Volume Title: Empirical Studies of Commercial Policy

Volume Author/Editor: Robert E. Baldwin, editor

Volume Publisher: University of Chicago Press, 1991

Volume ISBN: 0-226-03569-7

Volume URL: http://www.nber.org/books/bald91-1

Conference Date: March 16-17, 1990

Publication Date: January 1991

Chapter Title: Estimating the Effect of Quantitative Restrictions in Imperfectly Competitive Markets: The Footwear Case

Chapter Author: Bee-Yan Aw

Chapter URL: http://www.nber.org/chapters/c6714

Chapter pages in book: (p. 201 - 218)

7 Estimating the Effect of Quantitative Restrictions in Imperfectly Competitive Markets: The Footwear Case

Bee-Yan Aw

7.1 Introduction

Over the past decade and a half, U.S. manufacturing industries have come under increasing pressure to adjust to forces of change in the world economy. The rapid rate of growth of imports from the developing and newly industrialized countries (NICs), in particular, has given greater significance to the question of import competition. The NICs' explosive export growth in such labor-intensive and thus "sensitive" (from a developed country viewpoint) industries as footwear, clothing, and electronics has led to impositions and renewals of trade policies aimed at protecting domestic U.S. producers in these industries. The most popular of these policies is the voluntary export restraint (VER). A VER is a quantitative restriction imposed on the exports of selected foreign suppliers and is administered by the exporting country. VERs have limited U.S. imports of textiles and clothing, footwear, autos, carbon and some specialty steel, and machine tools.

There is a substantial body of theoretical and empirical literature looking at the upgrading effect of VERs as well as their effect on import prices and hence, implicitly, the welfare of the importing country.[1] Little, however, has been done to model empirically the effect of a VER on the domestic industry that the policy is aimed at protecting. While a VER, like any trade-distorting instrument, has its obvious economic costs, its beneficiaries, at least in principle, are the domestic producers of the constrained import. The VER also directly affects the foreign producers whose exports are being constrained.

Bee-Yan Aw is an assistant professor of economics at the Pennsylvania State University.

1. For theoretical work on the effect of VERs, see Falvey (1979) and Rodriguez (1979). For empirical work related to this issue, see Anderson (1985), Aw and Roberts (1986, 1988), and Feenstra (1984).

The primary goal of this paper is to examine the actual effects of the VER on domestic producers and compare these with the effects on foreign producers of footwear.

In the empirical literature on international trade, the conventional approach to modeling the demand and supply of a traded good is to assume that the market under consideration is perfectly competitive. In reality, relatively few markets for manufactured goods and services meet the assumptions of perfect competition. Although there has been considerable development in the theory of trade under imperfect competition in the last decade, the same cannot be said about empirical work on trade in imperfectly competitive markets. Helpman and Krugman (1989) offers a synthesis of the new theory of trade policy that arises specifically from the presence of imperfect competition. They conclude that allowing for imperfectly competitive markets leads to nonstandard impacts of trade policy and that the evaluation of trade policy should take imperfect competition into account from the start.

This paper utilizes an empirical model of the footwear industry in which imperfect competition is allowed. It proceeds to quantify the effect of the VER on footwear from the perspective of U.S. footwear producers. Drawing from recent tools developed in the industrial organization literature, the traditional approach assuming perfect competition is generalized to allow for imperfect competition in the market for U.S. domestic footwear over the 1974–85 period. A simultaneous equation model of demand and supply is specified and estimated for domestic footwear. The generalized supply relation allows us to identify deviations from competitive pricing in this market.

The U.S. footwear VER offers domestic footwear producers protection by directly raising price of domestic output as a result of the supply constraint. In addition, by limiting competition, the VER could lead to or enhance noncompetitive behavior by domestic footwear producers, enabling these producers to charge or alter the markup over the competitive prices in the market.[2] Thus, in the domestic market, deviations from competitive pricing may differ during the VER and non-VER periods. The empirical model developed in this paper allows us to estimate the effect of the supply constraint on domestic price and any change in price due to changes in noncompetitive behavior.

The traditional conclusions about the effects of trade policies on perfectly competitive foreign firms also breaks down when these firms are in fact not competitive.[3] The issues of the pricing behavior of foreign firms and the effect of the VER on import prices are examined in Aw (1991), which focuses on U.S. imports of footwear from Taiwan. Even with the VER in place, Taiwan's

2. This is a familiar argument: that protection of domestic industries is anticompetitive, allowing domestic firms to increase their markups at the expense of domestic consumers. The extent of this anticompetitive effect depends both on the form as well as the level of protection. Bhagwati (1969) shows that quotas in some sense are more anticompetitive than tariffs.

3. As Helpman and Krugman (1989) show, if tariffs or quotas are applied against foreign firms with market power, the importing country may gain by recapturing some of the monopoly rents the foreign firms extract from domestic consumers.

exports to the United States in 1980 were more than triple those of the next largest foreign supplier.[4] Results on the effects of the VER in the domestic footwear market are compared and contrasted with those for Taiwanese footwear exporters in Aw (1991).

The empirical results from this paper suggest that the direct effect of the VER on the U.S. domestic footwear price is significantly different from zero but small. The VER is associated with a 5 percent increase in the price of domestic footwear in contrast to a 22 percent increase in the price of imported footwear from Taiwan. On the supply side, the parameters representing the index of competitiveness are not significantly different than zero, implying that domestic footwear producers priced competitively during both the non-VER and VER periods. Taiwanese footwear exporters also priced competitively during the unconstrained period. Overall, while the VER did result in higher footwear prices, the footwear market in the United States is characterized by competitive pricing behavior on the part of both foreign and domestic suppliers, even during the constrained period.

Section 7.2 contains information of the changing condition of the U.S. footwear industry and the context in which the VER was granted to the industry. In section 7.3 the empirical model used to estimate the different effects of the VER on the domestic market is developed. Section 7.4 discusses the necessary data and estimation techniques and is followed by a discussion of the empirical results in section 7.5. A summary and conclusions are offered in section 7.6.

7.2 The Footwear Industry

The features of easy entry and exit, constant technology, and a large number of small firms have led economists to assume that the U.S. footwear industry is perfectly competitive. This assumption is often made despite the fact that a relatively small number of producers account for a large share of annual U.S. production. In 1976, about a quarter of the firms produced 82 percent of the output.

Footwear production is one of the relatively labor-intensive, technologically unsophisticated industries in which developing countries have held a comparative advantage over the developed countries for the past twenty years. The less developed countries' (LDCs') share of world footwear exports increased from 11 percent during the mid-1960s to almost 50 percent in 1985, with a significant and growing share of these exports destined for the U.S. market. The LDCs' quantity share of consumption of nonrubber footwear in the United States increased from 11 percent in 1971 to about 60 percent in 1985. By 1980, Taiwan alone accounted for over 40 percent of the total vol-

4. From the perspective of Taiwan, about 50–70 percent of Taiwan's footwear exports during the sample period were absorbed by the United States. From the U.S. perspective, Taiwan's share of total U.S. footwear imports ranged from 30 to 40 percent in the decade of the 1970s.

ume of U.S. footwear imports, an increase of more than 30 percentage points since the 1960s (see U.S. International Trade Commission 1981).

American production of nonrubber footwear declined 21.2 percent from 1971 to 1976, while the ratio of domestic shipments to U.S. consumption fell from 67.2 percent to 53.1 percent in the same period. Average annual employment in the industry declined 13.2 percent from 1973 to 1976. Footwear-worker wages relative to all manufacturing employees fell from 66.7 percent in 1973 to 62.6 percent in 1976. Thus, the performance indicators during the first half of the 1970s show a rapid decline of the domestic industry.

Consequently, the pressure to grant some form of protection to the U.S. domestic industry was high. In late 1977, VERs were negotiated with Taiwan and Korea to restrict their nonrubber footwear exports to the United States through 1981. In principle, the VER can offer protection to domestic producers by raising prices for imported footwear. Moreover, by directly limiting foreign competition, the VER may enable domestic producers to charge markups of price above marginal cost.

Empirical work on footwear has indicated that the VER-constrained countries responded by substituting into rubber footwear exports and upgrading the quality of the nonrubber footwear exported to the U.S. market (see Aw and Roberts 1986). To the extent that U.S. production concentrated on higher quality footwear, the VER led to increased competition for domestic producers. Furthermore, the major complaint of U.S. nonrubber footwear producers was that the relief provided by the VER was largely negated by import surges from noncontrolled sources. These imports rose from 141 million pairs in 1977 to 225 million in 1978 and 255 million in 1979. It is therefore not clear that competition from imports was in fact reduced by the VER.

7.3 The Empirical Model

In this section, we develop a model of the domestic footwear market in which deviations from perfectly competitive pricing are allowed. The model is used to test parametrically the hypothesis of competitive behavior in the market for U.S. domestic footwear over the 1974–85 period and to quantify the markup over marginal cost that accrues to U.S. footwear producers from the imposition of the VER.

The purpose of the model developed here is to estimate simultaneously an industry's demand and supply relations in the context of imperfect competition.[5] For this purpose we extend an empirical model formulated by Appelbaum (1982) for testing various hypotheses about noncompetitive behavior by explicitly incorporating the effect of VERs in order to empirically analyze the domestic footwear market.

5. An overview of the empirical techniques that have been applied in this area is provided by Bresnahan (1989).

Consider a noncompetitive industry producing a homogeneous output Q that faces an inverse market demand schedule

$$P = D(Q, Z), \tag{1}$$

where P is the price of Q and Z represents the exogenous variables that shift the demand function. Let the producers' cost function be represented by

$$C = C(Q, W), \tag{2}$$

where W are exogenous variables such as input prices or fixed factors of production. While the cost function (2) contains all the information on the firm's technology, more precise parameter estimates can be obtained by including additional equations summarizing the firm's input choice. A set of estimable factor demand equations can be derived from (2) by applying Sheppard's Lemma,

$$X = \partial C(Q, W)/\partial W, \tag{3}$$

where X is the vector of input demands.

When producers are not price takers in the output market, the generalized supply relationship is represented by the equality of marginal revenue and marginal cost. This can be written as

$$P\left(1 - \frac{\theta}{\eta}\right) = \partial C(Q, W)/\partial Q, \tag{4}$$

where η is the price elasticity of market demand and θ is the index of the degree of competitiveness in the domestic market. The markup of price over marginal cost depends on both the elasticity of demand and a market structure parameter θ which varies between zero (perfect competition) and unity (monopoly). Bresnahan (1989) explains the equivalence between this form and the markup commonly derived from a homogeneous product oligopoly model using conjectural variations.

This model is applied to the U.S. domestic footwear industry for the sample period 1974–85. From 1977 to 1981, the United States imposed VERs on footwear imports from Taiwan and Korea. The model is modified to take into account the effect of the VER on both the demand and supply sides. Under imperfect competition, a trade policy such as a VER may alter the markup of price over marginal cost.

The demand function is estimated in log-linear form and written as

$$\ln P_t = \gamma_0 + \gamma_1 \ln Q_t + \gamma_2 \ln GDP_t + \gamma_3 \ln I_t + \xi D_t + \varepsilon_t, \tag{5}$$

where P_t and Q_t are the price and quantity indexes of domestic footwear in period t. GDP_t is per capita U.S. real gross domestic product, I_t is a price index of U.S. imports of footwear, while D_t is a dummy variable that takes on the value of zero during the non-VER years and unity during the VER years.

It is important that the functional form chosen in estimating marginal cost

not place severe restrictions on these estimates. The translog cost function satisfies this criteria, since it places no a priori restrictions on the first or second derivatives of the cost function. Due to data availability, the empirical function estimated is a short-run cost function. Labor and materials are variable inputs purchased in competitive markets and capital is fixed. The short-run cost function is assumed to take the translog form

$$(6) \quad \ln VC_t = \delta_o + \delta_L \ln PL_t + \delta_K \ln K_t + \delta_Q \ln Q_t^P + (.5)\,\delta_{LL} \ln PL_t \ln PL_t + (.5)\,\delta_{KK} \ln K_t \ln K_t + (.5)\,\delta_{QQ} \ln Q_t^P \ln Q_t^P + \delta_{LK} \ln PL_t \ln K_t + \delta_{LQ} \ln PL_t \ln Q_t^P + \delta_{QK} \ln Q_t^P \ln K_t,$$

where VC_t is normalized variable cost (measured as the ratio of the sum of labor and material costs to the price of materials), $Q^P{}_t$ is the output produced in period t, PL_t is the price of labor relative to the price of materials, and K_t is the volume of capital stock.[6]

From (6), the marginal cost of footwear output is given by

$$(7) \quad \frac{\partial VC_t}{\partial Q_t^P} = \frac{VC_t}{Q_t^P}(\delta_Q + \delta_{QQ} \ln Q_t^P + \delta_{LQ} \ln PL_t + \delta_{QK} \ln K_t).$$

The labor demand equation, written in cost-share form, can be constructed from (6):

$$(8) \quad \frac{\partial \ln VC_t}{\partial \ln PL_t} = S_L = \delta_L + \delta_{LL} \ln PL_t + \delta_{LK} \ln K_t + \delta_{LQ} \ln Q_t^P,$$

where S_L is labor's share of the total expenditure on variable inputs.

Finally, (4), the supply equation, can be written as

$$(9) \quad P = \frac{\partial VC_t}{\partial Q_t}\left(1 - \frac{\theta}{\eta}\right)^{-1}.$$

Substituting the expression for marginal cost (eq. [7]) into (9) yields

$$(10) \quad \frac{PQ_t}{VC_t} = (\delta_Q + \delta_{QQ} \ln Q_t^P + \delta_{LQ} \ln PL_t + \delta_{QK} \ln K_t)\left(1 - \frac{\theta}{\eta}\right)^{-1},$$

which expresses the ratio of revenue to total variable cost as the product of the output-cost elasticity and a markup factor which depends on the demand elasticity, η, and θ, the index of the degree of competitiveness.

Equation (11) modifies (10) by incorporating the effects of the VER during the 1977–81 years of the sample period.

$$(11) \quad \frac{PQ_t}{VC_t} = (\delta_Q + \delta_{QQ} \ln Q_t^P + \delta_{LQ} \ln PL_t + \delta_{QK} \ln K_t)\,(1 - [\theta_V D_t + \theta_{NV}(1 - D_t)]/\eta)^{-1},$$

6. Normalizing the price of labor and variable cost by the price of materials imposes linear homogeneity in factor prices on the short-run cost function.

where D_t is the dummy variable that equals one during the VER years and zero otherwise and η is the demand elasticity, which equals the inverse of γ_1 from the demand equation (5).

Equation (11) allows the competitiveness index for the restricted and unrestricted periods to be estimated parametrically together with the parameters of the cost function. A familiar argument is that protection of domestic industries may be anticompetitive, allowing domestic producers to increase their markups at the expense of domestic consumers. Bhagwati (1969) argues that the degree of anticompetitiveness is higher with a quantitative restriction like a VER than with tariffs. The complete estimating system for the U.S. domestic footwear industry consists of the market demand equation (5), short-run cost function (6), labor share equation (8), and the output supply equation (11). From this set of equations we can estimate the effect of the VER on the price of domestic footwear as well as on the degree of competitiveness in the domestic footwear market.

7.4 Data

The basic data set to be analyzed consists of observations on prices and quantities of domestic U.S. footwear from 1974 to 1985. This section describes the measurement and specification of these variables as well as the exogenous variables in the demand and supply relations in the U.S. domestic market.

The price and quantity of domestic and imported footwear are measured using index number techniques that avoid the well-known bias contained in unit-value indexes. The enhanced incentive to upgrade the quality of the import bundle when a VER is imposed and the spillover effect on producers of the competing domestic product make it important to account for changes in the underlying mix of commodities in the domestic and import bundles over time. This paper relies on Törnqvist price indexes (see Aw and Roberts 1986) to control for these changes. The value and volume data needed to construct the price and quality indexes for domestic footwear are from the NBER four-digit manufacturing *Productivity Database, 1958–86,* which reports value and price of shipments for five product categories of footwear. The import price index in the demand equation for the domestic market is based on the footwear exports of the six major U.S. suppliers—Taiwan, Korea, Italy, Spain, Brazil, and Hong Kong.

In the domestic market, there are three exogenous variables in the demand equation (5). GDP_t, the U.S. gross domestic product in real terms per capita, is obtained from the IMF's *International Financial Statistics* 1986. The price of the substitute to the domestic output, I_t, consists of the Törnqvist price indexes of footwear imports from Italy, Spain, Taiwan, Korea, and Hong Kong and is based on data obtained from the Census Bureau's *U.S. General Imports: General and for Consumption,* Schedule A, FT 135 (1974–85). This publication reports values and quantities of U.S. footwear imports by desti-

nation countries disaggregated into thirteen seven-digit product categories. The third exogenous variable in equation (5) is the dummy variable indicating the presence, or absence of the VER.

The exogenous variables in the domestic producers' cost function, namely, total output of footwear production Q_t^P, input prices for labor and materials, and capital stock data, are all obtained from the NBER *Productivity Database*.

7.5 Estimation Results

The domestic market model is estimated for the sample period 1974–85 using the three-stage least squares estimator. The endogeous variables are the price and quantity of domestically produced footwear.

7.51 Domestic Market Estimates

The parameter estimates for the demand and supply functions for the domestic footwear market are presented in table 7.1. Two main inferences can be drawn from these estimates concerning the effects of the voluntary export restraint imposed on footwear imports from Taiwan and Korea. Firstly, the indexes representing the degree of competitiveness (θs) do not differ significantly from zero during the non-VER or the VER years. This suggests that the

Table 7.1 **Parameter Estimates for the Demand and Supply of U.S. Footwear Industry (standard errors in parentheses)**

Supply parameters:		
δ	7.794	(.014)**
δ_L	.330	(.004)**
δ_K	.178	(.372)
δ_Q	1.545	(.093)**
δ_{LL}	.084	(.026)**
δ_{KK}	.992	(.440)
δ_{QQ}	.407	(.160)*
δ_{LK}	.119	(.045)*
δ_{QK}	−.858	(.255)**
θ_V	.035	(.048)
θ_{NV}	.017	(.037)
Demand Parameters:		
γ_0	7.167	(2.847)*
γ_1	−.638	(.028)*
γ_2	−1.254	(.349)**
γ_3	.258	(.072)**
ξ	.053	(.021)*

*Rejects the hypothesis that the parameter equals zero at the 0.05 significance level using the two-tail test.

**Rejects the hypothesis that the parameter equals zero at the 0.01 significance level using the two-tail test.

Table 7.2 **Mean Marginal Cost, Price, and Markup**

Years	Marginal Cost	Price	Markup
1974–76	$4.442	$4.698	.056%
1977–81	$6.153	$6.545	.0637%
1982–85	$7.311	$7.858	.0748%

domestic footwear market was competitive not only during the period in which footwear imports were unrestricted but also during the VER period. Perhaps the fact that the VER was country-specific and that footwear imports surged from unrestricted sources meant that competitive pressures from imports continued to prevail despite the VER. Consequently, the price of domestic footwear generally reflects marginal cost throughout the sample period.

This becomes clear from examining the trend of marginal cost estimates and price over the three subperiods (pre-VER, 1974–76, during VER, 1977–81, and post-VER, 1982–85) in table 7.2. The price per pair of shoes averaged $4.7 before 1977 and rose by almost 40 percent to $6.6 during the VER years. After the VER, footwear price rose by 20 percent to reach $7.9 over 1982–85. These price increases are matched very closely by increases on the cost side. Estimates of the supply parameters in table 7.1 indicate that these increases are significantly related to increases in labor costs. Marginal cost per pair of shoes rose by 39 percent from an average of $4.4 in 1974–76 to $6.2 during the VER period. This rate of increase tapered off to 19 percent during the 1982–85 subperiod when the marginal cost averaged $7.3 per pair. It is not surprising, therefore, that the markup, calculated as the ratio of the difference in the price and marginal cost to price per pair of shoes, is small (6 to 7 percent) and does not vary significantly across the subperiods.

The second inference from table 7.1 concerns the price effect of the VER as reflected in the parameter estimate for ξ in the demand equation. By raising the price of imports which substitute for domestic footwear, the VER shifts up the demand curve for the latter and thus raises its price. The results indicate that this demand side effect is significantly different than zero and is slightly above 5 percent.

Except for the parameters measuring the competitiveness index and the capital stock, the other parameters in the supply and demand equations are significantly different from zero. The first-order parameters in the cost function all carry the expected signs. The elasticity of supply of domestic footwear is estimated at 1.6.

The inverse of the demand parameters, γ_1, γ_2, and γ_3 reflect the average price, income, and cross-price elasticities of demand for domestic footwear respectively, and are given in table 7.3. The demand elasticities for domestic footwear with respect to its own price and the price of imported footwear are estimated at -1.57 and 3.87, respectively. These estimates suggest that purchases of domestic footwear are generally more sensitive to changes in its own

Table 7.3 **Mean Elasticities for Domestic and Imported Footwear[c] (standard errors in parentheses)**

	Domestic	Imports
Own price	−1.57	−2.59
	(.028)*	(.348)**
Income	− .80	1.36
	(.349)**	(.239)**
Cross-price	3.87	6.01
	(.072)**	(.583)**
VER markup	.053	.22
	(.021)*	(.044)**

*Rejects the hypothesis that the parameter equals zero at the 0.05 significance level using the two-tail test.

**Rejects the hypothesis that the parameter equals zero at the 0.01 significance level using the two-tail test.

price and the price of imported footwear than previously thought. In their work on the footwear industry, Bale and Mutti (1981) estimated that the own and cross-price elasticities for domestic footwear from 1947 to 1972 are −.7 and .7, respectively. The negative sign on the income variable in the demand equation suggests that footwear is an inferior good.[7]

7.5.2 Contrasting the Domestic and Import Markets

In this section comparisons are made between the empirical estimates on the domestic market in this paper with those in the market for Taiwanese footwear imports analyzed in Aw (1991).

Aw (1991) estimated a model of Taiwanese export supply of high and low-quality footwear to the United States allowing for imperfect competition in that market. However, unlike the model for the U.S. industry where the availability of better cost data permits a more straightforward identification of market power, identification of the degree of competitiveness for Taiwanese exporters involves an appropriate specification of the market demand curve.[8] The empirical estimates on the market for U.S. imports from Taiwan used in this section are based on the estimation of a simplified single-quality version of Aw's model.

Estimates on the supply side of the import market model indicate that, like their domestic counterpart, prices of Taiwanese footwear exports to the United States were priced competitively during the unconstrained period of the

7. This result appears odd in light of the high cross-price elasticity and the positive income elasticity for shoes imported from Taiwan reported later. As suggested by the discussant of this paper, despite the use of the Törnqvist price index to account for quality changes, it is possible that not all of these changes have been fully expunged from the data.

8. More specifically, the demand function has to fulfill certain nonseparability conditions.

sample.[9] However, in contrast to the small price effect of the VER on the price of domestic footwear of 5 percent, there was a markup of about 22 percent on the price of Taiwanese footwear exports to the United States due directly to the supply restriction created by the VER. This figure represents the scarcity premium for a quota ticket in Taiwan, since the Törnqvist price index used to obtain the estimate corrects for any quality upgrading of the import bundle due to the VER. This percentage is at least double the estimate of 7–11 percent given by the Taiwanese Footwear Manufacturers Association.

Estimates of mean own-price, income, and cross-price elasticities of demand for U.S. imports from Taiwan are reported in the second column of table 7.3. The average own-price elasticity of demand for Taiwanese imports is estimated at -2.6. This is not only much higher than the estimate for the domestic market counterpart but exceeds most previous estimates of the responsiveness of imported U.S. footwear.[10] The cross-price elasticity is 6, implying that imports are very responsive to changes in the price of the domestic substitute. On the other hand, the income elasticity in the import market is 1.36 and statistically significant. This figure is considerably less than the previous estimates of 5.2 by Szenberg, Lombardi, and Lee. (1977) and 2.5 by Bale and Mutti (1981). Taken together with the estimate of income elasticity for the domestic market, these results suggest that the demand for footwear in the U.S. is not as sensitive to changes in income as previously thought.

7.6 Summary and Conclusions

The theory that free trade is not optimal in imperfectly competitive industries has increasingly been used to argue for government intervention in international trade. The results from this paper indicate that the justification for the imposition of the VER on footwear imports must lie in sources other than imperfect competition. There was competitive pricing behavior on the part of both domestic and foreign producers of footwear throughout the sample period. The distortion arising from the deviation of price from marginal cost in this industry was the result of the pure scarcity effect of the VER.

The results from this paper indicate that the direct effect of the VER on the price of domestic footwear, while significant, was much smaller than that on the price of the imported counterpart from Taiwan. The restraint on Taiwanese and Korean footwear exports resulted in a 5 percent increase in the price of domestic footwear but a 22 percent scarcity premium for Taiwanese exporters.

On the supply side, domestic footwear producers priced competitively not

9. Given that the VER on Taiwanese footwear was binding, the degree of competition in the output market does not matter during the constrained period.

10. For example, these estimates range from -1.33 in U.S. International Trade Commission (1977) to -1.5 in Szenberg et al. (1977). However, Bale and Mutti (1981) estimated the elasticity to be -3.1.

only during the non-VER period but when imports from Taiwan and Korea were restricted. Such competitive pricing behavior was probably the consequence of the availability of close substitutes from numerous U.S. suppliers and the existence of many noncontrolled foreign suppliers.

References

Anderson, James E. 1985. The Relative Inefficiency of Quotas. *American Economic Review* 75 (1): 178–90.

Appelbaum, Elie. 1982. The Estimation of the Degree of Oligopoly Power. *Journal of Econometrics* 19:287–99.

Aw, Bee Yan. 1991. An Empirical Model of Mark-ups in a Quality Differentiated Export Market. *Journal of International Economics*, forthcoming.

Aw, Bee Yan, and Mark J. Roberts. 1986. Measuring Quality Changes in Quota Constrained Import Markets: The Case of U.S. Footwear. *Journal of International Economics* 21:45–60.

———. 1988. Price and Quality Comparisons for U.S. Footwear Imports: An Application of Multilateral Index Numbers. In *Empirical Methods for International Trade*, ed. Robert C. Feenstra, 257–75. Cambridge, Mass.: MIT Press.

Bale, Malcolm, and John Mutti. 1981. Output and Employment Changes in a Trade Sensitive Sector: Adjustment in the Footwear Industry. *Weltwirtschaftliches Archiv* (Kiel). 117 (2).

Bhagwati, Jagdish. 1969. On the Equivalence of Tariffs and Quotas. In *Trade, Tariffs, and Growth*, ed. J. N. Bhagwati, 248–65. Cambridge, Mass.: MIT Press.

Bresnahan, Timothy F. 1989. Empirical Studies of Industries with Market Power. In *Handbook of Industrial Organization*, ed. Richard Schmalensee and Robert Willig. Amsterdam: North-Holland Publishers.

Falvey, Rodney E. 1979. The Composition of Trade within Import-restricted Product Categories. *Journal of Political Economy* 87:1105–14.

Feenstra, Robert C. 1984. Voluntary Export Restraints in U.S. Autos, 1980–1981: Quality, Employment, and Welfare Effects. In *The Structure and Evolution of Recent U.S. Trade Policy*, ed. R. E. Baldwin and A. O. Krueger, 35–59. Chicago: University of Chicago Press.

Helpman, Elhanan, and Paul R. Krugman. 1989. *Trade Policy and Market Structure*. Cambridge, Mass.: MIT Press.

International Monetary Fund. 1986. *International Financial Statistics: Yearbook 1986*. Washington, D.C.

National Bureau of Economic Research. *Productivity Database, 1958–86*. Cambridge, Mass.: National Bureau of Economic Research.

Rodriguez, Carlos. 1979. The Quality of Imports and Differential Welfare Effects of Tariffs, Quotas, and Quality Controls as Protective Devices. *Canadian Journal of Economics* 12:439–49.

Szenberg, Michael, John W. Lombardi, and Eric Y. Lee. 1977. *Welfare Effects of Trade Restrictions: A Case Study of the U.S. Footwear Industry*. New York: Academic Press.

U.S. Department of Commerce, Bureau of the Census. 1974–86. *Current Industrial Reports, Footwear*. Washington, D.C.

———. 1974–85. *U.S. General Imports: General and for Consumption*, Schedule A, FT 135. Washington, D.C.

U.S. International Trade Commission. 1981. *Non-Rubber Footwear.* USITC Publication 1139. Washington, D.C.

Comment

Keith E. Maskus

Bee-Yan Aw's paper is a nice example of how we can advantageously use straightforward partial-equilibrium models and sensible econometric techniques to examine basic questions about the effects of trade policy on domestic and foreign firms competing in the home market. Her approach is a simple modification of the standard textbook model of protection. Consider the home market for a standardized and rather homogeneous product, such as footwear, facing a high degree of import competition from price-elastic foreign suppliers. The modification comes in allowing for two possibilities that are not in the simple textbook model. The first possibility is that imported and domestic products may be differentiated in some way, allowing us to treat them in separated markets. The second, and related, possibility is that domestic and foreign suppliers may have some power to extract monopoly profits through imperfectly competitive pricing behavior. Aw's analysis shows that these issues may be incorporated analytically without much difficulty and that the payoff to doing so in terms of understanding the underlying form of competition can be rewarding.

The main purpose of the paper is to infer the effects of the voluntary export restraint (VER) negotiated between the United States and Korea and Taiwan on competition and prices in the U.S. markets for domestic and Korean and Taiwanese footwear. One might wonder about the choice of footwear for such an analysis, since there is likely to be a strong prior expectation that these markets come close to the perfectly competitive extreme. Both the domestic and Korean and Taiwanese sources of supply face strong competition from each other and from additional international suppliers. Footwear technology is highly standardized and stable so there is little scope for generating any dynamic forms of comparative advantage. Significant import penetration is simply the result of high costs in the U.S. industry. In short, the standard textbook model is probably the right one for this industry, implying that our conventional notions of the costs and benefits of trade barriers are also substantially correct.

Nonetheless, in any industry, market structure and the degree of competition are ultimately empirical issues that deserve investigation, as Aw has competently done. Further, as is well known, the imposition of the VER itself could have an impact on competitive behavior in U.S. markets, making it a worthy episode for study. In this context, Aw's results are reasonably clear

Keith E. Maskus is associate professor of economics at the University of Colorado, Boulder.

and would, I believe, stand up well to alternative specifications. In particular, prior expectations are borne out: the U.S. industry is forced to price competitively whether or not there is a VER in place against the major foreign supplier. The VER rents are transferred completely to foreign exporters. There was no strategic rent capture, and the VER clearly worsened the U.S. terms of trade. The main benefit of the program was that it offset the cost advantage of Taiwanese and Korean footwear suppliers, which presumably is precisely what the U.S. industry desired. Otherwise, the VER can only be considered to have been harmful to U.S. interests in the most damaging way possible. These results provide a sense of reassurance that economists are not misleading their students and themselves about the dangers of protection. After all, if Aw had discovered that the United States had somehow increased its welfare by imposing a VER on an apparently competitive industry, the profession would have been confronted with a surprising, and therefore noteworthy, result.

Thus, Aw's analysis has confirmed basic expectations, which fact may be sufficiently convincing of the correctness of the exercise. However, a few cautionary notes must be sounded before the conclusions are accepted wholeheartedly. These comments relate to both the adequacy of the model for capturing the true complexities of competition in footwear and to the empirical research design.

Four issues may be raised about aspects of competition in footwear markets that go unconsidered here. First, the model lacks any specification of what is thought to be the potential source of imperfect competition among domestic and foreign shoe producers. Each industry produces a homogeneous product, though there is differentiation between U.S. and foreign footwear. In itself, this assumption is uncomfortable, since presumably differentiation is greater across types of shoes (e.g., rubber versus nonrubber or finer classifications of characteristics), regardless of geographical source, than across country of origin. Aw's approach is thus reminiscent of trade models employing the Armington assumption, which has been shown to be of dubious value. The form of product differentiation is, in principle, significantly related to competitive decisions. For example, if U.S. firms consider their main competition to be other U.S. firms, which would be appropriate under the nation-specific differentiation hypothesis assumed in Aw's paper, they would likely perceive themselves to have fewer competitors than they would under the product-specific differentiation hypothesis with its global supply sources. The VER may then induce more, presumably inefficient, entry by U.S. firms in the former case. Perhaps more fundamentally, the notion that each national industry produces a homogeneous product leaves little scope for explaining uncompetitive behavior in the absence of further assumptions about entry barriers or the distribution of firm sizes and resulting strategic activity. In short, what is supposed in this analysis to induce, even potentially, collusive behavior by U.S. firms?

A second competitive issue stems from the first. Aw's model is designed

exclusively to consider pricing behavior. It is clear, however, that competitive pressures and the imposition of the VER could affect markets equally through output responses. No mechanism for entry, exit, or investment decisions is allowed here, which is understandable given the limited amount of data available. Nonetheless, as the author notes, the introduction of a quantitative import limitation in an imperfectly competitive market could result in greater or lower domestic output, depending on the competitive responses. The paper finesses this issue by considering only the estimation of a short-run cost function with fixed capital stock for the U.S. industry, which practice conditions the results of estimates of price-marginal cost gaps. It is likely that over the twelve-year period considered, new investments were undertaken by U.S. footwear firms, perhaps inefficiently, which would be an interesting question for subsequent analysis to consider.

A third concern is the absence of serious consideration of additional international supply sources. The issue is often raised in the paper but is not dealt with satisfactorily due to the strict focus on bilateral competition. The welfare effects of the VER depend on relevant trade elasticities from other footwear sources, both directly and because the behavior of U.S. and Taiwanese firms is affected by third-country competition. In the simplest view, it seems likely that, in lobbying for the VER, the U.S. industry succeeded only in making Taiwanese exporters richer while inviting greater imports from elsewhere, with few benefits to themselves. Indeed, in that context one wonders what the motivation for the VER, as opposed to, say, a nondiscriminatory tariff, could have been in the first place.

A final competitive issue is perhaps the least relevant for the modeling exercise, but an intriguing one all the same. Perhaps an important layer of competition has been missed here. Specifically, footwear producers in the United States, for whose benefit the VER was presumably erected, are not typically the final sellers of their products. Footwear retailers sell both American and imported products and may be in a position to exploit market power of their own through oligopsonistic procurement. This possibility could be significant both in considering the welfare effects of the VER, specifically the disposition of its rents, and in explaining the inability of U.S. producers to raise prices above marginal costs.

Turning to the empirical methods, which are generally sensible given the inevitable tradeoffs between analytical rigor and empirical tractability in these exercises, several concerns may be voiced as well. First, there are only twelve years of data. Yet sixteen parameters are estimated in one market and eleven parameters in the other market, and there is the subsequent desire to make inferences about market structure and associated demand and supply elasticities. Thus, the data are asked to reveal more information than they may legitimately contain. It might have been better to increase the sample size by considering some pooling possibilities across several footwear categories, which approach seems feasible given the prior categorical aggregation.

Second, the simultaneous-equations framework adopted in Aw's paper is a decided improvement over most other empirical efforts in the field of trade policy and imperfect competition. However, it is doubtful that all relevant relationships have been captured in the model. For example, it seems that some parameters should be codetermined in principle. Consider Θ (the competitiveness parameter in the U.S. market), η (demand elasticity), and ξ (the effect of the VER on demand for domestic footwear). The VER could influence not only the size of the demand for U.S. shoes, but also its elasticity, which would in turn affect the competitive behavior of U.S. producers. Similarly, since the prices of imported Taiwanese footwear are included in I_t, the price index of imported shoes in the U.S. demand equation, the VER on Taiwanese footwear products may dominate the estimated cross-price demand elasticity γ_3, implying that γ_3 and ξ may be codetermined. This latter problem could be handled simply by interacting the VER dummy variable with I_t. On a different plane, it is doubtful that modeling the markets for U.S. and Taiwanese footwear separately adequately captures their interrelationships, even allowing for the shift parameter in U.S. demand.

Third, the markedly different modeling strategies in the two markets are hard to understand. Aw has specified a log-linear demand for U.S. shoes with a VER dummy but a "linear" U.S. demand for Taiwanese shoes that incorporates an interaction term between imports and the prices of substitute footwear. It is difficult to make meaningful elasticity comparisons across markets in this context. At the same time, she has adopted a translogarithmic short-run cost function for U.S. producers and a linear long-run cost function for Taiwanese producers. There is no explanation for this rather marked conceptual difference between cost structures, a difference that conceivably could color the size of the relative markups.

A final small comment is in order. The author has taken pains to control for quality changes in the data in order to focus strictly on price competition. Yet a striking result in the paper is that the income elasticity for U.S. shoes is negative while that for Taiwanese imports is positive. Could it be that quality changes have not been fully expunged from the data?

Comment J. David Richardson

I like the spirit of this paper a great deal: specify an econometric model with careful attention to theory, apply it to a data set that the author herself has painstakingly validated for the purpose, and see how well the specification stands up against the data.

J. David Richardson is professor of economics at the Maxwell School of Citizenship and Public Affairs, Syracuse University, and a research associate of the National Bureau of Economic Research.

I find the conclusions from these procedures quite credible. The data suggest that VERs on Korean and Taiwanese footwear exports to the United States generated modest rent transfers. The data support no trace of imperfect competition in any footwear market, either before or after the VERs.

I am persuaded that these conclusions are robust, too, given our knowledge of the industry's structure. The paper motivates its search for indications of imperfect competition by observing that 82 percent of U.S. footwear output was produced by one quarter of the firms. But there are a lot of firms in that one quarter! So it does not surprise me that the results come out looking pretty competitive.

I was disappointed that the paper itself did not reinforce my sense of robustness that rent transfers would be everything and imperfectly competitive effects (on price/cost margins, on profits, on scale, on entry or exit, etc.) would be nil. The paper could have driven home that point by more imaginative experimentation with alternative specifications. It selects one specification only—and not a very compelling one at that, because of peculiarities and undefended asymmetries.

I can illustrate what I mean by abstracting from third-country suppliers and from other important detail that the paper includes but that is extraneous for my purpose. At its core, the model is made up of two inverse demand functions,

$$p_1 = p_1(q_1, p_2, \ldots), \tag{1}$$

$$p_2 = p_2(q_2, p_1, \ldots), \tag{2}$$

where p's are prices, q's are quantities, and 1 and 2 denote countries whose footwear competes as imperfect substitutes; and two marginal cost functions,

$$c_1 = c_1(q_1, \ldots), \tag{3}$$

$$c_2 = c_2(q_2, \ldots), \tag{4}$$

where c's are marginal costs.

This is where the asymmetries begin. Equation (1) is specified as a log-linear function but (2) is a conveniently nonlinear "linear" function—the product p_1q_2 enters linearly and conveniently in addition to other variables, on the right-hand side. I would have preferred for close substitutes to have consistent functional forms. Equation (3) is specified as a translog short-run cost function (capital held constant), but (4) is a linear long-run cost function (capital costs included on the right-hand side). The author comments soberly at one point that "it is important that the functional form chosen in the estimation of the cost relation not place severe restrictions on the estimates of marginal cost." But she seems unable to apply the spirit of that rule to (4) for lack of data, and unwilling to apply it to (1) and (2) despite the well-known hypersensitivity of results in imperfect competition to the curvature of the demand curve.

Another all-important specification question is how a VER should enter equations (1)–(4). Does it make the constrained supplier's cost curve vertical after a point? Does it introduce a vertical segment to one demand curve, with a consequent discontinuity in its marginal revenue curve? Does it shift the other demand curve, and if so exactly how—horizontally, linearly, . . . (the functional form question again)? The author opts for the first choice alone, and leaves it at that. In equation (11) of the paper, for example, there seemed to be a fairly simple opportunity to allow a VER dummy variable to shift both the "degree-of-competition" parameter and the demand elasticity. Only the former is permitted; the demand elasticity is assumed to be unaffected by the VER.

There are in addition two questions that the paper leaves peculiarly unresolved. One is whether product differentiation across varieties (rubber/nonrubber, and so on) is empirically more important than product differentiation across nationalities. The answer provided (in note 8) seems inadequate and at variance with common sense; countries produce many overlapping varieties, and casual observation suggests that shoe consumers do not put a great deal of weight on national origin, say, by comparison with consumers of automobiles and other consumer durables. A second unresolved question is whether the estimated cross-price elasticity of U.S. demand for imported footwear can credibly be 6, while the own-price elasticity is far smaller, and whether domestic footwear can be credibly considered an inferior good, as the paper maintains. Once again, the paper's answer seems inadequate. I would have appreciated some attention to how robust these results were to alternative specifications.