DISCUSSION PAPER 91.

Dairy industry policy and free trade with New Zealand

ABARE

Australian Bureau of Agricultural and Resource Economics

DISCUSSION PAPER 91.8

Dairy industry policy and free trade with New Zealand

Murray J. Lembit, Vernon Topp,
Steve C. Beare and Terry Sheales

Project 7121.101

ABARE

Australian Bureau of Agricultural and Resource Economics

ISSN 1030-9527
ISBN 0 644 14847 0

Australian Bureau of Agricultural and Resource Economics
GPO Box 1563 Canberra 2601

Telephone (06) 246 9111 Facsimile (06) 246 9699 Telex AGEC AA61667

ABARE is a professionally independent research organisation attached to the Department of Primary Industries and Energy.

Published for ABARE by the Australian Government Publishing Service, Canberra.

Printed in Australia by P. J. GRILLS, Commonwealth Government Printer, Canberra

Foreword

On 1 July 1990 an agreement between Australia and New Zealand allowing free trade in dairy products came into operation. The agreement is part of the Closer Economic Relations arrangements between the two countries. As New Zealand is widely considered the most efficient dairy producer in the world, the effects of free trade could be substantial.

This paper on the Australian dairy industry represents the completion of research into various aspects of the dairy market commenced in 1987 with financial assistance from the Dairy Research Council. Results from individual components of that research have appeared in a number of papers presented to industry and professional conferences during the course of the project.

In this paper the trade flows likely to result from free trade are estimated. Particular emphasis is placed on estimation of the levels of imports from New Zealand under various policy options. The free trade agreement is likely to be a major influence on domestic policy changes. The estimates of the effects of free trade with New Zealand provide a basis for the subsequent assessment of how interstate flows of fresh milk would be affected should there be changes in current marketing arrangements for such milk.

BRIAN FISHER
Executive Director

Australian Bureau of Agricultural
and Resource Economics

August 1991

Acknowledgments

The authors wish to acknowledge the contributions of Glenn Barry and Stephen Strachan to the collection of data and industry specific information, the initial modelling work by Greg Williamson and Lora Domine, and the helpful comments on early drafts of the paper provided by Gordon MacAulay, John Hogan, Bruce Bowen and Glyn Wittwer.

The financial assistance of the Dairy Research Council (and its successor, the Dairy Research and Development Corporation) to the development of the basic models and to the production of papers reporting the results as each component of the research program was completed is gratefully acknowledged.

Contents

Appendixes

List of figures and tables

Figures

Tables

Summary

The Australian dairy industry is reducing costs . . .

In the early 1980s, a large buildup of world stocks of dairy products led to a decline in world dairy prices, reducing farm returns. Developments in the world dairy market have kept the Australian industry under pressure to reduce costs in order to remain competitive.

. . . and assistance is falling, under the 'Kerin Plan' . . .

The current marketing arrangements for manufacturing milk, introduced in 1986, have as a key objective the achievement of a more competitive and economically efficient dairy industry. The 'Kerin Plan', as these arrangements are commonly called, provided for a gradual reduction in assistance, so as to reduce domestic price levels to import parity. A stimulus to the reduction in assistance was the expectation of free trade in dairy products between Australia and New Zealand from 1992. A reduction in assistance would, it was argued, place the Australian industry in a better position to compete with imported products from New Zealand.

. . . but New Zealand now has free access to Australian dairy markets . . .

Free trade with New Zealand, which was ultimately brought forward to 1990, is particularly important for the Australian industry because of the geographical closeness of the two countries, the similarities of their dairy industries as low cost producers, and the fact that significant quantities of New Zealand dairy products are already traded within Australia.

. . . and this has implications for Australia

The potential effects of free trade in dairy products between New Zealand and Australia under various policy scenarios are analysed here using a model of the Australian processing sector. This model was set up to simulate the effects on Australian manufacturing milk prices of different industry responses to competition from New Zealand. Further, it is possible that

present restraints on interstate trade in fresh milk could be removed, as a result of pressure on the manufacturing milk sector due to imports from New Zealand. As an extension of the analysis, therefore, the effects of removing these restraints were also estimated, using a second model.

The effects of competition

The Australian dairy industry is efficient

The results of the first part of the analysis indicate that a reduction in assistance is not likely to lead to a major contraction of the dairy industry. In fact, it appears that Australia can compete effectively with New Zealand on the domestic market, and would remain a net exporter if assistance to the manufacturing milk producing sector were removed.

The New Zealand industry, also efficient, already exports to Australia

Under current policy there is an incentive for New Zealand dairy products to be shipped to Australia, because Australian domestic prices for certain products are above import parity. That no immediate upsurge in New Zealand imports of dairy products to Australia followed the advent of free trade in July 1990 may reflect profit maximising by the New Zealand Dairy Board, rather than a lack of price incentive to enter the Australian market. The Board, which has monopoly control over exports and which can be expected to manage shipments to Australia so as to maximise net returns from sales, may initially be constraining sales in order to avoid price cutting reactions from competing Australian manufacturers, or to reduce the likelihood of a strong policy response in the event of sharply lower returns to Australian producers. However, competition from New Zealand is likely to increase beyond 1992, when the quota presently allowed to New Zealand for exports to the premium UK market comes to an end.

Australian consumers gain from increased imports, but Australian producers lose

Using the processing sector model, it was found that, under current policies, New Zealand exports to Australia would increase, reducing

domestic Australian prices and benefiting Australian consumers to an extent valued at $36 million a year, in the short term. However, annual revenue of Australian milk producers would fall by around $63 million, with Victoria and Tasmania (the largest producers of milk for manufacturing purposes) being the states most seriously affected. In this market environment, the New Zealand industry was estimated to gain around $30 million of the revenue transferred from Australian consumers to producers, under current arrangements.

Alternatively, Australian producers could lower domestic prices, benefiting consumers . .

In response to increased competition from New Zealand, the Australian industry could maintain its share of the domestic market by lowering market support for those products otherwise likely to be imported from New Zealand. This reduction of support would result in lower returns to Australian dairy producers, but it is estimated that the benefit to consumers would be worth close to $70 million, and revenue transfers to the New Zealand dairy industry would be eliminated.

. . . or all export support could be removed, causing resources to move out of dairying

It is estimated that the removal of all export support would reduce annual milk producer revenues by close to $120 million in the short term. But this annual loss would be reduced to a little over $40 million in the longer term as producers moved some resources into alternative activities. Australian consumers would be major beneficiaries from the removal of all export assistance, with gains valued at about $130 million a year because of lower prices for dairy products.

Potential for interstate trade

Incentives for interstate trade likely to increase . . .

Reduction in manufacturing milk prices resulting from increased competition from New Zealand and/or from the reduction or elimination of assistance to Australian producers may increase the incentives for interstate trade in market milk. Possible trade flows were analysed using a farm-level programming model of Australia's

mainland eastern states, New South Wales, Victoria and Queensland.

. . . but appreciable trade likely only below a critical price level

It was found that, in the case of a deregulated market for fresh milk in these three states, some interstate trade would take place if the farm-level price of manufacturing milk fell appreciably below the 1989-90 level. However, it seems unlikely that individual state industries would be severely affected, because transport costs would limit the volume of interstate trade.

Most states likely to fill their own fresh milk requirements

Given free trade in market milk between the eastern states, it is likely that the dairy industries in each of the three states would continue to produce most of the fresh milk requirements of their own consumers. Some trade would occur at certain times of year, such as autumn or winter, when market prices could be insufficient to bring about the necessary supply response in New South Wales and Queensland

Policy implications

Export support would need to be lowered to avoid subsidising New Zealand

On the evidence presented in this report, one policy option for keeping the Australian dairy industry competitive in the face of potential competition from New Zealand in the next few years would be to adjust or remove export support arrangements. The case for such action may become stronger from 1992, when New Zealand loses its butter quota in the relatively high priced UK market. The results presented in this report give some indication of the trade-offs that would be involved in varying dairy export support levels.

Removal of assistance would result in resource reallocation

The analysis of the potential for interstate trade in market milk reveals that little trade would occur unless there were a substantial decline in returns from manufacturing milk production. Nevertheless, the removal of the restrictions on such trade would enable the industry to develop, over time, along lines of greatest comparative advantage. Apart from improving economic efficiency through better resource allocation in the industry, there would

also be gains for consumers and the nation as a whole in having a more competitive dairy industry.

Adjustment costs could be spread by unifying the Australian milk market

From the perspective of producers, a move toward a single Australian market for fresh milk would enable the adjustment costs associated with lower returns from manufacturing milk production (due to a weaker world market and intensified competition from New Zealand) to be spread more equitably. In addition, by enabling adjustment to proceed more smoothly, it would give greater scope for maintaining industry returns close to the relatively high levels of recent years.

There are other possible policy options

Finally, it should be noted that the simulations reported here by no means exhaust the possibilities of the economic models used in the study. The models are designed to be run with a variety of assumptions so that the effects of a wide range of different dairy policies can be estimated. The models therefore have the potential to be particularly useful in the development of future marketing arrangements for the Australian dairy industry.

CHAPTER 1

Introduction

Throughout much of the 1980s, world dairy trade was affected by a buildup in surplus stocks — particularly of butter and skim milk powder — which depressed world prices. However, Australian dairy policies ensured that the local dairy industry was partly sheltered from developments in the world market. Despite this protection, resources continued to move out of the industry, with the result that the Australian dairy industry has become better able to meet the challenges of the changing world market. Nevertheless, because of the relatively high level of assistance to the domestic dairy industry (Industry Commission 1990) some resources have remained in dairying which could have earned a higher economic return if they had moved to other sectors of the Australian economy.

With the advent of free trade in dairy products between Australia and New Zealand from July 1990 under the Closer Economic Relations (CER) agreement, there has been some concern in the Australian industry as to how its producers will fare in the face of an expected increase in competition from New Zealand. The analysis reported in this paper was undertaken in order to provide an assessment of the short and medium term implications of the free trade agreement for the Australian dairy industry. Particular emphasis was placed on measuring the effects of current and possible future Australian dairy policies in an environment of free trans-Tasman trade in dairy products. The effects of free trade with New Zealand on the domestic fresh and manufacturing milk markets was of major interest.

With a view to stimulating debate among the various sectors of the industry on future policy directions which could take account of the new trading environment, the report contains information regarding the likely effects on the Australian dairy industry of various policy alternatives. The alternatives examined are by no means exhaustive: the quantitative models used to generate the results are capable of being used to quantify the effects of other policy options under other assumptions.

First, however, it is important to understand the particular policy and economic environment within which Australia's dairy industry operates. The physical and economic features of the Australian dairy industry are described in chapter 2. In chapter 3 the regulations affecting dairy production and marketing in Australia are examined. Key aspects of the CER agreement between New Zealand and Australia from the perspective of the dairy industry are discussed in chapter 4, including a brief overview of the New Zealand industry. A model-based evaluation of the likely effects on the Australian dairy products industry of free trade in dairy products between Australia and New Zealand is

contained in chapter 5. This is followed, in chapter 6, with a discussion of the effects on state and regional milk supply and interstate trade in Australia, drawing on results obtained with a second model. In the final chapter, the national and state-level policy implications of the CER agreement are examined.

Appendix A contains details of the programming model used to evaluate the effects on the national scale of free trade in dairy products with New Zealand, while appendix B contains details of the regional model used to estimate the effects on Australian milk supply at the state level.

CHAPTER 2

Features of the Australian dairy industry

The Australian dairy industry has undergone considerable change in the past 20 years. Initially the driving forces were technological innovations in milk production, transport and storage, which in turn were largely in response to changes in the demand for Australian dairy products. There was, however, a second major stimulus for change: the loss of the United Kingdom market, which had accounted for nearly 80 per cent of Australia's butter exports, following that country's entry into the European Community in 1973. Prior to 1973 the majority of Australia's dairy exports were in the form of butter, and most farmers produced cream for sale to butter factories. Loss of the UK market resulted in greater production of products other than butter, such as cheese and wholemilk powder.

It is with this history of continuous change and adaptation to new market circumstances that the Australian dairy industry now faces the possibility of intense competition from New Zealand. An examination of the key physical and economic characteristics of the Australian industry will provide a useful base for the analysis presented in the later chapters.

The discussion in this chapter is focussed on changes in the nature and operation of the Australian dairy industry. Trends in the number of farms and their output are covered first, and then the physical characteristics and enterprise mix of dairy farm operations. Milk utilisation is then examined, followed by an overview of the processing sector. Last, features of Australia's trade in dairy products are presented.

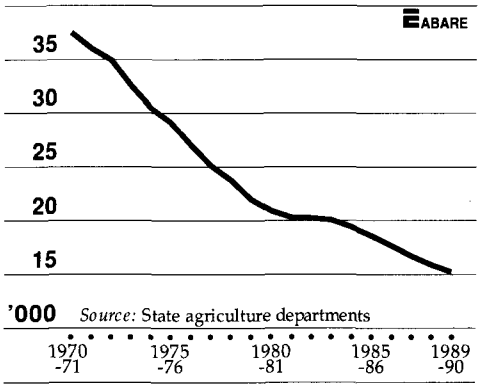
The changing structure of Australia's dairy industry

For the production of cheese and wholemilk powder, unlike butter production, factories require access to high quality, fresh liquid milk rather than cream. This has contributed to the need for refrigerated storage and transport of milk, especially from farm to factory, as well as stricter hygiene standards in milk production and handling.

With the introduction of mechanical milking and bulk milk handling, dairy farms began to expand in both land area and herd size, taking advantage of the economies of size offered by the new technologies embodied in this growth. Smaller, less efficient farms using old technologies were no longer economically viable, and either left the industry or were absorbed into expanding neighbouring farms. In the early 1970s the total number of farms started to fall rapidly (figure A). The result was a dairy industry comprising fewer but larger farms, with more cows and more land per farm.

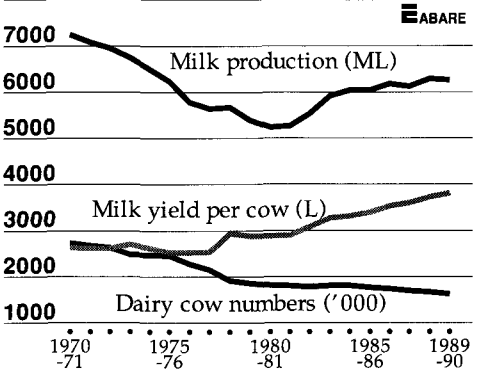
Australian milk production, after reaching its highest level since the

A Trend in number of dairy farms in Australia



Second World War in 1969-70, fell during the 1970s (figure B). Apart from the economic pressures and structural changes following the loss of the UK market for butter, unfavourable seasonal conditions may also have played a part in the 33 per cent decline in cow numbers during the decade. Through the 1980s milk production rose, but not to the levels of the late 1960s. This increase in production occurred despite continuing falls in cow numbers, and reflected higher yields per cow due to better breeding practices, and the improved feeding regimes for which increased returns from milk provided an incentive.

B Trends in Australian milk production, dairy cow numbers and yields per cow



Farm level changes in dairying

In order to gain a picture of the rate of change in the dairy industry at the farm level, ABARE has, since 1978-79, undertaken an annual survey of Australian dairy farms. This survey, the Australian Dairy Industry Survey, provides information on both the physical and financial characteristics of dairy farms in Australia. A summary of physical and financial data obtained from a selection of the ten most recent surveys is presented in table 1.

It is evident from the table that the physical structure of the average dairy farm in Australia did not change substantially during the 1980s. Nevertheless, while the average number of dairy cows increased by about 14 per cent between 1979-80 and 1989-90, average output of milk rose 46 per cent.

The conduct of alternative agricultural enterprises as a sideline activity on dairy farms remains fairly minor. On average, dairy activities accounted for 88 per cent of total farm receipts in 1989-90. Moreover, there does not appear to have been any significant move toward widening the enterprise mix on dairy farms in Australia. Most of the crops grown on dairy farms are used for the production of hay and silage for the dairy herd. Raising calves for beef and veal production is still a popular option for most dairy farms, particularly in Western Australia and Queensland, while the running of sheep is prevalent on South Australian dairy farms.

1 Australian farm survey results Averages per farm

	Unit	1979-80	1981-82	1983-84	1985-86	1987-88	1988-89	1989-90
Population	no.	20 072	17 540	19 019	16 189	15 832	15 682	15 178
Total closing farm area	ha	151	160	170	159	157	165	161
Field and other crops	ha	28	28	32	28	28	–	–
Crops for hay and silage	ha	16	18	23	22	22	–	–
Labour								
Family labour	wks	89	104	102	101	93	96	104
Hired labour	wks	10	12	13	11	9	10	10
Total	wks	105	125	123	118	111	116	123
Livestock (closing)								
Sheep	no.	73	68	43	17	18	31	29
Beef	no.	25	22	25	30	28	38	32
Dairy cows	no.	96	97	96	99	105	105	109
Dairy herds	no.	147	149	141	154	156	156	162
Capital a								
Plant, machinery and equipment	$	48 515	54 463	53 903	57 055	48 729	56 198	51 417
Land, fixed improvements	$	364 432	414 608	422 187	408 516	385 707	667 405	662 608
Total	$	526 224	647 458	631 752	623 945	586 814	836 809	815 548
Cash costs a								
Hired labour	$	3 737	4 499	4 802	3 868	3 045	2 922	2 959
Materials	$	30 829	38 366	38 089	34 780	36 533	35 687	41 161
Artificial insemination, stud fees	$	760	910	1 205	1 328	1 579	1 453	1 534
Services	$	18 252	21 890	22 939	22 664	27 869	18 402	25 024
Interest	$	5 386	7 580	8 409	9 649	9 369	8 549	12 092
Total	$	70 497	80 641	82 095	77 224	87 285	84 018	92 560
Cash receipts a								
Dairy cattle sales	$	13 707	10 051	11 764	11 046	13 674	11 867	11 460
Dairy products	$	78 160	97 624	92 191	91 259	99 530	108 637	108 665
Total	$	108 823	123 531	119 778	113 876	124 829	136 791	136 510
Farm cash operating surplus a	$	38 326	42 888	37 683	36 650	37 544	52 773	43 950
Total closing debt a	$	60 766	68 866	72 780	69 011	70 376	70 240	76 880
Market milk	L	72 510	81 325	76 609	86 873	100 025	101 345	112 832
Manufacturing milk	L	208 140	200 391	231 818	269 382	281 444	292 764	297 953
Total milk	L	280 650	281 716	308 427	356 255	381 469	394 109	410 786

a 1989-90 dollar terms. Capital and cash costs only partially itemised.

Milk utilisation in Australia

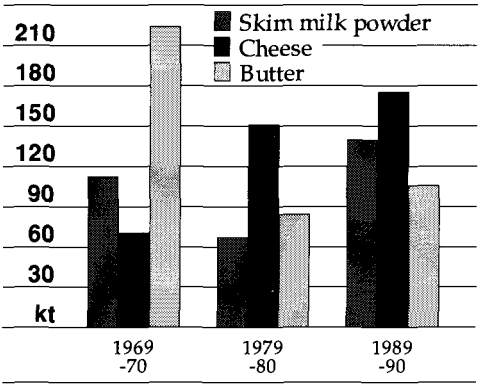
Milk produced in Australia is consumed as fresh (market) milk or is processed (as manufacturing milk) into a range of dairy products such as butter, cheese, milk powders, casein and ice cream.

Historically, around 25 per cent of Australian milk production has been needed to satisfy fresh milk demand. In 1969-70, market milk consumption was about 1.7 GL (billion litres). With increases in popularity of other liquid refreshments such as orange juice, and health concerns about the fat content of milk, consumer demand for milk fell during the 1970s. Although total Australian consumption of fresh milk recovered somewhat in the 1980s, consumption per person has declined from the 107 L recorded in 1974-75 to 101 L in 1989-90. In recent years there has also been a trend in consumption away from wholemilk and toward low fat or modified milk as a result of health concerns.

Approximately 75 per cent of Australia's milk output is used as manufacturing milk. Manufacturing milk production has followed the same trend as total production, falling from 1969-70 to 1981-82 before increasing. Changes in the production mix from the manufacturing milk sector are shown in figure C.

The cutback in butter exports to the United Kingdom following that country's entry into the European Community, and significant falls in Australian consumption of butter per person, resulted in a substantial decline in butter production. Cheese production has grown due to increases in demand as a result of changing consumer tastes and preferences, technological developments allowing for easier manufacturing of particular cheeses, and the need to develop other products and markets following the decline of butter sales to Britain. The nature of cheese production has also changed, with increases in production of natural and specialty cheeses to match increases in demand. These trends also reflect the relative strengthening of unit returns from cheese exports relative to butter.

C Trends in Australian dairy product output



Skim milk powder is a by-product of butter production, as the non-fat portion of milk used in butter production can be used for this purpose. Therefore factors affecting butter production will also influence the level of output of skim milk powder. However, production has also been influenced by international market conditions, as a significant proportion of skim milk powder is exported. Australian consumption per person has generally fallen in the past decade, the majority of Australian production being exported.

Casein is another coproduct of butter production in which the non-fat portion of milk is used, and since 1966-67 casein

output has likewise followed the trends in butter production. Typically, a small proportion of this output has been consumed domestically with the rest exported. In recent years casein production has been less than 10 kt.

Whole milk powder production increased between the late 1960s and early 1970s, and the inclusion of whole milk powder in marketing arrangements in the late 1970s accelerated this growth, bringing production to a peak of 80 kt in 1979-80. Output then fell in the early 1980s, but has since recovered.

The dairy processing sector

Under these stimuli, the Australian dairy processing industry has changed markedly since 1970. Table 2 contains data on the number of factories involved in the manufacture of dairy products in Australia. Each factory is classified according to the main product manufactured.

The total number of establishments fell by 42 per cent between 1969-70 (Small 1987) and 1987-88. However, the rate of departures from the industry slowed after 1974-75. The greatest decline has occurred in establishments predominantly producing butter, this decline being consistent with the downward trend in butter production. The number of milk and cream establishments has also fallen, reflecting reduced demand for liquid milk in Australia and increased factory size. The number of cheese factories fell between 1969-70 and 1975-76, largely reflecting improved technology which allowed increased cheese production in a given plant. After 1976, the number of cheese

2 Numbers of Australian dairy processing establishments, by product

	Milk and cream	Butter	Cheese	Ice cream	Other	Total
1971-72	160	106	60	45	14	385
1972-73	149	97	64	48	13	371
1973-74	146	70	60	48	15	339
1974-75	141	56	51	40	15	303
1975-76	133	55	51	42	15	296
1976-77	132	50	53	38	13	286
1977-78	138	45	57	34	20	294
1978-79	133	39	58	32	19	281
1979-80	125	36	64	33	20	278
1980-81	123	31	62	34	20	270
1981-82	117	27	66	34	18	262
1982-83	117	29	62	35	18	261
1983-84	120	27	68	35	16	266
1984-85	106	28	65	35	15	249
1985-86	**na**	**na**	**na**	**na**	**na**	**na**
1986-87	100	27	67	40	14	248
1987-88	99	26	65	43	13	246

na Not available
Sources: Small (1987); ABS (1988).

factories again rose as the demand for natural and specialty cheeses increased.

While the overall number of milk processing factories has declined, their size has increased (table 3). For cheese and liquid milk, output per factory has increased continually. Output per factory is larger in Victoria than in other states, largely due to the higher availability of milk in Victoria. Despite a 50 per cent fall in the number of butter factories in that state, Victorian production of butter was approximately the same in 1988-89 as in 1977-78. Victoria's cheese production nearly doubled in this time while its number of cheese factories increased by around 25 per cent. By 1988-89, 52 per cent of butter factories and 38 per cent of cheese factories were located in Victoria. These factories produced 87 per cent of Australia's butter output and 60 per cent of Australian cheese output.

Increase in the size of factories has enabled the introduction of technology to perform specialised and repetitive tasks, thus allowing higher output per unit of labour employed. Through economies of size, resources can be freed for research and development on new products and new production techniques, marketing and development of particular brands for specific markets and increased training of staff. Industry rationalisation and the trend toward bigger factories have also provided some of the financial and marketing capacity necessary to compete successfully in the international environment (Bardsley 1990). This is important, given that a significant proportion of Australian dairy products are exported.

Rationalisation and concentration in the dairy processing industry have coincided with increased concentration of ownership and the merging of enterprises or cooperatives. This is illustrated by the formation of Bonlac Foods in 1986 and by the 1990 merger of three New South Wales cooperatives — Dairy Farmers, Hunter Valley Dairy Co-operative and Shoalhaven Dairy Co-operative — to form Australian Co-operative Foods.

Vertical integration of dairy companies, in which one firm owns or controls more than one stage — for example, milk production, product manufacture, retailing — came to prominence in the late 1980s. By this means, a manufacturer can 'cut costs by spreading risk and diminishing the number of transactions and the information required to make the transactions' (Call and Holahan 1983). With costs thus reduced, the profitability of the firm can be increased. At the same time, vertically integrated companies engaged in the processing of market milk are able to earn income at more than one level.

3 Average output per factory

	Liquid milk	Butter	Cheese
1969-70	9.5	1 874	1 075
1974-75	11.3	2 880	1 937
1979-80	12.1	2 342	2 363
1984-85	15.1	4 071	2 455
1987-88	16.8	3 615	2 712

Sources: ABS (1986); unpublished statistics from the ABS Business Register.

Australian trade in dairy products

Australia produces more milk than is required for domestic consumer demand.

4 Australian exports of dairy products, by destination

Destination	Unit	1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	1988 -89	1989 -90 p
Cheese								
Iraq	kt	6.2	11.6	10.6	3.7	4.7	1.8	3.3
Japan	kt	15.4	20.3	18.7	20.0	24.3	25.0	17.4
Saudi Arabia	kt	14.3	13.4	10.8	11.0	11.6	8.7	7.0
United Kingdom	kt	3.3	3.2	1.6	2.9	1.8	2.5	2.7
United States	kt	3.5	3.3	3.0	3.7	5.4	5.4	4.9
Other **a**	kt	11.8	15.7	21.4	20.8	20.3	19.7	19.8
Total	kt	54.5	67.5	66.1	62.1	68.1	63.1	55.1
(value)	$m	(141.1)	(163.1)	(165.5)	(164.3)	(186.2)	(183.3)	(189.0)
Butter and butterfat b								
Iran	kt	0.0	2.4	5.8	0.0	10.5	0.0	4.0
Japan	kt	0.4	0.9	0.6	0.2	1.2	3.8	2.3
Malaysia	kt	2.9	4.5	3.4	3.1	4.5	3.9	3.1
Philippines	kt	0.4	0.7	1.9	2.0	1.9	3.6	2.0
Singapore	kt	2.9	5.2	5.4	3.2	2.4	7.9	8.9
Thailand	kt	1.8	2.8	2.7	1.8	4.4	4.1	3.4
Other **a**	kt	23.0	30.9	29.3	22.9	16.0	14.7	27.6
Total	kt	31.4	47.4	49.1	33.2	40.9	38.0	51.3
(value)	$m	(57.9)	(76.3)	(77.6)	(58.2)	(66.9)	(65.2)	(116.4)
Skim milk powder								
Japan	kt	11.7	14.8	12.0	8.4	4.4	12.2	9.6
Malaysia	kt	5.1	10.4	12.7	17.2	15.7	13.0	8.2
Philippines	kt	14.6	24.8	20.9	14.2	12.0	18.0	17.9
Thailand	kt	10.0	11.8	11.5	16.3	12.2	4.1	12.7
Other **a**	kt	20.1	31.0	21.5	22.6	23.2	14.6	43.5
Total	kt	61.5	92.8	78.6	78.7	67.5	61.9	91.9
(value)	$m	(53.7)	(79.0)	(77.9)	(89.1)	(94.4)	(136.4)	(193.8)
Casein								
Japan	kt	1.5	2.2	2.0	1.8	2.7	1.7	0.6
United States	kt	8.4	4.9	3.0	5.3	4.6	3.3	2.0
Other	kt	0.3	0.3	0.3	0.4	0.4	0.4	0.6
Total	kt	10.2	7.4	5.3	7.5	7.7	5.4	3.2
(value)	$m	(24.7)	(16.0)	(13.7)	(23.0)	(31.4)	(33.7)	(18.0)
Wholemilk powder								
Malaysia	kt	6.5	5.3	4.3	5.4	3.9	2.2	1.9
Philippines	kt	0.3	0.9	0.6	1.6	0.5	0.2	1.1
Singapore	kt	0.9	4.8	5.3	13.8	10.4	14.8	5.7
Taiwan	kt	12.8	12.6	13.0	14.4	11.7	11.7	9.6
Other **a**	kt	6.9	6.7	8.5	6.8	10.1	7.3	23.4
Total	kt	27.7	30.3	31.7	42.0	36.6	36.2	41.7
(value)	$m	(58.4)	(56.5)	(61.8)	(85.8)	(82.7)	(93.5)	(100.2)
Other products								
Fresh milk	ML	9.5	8.6	10.7	15.3	17.6	19.5	25.2
(value)	$m	**na**	**na**	**na**	**na**	(9.5)	(11.6)	(16.5)
Other fresh products	ML	0.8	0.9	1.3	2.0	1.8	2.1	4.5
(value)	$m	**na**	**na**	**na**	**na**	(1.8)	(2.5)	(4.7)
Condensed milk	kt	8.1	7.8	10.7	9.8	9.6	8.7	13.3
(value)	$m	(8.0)	(7.0)	(10.0)	(12.0)	(11.6)	(8.9)	(10.2)
Other powders	kt	19.9	18.5	18.0	25.3	24.3	25.8	24.5
(value)	$m	(32.0)	(25.0)	(29.0)	(44.0)	(48.3)	(57.6)	(64.7)

a 'Other' includes 20–25 different countries. **b** Includes ghee, dry butterfat, butter concentrate and butteroil, all expressed as butter. **p** Preliminary. **na** Not available.
Sources: Australian Dairy Corporation (1988); ABS (1990).

As a result, around 40 per cent by volume of Australian manufactured dairy produce is exported. However, Australia is only a small participant in the international marketplace. In 1988-89 Australian exports of dairy product accounted for less than 5 per cent of world dairy exports. Australia is thus a price taker in the world market and is susceptible to fluctuations and trends in the world economy. Consequently, the volume and value of exports can vary markedly from year to year depending on prevailing international market conditions.

The world dairy market is largely influenced by the policies of the European Community. In 1989 the European Community produced around 25 per cent of world milk output and 50 per cent of exports, giving it a high degree of market influence. The European Community has instituted trade policies which provide substantial support for its dairy industry, including the subsidising of exports. Such policies make it difficult for Australian producers to compete in the world market. New Zealand, another low cost producer of dairy products, is also adversely affected by EC dairy policies.

Trends in Australian exports of key dairy products are apparent from table 4.

Continuous rises in world butter production combined with falling per person consumption have increased the availability of butter on the world market. EC butter stocks have increased, and there has also been a buildup in US stocks of butter. These factors are likely to reduce the quantity of butter exported from Australia and also to increase the relative attractiveness of the Australian market to New Zealand butter producers (who, as an additional stimulus, will in 1992 lose their quota access to the UK market).

Cheese exports have tended to grow since the mid-1970s, offsetting the effect on total industry returns of the decline in butter exports. In 1989-90 around 55 kt of cheese valued at $A192 million was exported, making cheese the largest export earning dairy product.

Of particular importance in relation to this study is the penetration of the domestic Australian market by imported dairy products. Australian imports of dairy products other than cheese are negligible in the present context. In 1989-90, Australia imported over 20 kt of cheeses. Most of these were natural cheddar, processed cheeses other than cheddar, emmenthaler and gruyère. Their value was $A77 million.

More than 40 per cent by volume of these cheese imports, 9 kt, valued at $A29 million, came from New Zealand. Other dairy imports from New Zealand in the same year included 900 t of cream products, 729 t of casein, 394 t of ice cream and 305 t of butter. Australia takes 7 per cent of New Zealand's total cheese exports, and in 1988 was the third largest foreign buyer of New Zealand cheese. Australian imports of other New Zealand dairy products amount to less than 2 per cent of total New Zealand exports of those products.

CHAPTER 3

Regulation and assistance in the Australian dairy industry

With the potential for increased competition from New Zealand, the regulatory framework within which the Australian dairy industry operates is likely to have an important bearing on the nature and extent of any growth in trans-Tasman trade in dairy products. Any market distortions resulting from the highly regulated nature of Australia's market for milk and milk products may offer opportunities as well as impediments to expanded imports from New Zealand (the principal impediment, however, being the relatively high trans-Tasman shipping freight costs). Some appreciation of the nature of the regulatory environment in Australia is therefore important to the analysis of the effects of the CER agreement on dairy trade.

Regulation in the Australian dairy industry has traditionally covered both the manufacturing and market milk sectors, with state governments regulating the former and the Commonwealth the latter. The origin of such a separation of regulatory powers lies in the Australian Constitution — state governments being responsible for agriculture, and the federal government for international trade. However, while the responsibility for regulation has resided with different legislatures, the resulting regulations are not independent in their operation or effects on the industry.

Assistance to milk product manufacturing

Legislation covering manufacturing milk is the responsibility of the federal government, and has been enacted mainly to ensure the viability of the dairy export sector (Department of Primary Industry 1986). Assistance to the sector has been reduced in recent years, the estimated effective rate of protection falling from 80 per cent in 1985-86 to 39 per cent in 1988-89 (Industry Commission 1990).

The current marketing arrangements (commonly referred to as the 'Kerin Plan') began on 1 July 1986. Whereas the previous scheme provided support through consumer transfers and government payouts, the current scheme is designed to be industry funded and also to reduce consumer transfers. Specifically, the current arrangements were designed to bring prices on the Australian domestic market down to 'import parity'. To bring about this change, four mechanisms were legislated: an 'all-milk' levy; market support payments; product levies; and supplementary support payments.

The first two of these are the main instruments. The levy is collected from individual farmers on all milk produced in Australia. The amount payable can vary from year to year within a maximum of 45c/kg of butterfat. Throughout the course of the plan the

levy has increased, from 30c/kg in 1986-87 to 45 cents per kilogram in 1989-90. In 1990-91 the levy was set at 43c/kg.

The money collected from the all-milk levy is pooled into a market support fund. Money from the fund is paid out on all exports of dairy products at a rate determined by the Australian Dairy Corporation. Support payments are, for all products, the same percentage of the Corporation's assessment of the current export price of the particular product. A maximum support rate was set at 30 per cent of the assessed price, because at the time of the origin of the Kerin Plan import parity prices were approximately 30 per cent above average export prices. In the first year of the plan support was set at this maximum rate. However, during 1989-90 support fell to about 18 per cent as a result of higher world prices and the limited size of the support fund. (The 45c/kg limit on the levy has the effect of capping the total amount of export support which can be paid out each year.)

To enable a smooth transition to these new arrangements, product levies were charged on butter and cheese and were used to pay supplementary export support, initially at levels equivalent to the support that had been provided under the previous scheme. These levies were to be phased out gradually by 1992. However, with the early introduction of free trade with New Zealand in 1990, these product levies and the associated supplementary support were removed earlier.

The export support scheme is intended to provide support to domestic producer prices by increasing the returns from exports. Higher returns for exports make exporting dairy products more attractive, and should thus reduce the quantity supplied to the domestic market and force up domestic wholesale prices until returns from the two markets are equal. Thus, domestic wholesale prices for dairy products approximate the relevant world prices plus the uniform support percentage — currently around 18 per cent.

The Kerin Plan legislation includes a 'comfort clause' enabling the states to suspend payment of the all-milk levy if they feel disadvantaged by the actions of another state. Such a requirement was necessary in order to gain the agreement of all states to set up complementary legislation, without which Commonwealth legislation covering agricultural industries would not be effective. Under the provisions of the 'comfort clause', the levy can be suspended by a vote of a majority of the states. For example, those states obtaining the least benefit from the plan — those with the lowest sales of manufacturing milk — could suspend the levy if interstate sales of fresh milk from other states led to a reduction in incomes for their farmers (though this would not be an expected consequence of export support).

The estimated net benefits of the scheme per farm in 1989-90 are presented, by state, in table 5. The figures are calculated on the assumption that domestic dairy product prices were equal to the returns from exports including support payments. If, in fact, domestic prices were lower than export returns, the net benefits would be lower than are shown. Victorian and Tasmanian manufacturers, and hence farmers, benefit most from the scheme because of the high percentage of the milk

5 Estimated net farm benefits of present market support scheme, 1989-90

Unit	Victoria	New South Wales	Queens-land	South Australia	Western Australia	Tasmania
$ per farm	14 900	820	2990	4000	2 140	13 290
c/L	3.3	0.2	1.1	1.2	0.4	3.2

produced in those states that is sold as manufacturing milk (see figure D). Conversely, Queensland, Western Australia and especially New South Wales farmers gain less from the scheme.

Policies affecting the market for fresh milk

Legislation covering fresh milk is the domain of individual states. Two distinct types of policy have emerged: production quotas, and 'blended prices'. The type of policy used in a particular state is closely connected with the production characteristics in that state.

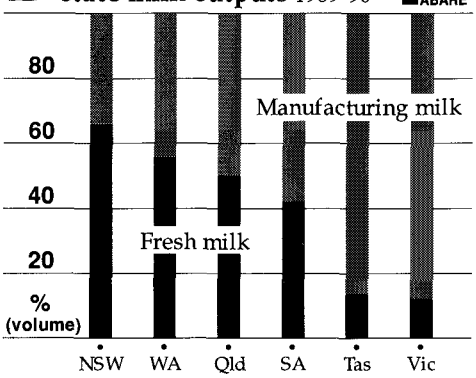
Production quotas

To ensure year-round supply of fresh milk, states with high fresh milk requirements in relation to their total milk production (see figure D) have instituted production quota systems. In what may be called the 'market milk' or 'quota' states — New South Wales, Queensland and Western Australia — all farms are required to produce a set quantity of milk each month throughout the year, and a premium price is paid to farmers for market milk sales as an incentive to maintain production. Prices for market milk are set by the state milk marketing authority, usually with some reference to the 'cost of production'. Farmers who do not produce their quota may be penalised by reduction of the size of their quota.

The imposition of year-round quotas leads to higher costs of production because of the need to supply sufficient feed for the energy requirements of a herd in times when pasture production is low. Lembit and Bhati (1987) estimated the additional costs associated with year-round production at 20 per cent above normal seasonal production costs. Lembit, Topp, Williamson and Beare (1988) estimated that, by moving to a more seasonal pattern of milk production based on a system of negotiable quotas, the New South Wales industry could save $2.5 million, or $1000 per farm.

In recent times the 'quota' states have attempted to reallocate quotas more efficiently by allowing farmers to buy and sell quota entitlements. While

D Shares of manufacturing milk in state milk outputs 1989-90 ABARE



Queensland and Western Australian authorities have made some steps toward freeing up the transfer of quotas, the most comprehensive negotiable quota system has been instituted in New South Wales.

Since 1989, quotas in New South Wales have been freely negotiable between farmers through a central pool. Exchange of quota occurs each four weeks, and any quantity of milk quota can be sold through the exchange pool. Farmers wishing to buy quota tender for a quantity of milk, and farmers disposing of quota set a reserve price. The central agency collects all these bids, and establishes the market clearing price. Quota purchases are permanent (that is, until resale).

Blended prices

States supplying greater quantities of manufacturing milk do not need to compel their farmers to supply milk all year round, because during most months of the year production is usually well above fresh milk requirements. Nevertheless, during winter months it is necessary to pay incentive payments to ensure that enough milk is produced to supply the fresh milk market. A premium, usually based on some estimate of 'cost of production', is paid on the milk used for fresh milk from each individual farm. In a given month all farms supply the same proportion of their total milk production to the fresh milk market. Returns from the fresh milk market are shared equitably among farmers, who receive the weighted average of the fresh and manufacturing milk price.

Topp, Williamson, Lembit and Beare (1989) suggested that blended pricing systems lead to an excessive use of resources in the dairy industry. They estimated that, at the 1986-87 levels of production and prices, the costs arising from misallocation of resources due to blended pricing in the Victorian industry were around $9 million, or 3.6 per cent of net industry returns. This misallocation results from individual farmers receiving a price for each extra litre of milk produced which is greater than the manufacturing milk price received by the industry as a whole for the additional milk, though it is used as manufacturing milk. Topp et al. suggested that the blended pricing scheme results in around 30 per cent more milk being purchased than would occur under an economically rational pricing scheme.

Implications for resource allocation

Regulations affecting the marketing of milk in Australia have important economic implications, especially with respect to the allocation of resources. Quota entitlements in the 'market milk states' (New South Wales, Queensland and Western Australia) have in the past resulted in a geographical pattern of milk production that is not economically efficient (Lembit et al. 1988). In New South Wales, under the new system of negotiable quotas, fresh milk will tend to be sourced from the least-cost producing regions of the state, resulting in economic gains. In the other 'market milk states', likewise, significant resource costs could well be saved by adopting more efficient milk sourcing policies.

Efficiency gains might also come from an expansion of interstate trade in

market milk (at present limited, in a variety of ways, to minor sales from Victoria). In this regard, a number of possible scenarios can be imagined. One possibility is that the predominantly market milk producing states permit some portion of their fresh milk requirements to be supplied by the predominantly manufacturing milk producing states. There is a large number of possible alternative market sharing arrangements, but in all cases farmers in the market milk states would give up some portion of the consumer transfers they receive from the price premium on sales of fresh milk. While such a redistribution of income would leave farmers in the market milk states worse off and those in the manufacturing milk states better off, it would not affect total returns to the Australian dairy industry and resources would be likely to be used more efficiently.

Major sources of pressure for industry reform may well be provided by the differential between market and manufacturing milk prices, and by the relative profitability of dairy farming between the states. If prices received for manufacturing milk were to fall relative to those for market milk, the profitability of dairy farming in the predominantly manufacturing milk states would be likely to fall relative to that in the predominantly market milk states (see p. 33). Further, this increase in the premium for market milk relative to manufacturing milk could make the transport of milk over longer distances economically feasible. This would provide suppliers with a greater incentive to trade milk interstate.

Thus, given the possibility of future reductions in manufacturing milk prices as a result of free trade with New Zealand in dairy products, it is possible also that the pressure for interstate trade in milk will increase. Although free interstate trade in milk would be a significant departure from current and historical marketing arrangements, it is an option that requires close attention, particularly in the context of increased potential for competition in the domestic market from imported New Zealand dairy products.

In the event of free interstate trade in market milk, the price premium to farmers for market milk would ultimately disappear, and with it the present (artificial) distinction between market and manufacturing milk. In the absence of the present market milk arrangements in each state, fresh milk requirements would be sourced from the least-cost milk suppliers, regardless of their state. Free trade, with producers responding to prices set by market forces rather than by governments, would ultimately result in milk production being located in the most efficient dairying regions.

CHAPTER 4

Dairy product trade under Closer Economic Relations

The Closer Economic Relations trade agreement (CER) between the New Zealand and Australian governments began to come into force in early 1983. The agreement was in response to a perceived need for a more flexible means of expanding bilateral trade than the item-by-item approach to liberalisation guided by the New Zealand–Australia Free Trade Agreement (NAFTA) of 1965. The 1965 agreement in any case did not include provisions for the bulk of New Zealand–Australian trade.

The primary objective of the CER agreement is the development of closer economic relations through a mutually beneficial expansion of free trade between New Zealand and Australia. Trade barriers between New Zealand and Australia are progressively to be eliminated in such a way as to minimise disruption and under conditions of fair competition (Department of Primary Industry 1986). CER also provides for the gradual opening of Australian and New Zealand markets to international competition.

From 1983, under the CER trade agreement, an informal arrangement existed between the Australian and New Zealand dairy industries, known as the Memorandum of Understanding. Under the Memorandum, growth in imports of cheese from New Zealand was restricted so as to remain in line with the rate of growth in consumption of domestically produced cheese in Australia. However, from 1 July 1990 this restriction was eliminated.

Role of the New Zealand Dairy Board

The purchase and sale of all production from New Zealand's dairy cooperatives that is destined for export is coordinated by the New Zealand Dairy Board, which is controlled by elected representatives of the cooperatives and thus by the suppliers of the milk. The Board has an export monopoly, setting export prices and quantities for each product and purchasing all export requirements of all dairy products manufactured by the cooperative dairy companies. It also has a price stabilising function, regulating both market and manufacturing milk prices to smooth returns to New Zealand's milk producers. It is the New Zealand Dairy Board's choice of price differentials between products that influences the product mix decisions of dairy product manufacturers.

Apart from controlling New Zealand's dairy export trade, the Board's activities are also important in terms of the national economy. In 1989 dairy product sales earned 23 per cent of total agricultural gross domestic product and contributed 3 per cent to New Zealand's gross domestic product. Dairy products comprised 15.4 per cent of New Zealand's total agricultural export income in that year.

In 1988, the New Zealand Dairy Board was released from its previous government ties, making it financially independent of the New Zealand government and free to make its own decisions on borrowing, investment and milk pricing. The activities of this newly deregulated enterprise are likely to be of particular importance to Australia as the Board seeks to maximise returns to New Zealand producers.

Likely trade flows under alternative policies

Free trade under the Closer Economic Relations agreement could have a significant effect on the Australian dairy industry. Given that New Zealand has the least supported of the world's dairy industries (OECD 1990), it is likely that competition from the New Zealand industry could be intense.

Although the current Australian dairy arrangements are designed to bring assistance to the Australian industry down to import parity, and should thus enable the industry to compete effectively with New Zealand product in the Australian domestic market, it is by no means clear that this outcome will be achieved. One potential weakness of the current Australian marketing arrangements is that the concept of 'import parity' employed does not distinguish between different products, although products differ greatly in the transport costs of bringing them to Australia.[1] For products which are relatively cheap to transport, though not necessarily for other products, the Australian domestic price, being roughly equal to the world price plus the uniform support percentage, could be highly profitable to New Zealand exporters. The response of Australian manufacturers would probably be to export those products which had been replaced by imports, in order to earn export support payments. This would reduce unit returns to Australian producers by spreading the support fund over a larger quantity of exports. The Australian domestic price would follow the supported export price downward, but would probably remain attractive to New Zealand exporters.

This problem has arisen largely as a result of the decision to bring free trade with New Zealand forward to July 1990 from the originally scheduled date of July 1992, by which time the export support arrangements are to be phased out. However, it should be noted that some sections of the industry — see, for example, Primary Industry Newsletter (1991) — would like to see the arrangements extended beyond 1992. The simulations reported in the following chapters give some indication of the possible consequences of doing so.

1 Because of the linkage of export support payments to a measure of import parity, debate on the effectiveness of this support arrangement has been complicated by arguments over how import parity should be measured: whether, in particular, the parity prices for New Zealand imports should be based on that country's marginal or average export prices. On the other hand it may reasonably be argued that, regardless of how best to estimate import parity, imports will in the medium term largely be determined by the commercial behaviour of firms within the industry and by relative exchange rate movements rather than by adjustments in the support rates. However, the focus of the present paper is on the effects of alternative support policies. The term import parity, where required, is here defined as observed Australian export price plus observed cost of transport from New Zealand.

Evaluating the effects on Australian production and trade

To evaluate the influence of the free trade agreement on the export support scheme, three alternative scenarios were simulated, using a model of the Australian milk products market including imports from New Zealand and total exports from Australia. In each simulation, Australian production, prices and domestic and export sales of each main milk product were generated, together with the amounts imported from New Zealand. The alternatives were compared with a baseline simulation replicating Australian price, production and trade figures for the 1989-90 season. In the baseline simulation, New Zealand imports were represented as zero: the comparisons thus give differences in trade, not absolute quantities.

The model used was a mathematical programming model developed by Beare, Domine and Lembit (1989). A general description of the model is presented in appendix A.

The scenarios evaluated

In all three scenarios (other than the baseline simulation) New Zealand is free to place products on the Australian market (diverted from its lowest returning markets) at the Australian domestic prices. In supplying the Australian market, the New Zealand industry is likely to sell product up to the point where the cost of supplying an additional unit of imports (the marginal cost) is equal to the return from selling that unit (the marginal return) in Australia. The lowest price at which New Zealand can deliver to Australia is the 'world' price (taken to be equal to the Australian export price, excluding support) plus trans-Tasman shipping costs (sea freight plus insurance): see table 6.

In the first scenario, Australian prices are affected by the quantities imported from New Zealand, as explained in the previous chapter. The Australian domestic price for each product is the supported export price, which is the export price plus a uniform percentage determined by the size of the support fund and the quantities exported. In this first scenario, the all-milk levy and total export payments are assumed to be maintained at 1989-90 season levels. The cost figures used in the evaluation are presented in table 6.

In the second scenario, the Australian industry is assumed to reduce domestic selling prices (by cutting unit export payments) in order to retain some or all of its present domestic market share.

6 Landed values of New Zealand products assumed in national model

	Transport cost	Import price
	$A/t	$A/t
Butter	255	2 345
Cheese	257	2 957
Skim milk powder	135	2 275
Whole milk powder	164	2 644
Casein	164	6 373

Source: Australian Dairy Corporation.

This is achieved in the model by setting the maximum rate of export support for each product at the trans-Tasman transport cost for that product, so as to equalise the domestic price on each product to the landed price of the New Zealand imports of that product (table 6).

In the third scenario, it is assumed that all intervention in the Australian market for manufactured dairy products is removed. That is, the all-milk levy is suspended and export payments are abolished.

As any adjustment in dairy production due to a policy change is likely to take time, both the initial response and that which might be observed over a longer (medium term) time period were estimated, even though not all the medium term linkages were represented within the model. Lags in adjustment can be expected, in part, because of biological constraints on the size of the dairy herd, producer uncertainty regarding the implications of initial price changes for future prices, and the costs of adjusting resources between different on- and off-farm enterprises.

In the short term — say, one to two years — the response in production to changes in the price of manufacturing milk may be negligible. It was for this reason that, in evaluating the short term effect of policy change, it could be assumed that the volume of milk produced would not change. However, over a three- to five-year time horizon, a sustained shift in the price of manufacturing milk could be expected to lead to changes in milk production. The potential for such changes to occur was incorporated in the medium term evaluation using known milk supply elasticities (see p.30).

Replicating the base situation

The base simulation was used to calibrate the production cost and demand parameters of the model and to provide a single standard set of results with which to compare the alternative scenarios, both short and medium term. In generating the baseline solution to the model, production of manufacturing milk, average production costs for each manufacturing technology, and export prices for the base year were taken as predetermined. The model was calibrated by adjusting demand schedules and production functions until the outputs replicated the 1989-90 manufacturing milk production, price of manufacturing milk and domestic consumption of manufactured dairy products.

Actual production, price and cost data for 1989-90 are presented in table 7. Figures in parentheses are those generated by the model. The 'actual' domestic prices shown are not observed but calculated: they are the export prices plus export support payments. The export support figure applied here is 18.0 per cent, which was estimated from Australian Dairy Corporation data.

The total quantity of manufacturing milk used (for all purposes) was calculated by scaling up the amount of manufacturing milk needed to produce the observed amounts of those products represented in the model. This calculation required only the conversion ratios from manufacturing milk to each product, including those not represented.

The relationships between prices and the quantities demanded domestically were determined using the response parameters given in table 19 (appendix

7 Australian production and prices, 1989-90, actual and modelled

Milk production **a**

	Unit	Manufacturing	Market
Output	GL	3.70	1.57
Price	c/L	24.8 (24.3)	–
All-milk levy rate	c/L	2	2

Product manufacture **a**

		Domestic market		Export market	
	Output	Sales	Price	Sales	Price (fob)
	kt	kt	$/t	kt	$/t
Butter	100 (100)	55 (55)	2 466 (2 477)	45 (45)	2 090
Cheese	185 (183)	125 (125)	3 186 (3 199)	60 (58)	2 700
Skim milk powder	127 (122)	62 (61)	2 525 (2 536)	65 (61)	2 140
Whole milk powder	90 (92)	28 (29)	2 926 (2 939)	62 (63)	2 480
Casein	6 (6)	1 (1)	7 327 (7 357)	5 (5)	6 209

Manufacturing costs

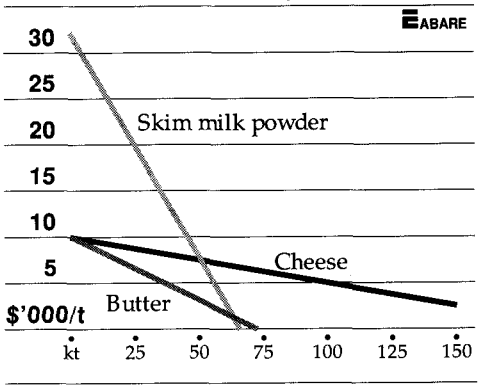
		Technology			
	Unit **b**	Skim milk	Whole milk	Cheese	Casein
Average cost	c/L	4.6	4.8	5.26	3.4

a Figures in parentheses are results generated by the model. **b** Cost per unit input.

A) and the domestic price and consumption figures given in table 7 (on which more detail can be found in Beare et al. 1989) The calculated demand schedules for butter, cheese and skim milk powder (adjusted as part of the calibration process) are shown in figure E.

The cost parameters for the four alternative technologies (termed the wholemilk powder, skim milk powder, cheese and casein 'lines'), were determined using an iterative process. First, a set of relative marginal production costs were found which replicated the product mix presented in table 7. These relative costs were then scaled to generate the base manufacturing milk price, yielding a set of absolute marginal costs. These marginal costs, along with Australian dairy industry survey information on average processing costs, were then used to calculate cost schedules for each technology. The production cost

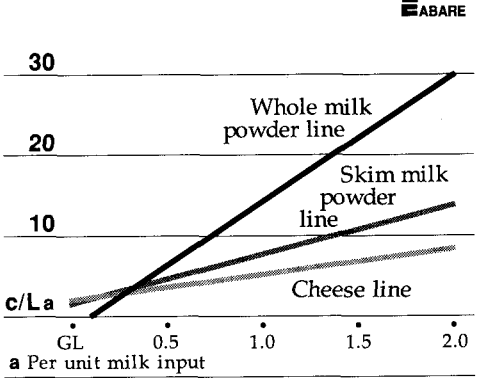
E Australian domestic demand schedules for dairy products



schedules for the skim milk, whole milk and cheese production 'lines' are shown in figure F. (The cost schedule for the casein technology is not included as only a very small amount of milk is used in the production of casein.)

It should be noted that these costs are per unit of milk input, not of product output. This is because output quantities are not directly comparable, and because all lines produce more than one output. From the cost schedule and the yield (appendix A, table 18) of each line, what can be inferred is the combined cost, for any input level, of specific amounts of two or three products. (Butter is a product of all these technologies.) As with any technology producing co-products, there is no specified cost schedule for any one product, and producers must take demands into account in selecting a mix of technologies and setting relative prices.

F Production cost schedules for dairy product technologies



a Per unit milk input

Short term effects of CER

The estimates of the near term effects of free trade with New Zealand on dairy product consumption, trade and prices under the three alternative scenarios considered are presented in table 8. These may be compared with the base results for 1989-90 shown in table 7.

With New Zealand products assumed to enter Australia at the supported domestic prices, and no Australian policy response (the first scenario), there is an incentive for New Zealand to bring milk powders and casein into Australia. As transport costs are a smaller percentage of the landed price for milk powders and casein than for other milk products, it is these (especially milk powders) which seem likely to enter Australia in increased quantities. In the simulation, there is sufficient incentive for New Zealand producers to completely displace Australian milk powders and casein from the domestic to the export market. In addition, a small amount of cheese may be displaced from the Australian market into exports as a result of imports from New Zealand. However, under the assumptions used in the model in regard to relative product prices, there is no incentive for New Zealand to place butter into Australia. Such an outcome is broadly consistent with the New Zealand Dairy Board's view of the potential for

8 Australian dairy product output, sales, imports and prices, under policy alternatives: near term

Scenario and product	Production	Sales		Imports from New Zealand a	Domestic price
		Domestic	Export		
	kt	kt	kt	kt	kt
1: No policy response to New Zealand access					
Butter	100	56	44	0	2 368
Cheese	184	119	65	9	3 059
Skim milk	125	0	125	61	2 425
Whole milk	90	0	90	29	2 810
Casein	6	0	6	1	7 036
2: Export price support reduced to individual product import parity					
Butter	99	56	43	0	2 344
Cheese	190	130	60	0	2 956
Skim milk	123	62	61	0	2 274
Whole milk	87	29	58	0	2 643
Casein	5	1	4	0	6 372
3: Removal of export price support					
Butter	100	58	42	0	2 090
Cheese	187	136	51	0	2 700
Skim milk	123	62	61	0	2 140
Whole milk	87	29	58	0	2 480
Casein	6	1	5	0	6 209

a Relative to baseline case.

New Zealand exports to Australia (Spring 1990).

It can be seen that the increase in Australian exports of milk powders, casein and cheese reduces the export support payments to 13.3 per cent of export prices. (Under the uniform support regime, this reduction of support applies also to butter.)

In the second simulation, the Australian industry is assumed to respond to the threat of New Zealand competition, and retain its domestic market, by lowering the level of export support to match the prices of New Zealand imports for individual products. With the fall in individual product prices to import parity, there is no longer an incentive for the New Zealand dairy industry to export any product to Australia. The reduction of export support eliminates imports from New Zealand and results in a small increase in domestic consumption of cheese, and slightly lower exports of most products, than in the base situation (table 7). These outcomes reflect an adjustment in the product mix as the returns from cheese production increase relative to other products. Total production of cheese increases while the production of butter, milk powders and casein fall slightly.

In the third simulation, in which there is no export price support, domestic price is assumed to fall to export parity. This

results in a greater volume of Australian production of butter and cheese being consumed domestically as Australian consumers respond to the lower prices.

From the perspective of the Australian dairy industry, it is the effects on prices of manufacturing milk and industry returns that are probably of greatest interest. These are summarised in table 9. Prices and revenue for Australian producers of manufacturing milk under the no-response and reduced support scenarios are higher than if export support is eliminated.

Revenues earned by the Australian dairy product industry from domestic and export sales total $1293 million in both the no-response and reduced support scenarios (see table 9).

The estimated welfare changes under the alternative policy response scenarios are also shown in table 9. The calculations provide an indication of the direction and magnitude of the costs and benefits to milk producers and consumers under each alternative. As the costs of manufacturing are roughly equal under the alternative scenarios, and supplies of milk are fixed in the short term, changes to combined net revenue of the milk production and manufacturing industries depend essentially on the price of manufacturing milk net of the all-milk levy. The changes in milk producer revenue in table 9 are shown in a state breakdown in the first half of table 10.

Gains to consumers were computed as the sum of the differences, for each product, between the total consumer surplus in the baseline simulation and that under each scenario. (The summation is valid only if a change in the price of any one dairy product has no influence on the demand for other dairy products.) Transfer payments to New Zealand (including to trans-Tasman

9 Manufacturing milk price, product sales and welfare effects, under policy alternatives: near term

	Unit	Baseline (1989-90)	No policy response	Reduced export support	No export support
Australian prices of manufacturing milk					
Producer price	c/L	24.3	22.6	21.1	18.3
All-milk levy	c/L	2.0	2.0	0.8	0
Net producer price **a**	c/L	22.3	20.6	20.3	18.3
Value of Australian milk product sales, and market share					
Domestic sales	$m	785	497	742	700
Export sales	$m	573	796	551	531
New Zealand imports	$m	0	266	0	0
Domestic market share	%	100	65	100	100
Welfare changes b					
Milk producer revenue	$m	–	–63	–56	–118
Consumer surplus **c**	$m	–	36	69	131
New Zealand	$m	–	31	0	0

a These are not true farm-level prices, since certain other charges to farms are neglected. **b** Relative to baseline situation. **c** The estimate of consumer surplus is an approximation based on the assumption of zero substitutability or complementarity between the products in consumption.

10 Farm revenue, by state, under policy alternatives: near term

Scenario	Unit	New South Wales	Queens-land	South Australia	Tasmania	Victoria	Western Australia
Change in total dairy farm revenue							
No policy response	$m	–4.4	–4.1	–6.7	–3.7	–43.1	–1.3
Reduced export support	$m	1.3	–1.4	–6.3	–3.9	–45.6	0.1
No export support	$m	0.5	–3.9	–13.1	–7.9	–93.0	–0.4
Average change in revenue per farm							
No policy response	$'000	–1.7	–1.8	–6.4	–4.6	–5.1	–2.3
Reduced export support	$'000	0.5	–0.6	–6.0	–4.7	–5.4	0.1
No export support	$'000	0.2	–1.8	–12.5	–9.7	–11.0	–0.7

shipping companies) were computed as the difference between the Australian market value of New Zealand product sold and the value of that product at Australian export prices (excluding support).

With no competitive pricing response by the Australian industry aimed at excluding New Zealand product, there is an estimated $31 million revenue transfer to New Zealand. This transfer is a portion of the revenues previously transferred from Australian consumers to Australian producers as a result of domestic price being above export parity. It is a direct welfare loss to Australia. The lower prices prevailing as a result of imports from New Zealand confer a gain valued at about $36 million on Australian consumers.

Reducing the level of export support to exclude New Zealand product from the Australian domestic market eliminates the transfer payment to New Zealand, and increases the value of gains to consumers to almost $70 million compared with the base case.

In the absence of a specific policy response, the reduction in consumer prices due to New Zealand imports results in Australian milk producers losing an estimated $63 million in revenue relative to their situation prior to the advent of free trade with New Zealand. The revenue loss is slightly less when export support is reduced to import parity for individual products. On the other hand, the complete elimination of the export support scheme results in a substantial decline in dairy industry revenue, but benefits Australian consumers and, in the longer term, the Australian economy as a whole.

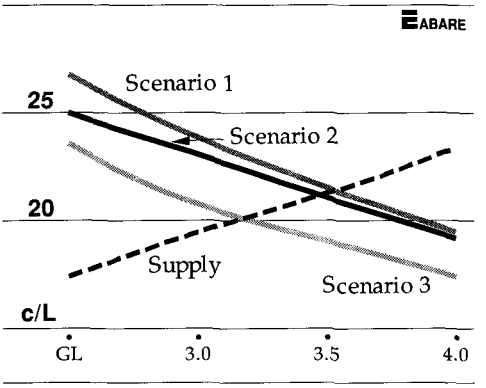
The different pricing and policy arrangements have distributional effects within the Australian dairy industry. The estimates for these, which have been calculated by applying the manufacturing milk price changes from the simulations to state data, are summarised in table 10. Clearly, the Victorian dairy industry suffers the greatest total loss in revenue in all scenarios. However, on a per-farm

basis, the decline in revenue is about equally great also in South Australia and Tasmania, the other states where a large proportion of total milk production is sold as manufacturing milk. Dairy industry revenues are estimated to decline in all states in the first scenario, in which the present level of export support is retained. In the second scenario, where there is a reduction in the rate of export support (and hence in the all-milk levy), New South Wales and Western Australia are better off than in the baseline situation. This is because they sell a large proportion of their total milk production as market milk, with the result that reduced levy payments more than offset the decline in revenue from manufacturing milk. Obviously, these distributional effects will change the incentives for interstate trade. Interstate effects are discussed in more detail in chapter 6.

Medium term effects

A two-stage procedure was used to determine the adjustment in both prices and supplies to a medium term equilibrium. First, demand schedules for manufacturing milk were generated using the processing model. This was accomplished by varying the level of milk available for processing and allowing the model to solve for the manufacturing milk price which would prevail at each level of availability. The exercise was repeated for all three policy scenarios. The results are summarised in table 11. Smooth curves were then fitted to the price and quantity data, as illustrated in figure G.

G Manufacturing milk supply and demands under the policy alternatives



Second, a measure of the rate at which milk supply responds to changes in price was determined. The measure selected was drawn from projections made from ABARE's Econometric Model of Broadacre Agriculture, details of which are given by Dewbre, Shaw, Corra and Harris (1985). In the medium term, a sustained 10 per cent increase in the producer price for manufacturing milk is projected to result in a 15 per

11 Manufacturing milk prices at different levels of availability, under policy alternatives

Scenario	2.5 GL	3.0 GL	3.5 GL	4.0 GL
	c/L	c/L	c/L	c/L
No policy response	26.8	23.9	21.6	19.5
Reduced export support	25.0	23.1	21.1	19.2
No export support	23.6	20.8	19.1	17.4

cent increase in production. Applying this elasticity to the 1989-90 base price and production data (table 7), a medium term supply schedule (also shown in figure G) was constructed. The intersection of this supply schedule with the estimated demand curves gives the equilibrium supply and price of manufacturing milk for the three import support policy scenarios. The modelling of each scenario was then repeated, with the appropriate equilibrium milk quantity in each case. The medium term effects on Australian industry production, sales, trade and prices under the alternative response scenarios are summarised in tables 12 and 13.

In the first scenario, where there is no policy response from Australia to retain market share, there is a moderate (5 per cent) decline in production of manufacturing milk, from 3.7 GL in the base year (table 7) to about 3.5 GL in the medium term. In Australian domestic sales and imports from New Zealand, there is little change from the short term patterns. Australian exports decline in line with the reduction in supplies of manufacturing milk, and accordingly the price support percentage rises slightly, to nearly 14 per cent.

A comparison of the results in table 9 (near term) and table 13 (medium term) reveals that the manufacturing milk price is higher once the Australian industry has had time to adjust its resource inputs to the changed market environment. Also, transfer payments to

12 Australian dairy product output, sales, imports and prices, under policy alternatives: medium term

Scenario and product	Production	Sales		Imports from New Zealand	Domestic price
		Domestic	Export		
	kt	kt	kt	kt	kt
No policy response: manufacturing milk production 3.52 GL					
Butter	95	56	39	0	2 380
Cheese	173	117	56	11	3 074
Skim milk	118	0	118	61	2 437
Whole milk	87	0	87	29	2 824
Casein	5	0	5	1	7 070
Reduced export support: manufacturing milk production 3.47 GL					
Butter	92	56	36	0	2 344
Cheese	175	130	45	0	2 956
Skim milk	115	62	53	0	2 274
Whole milk	83	29	54	0	2 643
Casein	5	1	4	0	6 372
No export support: manufacturing milk production 3.19 GL					
Butter	86	58	28	0	2 090
Cheese	156	136	20	0	2 700
Skim milk	107	62	45	0	2 140
Whole milk	79	29	50	0	2 480
Casein	6	1	5	0	6 209

13 Manufacturing milk price, product sales and welfare effects, under policy alternatives: medium term

	Unit	Baseline (1989-90)	No policy response	Reduced export support	No export support
Australian prices of manufacturing milk					
Producer price	c/L	24.3	23.5	22.0	20.0
All-milk levy	c/L	2.0	2.0	0.7	0
Net producer price **a**	c/L	22.3	21.5	21.3	20.0
Value of Australian milk product sales, and market share					
Domestic sales	$m	785	492	742	700
Export sales	$m	573	734	467	356
New Zealand imports	$m	0	273	0	0
Domestic market share	%	100	64	100	100
Welfare changes b					
Milk producer revenue	$m	–	–30	–17	–43
Consumer surplus **c**	$m	–	31	69	131
New Zealand	$m	–	33	0	0

a These are not true farm-level prices, since certain other charges to farms are neglected. **b** Relative to baseline situation. **c** The estimate of consumer surplus is an approximation based on the assumption of zero substitutability or complementarity between the products in consumption.

New Zealand increase and consumer benefits decline, relative to the short term outcome. However, the reallocation of resources away from the production of manufacturing milk to activities earning a higher economic return would result in an overall gain to the Australian economy.

In the second scenario, domestic sales and the gain in consumer welfare (relative to the baseline case) remain as in the short term. Production of manufacturing milk, however, declines by about 6 per cent, and there is a substantial decline in Australian exports. There is a moderate increase in the price paid for manufacturing milk (table 13) relative to the near term (table 9).

Following the removal of all export support, output of manufacturing milk declines by 14 per cent, to a little under 3.2 billion litres (table 12). This would still be sufficient to support a substantial export sector. As a result, domestic prices remain at export parity, and since domestic sales remain as in the short term, so does the consumer welfare effect (table 13). Because milk producers have time to adjust resources away from the production of manufacturing milk, losses to these producers are only about a third of those estimated for the near term. Thus there are significant gains to the Australian economy relative both to the baseline and to the other export price policies.

CHAPTER 6

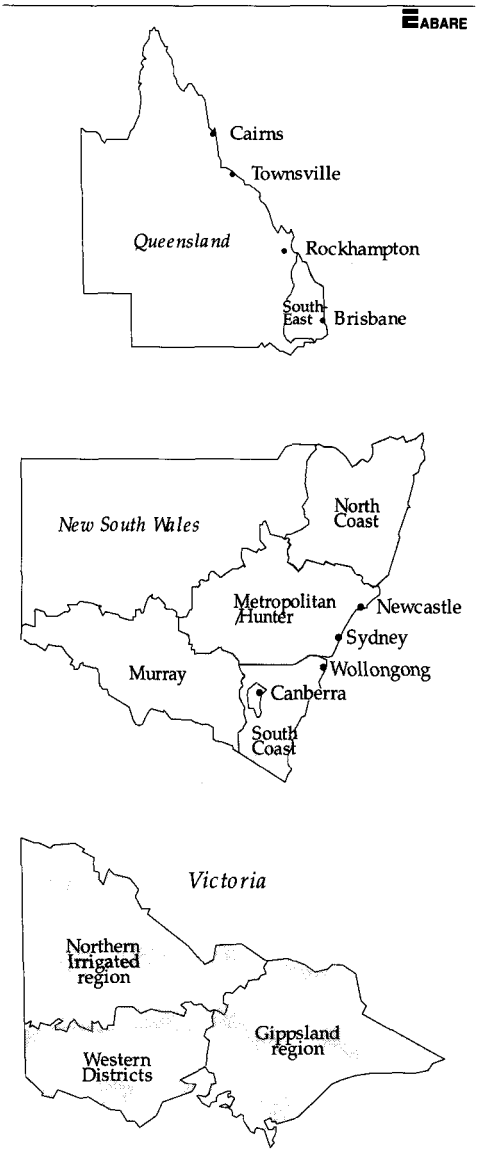
The effects on state and regional milk supply

As reported in the previous chapter, it is likely that the free trade agreement with New Zealand will cause a fall in the prices of manufacturing milk in Australia. Lower prices could result in added pressure for the reform of marketing arrangements for fresh (market) milk. If, while manufacturing milk prices fall, prices paid for milk used for fresh milk consumption continue to be administratively based, largely on assessed cost of production, it is likely that the incentive for interstate trade in fresh milk will increase.

Taken together, an increase in the interstate trade of market milk and lower prices for manufacturing milk are likely to have a significant impact on the regional supply of milk in Australia. In this chapter the likely effects of the free trade agreement on regional milk supply, and possible interstate trade in milk, are quantified.

To analyse the effects of free trade on state and regional milk supply, a programming model of dairy farming in the three eastern Australian mainland states was developed. The model covers Victoria, New South Wales and Queensland, which account for in excess of 80 per cent of Australian dairy production. The regions represented in the model are shown in figure H. The model was constructed using data on specialist dairy farms obtained from ABARE's Australian dairy industry survey. It is designed to be able to

H Dairy producing regions used in the interstate trade analysis



simulate milk production on dairy farms, at quarterly intervals, in accordance with the various state and federal government price and marketing arrangements. The model was designed to allow for changes to the institutional arrangements governing the production and sale of milk, and to estimate total milk supply given alternative prices for market or manufacturing milk. The alternative export support policies considered in the previous chapter enter into the farm model only through their effects on milk prices. An outline of the model is contained in appendix B.

Before discussing the results obtained from the model, it is important to note some limitations to its use. First, the model is not suitable for forecasting: that is, it does not give absolute values of likely output and prices. Rather, it is designed to give differences between outcomes under alternative policies. Production and prices in a base simulation, calibrated to match 1989-90 figures, are used as the bases for comparison with those under different policies. This calibration of the base solution rests on the assumption that if current prices and policies continued to prevail, regional levels of production in Australia would remain unchanged — that is, that the present situation is an equilibrium position, as are those generated by the model. While this is unlikely to hold in practice, it does not detract from the usefulness of the model so long as influences outside the domain of the model affect equally each of the alternatives being considered.

A second limitation of the model is that it can be used to estimate only the total — or, final — adjustment to a policy change. It is not dynamic, and thus cannot be used to estimate the path of adjustment over time. As regards the short run effects of a policy change, the model results indicate only the direction, not the magnitude, of adjustment. The time taken for dairy production to reach the indicated full adjustment to a price change has been shown by Dewbre et al. (1985) to be in excess of five years.

Base estimates of price responses of milk production

Estimated production of manufacturing milk at a range of possible prices is shown in table 14 for Victoria, New South Wales and Queensland, assuming no interstate trade, present production quotas and other marketing arrangements, and prices of market milk at the 1989-90 levels. It should be noted that the prices shown are at the farm level. For example, the price of 20.2c/L corresponds to what is termed a 'net producer price' of 22.3c/L in tables 9 and 13. This is the 1989-90 baseline price in the first, national model. The prices are here taken to be long run equilibrium levels, and the production figures are likewise long run responses to these prices. However, they should not be interpreted as absolute values. What is of interest is the changes in output in response to any given price change.

Not surprisingly, the state where a given increase in the prices for manufacturing milk leads to the largest absolute increase in milk production is Victoria, which is predominantly a producer of manufacturing milk.

14 Estimated state production of manufacturing milk at various prices, under current marketing arrangements

Manufacturing milk price	Victoria	New South Wales	Queensland
c/L	ML	ML	ML
24.2	3 999	593	163
23.2	3 963	434	163
22.2	3 601	279	148
21.2	2 963	245	62
20.2	2 648	102	28
19.2	2 462	87	8
18.2	2 400	38	0
17.2	2 080	28	0
16.2	1 673	4	0

Modelling free trade in fresh milk between states

In order to model free interstate trade in market milk, each state is assumed to have a market milk demand (dependent on price) which may be supplied by any of the individual regions or farm types. Allowance is made for the cost of transporting market milk between states and regions. Quota constraints for market milk in New South Wales and Queensland are removed. The 'blended' pricing scheme in Victoria is discarded. Thus, milk used for manufacturing purposes receives the actual (or marginal) return from each additional unit produced.

The market milk demand in each state was determined from individual state demand curves, calculated using price elasticities from the EMABA model described by Dewbre et al. (1985). When these demand curves are incorporated into the farm model, each additional litre of market milk produced receives a successively smaller return. Production of market milk expands until either the return from the last unit of market milk produced (the marginal return) equals the cost of its production (the marginal cost), or until the price of market milk is equal to the price of manufacturing milk.

Costs of transport were estimated using a regression analysis of milk transport costs in Victoria. Two alternative, lower, scales of transport charges were also used, since transport costs seem likely to be reduced by technical change.

Trade in market milk is also influenced by the price of manufacturing milk. Milk from each region and/or farm type is sold as either market or manufacturing milk depending on which type provides the higher return. A reduction in the price of manufacturing milk results in increased supply, and lower prices, for market milk.

Supply response with free trade between states

Estimates of milk production by region in Victoria, New South Wales and Queensland in the event of interstate free trade in market milk are as reported

15 Model estimates of milk production, by region, under current constraints and with free interstate trade a

State and region	Constrained b			Free interstate trade c		
	Manufacturing milk	Market milk	Total	Manufacturing milk	Market milk	Total
	ML	ML	ML	ML	ML	ML
Victoria						
Western Districts	617	72	689	572	0	572
Northern irrigated	1 297	1 432	1 309	53		1 362
Gippsland	734	114	848	429	299	728
Total	2 648	321	2 969	2 310	352	2 662
New South Wales						
North Coast	115	99	214	151	30	181
Metropolitan	0	154	154	0	179	179
South Coast	48	116	164	0	233	233
Murray	38	23	61	53	0	53
Total	201	392	593	204	442	646
Queensland	28	113	141	31	196	227

a Assuming an average farm-level price for manufacturing milk of 20.2c/L, the farm price in the 1989-90 base year. **b** All current arrangements continue; interstate trade is prevented. **c** Also, production quotas and related marketing measures are abolished.

in table 15 for the case where transport costs are as presently estimated. (These results are for representative farms, and do not show the variances characteristic of complete farm populations.) With the same average manufacturing milk prices, production of market milk in each state is slightly higher with free trade than under the present constraints. This outcome may be interpreted as being consistent with zero net interstate trade in market milk. That is, given current production and transport costs, New South Wales and Queensland dairy farmers can supply their respective states' fresh milk requirements more competitively than can Victorian dairy farms at most times of the year. There is, however, a substantial realignment of the market/manufacturing mix within and between regions of each state.

In New South Wales, market milk requirements are sourced mainly from the Metropolitan and South Coast regions, the former because of its closeness to the major market and the consequent freight advantage, and the latter because of a combination of relative market proximity and production costs. The two remaining regions (North Coast and Murray) sell most of their milk as manufacturing milk. The Metropolitan and South Coast regions produce no manufacturing milk, meaning that marginal costs of production in these regions are greater than the price of manufacturing milk.

Within Victoria, Gippsland becomes the main supplier of fresh milk, largely because of the freight advantage in supplying the major Melbourne market. The Northern Irrigated Region continues

16 Estimated state production of manufacturing milk at various prices, with free trade between states

Manufacturing milk price	Victoria	New South Wales	Queensland
c/L	ML	ML	ML
24.2	3 862	554	87
23.2	3 317	383	84
22.2	2 578	345	82
21.2	2 576	272	76
20.2	2 311	204	31
19.2	1 660	84	0
18.2	962	24	0
17.2	697	4	0
16.2	40	0	0

to produce some market milk in the autumn period, when supply from non-irrigated farms in Gippsland becomes more difficult at the manufacturing milk price.

In Queensland, there is self-sufficiency and some manufacturing milk is produced. Because of the distance of the Brisbane market from Victoria, and the resulting high cost of transport (estimated at around 12c/L), there is little opportunity for low cost Victorian producers to sell fresh milk into that market. Likewise, any production cost advantage of producers on the North Coast of New South Wales, though they do not suffer the same freight disadvantage as potential Victorian suppliers, appears to be insufficient for them to achieve any significant penetration of the Queensland market at the assumed manufacturing milk price and estimated transport costs.

However, returns from manufacturing milk may fall as a result of free trade with New Zealand (or indeed, as a result of a collapse in world prices for dairy products). In the model, lower returns for manufacturing milk increase the possibility of interstate trade in market milk as producers of manufacturing milk seek higher returns than are available from that source. In order to determine the effects of variations in manufacturing milk prices, responses were tested over the price range 16.2c/L to 24.2c/L at 1c/L intervals. The resulting solutions were used to ascertain the sensitivity of interstate milk trade to changes in manufacturing milk prices. Since the extent of any trade in market milk will depend on transport costs, and the latter are likely to fall for technological reasons, the exercise was repeated with two alternative rates of transport charge.

Table 16 contains estimates of manufacturing milk production for the range of prices examined. These figures were used to estimate the possible extent of interstate trade flows in market milk. As expected, trade in market milk increases as the manufacturing milk price falls (table 17), the trade being from Victoria to New South Wales and from northern New South Wales to Queensland. The milk traded into the New South Wales market comes from the Northern Irrigated Region of Victoria. At a manufacturing milk price of 18.2c/L, and at transport costs based

17 Estimated interstate trade in fresh milk

Manufacturing milk price	Victoria to New South Wales			New South Wales to Queensland		
	a	b	c	a	b	c
c/L	ML	ML	ML	ML	ML	ML
20.2	0	0	46	0	0	18
19.2	0	63	121	0	19	25
18.2	56	125	161	22	25	26
17.2	87	188	257	23	24	26

a Transport costs obtained from a regression based on Victorian regional milk transport costs. Transport cost (c/L) = 0.01235 + 0.0624 *D* where *D* is distance in '000 km. **b** Transport cost = 0.01235 + 0.0486D. **c** Transport cost = 0.01235 + 0.0312D.

on those actually observed, Victoria supplies 14 per cent of New South Wales' market milk requirement, all of it during the April–September period when, in the model, production costs in the principal supplying areas are above the supply price (inclusive of transport charges) from northern Victoria.

To simulate technical advances in milk transport, the variable cost component (charge per kilometre) was reduced by 25 per cent and 50 per cent. In the second of these cases, though not in the first, market milk is traded from Victoria to New South Wales and from New South Wales to Queensland when the manufacturing milk price is 20.2c/L. In this scenario, Victoria supplies around 10 per cent of the New South Wales market milk requirements, while the North Coast region of New South Wales supplies around 9 per cent of the market milk requirements of Queensland. The reduction in transport costs, like that in prices for manufacturing milk, affects the trade from Victoria to New South Wales far more than that into Queensland.

These results indicate that if the current restraints on interstate milk trade, and related arrangements, were to break down, the extent of interstate trade in milk could be quite significant. Relatively small reductions in prices of manufacturing milk or transports costs could result in significant quantities of milk being traded.

The results presented relate to the transport of bulk milk from depots in one region to processors in another region. In reality the transport of fresh milk could occur at any stage of the marketing process. However, the costs of transporting packaged milk are likely to be higher than those of transporting bulk milk. Hence, assuming that processing costs are similar between factories, the results presented can be seen as maximum figures for interstate sales at given transport costs.

CHAPTER 7

Policy implications of free trade with New Zealand

The results presented in chapters 5 and 6 confirm that the current export support scheme creates an incentive for New Zealand to place manufactured dairy products into the Australian market, and that this could have significant implications for the domestic marketing arrangements for both manufacturing and market milk.

In this chapter, the policy implications of free trade with New Zealand in dairy products are examined, and some possible policy responses (based on the analysis presented in the preceding two chapters) are explored. In the ensuing discussion it is assumed that the principal policy objective for the industry should be improved economic efficiency, so as to maintain the industry's ability to remain competitive in world markets as well as in the domestic market.

Maintaining export support

As was demonstrated in chapter 5, if the percentage level of export support remains equal for all eligible products, the incentives for the export of New Zealand product to Australia are greatest for milk powders and casein. This is because, for these products, trans-Tasman transport costs are a lower percentage of landed value than for other products. The difference between landed values and the supported domestic prices for these products is, in theory, sufficient to displace Australian production from the domestic to the export market. In contrast, the potential for growth in cheese imports from New Zealand appears limited. Here, the volumes imported would be likely to depend critically on the landed value of New Zealand product. Furthermore, at current transport costs and prices, there does not appear to be any incentive for New Zealand to export butter to Australia.

The increased availability of New Zealand dairy products on the Australian market can be expected to result in lower domestic prices. This will benefit Australian consumers, but will reduce returns to Australian dairy producers. The model simulation indicates that the greatest losses, on a per-farm basis, would occur in South Australia, Victoria and Tasmania, which produce a large percentage of manufacturing as opposed to market milk. New Zealand would capture some of the producer revenue generated by the export support scheme — namely, the difference between Australian domestic prices and New Zealand's returns from exports to other markets. Thus, some of the revenue previously transferred from Australian consumers to Australian producers, as a result of domestic prices being maintained above export parity, would go to New Zealand producers (and trans-Tasman shippers). The outcome would be a net social loss to the Australian economy.

Such losses can be reduced or avoided, however, by some adjustment to the method of determining export support payments. As can be seen from the analysis of alternative policy scenarios, the Australian industry can compete effectively with New Zealand to retain its share of the domestic market. It has been argued (ABARE 1991) that market share could be maintained by the Australian Dairy Corporation setting market support payments for individual products equal to the costs of transporting such products between New Zealand and Australia. Domestic prices would, as a result, be supported at actual import parity level. An alternative approach would be to reduce market support payments on individual products until no New Zealand product enters Australia. However, this latter approach might well be costly to administer because of the need for constant fine tuning.

While the adoption of the above types of competitive pricing strategies seem likely to lead to lower returns for Australian dairy producers compared with the present support payments, the revenue transfers to New Zealand would be eliminated, with all of the benefits of the price change then accruing to Australian consumers and the Australian economy as a whole. Reducing the size of export support payments would also mean that the all-milk levy paid by dairy farmers could be reduced.

The results presented here are not without some important qualifications, however, especially with respect to trade outcomes and estimates of the gains and losses to producers and consumers from the alternative actions. For example, the analysis does not take into account any form of non-price competition. Such competition could take two forms.

First, individual firms in Australia may compete to retain market share by cutting prices of their own brands. In this way, domestic prices could fall below those suggested above on the basis of support at average 'import parity' prices. In such an event, the incentives for New Zealand to place product into Australia, and the revenue transfers from consumers to producers as a result of maintaining export support, would be lower than indicated by the analysis. (Nevertheless, the resource allocation distortions arising from paying Australian producers an export return greater than the actual marginal return from exports would remain.)

Second, the mere knowledge that Australia may cut support to remove any incentive for New Zealand to export to Australia may be sufficient to deter imports. Should this be the case, the estimated losses to the Australian industry and the economy of continuing the current export support arrangements would be overstated.

Removing export support

As confirmed by the results presented in chapter 5, the elimination of all export support could be expected to have a significant effect on returns to dairy producers, as domestic prices would then be expected to fall to export parity. This would result in a substantial reduction in exports and, in the longer term, a reduction in milk production. However, at international dairy prices prevailing in 1989-90, the amount of manufacturing milk produced would still be sufficient to sustain a large export sector.

Because of the relatively high costs of trans-Tasman freight, it is unlikely that New Zealand product would enter the Australian market under such conditions. Entry would occur only if the marginal costs of production in New Zealand were lower than Australia's by more than the cost of freight. (However, it is possible that exchange rate movements could occur over time to make imports more profitable. Such movements would lead to a long term marginal cost advantage for New Zealand producers. This cost advantage would also allow New Zealand producers to export to other markets at lower prices than Australian producers.)

Removal of export support would affect producers in the manufacturing milk states (Victoria, Tasmania and South Australia) more than in the other states, since producers in those states are the principal beneficiaries of the current arrangements (see table 5). With lower prices for manufacturing milk, there would be pressure for greater interstate trade in market milk and probably erosion of the price premiums existing in that market.

While the results obtained using the eastern states programming model and presented in chapter 6 are indicative of little or no interstate trade in market milk under free interstate trade at present milk prices, it was found that trade would occur if the farm-level price received for manufacturing milk moved significantly below 1989-90 levels, as might occur in consequence of increased imports from New Zealand.

Spreading the adjustment burden

Whether as a result of free trade with New Zealand or — more generally — of a weakening in the world dairy products market, there is a possibility of an adjustment which would fall disproportionately on Victorian and Tasmanian producers. The question arises, therefore, of how best to spread this burden more equitably.

One way of doing this would be to create a single national market for milk, based on 'production entitlements' for market milk, as proposed in ABARE's submission to the Industry Commission inquiry into dairy marketing arrangements (ABARE 1991). Another would be for each state to allow producers in other states to trade quotas for the supply of its market milk requirements.

APPENDIX A

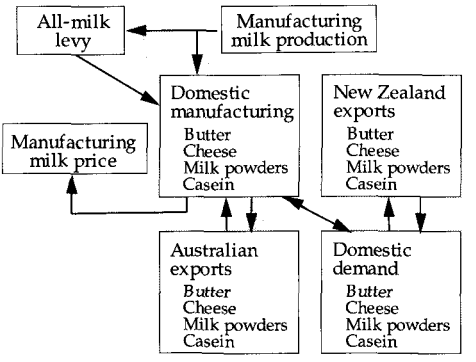
The national model

The programming model was designed to represent the economic incentives and outcomes in the production and trade of manufactured dairy products in Australia under different market conditions and policies. A mathematical programming model is formulated as an optimisation problem, solved by maximising some function subject to a set of constraints. The function and constraints are in this case chosen such that the solution to the problem satisfies two criteria. The first is that the price and quantity flows are fully determined. The second is that the production and allocation decisions represented by the model maximise the combined net returns to producers and consumers.

The discussion of the model in this appendix is limited to a description of the price and quantity flows and conditions represented by the model solution. A technical discussion of the model can be found in Beare, Domine and Lembit (1989). A diagrammatic representation of the model components is presented in figure I. The components include domestic production of the major manufacturing products, domestic demand, and Australian and New Zealand exports. Australian manufacturing and market milk supplies are predetermined in a given scenario. The all-milk levy is collected on both manufacturing and market milk. Manufacturing milk is allocated to the production of butter, cheese, skim milk powder, whole milk powder and casein. Four alternative production 'lines' are specified within the model. The four technologies yield joint products, as shown in table 18. Manufactured products are then allocated to the domestic and export markets. Manufactured dairy products from New Zealand can enter the Australian domestic market as long as the Australian domestic price for a product is high enough to yield a profit to New Zealand.

The production and allocation decisions of the Australian manufacturing industry are made on the basis of prices and the level of export support payments. The industry is assumed to be competitive. Hence, manufacturers maximise profits in response to domestic prices, export prices and support payments, without consideration of how their decisions may affect prices and

I Schematic diagram of the model used for the evaluation ABARE



18 Product yields of alternative manufacturing technologies

Technology ('line')	Butter	Skim milk powder	Whole milk powder	Cheese	Casein
	t/ML	t/ML	t/ML	t/ML	t/ML
Skim milk	54.5	82.4	5.4	–	–
Whole milk	14.9	–	135.9	–	–
Cheese	9.8	–	1.0	104.8	–
Casein	54.5	–	5.4	–	28.7

payments. Throughout the analysis both export (world) prices and the exchange rate between Australia and New Zealand are assumed constant. Support payments, and hence domestic product prices, are endogenous.

The product mix is determined by relative product prices, production costs and the production technologies ('lines'). The optimal product mix is achieved when the marginal net returns from each product line are equal — that is, when the transfer of a unit of manufacturing milk from one product line to another cannot increase profit. (Conversely, if, at the margin, the net return from one line exceeds that of another, the transfer of milk from one line to the other will increase profits.) The production costs of the four technologies were among the variables adjusted in calibrating the model to give the observed 1989-90 outputs and prices.

The price of manufacturing milk is the maximum price manufacturers are willing to pay for an additional unit of milk. This maximum equals the net return from processing an additional unit of milk and selling the associated product. (If the net return from processing an additional unit of milk were greater than the manufacturing milk price, manufacturers would be able to bid at higher prices to obtain additional milk. When the marginal net return is equal to the manufacturing milk price, manufacturers will have no incentive to expand production.)

There is a trade-off in the allocation of production between the domestic and export markets. If the allocation to the domestic market is increased, prices will need to fall to induce consumers to purchase the additional product. It is assumed that an increase in Australian exports, in contrast, will not affect world prices for manufactured dairy products. However, as exports are increased, support payments will fall as the all-milk levy is spread over a greater volume of product. At the profit-maximising allocation, the domestic price of each product will be equal to the export price plus the support payment. That is, any diversion of product from one market to the other will not increase industry returns.

The domestic market is represented by a set of consumer demand schedules which specify the quantity of product consumers are willing to purchase at given prices. For butter and cheese these demands are generally for direct consumption. For milk powders and

APPENDIX A

19 Response characteristics of the wholesale-level demand schedules used

Product	Percentage change in quantity demanded in response to a 1% change in price	Percentage change in price resulting in a 1% change in the quantity demanded
Butter	–0.27	–3.70
Cheese	–0.90	–1.11
Skim milk powder	–0.25	–4.00
Whole milk powder	–0.25	–4.00
Casein	–2.00	–0.50

casein the demands are largely indirect, being derived from the demand for other products which they are used to produce. In the model, the demand schedules determine the responses in domestic consumption to changes in product prices. In general, demand for dairy products is not highly responsive to changes in price. This implies that a small change in the volume of product placed on the market can have, in relative percentage terms, a large effect on price. The responsivenesses at wholesale level of product demand to price change, and vice versa, employed in the analysis are presented in table 19.

The effect of New Zealand imports on Australian returns

The New Zealand Dairy Board has sole control of the disposition of exports of dairy products from that country. It is therefore in a good position to adjust exports to Australia in the light of the potential or actual effects of its actions in the Australian market. These include the effect of New Zealand exports to Australia on prices, and the potential competitive response of the Australian industry. Within the model, the effect of New Zealand exports on Australian domestic prices is taken into account in determining the profit maximising level of exports for the New Zealand dairy industry.

An increase in New Zealand exports to Australia will place downward pressure on Australian domestic prices and hence reduce domestic returns to Australian producers relative to their export returns. This will result in the diversion of Australian product from the domestic to the export market, which in turn will lower the level of unit export support payments. Australian domestic prices are assumed to equal export prices including the support payments. It is also assumed that one unit of product from New Zealand will result in the displacement of one unit of Australian product from the domestic to the export market.[2] Thus, the fall in domestic prices is equal to the reduction in export support resulting from the all-milk levy being distributed over the additional Australian export volume. An increase in exports of any one product will affect the overall level of support and therefore domestic prices of all products.

From the perspective of the New Zealand industry, a unit increase in

2 The true rate of displacement would be slightly less than one, due to the fact that, as domestic prices fall, total demand increases.

exports has two effects on total revenue. First, there is the contribution to total revenue of the sale of an additional unit of product. Second, there is the effect of the price reduction on all units sold. Marginal revenue is the product of both effects. Marginal revenue will continue to decline as exports expand, as each successive decline in price applies to progressively larger quantities. As long as the net revenue from an additional unit of exports to Australia exceeds the landed cost of the product in Australia, there is an incentive to expand exports. At the profit-maximising level of exports for New Zealand, the net revenue from the last unit will equal its landed cost.

APPENDIX B

The regional supply model

The Australian dairy industry is composed of six state industries which, in many respects, can be regarded as separate, due to differences in state government regulations together with constraints on interstate trading. Therefore, the approach taken to the construction of an Australia-wide programming model was to build individual state models that can be run independently or linked together as appropriate. Models were developed of three states (New South Wales, Victoria and Queensland) which account for 84 per cent of total milk production in Australia.

The data used in constructing most of the farm-level technical coefficients in the model were final estimates for 1986-87 from ABARE's annual survey of dairy farms, the Australian Dairy Industry Survey. The basic information used related to specialist dairy producers who had an estimated value of agricultural operations (EVAO) greater than $20 000 in the 1986-87 survey. For the purposes of analysis, it was assumed that in the period from that year to the model base year, 1989-90, costs and returns had risen at approximately similar rates (allowing some mutual adjustment for model calibration).

In essence, the programming models are designed to simulate milk production on a representative (in fact, aggregate) dairy farm. One such farm model was developed for each region or for each of two or more types of farm (where these could clearly be distinguished) within a region. Each state model comprises the representative farms in that state plus the state milk market, which is cleared each quarter. Each representative farm has a pool of physical resources (such as land, labour and capital) which are used as inputs to the various activities in the model. Some of these activities, such as growing pasture, purchasing feed, and buying stock, cost the farmer money, while other activities, such as selling milk and selling stock, earn revenue. The objective in the model is to maximise net revenue (receipts over costs); the model maximises this function at annual intervals given resource levels, prices, and the activities available. Within each year, four quarters are distinguished as regards activity inputs and outputs.

The feed activities comprise growing pastures and buying grain. The pasture growing activities use land, labour, and capital and provide energy for cattle, and also incur costs. The amount of energy provided by a pasture activity in each quarter depends upon the type of pasture (annual, perennial, lucerne and so on) and the season. The available energy may be utilised in the same period it is produced, or it may be conserved in the form of hay or silage and fed out at a later period.

Resources for each region or farm type in the model are calculated by

aggregating the resources of the Australian Dairy Industry Survey sample farms in the particular farm type or region (ABARE 1989). For market milk, possible sales are limited, and the limit for each model farm was taken to be the total actual market milk production of the appropriate sample farms. Manufacturing milk production in the model has no such constraint.

Market milk states

Dairy farming in Queensland is principally carried out in the south-east corner of the state. the Queensland model has thus been limited to this region only. Two representative farm submatrixes are used, based on the results of a statistical clustering analysis of the Queensland sample farms. On the basis of that analysis, dairy farms in Queensland were separated into two categories according to whether or not they produced significant quantities of manufacturing milk. Those farms which produced significant quantities of manufacturing milk had lower total cash costs per litre of milk than the farms which did not produce manufacturing milk, suggesting that the latter have marginal costs of milk production higher than the manufacturing milk price. The sample farms were then classified into the two farm types, and regional resource levels and technical coefficients calculated for the two sub-matrixes. For further details on technical coefficients, resource levels, and the statistical clustering analysis see Williamson, Topp and Lembit (1988).

The New South Wales model is made up of eleven submatrixes representing various regions and farm types. New South Wales milk production is divided into four regions: North Coast; Sydney Metropolitan and Hunter Valley; South Coast; and Riverina–Murray. Dairy farms are classified into three types: mainly market milk producers; seasonal manufacturing milk producers; and 'winter' (that is, all-year) manufacturing milk producers. Separate submatrixes were constructed to represent each farm type in each region. As only two farm types could be identified in the Riverina–Murray region, only eleven such submatrixes were required. For full details on the construction of the New South Wales model, including farm types, regions, and resource levels, see Williamson et al. 1988.

To simulate the milk quota schemes in New South Wales and Queensland, each farm type in each region is constrained to produce a quantity of market milk equal to the total quota entitlements of the relevant sample farms. The market milk price is paid for this milk. In the manufacturing milk submatrixes, once this constraint is met further milk may be produced and sold at the manufacturing milk price, in accordance with the objective of maximising net revenue. (Processers offer suppliers a set price for each litre of milk they use for manufacturing dairy products, and farmers will produce manufacturing milk up to the point at which the cost of producing an extra litre of milk is equal to this return.)

A manufacturing milk state: Victoria

A statistical analysis of milk production characteristics among the Victorian dairy specialists surveyed was undertaken in an attempt to identify easily definable farm types. However, no evidence of

systematic differences among farms could be identified, and the Victorian industry is therefore simply modelled as three regions, each with its own average resource levels and technical coefficients. In Victoria, the pricing system for milk is different from that in New South Wales or Queensland. The revenue from the (higher returning) market milk sales is averaged out over all milk sales, resulting in a single 'blended' price for each litre of milk produced which is higher than the industry price for manufacturing milk. In the Victorian sector of the model, the blending formula is incorporated into the model's objective function. (The likely effects of this scheme on resource allocation are referred to in chapter 3.)

References

ABARE (1989), *Farm Surveys Report*, AGPS, Canberra.

—— (1991), *Future Dairy Marketing Arrangements*, Submission 91.3, to the Industry Commission, AGPS, Canberra.

ABS (Australian Bureau of Statistics) (1986), *Manufacturing Establishments, Summary of Operations, Australia*, 1986-87, Cat. No. 8202.0, Canberra (and previous issues).

—— (1988), *Manufacturing Establishments, Details of Operations by Industry Class*, Australia, Cat. No. 8203.0, Canberra (and previous issues).

—— (1990), *Foreign Trade, Australia*, Exports, 1988-89, Cat. No. 5436.0, Canberra (and previous issues).

Australian Dairy Corporation (1988), *Annual Report, 1987-88*, Melbourne.

Bardsley, A.J. (1990), Australian dairy manufacturers meeting the competitive challenge. Paper presented at the National Agricultural Outlook Conference, Canberra, 30 January — 1 February.

Beare S., Domine L. and Lembit, M. (1989), Trans-Tasman trade in manufactured dairy products: A mathematical programming model of imperfect sectoral competition. Paper presented at the 33rd Annual Conference of the Australian Agricultural Economics Society, Christchurch, New Zealand, 7–9 February.

Call, S. and Holahan, W. (1983), *Microeconomics*, 2nd edn, Wadsworth, California.

Department of Primary Industry (1986), New dairy marketing and assistance arrangements, Canberra (unpublished).

Dewbre, J., Shaw, I., Corra, G. and Harris, D. (1985), *EMABA: Econometric Model of Australian Broadacre Agriculture*, AGPS, Canberra.

Industry Commission (1990), *Annual Report 1989-90*, AGPS, Canberra.

Lembit, M.J. and Bhati, U.N. (1987), 'Farm cost effects of dairy policies', *Review of Marketing and Agricultural Economics* **55**(3), pp. 201–12.

Lembit, M., Topp V., Williamson G. and Beare S. (1988), 'Gains from a negotiable milk quota scheme for New South Wales', *Quarterly Review of the Rural Economy* **10**(3), 255–60.

OECD (1990), *Agricultural Policies, Markets and Trade: Monitoring and Outlook 1990*, OECD Publications Service, Paris.

Primary Industry Newsletter (1991), *Primary Industry Newsletter*, 2 April, pp. 3–4.

Small, A. (1987), Structure, concentration and cost schedules of the Australian dairy processing sector. Paper presented at the 31st Annual Conference of the Australian Agricultural Economics Society, Adelaide, 10–12 February.

Spring, D. (1990), The outlook for international dairy markets. Paper presented at the National Agricultural Outlook Conference, Canberra, 30 January – 1 February.

REFERENCES

Topp, V., Williamson, G., Lembit, M. and Beare, S. (1989), The resource costs of blended milk pricing in Victoria. ABARE paper presented at the 33rd Annual Conference of the Australian Agricultural Economics Society, Christchurch, New Zealand, 7–9 February.

Williamson, G., Topp, V. and Lembit, M. (1988), A subregional linear programming model of the New South Wales dairy industry: technical documentation. ABARE paper presented at the Australian Economics Congress, Canberra, 28 August – 2 September.

B91/21698 Cat No 91 1360 0