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THE AUSTRALIAN JOURNAL OF AGRICULTURAL ECONOMICS

VOL. 34

APRIL 1990

NO. 1

EXPLAINING THE DISTRIBUTION OF QUOTA RENTS FROM US CHEESE IMPORTS

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A theoretical model is outlined to illustrate how rents are generated from import quotas. The model is used to estimate rents from US cheese import quotas; rents are substantial. Relative rent capture by importers and exporters is explained by estimating an industrial organisation-type model. Unequal market power is important in explaining the distribution of rents between importers and exporters. Exporters tend to maintain price-cost margins and let importers capture a larger share as rent size increases.

From a theoretical perspective, economists have long recognised the importance of the creation and capture of rents resulting from policies that restrict international trade (Krueger 1974). An import quota is frequently cited as a classic example of such a policy (Corden 1971). The standard model used to explain the existence of rents is one in which quota rights are distributed to importing firms who capture the quota rents by purchasing imports at competitive world prices and reselling at higher domestic prices.

A number of agricultural economists have stressed the importance of rent creation through agricultural policies (McCalla and Josling 1981), while others have analysed cases where trade restrictions have been used explicitly by importing countries to capture monopsony rents (Anderson 1985; Carter and Schmitz 1979). Through this work it is apparent that, in reality, the rents and their distribution are jointly determined by the interaction of trade and domestic agricultural policies of both importing and exporting countries; thus, the process of determination is often more complex than suggested by the standard theoretical model.

Such complexity is illustrated by the US quota system for cheese, which has been used for more than a third of a century to protect domestic dairy farmers from foreign competition. From its introduction in 1951 until its restructuring in 1980, this system involved the allocation of import licenses to domestic importing firms on a commodity-specific basis by country of origin. Importing firms made purchases, often from single-seller exporters, in an international market dominated by the effects of domestic support programmes and

*We express our appreciation to anonymous reviewers and the editors of the Journal for their helpful comments.

characterised by the use of export subsidies. In the United States, cheese imports have also been subject to an *ad valorem* tariff. All these elements have meant that the generation and distribution of the rents associated with US cheese quotas have been far from straightforward.

The purpose of this paper is to develop a framework for determining the size and distribution of quota rents for US cheese imports. After a brief review of the quota system, the analysis proceeds in three steps. First, a conceptual model is outlined for determining the size and distribution of rents. Emphasis is given to the role played by tariffs and export subsidies in determining rents. Second, empirical estimates are derived of the quota rents from US cheese imports for 1974–80. This is a period for which consistent data are available and for which the exclusive reliance on country-specific quotas facilitates a country-by-country analysis. Finally, an industrial organisation-type model is developed and tested to explain the division of rents between importing and exporting industries.

The US Cheese Import Quota System

The United States consumed over 5.5 billion pounds of cheese in 1986; this is more than 23 pounds per person (US Department of Agriculture 1987). The consumption of cheese has been rising rapidly, and is now almost twice as large on a per capita basis as in the early 1970s. Imports in 1986 amounted to 295 million pounds or roughly 5 per cent of consumption. US imports were roughly 9 per cent of world imports, a figure that has been fairly stable throughout the 1980s. The sources of imports are diverse, but New Zealand is typically the largest single supplier, accounting for 17 per cent of the import total in 1986. Finland and the countries of the European Community (EC) are also significant. Finland, Denmark, Italy, France and Germany each provided between 8 and 10 per cent of US cheese imports in 1986. Import quotas have limited the ability of these and other exporting countries to capitalise on the growth in demand for cheese in the United States, but have provided a guaranteed access to a protected high-price market for the commodity.

The restriction of imports of cheese and other dairy products is an essential complement to the US price support programme for milk. Under this programme, the US government, through the Commodity Credit Corporation, purchases excess domestic supplies of butter, cheese and milk powder if the prices of these commodities fall to specified support levels. If imports were not controlled, the government might find itself having to purchase much larger quantities of domestic products in order to maintain support prices.

The restriction of imports through quotas is permitted under section 22 of the Agricultural Adjustment Act of 1938 as amended.¹ Through this legislation, the President is empowered to instruct the Secretary of Agriculture to restrict imports whenever these threaten to interfere with domestic price support programmes by displacing domestic production and increasing sales of supported goods to the government. The Secretary is charged with issuing import licenses for the 11 cheese

¹A detailed discussion of the quota system and its historical evolution is found in Hornig (1987).

types for which quota categories exist. In practice, this responsibility is delegated to officials of the Foreign Agricultural Service of the US Department of Agriculture (USDA 1981).

Licenses are issued to importing firms and specify both the type of import, that is, the category of cheese, and its origin. The regulations specify that such licenses may not be transferred between firms, except through acquisition of the entire business enterprise.² Originally, each supplying country was implicitly allocated a share of the quota based on the historical records of importing firms. In 1968, President Johnson instituted a policy of specifying country shares in Presidential Proclamation 3870. Provisions exist for temporarily transferring these shares between countries (but not cheese types), if for some reason the original designated country is unable to fulfill its quota. A significant change in the system occurred in 1980, when licenses which were formerly specified by country of origin in the EC were identified simply as an overall EC quota. This had the effect of globalising an important part of the quota.

An additional complication in the quota scheme is introduced by the policies of supplying countries. With the exception of New Zealand, the governments of all the major dairying countries intervene extensively in their dairy industries (OECD). Most countries support domestic prices above world market levels, and use export subsidies to dispose of products surplus to domestic requirements. Under the pre-1980 system, the combination of importer- and exporter-specific licensing and export subsidies created substantial complexities in the generation and distribution of quota rents.

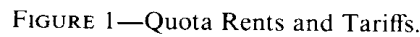
Determining the Size of Quota Rents and Subsidies

Rents exist because quantitative restrictions drive a wedge between supply and demand prices. The size of the rents varies with quota size, supply and demand elasticities, tariff levels, export subsidies and the characteristics of domestic agricultural programmes. Hornig (1987), building on the earlier work by Sampson and Snape (1980), has developed a one-commodity, two-country model designed to assess the impact of each of these factors on the size of quota rents. For present purposes, it is instructive to focus on that part of the model for which quotas exist simultaneously with tariffs and export subsidies.

The conceptual model

Figure 1 depicts the import market for a homogeneous commodity under quota in a two-country world. The P_1 and P_2 axes measure the component prices of quota rents and export subsidies, respectively. The excess demand curve, D^x , represents the wholesale demand for imports in the importing country, less the importing industry's costs (including capital service costs) of importing and distributing the good (that is, normal returns). The excess supply curve, S^x , represents the export supply at the wholesale level in the foreign country, including normal returns for the exporter. It is assumed that exporting firms buy, and importing firms sell, in competitive domestic markets. Thus, the only market in which importers and exporters may behave non-

²An example of such transfers is the acquisition of US cheese distribution firms by the New Zealand Dairy Board during the 1980s.



In the absence of tariffs or quotas, Q^* is traded at a price of P^* (ignoring transportation costs). A quota of $Q_1 < Q^*$ leads to an increase in the price in the importing country, from P^* to P_d^x on the P_1 axis. The quota rent is:

Assuming that the actual traded price (fas or fob) lies at P_s^f , the rent is divided between the exporter, X , and the importer, M , such that:

A quota of $Q_2 > Q^*$ will be filled only if exports are subsidised. Here, the goods cost the exporter P_s^x and are sold for P_d^x , measured on the

P_2 axis; there are no quota rents; and the government must furnish a subsidy of:

$$(3) \quad S = Q_2(P_s^x - P_d^x)$$

When an *ad valorem* tariff ' t ' is introduced, the supply curve (including tariff) becomes $S^x(1+t)$. This curve shows the landed cost of the import if the exporter sells at cost plus normal returns (priced along the S^x curve).³ The actual traded price, P_s^f , which is determined through bargaining and the outcome of the rent capturing process, must lie between the minimum possible price, P_s^x , and the maximum, $P_d^x/(1+t)$, on the P_1 axis. Given a quota of Q_1 , the rent is now divided into:

$$(4) \quad \text{Exporter rent, } X = Q_1(P_s^f - P_s^x)$$

$$(5) \quad \text{Tariff revenue, } T = Q_1(tP_s^f)$$

$$(6) \quad \text{Importer rent, } M = Q_1[P_d^x - P_s^f(1+t)]$$

With an *ad valorem* tariff, both T and $(X+M)$ vary with changes in the traded price, P_s^f . As the exporter raises the selling price of the good, and concurrently his own rent X , T also rises, amplifying the decrease in M .

If the quota is set at Q_2 , the tariff, which does not affect the size of the total quota rent R , will affect the size of the subsidy requirement S . On axis P_2 , P_d^x measures the highest price at which Q_2 can be sold in the importing country. In order to sell at this price, the good must be sold to the importer at or below $P_d^x/(1+t)$, the demand price less tariff. The total required subsidy will then be at least equal to:

$$(7) \quad S = Q_2[P_s^x - P_d^x/(1+t)]$$

A higher tariff rate ' t ' increases the subsidy required. This may explain why exporting governments that use subsidies are interested in negotiating tariff reductions in importing countries.

The coexistence of quota rents with export subsidies is not explained in the preceding model. However, under a bilateral quota such as is used in cheese trade, importers and exporters possess some power by virtue of holding exclusive rights to trade.

In the theoretical two-country model in Figure 2, the importer is a monopsonist and the exporter is a monopolist in trade and two new curves are introduced: D^x , which is marginal to D^x , and S^x , which is marginal to S^x . For Q_1 , the quantity traded, $P_s^{x'}$ shows the lowest fair price the exporter will be prepared to accept, and $P_d^{x'}$ the highest price the importer will be prepared to pay. As long as the quota is below Q' , the market will provide sufficient rents to satisfy both exporters and importers. If it is at Q_1 (between Q' and Q^*), rents will be generated (in

³Alternatively, the demand-minus-tariff curve becomes $D^x/(1+t)$. The $D^x/(1+t)$ curve shows the highest price the exporter could charge and still allow the importer to cover tariff costs and normal returns.

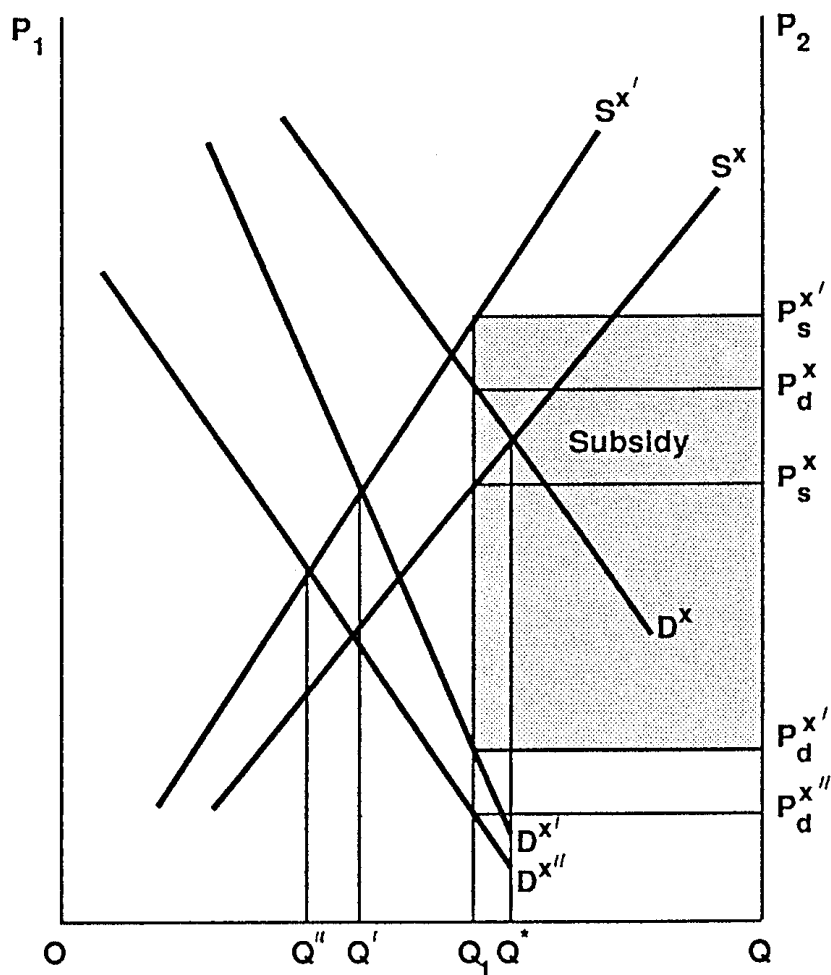


FIGURE 2—Quota Rents, Imperfect Competition and Subsidies.

the sense that P_d^x will exceed P_s^x) but they will be insufficient to allow traders to satisfy monopoly pricing conditions and generate trade. Quotas can then be filled only if the government of the exporting country pays a subsidy, S , which effectively allows exporter and importer to meet their price conditions:

$$(8) \quad S = Q_1(P_s^{x'} - P_d^x)$$

The price at which trade occurs is between P_d^x and P_s^x and is determined by the relative market power of the exporter and importer.

Adding tariffs to this model complicates the graph but introduces no fundamental changes. A new demand curve, $D^{x''}$, is added to show the highest price the importer would pay for a given quantity of imports if, in addition to holding the *fas* price at or below marginal revenue, an *ad valorem* tariff had to be paid. For any *fas* price on the $D^{x''}$ curve, there is a corresponding higher price on the tariff-inclusive $D^{x'}$ curve. S^x and

S^x are unchanged. As in the earlier case, the traded price would be determined from the outcome of bargaining and the rent capture process. The market will now cover exporters' and importers' rents only if the quota is at or below Q'' . With a quota greater than Q'' , a subsidy will be needed even though positive rents exist, as long as P_d^x is greater than $P_s^x(1+t)$ [for simplicity, the supply curve corresponding to this is omitted from Figure 2; it would be the same as $S^x(1+t)$ in Figure 1]. When the quota rises above Q'' , no positive rents are generated in the market; if exporters and importers are to receive excess profits, they would have to be paid out of export subsidies.

Empirical Method for Estimating Rents

Theoretically, quota rents are identified as the gap between the domestic wholesale price and the foreign wholesale price of the commodity imported under quota, both prices adjusted to allow for normal returns. In practice, in order to estimate rents, the component parts are measured piecemeal and added, as in equations (4), (5) and (6). In this way cif charges are accounted for, overlapping rents are sorted out, and the division of rents among the government, the importer and the exporter is identified. The proportion of any export subsidy captured by exporters or importers cannot be identified from available data, and the size of the subsidy must be explicitly reported by the exporter.

To estimate the rent components, one must first obtain five prices for each commodity from each country of origin: the wholesale selling price to the exporter (foreign ex-factory price); the exporter's fas price to the importer; the customs valuation of the commodity (usually the same as the fas price); the importer's cif price at the port of entry; and the domestic wholesale price at which the importer sells the good. The landed cost of the import is calculated by adding the tariff, obtained by applying the appropriate *ad valorem* rate to the customs valuation, to the cif price. All prices are expressed in US dollars per pound. This procedure is consistent with normal practice of quoting prices of dairy products traded internationally in US dollars.

If rents were calculated directly from these price data, however, they would include normal profits. Thus, some estimate of the competitive price-cost margins at the wholesale level for cheese or similar commodities must be obtained to adjust the exogenous prices in the system and remove from measured profits a normal return for each industry. Denoting the unadjusted foreign wholesale price as P_s^{x*} and the unadjusted domestic wholesale price as P_d^{x*} , the exporter's wholesale price, excluding a normal profit, n , is calculated as:

$$(9) \quad P_s^x = P_s^{x*} / (1 - n)$$

Similarly, the importer's wholesale price, excluding normal profit but including tariff and cif charges, is:

$$(10) \quad P_d^x = (1 - n) P_d^{x*}$$

By substituting these estimated prices in equations (4), (5) and (6) and dividing by quota amounts, empirical estimates of the per-pound quota rents can be derived.

Empirical Application to US Cheese Import Quotas

This section examines actual rents under US import quotas between 1974 and 1980. One major reason for choosing this period is the limited availability of data prior to 1974. A second reason is the fact that prior to 1980, the US cheese quota system relied exclusively on country-specific quotas, making it possible to examine on a country-by-country basis the interactions among quotas, tariffs and export subsidies in determining rents. Since the abolition of country-specific quotas for the members of the EC and the introduction of supplementary licenses in 1980, data in subsequent years might reflect a significantly different rent distribution and one that is difficult to disentangle on a country-by-country basis.

The data

The task of assembling the data needed to estimate rents was complex and data limitations pose a serious problem. A detailed account of how the data from numerous sources were collected and combined is in Hornig (1987). A brief overview is given in the Appendix.

The normal profit margin used to adjust both importer and exporter wholesale prices is 8 per cent. This is based on profits realised in domestic cheese wholesaling in the United States (first-handler level). Using the price spread between 40-pound block new Cheddar on the Wisconsin Cheese Exchange and the same cheese wholesaled in Wisconsin [a measure suggested by Lough (1980), pp. 36–7] as an indication of the normal profit realised by cheese handlers, the average margin on sales during the period 1974 to 1980 was 8.3 per cent.⁴ This was reduced to 8 per cent for convenience. The same assumption about normal profits is applied to both importing and exporting industries. This is not entirely satisfactory, but no data could be found to establish separate normal profit margins for each exporting industry. The appropriateness of the 8 per cent figure is supported by the fact that, in the industries examined, this percentage approximately equals the lowest gross (unadjusted) price–cost margin observed (on imports of Blue-mould from Denmark and Edam and Gouda from The Netherlands). Eight per cent, therefore, seems to be a satisfactory allowance for normal returns over the period 1974–80.

Industry coverage

As a direct consequence of the limited availability of price and subsidy data from the other and low-fat categories, only six from a total of 59 industries defined by cheese import quotas could be examined for a period of more than one year. A seventh could be included for 1980 only; in two other industries data for importers, but not exporters, could be secured. Hence, industries for which two-sided (importer and exporter) data can be obtained cover only 18 per cent of the total (excluding processed cheese from New Zealand and Australia). If these latter categories, plus the one-sided samples, are added, coverage rises to around 32 per cent. This is not highly satisfactory, but it is the best

⁴During 1975–79 actual values ranged from 7.3 to 8.8 per cent. In 1974 the figure was much lower: 4.0 per cent; in 1980, much higher: 14.6 per cent. Importers' margins did not increase substantially in 1980, however; therefore, it was decided to use the approximate annual average of 8 per cent.

TABLE 1

*Measured Cheese Import Quota Rents and their Component Parts,
Selected Industries at Constant \$1980 (\$ per Pound)^a*

Industry and year	Total rent $x + m + t$	Importer's rent m	Exporter's rent x	Tariff revenue t	Export subsidy s	Relative rent ^b
Blue-mould, Italy						
1980	1.22	0.33	0.60	0.29	0.28	39.9
1979	1.27	0.40	0.58	0.28	0.24	40.5
1978	1.14	0.40	0.46	0.27	0.14	36.4
1977	1.50	0.40	0.82	0.29	-0.01	45.9
1976	1.38	0.35	0.73	0.30	-0.03	45.1
1975	1.36	0.31	0.77	0.28	0.16	48.0
1974	1.05	0.26	0.56	0.23	0.11	44.1
Blue-mould, Denmark						
1980	0.23	-0.01	0.02	0.22	0.29	11.7
1979	0.32	0.02	0.06	0.23	0.38	15.3
1978	0.33	0.04	0.06	0.24	0.31	15.8
1977	0.37	0.05	0.09	0.23	0.18	16.9
1976	0.39	0.05	0.09	0.24	0.09	18.1
Edam and Gouda, The Netherlands						
1980	0.54	0.04	0.29	0.21	0.32	28.5
1979	0.78	-0.03	0.59	0.22	0.44	37.7
1978	0.83	0.00	0.58	0.25	0.34	37.4
1977	0.83	0.10	0.47	0.26	0.18	35.3
1976	0.80	0.01	0.53	0.26	0.08	34.7
1975	0.80	0.06	0.50	0.24	0.21	35.9
1974	0.53	0.03	0.30	0.20	0.20	29.3
Italian IOL, Italy						
1980	1.83	1.15	0.32	0.36	0.85	44.6
1979	1.82	0.93	0.38	0.51	0.76	39.5
1978	1.54	0.31	0.70	0.53	0.62	37.6
1977	1.93	0.90	0.55	0.47	0.41	45.2
1976	1.79	0.63	0.67	0.48	0.31	44.7
1975	1.65	0.57	0.62	0.45	0.33	44.3
1974	1.35	0.39	0.51	0.45	0.16	38.5
Cheddar, New Zealand						
1980	0.65	0.27	0.27	0.11	0.00	41.4
1979	0.69	0.36	0.21	0.12	0.00	44.4
1978	0.66	0.30	0.24	0.13	0.00	44.4
1977	0.65	0.15	0.36	0.14	0.00	44.7
1976	0.81	0.31	0.36	0.13	0.00	51.7
1975	0.68	0.26	0.28	0.14	0.00	44.0
1974	0.56	0.03	0.37	0.16	0.00	36.4
Cheddar, Australia						
1980	0.53	0.28	0.15	0.10	0.00	33.8
1979	0.57	0.39	0.06	0.11	0.00	36.6
1978	0.51	0.38	0.02	0.11	0.00	34.1
Swiss-type, Norway						
1980	0.37	0.05	0.19	0.13	0.00	11.2

^aSources: Calculated from equations (4), (5) and (6) on a per pound basis after substituting in equations (9) and (10) and data from Hornig (1987). Note: detail may not add due to rounding.

^bRent/domestic wholesale price, $(x + m + t)/P_d^x$.

that can be managed with available data. For these seven industries, Table 1 shows total rent (r), importer rent (m), exporter rent (x), tariff revenue (t) and export subsidy (s), in constant 1980 dollars, for each industry in each year included in the sample.

Size and observed division of rents

The size of quota rents varies considerably across industries but is reasonably consistent within industries over time (Table 1). In 1980, for instance, rents ranged from \$0.23 to \$1.83 per pound in the industries covered, the average for the seven (weighted by actual imports) being \$0.55. The rents are generally equivalent to 30–50 per cent of the US wholesale price of the cheeses involved; only for Blue-mould from Denmark and Swiss-type cheese from Norway are the rents less than 20 per cent. If these rents were being paid on all licensed cheese imports in 1980, total quota rents (recall that this excludes the 8 per cent allowance for normal profits by both exporters and importers) would have been around \$131 million for the year. Rents in 1980 were quite close to weighted averages for the sample period, being no more than 7 per cent higher nor 3 per cent lower. The one exception is Edam and Gouda from The Netherlands, which in 1980 was 26 per cent below the period average. This suggests that 1980 is a fairly representative year.

Because of differences among cheese types, it is difficult to explain differences in the magnitude of the rents in the majority of cases. One exception may be Australian and New Zealand Cheddar. In this case, comparison is facilitated because Cheddars from these countries are reasonably close substitutes, face similar excess demand curves in the United States, and neither country subsidises its exports. The larger total rent for New Zealand, therefore, is consistent with the country's position as a lower-cost supplier.

Table 2 shows exporters' and importers' shares of net rent, and the price–cost margins in excess of normal profits, for seven different cheese industries over various periods for the years 1974–80. Some interesting patterns emerge in this table. First, looking at net rent shares, the exporter's share is typically larger than the importer's. In 1980, the exporter's share equalled or exceeded 50 per cent in five out of seven industries; the unweighted average exporter share for all seven industries was approximately 63 per cent, or almost two-thirds of net rent. Importing firms in the United States thus captured a little over one-third of available rents under import quotas.

A second interesting feature is that the division of rents within each industry is fairly consistent over time, so that differences between industries are also maintained. In the case of Edam and Gouda from The Netherlands, for instance, the exporter's share is consistently higher than 80 per cent; in the case of Blue-mould from Italy, it ranges from 53 to 71 per cent, and so forth. This suggests that major differences in the division of rent do exist. Even in the case of Australian and New Zealand Cheddar, where the rent size differential is due primarily to differences in cost of production, the proportion of the total quota rent captured by New Zealand is substantially larger than that captured by Australia. This suggests that institutional or other factors are important in determining the division of quota rents.

Additional insight into the division of rents can be obtained from the percentage gross price–cost margins for both exporters and importers (without the subtraction of 8 per cent for normal profits) also shown in Table 2. First, the size of these margins suggests that significant excess profits would still exist in most cases even if the 8 per cent normal profit

TABLE 2

Net Rent Shares and Gross Price-Cost Margins, Cheese Exporting and Importing Industries 1974-1980 (%)^a

Industry and year	Exporter's share of net rent ^b	Importer's share of net rent ^b	Exporter's total price-cost margin ^c	Importer's total price-cost margin ^c
Blue-mould, Italy				
1980	64.5	35.5	37.4	18.6
1979	58.9	41.1	35.3	21.0
1978	53.4	46.6	29.2	20.8
1977	67.4	32.6	42.4	20.2
1976	67.5	32.5	40.7	19.5
1975	71.0	29.0	46.6	19.0
1974	67.9	32.1	40.8	18.8
Blue-mould, Denmark				
1980	100.0	0.0	10.9	7.6
1979	75.0	25.0	13.7	9.0
1978	62.5	37.5	13.1	9.6
1977	63.6	36.4	13.8	10.5
1976	63.6	36.4	13.8	11.9
Edam and Gouda, The Netherlands				
1980	87.9	12.1	28.8	10.0
1979	100.0	0.0	44.8	6.4
1978	100.0	0.0	41.8	8.0
1977	82.2	17.8	34.8	12.5
1976	97.5	2.5	36.5	18.7
1975	89.7	10.3	37.2	19.3
1974	90.5	9.5	29.4	19.0
Italian IOL, Italy				
1980	21.8	78.2	24.8	36.0
1979	29.2	70.8	23.6	28.2
1978	69.4	30.6	32.8	15.6
1977	37.7	62.3	28.3	29.3
1976	51.5	48.5	34.2	23.9
1975	52.4	47.6	34.6	23.3
1974	56.9	43.1	43.0	19.0
Cheddar, New Zealand				
1980	50.0	50.0	34.8	25.5
1979	36.5	63.5	30.7	31.0
1978	44.5	55.5	34.3	27.8
1977	70.0	30.0	43.7	18.4
1976	54.0	46.0	45.4	27.6
1975	52.6	47.4	35.9	24.8
1974	92.3	7.7	38.9	10.1
Cheddar, Australia				
1980	34.9	65.1	24.1	26.1
1979	14.3	85.7	16.2	33.1
1978	5.9	94.1	11.7	33.3
Swiss-type, Norway				
1980	79.2	20.8	21.9	10.2

^aNote: detail may not add due to rounding.

^bCalculated from Table 1, respectively, as per cent x and m are of $x + m$.

^cIncluding normal profits (Hornig 1987).

rate assumed in the analysis were too low. Furthermore, exporter price-cost margins show rather striking consistency within industries over time, suggesting that exporters attempt to maintain some expected margin and that importers tend to bear any price instability

that results. The price–cost margins also show that, on average, exporters do relatively better than importers under the quota system. In 1980, the unweighted average price–cost margin was around 31 per cent for exporters and 20 per cent for importers. This is consistent with relative success in net rent capture. The model that follows attempts to explain the factors that govern the observed patterns of the division of rent.

Explaining the Division of Quota Rents

The theoretical model discussed above illustrates that the size of quota rents is influenced by a number of factors. In this section, a model is developed to explain the division of rents between exporters and importers. Rent size is assumed to be exogenously determined, even where subsidies are paid. This is a simplification which permits an analysis of differences between exporters and importers without having to deal with the unobservable relationship between exporters and their subsidy-paying governments.

Trade economists have frequently linked rent capture to institutional factors. Corden (1971), for example, cites the case where ‘exporters . . . do their own importing, so that there are no separate trading firms . . . and the exporting firm receives the rent’ (p. 206). Krueger (1974) argues that some of the rents may go as bribes to civil servants, as a form of rent-seeking (the bribe being intended to secure an import license for the briber). McCulloch (1973) argues that if the importer uses the restricted good as an input, the rent is implicit and is revealed by changes in the price and output of the final product.

One of the more detailed descriptions of the effect of institutional factors on rent capture is by Mintz (1973), who argues that the division of rents depends primarily on the method by which the quota is distributed. For example, if the government sells import licenses through a competitive auction, the quota rent is captured by the government (taxpayers). If the government uses a global quota or licenses domestic firms to import a given quantity regardless of origin, such firms will capture the difference between lower cost import prices and higher domestic prices. Mintz argues that if the quota is allocated by country of origin and businesses in exporting countries are given the responsibility for filling the quota, these businesses will capture the quota rents.

The empirical estimates of the rents created by the US cheese import quota system, presented in Tables 1 and 2 above, suggest that some of these generalisations oversimplify. Even where market shares are fixed by country/commodity-specific quotas, rents are seen to be divided between exporters and importers rather than captured by exporters alone. Since the division of rent is fairly stable over time, but quite different across industries under the cheese quota, it appears that the rent capture may be determined by more than simply the method by which the rights to import are allocated.

The model

The problem of describing the division of net rent between exporting and importing industries is similar to the problem of relating profitability in a domestic industry to buyer and seller concentration in

industrial organisation theory (Scherer 1980). A number of empirical studies in the United States conducted during the 1970s used samples of US manufacturing industries at the 2- and 4-digit SIC levels to examine the relationship between seller profitability, bilateral concentration, and other institutional factors thought to confer market power (Brooks 1973; Lustgarten 1975; McGuckin and Chen 1976; Clevenger and Campbell 1977; LaFrance 1979). All these studies make use of the assumption that, *ceteris paribus*, an increase in seller concentration in an industry increases the ease with which sellers can collude and raise prices above the competitive level. Conversely, higher buyer concentration increases the probability that buyers will be able to hold down seller prices.

Based on this literature, a general model to represent the division of cheese quota rents between exporters and importers is specified as follows:

$$(11) \quad X_{ij}/(X_{ij} + M_{ij}) = f(Y_{kij}^x / Y_{kij}^m)$$

where X is the exporter's rent, M is the importer's rent, and the expression in parentheses on the right-hand side of the equation represents the ratio of the k th measure of market power Y in exporting country x and importing firms m , for cheese type i of country of origin j . Since the objective is to model relative rent capture, the dependent variable measures the share of the aggregate importer/exporter rent captured by the exporting industry rather than the absolute price-cost margin. The advantage of using shares of this 'net' rent is that the total rent will always be fully captured even when market power is low on both sides. The exporter's share of net rent is explained by a series of variables measuring relative exporter-importer market power in each particular (country/commodity-specific) industry.

The choice of explanatory variables (Y_k) is suggested by the industrial organisation literature and by the theoretical analysis of trade under quotas. One variable is a measure of relative concentration in the exporting and importing industries. Concentration can be measured by the market shares held by individual firms within industries and made explicit by licensed rights to trade through a 4-firm concentration ratio, for example. It might be hypothesised that with a fixed market share for each firm in the industry the incentive to collude with other licensees to obtain favourable prices is stronger than if firms are competing for market shares. Collusion, or at least the sharing of relevant information, is assumed to be easier when fewer traders are involved. On the other hand, if buyers and sellers are equally concentrated, neither might be expected to be better at bargaining. One would expect an exporter's rent share to be larger if the exporting industry is more concentrated than the importing industry with which it deals.

A second variable is a measure of the relative dependence of exporters and importers on each other as sellers and buyers (Lustgarten 1975). It might be hypothesised that the less diversified an importing or exporting industry's trading activities, the more effort it will devote to capturing rents in a given import or export sector or the more skilled it will be in obtaining these rents. Alternatively, the more dependent a seller is on a particular buyer's market, the less aggressive the seller may

be in seeking rents because of vulnerability to the loss of quota rights. In this case, the higher the dependence, the lower is the exporter's share of net rents.

Lastly, the absolute size of the available rent may itself influence relative rent capture. Where rents are large, the dominant industry may 'satisfice' and settle for a satisfactory price-cost margin at a lower rent share. Conversely, where rents are small, the dominant industry may have to seek a much larger share to achieve an adequate price-cost margin. Any year-to-year instability in rents will then be borne by the weaker party.

Empirical specification

The proposed model explains relative rent capture (measured by the exporter's share of net rent) as a function of relative market power (measured by concentration, dependence on each other's markets and the absolute rent available). In applying the model to US cheese trade, data problems force modification of some variables.

Two slightly different models are used, one for a 1980 sample including seven cheese categories, and one for a 5-year sample (1976–80) including five categories. The industries used in the 1980-only sample are the seven listed in Table 1: Blue-mould from Italy, Blue-mould from Denmark, Cheddar from New Zealand, Cheddar from Australia, Edam and Gouda from The Netherlands, Italian IOL from Italy, and Swiss-type from Norway. In the 5-year sample (1976–80), Cheddar from Australia and Swiss-type from Norway have to be eliminated because of the lack of data. The 1980 sample includes some data on exporter's and importer's concentration, so that variables on concentration can be used. Since data on concentration are only available for 1980, the 1976–80 model uses industry intercepts in an attempt to capture differences attributable to concentration.

For the 1980 sample, the model is:

$$(12) \quad EXSHARE = b_0 + b_1CONC1 + b_2CONC2 + b_3ARENT + b_4IMPORT + b_5MSHARE$$

where *EXSHARE* is the exporter's share of net rent, *ARENT* is the net rent per pound, *IMPORT* is the imported quantity and *MSHARE* is the share of the exporting country's total cheese exports (all varieties) going to the United States. The concentration variables, *CONC1* and *CONC2*, are dummy variables which group the industries according to relative concentration. Four groupings are specified: both parties low, both parties high, exporter high/importer low and importer high/exporter low. Since in the sample the last case does not occur, the low/low case is the intercept term (b_0): *CONC1* then equals 1 for exporter and importer both highly concentrated, 0 for other cases; *CONC2* equals 1 for exporter highly concentrated and importer low, 0 for other cases.

Theory suggests that rent capture will depend on relative market power. In terms of the variables used, one would expect b_1 (the coefficient of *CONC1*) to equal zero, since relative market power in this case is the same as in the case where concentration is low on both sides. The coefficient of *CONC2*, b_2 , is expected to be positive. The exporter's share of net rent should rise as the exporter becomes

relatively more concentrated than the importer. Since the third variable, *ARENT*, measures the actual rent available for capture, it is hypothesised that its coefficient, b_3 , should be negative: the exporter's rent share will decline as the amount of rent increases. This would be consistent with 'satisficing' behaviour, where the exporter attempts to maintain rents (or price-cost margins) at a constant level. Similar reasoning suggests that the sign on the *IMPORT* variable should also be negative. The sign on the coefficient of *MSHARE* could be positive or negative, depending on whether the exporter's increased dependence on the United States as a buyer leads it to learn more about the US market and negotiate more effectively (which would yield a positive sign), or whether increased dependence results in the less-aggressive pursuit of rent shares (yielding a negative sign).

For the 1976–80, 5-industry sample, industry intercepts are introduced and concentration variables dropped (because of the lack of data). The equation then becomes:

$$(13) \quad EXSHARE = b_0 + b_1IN2 + b_2IN3 + b_3IN4 + b_4IN5 + b_5ARENT + b_6IMPORT + b_7MSHARE$$

where *IN2* is the intercept for Blue-mould from Denmark, *IN3* is Cheddar from New Zealand, *IN4* is Edam and Gouda from The Netherlands, *IN5* is Italian IOL from Italy, and the intercept term is Blue-mould from Italy. *EXSHARE*, *ARENT*, *IMPORT* and *MSHARE* are defined as for the 7-industry case. No assumptions are made about the signs on the industry intercepts. As before, it is assumed that the coefficients of *ARENT* and *IMPORT* will be negative, while the coefficient of *MSHARE* could be either positive or negative.

To estimate equations (12) and (13), the exporter's share of net rent, *EXSHARE*, comes from the data in Table 2, while the net rent, *ARENT* is from Table 1. The sources of the other data are contained in Hornig (1987) and discussed briefly in the Appendix.

Results

The results derived from ordinary least squares estimation of the two models are summarised in Tables 3 and 4. The small sample sizes dictated by the availability of the data ($n = 7$ in one case, $n = 25$ in the other) limit the reliability of the results. For this reason, there was also little to be gained from the use of more sophisticated estimators which deal specifically with limited dependent variables.

Evidence obtained on the importance of relative concentration in the importing and exporting industries is ambiguous. Inspecting the coefficients of *CONC1* and *CONC2* in Table 3, one sees that the coefficient of *CONC2* is less negative than the coefficient of *CONC1*, with a gap of approximately 20 (equations 12.3 and 12.4). This suggests that the exporter's share of net rent is typically around 20 percentage points higher when the exporter is concentrated relative to the importer compared with the case when both importer and exporter are highly concentrated. Such a finding is consistent with the hypothesis that unbalanced market power rather than high concentration *per se* contributes to rent capture. Unfortunately, the coefficients of *CONC1* and *CONC2* are both well below zero, implying that the exporter's share of net rent is highest of all when both exporter and importer are not highly concentrated. The model used hypothesises that exporter's

TABLE 3

Results of Estimating Equation (12) for the 7-Industry Sample, 1980

Variable ^a	Equation number			
	(12.1)	(12.2)	(12.3)	(12.4)
Dependent variable: <i>EXSHARE</i>				
Explanatory variables:				
Intercept	87.80 (7.21)	87.68 (3.78)	154.66 (4.69)	156.23 (9.02)
<i>CONC1</i>			-66.02 (-2.47)	-86.64 (-5.54)
<i>CONC2</i>			-48.10 (-1.77)	-61.18 (-4.11)
<i>ARENT</i>	-44.64 (-2.65)	-39.07 (-1.51)	-92.93 (-3.55)	-96.57 (-7.01)
<i>IMPORT</i>		0.001 (0.36)		0.002 (2.98)
<i>MSHARE</i>		-0.53 (-0.45)		
\bar{R}^2	0.50	0.22	0.75	0.93

^a*t*-statistics are shown in parentheses. Variables are defined as follows: *CONC1* = 1 if exporter and importer both highly concentrated, 0 otherwise; *CONC2* = 1 if exporter highly concentrated and importer low, 0 otherwise; *ARENT* = actual net rent per pound, \$1980; *IMPORT* = quantity imported, thousand pounds; *MSHARE* = percentage of this country's total cheese exports going to the US; *EXSHARE* = percentage of net rent captured by exporting industry.

TABLE 4

Results of Estimating Equation (13) for the 5-Industry Sample, 1976-1980

Variable ^a	Equation number					
	(13.1)	(13.2)	(13.3)	(13.4)	(13.5)	(13.6)
Dependent variable: <i>EXSHARE</i>						
Explanatory variables:						
Intercept	96.70 (16.05)	97.95 (10.11)	102.86 (4.77)	107.34 (5.15)	133.55 (4.08)	112.54 (2.93)
<i>IN2</i>			-26.16 (-1.28)	0.19 (0.01)	-44.57 (-1.78)	-5.79 (-0.13)
<i>IN3</i>			-29.24 (-2.42)	35.58 (0.87)	-27.39 (-2.28)	29.52 (0.52)
<i>IN4</i>			8.32 (0.59)	90.73 (1.75)	-17.46 (-0.70)	77.86 (0.82)
<i>IN5</i>			-8.67 (-0.88)	21.91 (1.05)	-6.88 (-0.70)	19.22 (0.71)
<i>ARENT</i>	-12.92 (-1.76)	-13.25 (-1.71)	-39.96 (-1.94)	-43.34 (-2.19)	-46.07 (-2.21)	-44.13 (-2.11)
<i>IMPORT</i>		-0.00 (-0.17)		-0.01 (-1.65)		-0.01 (-1.04)
<i>MSHARE</i>	-1.62 (-4.08)	-1.64 (-3.91)			-1.27 (-1.23)	-0.23 (-0.16)
\bar{R}^2	0.59	0.58	0.68	0.71	0.69	0.69

^a*t*-statistics are shown in parentheses. Variables are defined as follows: *EXSHARE*, *ARENT*, *IMPORT*, *MSHARE*: see Table 3. *IN2*, *IN3*, *IN4*, *IN5*: industry intercepts for Blue-mould from Denmark, Cheddar from New Zealand, Edam and Gouda from The Netherlands, Italian IOL from Italy, respectively. The intercept term applies to Blue-mould from Italy.

rent shares should be approximately equal when exporter's concentration is matched by importer concentration, whether the former is high or low. If this were true, the coefficient of *CONC1* would be close to zero. As it happens, the only two industries where concentration is low on both sides are Blue-mould and Italian IOL cheese from Italy. In the pooled cross-section time-series model, concentration data are unavailable and industry intercepts are used instead. As can be seen in Table 4, the coefficients of these intercepts are unstable, switching signs when the *IMPORT* variable is introduced (none of them is highly correlated with *IMPORT*). The less than satisfying performance of the concentration variables in both models suggests that they fail to capture the forms of market power which exist.

The one variable whose coefficient is consistently and significantly negative with both the cross-sectional and pooled samples is *ARENT*, which measures the actual size of the net rent per pound available for capture. Its coefficient, around -40 in the pooled sample, indicates that for every \$0.10 by which the net rent rises the exporter's share falls by four percentage points. These qualitative results are interesting because they support the hypothesis that the exporter (assumed to be generally the dominant party under this sort of quota system) satisfices: that is, it aims for a particular price-cost margin in trade and tends to maintain it. When available rents rise, the exporter appears to exhibit satisficing behaviour, by letting the importer keep a larger share; conversely, when they fall, the exporter enlarges its share and the importer's share falls. As previously noted, the price-cost margins shown in Table 2 strongly suggest that this is what happens under this particular form of trade restriction.

The *IMPORT* variable, which measures the quantity traded, does not have significant explanatory power in either model, although in the pooled sample there is some indication that the exporter's share of net rent declines as the quantity exported increases (Table 4, equations 13.2, 13.4 and 13.6). This would reinforce the 'satisficing' hypothesis suggested by the coefficient of *ARENT*.

Lastly, in the second model there is some evidence that the exporter's share of net rent is negatively related to the level of the exporter's dependence on the United States as an export market, as measured by *MSHARE* (Table 4, equations 13.1, 13.2, 13.5 and 13.6). This suggests that the more dependent the exporting country is on the United States as a buyer, the less aggressively it seeks a share of rents.

Concluding Comments

This paper outlines a theoretical model to illustrate how rents are generated by import quotas, and how the size of the rents is affected by domestic import tariffs and foreign export subsidies. The model is used to estimate the size and division of rents under the US cheese import system. The sizes of these rents are then assumed to be exogenous and an industrial organisation-type model is estimated to explain the observed relative rent capture by importers and exporters.

Changes in the quota system, and difficulties in obtaining data on prices and the characteristics of importers and exporters, limited the empirical analysis to a selected group of import categories for the

period 1974–80. However, it was possible to examine imports of several major types of cheese from important European and Australasian exporters.

Despite the difficulties in obtaining data, the empirical analysis suggests that rents can be substantial, ranging from \$0.23 to \$1.83 per pound in 1980, a fairly representative year. Assuming that the average rent of \$0.55 per pound for the categories covered is applicable to the industry as a whole, total quota rents would have been around \$1.31 million in 1980. In terms of the division of rents, the exporters' shares are typically larger than the importers', with around 40 per cent going to exporters and approximately 30 per cent going both to importers and the government. The division of rents within industries is fairly consistent over time, as are exporters' price–cost margins.

Although the results derived from the statistical models to explain relative rent capture are based on small samples, they nonetheless provide some insight into the factors determining the division of rents. The two measures of industry concentration perform rather poorly and probably do not adequately reflect the role of market power in rent capture. There is, however, some evidence that unequal market power is more important than concentration *per se*. There is also evidence that exporters are satisficers. They tend to maintain price–cost margins and let importers capture a larger share as both the size of rents increases and the quantity exported rises. Finally, as an exporter's dependence on a single market rises, the relative rent captured by the exporter falls. Thus, either the exporters are less successful in sustaining their rent shares under these conditions or they are less aggressive for fear of losing a market for their products.

The results derived in this paper have some important policy implications. The quota system for cheese has provided a convenient mechanism for protecting US dairy farmers from international competition, while at the same time providing financial compensation to domestic cheese importers, and to exporting countries. The rents generated by the quotas are large and widely distributed. The proponents of reform and trade liberalisation have to recognise that several groups of individuals (importers, exporters and even US taxpayers) have a stake in the current system. Liberalisation of the quota system would benefit US consumers through lower prices and expanded access to a wider range of imported cheeses, but its net effect on the financial position of importing firms and exporting countries is unclear. It is perhaps not surprising that despite years of criticism by economists, both domestically and abroad, the US cheese quota system continues to survive.

APPENDIX

Sources of Data

Wholesale selling prices of imported cheese in the United States are obtained from the USDA Agricultural Marketing Service's *Dairy Market Statistics: Annual Summary*. Where prices are reported as high–low prices rather than as single figures, the arithmetic average of the high–low prices is used. The cif, fas and customs prices are all obtained from the US Department of Commerce, Bureau of the Census, *US Imports for Consumption and General Imports: TSUSA Commodity by Country of Origin* (1976–81). Tariff rates come from the US Tariff Commission's *Summaries of Trade and Tariff Information* (1968) and Presidential Proclamation 4707 (1979).

Non-US prices and subsidies come from a variety of sources. The Statistical Office of the European Communities (Eurostat) publishes ex-factory cheese prices, by variety and member country, on an annual basis, in various places. Cheese export subsidies are published at maximum 4-week intervals in the *Official Journal* (1974–80) of the EC (L series); the monetary coefficients and monetary compensatory amounts which are used to adjust the refunds [see Appendix B of Hornig (1987) for a detailed explanation] are also published at frequent intervals in the *Official Journal* (1974–80). The exchange rates required to complete this adjustment were obtained directly from the EC library in Washington, D.C. Subsidies and the factors by which they are adjusted must all be converted to annual averages; this is done by weighting each statistic by duration within the year. Prices for non-EC countries are obtained from individual country publications. The annual reports of the New Zealand Dairy Board (1974–81) and Australian Dairy Corporation (1977/78–1980/81) were used; Norwegian prices come from Norway's Central Bureau of Statistics, *Statistical Yearbook 1981*.

All prices are converted from national currencies to US dollars using IMF period average conversion rates (series 'rf') published in the country reports of the IMF's *International Financial Statistics* (1981). International dairy product prices are usually quoted in US dollars. For this reason, variations in the exchange rates of exporting countries need not be considered in calculating rents. To facilitate comparison across years, nominal dollars are converted to constant 1980 dollars via the GNP Implicit Price Deflator for the United States.

The additional data required to estimate the rent-share models come from several sources. Import quantities (*IMPORT*) are those reported by US Customs. Market-share data (*MSHARE*) for EC suppliers are calculated from NIMEXE; Australia's and New Zealand's are calculated from their respective marketing-board annual reports, and Norway's is obtained from Norwegian export data.

The concentration data are difficult to obtain. For importing industries in 1980, data are available to calculate 4-firm concentration ratios. For exporting industries, however, only qualitative evidence is available from published sources. Where prices are determined by a central agency, it is considered that concentration is high (Denmark, New Zealand, Australia, The Netherlands and Norway); where this is not the case, concentration is considered to be low (Italy). In order to ensure consistency, importer's concentration is also given a qualitative rather than numerical measure. It is specified as high if the 4-firm ratio is equal to or greater than 75 per cent and low if it is less than 75 per cent. The only two industries for which importer concentration is 'high' in 1980 are Cheddar from Australia and Swiss-type from Norway, neither of which appears in the 5-year sample (since there are no data for earlier years). There is, therefore, relatively little variation in either absolute or relative concentration across the sample, which is reflected in the empirical results obtained.

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