.[4]

In addition to the special regime, there are different quota arrangements within the MFA that affect the restrictiveness of the quotas. There are three types of quotas: specific limits, designated levels, and consultation mechanisms. A specific limit quota is a quantity constraint which increases at a fixed rate per year (in most cases six percent, with the exception of cotton fiber which increases at two percent per year). If the quantity restriction is met, then a specific limit quota is binding. A designated level is an informal barrier whose restrictiveness depends on the discretion of the administrators of the quota in the United States. Mexican officials can request an increase in the quota for a specific year which may or may not be granted depending on the U.S. administrator's judgment as to what effect this will have on the U.S. market.[5] Finally, consultation mechanisms impose no quantitative limit, but establish a mechanism by which the U.S. can consult with Mexico when exports are perceived to be affecting the U.S. market adversely. In practice, these consultation mechanisms have not been binding.

The arrangements described above affect a very large proportion of Mexican exports of apparel to the United States. Table 2 shows how they affect the groups of apparel that have been most bound by quota arrangements between 1981 and 1990.[6] The first column shows the average rate of quota utilization (quantity of exports/quota). In general, a consistent quota utilization rate of 90

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[4]For a more detailed description of these arrangements and their implications for textile trade under the North American Free Trade Agreement, see Bannister and Low, (1992).

[5]According to officials from the Department of Commerce, there are some MFA categories in which petitions for increase of the designated levels have been denied, so that there is reason to believe that at least in some cases these quotas are binding also.

[6]The composition of these groups is discussed in the Appendix.

percent or above may be considered to indicate that the quota is binding. The groups in Table 2 are aggregations of MFA categories, some of which were quota bound and some of which were not. In addition, not all groups were bound in all years. The most consistently bound groups were trousers, woven shirts and underwear. Of the groups presented only sweaters did not have a significant component of exports entering the U.S. under HTS 9802.00; between 80 and 90 percent of the exports of all other groups entered under HTS 9802.00, with an average value added in Mexico between 43 percent for shirts and 22 percent for underwear. This suggests that some of the rents accruing from the MFA in these products are captured by U.S. firms assembling apparel in Mexico. Under type of quota, all were subject to either designated consultation levels or specific limits, except for sweaters, which were only subject to consultation mechanisms.

Trousers, woven shirts, and underwear, being the most tightly constrained groups of exports, are probably where the rents, if any, are being generated.[7] Yet, as shown in the last column of Table 2, a high proportion of these exports in these groups entered the U.S. under the Special Regime and thus are effectively not bound, at least from 1989 on. Table 2 thus reinforces the contention that available rents from MFA quota restrictions are small, and under the most optimistic assumption that exporters receive all the rent, Mexican producers still capture only a portion.

[7]In the analysis that follows we consider these to be the quota bound groups.

Table 2. Summary data for Apparel Exports

Group	Average Quota Utilization (1981-90)	Average Percent of MFA under 9802 (1987-90)	Average Percent Value Added in U.S.	Type of Quota	Average Percent Special Regime (1988-90)
1. Sweaters	38.10	1.20	33.00	cm	00.00
2. Trousers	70.70	83.10	67.30	dl/sl	83.70
3. Men's Coats	42.90	88.20	65.50	dl	4.60
4. Women's Coats	51.80	80.10	70.10	dl/sl	29.20
5. Woven Shirts	63.40	89 70	57.70	sl	74.20
6. Underwear	59.30	82.30	78.30	dl/sl	59.70

Source: World Bank data tapes and U.S. Department of Commerce data.
cm=consultation mechanism; dl=designated level; sl=specific limit.

2. Testing for Rent-Sharing

2.1 The Data

The data used for this study are similar to those used by Erzan, Krishna and Tan (EKT). Because of conflicting classification systems between U.S. data and MFA import data the categories used were aggregated in the same fashion as the EKT data, choosing groups of apparel that minimized the differences between U.S. production groupings and aggregate MFA category groupings. Six industry groups were examined: sweaters, trousers, men's coats, women's coats, woven shirts, and underwear.[8] The data include observations for the following variables from 1981 to 1990, where j indicates the apparel group, and t indicates the year:

p_{jt}^{us} = the unit value of U.S. production.

$\bar{p}_{jt}^{m}$ = F.O.B. price of apparel imports from Mexico.

t_{jt} = Ad valorem tariff in the U.S.

T_{jt} = Unit transport cost from Mexico to the U.S.

p_{jt}^{m} = Adjusted Mexico price, where $p_{jt}^{m} = \bar{p}_{jt}^{m}(1+t_{jt}) + T_{jt}$.[9]

Q_{jt}^{us} = U.S. sales of U.S. production.

Q_{jt}^{m} = Mexican exports to the U.S. market.

H_{jt} = Numbers equivalent of the Herfindahl index of concentration among Mexican exporters.

V_{jt} = Quota level for Mexican exports to the U.S.

U_{jt} = Quota utilization rate defined as $U_{jt} = Q_{jt}^{m} / V_{jt}$.

The sources and composition of these data are found in the data appendix.

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[8]The composition of these groupings in terms of MFA categories is explained in the appendix.

[9]A further adjustment was made to the unit value of Mexican exports to take into account the lower tariff rates levied on imports with a high proportion of U.S. content under the production sharing arrangements codified in HTS 9802.00.

2.2 The Price Differences

As mentioned above, the implicit valuation of the quota rents is included in the Mexican F.O.B. price of exports to the U.S. Thus, we can test for rent-sharing by comparing the unit value of U.S. production with the Mexican F.O.B. price, appropriately adjusted for tariffs, transport costs, and HTS 9802 tariff concessions. Arbitrage in the U.S. market will cause these two prices to equalize if markets are competitive and all goods are homogeneous within each group. It is reasonable to assume that Mexican exporters are small, and therefore price-takers, in the U.S. market. However, if U.S. importers have monopsony power, this can lead to rent-sharing, if they can maintain a lower price for their imports than they pay for U.S. production.

Chart 1 plots the adjusted Mexican F.O.B. price on the vertical axis against the U.S. price on the horizontal axis for all six groups of products examined in this study. The arrow represents the forty-five degree line. The chart clearly shows that there is a significant difference between the two prices. The U.S. price is above the Mexican price in almost every instance, indicating that either sustained quality or composition differences or rent-sharing may exist. To test the significance of this difference, the following regression was run using time series data from 1981 to 1990, pooled over the six apparel groups:

$$(1) \qquad p_{jt}^{m} = \alpha + \beta p_{jt}^{us} + \gamma H_{jt} + \delta U_{jt} + \phi V_{jt} + \varepsilon_{jt}.$$

At this point the variation over groups of apparel is not considered, and so α is maintained constant. As Erzan, Krishna, and Tan point out, in this equation, the right hand side variables can be considered exogenous to the Mexican exporter. If there is no rent sharing, and markets are perfectly competitive, and if all goods are assumed homogeneous within groups, then $p_{jt}^{m} = p_{jt}^{us}$. In this case we expect the coefficient on the U.S. price not to be significantly different from one, and all other parameters not to be significantly different from zero. If, on the other hand, rent sharing exists, implying monopoly power on the part of U.S. importers, or the assumption of homogeneous goods is violated (by differences in quality or composition, for example), then we expect the coefficient on p^{us}

to be different from unity, and the coefficients on the other variables to be significant. H_{jt}, the numbers equivalent of the Herfindahl index, is an indicator of concentration in export license holdings among Mexican exporters.[10] All other things being equal, an increase in concentration will afford Mexican exporters greater bargaining power vis-à-vis U.S. importers, allowing them to retain a higher share of the rent.[11] In this case, we expect the coefficient on the Herfindahl index to be positive. The quota level V_{jt}, and the rate of quota utilization U_{jt} , reflect conditions in the supply of export licenses and the restrictiveness of the quota. All other things being equal, we expect an increase in the quota level to reduce the implicit export license price and hence for the coefficient on this term to be negative. An increase in the utilization rate, on the other hand, will make export licenses more scarce, and hence increase their implicit price. Under the hypothesis of rent-sharing, we thus expect the coefficient on U_{jt} to be positive.

[10]The numbers equivalent of the Herfindahl index is calculated as $1/\sum s_i$ where s_i is firm i's share of license holdings. In our application the shares are weighted by the number of firms in each apparel group. See the Appendix for details.

[11]In the extreme case where there is one monopsonist importer in the U.S. and all import licenses are held by one exporter in Mexico, Erzan, Krishna and Tan (1991) show that if the license price is determined by the outcome of a Nash bargaining process, the license price is proportional to the level of the exporter's bargaining power.

Figure 1
Scatter Plot, All Apparel Groups
(Price per unit in U.S. dollars)

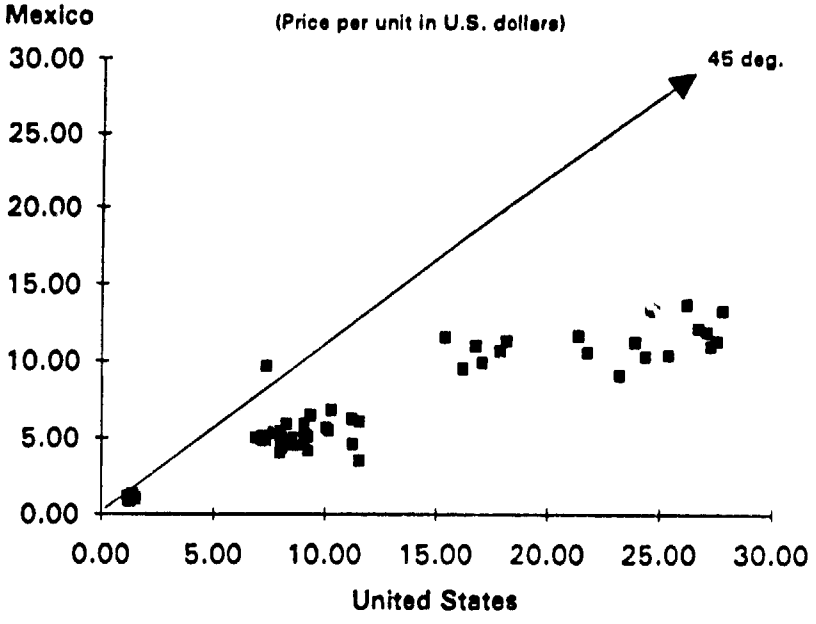

Table 3a. Regression Results for Equation 1 - Linear Specification.

Independent Variables	All Groups	Bound Groups (2,5,6)	Unbound Groups (1,3,4)
Intercept	2.4515 [a] (0.5964)	0.6050 [b] (0.3146)	4.6597 [a] (0.9263)
p_{jt}^{us}	0.4094 [a] (0.0257)	0.4676 [a] (0.0310)	0.4474 [a] (0.0478)
U_{jt}	-0.8343 (0.9247)	-0.2752 (0.4502)	-2.483 [c] (1.4850)
V_{jt}	-2.29×10^{-8} (2×10^{-8})	-6.79×10^{-9} (1×10^{-8})	6.21×10^{-7} (7×10^{-7})
H_{jt}	-0.0012 (0.0022)	0.0029 [a] (0.0011)	-0.0153 [b] (0.0075)
Adj. R^2	0.872	0.942	0.775
# observations	60	30	30
t Test, $\beta = 1$	-22.89 reject [a]	-17.16 reject [a]	-11.5 reject [a]
F Test, $\beta=1$ and $\alpha=\gamma=\delta=\phi=0$	338.71 reject [a]	292.09 reject [a]	268.81 reject [a]

Standard errors in parentheses.
[a] Significant at 1 percent.
[b] Significant at 5 percent.
[c] Significant at 10 percent.

Table 3a presents the resu'ts of running regression (1) on all groups, the quota bound groups and non-bound groups.[12] The first significant result is that for all three regressions the hypothesis of perfect competition ($\beta=1$ and $\alpha=\gamma=\delta=\phi=0$) and the hypothesis that the coefficient on the U.S. price β is equal to one, are both rejected. While this does not confirm the existence of rent sharing, it is consistent with the rejection of the hypothesis of perfect competition in the market for Mexican export to the U.S. in these groups of apparel. The intercept and the coefficient on the U.S. price are significant in all three regressions. In this context, the intercept can be interpreted as reflecting the effects of any fixed difference between the two prices common to all groups of apparel (the "fixed component"), and the coefficient on the U.S. price reflects the change in the Mexican price for every

[12]The definition of the groups is based on the data in Table 2.

unit change in the U.S. price, all other things held equal (the "marginal component").[13]

The fact that the intercept and the coefficient on the U.S. price are significant in all three regressions does not allow us to say anything about the probable cause of the price differences. It is interesting to not, however, that the fixed component on the bound group is significantly lower than the one on the unbound group, although the marginal components are similar in magnitude.[14] One obvious possible interpretation for this is that at least part of the difference between the two prices is being captured by exporters in Mexico in the form of quota rents, reflected in a higher price of Mexican exports. This interpretation is supported by the coefficient on the numbers equivalent of the Herfindahl index, which is positive and significant for the bound group, but negative and significant for the unbound group.

To test the robustness of the results in Table 3a, an alternative specification of the model in the logarithms of the variables was used. Under this specification, the coefficient on the log of the U.S. price can be interpreted as an elasticity of price transmission, while the other coefficients can be interpreted as elasticities reflecting the effects of the different characteristics of the quota-license market on the Mexican FOB price. The constant term can be interpreted as a proportional shift parameter. To determine whether the log specification is superior to the linear specification in (1), a Box-Cox test for model specification was used.[15] The test consists of comparing the sum of squared residuals of the two models after performing a simple transformation of the data. The sum of squared residuals for the linear specification was 4.163. For the log-linear specification it was 2.289. We thus can conclude that the log-linear specification fits the data better.

The results of the regression in logs are presented in Table 3b. As before, the hypothesis of perfect competition ($\beta = 1$ and $\alpha=\gamma=\delta=\phi=0$) is rejected for all three regressions. However, it is

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[13]Later in the paper we allow the intercept to vary across groups to explore the possibility that the fixed component can be explained by group-specific fixed differences in quality between U.S. production and imports from Mexico.

[14]Chow tests were run to see if the coefficients for the bound and the unbound groups were significantly different from each other. The tests rejected the null hypothesis that there was no difference between the groups at the one percent level.

[15]For a description of the Box-Cox test see Maddala (1992) p. 220 or Fomby et al. (1984) p. 423.

interesting to note that the hypothesis for $\beta = 1$ cannot be rejected for the unbound groups. In contrast with the linear specification, the intercept terms cease to be significantly different from zero. However, the coefficient on the log of the U.S. price is significant at the one percent level for all groups, and the coefficient on the log of the utilization rate is significant at the five and ten percent level. The log of the Herfindahl index is significant and negative at the five percent level for the unbound groups. Although it is difficult to interpret the negative coefficients on U_{jt} and H_{jt}, these results are not inconsistent with those of the linear specification, or with the hypothesis of rent-sharing for the bound groups of apparel.

Table 3b. Regression Results for Equation 1 - Log-linear Specification.

Independent Variables	All Groups	Bound Groups (2,5,6)	Unbound Groups (1,3,4)
Intercept	0.2639 (0.4178)	0.3082 (1.1384)	0.9294 (0.9968)
log p_{jt}^{us}	0.8090 [a] (0.0491)	0.8027 [a] (0.0450)	0.8752 [a] (0.1209)
log U_{jt}	-0.0995 [c] (0.0660)	-0.1003 [c] (0.0735)	-0.1776 [b] (0.1012)
log V_{jt}	-0.0244 (0.0248)	-0.0525 (0.0552)	-0.0166 (0.0857)
log H_{jt}	-0.0211 (0.0583)	0.0759 (0.0674)	-0.2501 [b] (0.1293)
Adj. R^2	0.939	0.976	0.735
# observations	60	30	30
t Test, $\beta = 1$	-3.889 reject [a]	-4.377 reject [a]	-1.031 cannot reject [a]
F Test, $\beta=1$ and $\alpha=\gamma=\delta=\phi=0$	97.093 reject [a]	97.096 reject [a]	49.113 reject [a]

Standard errors in parentheses.
[a] Significant at 1 percent.
[b] Significant at 5 percent.
[c] Significant at 10 percent.

2.3 Testing Differences in Composition

Although the results in the previous section seem to indicate the possible existence of rent sharing, there are other possible explanations for the difference between the Mexican export price and the U.S. price. One possible explanation is a difference in the composition of the groups of apparel, with Mexican exports concentrating on the lower value MFA categories that make up the groups, and U.S. products concentrating on the high value end. As explained in the data appendix, each of the groups examined is an aggregation of categories in the MFA export data and different categories of U.S. production data. The problem faced when attempting to compare the unit value of U.S. production to the unit value of Mexican exports under the MFA is that at the most disaggregated levels the two category groupings are not compatible. In aggregating them to the more comparable group levels, some compositional bias is inevitable, and it may show up in the marginal rent-sharing parameter β, the coefficient on p_{jt}^{us}, or in the intercept term. This section tests whether the price differences detected above can be explained entirely by this compositional bias. If composition bias cannot be ruled out, then the assumption of homogeneous product groups cannot be maintained and some accounting for product differences must be made.

The procedure for testing compositional differences follows that of Erzan, Krishna, and Tan (1991), with some modifications to allow for a more efficient estimation of the parameters and to explicitly test the assumptions underlying the test procedure. The aggregate prices can be decomposed into their production weighted components as follows:

$$(2) \qquad p_j^{us} = \sum_i p_{ij}^{us} \cdot (Q_{ij}^{us}/Q_j^{us}) = \sum_i p_{ij}^{us} \cdot w_{ij}^{us}, \quad i=1,\ldots,n, \; j=1,\ldots,6.$$

where the subscript i refers to the category belonging to apparel group j. Q_{ij}^{us} is the quantity of U.S. output in category i of group j, and Q_j^{us} is total output in group j. Hence w_{ij}^{us} is the quantity weight of category i in group j of U.S. production. Similarly, for Mexico:

$$(3) \qquad p_j^{m} = \sum_i p_{ij}^{m} \cdot (Q_{ij}^{m}/Q_j^{m}) = \sum_i p_{ij}^{m} \cdot w_{ij}^{us}, \; i=1,\ldots,n, \; j=1,\ldots,6.$$

The difference between the Mexican export F.O.B. price and the U.S. unit value of production at the group level can then be expressed:

$$(4) \qquad p_j^m - p_j^{us} = \sum_i p_{ij}^m \cdot w_{ij}^m - \sum_i p_{ij}^{us} \cdot w_{ij}^{us} .$$

Data only exist for p_j^m, p_j^{us}, p_{ij}^m, and w_{ij}^m. To get around this problem we assume that the following relationship holds for each sub-group (MFA category) i within each group j:

$$(5) \qquad p_{ij}^m = \alpha_j + \beta_{1j} p_{ij}^{us} + \beta_{2j} X_{ij} + e_{ij} .$$

where X_{ij} is a general term for the independent variables included in equation (1): the level of the quota, the utilization rate, and the Herfindahl index of concentration in export supply. Note that we assume α, β_1, and β_2 are constant over all the members of each group j. Solving for p_j^{us} and substituting into (4) yields:

$$(6) \qquad p_j^m - p_j^{us} = \gamma_j + \sum_i (w_{ij}^m - \delta_{1j} w_{ij}^{us}) p_{ij}^m + \delta_{2j} \sum_i w_{ij}^{us} X_{ij} + \delta_{1j} \sum_i w_{ij}^{us} e_{ij} .$$

where $\gamma_j = \alpha_j / \beta_{1j}$, $\delta_{1j} = 1/\beta_{1j}$, and $\delta_{2j} = \beta_{2j}/\beta_{1j}$. With one key assumption we can estimate equation (6) and test the coefficient on p_{ij}^m to see if the composition effect is statistically significant. The assumption is that $\delta_{2j} = 0$ for all j, that is, that the change in the Mexican export price is entirely determined by the change in the U.S. price, and variables such as quota levels, quota utilization, and concentration have no systematic effect. This seems to be a strong assumption, but it is borne out in the aggregate by the results of estimating equation (1) for all groups. Introducing this assumption, the regression equation then becomes:

$$(6') \qquad p_j^m - p_j^{us} = \gamma_j + \sum_i \theta_{ij} p_{ij}^m + u_j ,$$

where $\theta_{ij} = (w_{ij}^m - \delta_{1j} w_{ij}^{us})$, and $u_j = \delta_{1j} \sum_i w_{ij}^{us} e_{ij}$. In order for $E(u_j) = 0$ and the regression to be well specified, we have to make the additional assumption that the $E(w_{ij} e_{ij}) = 0$, that is , that the U.S. quantity weights and the error term are independent random variables.

To test for significant differences in the U.S. and Mexican category weights w_{ij}^{us} and w_{ij}^{m}, a compositional bias, it is necessary to impose the additional restriction that δ_{ij}, the marginal component of the price relationship in each group, is equal to 1.[16] When this is the case, the sum of the coefficients on the p_{ij}^{m} terms in equation (6') is equal to zero, since $\sum_i w_{ij}^{m} = \sum_i w_{ij}^{us} = 1$. We can test the validity of this restriction using a joint F test on the coefficients of the p_{ij}^{m} terms in (6'). If the test cannot reject the hypothesis that $\sum_i \theta_{ij} = 0$, then we take this to be sufficient evidence that $\delta_{1j} = 1$. At this point we can examine the significance of the individual θ_{ij} coefficients for evidence of a composition effect, that is, a difference between w_{ij}^{m} and w_{ij}^{us}. In addition, we can test the joint hypothesis that all the θ_{ij} coefficients are equal to zero for further evidence of a composition effect.

If the hypothesis that $\sum_i \theta_{ij} = 0$ is rejected, then we could bring more information to bear on the problem. In particular, we can take advantage of the fact that we know w_{ij}^{m} to test for the difference directly. First, note that an estimate of δ_{1j} can be obtained from the estimates of the coefficients θ_{ij}:

$$(7) \qquad \hat{\delta}_{1j} = 1 - \sum_i \hat{\theta} \quad ,$$

so that for each individual category we can estimate the U.S. share as:

$$(8) \qquad \hat{w}_{ij}^{us} = \frac{w_{ij}^{m} - \hat{\theta}_{ij}}{1 - \sum_i \hat{\theta}_{ij}} \, .$$

We want to test whether w_{ij}^{us} is significantly different from w_{ij}^{m}, that is, whether

[16]Erzan, Krishna and Tan (1991) assume that this restriction holds, but do not test it explicitly.

$$(9) \qquad w_{ij}^{m} = \frac{\theta_{ij}}{\sum_{i} \theta_{ij}} .$$

If the hypothesis in (9) is rejected then significant compositional differences exist. Unfortunately (9) is a nonlinear hypothesis that depends on the distribution of w_{ij}^{m}, and is very difficult to implement. However, even without testing (9) we can still obtain estimates of δ_{1j} and examine their significance.

The regressions in (6') were run together in a seemingly unrelated regression framework to correct for contemporaneous correlation of the error terms due to exogenous shocks that might affect them in a similar manner. It seems likely that in the case of Mexico during the 1980s, such correlation exists.[17] If contemporaneous correlation does exist, then the seemingly unrelated regression framework will yield more efficient estimates of the coefficients.[18]

Table 4 presents the results of regressions (6'). Differences in composition seem to be indicated by significant θ coefficients in group 1 at the one and five percent significance level, in groups 2 and 3 at the ten percent level, and in group 4 at the five percent level. However, without testing whether $\delta_{1j}=1$ in each group we can have little confidence in these coefficients as indicators that a composition effect is at work. Table 5 presents the results of F tests. The first column tests for the existence of a marginal effect, that is if δ_{1j} is different from one, which is implied when the sum of the θ_{ij} coefficients is not equal to zero. Column two tests for the composition effect, that is if each theta coefficient is different from zero. Column three tests for the existence of rent-sharing; the joint hypothesis that both the intercept (the fixed rent sharing effect) and all the θ coefficients (which include δ_{1j} , the marginal component) are equal to zero. If the hypothesis of in column one is not rejected, then we can interpret the results of the tests in columns two and three. If it is rejected, we cannot continue, since a marginal component δ_{1j} not equal to one could cause us to erroneously reject the hypothesis that no composition effect exists.

The hypothesis of no marginal effect ($\delta_{1j} = 1$) can be rejected for groups 2 and 4. Of the

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[17]Economy wide events such as the debt crisis in 1982 and the subsequent imposition of exchange controls are typical events that might lead to contemporaneous correlation of the error terms.

[18]For a discussion of the relative efficiency of seemingly unrelated regression estimates versus OLS estimates see Fomby, Hill, and Johnson, (1984), pp. 155-166.

remaining groups 1, 3, 5, and 6, only in group 1 was the hypothesis that no composition effect was at work rejected. For groups 1, 3, 5, and 6, the hypothesis that no rent-sharing was in effect could be rejected. Under the most conservative assumptions, then, we can test for rent-sharing only in groups 3, 5, and 6 with the assurance that no composition effect will bias the results.

Table 4. Coefficients on the Regressions Testing for the Composition Effect

	γ_j	θ_{1j}	θ_{2j}	θ_{3j}	θ_{4j}	θ_{5j}
j						
Group 1	-4.412 (4.0361)	1.178 [a] (0.3018)	0.638 [a] (0.1602)	-0.537 [a] (0.1536)	0.579 [c] (0.3496)	0.409 (1.0833)
Group 2	1.131 (1.8777)	-0.428 (0.4093)	-0.011 (0.0201)	0.053 (0.0355)	0.888 [b] (0.4239)	
Group 3	23.059 [b] (8.3124)	-1.554 [b] (0.8387)	0.010 (0.0484)			
Group 4	22.570 [a] (4.1507)	-0.572 [b] (0.2117)	-0.129 (0.1340)			
Group 5	5.896 [c] (3.4188)	0.076 (0.2967)	-0.498 (0.3835)	-0.039 (0.0299)	0.011 (0.0483)	-0.065 (0.4308)
Group 6	0.173 (0.1608)	0.274 (0.2363)	-0.082 (0.1146)			

System weighted R^2 = 0.8142.
Standard errors in parentheses.
[a] significant at the one percent level.
[b] significant at the five percent level.
[c] significant at the ten percent level.

Table 5. F-Tests for Composition Effect

Ho:	$\sum_i \theta_{ij} = 0$	$\theta_{ij} = 0$	$\gamma_j + \sum_i \theta_{ij} = 0$
	No Marginal Effect	No Composition Effect	No Rent Sharing
j			
Group 1	F(1,34)=3.559 cannot reject	F(5,34)=15.71 reject	F(6,34)=22.25 reject
Group 2	F(1,34)=2895 reject	(?)	(?)
Group 3	F(1,34)=3.860 cannot reject	F(2.34)=2.194 cannot reject	F(3,34)=25.111 reject
Group 4	F(1.34)=7.287 reject	(?)	(?)
Group 5	F(1.34)=0.638 cannot reject	F(5,34)=1.721 cannot reject	F(6,34)=40.774 reject
Group 6	F(1,34)=1.550 cannot reject	F(2,34)=0.824 cannot reject	F(3,34)=13.534 reject

Note: All rejections are at the one percent level. Failure to reject is at the five percent level.

2.4 Testing for Fixed Differences in Quality

Another factor that might explain the difference between the price of U.S. production and the Mexican adjusted F.O.B. import price is a difference in the quality of the apparel. If Mexican imports are perceived to be of lower quality, they will receive a lower price. Mexican exports will then be imperfect substitutes for their U.S. counterparts, and the assumption of homogeneous products must be dropped. A test for the possible existence of differences in quality can be developed by first assuming that such differences are constant over time. It is then possible to control for the unmeasurable fixed difference in quality between U.S. and Mexican products in each group (that is, the proportion of the spread between the price of the two products that is due to fixed differences in quality), by inserting group-specific dummies in equation (1). In addition, including a time trend, T_t, captures any constant change in the quality difference between the two periods. At this stage, we drop groups 1, 2, and 4, since composition effects cannot be ruled out in these products. The regression equation for the remaining groups is:

$$(10) \quad p_{jt}^{m} = \alpha_6 + \alpha_3 D_3 + \alpha_5 D_5 + \beta' p_{jt}^{us} + \gamma' H_{jt} + \delta' U_{jt} + \phi' V_{jt} + \tau T_t + \varepsilon_{jt},$$

where D_3 and D_5 are the dummies for the respective groups. Under this specification, the constant term α_6 is equal to $\alpha' + pZ_6$, where α' is the fixed component net of the effects of product differentiation (quality differences), π is an arbitrary constant, and Z_6 is the price effect of differences in quality in group 6. The coefficients on the dummies are $\alpha_i = \pi(Z_i - Z_6)$, and β' is the marginal component net of product quality differences.

The results of regression (10) for groups 3, 5, and 6 are presented in Table 6. The coefficients on D_5 and D_3, as well as the intercept terms α_3, α_5, and α_6, are significant at the one percent level, indicating that quality differences, fixed over time, may be a significant component of the difference between the U.S. and the Mexican price for these groups. The time trend coefficient is not significant. Unfortunately, we cannot distinguish between the fixed quality effect Z_i and the

fixed rent-sharing coefficient α'.[19] However, the coefficient on the U.S. price in Table 6 is close to zero and not significant. Only the coefficient on the Herfindahl index is significant and positive as expected.

Several tests can be performed to gauge the importance of the presumed quality difference. If the fixed quality difference can explain all the spread between the U.S. and Mexican prices then the coefficient on p_{jt}^{us} would be equal to one, and all other coefficients, excluding the dummies and the intercept, would be equal to zero. Tests for this hypothesis are presented below Table 6. The t test and F test for $\beta' = 1$ are rejected at the one percent level. The F test for $\beta' = 1$ and the coefficients on all other variables except the dummies equal to zero is also rejected at the one percent level.

The fact that we have one group (3) whose exports are not quota bound may be an explanation for the lack of significance of the coefficient on p_{jt}^{us}. To see whether rent-sharing exists for those groups that are quota bound, group 3 was dropped from the sample and the regression was re-estimated. The results are presented in Table 7. The coefficient on p_{jt}^{us} is now positive at 0.514 and significant at the one percent level. Of the other coefficients, those on the Herfindahl index and the time trend are significant. The positive coefficient on the Herfindahl index suggests that a small part of the spread between the U.S. and Mexican prices may be due to the existence of concentration among Mexican exporters. The negative time trend coefficient indicates an increasing discrepancy between the Mexican and U.S. prices over time which may be due to increasing quality differentials. The fact that neither the intercept term, α_6, nor the coefficient on D_5, nor the intercept α_5 are significant suggests that this effect was not specific to either of the groups in the sample. The tests presented below Table 7 also reject the hypothesis that fixed quality differences are the sole explanation for the differences between the price of U.S. production and the price of imports from Mexico.

The results of Table 7 indicate that the price difference in groups 5 and 6 cannot be explained

[19]Although we have been referring to this constant term as the fixed rent-sharing effect throughout the paper it is possible that other considerations aside from rent-sharing or constant quality differences may explain part of this difference between the prices. Other possible explanations might be fixed costs in the quota allocation system.

solely by fixed quality differences between U.S. and Mexican apparel. Furthermore, while we cannot distinguish between the fixed component of rent-sharing, and the fixed quality effect, the results seem to indicate that for the quota bound group this fixed effect is not very important. One interpretation of the coefficient on the U.S. price is that for these two groups (woven shirts and underwear), an increase of one dollar in the U.S. price has led to an average increase of 51 cents in the Mexican price. This may be an indication that U.S. retailers are receiving up to forty-nine percent of the rent from the MFA quota restrictions in these two groups of apparel.

Table 6. Fixed Effects Quality Difference Regression
Groups 3, 5, and 6

Independent Variables	Coefficient	t Statistic	Intercepts α_i	F Statistic (1,22) Ho: $\alpha_i=0$
α_6	1.299 (0.4913)	2.644 [a]		
p_{jt}^{us}	-0.136 (0.1913)	-0.711		
H_{jt}	0.006 (0.0023)	2.603 [a]		
U_{jt}	-0.661 (0.4902)	-1.348		
V_{jt}	-1.712×10^{-9} (2×10^{-8})	-0.878		
T_t	0.082 (0.0809)	1.019		
D_3	11.303 (1.4815)	7.629 [a]	12.602	67.37 [a] reject
D_5	3.413 (0.8368)	1.019 [a]	4.712	26.12 [a] reject

Adjusted R^2 = 0.98, n=30.
Standard errors in parentheses.
[a] significant at one percent.
[c] significant at ten percent.

Hypothesis Tests
1. $\beta' = 1$, t statistic, -5.938 , reject at one percent.
2. $\beta' = 1$, $F(1,22) = 154.778$, reject at one percent.
3. $\beta' = 1, \gamma' = \delta' = \phi' = 0$, $F(4,22)=48.97$, reject at one percent.

Table 7. Fixed Effects Quality Difference Regression
Bound Groups 5 and 6

Independent Variables	Coefficient	t Statistic	Intercepts α_i	F Statistic (1,22) Ho: $\alpha_i=0$
α_6	1.502 (0.9162)	1.640 [c]		
p_{jt}^{us}	0.514 (0.0612)	8.402 [a]		
H_{jt}	0.008 (0.0045)	1.788 [b]		
U_{jt}	-0.412 (0.9133)	-0.451		
V_{jt}	7.2×10^{-9} (4×10^{-8})	0.201		
T_t	-0.249 (0.1275)	-1.956 [b]		
D_5	-1.293 (1.0282)	-1.258	0.209	0.025 cannot reject

Adjusted R^2 = 0.93, n=20.
[a] significant at one percent.
[b] significant at five percent.
[c] significant at ten percent.

Hypothesis Tests
1. $\beta' = 1$, t statistic, -4.616 , reject at one percent.
2. $\beta' = 1$, F(1,23) = 63.050, reject at one percent.
3. $\beta' = 1, \gamma' = \delta' = \phi' = 0$, F(4,23)=83.107, reject at one percent.

A test for the log specification of equation (10) was also run, with the bound data groups 5 and 6. The tests reveal that the linear specification fits the data better. Nevertheless, the results of the regression in logs, presented in Table 8, are consistent with the previous results in Table 7. Coefficients on the fixed effect dummies and the constant are not significantly different from zero, suggesting no fixed quality effect was operating. These results are supported by the hypotheses tests which reject the existence of fixed quality differences as the sole explanation for the price differences, at the one percent level. The coefficient on the U.S. price is significant at the one percent level, with an elasticity of price transmission, all other variables held constant, of 0.59. The Herfindahl index is also significant and positive at the ten percent level. The only difference is that the coefficients on the log of the quota level V_{jt} and the log of the utilization rate U_{jt} are also significant and negative. This is the sign we would expect for the quota level effect.

Table 8. Fixed Effects Quality Difference Regression
Bound Groups 5 and 6 - Log Specification

Independent Variables	Coefficient	t Statistic	Intercepts α_i	F Statistic (1,22) Ho: $\alpha_i=0$
log α_6	0.0374 (0.4339)	0.086		
log p_{jt}^{us}	0.591 (0.1048)	5.678 [a]		
log H_{jt}	0.189 (0.1280)	1.482 [c]		
log U_{jt}	-0.101 (0.0519)	-1.943 [b]		
log V_{jt}	-0.186 (0.0680)	-2.734 [a]		
log T_t	-0.004 (0.0169)	0.249		
D_5	0.106 (0.1819)	0.583	-0.068	0.056 cannot reject

Adjusted R^2 = 0.98, n=20.
[a] significant at one percent.
[b] significant at five percent.
[c] significant at ten percent.

Hypothesis Tests
1. $\beta' = 1$, t statistic, 3.904 , reject at one percent.
2. $\beta' = 1$, F(1,23) = 15.247, reject at one percent.
3. $\beta' = 1, \gamma' = \delta' = \phi' = 0$, F(4,23)=9.854, reject at one percent.

Test of Log Specification
Sum of squared residuals for the linear specification = 0.28936
Sum of squared residuals for the log specification = 0.34268

Conclusions

This paper has tested for the existence of perfect markets and rent sharing in Mexican apparel exports to the U.S. between 1981 and 1990. The tests were run on six apparel groups: sweaters, trousers, men's coats, women's coats, woven shirts, and underwear. The data indicate that there are consistent differences between the Mexican export F.O.B. price of apparel in the U.S. market adjusted for tariffs and transport costs, and the unit value of U.S. production. The adjusted price of Mexican exports is consistently below the price of U.S. production indicating that rent sharing may be taking place. Alternative explanations for the price differential were tested using the methods of Erzan, Krishna, and Tan (1991) with modifications to allow for more efficient estimation of the test parameters and to explicitly test the assumption underlying the test procedure. The existence of differences in composition in the groups of Mexican exports and U.S. production is rejected for three out of the six groups mentioned. After ruling out differences in composition in three of the apparel groups, the existence of significant quality differences is also controlled for. The final result indicates that rent sharing may exist in woven shirts and underwear (two out of the three groups in the sample that are quota bound). In particular, U.S. importers may obtain up to forty-nine percent of available rents.

In addition to the tests of rent sharing, the paper reviews the institutional arrangements that exist between the U.S. and Mexico that make MFA quotas much less restrictive than they would ordinarily be. Because of these arrangements it is doubtful that MFA restrictions result in significant rents that would benefit Mexican exporters. In addition, production-sharing arrangements suggest that the small rents that are generated may be going in large part to U.S. owned firms in Mexico. The welfare effects of quota restrictions and rent sharing are thus probably not very important in this case.

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Appendix : Data Sources and Calculations

The data presented in section 2.1 include observations from 1981 to 1990, and were taken from the following sources described below. The aggregations of the data follow the methods used by Erzan, Krishna and Tan (1991) with some modifications to deal with the special case of Mexico.

1. p_{jt}^{us}, Unit value of U.S. production, and Q_{jt}^{us}, U.S. sales of U.S. production:

These variables were taken from data created by Erzan, Krishna and Tan (1991) up to 1988. Erzan, Krishna and Tan defined and created aggregations of the U.S. data from the Current Industrial Reports published by the U.S. Department of Commerce, Bureau of the Census. The data for 1989 to 1991 were created using their aggregation method. The U.S. price of each of the six apparel groups was computed as a quantity weighted average of the unit values of the production categories that made up the group. For example, for each apparel group j made up of two or more production categories i, i=1,..,n, let p_j denote the unit price of the apparel group, p_{ij} denote the unit price of each production category in group j, and Q_{ij} the quantity produced of category i in group j. Then:

(A1) p_j = (value of production)$_j$/(Quantity of production)$_j$

$$p_j = \sum_i \frac{p_{ij}Q_{ij}}{\sum_i p_{ij}Q_{ij}} ,$$

$$p_j = \sum_i p_{ij}\left[\frac{Q_{ij}}{\sum_i p_{ij}Q_{ij}}\right] .$$

2. $\bar{p}_{jt}^{m}$, The F.O.B. price of apparel imports from Mexico, Q_{jt}^{m}, Mexican export to the U.S. Market, V_{jt}, the quota level for Mexican exports.

These were taken from the MFA database in the International Trade Division of the International Economics Department at the World Bank. This data set contains the customs value of imports of apparel,[20] the quantity imported in square meter equivalents (SME), the quota level, and type of quota that is applied, all at the level of the MFA category. The unit price at the category

[20]This is the price actually paid or payable for merchandise when it is sold for export to the U.S., excluding U.S. import duties, freight, insurance, and other charges incurred in bringing the merchandise to the U.S. The information from the MFA data set is taken from the U.S. Department of Commerce, Office of Textiles, Expired Performance Reports.

level was calculated as the ratio of the customs value of imports to the quantity imported in SMEs. This is consistent with the U.S. production data which are also in SMEs. The unit FOB price at the MFA category level was then aggregated up to the group level (j) using an import quantity weighted average as described above. The quota at the group level was calculated as the sum of the quota at the category level. Following Erzan, Krishna and Tan (1991) the Utilization rate was calculated using a quota-weighted average.

3. Group definitions:

Each grouping of apparel used, both in the case of U.S. production and imports from Mexico, is made up of a number of different categories or sub-groups. Unfortunately, the categories or sub-groupings for U.S. production are not compatible with the categories or sub-groupings under the MFA. Thus, a higher level of aggregation must be found at which these groups are comparable. Erzan, Krishna and Tan (1991) devise group definitions which are broadly comparable as follows:

Appendix Table 1
Relation Between the MFA Categories and U.S. Production Categories
for Apparel Groupings

Apparel Group	MFA Category	U.S. Production Category
1. Sweaters	345, 445, 446, 645, 646	11, 36
2. Trousers	347, 348, 447, 448, 647, 648	12, 13, 14, 15, 20, 21*, 24, 25*, 26, 44, 45*, 48*, 49, 51, 54
3. Men's Coats	334, 434, 634	3, 4, 16, 17, 21*, 23, 29
4. Women's Coats	335, 435, 635	37, 38, 39, 42, 45*, 47
5. Woven Shirts	340, 341, 440	7, 8, 28, 33, 640, 641
6. Underwear	352, 652	57, 59, 60, 61, 62, 63

From Erzan, Krishna and Tan (1991).
* jogging suits which comprise both trousers and coats. Each group is credited with half the quantity and value figures in these items.

4. Tariffs and Transportation Costs

These were taken from 1986 U.S. IM-145 Import Trade tapes. Since 1986 is the only year for which reliable data are available, it was assumed that the structure of tariffs and transportation

costs did not change significantly during the period, and the 1986 rates were applied to the data for the whole decade. The tariff rates and unit transportation costs of each of the six apparel groups were computed as weighted averages of tariff rates and transportation costs of the MFA categories that made up each group. Value-weights were used for the tariff, and quantity weights were used for the unit transportation costs. Thus, as the relative shares of each category in the group changed over the years in the sample, so did the ad-valorem tariff and the unit transportation costs.

5. Adjusting the Mexican unit import price

The Mexican unit import price from the MFA data set had to be adjusted to include unit transportation costs and tariffs. In addition, it was necessary to take into account the proportion of imports that entered under the HTS 9802, and of these imports, the proportion of value added in Mexico on which the tariff was levied. Information on the value and quantity shares of imports for each MFA category from Mexico entering the U.S. under HTS 9802, and the share of 9802 value that was added in Mexico, was obtained for the years 1987-1991 from the U.S. Department of Commerce, Office of Textiles.

The adjustment procedure using this information was as follows:

Let V_{ij}^{802} be the value of imports under the MFA in each category i of group j that enter under the HTS 9802 provisions, and V_{ij}^{m} be that part of V_{ij}^{802} added in Mexico. Then the share of Mexican value added for category i of group j is:

$$(A2) \quad s_{ij} = \frac{V_{ij}^{m}}{V_{ij}^{802}}.$$

The share of Mexican value added in each group of apparel j was calculated as a weighted average of the component category shares for each year, using the HTS 9802 value shares as weights:

$$(A3) \quad s_j = \sum_i s_{ij} \frac{V_{ij}^{802}}{\sum_i V_{ij}^{802}} = \frac{\sum_i V_{ij}^{m}}{\sum_i V_{ij}^{802}}.$$

Similarly, let γ_{ij} be the quantity share of imports entering under HTS 9802, and φ_{jt} be the value share of imports entering under HTS 9802. The aggregate HTS 9802 quantity and value shares in total

imports at the group level were then calculated as:

$$(A4) \quad \gamma_j = \frac{\sum_i Q_{ij}^{802}}{\sum_i \left(Q_{ij}^{802} + Q_{ij}^{n802}\right)}$$

$$(A5) \quad \varphi_j = \frac{\sum_i V_{ij}^{802}}{\sum_i \left(V_{ij}^{802} + V_{ij}^{n802}\right)}$$

where V_{ij} and Q_{ij} are the value and quantity of imports for each category i in group j. The FOB value of HTS 9802 imports (denoted by superscript 802) and non-HTS 9802 imports (denoted by superscript n802) was calculated using these shares, calculated from the Department of Commerce, Office of Textiles data, and the aggregate FOB value from the MFA data base, which we denote $\bar{p}_{jt} = \frac{V_j^{802} + V_j^{n80'}}{Q_j^{802} + Q_j^{n802}}$:

$$(A5) \quad \bar{p}_j^{802} = \bar{p}_j(\varphi_j/\gamma_j) = V_j^{802}/Q_j^{802},$$

$$(A6) \quad \bar{p}_j^{n802} = \bar{p}_j(1-\varphi_j)/(1-\gamma_j) = V_j^{n802}/Q_j^{n802}.$$

In the above expression we have omitted the time subscript for simplicity, but since the composition of value shares changes over time, the aggregate shares also change.[21]

The price of those imports entering the U.S. under HTS 9802 was then calculated as:

$$(A7) \quad p_{jt}^{802} = \bar{p}_{jt}^{802}(1 + s_{jt}t_{jt}) + T_{jt}$$

where t_{jt} is the ad-valorem tariff rate and T_{jt} is the unit transportation cost at the group level. For those goods not entering under HTS 9802, the full tariff applies, so the price of imports was calculated:

$$(A8) \quad p_{jt}^{n302} = \bar{p}_{jt}^{n802}(1 + t_{jt}) + T_{jt}.$$

The aggregate price for each category was then calculated as a quantity weighted average of the price of imports entering under HTS 9802 and those not entering under HTS 9802:

$$(A9) \quad p_{jt}^{m} = \gamma_{jt}p_{jt}^{802} + (1-\gamma_{jt})p_{jt}^{n802},$$

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[21]Note, however, that we only have data for s_j, φ_j and γ_j from 1987 to 1991. For previous years we use the 1987 shares.

where the quantity weights are the quantity shares of imports entering under HTS 9802 in (A4). Using calculations (A5) - (A8), it can be shown that the adjusted price of Mexican imports in the U.S. market for each group j in (A9) is equivalent to:

$$(A9') \quad p_{jt}^{m} = \frac{\left[V_{jt}^{802}\left(1+s_{jt}t_{jt}\right)+Q_{jt}^{802}T_{jt}\right]+\left[V_{jt}^{n802}\left(1+t_{jt}\right)+Q_{jt}^{n802}T_{jt}\right]}{Q_{jt}^{802}+Q_{jt}^{n802}},$$

which is the required expression of total value of imports divided by the total quantity of imports.

6. H_{jt}, the numbers equivalent of the Herfindahl index of concentration in export permits among Mexican exporters.

The Herfindahl index of concentration of quota holdings among Mexican exporters was calculated as:

$$(A10) \quad H_{jt} = \frac{1}{\sum_{i} S_{ij}^{2} / n}$$

where n = the number of firms holding quota export rights in category i, and S_{ij} = the share of shipments of category i in group j by volume. Information on the number of firms in Mexico holding export permits was provided, for 1990 and 1991, by the Mexican Ministry of Commerce (SECOFI), Office of International Agreements. It was assumed that for earlier years the 1990 firm structure prevailed. S_{ij} was taken from the MFA database.

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