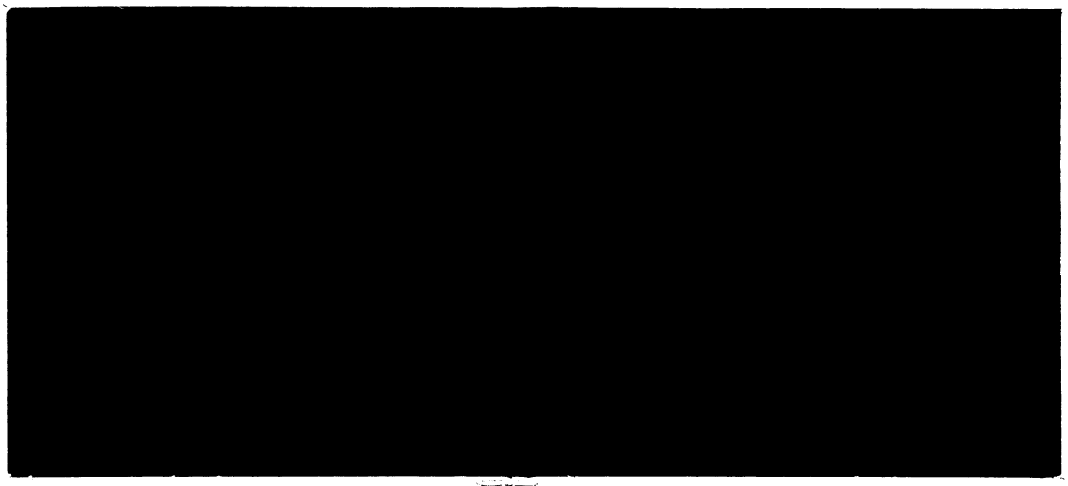
Working Paper Series



DEPARTMENT OF AGRICULTURAL AND
RESOURCE ECONOMICS

BERKELEY

CALIFORNIA AGRICULTURAL EXPERIMENT STATION

University of California

[redacted]

Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA

Working Paper No. 191 Rev.

VOLUNTARY QUOTAS AS TRADE POLICY

by

Roy Allen, Claudia Dodge, and Andrew Schmitz

California Agricultural Experiment Station
Giannini Foundation of Agricultural Economics
April 1982

VOLUNTARY QUOTAS AS TRADE POLICY

by

Roy Allen, Claudia Dodge, and Andrew Schmitz

Roy Allen and Claudia Dodge are research assistants at the University of California, Berkeley. Andrew Schmitz is a professor of agricultural and resource economics at the University of California, Berkeley.

VOLUNTARY QUOTAS AS TRADE POLICY*

Introduction

In this paper, we consider voluntary export quotas which are becoming a common trade policy instrument. They are "voluntary" because the exporting country has the choice between curtailing some of its exports or having them reduced by a protectionist measure such as tariffs in the importing country. When faced with this choice, an exporting country often chooses to voluntarily limit its exports because, as this paper shows, voluntary quotas can improve the welfare position of the exporting country, not the importing country that instigates the trade restriction. A reason this result holds is because the exporting country can capture tariff equivalent revenues. We first develop the theory to support the proposition that voluntary quotas benefit exporting countries at the expense of the importer, and then apply the model to international beef trade for illustration.

There are several well-known results of international trade theory which are relevant to our study. With a tariff, the importing country's welfare can improve only under the large country assumption (upward sloping import supply curve), and both exporter and importer lose in the small country case (perfectly elastic import supply curve). It has also been shown that a quota used by an importer can be equivalent to using tariffs (Bhagwati). If the importing country auctions off the rights to import restricted commodities then, with perfect competition, an import quota is equivalent to a tariff. The empirical work in both agricultural and nonagricultural goods has focused largely on the effects of tariffs and equivalent quotas. Results generally show that exporting countries lose from such barriers to trade. In contrast,

we find that exporting countries gain and importing countries lose with a voluntary export trade restriction.

Framework of the Analysis

To show the possible welfare effects of a voluntary quota, consider figure 1 where this type of quota is compared with a tariff in a two-country model. The exporting country's supply and demand is S_f and D_f from which the excess supply curve, ES, is derived; MO is the marginal outlay curve viewed from the standpoint of the importing country. Supply and demand in the importing country is S_d and D_d. The excess demand curve is ED, the free trade price is P_F, and exports are OX_3. The importer can gain by imposing a tariff or equivalent quota if and only if the excess supply curve is upward sloping (the large country assumption). The ootimal tariff is determined by the intersection of the marginal outlay curve and the excess demand curve. The indicated tariff, $P_T - P_E$, or equivalent quota restriction, OX_2, maximizes the importer's social welfare as long as the tariff revenues are retained domestically. The net gain to the importer is the cross-hatched area minus the two shaded areas.

In this model, the difference between a voluntary export quota and the more traditionally used import quota is the allocation of the quota rents, lmno. With a voluntary quota, the quota rents go to the exporting country. This result will hold if producers and marketing intermediaries in both countries are competitively organized. An export quota administered in such a way that entry into the exporting industry is limited causes the competitive importing firms to bid away any excess profit and allows the exporting country to capture any scarcity rent. If the exporting country auctions off the right

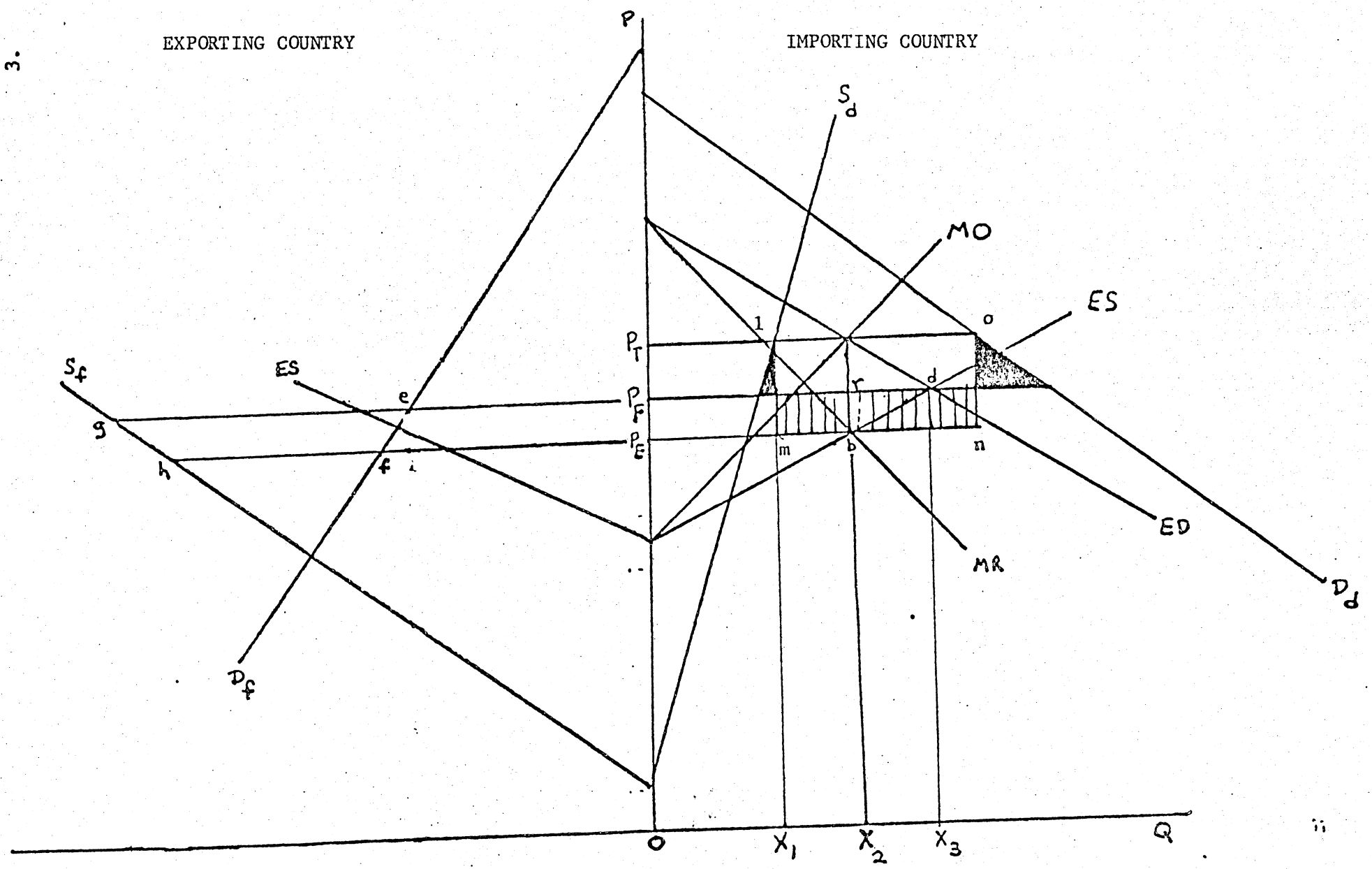


Figure 1. The Optimal Tariff and a Government Voluntary Export Quota Compared

to export the restricted commodity, then the importing country, by initiating voluntary export quotas, sets up the equivalent of an export tax for the exporting country.

The welfare effects of voluntary export quotas will be apparent by deriving the optimal export tax in figure 1. The marginal revenue curve to the excess demand curve is MR. The optimal export tax is obtained by equating MR to ES. Now, importers pay P_T, and export tax revenue is lmno. (For clarity of exposition, the optimal import tariff and export tax were constructed to yield the same quantity of imports.) Producer and consumer prices in the exporting country drop to P_E, and consumers in the exporting country gain $P_F efP_E$. As a result, the exporting country, as a whole, gains since the producer loss, $P_F ghP_E$, in the exporting country is more than offset by the consumer gain plus the export tax revenue.

If the importer sets the limit at OX_2 and the exporter voluntarily agrees, then the voluntary quota yields the optimal export-tax solution. However, there exists a range of voluntary quota restrictions which will provide a net benefit to the exporting country <u>vis-a-vis</u> free trade. If rd = mb, then X_1X_3 is the quota range which improves the exporting country's welfare. The exporting country benefits as long as the loss in producer surplus (including profits of marketing intermediaries) is less than the consumer gains plus the export tax equivalent revenue. Therefore, even though voluntary quotas restrict trade, the exporting country will accept a range of restrictions.

Three points are important. First, the policy of voluntary quotas results in a net welfare loss to the importing country. A higher import price is paid

for fewer imports and there are no tariff or equivalent quota revenues to compensate consumers. Second, both tariffs and voluntary quota policies protect the producers in the importing country, and they are equally well off under either policy if the restrictions both result in the same quantity of imports. Thus, consumer interests are sacrificed for the benefit of producers in the importing country. Since consumers are generally less aware of the higher price effect of voluntary export quotas than of tariffs, voluntary quotas become more politically viable given a policy goal of protecting producers. Third, an importing country cannot easily impose tariffs while concurrently pushing for freer trade in products which it exports. Voluntary quotas have the desirable quality of protecting producers while avoiding trade retaliation.

There is another important aspect of voluntary export quotas which has to do with the nature of the export supply curve. Consider figure 2 where ES is the totally elastic export supply curve, and S_d and D_d are the importer's domestic supply and demand curves. Under free trade, imports are X_1X_2. In this case, a tariff will harm the importer. For example, a tariff which raises the price from P_F to P^1 results in a loss of the two shaded areas to the importer. However, if the export supply curve was ES^1, the importer could optimally gain by setting the tariff at $P^* - P_F$. Thus, tariffs can only benefit importing countries when the export supply curve is less than totally elastic. In contrast, a voluntary export quota can be welfare improving for the exporter even with a perfectly elastic excess supply curve. With excess demand, ED, marginal revenue, MR, and excess supply, ES, the exporter can restrict exports to OX_3 and gain from the optimal export tax or an equivalent voluntary export quota policy. The optimal export tax or voluntary-quota

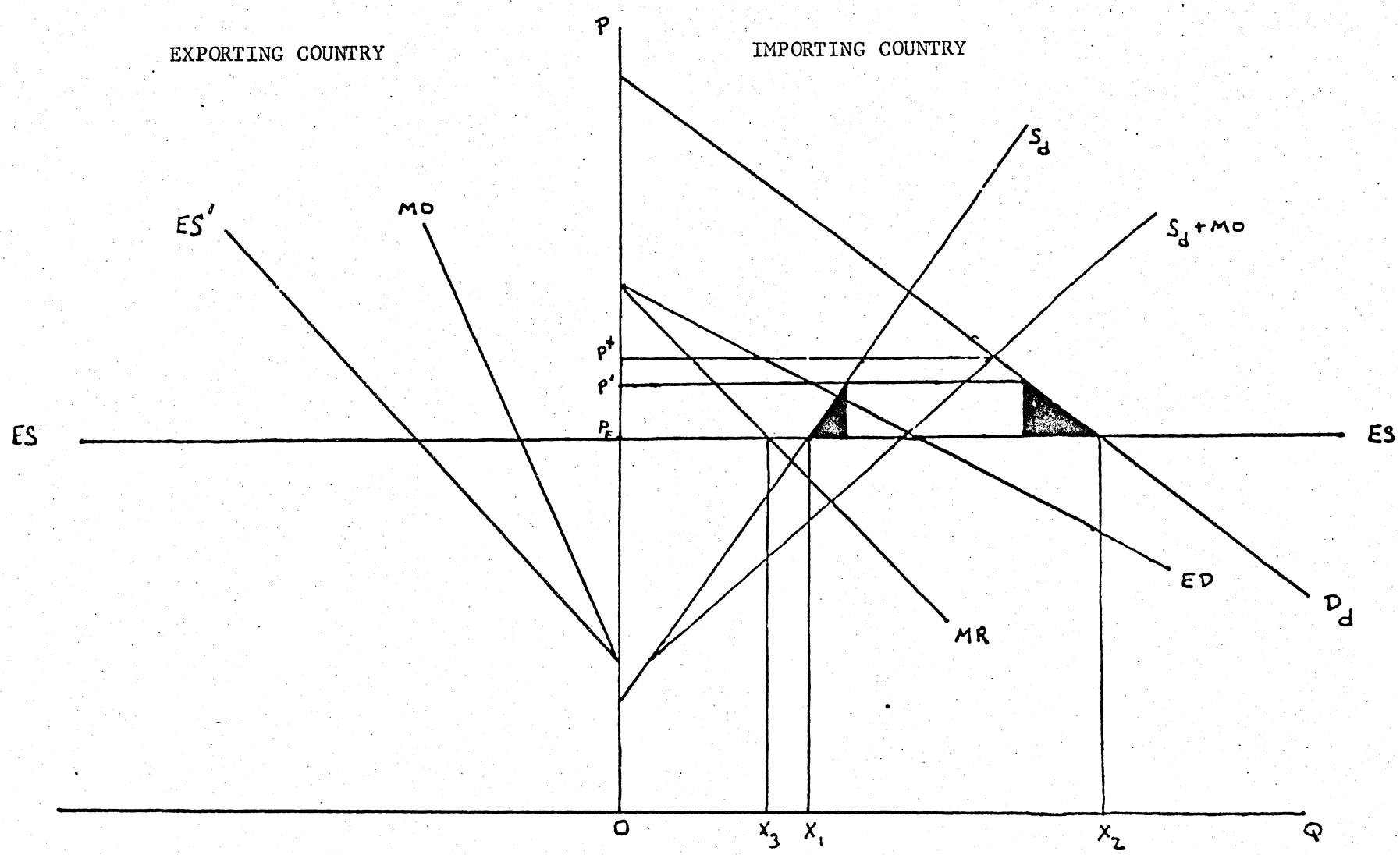


Figure 2. Tariffs and Voluntary Export Quotas Under Different Supply Conditions

solution requires only that the excess demand curve of the importer be downward sloping, whereas the optimal-tariff solution requires that the export supply curve be upward sloping. The latter is a monopsony model, while the export-tax model is the monopoly solution.

Empirical Results

We apply the above analysis of voluntary quotas to the beef trade. Imports of frozen boneless beef into the United States were unrestricted before the passage of the 1964 Meat Import Law. This legislation allowed for the implementation of U. S. import quotas in any year if certain fresh, chilled, or frozen meat imports exceeded an established level. The legislation provided for the import quota to rise proportionally with the expansion of the domestic beef industry from a base which was formulated as the average level of imports over the period 1959 to 1963. To that adjusted base quota for any year, a figure of 10 percent was added to represent the "trigger point." The President of the United States is then required to invoke the import quota, but he also has the power to suspend or raise the quota level.

Essentially free trade continued from 1965 to 1967 since imports were less than the trigger point. In 1968 it became evident that the trigger level would be exceeded. The threat of import quotas resulted in the establishment of voluntary quotas by the beef exporters to the United States since, under voluntary quotas, the exporting countries do not pay for the right to export. This voluntary system has remained the tool to limit frozen beef imports to the present. However, there was a short period during 1972-1974 when the President suspended the import quota triggering levels because of strong upward pressure on prices due to short domestic supplies.

Three markets are identified to analyze the welfare effects of the frozen boneless beef voluntary export quotas: the exporting countries (XC), the United States (US), and the rest of the world (ROW). The exporting countries consist of Australia, New Zealand, the Central American countries, and Canada. Together they account for over 90 percent of the U. S. frozen beef imports. Australia alone supplies over 50 percent of the imports, and New Zealand supplies over 20 percent. The dominant rest of the world importers are Japan and the European Economic Community.

The years ending in June, 1969, and June, 1970, were chosen for empirical analysis because they were the first two years in which the quota was fully effective. In addition, the years 1976 and 1977 were chosen because they followed the reinstitution of the voluntary quotas and were the last years in which relevant data were published in the Australian Meat Board Annual Reports, which supplied data on U. S. total frozen boneless beef imports, Australian wholesale prices, average free alongside (FAS) price to the United States, and average FAS price to the rest of the world. Given Australia's dominance as the major exporter and the homogeneity of frozen boneless beef, it was assumed that the aggregate XC received these FAS prices. Production and export data were supplied by the Statistical Yearbook (United Nations) and the Trade Yearbook (Food and Agricultural Organization). When necessary for compiling data, it was assumed that one head of beef resulted in 0.394 metric tons of product weight and that one ton of carcass weight produced 0.67 tons of product weight.

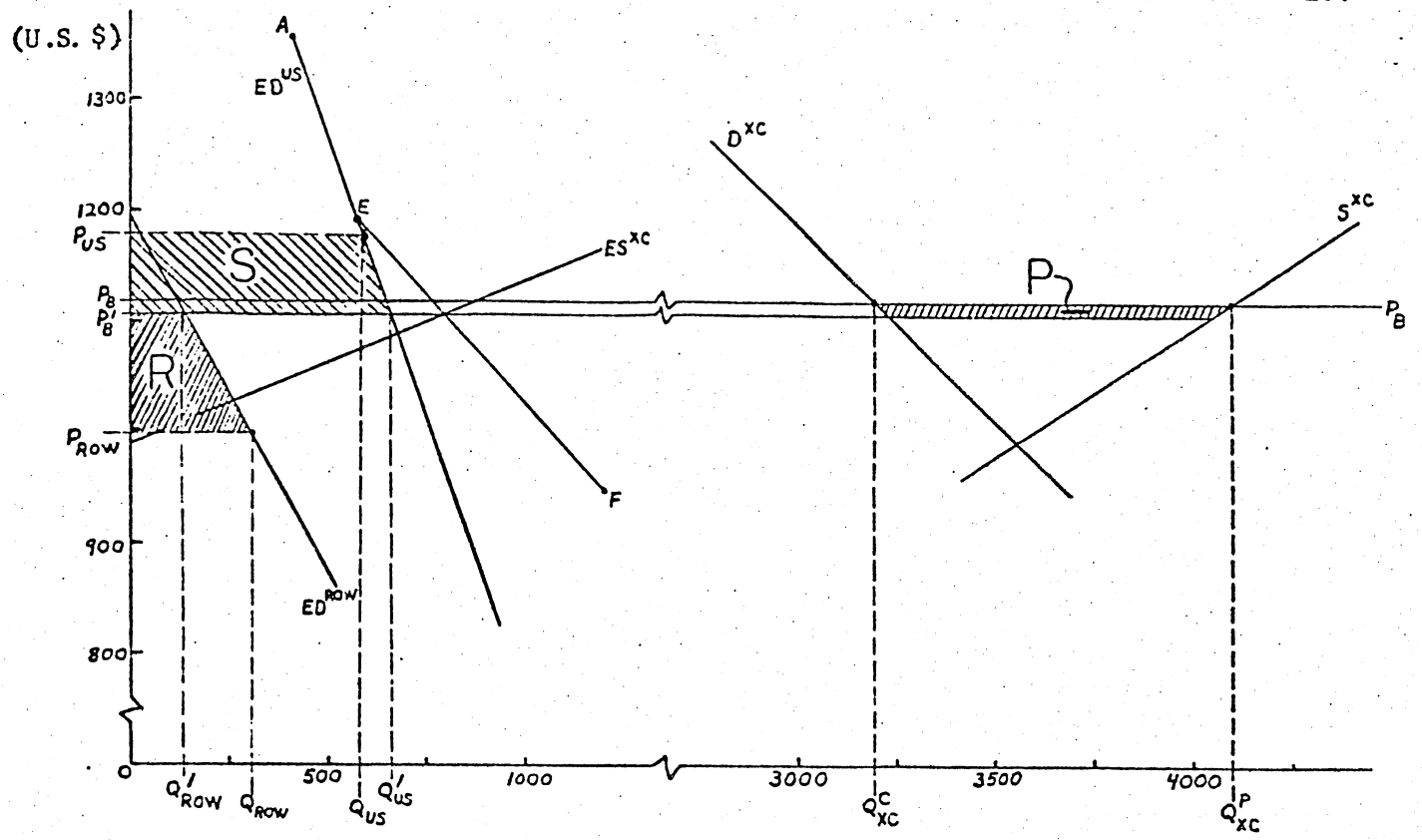
The wholesale supply and retail demand curve elasticities of the exporting countries at the observed price quantity points (P, Q) for each year studied were assumed to be 0.5 (Wicks and Dillion) and -1.0 (Richardson). In the

elasticity of supply, P is the wholesale price and, in the elasticity of demand, the retail price. These elasticities are short-run estimates, and they represent the estimates reviewed in the above articles. Although these estimates are for Australia, the absence of estimates for other exporters forces us to assume they have similar elasticities. Because these elasticities are felt to be reasonable for New Zealand and thus reasonable for over 70 percent of the exports, they appear to be good approximations for the aggregate XC. Using these elasticities, constant slope and constant elasticity wholesale supply and retail demand curves were derived for XC for each year studied. Each curve passes through the appropriate (P, Q) and has a slope at (P, Q) of $P/\varepsilon Q$ where ε is the elasticity of supply or demand.

Constant slope and constant elasticity retail excess demand curves for beef in the United States for each year were constructed in the same manner from an elasticity estimate of -2.9. Houck estimated that a 10 percent increase in processed beef imports results in a decline of 3.46 percent in retail prices. This translates into an elasticity of import demand (10/-3.46 = -2.9).

Figure 3 illustrates the welfare effects of the beef voluntary quotas for the year ending June, 1977, under both the linear assumption and the constant elasticity assumption. The aggregate supply and demand curves for the exporting countries, S^{XC} and D^{XC}, pass through a FAS blend price, P_B, at the observed quantities and are generated from the wholesale supply and retail demand curves with a constant markup hypothesis. P_B is defined as

$$P_B = \frac{P_{US}\, Q_{US} + P_{ROW}\, Q_{ROW}}{Q^E_{XC}}$$



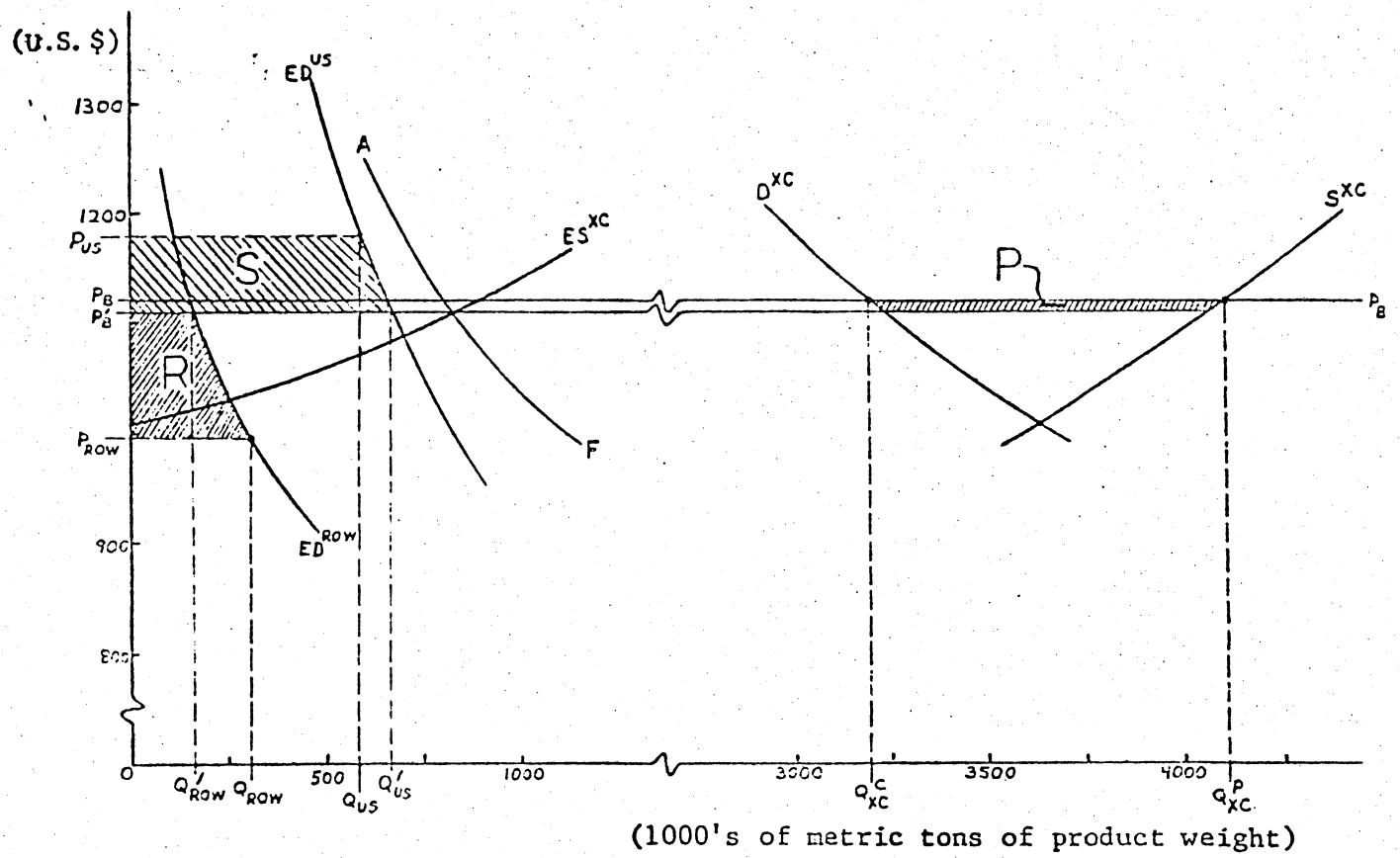


Figure 3. Empirical Estimates of Welfare Impacts of Frozen Boneless Beef Voluntary Quotas For Year Ending June, 1977; Linear Assumption (above) and Constant Elasticity Assumption (below).

where

Q_{US} = quantity shipped from XC to US

Q^C_{XC} = quantity consumed by XC

Q^P_{XC} = quantity produced by XC

Q_{ROW} = quantity shipped from XC to ROW

Q^E_{XC} = quantity exported by XC = $Q^P_{XC} - Q^C_{XC} = Q_{US} + Q_{ROW}$

P_{ROW} = FAS price paid by ROW to XC

and

P_{US} = FAS price paid by US to XC.

The Australian Meat Board's method of limiting exports to the United States vis-a-vis free trade was to allow such exports only in a fixed ratio with exports to the other less lucrative markets. Assuming the only restriction on trade is a tied-sales export policy, entry into both exporting and importing industries occurs until profit on the margin equals zero. In the exporting country, this implies that P_B, the FAS price of a unit of export sales, equals the retail price plus δ where δ equals the difference in marginal cost between preparing the product for shipping and preparing the product for retailing. P_B also equals the wholesale price plus θ where θ equals the marginal costs incurred between wholesaling and shipping. A country's marginal profit from importing equals zero when the quantity purchased at an FAS price lies on its excess demand curve at FAS prices. Or, the retail price in the importing country equals the FAS price plus γ where γ equals the marginal costs incurred by middlemen in the importing country.

Assuming the markups δ, θ, and γ to be constant allows construction of the FAS curves S^{XC}, D^{XC}, and ED^{US} shown in figure 3 from the corresponding wholesale supply and retail demand curves. ED^{US} is the excess

demand of the United States. The excess demand curve for the rest of the world, ED^{ROW}, is constructed to pass through the observed FAS price and quantity with an arbitrarily chosen elasticity of -5.0. And the aggregate excess supply of the exporting countries at the FAS level, $ES^{XC} = S^{XC} - D^{XC}$.

With free trade, the FAS price paid by all importers would have been at P_B' in figure 3 where ES^{XC} intersects the horizontal summation of ED^{US} and ED^{ROW}. This summation is given by AEF in the linear case and AF in the constant elasticity case. The United States would have imported Q_{US}', and the rest of the world would have imported Q_{ROW}'. Since the actual ratio of U. S. imports to the imports of the rest of the world, Q_{US}/Q_{ROW}, was not equal to Q_{US}'/Q_{ROW}', the tied sales export policy caused a divergence between P_{US} and P_{ROW}. In fact, the export policy required $Q_{US}/Q_{ROW} < Q_{US}'/Q_{ROW}'$, meaning $P_{ROW} < P_B' < P_{US}$ so that exports to the United States were restricted vis-a-vis free trade and did not exceed the trigger level legislated by the United States.

From the definition of P_B, the reader can easily check that the blend price received by exporters from the tied-sales export policy can theoretically increase or decrease relative to the free trade price meaning net welfare in XC can increase or decrease. This result is contrary to the case discussed in the previous section where a licensing procedure used by the exporting country to restrain exports limits entry into exporting and increases export price and net welfare in the exporting country. Because entry into exporting is not restricted under the tied-sales export policy, there is no scarcity rent and net welfare in the exporting countries increases only when a higher blend price causes production to increase. Australia's

gradual shift in 1978-1980 from the tied-sales export policy to an export quota licensing policy is a reflection of these results. However, both policies--by restricting shipments to the United States and increasing its import price--necessarily decrease net welfare in the United States.

Figure 3 shows that in 1977 the use of voluntary export quotas decreased net welfare in the United States by the cross-hatched area, S, and increased net welfare in XC and ROW by areas P and R, respectively. The U. S. dollar values of these areas for each year studied under both the linear and constant elasticity assumptions are listed in table 1. The results show that, in all cases, the United States had a net welfare loss from the voluntary quotas, while the exporters and other importers both gained in aggregate. When the constant elasticity rather than the linear specification is used, there are only minor changes in the calculated welfare areas.

Note that, if ES^{XC} is horizontal at the observed blend price, P_B, then a voluntary quota cannot change P_B or welfare in the exporting countries. But, like in the case examined above, quota imposition causes production in XC to increase. That is, the increase in shipments to the rest of the world are greater than the reduction in shipments to the United States. For the quota year illustrated in figure 3, a quota imposition, given a horizontal excess supply curve (in the linear case), would decrease net welfare in the United States by $38,000,000 rather than the $50,000,000 under the upward sloping excess supply curve.

Our results support the proposition that voluntary export quotas do yield a net welfare improvement for the beef exporting countries even though they do not appear to be used as the equivalent of an optimal export-tax policy. The exporting countries could maximize their welfare if they instituted a

TABLE 1

Change in Welfare from Quota Imposition Evaluated in U. S. Dollars
Linear Assumption (Constant Elasticity Assumption)

Year ending June	US (area S)	ROW (area R)	XC (area P)	Total
1969	-13,000,000 (-13,000,000)	6,000,000 (7,000,000)	2,000,000 (3,000,000)	- 5,000,000 (- 3,000,000)
1970	-36,000,000 (-36,000,000)	14,000,000 (20,000,000)	6,000,000 (6,000,000)	-16,000,000 (-10,000,000)
1976	-42,000,000 (-40,000,000)	17,000,000 (19,000,000)	15,000,000 (14,000,000)	-10,000,000 (- 7,000,000)
1977	-50,000,000 (-45,000,000)	24,000,000 (27,000,000)	10,000,000 (9,000,000)	-16,000,000 (- 9,000,000)

quota-licensing system within each country and then formed an exporting cartel in order to further limit beef exports to the United States. However, the move to a cartel is unlikely (Caves). Difficulties in coordinating cattle cycles, heterogeneity of purchase agreements, geographic dispersion, and cultural differences are specific reasons why cooperation among beef exporters does not exist. Thus, ironically, an export-cartel solution can only occur when the United States forces enactment of a system of voluntary export quotas. That is, the use of voluntary quotas by the United States allows exporters to restrict trade with the resulting welfare effects similar to those of an association of exporters.

It is important to recognize the coalition implications once exporting countries move to policies that allow the producers in the exporting countries to collect the quota rents. Clearly, there is then an incentive for producers in both importing and exporting countries to promote a voluntary quota-export system through their various trade associations. This is because both sets of producers become better off vis-a-vis free trade--unlike a tariff policy which hurts producers in the exporting countries. Note that the trade restriction goals of the exporting countries will depend on who controls production and marketing. A government cartel group would lobby more actively with producers in the importing country for tighter import controls than a producer export cartel group because a government export cartel would prefer a higher import price and fewer exports (derivable from Carter, Gallini, and Schmitz).

Conclusions

This paper has shown the economic effects of voluntary quotas compared to tariffs and their equivalent quotas. Theoretically, voluntary quotas can

allow exporters to improve their welfare since their effects can be shown to be equivalent to an export tax. International trade in frozen boneless beef was modeled, and the results show that countries which export beef to the United States do indeed gain by the use of voluntary quotas. The United States, by insisting on voluntary export quotas to restrict imports rather than using tariffs or their equivalent quotas, is clearly pursuing the wrong import policy. With both tariffs and voluntary quotas having equivalent effects on U. S. producer's welfare, voluntary quotas make exporting countries better off in aggregate while making the United States worse off in aggregate. Since policies are often ranked as first, second, third, or fourth best using welfare criteria, the insistence by the United States to use voluntary export quotas has to be a fourth-best policy to pursue, unless the policy goal is to maintain a free-trade posture while benefiting producers at consumer expense. It has been shown elsewhere that <u>importers</u> of U. S. products gain by the use of optimal tariffs at the expense of the United States (Carter and Schmitz). As this paper suggests, <u>exporters</u> of products into the United States may also gain at the expense of the United States by the use of voluntary export quotas.

Footnotes

*Giannini Foundation Paper No. (reprint identification only).

Authors thank John Freebairn, Stanley Johnson, Maury Bredahl, and Ed Schuh for helpful comments.

References

Australian Meat and Livestock Corporation, Report of the Australian Meat and Livestock Corporation, Sydney, Australia, 1969-1978.

Bhagwati, J. "On the Equivalence of Tariffs and Quotas." R. E. Baldwin et al., Trade, Growth and the Balance of Payments--Essays in Honor of G. Harberler. Chicago: Rand McNally, 1965.

Carter, C., N. Gallini, and A. Schmitz. "Producer-Consumer Trade-Offs in Export Cartels: The Wheat Cartel Case." Amer. J. Agr. Econ. 62(1980):812-18.

Carter, C., and A. Schmitz. "Import Tariffs and Price Formation in the World Wheat Market." Amer. J. Agr. Econ. 61(1979):517-22.

Caves, R. E. "International Cartels and Monopolies in International Trade." International Economic Policy: Theory and Evidence, eds. R. Dornbusch and J. A. Frenkel, pp. 36-73. Baltimore: Johns Hopkins University Press, 1979.

Food and Agriculture Organization of the United Nations. Trade Yearbook, 1968-1978.

Houck, J. P. "The Short-Run Impact of Beef Imports on United States Meat Prices." Aust. J. Agr. Econ. 18(1974):60-72.

Richardson, R. A. "Structural Estimates of Domestic Demand for Agricultural Projects in Australia: A Review." Rev. Mktg. Agr. Econ. 44(1976):71-100.

United Nations Department of Economic and Social Affairs. Statistical Yearbook, 1968-1978.

Wicks, J., and J. Dillion. "APMAA Estimates of Supply Elasticities for Australian Wool, Beef, and Wheat." Rev. Mktg. Agr. Econ. 46(1978):48-57.