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Australian and New Zealand Dairy Industry Programs

Paul V. Johnston

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ABSTRACT

Domestic subsidies on dairy products became an issue between Australia and New Zealand in the early eighties when these countries began discussing a new free-trade agreement. Subsidies alter the production and marketing efficiency in their dairy industries and affect the degree to which Australia's and New Zealand's dairy industries compete in each other's domestic and international markets. The Australian dairy industry is more heavily subsidized than New Zealand's. Removing the subsidies in both countries would favor New Zealand's competitive position in Australia's domestic and international markets.

Keywords: Dairy industry, subsidy, fluid milk, dairy products, Closer Economic Relations Trade Agreement, General Agreement on Tariffs and Trade.

Note: This report uses metric units throughout. Ton refers to a metric ton; 1 metric ton = 2,204 pounds and 1 kilogram = 2.2 pounds.

ACKNOWLEDGMENTS

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SUMMARY

Dairy industry subsidies became an issue between Australia and New Zealand when discussion began on the Closer Economic Relations Trade Agreement (CER). This new agreement replaced the New Zealand-Australia Free Trade Agreement (NAFTA) of 1966 and exposed all merchandise trade within 5 years to the comparative efficiency of industries, without regard to quotas, tariffs, licenses, and subsidies. However, the agreement permitted Government intervention in some domestic industries to continue. For example, removing subsidies in the dairy industries of Australia and New Zealand would likely alter the industries' comparative efficiency. The Australian Bureau of Agricultural Economics (BAE) suggested that because New Zealand's subsidies were larger, their removal would place Australian dairy producers at a disadvantage in both countries' domestic and international markets.

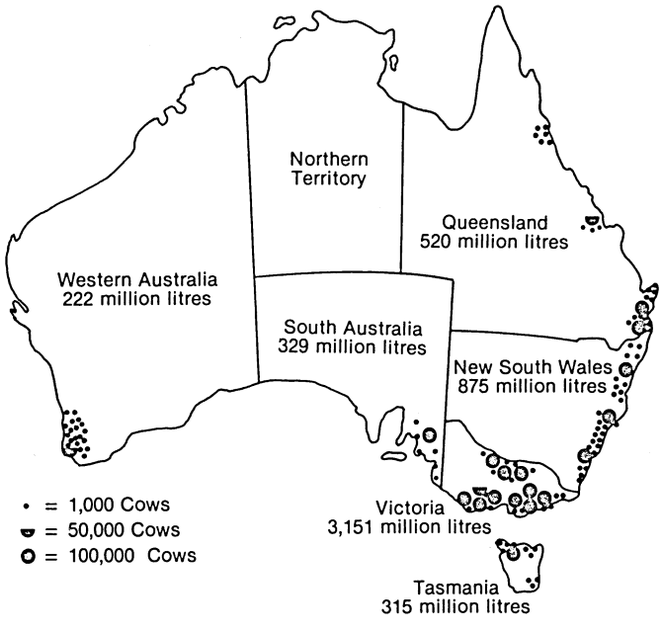
Measuring the dairy industry subsidies in both countries would help answer the question of comparative efficiency. The BAE and the Industries Assistance Commission (IAC) measured Australia's subsidies. Results were criticized and a new estimate was made. The BAE, IAC and new estimates were $289, $166, and $250 million (Australian dollars), respectively.

New Zealand's dairy industry subsidies were estimated to be $52 million (Australian dollars) or $58.5 million (New Zealand dollars); about one-fifth the value of Australia's subsidies. On a liter or a per farm basis, Australia subsidies compared unfavorably with New Zealand's. New Zealand's subsidy per liter of milk was less than one cent, while Australia's was between three and five cents, depending on the estimate used. New Zealand dairy farms received an average $3,000 (Australian dollars), while Australia's dairy farmers got about $11,000 (Australian dollars).

Eliminating Australian dairy subsidies would reduce production as producer prices fell to world-market levels. Exports would decline because of lower production and domestic consumption would increase because of lower prices. In New Zealand, consumer prices would increase and production would decrease, but the net effect on exports is unknown.

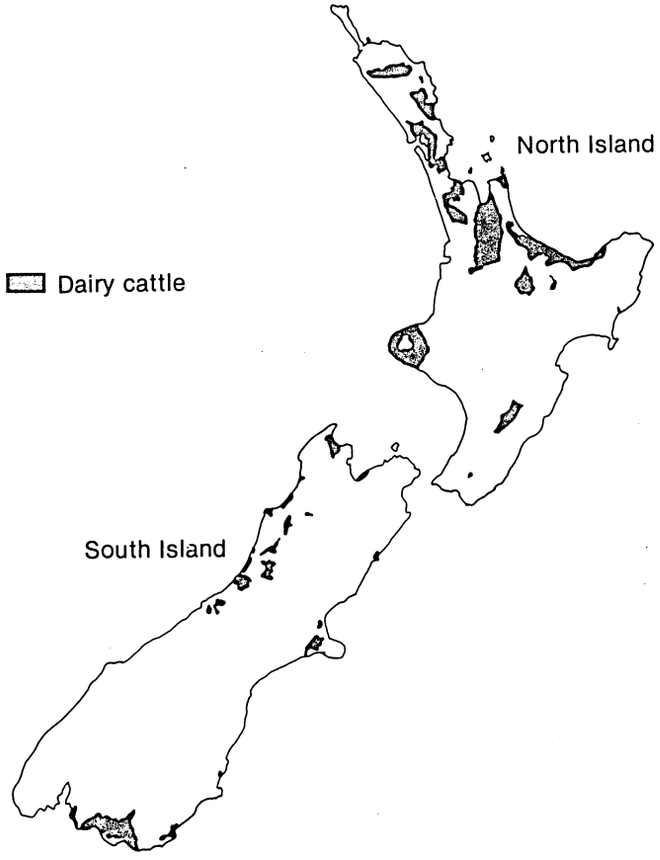
The potential effects of eliminating subsidies in Australia and New Zealand extend to third countries, including the United States. Depending on the product, dairy industries in these three countries compete in 2 to 12 markets. Competition is usually dominated by one country or it is relatively small in volume. For example, the United States sold 60,000 tons of milk products and New Zealand sold 10,000 tons of milk products to Mexico. Twelve cheese markets overlap: Japan gets 1,200 tons from the United States but 40,000 tons come from Australia and New Zealand.

Cow Numbers and Milk Production: Australia 1979/80



Source: Australian Dairy Corporation

Distribution of Dairy Farms in New Zealand



Source: New Zealand Atlas, 1976

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INTRODUCTION

Interest in the relative competitive position of the Australian and New Zealand dairy industries was intensified by the 1983 Closer Economic Relations Trade Agreement (CER) between these countries. This interest comes not only from the free-trade provisions but also from the domestic subsidy programs of each country. This report focuses on dairy industry subsidies.

The CER agreement allowed domestic subsidies to continue. However, it is reasonable to conclude that in the long term the agreement will foster the rationalization of each other's industries, at least with respect to trade in third-world countries, especially those in the South Pacific and Southeast Asia. Efficient use of resources implies that industries will contract or expand in either country according to the relative efficiency of the industry. For example, Australia's dairy industry has been declining because of restructuring of farms and relocation of the industy; this process may be further encouraged by free trade if New Zealand is more efficient. The Heads of Agreement statement on the CER, signed by the trade representatives of the two countries, reinforces the importance of rationalizing domestic industries. The agreement states: "It is expected that the expansion of trade that will result from liberalization will lead to the more effective use of each country's resources. Increasingly, each will do more of what it can do best."1/ However, two parts of the formal agreement between the two countries dilute the extent of this rationalization process. In Objectives and Article 13, the references to efficiency are couched in third-world terms: as stated in Objectives, the CER will "...lead to a more effective use of resources and an increased capacity to contribute to the development of the region through closer economic and trading links with other countries."2/ 3/ Thus, efficiency as used in the CER seems to emphasize a joint or combined notion toward third countries, rather than singling out each country.

1/ Heads of Agreement, signed by Mr. Anthony, Acting Prime Minister and Prime Minister for Trade and Resources of Australia and Mr. Muldoon, Prime Minister of New Zealand; paragraph 1.04, p. 1.

2/ CER, p. 5., Article 13, Rationalization of Industry, reinforces this objective.

3/ Ibid., pp. 30-32.

The agreement calls for the immediate elimination of some tariffs, but most tariffs are scheduled for elimination within 5 years.4/ On the other hand, reductions in quantitative restrictions, including tariff quotas, permit annual increases in imports from the other country of 10 to 15 percent of their base levels.

Both Australia and New Zealand subsidize fluid and manufacturing milk and dairy products. These subsidies range from (1) subsidizing dairy product producers by raising the domestic price above the world price, (2) subsidizing consumer prices of fluid milk, and (3) reducing costs of fluid milk through input subsidies. Subsidies mask the relative efficiency of the dairy industries and distort their competitive character because they alter the cost and volume of production and exports.

The simultaneous movement toward free trade and the potential deregulation of domestic dairy markets make the relative amount of subsidies to the Australia and New Zealand dairy industries an important issue.

Subsidies: The Agreement on Tariffs and Trade

The General Agreement on Tariffs and Trade (GATT), signed by both Australia and New Zealand, discourages subsidies within the international trade community, but recognizes their use by Governments "...to promote important objectives of national policy."5/ 6/ GATT, however, recognizes some potentially harmful effects of subsidies on trade and production, the signatories signed an interpretative agreement, the Subsidies Code, on Articles VI, XVI, and XXIII which cautions Governments in their use of such subsidies. Article 11 of the "Interpretation" reads:

> Signatories recognize, however, that subsidies other than export subsidies may cause or threaten to cause injury to a domestic industry of another signatory or serious prejudice to the interests of another signatory or may nullify or impair benefits accruing to another signatory under the General Agreement, in particular where such subsidies would adversely affect the conditions of normal competition. Signatories shall therefore seek to avoid causing such effects through the use of subsidies.7/

Furthermore, Article XVI of the GATT raises the issue of the influence of subsidies on exports and imports. Article XVI states that in the case of any subsidy, "including any form of income or price support, which operates directly or indirectly to increase exports of any product from or to reduce imports of any products into its territory," the country granting the subsidy must identify the circumstances requiring the subsidy and discuss the possibility of limiting the subsidy.8/ This provision on income and price

4/ Exceptions were detailed in selected agreements between Australian and New Zealand industries and annexed to the CER. See Appendix 1, paragraphs 3 and 4 of Article 4 on tariffs, and Article 5 on quantitative restrictions.

5/ Kenneth Dam. The GATT: Law and International Economic Organization, p. 132.

6/ Article 11, "Subsidies other than export subsidies," in "Agreement on Interpretation and Application of Articles VI, XVI, and XXIII" of the General Agreement on Tariffs and Trade, 1979, p. 5.

7/ Op. cit., Interpretation, p. 20.

8/ Op. cit., Interpretation, Section A, Article XVI of GATT, p. 38.

support directly applies to both Australia's and New Zealand's dairy industries because their industry subsidies influence dairy product exports.

The CER and GATT

The CER recognizes its "rights and obligations under the General Agreement on Tariffs and Trade." Both Article 10, Agricultural Stabilization and Support, and Attachment II of Annex E of the CER caution the use of new stabilization policies and both countries agree to consult on policies that may "...affect the dairy industries in either country."9/ Accordingly, the Joint Dairy Industry Consultative Committee (JICC) meets twice a year on, among other things, "...any changes in domestic policies which may affect the dairy industries in either country."10/ While Attachment II is consistent with the consultative policy of GATT, it contains two references to third-party effects, which are a concern of GATT. The attachment enjoins the dairy organizations of the two countries to cooperate in international markets to optimize joint returns.11/

The attachment also refers to the consultation on joint dairy trade policy issues. Thus, the dairy aspects of the CER promote a unified approach to trade policy to maximize profits. Such efforts to stimulate some monopolistic influence over the dairy trade with respect to third countries is not consistent with GATT objectives and may conflict with the principle of an "equitable share of world export trade."12/

Australian Dairy Industry

About 23,000 Australian dairy farmers produced an annual average of 5.5 billion liters of whole milk between 1977/78 and 1980/81.13/ The typical dairy farm produces both fluid and manufacturing milk, but these farms can be distinguished by the proportion of fluid milk produced. In a recent report, the Bureau of Agricultural Economics (BAE) defines a manufacturing-milk farm as one that produces 70 percent or more of its milk for dairy products.14/ The fluid-milk farm is one that produces more than 50 percent of the milk for the fluid-milk market. This leaves a gap of unclassified farmers whose fluid-milk output lies between 30 and 50 percent of production. Because fluid-milk production is less than 50 percent of the milk produced, these farms are added to the manufacturing-milk group.

9/ Attachment II, Annex E, CER, p. 124. Attachment II states that both countries "attach great importance to their respective domestic arrangements which can influence the size and structure of the industries in each country." Ibid., p 126.

10/ Ibid., p. 124.

11/ Ibid., p. 125.

12/ See Kenneth Dam, The Gatt: Law and International Economic Organization, 1970, p. 417.

13/ According to the Bureau of Agricultural Economics survey methodology on the dairy industry, a dairy farm must have 30 or more cows and must not be heavily engaged in stud or milk vending activities. See "Dairy Industry: Preliminary Survey Results for 1982-83 and Projections for 1983-84," by Richard Hunter in Quarterly Review of the Rural Economy, Vol. 6, No. 1, February 1984, Survey Supplement. For production data, see "BAE Trends," various years.

14/ See "Comparative Efficiency Between Australian and New Zealand Dairy Industries," Occasional Paper No. 60, p. 28.

About 19,000 dairy farmers produced 4 billion liters of manufacturing milk or milk used to produce dairy products such as butter and cheese. The other 4,000 dairy farmers produced 1.5 billion liters of fluid or market milk. Although these two types of dairy producers will not be maintained over the long run, several changes are expected in other aspects of the dairy industry. The Australian dairy industry will likely shift to larger processing and distribution operations, reduce the number of dairy farms, increase the herd size, and shift production to lower cost regions.15/

About 60 percent of all the milk produced in Australia is consumed in the domestic market as fluid-milk or dairy products. Between 1977/78 and 1980/81, Australia's dairy product exports averaged 162,000 tons, or 42 percent of production (table 1). Milk powders have been the major export product, followed by cheese and butter. Casein production and exports have declined in recent years. Casein production declined from 19,000 to 14,000 tons between 1977/78 and 1980/81. Casein exports declined from the 4-year average of 13,000 tons to 11,000 tons, or 6 percent of dairy product shipments in 1980/81.

The Australian Government, along with the Australian Dairy Corporation and the State dairy boards, formed a modified price-discriminating market structure in dairy products and fluid milk in an attempt to stabilize dairy prices and income.16/ Such use of price regulation, revenue pooling, guaranteed prices, and stabilization funds has generated various types of subsidies.

New Zealand Dairy Industry

The structure of New Zealand's dairy industry is similar to Australia's. About 15,000 manufacturing-milk producers and 1,700 fluid-milk producers averaged almost 6.3 billion liters between 1977/78 and 1980/81. The town-milk or fluid-milk sector consumes about 10 percent of milk production, leaving about 90 percent for manufactured dairy products.

New Zealand's exports of milk, butter, and cheese averaged 571,000 tons between 1977/78 and 1980/81. New Zealand's exports of these products exceeded Australia's in each category; the difference was relatively small for only cheese exports (table 1). The proportion of production exported varied by product but exceeded 70 percent for all products. Nearly 100 percent of

15/ Situation and Outlook, 1981, p. 14. Article 13 of the CER, Rationalization of Industry, paragraph 2a refers to the extent to which the restructuring and relocation is "...likely to lead to more efficient use of resources and improvements in competitive ability in third country markets." Thus, the long-range goal of efficiency is related to world markets rather than to the joint efficiency of Australian and New Zealand dairy industries.

16/ Price stabilization policies are more effective in stabilizing farmers' income when they include a high number of competing commodities or when the stabilized commodity constitutes a high proportion of farm income. In Australia, the economic effects of Government regulations on dairy farmers are somewhat blunted because about 30 percent of the farm income comes from nondairy sources, such as grain and livestock sales. Consequently, Australian dairy farmers have been able to shift their resources to other commodities as relative prices and costs dictate. Moreover, the effect of the dairy stabilization-income program is somewhat reduced because the price stabilization scheme is directed to selected rather than all dairy farm products.

Table 1--Dairy product exports, 1980/81, Australia and New Zealand 1/

Commodity	Australia dairy exports		New Zealand dairy exports	
	Value	Volume	Value	Volume
	Million dollars	1,000 tons	Million dollars	1,000 tons
Butter	30	16	301	203
Cheese	104	54	104	80
Milk powders	--	--	231	262
Skim	6	7	--	--
Whole	71	45	--	--
Casein	26	11	89	43
Other*	43	40	--	--
Total	280	173	726	588

* Condensed milk and other dried milk powders.
-- Not applicable.
1/ Dairy product exports in 1983/84 were higher in all categories and the rankings remained the same for products exported and countries. The current period's data are not presented because the subsidy data are for 1977/78 to 1980/81. Values are reported in Australian dollars.
Sources: Australia, BAE, Trends in the Australian Rural Sector, September Quarter, pp. 10-11. New Zealand, New Zealand Yearbook, 1983, pp. 623-626.

casein and skim milk products are exported, while butter exports account for 80 percent of production, and cheese exports average 77 percent of production.

Purpose and Organization of Research

The purpose of this research is to identify and measure the subsidies to Australia's and New Zealand's dairy industries and to determine which country has the greater unit subsidy. The potential domestic and trade responses of these industries are also discussed.

The first section outlines the theoretical structures for Australia's and New Zealand's subsidies to their respective dairy industries. The second section discusses the institutional framework of the dairy industries, and the third section discusses the various measures of the subsidies. Section four presents some of the implications of eliminating domestic subsidies on the competing markets of Australia, New Zealand, and the United States.

THEORETICAL STRUCTURE OF SUBSIDIES

Australian Subsidies

The theoretical model of Australia's Government regulations and subsidies to dairy prices and the dairy industry is quite complex. Keys to understanding the model include: (1) the use of both a world price and a higher, regulated

domestic price; (2) pooled prices which reflect the relative quantities sold on domestic and world markets; (3) subsidies to some inputs; and (4) income averaging for farmers.

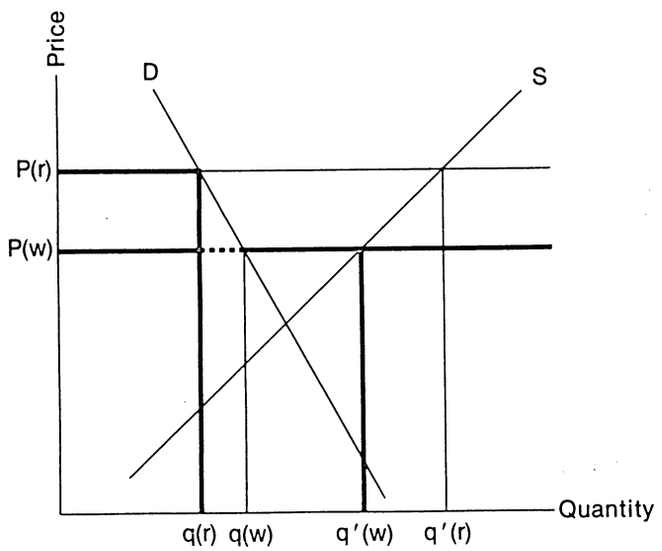
The Australian Government sets the domestic price of five prescribed products--butter, cheese, skim- and whole-milk powders, and casein--above the world price (fig. 1), while simultaneously lowering production costs by input subsidies and tax or interest concessions. Butter is used as a representative commodity for discussing subsidies on prescribed products. At the world price P(w), production is q'(w), domestic consumption is q(w), and exports are q'(w) - q(w).17/ At the higher regulated price P(r), domestic consumption is q(r).

Because of Australia's regulation of the domestic butter price, consumers transfer the amount [P(r) - P(w)]q(r) to butter producers. This consumer-to-producer transfer is the largest subsidy to the Australian dairy industry.

Producers do not receive the regulated price on domestic sales but they do receive a pooled or blended price. Because total production q(f) is the sum of domestic sales q(r) and foreign sales q(f) - q(r), the pooled price P(f) is

Figure 1

Butter Market: Australia



17/ In general, it is unknown if the expanded production will be stored or sold overseas. It is assumed that excess production over domestic consumption will be exported and stocks held to a minimum because the dairy products industry provides an important source of foreign exchange.

a weighted sum of domestic and international prices (fig. 2), the weights being the proportions of total sales going to each market. Thus, the pooled price is:

$$P(f) = aP(r) + bP(w)$$

where: a is q(r)/q and b is q(w)/q.

As figure 2 shows, the pooled price P(f) is always higher than the foreign price but less than the regulated domestic price. The pooled price falls rapidly during the initial expansion of exports. However, as exports become a larger proportion of total production and a larger weight in computing the pooled price, this pooled price declines slowly until it approximates the world price P(w).

Determining total production q(f) is complicated because producers respond to the pooled price while the pooled price depends on the level of production. Thus, additional exports lower the pooled price and a lower pooled price reduces production. Hence, to determine a definitive level of production, assume for simplicity that output is given by:

$$q(f) = kP(f)^{B}$$

Written in full, to show the relative influence of q(r), q(w), and q(f), the pooled price is:

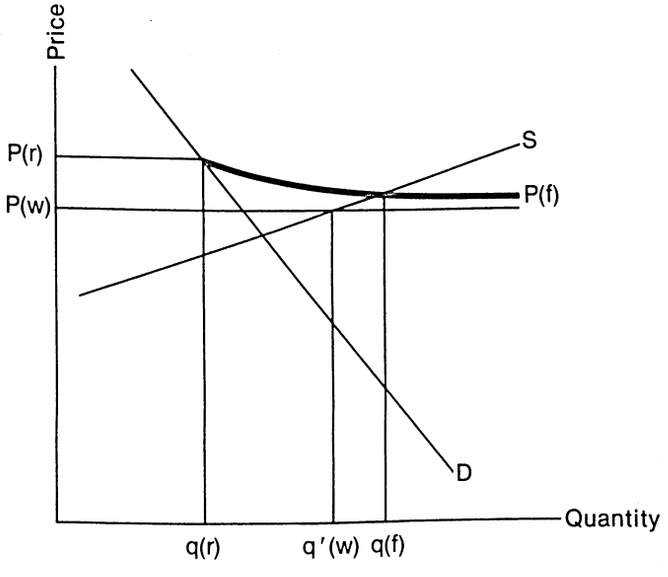
$$P(f) = [P(r)q(r) + P(w)q(w)]/q(f)$$

Then an explicit solution for q(f) is:

$$q(f) = k^{1/(1+B)}[P(r)q(r) + P(w)q(w)]^{B/(1+B)}$$

Figure 2

Butter Market with Pooled Price: Australia



Total butter production under the pooled price scheme shows the expanded level of production under the pooling system compared with that under the world price P(w) (fig. 2). At the pooled price P(f), the dairy industry produces q(f), which is greater than production q'(w) at the world price P(w). Because the pooled price is derived from a price regulation that induces a subsidy and expands exports, a pooled price comes under the restrictions of Article XVI of GATT.

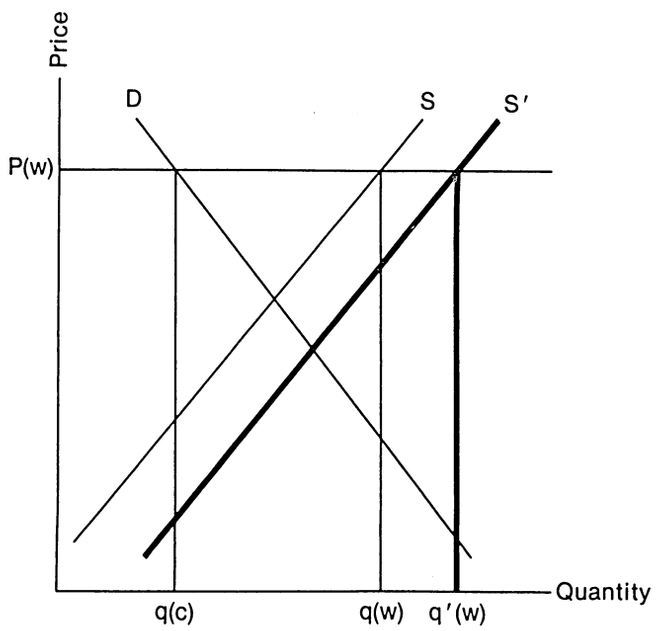
Input subsidies reduce costs for a given level of production (fig. 3) and are represented by a downward or rightward shift in supply from S to S'. The amount of the shift measures the effect of the subsidy on butter production costs but is not the subsidy itself. At the world price P(w), production expands to q'(w), whereas domestic consumption remains at q(c).

The graphic analysis of income averaging is complicated when the tax is based on average income because the average is done over time rather than over production levels. Moreover, income is not always averaged. Of course, farm income varies in the same direction as production; but, with income averaging over time, there is no unique relationship between the farmer's tax liability and the amount of milk produced in a given year. On the other hand, if production levels are constant for the averaging period, costs of production tend to rise or fall, depending on the relative strength of technological advances and rising factor prices.

One approach to a graphic interpretation is to consider that taxable income rises with production, then treat the averaging process as a shift in the supply response relation. Two taxable supply schedules (fig. 4) depict this tax scheme; one schedule is based on averaging while the other is based on a current income below the average.

Figure 3

Input Subsidy to Butter Production: Australia



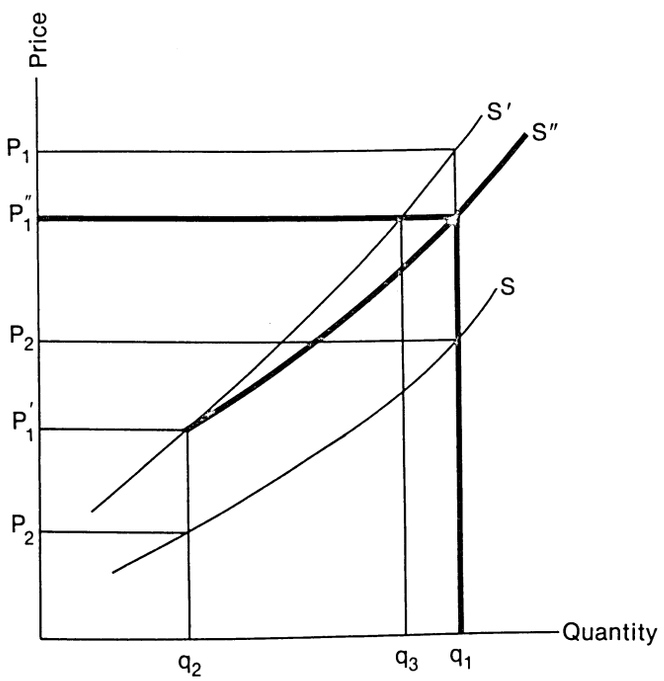
Income averaging (fig. 4) in Australia permits farmers to pay the going rate if their current income is lower than the average of the 5 years ending in the current year.18/ If a farmer's current income is higher than the 5-year average, the tax rate is based on average income. The tax rate is applied to current income and not to average income.

Because of the progressivity of the personal income tax, the supply schedule under taxes (S') rises rapidly, and the difference between S' and S at various levels of production is the unit tax for q production. For example, the unit tax on an income of P'_1q_2 is less than that on an income of P_1q_1, making the tax rate $(P_1 - P_2)/P_2$ higher than $(P'_1 - P'_2)/P'_2$ because of the progressivity of the tax schedule.

The tax averaging scheme changes this presentation. If, for example, we assume that a farmer's current income of P_1q_1 exceeds the 5-year average income of P'_1q_2, the tax rate is reduced from $(P_1 - P_2)/P_2$ to $(P'_1 - P'_2)/P'_2$ so as to correspond with the average income. This lower rate is applied to the higher income, yielding a new unit tax of $(P'_1 - P'_2)(P'_1/P'_2)$, which is higher than the unit tax at q_2 because P'_1 is greater than P'_2. This averaging procedure yields a supply response curve (S") which can be thought of as supply corresponding to an average income of $P''_1P'_2$; current income can be anywhere above the average.

Figure 4

Income Tax Averaging



Bureau of Agricultural Economics, Rural Industry in Australia.

18/ Bureau of Agricultural Economics, Rural Industry in Australia, 1983, p. 115.

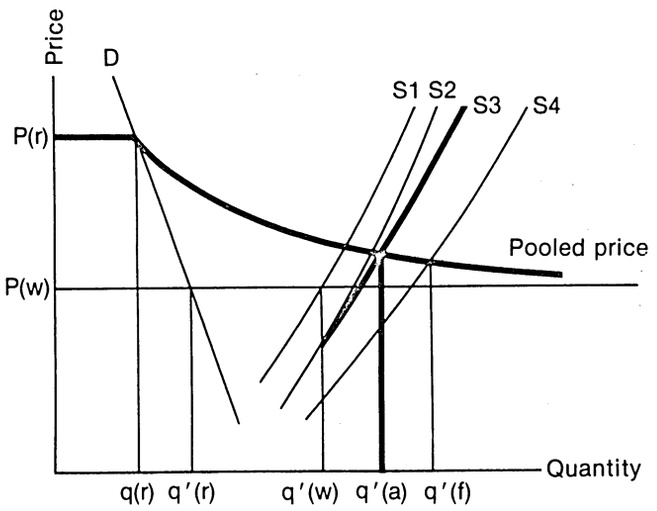
There is an S" for each average income. If a farmer's income lies below the average, the tax rate is no longer based on the average but rather on current income. That is, let the average taxable income correspond to P'_1q_2. Because current income is assumed to be lower than the average, the tax would not lie along S", but along S', to the left of q_2. The net result of tax averaging with rising incomes is that farmers offer more milk on the market at a given price. Thus, if the price is $P"_1$ and the farmer's income averages P'_1q_2, the farmer would offer q_1 to the market rather than q_3.

This discussion has dealt with price and tax subsidies separately to show their unique consequences on domestic demand, exports, and production. Australia has combined several of these subsidies for the dairy industry. Hence, to analyze the effect of all of the individual subsidies, a more complex model of Australian subsidy policies on dairy production and farm prices is needed.

The results of all these subsidies on price, production, and exports (fig. 5), reveal an overall increase in production and exports. The relations described by S(1) through S(4) are: S(1) the initial supply relation; S(2) the initial effect of income taxes without averaging, S(3) the net effect of income taxes, and S(4) the effect of input subsidies. At the pooled price P(f), the net effect of subsidies on output is q(a). Domestic consumption is q(r), and the increase in exports due to all subsidies and regulations is the sum of reduced consumption q'(r) - q(r) and the net effect of supply subsidies q'(w) - q(a). Pooling and input subsidies increase production to q'(f), but taxes reduce the strength of pooling by q'(f) - q(a). The net effect of income averaging is to increase production and exports, and a lower export price reduces the pooled price and farm revenues. Quantitative information is needed to identify if total farm revenues increase or fall in response to the tax-averaging scheme.

Figure 5

Joint Effect of Dairy Subsidies and Regulations: Australia



New Zealand Subsidies

Some of New Zealand's subsidies, like those in Australia, reduce production costs for manufacturing-milk products and fluid milk. But, one of New Zealand's subsidies increases domestic demand for fluid milk and reduces the export potential for dairy products.

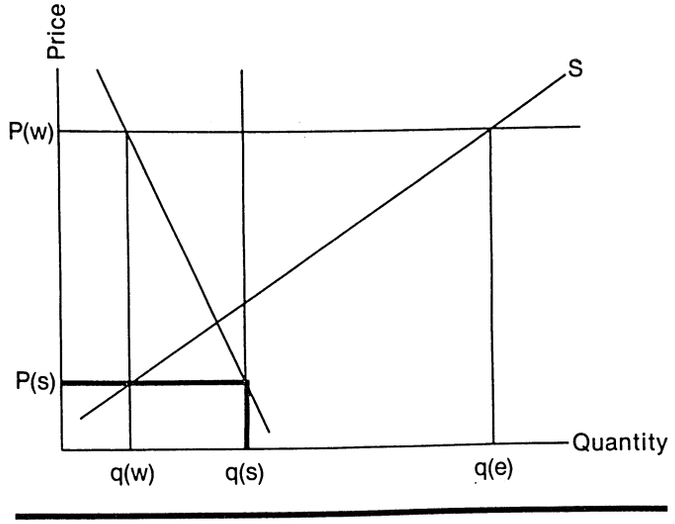
Production costs are reduced by interest concessions, health aid to dairy cattle, and fertilizer subsidies. Domestic demand for fluid milk increases beyond the free-market level because consumers pay about half the sum of the production and marketing costs of fluid milk (fig. 6).

Without subsidies and paying world prices, New Zealanders would buy q(w), produce q(e), and export q(e) - q(w). Because of the subsidy, consumers increase their demand for fluid milk from q(w) to q(s) (fig. 6). To encourage this volume of fluid milk production, producers would have to be paid price P(m) corresponding to q(s). However, the higher world price P(w) generates enough output to more than satisfy domestic demand at the subsidized price. Although the level of production is not affected by the subsidy and remains at q(e), it is redistributed among domestic and international markets in favor of domestic consumers. Exports decline by the increase in domestic consumption, q(s) - q(w), leaving q(e) - q(s) for sales to international markets.

New Zealand's subsidies lower production costs and have the same directional effect as subsidies in Australia. Exports expand by q(e)q'(s) without affecting domestic consumption which remains at q(s) (fig. 7). However, this may not be the only case, because the subsidy may be based on production costs rather than on a specified level of milk consumption, such as q(s).

Figure 6

Consumer Subsidy and World Price for Fluid Milk: New Zealand



The effects of New Zealand's subsidies are to expand total production by q(e)q(s) and domestic demand by q(w)q(s) (fig. 7). However, no definitive statement can be made about the net change in total exports. They will increase or decrease depending on whether q(w)q(s) is less or greater than q(e)q'(s), that is, whether consumers increase their demand more than producers increase their supplies.

INSTITUTIONAL FRAMEWORK OF SUBSIDIES

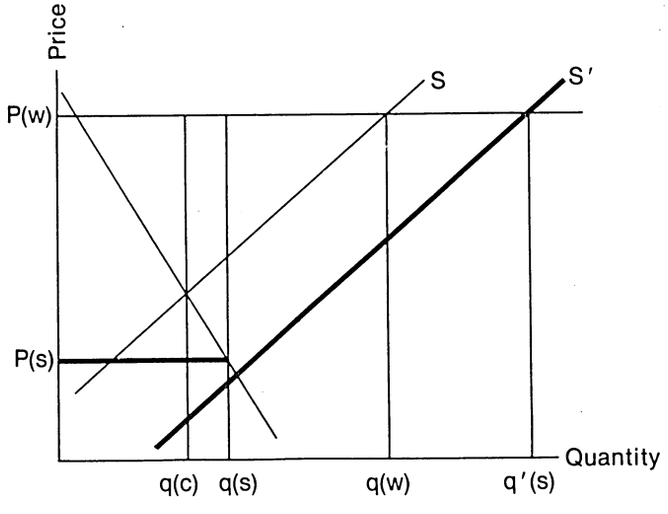
General Effect of Australian and New Zealand Subsidies

The previous models show the effects of the major subsidies and regulations on prices, production, domestic consumption, and exports for Australia and New Zealand. The analysis shows that Australia's dairy policies have raised domestic prices and altered the distribution of production in favor of exporters over domestic consumers. Additional subsidies for farm costs increased production of fluid milk and expanded dairy product output. Thus, Australia's subsidy program has expanded overall production and exports while domestic consumers have subsidized foreign consumers.

New Zealand's subsidies have also expanded production but not at the expense of the domestic consumers of fluid milk who have increased their consumption at the expense of foreign consumers. Hence, in direct contrast to Australian dairy policy, New Zealand has reduced its trade balance in exchange for increased domestic consumption of fluid milk.

Figure 7

Joint Subsidies of Production Costs and Consumer Prices: New Zealand



New Zealand's decision to increase domestic milk consumption at the expense of exports still leaves the question of the effect of subsidies on trade between the CER members. Australia's BAE believes that the current dairy subsidy programs favor New Zealand and, if left intact under the CER, such programs would drive Australia out of many of its domestic and international dairy product markets.19/ The BAE further argues that without competition from Australian dairy producers, New Zealand could establish high monopoly prices once it becomes the sole supplier of dairy products in the region.

But, the BAE's concern must be put in perspective. State dairy boards, the Australian Dairy Corporation, and the Commonwealth Government now act as a monopolist in the domestic market, setting prices and controlling production and imports. Consequently, Australia is the sole supplier of domestic dairy products, except cheese. Because of its domestic monopolistic position, Australia has often raised domestic dairy product prices above competitive world prices. Hence, both countries have monopolistic power in their domestic markets, and according to the BAE, New Zealand has potential monopoly power over Australia's domestic market.

Government Intervention in the Dairy Industry

The Commonwealth Government of Australia has intervened to assist the dairy industry in three basic ways. It has set up a modified discriminating monopolist pricing plan, distributed the resulting higher revenues, and attempted to raise dairy income and stabilize prices by guaranteeing domestic prices and by pooling all domestic and international prices for selected dairy products.20/

The model describing the Australian dairy industry is interesting because of its mixture of monopolistic and competitive elements. The model shows price discrimination on the demand side but price competition on the supply side. The modified price discrimination system has raised farm revenues above what they would have been in either a competitive market or a purely discriminating monopoly. The competitive price and the price charged by the purely discriminating monopolist in international markets would be the same, P(w). But, the monopolist's domestic price P(w) would correspond to the additional cost of aggregate production. The comparison is depicted in fig. 8.

In the price discrimination model of a monopolistic seller, the domestic selling price is P(m) and Q(m) is sold. The balance of production Q(1) - Q(m) is sold on world markets at P(w). Revenue is P(m)Q(m) + P(w)(Q(1) - Q(m)).

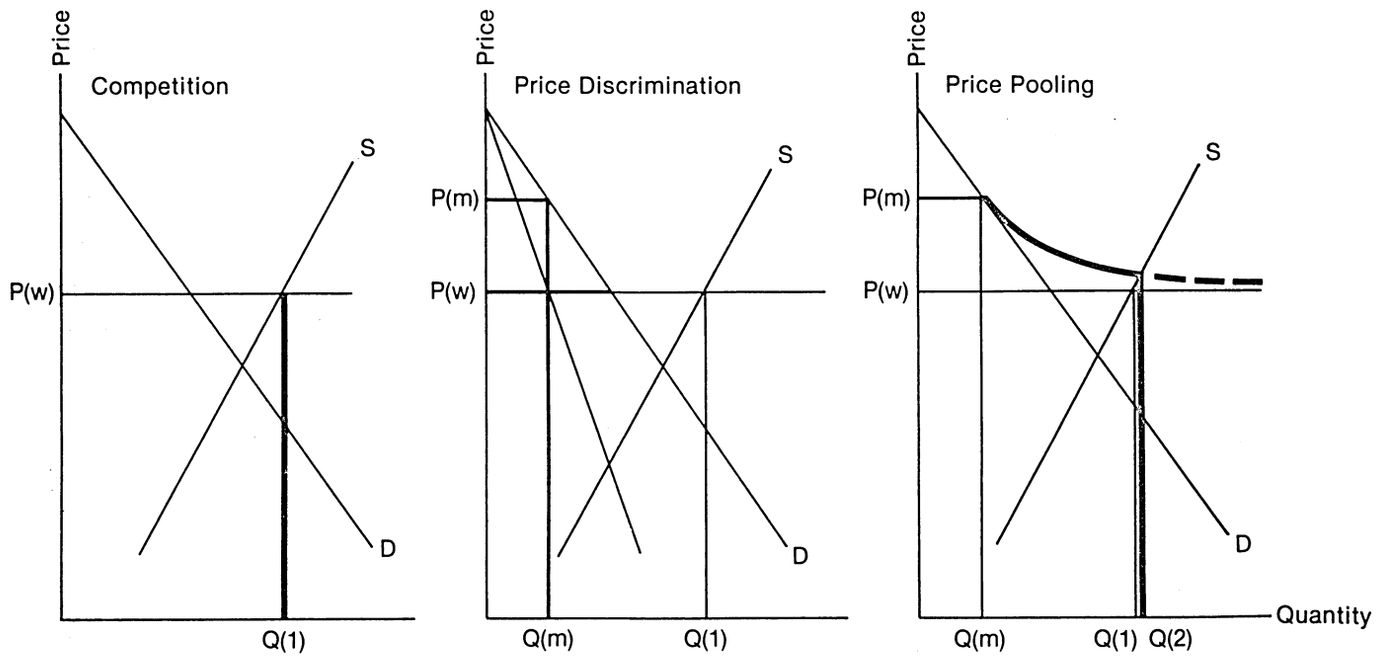
Using price pooling, and assuming that the Government's domestic price equals the discriminating price, the Government sells Q(m) at P(m) and sells the balance of production at the world price of P(w). The distinction between this and the monopolistic price discrimination model is that production is greater in the former by Q(2) - Q(1) because farmers respond to the pooled price P(p) rather than to the world price P(w). Revenue is (P(m) - P(w))Q(m) + P(w)Q(2) + P(p)Q(2).

19/ "Closer Economic Relations and the Rural Sector," p. 12, by Geoff Miller and Andy Stoeckel, presented at the Annual Conference of the Australian Agricultural Economics Society, February 1981, Christchurch, New Zealand.

20/ Situation and Outlook, Dairy, 1983, p. 10.

Figure 8

Market Competition, Price Discrimination and Price Pooling



Since, in the competitive model, all production is sold at the world price, domestic consumption is Q(c), exports are Q(1) - Q(c), and revenue is P(w)Q(1).

Hence, production in the competitive and pure price discrimination models is the same, but domestic consumption is greater in the competitive model. Revenue and production are greatest in the pooling price model. Revenue from pooling exceeds that from pure price discrimination by (P(m) - P(w))Q(m) and from competition by (P(p) - P(w))Q(2) + (P(m) - P(p))Q(m).

Pooling then modifies the character of the purely price discriminating monopolist. Additional revenues are distributed to farmers rather than being secured by the monopolist, and farmers decide production levels on the basis of the pooled price. Thus, figure 8 shows that production would be Q(1) under a pure price discriminating monopolist market, but the competitive nature of supply increases production to Q(2).

Guaranteed prices for domestic sales, on occasion, have been above world prices and have raised incomes above what the world market would have provided (table 2).

Price Discrimination

Australia's dairy industry satisfies three conditions for successful price discrimination. These conditions are that firms can exercise sufficient market power, that markets have different demand elasticities, and that product markets are separable. For markets to be separable, some barrier must exist to preclude arbitrage between two or more markets. If two markets are separated simply by distance, then the price difference in the markets can be no larger than transportation costs, otherwise arbitrage will take place as goods can be bought in the cheaper market and sold in the high-priced market.

Table 2--Australia's guaranteed price and world prices for prescribed dairy products, 1977/78 to 1979/80

Commodity and Year	Guaranteed price 1/	World price 1/
	Dollars/ton	
Butter:		
1977/78	1,200	NA
1978/79	1,240	851
1979/80	1,240	1,015
Cheese:		
1977/78	908	NA
1978/79	974	994
1979/80	818	1,207
Whole-milk powder:		
1977/78	715	NA
1978/79	735	693
1979/80	1,075	747
Skim-milk powder:		
1977/78	390	NA
1978/79	440	427
1979/80	534	587
Casein:		
1977/78	1,012	NA
1978/79	1,096	1,149
1979/80	1,383	1,511

NA = Not available.

1/ Values reported in Australian dollars.

Source: Industries Assistance Commission, (draft report), "The Dairy Industry," 1983, p. 27.

The first condition for price discrimination is met because the collective aegis of Government authorities sets dairy prices on the domestic market for manufacturing milk in Australia. The Australian Dairy Corporation (ADC) administers five prescribed dairy products programs grouped under cheese, butter, whole- and skim-milk powders (WMP and SMP), and casein.21/ State dairy industry authorities are responsible for production and marketing activities, for setting the farm-gate price of fluid milk, and for establishing processor margins at all stages of marketing, thus ensuring market control. Moreover, farmers are not free to enter the fluid-milk market but must buy out an existing milk base or wait until market growth increases demand.

21/ Butter includes butter, butteroil, processed butteroil, and ghee. Leviable varieties of cheese are cheddar, stirred curd/granular, processed, monterey, cheedam, and colby. SMP includes skim-milk powder, buttermilk powder, mixtures of skim-milk and buttermilk powders, and modified SMP. Casein includes casein which incorporates caseinates and coprecipitates. WMP is only whole-milk powder. IAC report, No. 333, The Dairy Industry, 1983, p. 6.

The second condition is also satisfied. Manufactured products sold in both domestic and international markets are separable. Although the high-priced domestic products would ordinarily turn consumers toward the lower priced international dairy products markets, Government restrictions on imports preclude such purchases at the world price.

Estimates of demand elasticities in the international and domestic markets suggest that the third condition is satisfied. Observed elasticities are presented in table 3.22/

Elasticities differ between retail fluid milk and retail dairy products (table 3), and, with a proportional markup, derived demand elasticities for fluid and manufacturing milk would reflect the same differences as those for final products.23/ Evidence of price discrimination for prescribed dairy products occurs because higher prices are charged in the domestic market not in the world market (table 4).

Price discrimination for fluid-milk is suggested because differences in market-milk and manufacturing-milk prices are greater than the difference in costs of production. The cost difference is due to the requirement that dairy farmers maintain additional cows to supply the fluid-milk market all year rather than for the 9 months established for production of manufacturing milk. Yet, Blank rules out any price difference based on higher costs because he found no significant cost differences between fluid-milk and manufacturing-milk production costs.24/ Another factor is the higher quality of fluid milk, but this factor was discounted in the IAC's dairy industry

22/ Bureau of Agricultural Economics, Occasional Paper No. 84, An Economic Evaluation of Australian Dairy Pricing Policy, 1983.

23/ This can be shown to be the case when output prices are proportional to input prices and inputs are proportional to outputs. Thus, let output price $P(o) = aP(i)$, where a is the proportionality constant and P(i) is the input price. Also let $Q(o) = bQ(i)$, where Q(o) and Q(i) are output and input, respectively, and b is the ratio of the two. Then the price elasticity of demand, n, for Q(o) is:

$$n = (dQ(o)/dP(o))(P(o)/Q(o))$$

Making the appropriate substitutions yield $dQ(o) = bdQ(i)$, $dP(o) = adP(i)$. We then have:

$$n = (bdQ(i)/adP(i))(aP(i)/bQ(i))$$

the a's and b's cancel, leaving:

$$n = (dQ(i)/dP(i))(P(i)/Q(i))$$

Hence, the two elasticities are the same. With a fixed markup, and butter or cheese produced from a fixed proportion of milk, the equality of the two elasticities is appropriate.

24/ Bureau of Agricultural Economics, Occasional Paper No. 60, Comparative Efficiency Between Australia and New Zealand Dairy Industries and Implications for Trans-tasman Trade, 1981, p. 27.

Table 3--Elasticities of demand for dairy products, Australia

Commodity	Elasticity	
	BAE 1/	IAC 2/
Butter	.07	.5
Cheese	.05	.9
Whole-milk powder	NA	.25
Skim milk powder	.28	.25
Casein	NA	-2.00
Fluid milk	NA	.25
Manufacturing milk	NA	.45

NA = Not available.
1/ Bureau of Agricultural Economics, Occasional Paper No. 84, Blank, Steve, p. 58.
2/ IAC Report No. 333, 1983, p. 33.

Table 4--Australia's domestic bulk-wholesale price and world prices for dairy product groups, 1980/81

Commodity	Domestic bulk-wholesale price 1/	World price 2/
	Dollars/ton 3/	
Butter	1,674	1,412
Cheese	1,578	1,415
Whole-milk powder	1,161	1,154
Skim-milk powder	858	857
Casein	2,210	2,226

1/ Assessed export price plus weighted average levy.
2/ Gross average export return.
3/ Values reported in Australian dollars.
Source: Industries Assistance Commission, draft report, August 1983, p. 27.

report of 1983.25/ In a report on casein subsidies for Australia and New Zealand, Roberts calculates that a 40-percent increase in the costs of market-milk production during the last 3 months of the fluid-milk season translates into a 1.3-percent increase of costs over the year.26/

Roberts concludes that the higher premium on fluid milk increased returns over costs by 20 percent above returns on market milk, and that the premium was excessive in its reflection of higher costs.27/

25/ Op. cit., Occasional Paper No. 84, p. 49.
26/ Roberts, Tanya, "Australian and New Zealand Casein Exports and Estimation of Effective Rates of Assistance," draft, June 1984, p. 13.
27/ Ibid.

Underwritten Price

The underwritten (guaranteed) price scheme for each prescribed product group, developed to protect the Australian dairy product industry from sharp declines in world-market prices, provides a floor price on the five prescribed product groups. The floor price is supported by both a Stabilization Trust Fund (STF) and a Government subsidy. If the pooled price from domestic and international sales is lower than the guaranteed price, supporting funds are claimed from the STF (fig. 2). If these stabilization funds are insufficient to bring the pooled price up to the guaranteed price, the Government subsidizes the difference. Underwritten prices for the past 2 years are presented in table 5.

Price Pooling

Price pooling is a simple means to stabilize farm prices and has been applied to dairy products and fluid-milk markets. In contrast to underwriting where prices are guaranteed, pooling is a weighted average of domestic and international prices, combining volatile international prices and sales with fairly stable domestic prices and demand elements.

The marketing arrangement, which established the levy system for financing the STF, provided two stages of implementation. The first stage established the pooling system for butter, cheddar and Gouda cheese, skim-milk powder, and casein beginning in July 1977. The second stage, beginning July 1978, added whole-milk powder to the list.28/

Dairy products, in contrast to market milk, operate under a dual pooling system and the Australian Government may subsidize either or both. The division of contributions between manufacturers and the Government depends on whether the export price is higher or lower than the assessed export price. Under the export pool scheme, manufacturers receive a minimum or guaranteed export price (in this case, not the same as the underwritten price) on all exports. Whenever the assessed export price is lower than the minimum price, Australia subsidizes the difference by paying this amount to the export pool. Manufacturers contribute when the assessed export price is higher than the minimum price. Hence, the total contribution to this pool in any year is the difference between the assessed export price and the minimum price, multiplied by the quantity of exports.

The second pool operates through the STF. The STF is supposed to be self-financing in that payments are received in high-priced years and funds disbursed in low-priced years. Recognizing that the fund would not always support the guaranteed price, the Government established the conditions under which it would subsidize the fund. Dairy product manufacturers pay the STF, a levy on each ton of product sold on the domestic market. No levy is collected on exports. The levy, which is determined three times a year for each product group, is really a residual difference and is not determined independently. The bulk-wholesale price, based on expectations of domestic sales, the relevant demand elasticity, competing product prices, relative production levels of other competing products, export trends, and expected inflation

28/ Annual Report, Australian Dairy Corporation, 1977/78, p. 11.

Table 5--Underwritten prices of prescribed products, Australia

Commodity	1979/80	1980/81
	Dollars/ton 1/	
Butter	1,240	1,655
Cheese	1,075	1,490
Whole-milk powder	818	1,110
Skim-milk powder	534	835
Casein	1,383	2,085

1/ Values reported in Australian dollars.
Source: Situation and Outlook, Dairy, 1983, p. 36.

is determined first.29/ Then the levy is calculated by subtracting the assessed export price, the average overseas price received from Australian sales of leviable goods (table 6).

The Government subsidy to farmers through the STF is complicated. The subsidy is not direct and involves the export pool as well as the STF. When funds in the STF are not enough to underwrite the guaranteed price, the export pool is the first source of funds. If these funds are still not sufficient to bring the average export price up to the guaranteed price, STF funds are used. If there is still a deficiency, the Government then subsidizes the balance from general tax revenues. Because the Commonwealth may subsidize the export pool, transferring pooled funds to the STF does not imply that there is no Government subsidy.30/

MEASUREMENT OF SUBSIDIES

Although other subsidies which supplement the major consumer-to-producer transfers are not explicitly discussed here, they are included in the total value of Australian subsidies.

29/ Industries Assistance Commission, "The Dairy Industry" (draft report), August 1983, pp. 111-112. The precise formulation necessary to assess the relative amount and direction of influence of the variables on the wholesale price is not known. The weights of the variables change according to the net result of conflicting policies. For example, if the purpose of agricultural policy is to pass along higher production costs, but general economic policy is to reduce inflation, the net effect these conflicting policies have on the bulk price may be zero.

30/ The levy on dairy products imparts a heavy burden on the dairy farmer. High levies increase the current tax on farm income and can reduce fund revenues. The higher levy raises the domestic wholesale price and reduces domestic consumption which forms the base for levy contributions. That is, the subsidy program resulting from a price discrimination policy that raises domestic prices may also reduce the source of funds necessary to limit the Government subsidy.

Table 6--Assessed export price; domestic bulk-wholesale price; levy; and world export price of prescribed products, Australia, 1980/81

Commodity	Assessed export price	Domestic bulk-wholesale price	Levy	World price
	Dollars/ton 1/			
Butter	1,080	1,674	594	1,412
Cheese	1,200	1,578	378	1,415
Skim-milk powder	750	858	108	857
Whole-milk powder	824	1,161	337	1,154
Casein	1,900	2,210	310	2,226

1/ Values reported in Australian dollars.
Source: Industries Assistance Commission, "The Dairy Industry" (draft report), August 1983, p. 27.

Two Australian Government agencies, the Industries Assistance Commission (IAC), and the BAE have published reports measuring the Government's assistance to the fluid- and manufacturing-milk sectors.31/32/ Over the years, they have shown wide variations in the levels of assistance, especially in consumer-to-producer transfer payments.

The IAC identified three subsidy categories: general agriculture, input, and output. An example of an input subsidy is paying lower than market prices for fertilizer. Output subsidies are directed to increasing the volume of production or exports, such as bounties on exports.

Output Subsidies

Output subsidies have included bounties, devaluation assistance, export incentives, consumer-to-producer transfer payments, and underwriting schemes. 33/34/ The first two subsidies have been eliminated. Bounties, partially developed to encourage the production of cheese, butter, and processed-milk products, were paid until 1975/76. The bounty was paid to manufacturers who voluntarily maintained a price differential between the domestic and international market. This bounty scheme was replaced by the underwriting scheme in 1977/78. Export incentives, averaging $200,000 per year over the last 4 years, took the form of grants for market development and export expansion to small and medium-size firms.

Underwriting Subsidy

The IAC believes that these consumer-to-producer transfers were nearly eliminated in the 1977/78 change to the underwriting scheme. This Government

31/ Industries Assistance Commission, Assistance to Australian Agriculture, Information Paper, 1983.
32/ Op. cit., Bureau of Agricultural Economics, Occasional Paper No. 84.
33/ Bounties were $44 million in 1970/71. Ibid, Industrial Assistance Commission, Assistance, p. 57.
34/ The dairy industry received $15 million in devaluation compensation in 1970/71 and 1971/72. Op. cit., Industries Assistance Commission, Assistance, p. 50.

subsidy arose from two sources. First, money was taken from the export pool if the pooled price was less than the guaranteed price. Second, money in the STF was distributed if the export pool was insufficient to make up the difference. If the pooled price was still below the underwritten price, the Government subsidized the balance. Thus, the deficit in the pooled price subsidy, recovered through funds from the export pool, may have a Government element; the export pool can have private contributions as well as Government subsidies.

However, the underwriting subsidy must be added to consumer-to-producer transfers rather than substituted for them. The underwriting scheme is distinct from transfers because it is based on the guaranteed price and gets its subsidy directly from the Government. Consumer-to-producer transfers depend on the current domestic and world prices and are a direct payment between these groups. Government subsidies to the underwriting scheme averaged $9.2 million per year between 1977/78 and 1980/81.35/

General Agricultural and Input Subsidies

The six subcategories of general agricultural subsidies apportioned to dairy are adjustment and reconstruction, extension services, concessional credit, income tax relief, natural disaster relief, and research. Income tax concessions, especially income averaging, have been the most important. Tax concessions to dairy arise from accelerated depreciation, income averaging (fig. 4), deferred tax payments, losses that can be carried forward, and deducting depreciation on land clearing expenses and buildings not usually allowed for commercial taxpayers. Accelerated depreciation is essentially an interest-free loan from the Government, income averaging is a grant to the taxpaying farmer, and the ability to depreciate items not generally depreciable for tax purposes reduces tax liability in subsequent years. For the period 1977/78 to 1980/81, the average annual estimate of all of these subsidies was $11.2 million. If income averaging in dairy is the same percentage of total tax concessions for all of agriculture, income averaging accounted for 95 percent, or $11.1 million.36/

All of these schemes operated on a cooperative basis between the Commonwealth and State Governments. The Commonwealth Government provided the bulk of the assistance funds while the States shared the administrative costs with the Commonwealth.

The six original adjustment and reconstruction schemes surfaced in the seventies in response to the drought, the devaluation of the pound sterling in the late sixties, and the loss of Great Britain as a major export market when it joined the EEC in 1973.37/ Especially because of the latter, the Commonwealth Government decided that longrun adjustments for some rural industries, including dairy, were necessary and began programs to help farmers cope with the financial stress of the changed marketing conditions. The overriding objective of these readjustment schemes was to "...restore to viability those farms and farmers with the capacity to maintain viability once achieved." 38/ This meant that an existing farmer must be in financial

35/ Op. cit., Industries Assistance Commission, Assistance, p. 53.
36/ Op. cit., Industries Assistance Commission, Assistance, p. 136.
37/ This discussion relies heavily on the IAC report on Government assistance.
38/ Op. cit., Industries Assistance Commission, Assistance, p. 141.

difficulties to receive Government assistance. The emphasis here is on existing farmers; for the scheme excluded new farmers, those who could obtain funds on commercial markets, and part-time and corporate farmers.39/

The first dairy adjustment scheme, Marginal Dairy Farm Reconstruction Scheme (MDFRS), provided funds for small, low-income farmers at concessional interest rates to purchase land and to improve farm operations so that they would become long-term, viable farmers. But, larger farmers also had access to concessional rates if they bought land from small farmers. Thus, the small farmers had a chance to make their farms economically sustainable or make their land more salable to larger farmers who could use the land more efficiently.

The second dairy scheme, the Dairy Adjustment Program (DAP), expanded the range of assistance of the MDFRS to include aid for dairy farms and factories to convert to refrigerated milk capability, for farm diversification and development, for relocation or ceasing dairy operations, and for short-term financing of farm operating costs.

The third scheme, which began in 1977, was incorporated into all agricultural activities rather than having a separate plan for each industry. This Rural Adjustment Scheme (RAS) provided assistance to viable farmers for debt reconstruction, current operating costs, loans to buy land from small, nonviable farmers, and two types of assistance for farmers leaving the industry--limited assistance to farmers with personal financial hardships and temporary funding for farmers leaving the industry.

These programs assist farmers by offering concessional interest rates for debt reconstruction, farm buildup, and farm development conversion to refrigerated milk operations. Farmers who leave the dairy industry receive a lump-sum grant in compensation for the sale of farm assets and losses incurred in the sale of the dairy herd. Concessional interest loans or grants are provided for farmers whose land is purchased by other farmers in the buildup scheme but who currently maintain a farm operation, and for farmers who are leaving the industry but have personal financial difficulties.

On average, the dairy industry has received $5 million per year from these adjustment/reconstruction schemes.40/ The agricultural extension subsidy averaged $600,000. For dairy, the amount of concessional interest on loans for items such as the purchase of livestock and plants, water supply, onfarm storage, pasture improvement, assistance to marketing, and processing averaged $3.2 million out of $22.2 for all of agriculture.

Dairy farmers obtain an advance cash payment from the Government to bridge the gap between farm cash outlays for inputs and receipts from product sales. In effect, this interim stabilization payment is an interest-free loan and a subsidy.41/ The value of the subsidy is half the interim fund outstanding, multiplied by the current market rate on short-term loans from the Rural Credits Department of the Reserve Bank of Australia. Determining the time period and the amount of outstanding loans is complicated because sales receipts from several pools occur in the same calendar year and pooling periods overlap. However, because the bulk of the loan is repaid within the first year of the pool, and to avoid the serial payment problem, it is assumed

39/ Ibid.
40/ Op. cit., Industries Assistance Commission, Assistance, p. 53.
41/ Australian Dairy Corporation, Annual Report, 1978/79, p. 6.

that the entire loan is repaid during the first year of the pool. The average annual amount of interest foregone by the bank on interim stabilization payments was $6 million, using this assumption.

Dairy farmers also received research subsidies averaging $4.2 million per year. An annual fertilizer subsidy and a small, animal health subsidy of $120,000 together averaged $1.3 million. The general and input subsidies are summarized in table 7.

Consumer to Producer Transfers, IAC Approach

There are wide differences in estimates of consumer-to-producer transfers by the BAE and IAC. Consumer-to-producer transfers follow from the price discrimination scheme in manufactured dairy products and in the fluid-milk market. Margins for processing and marketing of dairy products are set by the State dairy boards so that price increases are passed on to the farmer. The domestic income transfer is from consumers to producers. These transfers, which averaged $124.5 million from 1977/78 to 1980/81, have been the largest subsidy. According to IAC calculations under the import parity concept, 84 percent of these transfers were in the market-milk sector. But, when the export parity is used as the subsidy basis, the market-milk sector's share of total milk subsidies drops to 56 percent.42/

The IAC measures consumer-to-producer transfers in both fluid- and manufacturing-milk sectors by the difference between the domestic price and the competitive price that would prevail without Government intervention (fig. 2). The IAC considers import and export parity as contenders for the competitive price without Government intervention. Selecting the appropriate parity concept is not an academic technicality because the choice makes a substantial difference in the estimate of these transfers. The IAC prefers import parity or the import price, which includes transportation costs, as the competitive price. Because an import parity price is higher than an export parity or free on board (f.o.b.) export price, it reduces the unit subsidy. For import parity, the BAE chose to impute the cost of manufacturing milk from the prices of products that would be imported from New Zealand, because under free trade, that country would be Australia's closest competitor.

According to import parity for each of the prescribed products, the prices of whole-milk inputs into these products were imputed from landed and domestic prices. Multiplying the difference in these imputed prices by domestic consumption gives the value of consumer-to-producer transfer payments caused by price discrimination. Assistance at the State level was not included in this calculation. In 3 of the 4 study years, the imputed whole-milk price for imported products exceeded that for domestic products, and no Government subsidy was necessary (table 8).

The price differential for export parity between the domestic bulk-wholesale price, f.o.b., and the imputed price of the milk used in dairy exports was higher each year and positive all 4 years (table 9). Yearly subsidies were cut by more than half in the 4 years between 1977/78 and 1980/81 but averaged $47.3 million higher than subsidies under the import parity method (table 10).

42/ During the 8 years when manufacturing-milk and market-milk consumer transfers existed under the BAE interpretation, market milk received an average subsidy of $15 million under the import parity concept and $61 million under export parity. Op.cit., Assistance, p. 157.

Table 7--General agricultural and input subsidies, Australia 1/

Subsidies	Amount
	Million dollars
Rural reconstruction	5.0
Extension	.6
Concessional credit	3.2
Income tax concessions	11.2
Interim stabilization	6.0
Research	4.2
Fertilizer and health	1.4
Total	31.6

1/ Industries Assistance Commission report data; averages over 1977/78 to 1980/81. Values reported in Australian dollars.

Table 8--Import parity and imputed prices of milk, Australia

Year	Imputed price of milk used in dairy products sold in Australia 1/	Imputed price of milk equivalent to landed price of New Zealand dairy products 2/	Price difference 3/	Domestic consumption of dairy products, whole-milk equivalent
	Cents/liter 4/			
1977/78	5.9	5.7	0.2	2,750
1978/79	6.2	6.8	0	2,740
1979/80	6.9	7.8	0	2,562
1980/81	12.8	13.4	0	2,532

1/ Industries Assistance Commission Information Paper, Assistance to Australian Agriculture, 1983, p. 52.
2/ Situation and Outlook, Dairy, 1982, p. 25.
3/ Only a positive price difference is recorded.
4/ Values reported in Australian dollars.

Table 9--Export parity and imputed prices, Australia

Year	Imputed price of milk used in dairy products sold in Australia	Imputed price of milk used in dairy products exported from Australia	Price difference
		Cents/liter 1/	
1977/78	5.9	3.7	2.2
1978/79	6.2	4.0	2.2
1979/80	6.9	5.1	1.8
1980/81	12.8	11.7	1.1

1/ Values reported in Australian dollars.
Source: Op cit., Industries Assistance Commission, Assistance, p. 52.

Table 10--Manufacturing subsidies by parity type, Australia

Parity Price	1977/78	1978/79	1979/80	1980/81
		Million dollars 1/		
Import	5.3 2/	0	0	0
Export	61.1	60.4	45.0	28.1

1 Values reported in Australian dollars.
2/ This differs from the $5.6 million figure derived from data in table 9 and may be due to rounding.
Source: Industries Assistance Commission Information Paper, Assistance to Australian Agriculture, 1983, p. 159.

A Critique of Import and Export Parity

How is the choice to be made between import and export parity? The IAC's assumption that New Zealand would be its closest competitor is, of course, reasonable, and determination of the appropriate competitive price is a key issue concerning transfer payments. But, the BAE's choice of the international price as the better choice to represent the competitive price is open to question. Choosing import parity over export parity implies that it is foreign competition that makes Australian prices competitive. Thus, the Australian domestic dairy industry is not sufficiently competitive to establish a competitive price. This idea seems questionable.

The standard assumption in the theory of a competitive firm is that the minimum price at which farmers would, in the long run, continue to produce milk for domestic markets is the minimum shortrun cost of production. Although this price is not observed, the border price, the f.o.b. export price, is used to represent the competitive price of domestically produced dairy products. Of course, the border price includes transportation, handling and loading, and the wholesale price of the dairy product. It is assumed that

the costs of shipping and handling are the same for both exports and domestic bulk-wholesale products. The consumer price does not include a loading charge but it is assumed that this is minor and can be disregarded.

The criterion for a competitive market is that no farmer has any influence over product or resource prices. This implies that there must be a large number of firms, none of which produces a large proportion of total output. As tables 11-13 show, there has been considerable consolidation among dairy holdings with some increase in the number of larger holdings and a 65- to 75-percent reduction in the number of smaller holdings. Table 12 shows, however, that consolidation continues to permit competition. In 1971, the largest 2,200 dairy farmers held about 6 percent of the total holdings and about 12 percent of the cattle. In 1982, the largest 2,800 firms held about 14 percent of all dairy holdings and about 23 percent of all cattle. Thus, whereas the larger farmers hold proportionally more cattle and constitute a larger proportion of all farmers in the later period, they are still numerous, and the average large farmer has a very small percent (0.008) of all cattle.

Although these figures represent all dairy farmers, they are assumed to reflect the degree of competition among manufacturing-milk farmers since most farmers produce for this sector. Hence, the competitive character of the manufacturing-milk producer is determined internally rather than with respect to New Zealand's potential entry.

The counterargument by the IAC, that a domestic price below import parity is not viable because producers would abandon the domestic market in favor of export markets, does not appear to be tenable. The import price includes the cost of transportation which is not a payment for farmers' services and is not a factor in producers' output decisions. For this reason, domestic and international prices can differ by the amount of transportation costs without inducing a scramble to sell in the international market.

The f.o.b. export price is used as the domestic competitive price and compared with the computed price of manufacturing milk. Table 14 shows the differences in the subsidies under import and export parity.

BAE Approach

The BAE takes a different approach to consumer transfers. They use export parity as the competitive price and the levy on dairy products as the unit subsidy to calculate producer transfers in the market- and manufacturing-milk sectors.

Manufacturing-Milk Subsidy

The BAE constructs the unit manufacturing-milk subsidy in two ways. For skim-milk powder the total subsidy was determined by multiplying the difference between the prices for domestic bulk-wholesale products, and for f.o.b exports by domestic consumption.43/ For the other four products, the BAE measured the difference between the competitive and export prices by the levy. These methods were applied to 1981/82, but in this study they were

43/ Bureau of Agricultural Economics, Occasional Paper No. 84, Blank, Steve, p. 48.

Table 11--Distribution of dairy holdings by herd size, Australia

Herd Size	1971	1982
	Number	
30-59	8,765	2,223
60-99	12,865	4,539
100-149	10,118	6,331
150-199	3,562	3,721
200 and over	2,209	2,829

Source: The Dairy Industry, Industries Assistance Commission, Report No. 333, 1983, p. 106.

Table 12--Size distribution of dairy farmers by number of holdings, Australia

Herd size	1971	1982
	Percent	
39-59	23.4	11.3
60-99	34.3	23.1
100-149	27.0	32.2
150-199	9.5	18.9
200 and over	5.9	14.4

Source: Calculated from table 11.

Table 13--Size distribution of dairy farmers by percentage of cattle, Australia

Herd size	1971	1982
	Percent	
30-59	10.7	4.1
60-99	26.2	14.5
100-149	34.3	32.1
150-199	16.9	26.4
200 and over	12.0	22.9

Source: Calculated by midpoint of range and number of holdings; because the largest range had no midpoint, 200 is used as the number of cattle on the farm. This method tends to underestimate the significance of large farms.

Table 14--Summary of Australia's average subsidies using the Industries Assistance Commission approach

Category	Subsidy	
	Import parity	Export parity
	Million dollars 1/	
General assistance	30.2	30.2
Input	1.4	1.4
Output:		
Export incentives	.2	.2
Milk--		
Manufacturing 2/	10.5	57.9
Market	123.2	123.2
Total	133.7	181.1
Total	165.5	212.9

1/ Values reported in Australian dollars.
2/ Includes underwriting payments.

extended to the 1977/78 to 1980/81 period. Tables 15-19 show the results of these calculations and table 20 presents a summary of the BAE estimates of transfer payments.

A Critique of the Blank/BAE Methodology

There are three weaknesses in the Blank/BAE approaches. In calculating the subsidy, the BAE multiplies the average price and the average consumption to obtain the average subsidy. This method is not mathematically valid for determining a weighted average. The correct weighted averaging process is to add the total values of the annual subsidy, then divide by the number of years. 44/

In measuring the dairy transfer from consumers to producers, the BAE considered the levy and the unit subsidy to be the same. However, this is incorrect. The subsidy is derived from the difference between domestic bulk-wholesale and actual world prices. Because the levy is based on estimated world prices rather than actual prices, it cannot be used as a unit measure of the subsidy. If the levy really measured consumer-to-producer transfers, the domestic bulk-wholesale price would always be higher than the world price by the amount of the levy. But, as observed in 1980/81, for example (table 7), this difference was considerably less than the levy on four of the five products, and the world price exceeded the domestic price for casein.

The consequences of this disparity are straightforward. Because the estimated or assessed export prices have been less than actual prices, the BAE has overstated the subsidies.

44/ In general, the average of a product is not the product of the averages. Let $a = \Sigma a(i)/n(1)$, $b = \Sigma b(i)/n(2)$, and $n = n(1) + n(2)$. Then $ab = \Sigma a(i)b(i)/n$. The BAE uses the incorrect product of sums: $\Sigma a(i)/n1)x(\Sigma b(j)/n2)$.

Table 15--BAE subsidy for butter, Australia 1/

Year	Levy 4/	Domestic consumption 2/		Subsidy 3/	
		BAE 5/	Leviable	BAE 5/	Leviable 6/
	Dollars/ton	--- Kilotons ---		Million dollars	
1977/78	650	72.4	69.6*	47.1	45.2*
1978/79	690	64.9	64.3	44.8	44.4
1979/80	680	66.5	62.0	45.2	42.2
1980/81	663	63.7	68.2 7/	42.2	45.2
Average	--	--	--	44.8	44.3

-- = Not applicable.

* Estimate based on consistent data.

1/ Values reported in Australian dollars.

2/ Bureau of Agricultural Economics, Situation and Outlook, Dairy, 1983, p. 43.

3/ Based on the method described in Occasional Paper No. 84, pp. 47-48.

4/ The 1977/78 data are from the Australian Dairy Corporation, Annual Report, 1979/80, p. 45. Balance of levy data from ibid., June 1982, p. 49.

5/ Bureau of Agricultural Economics consumption data are for total products of a group rather than only leviable products. Hence, the leviable column is for consumption of leviable products.

6/ Corrected for the difference between consumption of leviable and nonleviable products.

7/ Because aggregate consumption must be greater than or equal to leviable consumption, the higher leviable consumption in 1980/81 shows an inconsistency. Since the correct figure is unknown, the differences in the subsidy calculations are explained by the difference in consumption of leviable versus total products and by some degree of inconsistency. This explanation also applies to tables 16-19.

Table 16--BAE subsidy on cheese, Australia 1/

Year	Levy 4/	Domestic consumption 2/		Subsidy 3/	
		BAE 5/	Leviable	BAE 5/	Leviable 6/
	Dollars/ton	----- Kilotons -----		Million dollars	
1977/78	325	78.6	59.9*	25.5	19.5*
1978/79	425	78.6	65.3	33.4	27.8
1979/80	450	85.2	64.0	38.3	28.8
1980/81	445	84.3	59.7	37.5	26.6
Average	--	--	--	33.7	25.7

— = Not applicable.

* Estimate based on consistent data.

1/ Values reported in Australian dollars.

2/ See 2/, table 15.

3/ See 3/, table 15.

4/ Occasional Paper No. 84, ibid, pp. 46-47.

5/ See 5/, table 15.

6/ See 6/, table 15.

Table 17--BAE subsidy for skim-milk powder, Australia 1/

Year	Average wholesale price	World export price	Domestic consumption: BAE 2/	Domestic consumption: Leviable	Subsidy BAE 2/	Subsidy Leviable 3/
	--Dollars/ton--		-----Kilotons-----		Million dollars	
1977/78	714	562	42.9	41.4*	6.5	6.3*
1978/79	765	613	46.9	49.0	7.1	7.4
1979/80	870	680	54.1	52.2	10.3	9.9
1980/81	989	989	45.6	47.4	0	0
Average	--	--	--	--	6.0	5.9

— = Not applicable.
* Estimate based on consistent data.
1/ Values reported in Australian dollars.
2/ See 5/, table 15.
3/ See 6/, table 15.
Source: Occasional Paper No. 84, p. 39.

Table 18--BAE subsidy on whole-milk powder, Australia 1/

Year	Levy 4/	Domestic consumption 2/: BAE 5/	Domestic consumption 2/: Leviable	Subsidy 3/: BAE 5/	Subsidy 3/: Leviable 6/
	Dollars/ton	------Kilotons------		Million dollars	
1977/78	NA 7/	19.7	18.3*	NA	NA
1978/79	185	13.1	14.3	2.4	2.6
1979/80	250	13.8	13.0	3.5	3.3
1980/81	425	17.1	13.6	7.3	5.8
Average	--	--	--	4.4	3.9

-- = Not applicable.
NA = Not available.
1/ Values reported in Australian dollars.
2/ See 2/, table 15.
3/ see 3/, table 15.
4/ See 4/, table 15.
5/ See 5/, table 15.
6/ See 6/, table 15.
7/ The prescribed product scheme for whole-milk powder was introduced in 1978/79.

Table 19--Subsidy on casein, Australia 1/

Year	Levy 4/	Domestic consumption 2/		Subsidy 3/	
		BAE 5/	Leviable	BAE 5/	Leviable 6/
	Dollars/ ton	-----Kilotons------		Million dollars	
1977/78	230	1.2	1.1*	0.3	0.3*
1978/79	325	1.6	1.3	.5	.4
1979/80	445	1.6	1.6	.7	.7
1980/81	500	1.6	2.3	.8	1.2
Average	--	--	--	.6	.7

-- = Not applicable.
* Estimate based on consistent data.
1/ Values reported in Australian dollars.
2/ See 2/, table 15.
3/ See 3/, table 15.
4/ See 4/, table 15.
5/ See 5/, table 15.
6/ See 6/, table 15.

Table 20--Average annual manufacturing-milk subsidies, Australia, 1978/79-1980/81

Commodity	BAE estimate (1)	BAE estimate corrected for leviable goods (2)	BAE estimate corrected for math and price (3)	ERS estimate corrected for leviable goods, math, and price (4)
	Million dollars 1/			
Butter	44.8	44.3	33.3	32.5
Cheese	33.7	25.7	16.0	12.3
Skim-milk powder	6.0	5.9	4.2	4.2
Whole-milk powder	4.4	3.9	1.7	1.7
Casein	.6	.7	.3	.3
Underwriting	9.2	9.2	9.2	9.2
Total manufacturing-milk subsidy	98.7	89.7	64.7	60.2

1/ Values reported in Australian dollars.

The third concern with the BAE analysis is the use of total domestic consumption rather than the consumption of leviable products. In general, because all products are not under the guarantee, the volume of leviable products produced and consumed is less than the total; consequently, subsidy calculations have been overstated by the BAE.

Re-estimation

Correcting for the difference in consumption but still using the BAE's approach, the new calculations show subsidies falling from $99 to $90 million (column 2, table 20). Re-estimating the subsidies from the difference between the wholesale price and the actual export price on each leviable product and using the correct averaging method yields a new total manufacturing-milk subsidy of $64.7 million (column 3). The major difference between this amount and the $98.7 million calculated by the BAE results from the underestimate of world butter and, especially, cheese prices. The underestimation of prices caused large changes in the value of the subsidy because these products account for most domestic dairy consumption.

The ERS estimate of annual subsidies to manufacturing-milk prices is $60 million below the Blank/BAE estimate of $99 million but well above the IAC estimate of $11 million.

Market-Milk Subsidy

Individual States control fluid-milk industries from production to retail by regulating the quantities of fluid milk State boards accept and the prices at most stages of production and distribution (table 21). This process maintains market-milk prices above those for manufacturing milk. Interstate trade in fluid milk is limited to three cases, two companies in Victoria sell to New South Wales and South Australia, and one company in South Australia supplies a town in New South Wales. In general, States have both explicit and implicit quotas on fluid-milk production and two States, Victoria and South Australia, have explicit price equalization schemes across the two classes of milk. Market entry is strictly controlled.

The average subsidy rate in kilograms of milkfat is defined as the percentage difference between the average farm price and the average price of milk used in manufactured products (table 22). Because the State dairy boards manage their own programs, average subsidy rates vary by State (table 22).

The weighted average subsidy rate for market milk in Australia exceeds 40 percent of the manufactured products price. The total subsidy for each State cannot be derived from these figures. The total subsidy is derived from national data weighted by the market milk produced by each State, by the proportion of each of the five prescribed products produced by each State, and by the butterfat content of the product. Based on these considerations, the difference between the farm-gate return for market milk and that for manufacturing milk is presented in table 23.

Farm-gate returns on market and manufacturing milk increase each year, but the difference between these prices is relatively stable. The consumer-to-producer transfer for fluid milk is calculated by multiplying the price differential of table 23 by the volume of domestic consumption. The resulting transfer subsidy averaged $158 million for the 4-year period of this

Table 21--Unpooled farm-gate prices for milk, Australia, 1978/79

Product	States					
	Victoria	South Australia	Queensland	Western Australia	New South Wales	Tasmania
	Dollars/kilogram milkfat 1/					
Market milk	3.83	4.61	4.90	4.68	4.60	4.05
Wet products	1.95	1.82	2.20	2.20	1.90	1.90
Nonprescribed	1.90	1.81	2.10	1.80	1.75	1.89
Prescribed	1.85	1.80	1.80	1.75	1.74	1.88
State average	2.13	2.65	3.20	3.31	3.36	2.13

1/ Values reported in Australian dollars.
Source: Australian Dairy Corporation, Annual Report, 1978/79, p. 13.

Table 22--Average subsidy rates for the Australian States, 1978/79

State	Milk prices at the farm gate		Subsidy
	Manufactured products	Average farm price	
	Dollars/kilogram milkfat 1/		Percent
Queensland	1.80	3.20	78
New South Wales	1.74	3.36	93
Victoria	1.85	2.13	15
South Australia	1.80	2.65	47
Western Australia	1.75	3.31	89
Tasmania	1.88	2.13	13

1/ Values reported in Australian dollars.
Source: Australian Dairy Corporation, Annual Report, 1978/79 p. 13.

Table 23--Price differentials for market and manufacturing milk, Australia

Year	Farm-gate return on market milk	Manufacturing-milk return	Difference in market- and manufacturing-milk prices
	Cents/liter 1/		
1976/77	17.2	5.9	11.3
1977/78	18.0	6.7	11.3
1978/79	18.5	8.5	10.0
1979/80	20.0	9.7	10.3

1/ Values reported in Australian dollars.
Source: Industries Assistance Commission, draft report, Aug. 1983, p. 83.

study (table 24). The general, output, and input subsidies amount to $289 million. Table 24 summarizes the BAE's estimates and the re-estimates based on the above analysis.

Comparison of IAC and BAE Estimates of Subsidies

Table 25 shows the comparisons among all estimates (the original and my subsequent re-estimates). Differences in the IAC and the BAE subsidies, almost $150 million, are derived from differences in measuring transfer payments resulting from price discrimination. Using the import parity method, the IAC lowered transfers by $47 million (tables 10 and 14). When subsidies are adjusted upward by this amount, the BAE figure is still $90 million higher. Most of this difference results from the IAC's likely understatement of the manufacturing-milk subsidy and the BAE's overestimate of the same subsidy. The IAC's assumption that underwritten subsidies have replaced consumer transfer payments is not valid because transfer payments of this sort are derived from price discrimination rather than the guaranteed price provision of the stabilization program. 45/46/47/ On the other hand, the BAE overstates the manufacturing-milk subsidy from $9 to $39 million by using the levy as the subsidy rate per ton when the levy is not a subsidy and is greater than the actual subsidy rate and by using total rather than leviable products for domestic consumption.48/ My choice is $250 million because it is based on the domestic bulk-wholesale price of leviable products, the actual world price, and leviable consumption.

New Zealand

As in Australia, direct and indirect subsidies to the New Zealand dairy industry reflect benefits to producers from a regulated market structure, payments to improve plant health, and interest concessions. Consumers receive a direct subsidy on town milk because the Government sets a retail price below the cost of production. This price control scheme is not fraught with the problem of rationing because the Milk Board sets a producer price that covers the cost of production for the amount of milk consumers want. Consequently, the scheme also involves a subsidy to producers because they produce more fluid milk at a higher price than the market would yield under competitive conditions. In 1977/78, for example, the cost of producing and marketing town milk was estimated at 28 cents per liter, while the consumer paid 15.3 cents per liter or about half of the costs (table 26).49/

Government subsidies per liter of milk declined from 12.9 cents per liter in 1977/78 to 9.22 cents in 1980/81. As a result, consumers paid most of the cost as the price rose from 16 to 41 cents per liter in this 4-year period. Correspondingly, the total milk subsidy was reduced about one-third between 1977/78 and 1980/81 (table 27).

45/ Underwriting subsidies result from the Government's support of the guaranteed price.

46/ The transfer payment is the difference between what consumers pay for domestic dairy products and the world price when consumer purchases are limited by the domestic price.

47/ The stabilization program includes underwritten prices, regulated domestic consumption prices, pooling, and the stabilization fund.

48/ The levy is simply the difference between the assessed export price and the domestic bulk-wholesale price and the per ton price paid by manufacturers to the stabilization fund on domestic sales.

49/ The New Zealand Dairy Industry, A Survey, p. 17.

Table 24--Bureau of Agricultural Economics, subsidies to the Australian dairy industry, 1977/78-1979/80

Item	Initial	Recalculations (1)	(2)	(3)
	Million dollars 1/			
General assistance	30.2	30.2	30.2	30.2
Input	1.4	1.4	1.4	1.4
Output:				
Export incentives	.2	.2	.2	.2
Milk--				
Manufacturing 2/	98.7	89.7	64.7	60.2
Market	158.0	158.0	158.0	158.0
Total	256.7	247.7	222.7	218.2
Total	288.5	279.5	254.5	250.0

1/ Values reported in Australian dollars.
2/ Includes underwriting payments.

Table 25--IAC and BAE manufacturing-milk subsidies and re-estimations, Australia, 1977/78-1979/80

Manufacturing Milk Subsidies	IAC Original	IAC(R)	BAE Original	R(1)	R(2)	R(3)
	Million dollars 1/					
Total	166	210	289	280	255	250

R = Re-estimation.
1/ Values reported in Australian dollars.

Table 26--Production and consumer costs of fluid milk, New Zealand, 1977/78

Item	Costs
	Cents/liter 1/
Payments to producers	13.01
Handling	2.06
Cartage from farms	.53
Processing and bottling	4.02
Distribution	7.97
Administration	.40
Total	27.98

1/ Values reported in New Zealand dollars.
Source: The New Zealand Dairy Industry, A Survey, 4th ed., March 1980, p. 17.

Table 27--Consumer costs per liter, New Zealand, 1977/78

Item	Cost
	Cents/liter 1/
Consumer price	15.29
Consumer subsidy	12.69
Total	27.98

1/ Values reported in New Zealand dollars.
Source: The New Zealand Dairy Industry, A Survey, 4th ed., March 1980, p. 17.

Table 28--Government subsidy for town milk, New Zealand 1/

Year	Unit subsidy	Government subsidy
	Cents/liter	Thousand dollars
1977/78	12.92	51,068
1978/79	11.44	44,192
1979/80	10.80	40,524
1980/81	9.22	33,747
Average	--	42,383

-- = Not applicable.
1/ Values reported in New Zealand dollars.
Source: New Zealand Official Yearbook, 1983, p. 578.

Interest Rate Subsidy

Farmers receive special treatment, an interest subsidy, from the Rural Banking and Finance Corporation, derived from paying lower rates than other industries. Most farm loans in New Zealand require mortgaging farm assets. These include mortgages for the initial settlement of farms, the purchase of additional land, and land development. Farm purchase or settlement and development loans are the major farm loans in both value and number (table 29). The development loan is the most extensive in its provisions and includes funds for housing and other farm buildings, additional livestock, plants, fencing, clearing, grassing, fertilizer, and irrigation. Settlement loans assist young, landless farmers into ownership of their first farm and account for the largest amount of any category.

The maximum amount of the loan per farm is limited by farm type. Dairy farm limitations were around $20,000 to $25,000 less than sheep farms and $10,000 to $15,000 above horticulture farms. No general statement can be made about the relative amount compared with beef. The loan amounts vary by year so the share for dairy varies. In 1978/79, for example, $95,000 was the loan

Table 29--Rural Banking and Finance Corporation of New Zealand loan authorizations: Number and amount

Loan type	1977/78		1978/79		1979/80		1980/81	
	Number 1/	Million dollars 2/	Number 1/	Million dollars 2/	Number 1/	Million dollars 2/	Number 1/	Million dollars 2/
Standard settlement	975	50	974	63	834	64	880	74
Special settlement	105	12	100	13	96	15	104	20
Stepping stone	74	2	130	4	188	6	252	10
Additional land	325	11	329	12	271	11	305	15
Sharemilkers suspensory (farm purchase)	142	3/	141	3/	163	3/	211	3/
Development	4,025	62	4,943	80	4,608	87	5,555	107
Stock and plant	925	10	1,011	13	934	16	1,158	26
Livestock incentive scheme	3,147	28	2,584	21	1,854	15	2,263	21
Land development encouragement	NA	NA	1,661	30	1,811	34	1,758	45
Total	11,708	228	13,775	293	12,436	307	13,933	370

NA = Not available.
1/ Amounts are rounded to the nearest million.
2/ Values reported in New Zealand dollars.
3/ Less than $500,000.
Source: Annual reports of the Rural Banking and Finance Corporation of New Zealand.

limitations for sheep, cattle, and large cropping farms; $70,000 for dairy; and $60,000 for orchards. 50/ For the previous year, these limitations were $75,000 for sheep farms, $55,000 for dairy farms, and $40,000 for intensive horticulture and livestock units. 51/

In 1979/80, the year for which data are available for both mortgage and term loans, mortgage loans were $859 million and term loans were $12 million, less than 2 percent of all farm loans. Dairy's share of mortgage or term loans is

50/ Op.cit., Rural Banking and Finance, March 31, 1979, p. 7.
51/ Ibid. March 31, 1978, p. 6.

not given explicitly but is estimated on the basis of dairy's share of standard and special settlement loans, and livestock incentive schemes for which data were given by type of industry (table 30). Dairy's total share of mortgage loans averaged 36 percent or $287 million per year.

The concessional interest rate is derived from the weighted average of loan rates charged on farm loans, not explicitly dairy farm mortgage loans, by the Rural Banking and Finance Corporation (RBFC). 52/ From 1977/78 to 1980/81, the interest on farm loans and the term market rate of interest demonstrate the sizable interest rate subsidy, up to 30 percent of the market rate (table 31). The dairy sector's share of the subsidy is determined by dairy's share of loans and the interest rate subsidy. The estimated average annual interest subsidy of $10.0 million is probably overstated, because the market rate is for new loans while the average rate is for outstanding loans. Had the interest rate remained constant, there would be no difference, but because the interest rate rose over the years, the current rate exceeds the average rate.

Other Subsidies

Other subsidies for New Zealand farms (table 32) averaged $128 million for the 4-year period 1977/78 to 1980/81. Only $6 million is direct financial aid to the dairy industry. Other amounts have been allocated to the dairy industry by the proportion of land in dairy and the relative contribution of dairy products to rural production (table 32).

The subsidy on fertilizer was the largest for any single commodity. If the lime and fertilizer transport subsidy is added, the importance of improving pasture land is highly evident. The fertilizer subsidy averaged over $55 million for the 4 years, while transportation services for fertilizer received another $24 million, thus giving farmers $79 million to improve the productivity of their lucerne (alfalfa) grasses.

Allocating fertilizer and lime transport subsidies and fertilizer price subsidies results in about $12 million available to the dairy industry. Total pest, plant, and disease control; training; livestock incentive schemes; and artificial breeding incentives account for $42 million; less than $10 million is allocated to dairy. There is a direct subsidy of about $6 million to the dairy industry, the largest part coming from a dairy diversion scheme.

All dairy subsidies totaled $27 million or about 21 percent of all farm subsidies listed (table 32). These New Zealand dairy subsidies have been classified to correspond with the general assistance, input, and output categories used in the Australian section (table 24). The average annual subsidy payments to the New Zealand dairy industry from 1977/78 to 1980/81 was $58.5 million (table 33).

A Comparison: Subsidies in Australia and New Zealand

To compare dairy subsidies between Australia and New Zealand, the totals must be converted to a common currency. Using the Australian dollar as the base, and the midperiod exchange rate of 0.8846 Australian dollars per New Zealand dollar, New Zealand's subsidies in Australian dollars averaged $52 million.

52/ For example, see Rural Banking and Finance Corporation, March 31, 1981, p. 18.

Table 30--Dairy's approximate share of farm mortgages, New Zealand

Year	Total farm mortgages	Dairy's share	
		Percentage	Value
	Thousand dollars	Percent	Thousand dollars
1977/78	579,589	33.4	194,000
1978/79	694,640	33.5	233,000
1979/80	859,242	33.3	286,000
1980/81	1,042,827	41.8	436,000
Average	--	36.0	287,000

-- = Not applicable.
Source: Report of the Rural Banking and Finance Corporation of New Zealand, various years.

Table 31--Dairy industry interest subsidy, New Zealand

Year	Market interest rate on mortgages 1/	Average farm interest rate 2/	Interest rate subsidy	Dairy interest subsidy
	Percent			Million dollars 3/
1977/78	9.85	6.66	3.19	6.2
1978/79	10.30	6.86	3.44	8.0
1979/80	10.86	7.51	3.35	9.6
1980/81	11.38	7.70	3.68	16.0
Average annual interest subsidy	--	--	--	10.0

-- = Not applicable.
1/ Monthly Abstract of Statistics, New Zealand, various years.
2/ Annual reports of Rural Banking and Finance Corporation of New Zealand, various years.
3/ Values reported in New Zealand dollars.

New Zealand's dairy subsidies amounted to about $200 million less than those of the Australian dairy industry (tables 25 and 33). 53/

Differences in the sizes of the two industries must also be considered. Australia produces less milk but its total dairy subsidy is four times greater than New Zealand's. Total milk production from town- and manufacturing-milk

53/ The range of the differences is $114 to $237 million, depending on the subsidy method used. The $200 million figure is based on my preferred estimate of $250.

Table 32--Dairy's share of other subsidies for agriculture, New Zealand, 1977/78-1980/81

Subsidies	Average annual subsidy	Average annual dairy share
	Thousand dollars 1/	
Fertilizer:		
Transportation	23,640	3,546
Fertilizer purchases	55,135	8,270
Total fertilizer	78,775	11,816
Plant and pest control, and animal disease eradication	19,896	995
Beef-dairy-sheep programs (general)	20,342	7,947
Training/education/management councils	1,493	746
Direct financial aid to the dairy industry	5,552	5,552
Flood and drought assistance	1,821	346
Total	127,879	27,402
	Percent	
Average dairy share	21	

1/ Values reported in New Zealand dollars.
Source: New Zealand Yearbook, 1983, p. 413.

Table 33--Average annual subsidies, New Zealand, 1977/78 to 1980/81

Subsidy	Amount	
	New Zealand dollars	Australian dollars
	Million dollars	
General assistance	18.2	16.1
Inputs	13.5	11.9
Output	26.8	23.7
Total	58.5	51.7

farms and the total value of milk production are used for comparing the subsidies on a size basis. New Zealand's total milk production was 6,499 million liters and Australia's was 5,398 million liters in 1979/80. Accordingly, New Zealand's dairy subsidy per liter was less than 1 cent or 0.90 cents; in Australian currency, it was even smaller, 0.80 cents. For Australia, the subsidy varied between 3.1 and 5.4 cents per liter ($30.10 to $52.44 per ton), or up to six times that for New Zealand.

On the basis of the 4-year average gross value of whole milk production of $593 million, the several estimates of Australia's subsidies yield a subsidy rate in the range of 28 to 50 percent, or from $166 to $289 million. For New Zealand, subsidies as a percentage of the average value of dairy production are around 10 percent.

Hence, the evidence suggests that New Zealand's dairy industry is less subsidized per liter and per dollar value of production than Australia's. Consequently, concern by Australia's Bureau of Agricultural Economics that the competition from New Zealand's dairy products will make deep inroads into Australia's domestic market for the manufacturing-milk sector must be explained by factors other than subsidies.

IMPLICATIONS OF FREE TRADE

Potential Effects on Australia and New Zealand

A final consideration is the effects of these subsidies on international trade of dairy products. This analysis suggests that New Zealand's competitive advantage in dairy products is not based on subsidies. Consequently, if both Australia and New Zealand were to discontinue their dairy subsidy programs, then it would be possible for New Zealand's dairy producers to compete effectively with Australian dairy producers in their domestic and international markets.

An estimate of Australia's current dairy products output is crucial to any assessment of the potential threat from New Zealand. Australian exports of dairy products, in terms of milk production, were 987 million liters in 1980/81, or 20 percent of total milk production. 54/ If New Zealand's cost advantage were enough to displace Australia's exports, whole-milk production in New Zealand would have to increase only 15 percent. 55/ On average, this would require an annual increase of over 67,000 liters of manufacturing milk from the average dairy farm which in 1980/81 produced an average of 391,000 liters. 56/

The additional output could be achieved through herd expansion and yield improvement. At the current New Zealand level of milk production per cow, (3,198 liters), an additional 21 cows per farm would be necessary. In turn, this would require an additional 12 hectares of pasture land per farm. This land could become available by consolidating small farms into large farms, if there are scale economies, or by using prices to reallocate land from sheep and beef to dairy. On the other hand, with 129 cows per farm in 1980/81, the additional 21 cows bring the total to 150, which is still within the management capabilities of the family farm. These figures are only suggestive of the actual adjustment process which would take place over several years. In the meantime, output per cow is likely to change through improved pastures, selective breeding, and new management practices.

Thus, under current conditions, the New Zealand family farm could produce an extra amount of milk equal to Australia's dairy exports in terms of milk equivalent. The capacity of manufacturing-milk factories to support extra milk production and the cost of new capacity are not discussed here.

54/ About 40 percent of Australia's dairy products are exported.

55/ This assumes that economics, not politics, is the overriding criterion for such a decision.

56/ 1983 Annual Report, New Zealand Dairy Board, p. 18.

Potential Effects on U.S. Exports

If Australian subsidies were eliminated, production would decline as producer prices fell to world-market levels. There would no longer be a pooled price which gave production a boost from q'(w) to q(f) (fig. 2). This would reduce the volume available for export. New Zealand's case is somewhat more complicated. Exports are encouraged by subsidizing inputs but consumer demand is encouraged by a subsidized price. Hence, by eliminating all subsidies, production would decline but consumer demand would also fall as domestic prices increased (fig. 5). Whether the net effect is more or less exports cannot be known without a quantitative analysis of supply and demand.

Australia's dairy industry would be subject to strong competitive pressures from its closest competitor, New Zealand, even if both countries eliminated their dairy subsidies. However, the potential effect of such elimination extends beyond their borders to third markets where the United States also competes for dairy sales. Depending on the product, Australia, New Zealand, and the United States dairy industries compete in 2 to 12 countries. The United States, with about one-third of the milk exports, dominates in two markets, Mexico and Bangladesh. The United States supplies Mexico, the largest U.S. export market, with 60,000 tons of dairy products, while New Zealand ships 10,000 tons there. Oceania's largest volume of exports go to Indonesia, Malaysia, Japan, and China, respectively. Bangladesh and El Salvador received a total of 1,100 and 5,100 tons, respectively, of the 333,000 tons of dairy exports from Australia and New Zealand.

Twelve cheese markets overlap, but only in Canada are the quantities of imports from the United States and Oceania comparable. The United States ships 900 tons and New Zealand ships about 700 tons of cheese to Canada. The second largest importer of U.S. cheese is Japan which receives 1,200 tons. Australia and New Zealand each ship about 20,000 tons of cheese to Japan. Denmark is the third largest importer of U.S. cheese, but again, Oceania overwhelmes such imports; New Zealand's shipments are 20 times those of the United States.

U.S. exports of cheese are comparatively minor and unlikely to be competitive with New Zealand if New Zealand captures all or part of Australia's exports. New Zealand's shipments of cheese would expand 70 percent, or 56,000 tons, compared with total U.S. cheese exports of less than 6,000 tons. But, Poland takes 16,000 tons of butter from the United States compared with 3,500 tons from New Zealand.57/

SUMMARY AND CONCLUSIONS

My estimate of $250 million in subsidies to Australia's dairy industry far exceeds New Zealand's $52 million in dairy subsidies. This is significant because the number of market- and manufacturing-milk producers and total production of milk are nearly the same in both countries. Australia's 23,000 dairy farmers produced about 5.5 billion liters of milk and about 16,700 New Zealand farmers produced 6.3 billion liters of milk. On a per farm basis, Australia's dairy farmer received about $11,000 in subsidies, while New Zealand's farmer got around $3,000, or one-fifth as much.

57/ Commercial sales: there were no Pub. Law 480 sales of dairy products to Poland in 1980/81.

Australia's heavy concentration on consumer transfers, which made up 60 percent of the total, contrasted with New Zealand's more even distribution between consumer transfers and inputs. Australia spent $1.5 million on fertilizer subsidies compared with New Zealand's $11.5 million. However, Australia has chosen to raise domestic prices above world prices as the primary means of supporting the dairy industry, pumping over $160 million in transfers from the consuming public to the dairy sector. These subsidies alone exceeded total dairy subsidies in New Zealand.

If free trade for dairy products were permitted under the CER and if subsidies were eliminated, it is possible that competition from New Zealand's products would pressure Australia's manufacturing-milk sector to reduce costs by further consolidating its industry or applying new technology. The potential threat of such competition is perhaps part of the reason for the industry's interest in rationalizing their production and marketing processes.

However, New Zealand dairy farmers' lower production costs are not likely to reshape trade flows, because of the restraints of the CER treaty. Paragraphs 4b and 4d of the dairy industry agreement that are part of the CER state: 4b(ii) consultations between the two countries will "...not undermine the returns to the industries of either country", 4b(iii) will "...not undermine the established price structure in either country", and 4d "Governments in Australia [and New Zealand] have the right to set domestic prices and also the right to prevent these prices falling at times of depressed international prices."

Allowing New Zealand to expand into the Australian market because of the high cost of production in Australia would certainly undermine the returns of the high-cost firms as they would be forced to seek other opportunities. The Government has the right to set prices and this has led to pooling and a major subsidy to producers from consumers. Much of this protection can continue under the CER. The net result is that the New Zealand dairy industry cannot enter Australia by undercutting Australia's domestic price because the Australian Government will continue to set dairy prices.

REFERENCES

Agreement on Interpretation and Application of Articles VI, XVI, and XXXVI of the General Agreement on Tariffs and Trade: Geneva, 1979.

Anthony, Douglas (Australian Deputy Prime Minister and Minister for Trade and Resources), and Robert Muldoon (New Zealand Prime Minister), "Heads of Agreement with Respect to the Closer Economic Relations Trade Agreement," signed December 14, 1982.

Australia-New Zealand, "Closer Economic Relations: Trade Agreeement," effective January 1, 1983.

Australian Dairy Corporation, Annual Report, 1977/78.

Blank, Steve. An Economic Evaluation of Australian Dairy Pricing Policy, Occasional Paper No. 84, Bureau of Agricultural Economics, Australian Government Publishing Service: Canberra, 1983.

Bureau of Agricultural Economics, Comparative Efficiency Between Australia and New Zealand Dairy Industries and Implications for Trans-Tasman Trade, Occasional Paper No. 60, Australian Government Publication Service: Canberra, 1981.

_____, Factors Influencing Future Trans-Tasman Dairy Competitiveness, Occasional Paper No. 85, Australian Government Publication Service: Canberra, 1983.

_____, Rural Industry in Australia, Australian Government Publishing Service: Canberra, 1983.

_____, Situation and Outlook, Dairy, Australian Government Publishing Service: Canberra, 1981, 1983.

_____, BAE Trends in the Australian Rural Sector, Australian Government Publishing Service: Canberra, various issues.

_____, Quarterly Review of the Rural Economy, Vol. 6, No. 1, Australian Government Publishing Service: Canberra, 1984.

Dam, Kenneth, The GATT: Law and International Economic Organization, University of Chicago Press, 1970.

Industries Assistance Commission, Information Paper: Assistance to Australian Agriculture, Australian Government Publishing Service: Canberra, 1983.

_____, The Dairy Industry, Australian Government Publishing Service: Canberra, No. 333, 1983.

_____, Draft Report on the Dairy Industry, Australian Government Publishing Service: Canberra, August 1983.

Miller, Geoff, and Andy Stoeckel, "Closer Economic Relations and the Rural Sector," paper presented at the Annual Conference of the Australian Agricultural Economics Society, February 1981, Christchurch, New Zealand.

New Zealand Dairy Board, Annual Report, Wellington, 1983.

_____, A Survey of the New Zealand Dairy Industry, 4th ed., Wellington, New Zealand, March 1980.

Roberts, Tanya, "Australian and New Zealand Casein Exporters and Estimation of Effective Rates of Assistance," draft report, June 1984.

Rural Banking and Finance Corporation of New Zealand, Annual Report, various years.