

Shortages in Refrigerated Shipping

Occasional Paper

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Shortages in Refrigerated Shipping

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ABSTRACT

Changes in the markets for Australia's refrigerated exports have created pressures on cargo facilities on ships and at ports. This demand has led some exporters to express concern at the difficulties in obtaining sufficient cargo space, particularly during the peak season.

This Paper aims to provide an overview of the seaborne export of refrigerated goods, identify whether problems exist and their magnitudes, and explore possible future directions for change.

The refrigerated export market is described and analysed for the period 1982-83 to 1986-87 (the latest available detailed trade data). The utilisation of cargo space to the major trade areas and by port of loading was estimated for the period 1986-87 to 1988-89, and forecast for 1989-90. It was concluded that exporters would have had difficulties in obtaining sufficient refrigerated cargo space to a number of trade areas in peak periods. However, the industry is adjusting refrigerated capacity (although with some time lag) to meet the shifts in demand patterns.

A range of emerging issues which are likely to affect the economic outlook of the industry are discussed. The Paper concludes with an outline of a number of measures which might be undertaken by industry to improve performance. Suggested measures include the introduction of seasonal rate structures; increased use of chartered ships; introduction of a booking system on a fee paying basis; and increased communication and co-operation between all industry participants.

FOREWORD

This Paper was initiated from a request by the Maritime Policy Division of the Department of Transport and Communications to identify possible causes of refrigerated cargo space shortages, their magnitudes, and some solutions that may assist in alleviating these shortages.

The report was undertaken by a team led by Dr N. Ada. Members of the team were Mr S. Wheatstone, Ms S. Zapirain and Ms R. Lyne, with assistance from Mr G. Haselberger.

The preparation of this Paper was greatly assisted by the Maritime Policy Division of the Department of Transport and Communications. The Bureau would also like to acknowledge the considerable assistance provided by all the organisations approached by the Bureau in the course of the study.

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Bureau of Transport and Communications Economics
Canberra
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SUMMARY

The refrigerated shipping industry has experienced steady growth over recent years to return to the high levels of 1982-83. In 1986-87¹, Australia exported nearly 1.12 million tonnes of refrigerated produce by sea, valued at \$2755 million. This represented 9 per cent of Australia's total seaborne exports by value in 1986-87.

Meat has dominated refrigerated exports, accounting for 68 per cent of export volumes in 1986-87. Dairy, fruit and vegetable products accounted for a further 12, 11 and 7 per cent respectively. Seafood, although accounting for less than 3 per cent of refrigerated export volumes, was the most valuable refrigerated cargo at an average unit value of \$13 100 per tonne. This compares with an average of \$2500 per tonne for all refrigerated cargoes.

The major markets for Australian refrigerated products are the North American, China Sea and European regions. These three markets accounted for over 86 per cent of refrigerated exports by value in 1986-87.

Shipping lines which provided a refrigerated service called at a total of 22 Australian ports in 1986-87. Nearly 81 per cent of Australia's refrigerated exports passed through the ports of Melbourne, Brisbane and Sydney. Fremantle and Adelaide accounted for a further 12 per cent.

AVAILABILITY OF CARGO SPACE

Large demands have been placed on refrigerated cargo facilities on ships and at ports between 1986-87 and 1987-88. This demand has led some exporters to express concern about cargo space shortages, particularly during the seasonal peak to the European market. In

1. 1986-87 was the latest available detailed trade data.

addition, there was some concern expressed about the availability of porthole facilities at major ports to meet the demand. A number of factors led to this apparent shortage of space during this period.

First, exports of refrigerated cargoes to both the North American and European regions have grown steadily over recent years. This growth has not yet been matched by significant growth in shipping capacity, resulting in a tightening in the availability of cargo space. The change in trading patterns has coincided with a change in the commodity mix. Horticultural exports have risen steadily, and have resulted in large demands for suitable containers for chilled products.

Second, the change in the commodity mix has also brought about fundamental changes in the timing of exports. Over the last five years, the timing of exports have shifted from a pattern of relatively low seasonal variation to one of distinctive seasonal peaks, particularly in the North American and European trade areas. It is these peaks which have caused problems in the availability of cargo space.

Third, the tightening in the availability of cargo space can also be seen in terms of the growing world refrigerated market and the exchange rate changes brought about in Australia over the last few years. Where shipping companies have thought freight rates for export cargoes were too low, they have been prepared to shift resources to other more profitable trades. Australian exporters also compete for cargo space with New Zealand exporters in the seasonally tight trades of Europe and North America.

Finally, the turnaround in the trading balance of Australian imports and exports has also contributed to problems in cargo space. By 1986-87, the reduction in inbound liner services resulted in a decline in refrigerated export capacity, at a time when exports were increasing. The tightening of cargo space has created further problems as some shippers overbooked or double booked refrigerated cargo space resulting in under utilised space at departure time.

MEASURES TO IMPROVE PERFORMANCE

Total volumes of refrigerated exports in 1989-90 are forecast to increase from previous years' levels. Utilisation levels of refrigerated capacity in the ports and trade areas are expected to return to the 1987-88 levels. As a result of the liberalisation of the Korean and Japanese meat markets, utilisation of shipping capacity

to these markets is expected to increase sharply. Utilisation of shipping in the European trades is expected to continue at high levels in the peak period of March to May. Industrial problems on the Australian waterfront in early 1989 appear to have aggravated the situation.

In the short-term, the issues of the seasonality of exports and the booking practices should be addressed. A change to a seasonal freight rate structure and the increased use of chartering of refrigerated vessels should be considered as a means to reduce the peak demand facing liner services. The introduction of a forward booking system incorporating fees and penalties would also have a significant effect on increasing the utilisation rates of individual ships and containers.

In the long-term, shipping companies and terminal operators are already reacting to the tightening of cargo space. Shipping companies involved in all trades are reviewing their respective capacities, and where necessary, are endeavouring to provide additional capacity. There are also plans by terminal operators to provide additional porthole facilities in the port of Melbourne. In the longer term, it appears that commercial developments in the shipping industry will provide adequate refrigerated cargo space if effective utilisation can be improved through more efficient pricing and booking arrangements.

CHAPTER 1 INTRODUCTION

The export of refrigerated products by sea is a major industry in Australia and in 1986-87 accounted for \$2755 million or 9 per cent of total seaborne exports. By 1986-87, refrigerated exports had returned to the 1982-83 levels, after a sharp drop in 1983-84. The steady growth experienced in the period 1984-85 to 1986-87 is expected to continue in the short-term.

Although refrigerated volumes have not changed substantially between 1982-83 and 1986-87, the mix of commodities and the trading patterns have changed. These developments, along with other factors, have placed large demands on the availability of refrigerated cargo space on ships and at ports, and has led some exporters to express concern about shortages in cargo space.

Despite the significance of the industry and the changes in the task, no comprehensive analysis of the industry has been undertaken. This Paper aims to provide an industry overview of the export of refrigerated goods, identify whether problems exist and their magnitudes and explore possible future directions for change.

SCOPE OF STUDY

Refrigerated goods are defined in this study as perishable food products that require controlled environments while in transit. The major refrigerated trades are meat, fish, fruit, vegetable and dairy products.

There are two ways in which refrigerated cargoes may be carried by sea. The first is as non-bulk cargo in the refrigerated holds of a ship. Such ships are referred to as 'reefer ships' in this Paper. The second method of transporting refrigerated products is in specialised refrigerated containers which are known as 'reefers'. Appendix I contains details of the commodities requiring refrigeration and the types of containers used to transport refrigerated cargoes.

The emphasis of this Paper is on the seaborne transport of refrigerated cargoes since it accounts for approximately 91 per cent of refrigerated export volumes. Although there are no shortages of inbound refrigerated space, the import task is also examined since these cargoes compete with export refrigerated cargoes for facilities at ports.

In order to assess the causes and magnitudes of the problems in the export of refrigerated cargoes, the following aspects were examined:

- . the impact on the shipping industry of the changing balance of trade;
- . whether there are space shortages in the export of refrigerated cargoes by sea;
- . the availability and utilisation of refrigerated cargo capacity to the major trade areas;
- . the availability and utilisation of refrigerated cargo capacity at major Australian ports; and
- . estimated 1988-89 demand for refrigerated cargo space, compared with estimated supply.

Estimates of inward and outward refrigerated cargo movements at Australian ports was derived from the Shipping and Air Cargo Commodity Statistics (SACCS) data base (ABS 1988b). Using these movements and estimates for the refrigerated capacity of vessels identified in the data base, it was possible to assess the utilisation of refrigerated shipping capacity. A similar methodology was used to determine port capacity utilisation.

The Paper concludes with a discussion of the problems faced by the refrigerated shipping industry, and outlines a number of measures which might be undertaken by the industry to improve performance.

CHAPTER 2 REFRIGERATED SHIPPING INDUSTRY

An understanding of the structure of the refrigerated shipping industry is necessary before a detailed analysis of the industry can be undertaken. The main participants are shipping lines, conferences, shippers associations and commodity boards and the terminal operators within the ports. This chapter describes the operations and services that each organisation provides and examines the refrigerated shipping task.

INDUSTRY PARTICIPANTS

Shipping lines and conferences

Exporters of refrigerated cargoes use two types of shipping: reefer container ships and conventional reefer ships. Although either service can be obtained from liner or charter services, reefer container ships are usually liner services and conventional reefer ships are usually chartered.

Liner services

In all trade areas, some shipping lines that provide liner services have banded together to form conferences. A shipping conference is an association of liner shipping operators who agree to charge common rates for services and who agree to limit the competition amongst themselves on a defined route (Sturmey 1972). Conferences take on different aspects, depending on circumstances. They can vary in size, the degree of internal arrangements and in agreements with shippers. Often some shipping lines within a conference band together to form a consortium and act as one conference member. A detailed explanation of conferences in the Australian liner trade can be found in BTE (1986).

There were 24 registered conference agreements in the Australian outward trades at June 1987 (Department of Transport 1987). Some of the major conferences were the Australia to Europe conference (AESC), the North American conferences and the Australia Northbound Shipping Conference (ANSCON) which serves the China Sea region (Japan, Korea,

Phillippines, Hong Kong and Taiwan). A total of 56 refrigerated services were provided by conference lines in 1988 (Department of Transport and Communications pers. comm.).

Usually in competition to each conference, are other shipping lines providing non-conference liner services. At June 1988, 49 refrigerated services were provided by non-conference lines for Australian export cargoes (Department of Transport and Communications pers. comm.).

The amount of capacity provided by liner shipping depends to a degree on how they see the likely future demand in the market and the current freight rates. Where and when a shipping line foresees a large demand, the line attempts to concentrate equipment and schedule its larger ships to call.

For large known seasonal fluctuations in demand, shipping lines may also charter in extra vessels. However, such vessels are not easily obtained, since at present, there is a world wide shortage of refrigerated shipping. In addition, the Australian peak season (particularly in horticulture products) coincides with other competing southern hemisphere nations. Charterers, knowing these constraints, charter their vessels accordingly.

Charter services

Charter services provide an alternate shipping service. Chartering usually involves a contract to ship a specified amount of cargo from a set destination to another pre-determined destination over a specific period. The shipper has to pay regardless of whether or not the cargo is available.

Very few refrigerated cargoes are exported from Australia by chartered vessels, with industry sources suggesting two reasons for this practice:

- . exporters are afraid of flooding the market with large volumes of produce in a short time span, and thus reducing the prices of the goods; and
- . many exporters cannot arrange to have sufficient volumes of produce to fill a vessel.

At present, Australian shippers primarily use charters to fulfill specialised reefer shipments where the present services do not provide the necessary equipment or the services desired. Overseas countries make more extensive use of this type of shipping service.

Ships agents

Ships agents are used by shipping lines to look after their interests in a port. A shipping line has an agent in each port of call. Ships agents may be associated with a shipping line, or they may be an independent company hired to act on the shipping line's behalf.

It is through the ships agents that importers and exporters arrange for the shipment of their goods and the supply or return of empty containers. Ships agents not only look after the ship, its cargo and their associated paperwork, but they also look after the shipping lines' interests within the port. This includes the arranging and/or supervision of the supply, return, storage, cleaning, maintenance and testing of containers in its care.

Export associations

Export associations are groups of exporters who band together to either consolidate, distribute or market produce for members of the group. One of the tasks undertaken by some of these associations is the forecasting of the future refrigerated space requirements of the industry.

To help shipping lines to foresee likely future demand and to ensure adequate supply of shipping services, most shippers through their export associations provide information on the size of the reefer service their members desire in the forthcoming season. This usually occurs some six to nine months prior to the actual start of the shipments. Since this information is only provided as an aid to the shipping lines and the associations do not reserve the space they predict, there is no compulsion on the shipping lines to provide that space and service. Rather, shipping lines determine their requirements based on this information, historical information from past seasons, reliability of past information provided, and upon their present and likely future market shares.

There are a number of types of export associations, each providing a different level of support to individual shippers. These are shippers councils, commodity boards and shippers associations.

Australian Shippers' Council

The Australian Shippers' Council (ASC) is the designated shipper body as provided for in Part X of the *Trade Practices Act 1984*. Its main purpose is to undertake negotiations with shipowners and other carriers with regard to the arrangements, terms and conditions of the carriage of outward liner cargo. At June 1987, membership of the ASC

comprised 20 full and 3 associate members. The ASC members concerned with the shipping of refrigerated commodities were:

- . Australian Abattoir Export Products Association;
- . Australian Dairy Corporation;
- . Australian Meat and Livestock Corporation; and
- . New South Wales Egg Corporation.

Commodity boards

Those industries that have large volumes or values of export cargoes, have commodity or marketing boards to coordinate the industry. Commodity boards promote the export and marketing of the particular commodity, and protect the interest of the industry in relation to that export. Their main responsibilities in relation to shipping are therefore to participate in rate negotiations with shipping lines and conferences, and investigate the whole transport chain, with the aim of reducing transport costs.

Rate negotiations are conducted by commodity boards either directly with operators or through the Australian Shippers' Council. The former negotiations may include the appointment of a number of shipping lines as 'licensed exporters' to ship the cargo. Where 'licensed exporters' are appointed, individual shippers are free to choose amongst the 'licensees'.

The three major commodity boards involved in the export of refrigerated cargoes are the:

- . Australian Meat and Live-stock Corporation (AMLC);
- . Australian Dairy Corporation (ADC); and
- . Australian Horticultural Corporation (AHC).

The corporations aim to create and enhance marketing opportunities for their respective industries. With particular regard to the export of refrigerated products, the corporations' objectives are to ensure continued access to overseas markets.

Although, having similar objectives, the corporations do differ in their methods of operation. The AMLC does not export any products on its own behalf, but rather licences shippers to undertake the export task. On the other hand, the ADC both undertakes the export task and licences other shippers. The AHC was formed in 1988 and replaces the Australian Apple and Pear Corporation. The corporation is not yet operational.

Shipper associations

Shipper associations are groups of shippers who band together to facilitate the transport of their products. There are a vast number of shipper associations in each state, and are very prominent in the fruit and vegetable industry. This has probably been due to the lack of an industry corporation to facilitate refrigerated exports, and the traditional reliance of producers on the domestic market to take all of their produce. However, with the development of the new AHC, the relative importance of these bodies in the horticultural industry may change.

Terminal operators and operations

Ports in Australia provide the interface between the ship and the land transport systems. All container terminals handling refrigerated products, require special storage slots to maintain and monitor refrigerated containers. These slots vary from power outlets for integral and porthole containers with clip-ons units, to cooling tower machinery to provide chilled air to porthole containers. There are 18 container terminals providing overseas refrigerated capacity in the five major ports of Australia. These terminals are operated by a total of ten companies.

Where refrigerated goods are shipped by conventional reefer ship, cool store facilities are required close to or on the wharf. Loading of ships involves the transfer of goods directly from the cool store into the refrigerated hold of the ship. The operation must ensure that there is no chance of the cargo defrosting or warming.

SEABORNE TASK

The majority of ships providing a refrigerated service in the Australian trade are also an essential part of the non-bulk cargo service. Therefore, any change in the Australian seaborne task will affect the refrigerated capacity.

Recent performance

Liner task

Between 1982-83 and 1986-87, inward liner cargo volumes grew steadily by 32 per cent from nearly 5 million tonnes to 6.6 million tonnes (see Table 2.1). The value of inward liner cargoes increased between 1982-83 and 1985-86, from \$17.5 billion to \$22.2 billion, but then dropped slightly in 1986-87 to \$21.8 billion. Both volumes and values of outward liner cargoes fell slightly in 1983-84, but then increased steadily until 1986-87.

TABLE 2.1 LINER TASK, 1982-83 TO 1986-87

Year	Inward		Outward	
	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)
1982-83	4 995	17 528	6 768	9 599
1983-84	5 683	19 217	6 316	9 566
1984-85	5 913	20 794	7 170	10 347
1985-86	6 182	22 208	7 301	10 411
1986-87	6 608	21 783	8 634	13 328

Note 1986-87 prices.

Source ABS (1988b).

The table shows that over the period, outward liner volumes always exceeded inward liner volumes. However, the inward cargoes were much more valuable, worth nearly \$3300 per tonne in 1986-87 compared to only \$1550 per tonne for outward cargoes. Because of the increased revenue potential, shipping lines have seen the inward trade as the primary task and the outward trade as the backhaul leg.

Although inward liner cargo volumes increased steadily over the period, the number of fully utilised containers has not shown the same trend. Table 2.2 shows that the numbers of containers utilised on the inward trade increased to 1984-85, but then fell dramatically by 21 per cent, from 424 595 to 335 033. The number of containers used on the outward trades rose from 265 355 in 1982-83 to 361 590 in 1985-86, which corresponds to the rise in liner export volumes of the same period. However, in 1986-87, container numbers in the outward trade fell slightly.

The container ratio of the numbers of fully utilised containers in the outward trade to the inward trade was 0.87 in 1982-83. This clearly shows the dominance of the inward trade. By 1986-87 however, the ratio had changed to 1.04, emphasising the change in the trading pattern.

TABLE 2.2 NUMBER OF FULLY UTILISED CONTAINERS IMPORTED AND EXPORTED
AT AUSTRALIAN PORTS, 1982-83 TO 1986-87
(TEUs)

<i>Year</i>	<i>Imports</i>	<i>Exports</i>	<i>Ratio^a</i>
1982-83	304 325	265 355	0.87
1983-84	372 519	272 189	0.73
1984-85	424 595	323 916	0.76
1985-86	416 772	361 590	0.87
1986-87	335 033	347 673	1.04

a. The ratio of exports to imports.

Source ABS (1988a).

These trends may be attributed to macroeconomic changes which have occurred during this period. The fall in the \$A between 1984 and 1986, has contributed to the competitiveness of the industry, opened up new markets and has influenced the turnaround in the balance of trade.

Other changes in the Australian and the world liner trades have contributed to the import and export trends. For instance, the increased penetration of non-conference and State controlled shipping services have been influential in depressing freight rates. This has been particularly evident in the outward liner services. Major developments in the international liner shipping scene, such as the over capacity and the introduction of Round-the-World services has also depressed the level of freight rates.

Refrigerated shipping task

In 1985, the world refrigerated seaborne task totalled nearly 26 million tonnes (Drewry 1988). Australia accounted for approximately 5 per cent of this trade. In 1987, the world refrigerated task involved 890 reefer vessels with a capacity of about 6.8 million cubic metres and 752 container vessels providing 146 000 TEUs.¹ Approximately 10 per cent of this fleet provided some refrigerated service from Australia.

1. Includes reefer vessels of 60 000+ cubic feet capacity and container vessels of 100+ TEUs total capacity and 60+ reefer capacity.

Both the volume and value of Australian refrigerated imports have been steadily increasing since 1982-83, at an average rate of 13.4 and 13.0 per cent per year respectively (see Table 2.3). Between 1982-83 and 1986-87, the average value of imports declined slightly, from \$2540 to nearly \$2500 per tonne.

By 1986-87, refrigerated export volumes had returned to the levels of 1982-83 after a dramatic fall in 1983-84. The average value of exported cargoes fell from nearly \$2690 per tonne in 1982-83 to \$2460 per tonne in 1986-87.

The refrigerated seaborne task is the reverse of the liner trade situation, with the outward leg being the primary task, and the inward trade being the backhaul. Therefore, many of the inward refrigerated containers carry either non-refrigerated cargo or are returned empty.

TABLE 2.3 REFRIGERATED SEABORNE TASK, 1982-83 TO 1986-87

Year	Imports			Exports		
	Quantity ('000 tonnes)	Value (\$m)	Value per tonne (\$)	Quantity ('000 tonnes)	Value (\$m)	Value per tonne (\$)
1982-83	90	229	2 540	1 094	2 940	2 690
1983-84	105	288	2 730	865	2 453	2 840
1984-85	118	304	2 580	889	2 377	2 670
1985-86	129	335	2 600	1 038	2 586	2 490
1986-87	149	373	2 510	1 119	2 755	2 460

Note 1986-87 prices.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

Shipping characteristics

In 1986-87, nearly 89 per cent by weight of all refrigerated export cargoes were carried by liner services. Liner shipping in the Australian trades has been characterised by the presence of shipping conferences and the trade route division of markets. This section examines the characteristics of the refrigerated shipping trade from

Australia in terms of the conference and non-conference market shares, fleet characteristics and the quality of service provided by the shipping lines.

Conference and non-conference operations

Australia has relied heavily on conferences to transport its overseas trade. Table 2.4 shows the task performed by conference, non-conference and non-liner operators on the inbound and outbound refrigerated trades, between 1982-83 and 1986-87.

Conference operators performed over half the inward task by volume in 1986-87, a significant change from 1982-83, when conference operators carried over 71 per cent of the volumes. Over the period, non-conference and non-liner operators have increased their share of the market volumes by 142 and 362 per cent respectively. In 1982-83, all inward operators carried similar valued cargoes on a per tonne basis. By 1986-87, conference operators carried the more valuable cargo compared to the other operators, \$3200 per tonne to \$2400 and \$1000 for non-conference and non-liner operators respectively.

In terms of the outward task, conference operators carried nearly three quarters of the total value of refrigerated goods in 1986-87. This relationship has not changed significantly since 1982-83. Non-conference operators have nearly doubled their market share in terms of volume since 1982-83, at the expense of the non-liner operators. Refrigerated shipping is a high cost, capital intensive venture, and thus remains the province of conference operators.

Composition of the fleet

Nearly two-thirds of the total value of refrigerated exports were shipped by container vessels in 1986-87, although they only accounted for 32 per cent of the fleet (see Table 2.5). Bulk ships on the other hand, although comprising over 21 per cent of the vessels used, only transported 5 per cent of the value of goods. Since 1982-83, the volume and value of cargo carried by bulk ships has halved, despite comprising a similar proportion of the fleet over the period.

Although the percentage of general cargo vessels has fallen between 1982-83 and 1986-87, there has been a greater decline of 21 and 41 per cent in their market share by volume and value respectively. This volume has mainly been diverted to container ships. The number of Ro-ro vessels has increased by nearly 77 per cent since 1982-83, although the volume and value of cargo carried by these vessels has remained almost unchanged. Despite the variety of ship types, the majority of refrigerated cargoes were carried in containers on these vessels.

TABLE 2.4 REFRIGERATED CARGO TASK BY TYPE OF OPERATOR, 1982-83 TO 1986-87

Years	Inward						Outward					
	Liner conference		Liner non-conference		Non-liner		Liner conference		Liner non-conference		Non-liner	
	Quantity ('000 tonnes)	Value (\$m)	Quantity ('000 tonnes)	Value (\$m)	Quantity ('000 tonnes)	Value (\$m)	Quantity ('000 tonnes)	Value (\$m)	Quantity ('000 tonnes)	Value (\$m)	Quantity ('000 tonnes)	Value (\$m)
1982-83	65	159	19	54	7	16	780	2 178	123	330	191	432
1983-84	70	198	22	55	14	34	731	2 111	63	174	71	168
1984-85	59	173	27	62	32	69	707	1 928	90	215	92	234
1985-86	71	202	38	88	19	45	709	1 820	139	266	191	500
1986-87	76	242	43	100	30	30	765	2 022	226	476	128	257

Note 1986-87 prices.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

TABLE 2.5 DISTRIBUTION OF SHIP TYPES IN THE REFRIGERATED EXPORT TASK, 1982-83 AND 1986-87

Ship type ^a	1982-83			1986-87		
	Number of ships	Quantity (000 tonnes)	Value (\$m)	Number of ships	Quantity (000 tonnes)	Value (\$m)
Container	99	572	1 662	113	681	1 767
Ro-ro	30	232	547	53	248	598
General cargo	105	154	421	99	122	250
Bulk	64	128	301	74	63	126
Others	7	7	9	11	4	15
Total	305	1 094	2 940	350	1 119	2 755

a. Lloyd's classification of ship type.

Notes 1. Figures may not add to totals due to rounding.
2. 1986-87 values.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

The carriage of Australian refrigerated exports has been dominated by the ships of six nations (see Table 2.6). The major flag nation has been the United Kingdom, which since 1982-83, has increased its market share in terms of volume carried from 20 to 25 per cent. This is despite a reduction in the number of vessels. Hong Kong flag vessels have also increased their market share, from 4.9 to 6.8 per cent over the period. Australian flag vessels accounted for 5.4 per cent of vessels in 1986-87, an increase since 1982-83. However, over the same period the market share of Australian flag vessels has fallen from 100 000 tonnes to 89 000.

Shipping services

This section examines the quality of service provided by both the conference and non-conference operators in terms of ports visited and shipping capacity.

TABLE 2.6 DISTRIBUTION BY FLAG IN THE REFRIGERATED EXPORT TASK,
1982-83 AND 1986-87

Flag	1982-83		1986-87	
	Vessels	Volume carried ('000 tonnes)	Vessels	Volume carried ('000 tonnes)
United Kingdom	33	221	31	279
West Germany	36	180	38	173
Japan	20	114	22	109
Australia	14	100	19	89
Hong Kong	13	53	15	76
Panama	34	65	43	62
Others	155	360	182	331
Total	305	1 094	350	1 119

Note Figures may not add to totals due to rounding.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

Ports

Conference and non-conference vessels exported refrigerated cargoes from 22 ports in Australia and made an estimated 3546 calls during 1986-87. Nearly 59 per cent of the port calls were made by conference vessels, which also transported over 68 per cent of refrigerated cargoes (see Table 2.7). The major ports of call for both conference and non-conference vessels were Melbourne, Brisbane and Sydney, accounting for over three quarters of all calls.

Overall, 80 per cent of refrigerated exports passed through these three major ports, mainly due to the conference services. Non-conference services on the other hand, carried a larger share from the other Australian ports. Conference operators appear to have provided a better quality of service from the major ports, while non-conference operators provided a better service from the minor ports of Australia.

TABLE 2.7 PORTS OF CALL FOR CONFERENCE AND NON-CONFERENCE VESSELS,
1986-87

<i>Port</i>	<i>Conference</i>		<i>Non-Conference</i>		<i>Total</i>	
	<i>Volume</i>		<i>Volume</i>		<i>Volume</i>	
	<i>Calls</i>	<i>tonnes</i>	<i>Calls</i>	<i>tonnes</i>	<i>Calls</i>	<i>tonnes</i>
Melbourne	660	293	503	102	1 163	395
Brisbane	368	231	216	67	584	297
Sydney	589	128	416	80	1 005	208
Fremantle	188	45	152	42	340	88
Adelaide	148	37	66	11	214	48
Other	128	31	112	52	240	83
Total	2 081	765	1 465	354	3 546	1 119

- Notes* 1. Non-conference includes non-liner services.
2. Figures may not add to totals due to rounding.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

Trade capacity

Shipping capacity to various trade areas by conference and non-conference operators is presented in Table 2.8. Non-conference operators provided more ships in each of the listed trade areas compared to conference operators, although the difference varied markedly for each trade area. Despite ship numbers being different, the average number of voyages per month by conference and non-conference operators were similar, except for South-East Asia and the East Coast of North America.

In terms of capacity, conference operators provided between 61 and 86 per cent of total capacity, for the Middle East and European trades respectively. It appears from Table 2.8 that the conference operators provide a better quality of service in terms of annual capacity for refrigerated exports.

TABLE 2.8 CONFERENCE AND NON-CONFERENCE REFRIGERATED SHIPPING SERVICES TO VARIOUS TRADE AREAS, 1986-87

Trade area ^a	Conference			Non-conference			Total		
	<i>Ships</i>	<i>Voyages per month</i>	<i>Annual reefer capacity (TEUs)</i>	<i>Ships</i>	<i>Voyages per month</i>	<i>Annual reefer capacity (TEUs)</i>	<i>Ships</i>	<i>Voyages per month</i>	<i>Annual reefer capacity (TEUs)</i>
North America									
ECNA	17	6	18 277	18	2	10 725	35	9	29 002
WCNA	15	7	14 767	20	9	3 374	35	16	18 141
China Sea	23	12	38 849	53	15	7 718	76	26	46 567
Europe	39	11	22 526	42	9	3 781	81	19	26 307
South-East Asia	8	6	9 934	39	13	5 436	47	19	15 370
Middle East	14	6	8 837	21	5	5 700	35	11	14 537

a. Trade areas are defined in Appendix II.

- Notes 1. Non-conference includes non-liner services.
2. Figures may not add to totals due to rounding.

Sources BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics. Lloyd's (1987a and b).

CHAPTER 3 CHARACTERISTICS OF THE TRADE

Although the level of the refrigerated shipping task has not changed significantly since 1982-83, there have been changes in the relative proportions of the types of commodities traded and the trading patterns. Further, the relative share of refrigerated goods through the major Australian ports has likewise changed. These changes have placed large demands on the availability of refrigerated cargo space on ships and at ports, and has led some exporters to complain of cargo space shortages.

This chapter presents an overview of the structural characteristics of the refrigerated shipping task. The characteristics of the export and import cargoes are examined in terms of commodities, trade areas and the Australian ports utilised. The emphasis of the chapter is on the export trade, since this is the area of possible space shortages. Further statistical details can be found in Appendix III.

COMMODITIES

Exports

Refrigerated exports totalled 1.119 million tonnes at a value of \$2755 million in 1986-87 (see Table 3.1). This represents only a slight change from the levels in 1982-83. However, in the intervening years, there had been a dramatic fall, followed by a steady recovery. The fall in refrigerated exports in 1983-84 occurred in all major commodity divisions, except dairy and vegetable produce. The drought of 1982-83 was a contributing factor in this decline, as stock numbers and crops recovered from the harsh conditions. In addition, this period saw the closure of the South Korean and Taiwan beef markets.

Description

Meat products dominated refrigerated exports between 1982-83 and 1986-87, comprising 72 per cent of the export market by value in 1986-87. Beef products were the largest refrigerated exports, accounting for 50 per cent of total refrigerated export volumes in 1986-87. Lamb, which totalled 137 000 tonnes in 1986-87, was the

TABLE 3.1 REFRIGERATED COMMODITIES EXPORTED, 1982-83 TO 1986-87

Commodity group ^a	1982-83		1983-84		1984-85		1985-86		1986-87	
	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)
Beef	605	1 667	456	1 342	433	1 284	497	1 410	561	1 665
Lamb	151	260	84	151	89	157	130	197	137	217
Pork	2	7	2	7	4	14	2	8	4	13
Poultry	2	4	1	3	1	3	2	4	3	5
Other meat	57	96	43	71	46	86	50	93	53	97
Total	817	2 034	586	1 574	572	1 544	682	1 713	758	1 997
Cheese	25	56	50	118	80	192	81	189	73	158
Butter	65	155	56	124	54	101	56	98	45	71
Milk	11	7	9	6	8	5	10	5	16	7
Eggs	6	7	12	12	5	7	4	5	2	4
Other dairy	2	7	3	10	2	7	4	10	4	11
Total	109	232	130	270	150	312	156	308	140	251

TABLE 3.1 (Cont.) REFRIGERATED COMMODITIES EXPORTED, 1982-83 TO 1986-87

Commodity group ^a	1982-83		1983-84		1984-85		1985-86		1986-87	
	Quantity ('000 tonnes)	Value (\$m)	Quantity ('000 tonnes)	Value (\$m)	Quantity ('000 tonnes)	Value (\$m)	Quantity ('000 tonnes)	Value (\$m)	Quantity ('000 tonnes)	Value (\$m)
Fish	15	31	9	20	7	17	6	14	7	23
Prawns	18	284	19	263	16	201	17	250	15	197
Lobster	8	197	6	167	5	156	5	136	4	118
Scallops	3	35	2	36	1	16	1	13	1	10
Other seafood	2	32	2	40	2	32	2	36	2	34
Total	45	579	38	525	31	423	31	449	29	382
Apples	60	52	45	37	58	47	63	50	65	51
Citrus	30	21	18	12	24	17	40	26	41	24
Grapes	1	1	1	2	1	2	4	7	9	13
Other fruit	1	1	2	2	3	5	3	4	4	5
Total	92	75	66	53	87	71	109	87	119	92

TABLE 3.1 (Cont.) REFRIGERATED COMMODITIES EXPORTED, 1982-83 TO 1986-87

Commodity group ^a	1982-83		1983-84		1984-85		1985-86		1986-87	
	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)
Onions	16	9	22	14	27	13	34	12	43	16
Other vegetables	16	12	24	18	21	13	27	16	31	17
Total	31	21	46	32	48	26	61	29	74	33
Total	1 094	2 940	865	2 453	889	2 377	1 038	2 586	1 119	2 755

a. Commodity groups are defined in Appendix I.

Notes 1. Figures may not add to totals due to rounding.
2. 1986-87 prices.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

second largest commodity group exported, accounting for 12 per cent of total volumes.

The major dairy exports were butter, margarine, cheese, fresh milk, eggs and other commodities such as ice cream and chocolates. Overall, dairy exports increased over the period, mainly due to an increase of 192 per cent in cheese exports, from 25 000 tonnes in 1982-83 to 73 000 tonnes in 1986-87.

Seafood exports followed a declining trend, falling from 45 000 tonnes in 1982-83 to 29 000 tonnes in 1986-87. Although seafood only accounted for 3 per cent of the volume of exports in 1986-87, it accounted for nearly 14 per cent of refrigerated exports by value. This made seafood one of the most valuable refrigerated cargoes exported, at an average of \$13 100 per tonne compared to an average of nearly \$2460 per tonne for all refrigerated cargo.

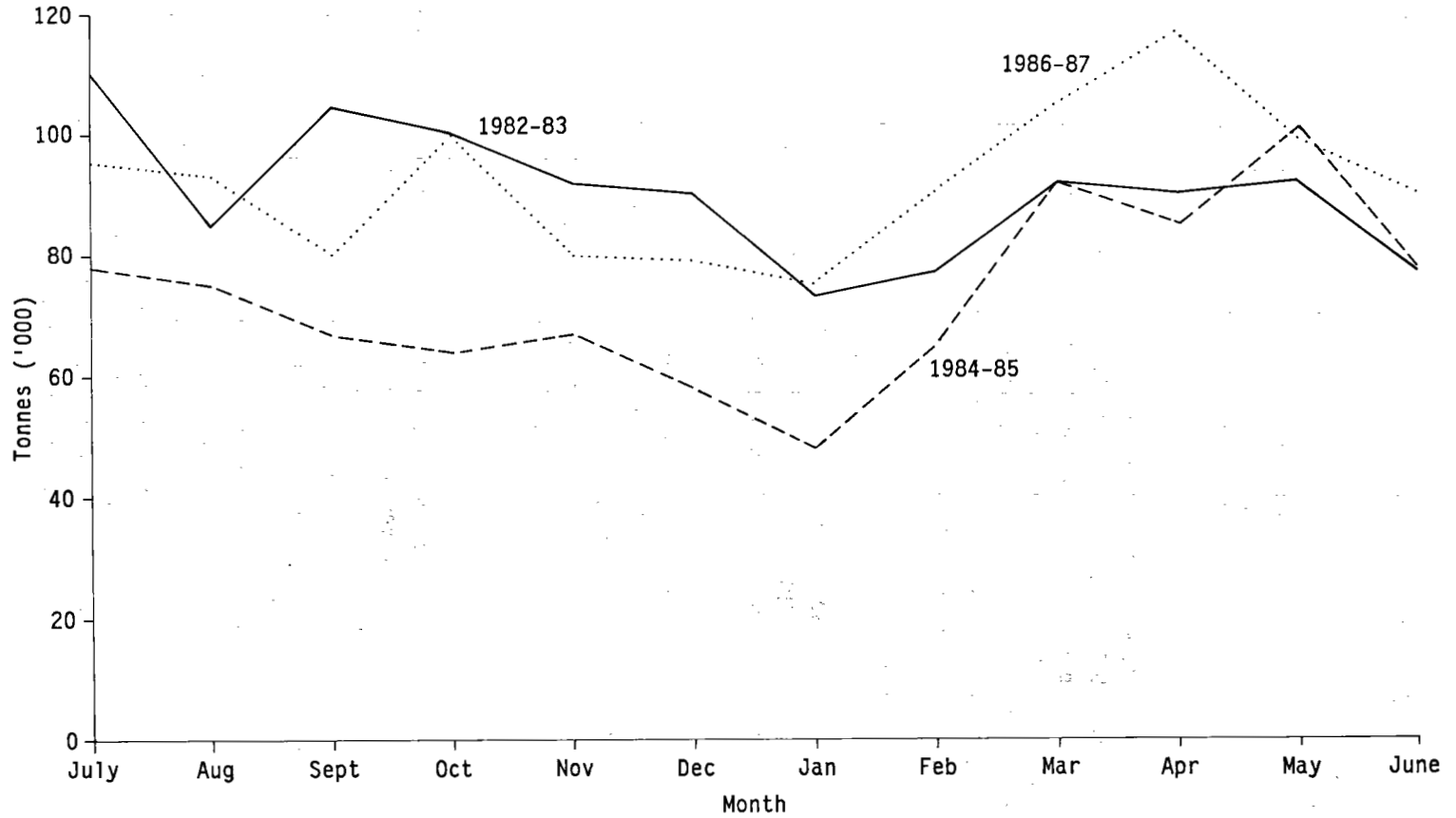
By 1986-87, fresh fruit volumes had recovered and passed the 1982-83 levels, with an average growth rate of 6.5 per cent per annum. The growth since 1983-84 was mostly due to increases in the volumes of citrus products and grapes. Apples (which includes pears) were the major fruit product exported, accounting for over half of total fruit exports.

Vegetables represented nearly 7 per cent of the total volume of refrigerated exports in 1986-87, but only accounted for about 1 per cent of total value. Since 1982-83, vegetable exports have risen steadily by nearly 137 per cent. Over 50 per cent of vegetable exports since 1984-85 consisted of onions, which are transported in fantainers.

Seasonality

There is a definite season associated with the export of refrigerated commodities and this is derived from the demand by foreign importers and the time of harvest and production in Australia. The seasonality of exports is important since a large seasonal peak can place severe demands on cargo space during particular periods of the year.

Figure 3.1 shows the monthly volumes of refrigerated products exported for some years between 1982-83 and 1986-87. It is clear that overall, the seasonality of exports has changed over the period. In 1982-83, the monthly volumes were largest in the period July to October. However, there was no clearly defined seasonal peaking of volumes. It was not till 1984-85, when a new seasonal pattern began to emerge. By 1986-87, this seasonal pattern had become more pronounced.



Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

Figure 3.1 Refrigerated export volumes, 1982-83, 1984-85 and 1986-87

The changing nature of the seasonal pattern over the years is due to the change in proportions of commodities exported. Since 1982-83, the volumes of seasonal products such as fruit and vegetables have risen from 123 000 tonnes to over 192 000 tonnes, a rise of nearly 56 per cent over the period. In addition, meat exports in August to November steadily declined between 1982-83 and 1984-85, but then slowly increased (see Figures III.1 to III.5). The decline in the spring meat volumes, coupled with the increases in the fruit and vegetable volumes later in the year have resulted in the pronounced seasonal peak during March and April.

Export volumes of the five commodity groups for the year 1986-87 are shown in Figure 3.2. Over 37 per cent of refrigerated cargoes were exported between February and May in 1986-87. Meat products exhibited two peaks, in October and April. Dairy products were relatively stable throughout the year. Fruit exports increased significantly from January, peaking in April and May, and then slowly declined. These times are basically determined by the harvesting season. Vegetables showed a similar trend. Seafood, on the other hand, remained relatively stable throughout the year.

Imports

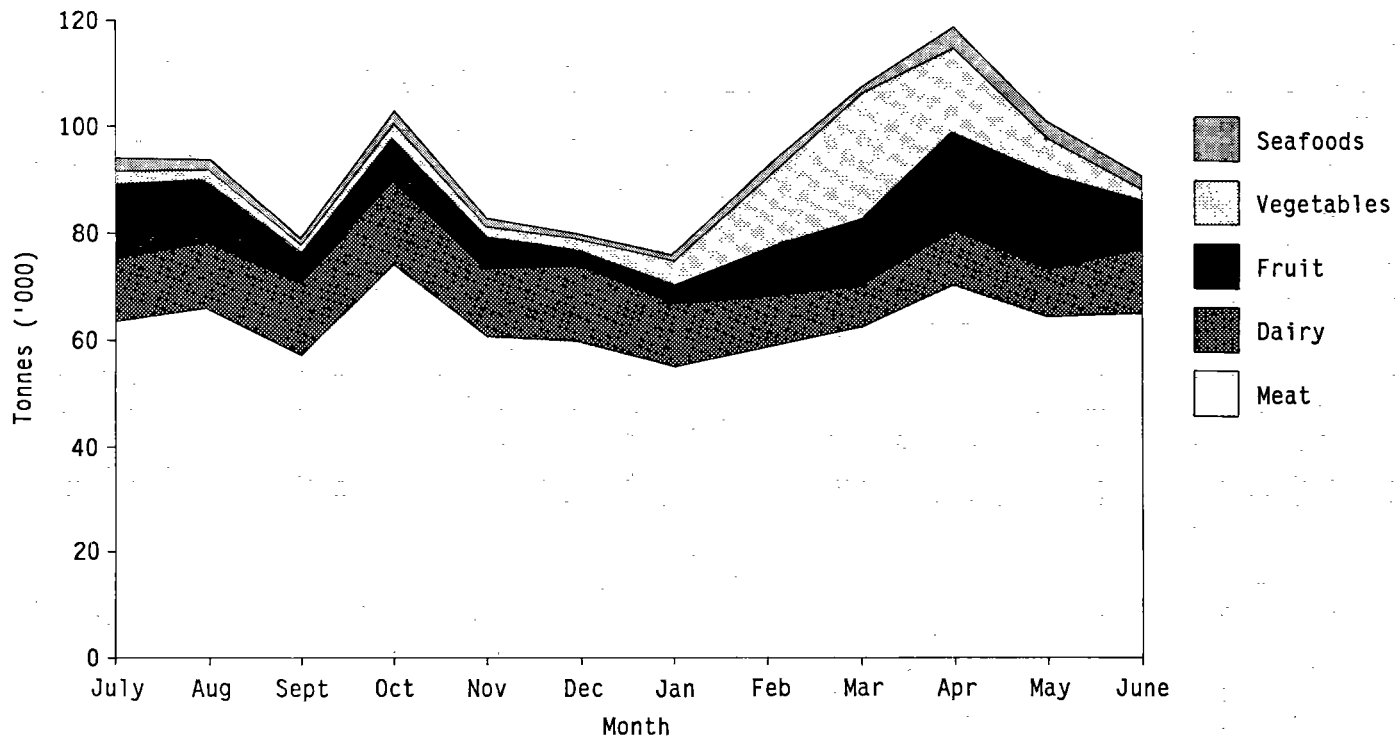
The volume of refrigerated imports is relatively small in comparison to the volume of refrigerated exports. Imports have grown steadily since 1982-83, from 90 000 tonnes to 149 000 tonnes in 1986-87, a growth rate of over 13 per cent per annum (see Table 3.2).

Like exports, the import commodity mix has changed significantly since 1982-83. Fruit was the major commodity imported in 1982-83, accounting for 40 per cent of volumes. Seafood was the other main commodity group, with 29 per cent of the volume of imports. However, by 1986-87, seafoods had become the major item, accounting for nearly half of the volume of imports. Fruit volumes dropped from 36 000 tonnes to 28 000 tonnes, a decline of 22 per cent. Vegetable volumes increased significantly, from 9000 tonnes to 24 000 tonnes. Dairy volumes increased initially, and then fluctuated.

TRADE AREAS

Exports

Nearly three quarters of Australia's refrigerated cargoes are exported to three trade areas: North America; China Sea; and Europe (see Table 3.3). However, the most valuable cargoes were exported to North America and the China Sea, accounting for nearly 78 per cent of the



Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

Figure 3.2 Seasonal patterns of refrigerated exports, 1986-87

TABLE 3.2 REFRIGERATED COMMODITIES IMPORTED, 1982-83 TO 1986-87

Commodity group ^a	1982-83		1983-84		1984-85		1985-86		1986-87	
	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)
Meat	1	3	3	5	2	6	3	7	3	7
Dairy	18	77	29	98	28	94	33	104	26	95
Seafood	26	124	37	143	42	150	47	163	67	205
Fruit	36	15	25	29	28	37	29	42	28	43
Vegetables	9	11	11	12	17	18	15	18	24	23
Total	90	229	105	288	118	304	129	335	149	373

a. Commodity groups are defined in Appendix I.

Notes 1. Figures may not add to totals due to rounding.
2. 1986-87 prices.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

TABLE 3.3 REFRIGERATED COMMODITIES EXPORTED BY TRADE AREA, 1982-83 TO 1986-87

Trade area ^a	1982-83		1983-84		1984-85		1985-86		1986-87	
	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)
North America	364	1 071	282	900	297	900	363	1 005	398	1 123
China Sea	368	1 187	307	1 010	273	931	283	984	308	1 013
Europe	96	184	70	136	95	154	121	199	142	240
Middle East	124	271	86	197	88	194	110	195	92	156
South-East Asia	97	131	79	118	88	116	89	107	97	110
Pacific	18	32	17	31	20	32	30	42	36	48
South America	13	32	11	29	12	28	9	19	13	23
Africa	9	25	8	23	8	13	7	13	12	17
New Zealand	2	2	4	5	2	3	12	12	13	15
India	2	3	2	3	5	5	14	10	9	8
Other	-	1	-	2	-	1	-	1	-	-
Total	1 094	2 940	865	2 453	889	2 377	1 038	2 586	1 119	2 755

a. Trade areas are defined in Appendix II.
- Rounded to zero.

Notes 1. Figures may not add to totals due to rounding.
2. 1986-87 prices.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

value of total refrigerated products in 1986-87. The share of refrigerated exports to both the European and North American markets increased between 1982-83 and 1986-87, from 9 to 13 per cent for Europe and 33 to 36 per cent for North America.

Although exports to New Zealand and the Pacific region have risen dramatically since 1982-83, they are still only a small proportion of Australia's total refrigerated exports. All of the major trade areas were affected by the dramatic fall in the export of refrigerated cargoes from Australia in 1983-84. Exports to two trade areas have not yet returned to the 1982-83 levels: China Sea and the Middle East.

The table shows that the dominant trade areas in 1986-87 were: North America, the China Sea, Europe, South-East Asia and the Middle East with market shares of 36, 28, 13, 9 and 8 per cent respectively by volume. These areas will now be discussed in more detail. Tables supporting this examination can be found in Appendix III.

North America

The North American region encompasses both Canada and the United States of America. Approximately 400 000 tonnes of refrigerated commodities were exported to this region in 1986-87. The trade is dominated by meat products, accounting for nearly 96 and 91 per cent of total exports by weight and value in 1986-87.

Seafood, although not large by weight standards (less than 2 per cent) accounted for nearly 16 per cent of the value of exports in 1982-83. However, since then, tonnages have halved and by 1986-87, accounted for only 8 per cent of the value of exports. Lobster was the major seafood item shipped to North America.

North America is not a major importer of dairy and horticultural products. The North American trade can be split into two distinctive areas: the East Coast (ECNA) and West Coast (WCNA). The former area is the major market and accounted for 68 per cent of North American volumes in 1986-87.

China Sea

The China Sea region covers Hong Kong, Taiwan, Philippines, Korea, China, Japan and the eastern ports of Russia. This region is the second largest importer of Australian refrigerated cargoes, importing just over 300 000 tonnes in 1986-87. Exports to this region fell until 1984-85, and were followed by gradual growth. However, by 1986-87, volumes were still 16 per cent lower than 1982-83 levels.

Meat dominated the trade, accounting for nearly three-quarters of total refrigerated exports in 1986-87. Recently, Australia has signed with Japan an agreement to increase access of beef to the Japanese market. In addition, the South Korean and Taiwan meat markets were reopened in late 1988.

The China Sea region is Australia's largest dairy importer, accounting for nearly 36 per cent of the total volume dairy exports in 1986-87. Dairy exports grew from 37 000 tonnes in 1982-83 to 51 000 the following year and have remained relatively stable since. Over half of the dairy export volumes to this region comprised cheese.

Seafood products accounted for 25 per cent of the value of refrigerated exports to this region, but only 6 per cent of volumes in 1986-87. This is a decline of 29 and 21 per cent respectively since 1982-83.

Over 72 per cent of the volume of refrigerated cargoes to this region were in the Japanese and South Korean trade. This trade dominates all commodity divisions except for dairy and fruit products. The decline in exports to this region are due to the decline in meat volumes and the value of seafood.

Europe

This region includes the European, Mediterranean, Black Sea and Scandinavian countries. Over 140 000 tonnes were exported to the region in 1986-87, dominated by meat, fruit and vegetables. Total tonnages have risen since 1982-83, mainly due to significant increases in vegetable produce. Meat and seafood volumes have declined since 1982-83.

Meat dominated the European trade in 1982-83, accounting for 55 and 67 per cent by weight and value. By 1986-87, this had dropped to 30 and 55 per cent respectively. Dairy exports to this region have risen substantially since 1982-83, from 4000 tonnes to 13 000 tonnes in 1986-87. Cheese and butter are the only dairy products exported to Europe.

While seafood volumes have declined since 1982-83, values have increased. In 1982-83, seafood was worth an average of about \$2800 per tonne. By 1986-87, this had increased three fold to \$9000 per tonne.

This region is Australia's second largest export market for fruit. Overall, fruit exports to this region have grown at a steady pace, nearly doubling since 1982-83. Apples are the largest commodity group exported, comprising nearly 82 per cent of fruit tonnages in 1986-87.

Vegetable exports have increased dramatically over the period, from 11 000 tonnes to 51 000 tonnes, an increase of 364 per cent. By 1986-87, vegetables had passed meat to be the main export item by volume to the region.

South-East Asia

South-East Asia is Australia's fourth largest export market for refrigerated goods. The region covers Indonesia, north to Malaysia, Singapore and Indo China. Except for 1983-84, fruit has been the major export commodity group to this region. However, in terms of value, meat and dairy were the main exports to this region. Exports of seafood were negligible.

This region is Australia's largest export market for fruit, accounting for 47 per cent of fruit exports in 1986-87. Apples and citrus make up in excess of 92 per cent by volume of the fruit market to this region. Vegetable volumes have remained relatively stable over the period.

Meat exports have declined since 1982-83, from 30 000 tonnes to 22 000 tonnes in 1986-87. Dairy products have increased by 54 per cent since 1982-83. Butter is the main product, accounting for over 68 per cent of all dairy products.

Middle East Region

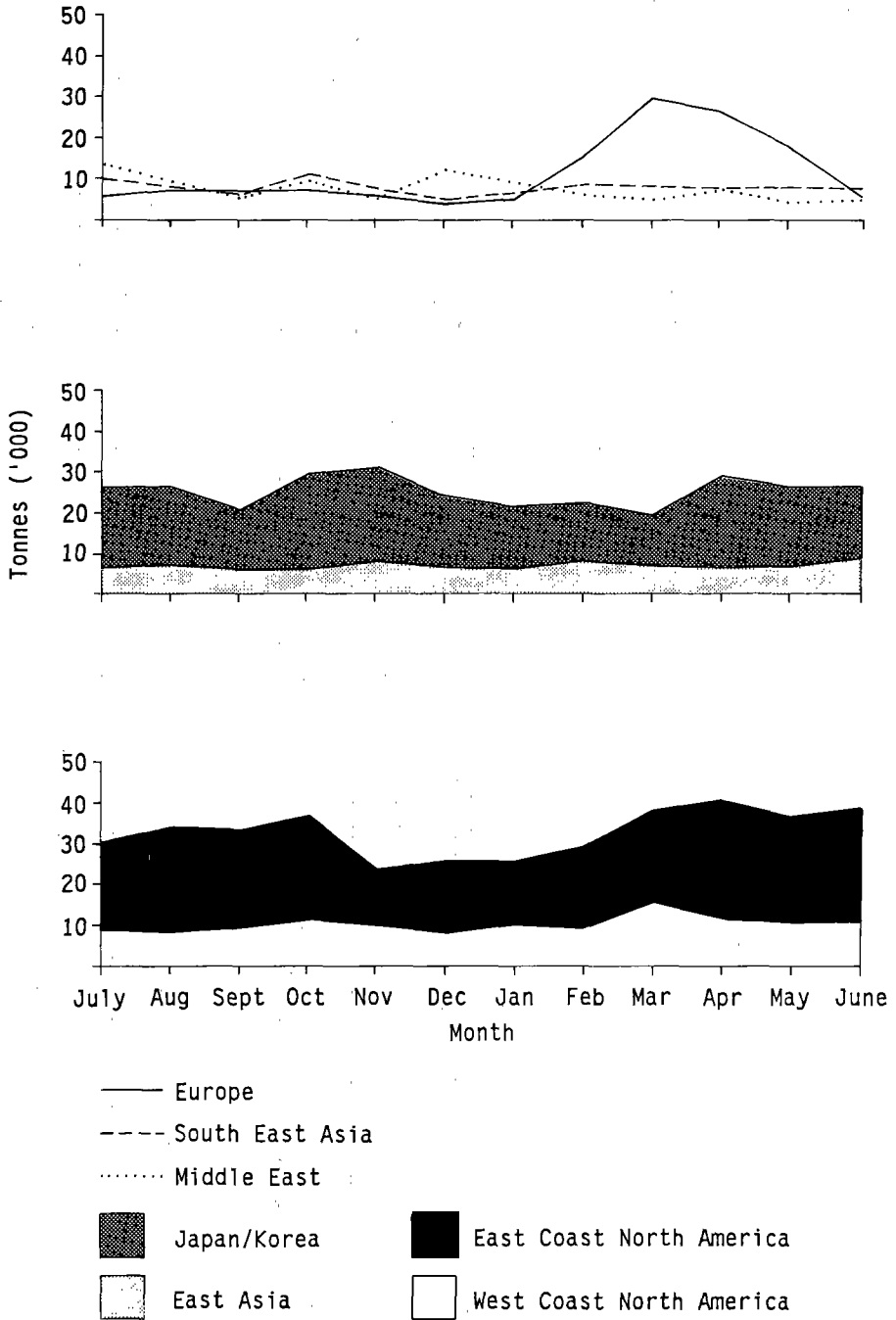
Volumes of exports to this region totalling 124 000 tonnes in 1982-83, have decreased steadily to 92 000 tonnes in 1986-87. This fall has been due to the decline in the meat and dairy trades. The region imports small volumes of seafood, fruit and vegetables.

Meat exports have declined nearly 35 per cent since 1982-83. This region is Australia's second largest market for lamb and goat meat, which accounts for 87 per cent of total meat exported to the region.

The region was also Australia's second largest market for dairy products in 1986-87. This was despite a fall in dairy exports in this region of 31 per cent between 1985-86 and 1986-87. Cheese was the main product exported, accounting for 86 per cent of the total volume of dairy products exported to the Middle East in 1986-87.

Seasonality

Figure 3.3 shows the volumes of refrigerated cargoes on a monthly basis to the five major trade areas for 1986-87. Only the European and ECNA trades show clearly defined seasonal patterns.



Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

Figure 3.3 Refrigerated exports by trade area, 1986-87

The European trade area shows a very seasonal pattern with the volume of exports building up in February to peak in March, April and May. Over half of the yearly refrigerated exports are shipped in the period from March to May. Fruit and vegetables are the major commodities that comprise this peak.

An extended peak period from March through to October is evident in the North American region. This is primarily due to meat exports to the ECNA trade.

The China Sea region shows some fluctuations, which are all in the Japanese and South Korean trade. These fluctuations are mainly due to meat exports. The small peaks in the Middle East trade are caused by meat and dairy exports, while in the South-East Asian trade, dairy and fruit volumes cause minor peaking.

Market restrictions

This section discusses some of the factors that affect the access of Australian exports to the trade areas. These factors include market restrictions such as quotas and quarantine laws.

Most Australian refrigerated exports are subject to quarantine restrictions. Countries such as Japan, China and the USA prohibit the import of many fruit and vegetable products, and those that are allowed, must be fumigated or cold sterilised to remove fruit fly and other insects. Cold sterilisation requires the exporter to monitor the chilled fruit in the refrigerated container for five days prior to sailing. Meat exports also attract overseas quarantine restrictions on chemical residues.

Quotas and tariffs also affect the levels of exports to certain trade areas. The North American, European and Japanese markets all place quotas or trigger levels (or sometimes both) on meat imports from Australia. Quotas can also be closely related to 'off-seasons' in the market. Italy for example, restricts access for Australian fruit products to a three to four month period which corresponds to the country's 'off-season'.

Freight rates

Freight rates are generally set for a 12-month period and do not fluctuate according to the seasonal availability of produce. Rates are determined by negotiations between shipping lines and shipping bodies and only vary during the year due to currency fluctuations and ship bunker prices.

Generally, maximum freight rate levels are negotiated between the conference representing the shipping lines in a trade area and the ASC which is the designated shipping body under the Trade Practices Act. Rate negotiations are also conducted between conferences and commodity boards. These rates are generally lower than those obtained by the ASC, because of the large volumes involved. Non-conference operators have usually tended to offer lower rates when compared to conference lines. Variations in rates, transit times and service for conference and non-conference operators, vary markedly both within and across trades.

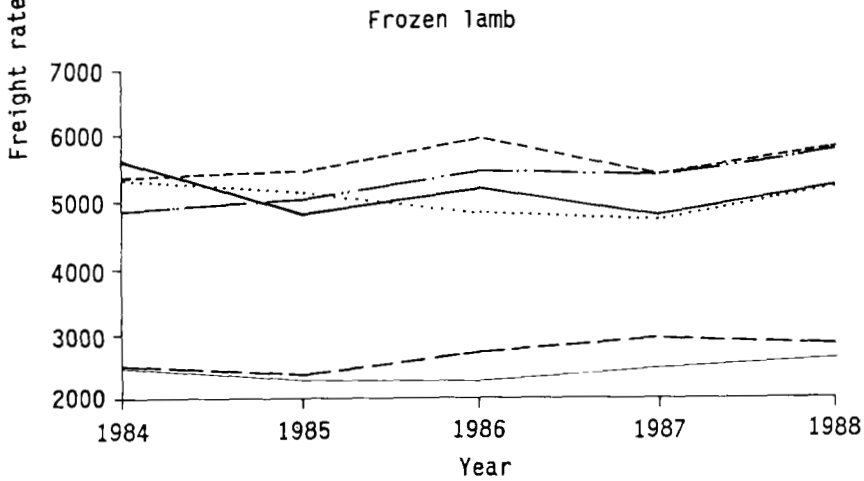
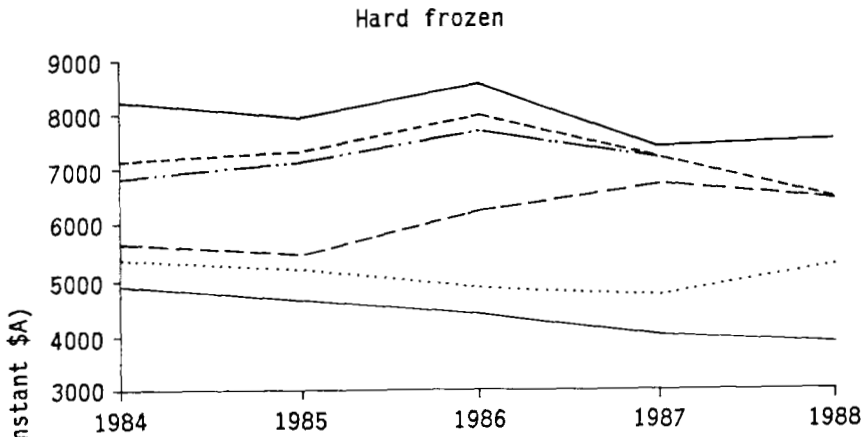
Promotional rates can be negotiated between shippers and shipping lines, however these rates can be limiting and long-term markets cannot be established on the basis of such rates.

Refrigerated products have benefited from competition between conference and non-conference operators. Figure 3.4 shows freight rates for hard frozen beef and lamb carcasses for various trade areas between 1984 and 1988. The figure shows that for hard frozen beef, freight rates (\$A) to a number of trade areas have either remained relatively stable or declined in real terms (GDP implicit price deflator ABS (1988c)). The exception is in the Japanese trade, where freight rates have increased in real terms over the period. Freight rates for lamb carcasses have remained relatively stable, except for increases in the North American trades.

Freight rates are negotiated according to the ability of the product to pay and the cost of the service. Table 3.4 illustrates the conference freight rates for various reefer commodities and trades. In the European trade, chocolate attracts the highest freight rate of those shown, with fruit being the lowest. The relative freight rate differential between the commodities (except for chocolate), does not change significantly between the trades.

Generally, commodities where the price of transport represents a high proportion of the final price and where they face competition in the market place, are more likely to be responsive to changes in freight rates. Under these circumstances, changes in the freight rate can reduce the competitiveness of the commodity.

Table 3.5 shows the ratio of the value of the product to the freight rate for various commodities in the European trade. The freight rate for highly valued fish and meat exports, only accounts for 2.2 and 5.6 per cent of the values respectively. In comparison, the freight rate for citrus products amounts to over half of the value. The evidence



- Middle East
- - - - East Coast North America
- · - · West Coast North America
- · — · Japan
- Europe
- East Asia

Note In 1987-88 prices.

Source Australian Meat and Livestock Corporation (1988).

Figure 3.4 Freight rates for meat, 1984 to 1988

TABLE 3.4 AUSTRALIAN CONFERENCE FREIGHT RATES FOR SELECTED COMMODITIES

(\$/TEU)

<i>Freight rates at 1.1.88</i>	<i>Europe</i>	<i>West Coast North America</i>	<i>East Asia</i>	<i>South- East Asia</i>
Beef	5 200	6 358	3 833	4 100
Fish	5 707	6 415	4 034	4 200
Chocolate	9 160	5 590	3 833	3 850
Citrus	4 275	6 400	3 320	3 419 ^a
Grapes	4 490	..	3 631	3 450
Apples	4 115	5 400	3 400	3 480
Pears	4 293	6 310	3 400	3 749

a. 1987 season rate for 8'6" TEU.

.. Not applicable.

Source IAC (1988).

TABLE 3.5 RELATIONSHIP BETWEEN FREIGHT RATES AND THE VALUE OF SELECTED COMMODITIES IN THE EUROPEAN TRADE, 1986-87

<i>Commodity</i>	<i>Value</i>	<i>Freight rate</i>	<i>Ratio^a</i>
	<i>(\$/tonne)</i>		<i>(per cent)</i>
Crustaceans	12 290	275	2.2
Hard frozen beef	4 826	270	5.6
Grapes	1 764	429	24.3
Citrus	626	329	52.6

a. Ratio of freight rate to value.

Source BTCE estimates derived from ABS Shipping and Air Cargo commodity Statistics. Shipping Conferences Services (pers. comm.).

suggests that citrus products in the European trade may be highly sensitive to freight rate changes, since they face competition from other southern hemisphere exporting nations.

International competition for refrigerated shipping

Australia also competes for shipping services in the world market. At present, there is a world wide shortage of refrigerated shipping services during the peak export seasons. In 1985, Australia exported approximately 5 per cent of the total world sea trade in refrigerated products. In comparison, South America's, North America's and New Zealand's shares were approximately 30, 10 and 6 per cent respectively. As such, these nations tend to attract a larger proportion of the world refrigerated capacity.

Imports

Europe and New Zealand were the main sources for imports of refrigerated cargo into Australia in 1986-87, accounting for 45 per cent of total imports. Other major sources were South America, Africa, North America and the China Sea. New Zealand provided over 97 per cent of all meat imports in 1986-87, with three-fifths of the volume arriving between March and July.

Approximately 62 per cent of total dairy imports originated from the European countries in 1986-87, with New Zealand contributing a further 35 per cent. Dairy imports peaked during October.

Seafood imports originated mainly from the South American and African trades. During 1986-87, there was a high peak in April when over 27 per cent of seafood imports arrived in the single month.

The major sources of fruit imports were North America and New Zealand with 49 per cent being imported between January and March.

In 1986-87, 24 356 tonnes of vegetables were imported, mainly from Europe, North America, New Zealand and the China Sea. December was the peak month, with 17 per cent of the volume.

PORTS

Australia's refrigerated exports are very dependent on the capacity of the port to provide suitable levels of refrigerated storage space. The equipment used for the storage of refrigerated cargoes represents a large capital outlay, and as such, not all ports provide these facilities. This section describes the commodities that pass through the ports, and their associated seasonalities.

Description

Refrigerated products were exported from a total of 22 Australian ports during 1986-87. However, over 92 per cent of refrigerated products were exported through only five ports: Melbourne; Brisbane; Sydney; Fremantle and Adelaide (see Table 3.6). The dominance and ranking of the ports has not changed since 1982-83. In 1986-87, the respective shares of the major ports were 35, 27, 19, 8 and 4 per cent of total refrigerated exports.

Although the rankings have not changed, the relative proportions of total refrigerated products to each of the major ports has. Both Brisbane and Sydney have increased their relative shares, from 26 to 27 and 15 to 19 per cent of total refrigerated exports respectively. The growth of exports in these ports was mainly due to meat and dairy products. The market shares of the other ports have declined, mainly due to a decline in meat volumes.

Nearly nine out of ten tonnes of meat products were exported through the ports of Brisbane, Melbourne and Sydney. Melbourne was the most important port for dairy products, shipping about three quarters of the total dairy trade in 1986-87. Seafood was exported from all major ports in similar volumes. Nearly half of all fruit exports passed through the port of Melbourne in 1986-87, while the large proportion of vegetables through 'other' ports comprised onions from Tasmania.

Seasonality

Seasonal patterns are not readily identifiable in all major ports (see Figure 3.5). For instance, Adelaide exhibits a relatively stable volume of exports throughout the year while exports through Sydney constantly fluctuate. Exports through the port of Fremantle peaked between the months of February and April, due to the large volumes of fruit and vegetables exported during this period. The port of Brisbane on the other hand had a relatively long peak season, from March to October. This peak was due to the high level of meat exports.

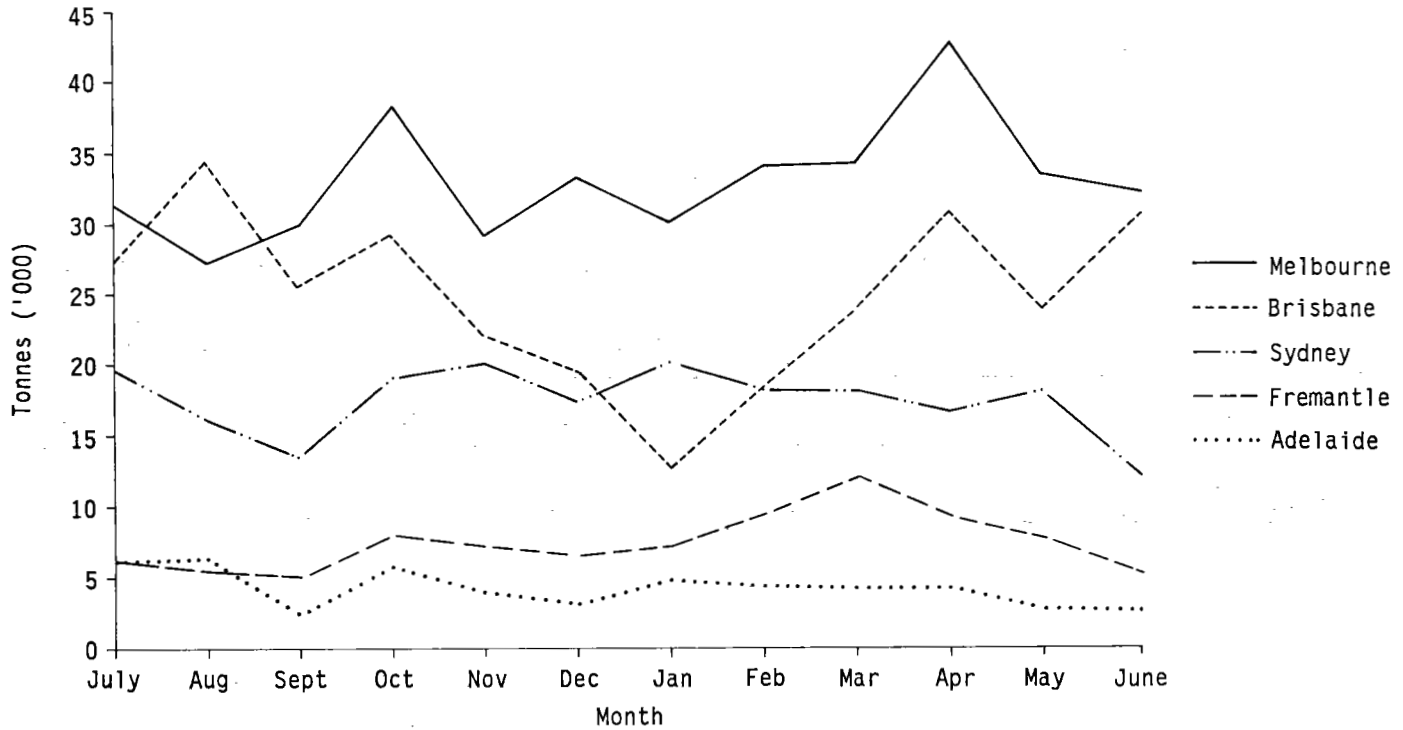
Two seasonal peaks occurred in the export of refrigerated commodities through the port of Melbourne in 1986-87. The October peak was largely due to increased exports of dairy products, while the large increase in fruit volumes caused the peak in April.

TABLE 3.6 REFRIGERATED COMMODITIES EXPORTED THROUGH PORTS, 1982-83 TO 1986-87

Port	1982-83		1983-84		1984-85		1985-86		1986-87	
	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)
Sydney	163	384	122	303	137	348	192	463	208	496
Melbourne	425	1 060	304	783	353	815	392	835	395	874
Brisbane	281	851	273	824	234	740	259	785	297	903
Adelaide	63	97	27	47	33	45	56	94	48	72
Fremantle	105	412	82	340	82	324	88	312	88	281
Other	57	136	57	157	49	103	52	97	83	129
Total	1 094	2 940	865	2 453	889	2 377	1 038	2 586	1 119	2 755

Notes 1. Figures may not add to totals due to rounding.
2. 1986-87 prices.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.



Source: BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

Figure 3.5 Seasonal patterns of refrigerated exports through major ports, 1986-87

CHAPTER 4 UTILISATION OF EXPORT CARGO SPACE

The previous chapter has shown how the commodity and trade proportions have changed over the last five years. These changes, along with the seasonality pressures, have placed large demands on the availability of refrigerated cargo space on ships and at ports. This chapter begins with an assessment of the utilisation of export refrigerated cargo space to the major trade areas and at the five major Australian ports in 1986-87. The degree to which refrigerated cargo space was available during the year is shown, indicating the difficulty that exporters may have encountered in locating cargo space.

The chapter also assesses the likely utilisation of cargo space by trade area and port for the period 1987-88 to 1989-90. This involved estimating volumes of refrigerated exports by sea for these years.¹ These estimates were then used with the available cargo space to determine trade area and port utilisations. Details of the methodology can be found in Appendix IV. An assessment of the availability of refrigerated containers was not undertaken due to a lack of data and the cost in obtaining the necessary data.

CURRENT PERFORMANCE

The following sections examine the utilisation of refrigerated cargo space for 1986-87. Utilisation is expressed as the ratio of the number of equivalent containers required to the number of equivalent shipping slots available.

In 1986-87, it was estimated that nearly 96 500 TEUs were required to export 1.12 million tonnes of refrigerated products by sea from Australia (see Table 4.1). This cargo space included the volumes of refrigerated products sent in conventional reefer ships. Excluding those cargoes that went by conventional refrigerated vessels, it was estimated that approximately 83 600 refrigerated containers were needed in 1986-87.

1. Estimates for 1987-88 were developed, since no detailed trade data was available.

TABLE 4.1 CARGO SPACE REQUIREMENTS FOR REFRIGERATED EXPORTS, 1986-87

<i>Commodity group</i>	<i>Seaborne volume ('000 tonnes)</i>	<i>Cargo space^a ('000 TEUs)</i>	<i>Container space^b ('000 boxes)</i>
Meat	758.2	65.1	56.0
Dairy	139.7	10.6	10.0
Seafood	29.2	2.5	2.3
Fruit	118.6	12.0	10.7
Vegetables	73.7	6.2	4.5
Total	1 119.2	96.4	83.6

- a. Cargo space required to transport all seaborne refrigerated products, both containerised and break-bulk.
- b. Cargo space required to transport seaborne refrigerated products that went by containers in 1986-87.

Note Figures may not add to totals due to rounding.

Source BTCE estimates.

The difference between the total cargo space and containers required represents the amount of cargo that is shipped in conventional reefer ships. The main reefer shipments were in the meat, fruit and vegetable trades (see Table 4.1). The meat trade comprised shipments to both the Middle East and North America.

Utilisation of cargo space to major trade areas

The utilisation of cargo space to the major trade areas was estimated by comparing the volume shipped with the capacity to each trade area. Table 4.2 shows that the average yearly utilisation of refrigerated cargo space during 1986-87 varied from 0.49 in the European trade to 0.72 in the Middle East trade. Except for the latter trade, refrigerated shipping space was not consistently highly utilised over the year.

Mean utilisation rates for North America and Europe were low, despite the fact that some ships in these trades commonly served both New Zealand and Australia. It was estimated that on average, nearly 21 and 33 per cent per annum of available space in the North American and European trades was allocated to New Zealand exporters. These percentages changed on a monthly basis.

TABLE 4.2 UTILISATION OF REFRIGERATED CARGO SPACE TO MAJOR TRADE AREAS, 1986-87

<i>Trade area^a</i>	<i>Months</i>												
	<i>July</i>	<i>August</i>	<i>September</i>	<i>October</i>	<i>November</i>	<i>December</i>	<i>January</i>	<i>February</i>	<i>March</i>	<i>April</i>	<i>May</i>	<i>June</i>	<i>Total</i>
North America													
ECNA	0.49	0.52	0.57	0.81	0.58	0.74	0.61	0.79	0.73	0.88	0.75	0.56	0.65
WCNA	0.46	0.41	0.48	0.51	0.48	0.47	0.46	0.53	0.67	0.56	0.57	0.48	0.51
China Sea	0.47	0.54	0.46	0.66	0.67	0.52	0.49	0.67	0.59	0.61	0.77	0.57	0.58
Europe	0.24	0.28	0.29	0.30	0.29	0.23	0.21	0.69	0.95	0.90	0.89	0.41	0.49
South-East Asia													
Asia	0.75	0.68	0.59	0.76	0.61	0.37	0.47	0.67	0.76	0.56	0.65	0.60	0.62
Middle East	0.80	0.77	0.48	0.78	0.65	0.85	0.80	0.75	0.70	0.69	0.76	0.46	0.72

a. Trade areas are defined in Appendix II.

Source BTCE estimates.

Although the yearly mean utilisations were low, monthly utilisations did vary substantially in individual trades. In the ECNA trade, cargo space utilisation increased significantly in the seasonal months of October and April, reaching 0.81 and 0.88 respectively. These utilisation rates indicate that exporters would have encountered problems in finding refrigerated cargo space during these months.

The European trade showed significant seasonal patterns, with utilisation rates increasing from approximately 0.2 to 0.9. With approximately 90 per cent of cargo space utilised between March to May, exporters at particular ports would have encountered significant problems in obtaining the necessary refrigerated cargo space to the European trade.

Both the China Sea and South-East Asian trade routes showed no signs of pronounced seasonality, and there was no evidence to suggest that exporters would have had difficulty in finding refrigerated cargo space.

In contrast to the other four trades, the Middle East trade exhibited high utilisation rates throughout the year, with no evidence of a seasonal trend. However, the consistently high utilisation rates throughout the year would suggest that some difficulty may have been encountered in finding sufficient cargo space, particularly in December.

The above analysis does not preclude the possibility that there may have been difficulties in obtaining sufficient cargo space to individual countries within a trade area, or from a specific Australian port. However, from a national perspective, there appears to be sufficient cargo space available to the major trades, except during the seasonal peaks in the European, ECNA and Middle East trades.

Refrigerated cargo facilities at ports

Table 4.3 shows the refrigerated container capacities and movements through the major ports in 1986-87. Capacity for integral containers is provided at all major ports. Melbourne has the largest capacity for these units, comprising 34 per cent of the total capacity of the major ports listed.

Capacity for porthole containers is only provided at Melbourne, Brisbane, Sydney and Fremantle. These are the main ports which export containerised refrigerated cargoes to Europe and North America. Porthole containers also move through ports without porthole facilities, by utilising clip-on units in conjunction with integral slots.

TABLE 4.3 REFRIGERATED CONTAINER CAPACITIES AND MOVEMENTS IN MAJOR AUSTRALIAN PORTS, 1986-87
(Containers)

Ports	Container capacity	Movement				
		Exports	Imports	Coastal	Total	
Melbourne	I ^a	2 152	24 387	2 461	19 743	46 591
	P ^b	524	9 085	1 060		10 145
Brisbane	I	1 546	13 536	347	1 055	14 938
	P	208	5 232	85		5 317
Sydney	I	1 040	8 009	4 270	5 510	17 789
	P	316	5 406	1 205		6 609
Fremantle	I	1 147	8 002	704	721	9 427
	P	48	990	191		1 181
Adelaide	I	499	3 623	190	821	4 634
Total	I	6 384	57 557	7 972	27 850	93 379
	P	1 096	20 713	2 541		23 252

a. Integral.

b. Porthole.

Notes 1. Container capacities include freight forwarders' depots located near the port.

2. Movements are for fully utilised refrigerated containers only.

Sources BTCE estimates derived from ABS Shipping and Air Commodity Cargo Statistics. Department of Transport and Communications (1988, pers. comm. 1988).

The table shows that the proportions of total containers through the major ports are roughly similar to the capacity proportions in each port. The exception is the port of Melbourne, where nearly half of the total integral containers flow through the port. However, Melbourne only has one third of the capacity of the five major ports. Its large container flow is due in part to the significant coastal trade, of which 71 per cent flows through Melbourne. However, the majority of the coastal trade is not expected to utilise the integral facilities at ports.

The majority of exports are transported in integral containers, and the major ports of exit are Melbourne, Brisbane and Sydney, with

nearly 80 per cent of integral export container movements through the major ports. The number of refrigerated containers used in the import trade is relatively small when compared to the export trade. Over half of containerised imports flow through Sydney, with Melbourne accounting for another one third. Like exports, the majority of imports are transported in integral containers.

Utilisation of cargo space at major ports

Many refrigerated containers can use a single 'reefer slot' at a terminal over a period of time and it is therefore not possible to directly compare the requirements for cargo space with the capacity available. For this study, the utilisation of refrigerated cargo facilities at ports is expressed in terms of potential holding time of a container. This quantity is defined as the average time in days that a container could occupy one storage slot at a port. The containerised cargo space requirements were used to determine the utilisation of container terminal facilities, since cargo shipped by conventional refrigerated vessels does not use container slots.

It is important to note that the potential holding time should be taken as an indicator of cargo space availability, rather than as a particular value. In general, it can be stated that a potential holding time of more than 10 to 15 days would indicate that there is unlikely to be pressure on the storage facilities, since ships to trade areas may depart every third day. However, capacity may be fully utilised at any one terminal or at any time during the month.

Table 4.4 shows the estimated time that a container could occupy a storage slot at the major ports in 1986-87. The table suggests that integral port capacities were sufficient to meet the yearly demand. In fact, the ports of Brisbane, Adelaide and Fremantle were able to provide holding capacity for each integral container for at least 37 days. The porthole facilities were more highly utilised over the year than the integral facilities, ranging from 14 to nearly 19 days holding capacity for each container.

The monthly utilisation rates differed significantly from the yearly rates (see Table III.12). There would appear to have been no difficulty in obtaining an integral reefer slot at each of the major ports in 1986-87, although this may not be a true reflection of the situation on the basis on individual terminals. Maximum holding time in the porthole facilities dropped below 11 days in all ports except Sydney during the peak seasons. This would indicate that during these months, porthole facilities were highly utilised.

TABLE 4.4 AVERAGE TIME AVAILABLE FOR REFRIGERATED CONTAINER STORAGE
AT MAJOR PORTS, 1986-87
(days)

<i>Port</i>	<i>Container type</i>	
	<i>Integral</i>	<i>Porthole</i>
Sydney	21.3	17.5
Melbourne	16.9	18.9
Brisbane	37.8	14.3
Adelaide	39.3	..
Fremantle	44.4	14.8

.. Not applicable.

Source BTCE estimates.

FUTURE REQUIREMENTS FOR CARGO SPACE

It is important for both terminal and shipping companies to know there is sufficient demand for refrigerated facilities in order to support continued investment in existing facilities, or to encourage new investment. Similarly, shippers of refrigerated products need to know that there is an adequate supply of facilities to meet the export demand. There was evidence to suggest that in 1986-87, exporters encountered difficulties in obtaining sufficient cargo space to some trade areas during the seasonal peak months.

Refrigerated export volumes

Industry sources suggested that trading patterns and capacity for refrigerated exports did not vary significantly between 1986-87 and 1988-89 (and thus were not changed for these years). However, a growing share of Australian meat exports is expected to go to the Japanese and Korean markets (as import policies are liberalised), and this is taken into account in the estimates of demand patterns for 1989-90. Significant changes in refrigerated shipping capacity are expected in 1989-90 (and have been taken into account in assessing capacity utilisation).

Approximately 1.17 million tonnes of refrigerated products were estimated to be exported by sea in 1987-88, an increase of over 4 per cent from the previous year (see Table 4.5). The main increases occurred in meat, fruit and vegetable exports. Dairy products declined by 5 per cent, while seafood exports were relatively stable.

The total cargo space required to transport these cargoes in 1987-88 was estimated at 99 400 TEUs, an increase of 3 per cent since 1986-87. However, the number of refrigerated containers were estimated to be 92 200, an increase of over 10 per cent. This significant increase was due to the change in the commodity mix.

In 1988-89, export volumes of refrigerated cargoes are estimated to decline to nearly 1.13 million tonnes, due mainly to a decline in meat and fruit products. Dairy volumes are estimated to return to the 1986-87 levels, while vegetables are expected to grow steadily. Total cargo space requirements are estimated to return to the 1986-87 levels, although the container estimates are still above the 1986-87 levels.

Refrigerated exports are forecast to rise in 1989-90, mainly because of the increased opportunity for meat exports. Cargo space required will slightly exceed the 1987-88 levels.

Utilisation of cargo space to major trade areas

The mean yearly utilisation rates to the major trade areas are estimated to rise in 1987-88 and then fall in 1988-89 with the exception of the European trade (see Table 4.6). This follows the trend in the forecasts of refrigerated export volumes.

The estimated rise in 1987-88, was not expected to provide a problem for exporters, except in the East Coast North American and European trades. This was due to the fact that the other trade areas showed no clearly defined seasonal patterns. Therefore, any volume increases to these areas were likely to be spread over the year. However, the majority of increases to the European and ECNA trade areas were likely to occur in the seasonal peaks.

Since shipping capacities did not change significantly between 1986-87 and 1987-88, these demand estimates were compared to the 1986-87 capacities. Exporters would have had great difficulty in obtaining refrigerated cargo space to the European trade area between March and May in 1988. The increased utilisation rates for these months are due to the strong growth predicted in fruit and vegetable exports. It is expected that there would have been significant difficulties in obtaining cargo space to ECNA in April 1987-88, due to the increased beef volumes.

TABLE 4.5 ESTIMATED CARGO SPACE REQUIREMENTS FOR REFRIGERATED EXPORTS, 1987-88 TO 1989-90

<i>Commodity group</i>	<i>Seaborne volume ('000 tonnes)</i>	<i>Cargo space^a ('000 TEUs)</i>	<i>Container space^b ('000 boxes)</i>
1987-88			
Meat	784.1	65.8	61.2
Dairy	132.7	10.1	10.1
Seafood	29.6	2.6	2.5
Fruit	139.1	14.0	13.1
Vegetables	83.1	7.0	5.3
Total	1 168.5	99.4	92.2
1988-89			
Meat	743.1	62.1	57.8
Dairy	138.1	10.5	10.4
Seafood	28.5	2.5	2.4
Fruit	131.9	13.2	12.4
Vegetables	92.4	7.8	5.9
Total	1 133.9	96.0	88.9
1989-90			
Meat	791.6	65.2	60.7
Dairy	141.6	10.8	10.7
Seafood	24.5	2.2	2.1
Fruit	139.5	13.8	12.9
Vegetables	101.8	8.9	6.5
Total	1 199.0	100.5	93.0

a. Cargo space required to transport all seaborne refrigerated products, both containerised and break-bulk.

b. Cargo space required to transport seaborne refrigerated products that are estimated to be carried in containers.

Note Figures may not add to totals due to rounding.

Source BTCE estimates.

TABLE 4.6 ESTIMATED UTILISATION OF REFRIGERATED CARGO SPACE TO MAJOR TRADE AREAS, 1987-88 TO 1989-90

Trade area ^a	Year	Months												Total
		July	August	Sept- ember	Oct- ober	Nov- ember	Dec- ember	Jan- uary	Feb- ruary	March	April	May	June	
North America														
ECNA	1987-88	0.50	0.53	0.57	0.82	0.58	0.75	0.61	0.81	0.74	0.90	0.76	0.57	0.66
	1988-89	0.47	0.50	0.54	0.78	0.55	0.71	0.58	0.77	0.70	0.85	0.72	0.54	0.63
	1989-90	0.49	0.53	0.56	0.92	0.65	0.80	0.71	0.95	0.79	0.96	0.75	0.56	0.69
WCNA	1987-88	0.48	0.42	0.48	0.51	0.48	0.48	0.46	0.54	0.69	0.58	0.58	0.49	0.52
	1988-89	0.45	0.39	0.46	0.48	0.46	0.45	0.44	0.51	0.65	0.55	0.55	0.46	0.49
	1989-90	0.53	0.36	0.54	0.50	0.43	0.42	0.44	0.52	0.61	0.59	0.50	0.53	0.50
China Sea	1987-88	0.48	0.54	0.46	0.66	0.67	0.52	0.49	0.68	0.60	0.62	0.78	0.58	0.58
	1988-89	0.46	0.52	0.44	0.64	0.64	0.50	0.48	0.65	0.58	0.59	0.75	0.56	0.56
	1989-90	0.54	0.71	0.61	0.77	0.79	0.69	0.65	0.83	0.92	0.72	0.78	0.70	0.72
Europe	1987-88	0.25	0.29	0.29	0.30	0.29	0.23	0.22	0.75	1.05	1.01	1.00	0.45	0.53
	1988-89	0.24	0.28	0.28	0.29	0.28	0.22	0.22	0.78	1.11	1.03	0.98	0.43	0.54
	1989-90	0.26	0.24	0.27	0.31	0.22	0.25	0.20	0.85	1.02	0.95	0.97	0.44	0.52

TABLE 4.6 (Cont.) ESTIMATED UTILISATION OF REFRIGERATED CARGO SPACE TO MAJOR TRADE AREAS, 1987-88 TO 1989-90

<i>Trade area^a</i>	<i>Year</i>	<i>Months</i>												<i>Total</i>
		<i>July</i>	<i>August</i>	<i>Sept- ember</i>	<i>Oct- ober</i>	<i>Nov- ember</i>	<i>Dec- ember</i>	<i>Jan- uary</i>	<i>Feb- ruary</i>	<i>March</i>	<i>April</i>	<i>May</i>	<i>June</i>	
South-East	1987-88	0.83	0.75	0.63	0.81	0.65	0.39	0.51	0.72	0.83	0.62	0.71	0.66	0.67
Asia	1988-89	0.81	0.72	0.61	0.78	0.62	0.38	0.50	0.71	0.81	0.59	0.69	0.65	0.65
	1989-90	0.64	0.57	0.39	0.59	0.47	0.30	0.39	0.55	0.58	0.43	0.56	0.50	0.50
Middle	1987-88	0.82	0.79	0.47	0.79	0.64	0.84	0.80	0.76	0.70	0.70	0.78	0.46	0.73
East	1988-89	0.78	0.76	0.46	0.76	0.63	0.82	0.77	0.73	0.68	0.68	0.75	0.45	0.71
	1989-90	0.80	0.70	0.48	0.80	0.52	0.88	0.71	0.65	0.71	0.60	0.72	0.48	0.69

a. Trade areas are defined in Appendix II.

Source BTCE estimates.

In 1988-89, the situation is estimated to ease slightly, in all trade areas except for the European trade, where it remains unchanged compared to 1987-88. This is due to the strong growth predicted for vegetable exports, but accompanied with a decline in fruit exports. With the fall in beef volumes to North America, the tightening of cargo space to ECNA in April should ease.

Forecasts of refrigerated exports to the major trades in 1989-90 were compared with estimated refrigerated capacity for 1989-90. The increased cargo space demands in 1989-90 mainly affect the China Sea and ECNA markets, due to the forecast increase in beef exports.

Refrigerated cargo space is likely to become highly utilised in October, February and April to ECNA, and in March to the China Sea region. Capacity to the European trade is likely to remain highly utilised in the March to May period. Capacity in the South-East Asian market is forecast to increase from previous levels, and as for the Middle East and WCNA markets, there are unlikely to be major problems for exporters.

Utilisation of cargo space at major ports

The measure of port utilisation is the average time in days that a container could be held at a port. This measure indicates the general tightness of the availability of the refrigerated cargo space at a port.

There appears to be more than adequate integral capacity at all ports in 1987-88 and 1988-89, with the exception of Melbourne (see Table 4.7). The lower available holding time factor of 16.1 compared to other ports can be explained by the large volumes of refrigerated coastal trade passing through Melbourne. However, since it is unlikely that all coastal refrigerated trade uses the port facilities, there may be more integral capacity available at Melbourne than is indicated. There is no evidence to suggest that integral port capacity will be highly utilised on a monthly basis (see Table III.15).

Porthole capacity, on the other hand is much more highly utilised in all ports, as evidenced by the lower available holding times compared to integral capacity. It is expected that there will be an easing in the yearly porthole utilisation in all ports in 1988-89 compared to the previous year.

In 1989-90, both porthole and integral utilisations are forecast to return to the 1987-88 levels, and similar problems to those reported in 1987-88 should be expected in the peak export months.

TABLE 4.7 ESTIMATED AVERAGE TIME AVAILABLE FOR REFRIGERATED CONTAINER STORAGE AT MAJOR PORTS, 1987-88 TO 1989-90
(days)

Ports	Container ^a type	Year		
		1987-88	1988-89	1989-90
Sydney	I	20.5	20.9	20.5
	P	16.2	17.0	16.3
Melbourne	I	16.1	16.3	15.9
	P	17.0	17.8	17.1
Brisbane	I	35.0	36.5	35.1
	P	13.1	13.8	13.2
Adelaide	I	35.0	35.8	34.6
Fremantle	I	40.3	41.7	40.2
	P	13.6	14.2	13.8

a. Integral or porthole.

Source BTCE estimates.

SUMMARY

The capacity utilisations indicate that there was sufficient refrigerated cargo space in the major trade areas in 1986-87, except for the European, Middle East and ECNA trades. In the latter trades, exporters would have encountered difficulties in obtaining sufficient cargo space in the peak season. There is some concern that porthole capacity in all ports during the peak months was not sufficient to meet the demand.

It is expected that difficulties will be encountered in 1988-89, in obtaining sufficient cargo space in the European trade during March to May. Porthole capacity in all major ports is also expected to be highly utilised during the same period.

Refrigerated exports are likely to increase in 1989-90 due to the liberalisation of the Japanese and Korean markets. Capacity to these markets is expected to become highly utilised in 1989-90. Exporters will continue to experience difficulties in obtaining refrigerated cargo space to the European market in the peak period between March and May. Problems may also be experienced in the ECNA trade in October, February and April.

Recent developments in the first part of 1989 support these views. Industry sources also suggested that industrial problems on the Australian waterfront, especially in Sydney and Brisbane during the beginning of 1989, aggravated the situation.

CHAPTER 5 STRUCTURAL PROBLEMS AND MEASURES FOR IMPROVEMENT

The refrigerated export industry has experienced considerable growth over the last few years. To sustain this growth, the long-term development of the industry will be affected in part, by the level of commitment of producers in particular industries to an export market.

Evidence presented in Chapter 4 substantiates the claims made by exporters that there were difficulties in obtaining refrigerated cargo space during peak periods to some trade areas in the last two years. This tightening of available space is compounded by some of the practices that occur in the industry. They primarily relate to the procedures used to book cargo space and the availability of containers. Other factors that affect the availability of cargo space are issues related to growth in world refrigerated trades, the changes in the mix of commodities and trading patterns, delays in shipping and the organisation of the industry. The above list is by no means exhaustive and is intended to highlight some of the more prominent issues that face the industry at present.

ISSUES

Many of the issues facing the industry stem from a breakdown in some of the processes undertaken to export refrigerated commodities. These issues can be categorised as market, communication and service related. The following sections examine these issues in more detail.

Market characteristics

Requirements for refrigerated cargo space are affected by a number of market issues. Producers of many refrigerated products are oriented to local markets as opposed to export markets and this has implications for export cargo space requirements. Seasonality and weather factors also play a large part in affecting the demand for cargo space.

Generally good prospects in the domestic markets have resulted in the export market being seen as a market for surplus production. When domestic prices drop or a surplus occurs, export levels can rise significantly as producers change markets. This surge obviously places large and unforeseen demands on shipping space. This problem is particularly evident in the horticultural industry. Both the Industries Assistance Commission (IAC) (1988) and the Australian Trade Commission (Austrade) (1986) support the view that there is a lack of commitment to exports over the long-term, by some horticultural producers.

Seasonality is also an issue that faces the refrigerated industry. Some refrigerated goods are subject to seasonality and at times peak seasons of these goods coincide, placing large demands on shipping services. Many of the horticultural and meat products have seasonal patterns which are reflected in the tightening of available space to certain trade areas. Europe in particular exhibits a high seasonal peak between February and April. Shipping lines find it difficult to provide adequate services during these high seasonal peaks, without providing large over capacity during the rest of the year.

Weather is also an influential factor which can affect the availability of cargo space, particularly in the horticultural and dairy industries. Producers usually book cargo space to coincide with projected harvest times. However, weather conditions can either force early or late harvesting, drastically altering shipping bookings. During seasonal months, this aggravates the shortage of space.

Communication practices

A communication process between all export groups is needed for the overall successful export of refrigerated cargoes to markets. However this is not always adequate. The lack of direct communication between exporters and shipping lines can cause many problems, resulting in either the overbooking or double booking of containers. Shipping industry sources suggest that these practices are more prevalent in those industries which exhibit large seasonal fluctuations such as horticultural products.

Shipping industry sources indicated that exporters often make optimistic forecasts of the volumes of refrigerated produce for export and based on these forecasts, book the required amount of cargo space. By the time of shipment, exporters frequently fail to fill the amount of booked space. This overbooking leads to the elimination of the available cargo space on paper, with the subsequent effect of vessels

not being fully utilised when they sail. Industry sources also suggest that some exporters overbook the cargo space required in order to displace competitors in the market place. However, it appears that most overbooking occurs from inaccurate forecasting of export volumes.

The occurrence of double booking is another issue. Often, goods are sold several times in Australia before export. Exporters book the required space on vessels before selling the produce to another exporter. When the booked produce is sold to another exporter, the previous booking is often not cancelled. The new exporter then books the required amount of cargo space. The result is the multiple booking of the required space. This practice is particularly evident in the meat industry.

Similarly, exporters often book space in more than one trade, and wait to see which trade appears to be more profitable. Exporters may also book space with more than one shipping line in order to guarantee cargo space at different times. Industry sources suggested that these practices were mostly evident in the horticultural industry.

Both practices create considerable problems for shipping lines. Shipping companies attempt to minimise the effect of overbooking by not allocating all of the space required by some exporters. Therefore, when forecasts are not met, the problem of unutilised space is reduced. The proportion allocated is based on the shipping lines experience and their own forecasts. If all forecasts were met, there could be a large deficit in capacity.

The Australian refrigerated industry has in the past been regarded by shipping companies as less organised in comparison to New Zealand, where the export industry is highly coordinated and commodities are produced to meet export market needs. However, not all Australian refrigerated exporters should be described as such. The meat, dairy and fish export industries are highly organised and market driven, producing specialised export quality products. For the first two industries, this can be in part attributed to the presence of commodity boards. These commodity boards serve not only to negotiate favourable freight rates for the industry, but act as a broad communication channel between exporters and the shipping lines.

On the other hand, the Australian horticultural export industry is characterised by a large number of small producers. Some of these exporters have been involved in sporadic and opportunistic exporting, rather than in long-term market development. Despite the large number of horticultural export associations, the industry appears to be

uncoordinated and has poor communication channels. This results in inaccurate forecasts of space requirements with consequent difficulties in shipping.

Service factors

Service issues involve the type, amount and quality of services provided by the shipping lines. The major service issues raised in discussion with the industry were the availability and reliability of containers, delays in the arrival of cargo in the market place, freight rates and the competition from New Zealand exporters.

One of the primary issues facing seaborne refrigerated exports, is that they must compete for shipping services in the world market. There is a current shortage of refrigerated shipping in the world. The competition for shipping space increases further during the peak season from February to May, since this peak coincides with the peak horticultural seasons of all southern hemisphere nations which export refrigerated cargoes.

The tightening of available refrigerated cargo space has not only been affected by the increasing volumes of exports in 1987-88, but also by the changing patterns of trade. Refrigerated volumes have increased significantly to Europe and North America. This change in the trading pattern has contributed to the tightening of the available cargo space, particularly during the peak season.

By 1986-87, the balance of the containerised trade had shifted from inbound to outbound. Some shipping lines were therefore under pressure to reduce inbound services in order to maintain viability. Since refrigerated containers are carried alongside dry containers, the removal of inbound services would also usually reduce inbound refrigerated capacity. Any such inbound reduction naturally reduces the capacity for the export trade.

From the shipping lines point of view, the carriage of refrigerated cargoes is a costly task, requiring the use of expensive terminal and shipping infrastructure. Shipping lines suggest that the low freight rates that have been applicable to export refrigerated cargoes lately, are a disincentive to invest in more reliable and sophisticated technology. Further disincentives are caused by limited horticultural seasons. Shipping lines find it difficult to secure reasonable utilisations for the capacity during the long 'off-seasons'. This is particularly evident in the European trade.

The availability of containers is another issue facing the industry. Some industry sources suggested that during the peak season, containers for lower value products such as horticultural goods, were hard to obtain. Several factors are involved in such a shortage.

A rise in the world refrigerated trade is increasing the pressure on the availability of refrigerated containers. Shipping lines suggested that refrigerated containers were being switched to more profitable world trades because of low freight rates. The recent increases in refrigerated container rates for 1989 may alleviate this problem.

The practice of overbooking and doublebooking also creates shortages in containers. When many of these containers are not utilised, it is often too late for other exporters to use those containers. Shortages are further aggravated by the fact that some shipping lines encourage refrigerated cargoes to be shipped in containers provided by the shipping lines. The purpose of this practice is so that shipping lines can easily repair faulty boxes at sea, since the line will carry spares for company boxes.

Changes in the commodity mix of seaborne refrigerated exports have also contributed to shortages in container availability. In the past, most refrigerated containers were designed to transport hard frozen commodities, which did not require sensitive and accurate monitoring devices. Chilled products require containers that have more sophisticated and sensitive monitoring and control devices as compared to frozen products. The increasing proportion of chilled products has placed large demands on the availability of these specialised containers.

Delays in shipping were another service issue raised by exporters. Shipping delays stem from industrial disputes and inefficient practices in ports and on the waterfront. These delays increase the demand on terminal facilities, extend transit times, and affect the market values of the produce. Delays can cause produce to spoil, to miss the market window and cause further return shipping delays. A loss of future contracts can then occur as Australia loses credibility as a reliable supplier.

The treatment of New Zealand and Australia as one market by many shipping lines is another service issue. Australian exporters compete with New Zealand not only in the commodity markets, but also for transport to the European and North American markets. Around one-third and one-fifth of yearly available cargo space is estimated to be taken by New Zealand exporters on the European and North American

trades. Industry sources suggest that New Zealand exporters compete effectively for refrigerated cargo space as they often pay higher freight rates compared to Australian cargoes. Some New Zealand exporters can afford these higher freight rates as they export higher quality produce, which commands higher prices. Higher freight rates encourage shipping lines to invest in new and more reliable technology. With better equipment, produce is more likely to arrive in the market place in better condition which increases its value.

Generally, Australian exporters have not in the past considered the chartering of refrigerated vessels as a serious option. Many overseas countries exporting refrigerated products charter vessels to reduce pressure on scheduled services during peak seasons. Australian exports have been wary of this practice since the industries involved are usually not appropriately structured to arrange the volume required to make chartering worthwhile or willing to risk paying in advance for the cargo space. These impediments to chartering vessels also affect Australia's degree of competitiveness and export flexibility.

The introduction of controlled atmosphere is an issue that both the air and sea freight industries face. The aim of controlled atmospheres is to slow the ripening process, thereby extending the shelf life of the produce. The consequence of the successful introduction of this technology, is that produce which had to be exported by air, could be transported by sea. The increased frequency of the use of controlled atmosphere is expected to create a substitution effect between air and sea. The shift from air to sea for many highly perishable cargoes will expand overseas markets. This will add pressure to the demand for available cargo space at ports and on ships.

MEASURES TO IMPROVE PERFORMANCE

The above discussion has shown that the current problems in the availability of space have been caused by the interaction of a number of factors. Short-term forecasts indicate that the volume of refrigerated exports to some trade areas will continue to grow.

Shipping companies however, have reacted to the changing demand patterns. Capacity has been increased to the European/Middle East regions, and South-East Asia for 1989. Following the trend in exports to the China Sea over the last few years, shipping lines reduced capacity to the region in 1989. However, the liberalisation of the meat markets in this region may pose problems for exporters in obtaining sufficient cargo space.

Terminal operators are also reacting to the shortages in container slots in ports. In the port of Melbourne, additional porthole facilities are planned to be introduced.

These developments show that the industry adjusts (with some time lag) to shifts in demand patterns. However, an efficient accommodation will probably require some modifications in rate structures (to address seasonality problems) and in booking practices. The use of chartered vessels might offer further improvements.

Seasonal rate structures

Currently, shipping lines and conferences charge uniform freight rates throughout the year. A variable rate structure, similar to the low, shoulder and high season rates of other transport industries may alleviate some of the pressure for cargo space in peak seasons. The implementation of such a rate structure would provide incentives for those exporters whose cargoes are not affected by market windows, to transfer cargoes from the peak season to the low and shoulder seasons at discount rates, thus reducing seasonal demand.

Booking practices

One of the major pressures on the availability of cargo space is the practice of overbooking space requirements. The introduction of new booking practices could alleviate some of this pressure. Shipping lines could introduce a forward booking system which imposes a cost on exporters who fail to meet their booking requirements. The forward booking system could be implemented in a number of ways: including a deposit with a non-refundable period; advance purchase of capacity; or a penalty for overbooking. Shipping lines have recently begun to address the issue of overbooking. A trial booking fee was introduced for grapes during 1987-88, and for citrus and onion produce in the European trade in the 1988-89 season.

Chartering

Australian exporters have not in the past exported large volumes of refrigerated produce by chartered vessels, although many overseas countries do so to reduce pressure on scheduled services. To successfully utilise charter services, shippers need to provide both a sufficient quantity of produce, and a guarantee of supply. It may be necessary for many exporters of various refrigerated commodities to share the vessel, thus providing sufficient volumes. However, this will require more organised cooperative efforts by the producer groups.

In addition, with the Closer Economic Relations (CER) with New Zealand, the Australian refrigerated industry should address the issue of sharing chartered vessels with the New Zealand industry. The industry is already moving towards closer ties, with the New Zealand Apple and Pear Marketing Board offering to market up to 50 per cent of Australia's 1988-89 pear crop.

APPENDIX I REFRIGERATED COMMODITIES AND CONTAINERS

Details of the classification of refrigerated commodities and the types of containers used to transport them are provided in this appendix. The commodities needing refrigeration are identified and in addition, the types of containers used such as portholes, integrals and fantainers are described.

IDENTIFICATION OF REFRIGERATED COMMODITIES

The Shipping and Air Cargo Commodity Statistics (SACCS) data base (ABS 1983 to 1987) contains statistics of inward and outward shipping and air cargo commodity movements at Australian ports. The statistics have been compiled by the Australian Bureau of Statistics (ABS) from information contained in import and export documents submitted by importers and exporters or their agents to the Australian Customs Service as required by the Customs Act 1901. Inward cargo statistics relate to cargo loaded overseas, discharged from ships or aircraft at Australian ports. Similarly, outward cargo statistics relate to cargo loaded on ships or aircraft at Australian ports for discharge at overseas ports. The statistics include cargo shipped by sea or air on behalf of both the private and government sectors and include Australian produce and re-exports of foreign product.

The SACCS data base is classified according to the Australian Transport Freight Commodity Classification (ATFCC). The ATFCC code is a commodity classification which provides a systematic arrangement of goods which are judged to be important in terms of their impact on Australia's transport network.

In choosing commodities that were considered to need refrigeration, reliance was placed on the detailed information on the commodity types. From this it was possible to determine those commodities that would need refrigeration. Once the commodities were identified, they were then aggregated into sections. For the purpose of this study, the commodities have been classified into five divisions, each of which is further categorised by several commodity groups. The ATFCC codes for each division and group are presented in Table I.1.

TABLE I.1 REFRIGERATED COMMODITY DIVISIONS AND GROUPS

<i>Division</i>	<i>Commodity groups</i>	<i>ATFCC codes</i>
Meat	Beef	0111, 0112, 0113, 0115, 0116, 0118, 0119
	Lamb	0121, 0122, 0123, 0124
	Poultry	0131
	Pork	0132
	Other meat	0139
Dairy	Milk	0211
	Butter	0126, 0920
	Cheese	0217
	Eggs	0221, 0222
	Other dairy	0991, 0992
Seafood	Fish	0311, 0312
	Lobster	0321
	Oysters	0322
	Prawns	0323
	Other seafood	0327
Fruit	Apples	0511
	Citrus	0512
	Grapes	0513
	Other fruit	0516, 0517, 0519, 0559 ^a
Vegetables	Onions	0572
	Other vegetables	0573, 0579 ^a , 0589 ^a

a. It was necessary to differentiate between reefer and non-reefer cargoes in these classifications. Estimates of the proportion of reefer cargoes in these codes were obtained using the Standard International Trade classification.

Note The ATFCC codes for vegetables carried in 1983 were slightly different from what is listed in the table.

Source Derived from ABS (1985).

REFRIGERATED CONTAINERS

Refrigerated products can be categorised into two groups; chilled and frozen cargoes. Chilled products consist largely of fruit, vegetables and dairy products, and are cooled to a temperature to preserve the condition of the product until it reaches the market. In some cases, such as bananas, the refrigeration is used to control the timing of the ripening of the fruit. Chilled products require sophisticated and expensive monitoring devices, since very small tolerances are necessary in maintaining the correct temperature. Too low a temperature, and the product will freeze and spoil; too high and the product will ripen and spoil. Recently, controlled atmosphere technology has enabled shelf times of products to be significantly extended.

Frozen products, consisting mainly of meat and seafood are the easiest to transport. Temperature tolerances are relaxed since quality is less affected by small changes in temperature.

There are two types of refrigerated containers, porthole and integral. A porthole container has two holes in one end wall, where cold air is blown in the bottom hole and warm air is exhausted through the top hole. These containers require an external source of cold air. This source is usually produced by a refrigeration tower on land, or a refrigeration plant on board ship. Alternatively, a separate refrigeration unit can be 'clipped on' to the porthole unit to provide the external air source. This 'clip-on' unit is usually used in the land transport component, but can be used at any stage, only requiring a power source.

The integral container is a box with an electric refrigeration unit built in. This container only needs to be connected to a power source on land or sea.

Porthole reefers provide more reliable temperature control, greater cubic capacity and payload than the integral units, and are cheaper to produce. However, they require expensive cooling facilities on land and ship. Large volumes of a single commodity are more suited to porthole containers, since many containers can be kept at the same temperature. Small volume commodities are better suited to integral containers, where each container can be kept at individual temperatures.

Because of the significant capital expense associated with porthole containers, they are primarily the province of the large volume conference operators. Most other operators prefer integral containers

due to their versatility. Some operators, who mainly provide porthole container space, also provide some integral space to support low volume commodity shipments.

Not all perishable cargoes require refrigerated transport. Ventilated or fan containers may be used to keep the cargo at an ambient temperature but require ventilation to remove moisture. These containers are basically a normal container with ventilation fans for providing fresh air to the cargo. They are used to transport certain vegetables such as onions and have been included as a refrigerated product in the study, since these containers need a power source and will utilize an integral container slot both on the ship and in the terminal.

APPENDIX II DEFINITION OF TRADE AREAS

This study uses a system of referencing trade areas based on 11 geographical regions. This system is based on the Department of Transport and Communication's system of referencing trade areas. These trade areas reflect the geographical destinations of commercial shipping from Australian ports. The 11 geographical regions are listed in Table II.1.

Table II.2 lists the countries comprising each of the trade areas listed in Table II.1.

TABLE II.1 GEOGRAPHICAL CLASSIFICATION OF TRADE AREAS

-
1. EUROPE, includes Mediterranean and North African countries
 2. CHINA SEA, includes those countries bordering the China Sea
 3. NORTH AMERICA, includes Canada and divided into East and West Coast
 4. SOUTH AMERICA, which includes the Caribbean and Gulf of Mexico
 5. AFRICA, excluding countries on the Mediterranean
 6. MIDDLE EAST, which are Red Sea and Persian Gulf countries
 7. INDIAN SUB-CONTINENT
 8. SOUTH-EAST ASIA
 9. NEW ZEALAND
 10. PACIFIC OCEAN (including Papua New Guinea)
 11. OTHER
-

TABLE II.2 TRADE AREAS BY COUNTRY

<i>Trade area</i>	<i>Countries</i>
Europe	Albania Algeria Austria Belgium and Luxemburg Cyprus Czechoslovakia Denmark East Germany (DR) Egypt (Mediterranean) Finland France Gibraltar Greece Hungary Iceland Ireland Israel (Mediterranean) Italy Lebanon Libya Malta Morocco Netherlands Norway Poland Portugal Romania Spain Sweden Switzerland Syria Tunisia Turkey United Kingdom Union of Socialist Soviet Republics (USSR) (Europe and Black Sea) West Germany (FR) Yugoslavia

TABLE II.2 (Cont.) TRADE AREAS BY COUNTRY

<i>Trade area</i>	<i>Countries</i>
China Sea	China Hong Kong Japan Macao North Korea (DR) Philippines South Korea Taiwan USSR (Asia)
North America	Canada St Pierre and Miquelon United States of America
South America	Anguilla Antigua and Barbuda Argentina Bahamas Barbados Belize Bermuda Bolivia Brazil Cayman Islands Chile Costa Rica Dominica Dominican Republic El Salvador Ecuador Falkland Islands Grenada Guatemala Guiana (French) Guyana Haiti Honduras Jamaica Mexico Montserrat

TABLE II.2 TRADE AREAS BY COUNTRY

<i>Trade area</i>	<i>Countries</i>
South America (cont.)	Netherland Antilles
	Nicaragua
	Panama
	Panama Canal Zone
	Paraguay
	Peru
	Puerto Rico
	St Kitts
	St Kitts-Nevis
	St Lucia
	St Vincent
	Trinidad and Tobago
	Turks & Caicos Islands
	Uruguay
	Venezuela
	Virgin Islands
	Virgin Islands (US)
	West Indies (Dominican)
	West Indies (French)
	Africa
Benin	
British Indian Ocean Territories	
Burundi	
Cameroon	
Cape Verde Islands	
Central African Republic	
Chad	
Comoros	
Equatorial Guinea Republic	
Gabon	
Gambia	
Ghana	
Guinea	
Guinea Bissau	
Ivory Coast	
Kenya	
Lesotho	
Liberia	
Madagascar	

TABLE II.2 (Cont.) TRADE AREAS BY COUNTRY

<i>Trade area</i>	<i>Countries</i>
Africa (cont.)	Malawi
	Mali
	Mauritania
	Mauritius
	Mozambique
	Namibia
	Reunion Island (Fr)
	Rwanda
	Sao Tome and Principe
	Senegal
	Seychelles
	Sierra Leone
	Somalia
	South Africa
	South West Africa
	St Helena
	Swaziland
	Tanzania
	Togo
	Uganda
	Upper Volta
	Western Sahara
	Zaire
	Zambia
	Zimbabwe
Middle East	Bahrain
	Djibouti
	Egypt (Red Sea)
	Ethiopia
	Iran
	Iraq
	Israel (Red Sea)
	Jordan
	Kuwait
	Oman
	Qatar
	Saudi Arabia
	Sudan
	United Arab Emirates

TABLE II.2 (Cont.) TRADE AREAS BY COUNTRY

<i>Trade area</i>	<i>Countries</i>
Middle East (cont.)	Yeman (AR) Yeman (DR) Persian Gulf Confidential Red Sea Confidential
Indian Sub- Continent	Afghanistan Bangladesh Bhutan Burma India Maldives Nepal Pakistan Sri Lanka
South-East Asia	Brunei Indonesia Kampuchea Laos Malaysia Singapore Thailand Vietnam
New Zealand	New Zealand
Pacific Ocean	Cook Islands Fiji Guam Johnston and Sand Islands Kiribati Midway Island Nauru New Caledonia New Hebrides Niue Papua New Guinea Pitcairn Island Polynesia (Fr) Samoa (USA) Solomon Islands

TABLE II.2 (Cont.) TRADE AREAS BY COUNTRY

<i>Trade area</i>	<i>Countries</i>
Pacific Ocean (cont.)	Tokelau Tonga Tuvalu Pacific Islands (US) US Trust Territories Vanuatu Wake Island Wallis and Futuna Islands Western Samoa
Other	Not elsewhere stated

APPENDIX III REFRIGERATED IMPORT AND EXPORT STATISTICS

This appendix provides further statistical information about refrigerated imports and exports. The material presented provides greater detail of the import and export task followed by the demand forecasts.

COMMODITIES

Tables III.1 and III.2 show the quantity and value of refrigerated exports and imports by division and month for the year 1986-87.

Meat was the major commodity exported, and volumes peaked in the months of October and April. Dairy and seafood products were relatively stable during the year. Fruit peaked from March through to August, while vegetables had a much shorter season from February to April.

Imports were dominated by the seafood trade, and exhibited no seasonal pattern, despite a large volume of seafood products in April.

Figures III.1 to III.5 show the seasonal pattern of the five commodity divisions for refrigerated exports between 1982-83 and 1986-87. The figures show that the seasonal pattern for fruit and vegetables has always been present, although volumes have increased significantly over the years. Meat products have also contributed to the seasonal peak due to the decline in meat exports between July and December.

TRADING PATTERNS

Tables III.3 to III.7 show the volume and value of refrigerated exports by trade areas between 1982-83 and 1986-87.

Exports to North America (see Table III.3) were categorised by the East Coast and West Coast markets. Over 68 per cent of volumes were exported to the East Coast, with meat and dairy products being the main commodities. Seafood products were primarily exported to the West Coast. Fruit and vegetables were exported to both markets in approximately equal proportions.

TABLE III.1 EXPORTED REFRIGERATED GOODS: BY DIVISION AND MONTH, 1986-87

<i>Division^a</i>	<i>July</i>	<i>August</i>	<i>September</i>	<i>October</i>	<i>November</i>	<i>December</i>	<i>January</i>	<i>February</i>	<i>March</i>	<i>April</i>	<i>May</i>	<i>June</i>	<i>Total</i>
('000 tonnes)													
Meat	64	66	57	74	61	60	55	59	62	70	64	65	758
Dairy	11	12	13	15	12	14	12	10	8	10	9	12	140
Seafood	3	2	2	3	2	1	1	2	1	4	4	3	29
Fruit	14	12	6	9	6	3	4	9	12	18	18	9	119
Vegetables	2	1	1	2	1	2	4	13	23	16	6	2	74
Total	94	94	79	103	83	80	76	92	107	119	101	91	1 119
(\$m)													
Meat	159	173	161	198	168	157	138	147	163	187	171	176	1 997
Dairy	22	22	23	28	22	28	22	17	15	19	13	19	251
Seafood	35	28	27	39	30	22	16	26	25	53	49	34	382
Fruit	9	8	4	5	4	2	3	8	13	18	13	7	92
Vegetables	1	1	1	1	1	1	2	5	9	6	3	1	33
Total	225	232	215	272	224	210	180	204	225	283	248	237	2 755

a. Commodity divisions are defined in Appendix I.

- Notes* 1. Figures may not add to totals due to rounding.
2. 1986-87 prices.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

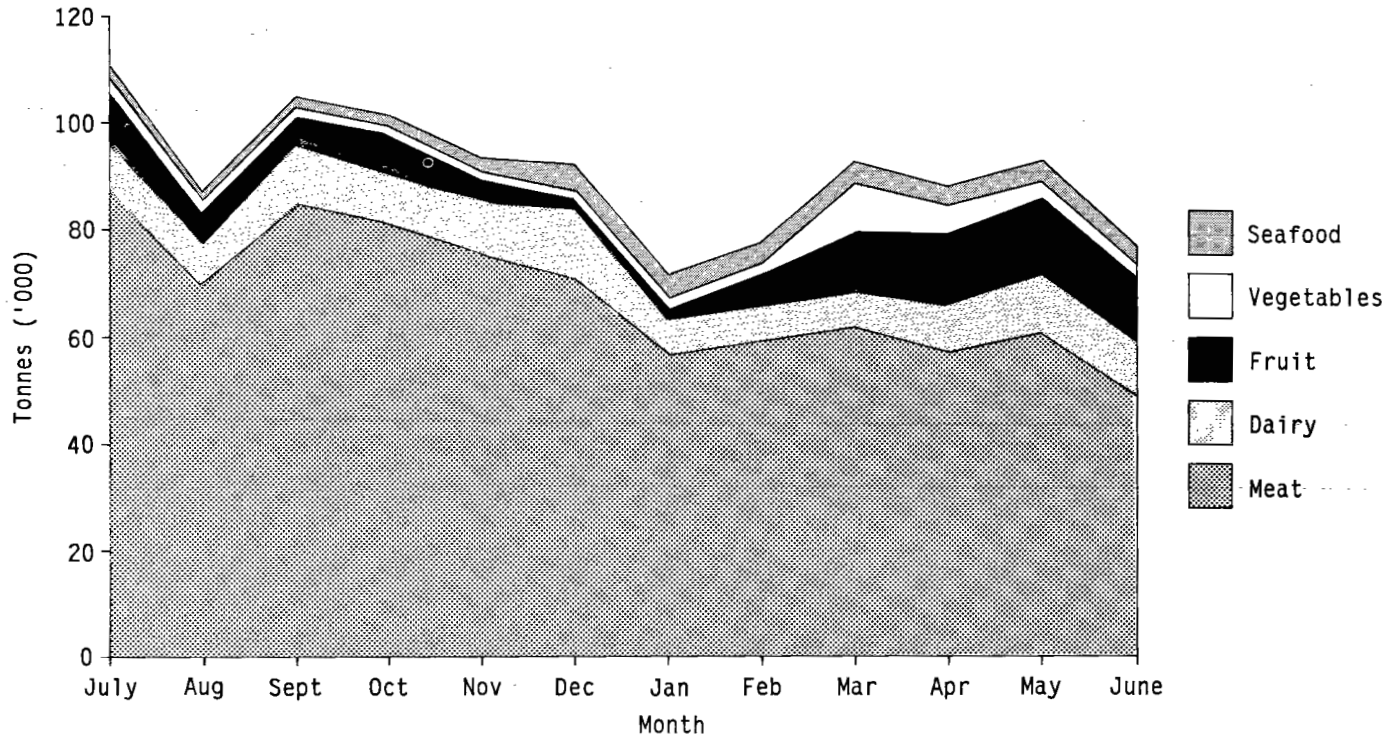
TABLE III.2 IMPORTED REFRIGERATED GOODS: BY DIVISION AND MONTH, 1986-87

<i>Division^a</i>	<i>July</i>	<i>August</i>	<i>September</i>	<i>October</i>	<i>November</i>	<i>December</i>	<i>January</i>	<i>February</i>	<i>March</i>	<i>April</i>	<i>May</i>	<i>June</i>	<i>Total</i>
('000 tonnes)													
Meat	1	-	-	-	-	-	-	-	-	-	-	-	3
Dairy	3	2	2	3	2	2	2	2	2	2	2	2	26
Seafood	3	3	3	6	5	6	4	4	5	18	5	3	67
Fruit	1	2	2	2	2	2	3	6	5	1	1	1	28
Vegetables	2	2	2	2	2	4	2	1	2	2	2	2	24
Total	9	10	9	13	12	15	12	13	14	23	11	9	149
(\$m)													
Meat	2	-	-	-	1	-	1	-	1	-	-	1	7
Dairy	9	8	8	9	8	7	9	7	8	7	9	6	95
Seafood	10	12	11	19	20	21	19	17	22	20	20	15	205
Fruit	2	3	3	4	5	4	4	7	6	2	2	2	43
Vegetable	2	2	2	2	2	3	2	1	2	2	2	2	23
Total	24	26	25	34	35	35	35	33	37	30	33	26	373

a. Commodity divisions are defined in Appendix I.
 - Rounded to zero.

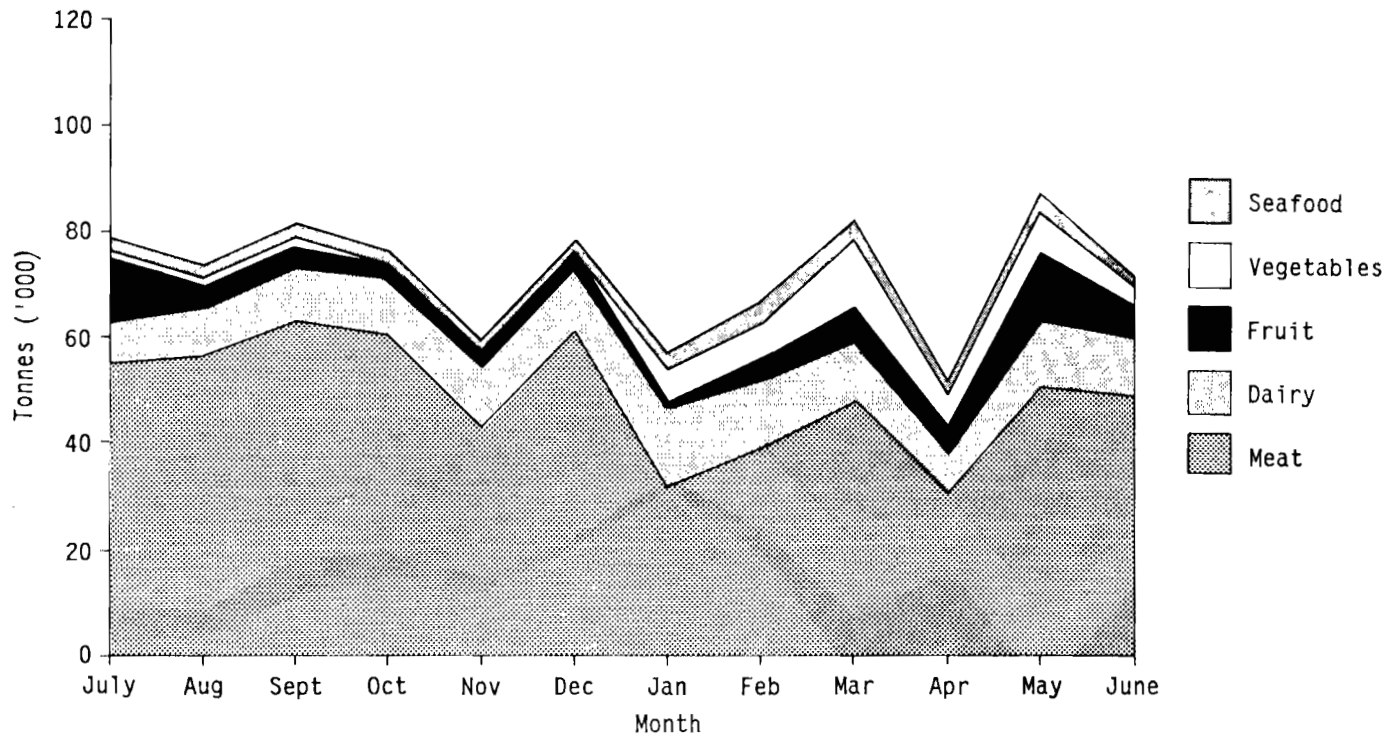
Notes 1. Figures may not add to totals due to rounding.
 2. 1986-87 prices.

75 Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.



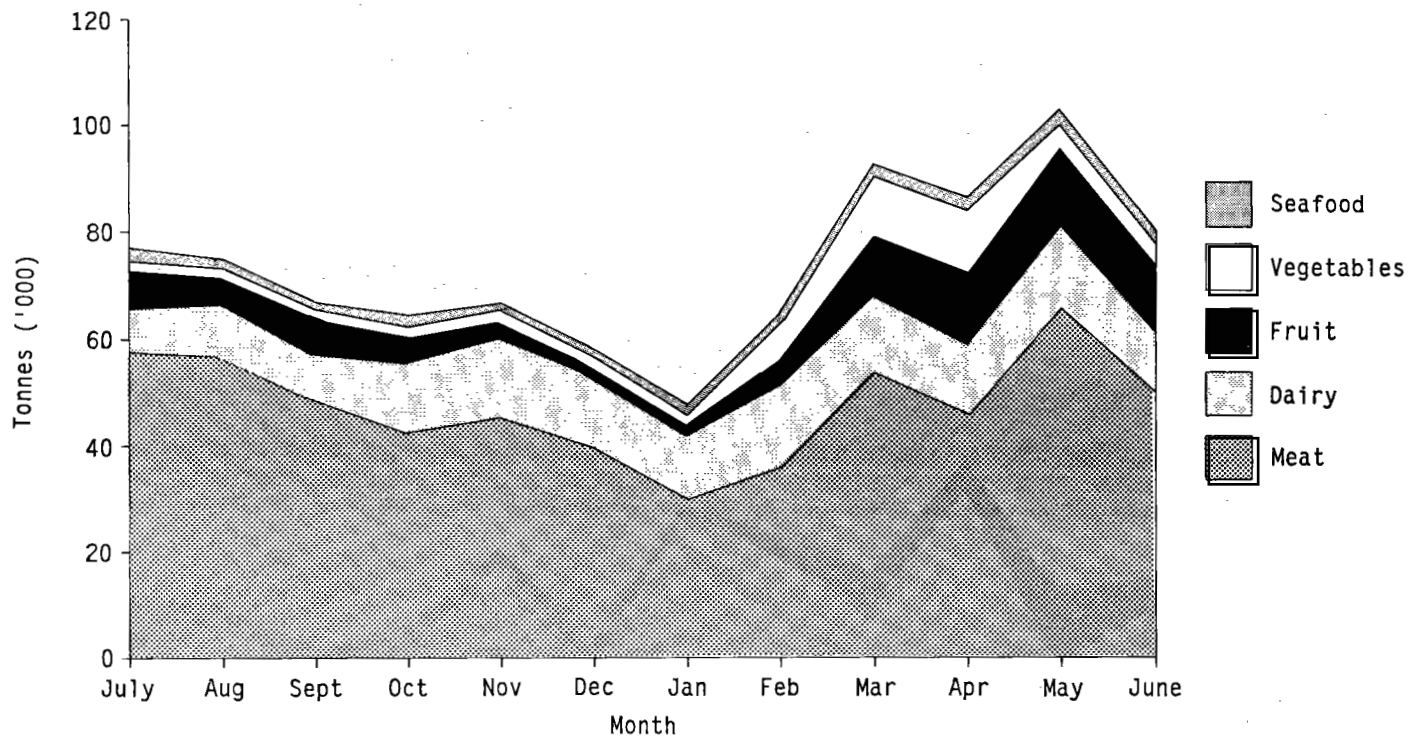
Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

Figure III.1 Seasonal patterns of refrigerated exports, 1982-83



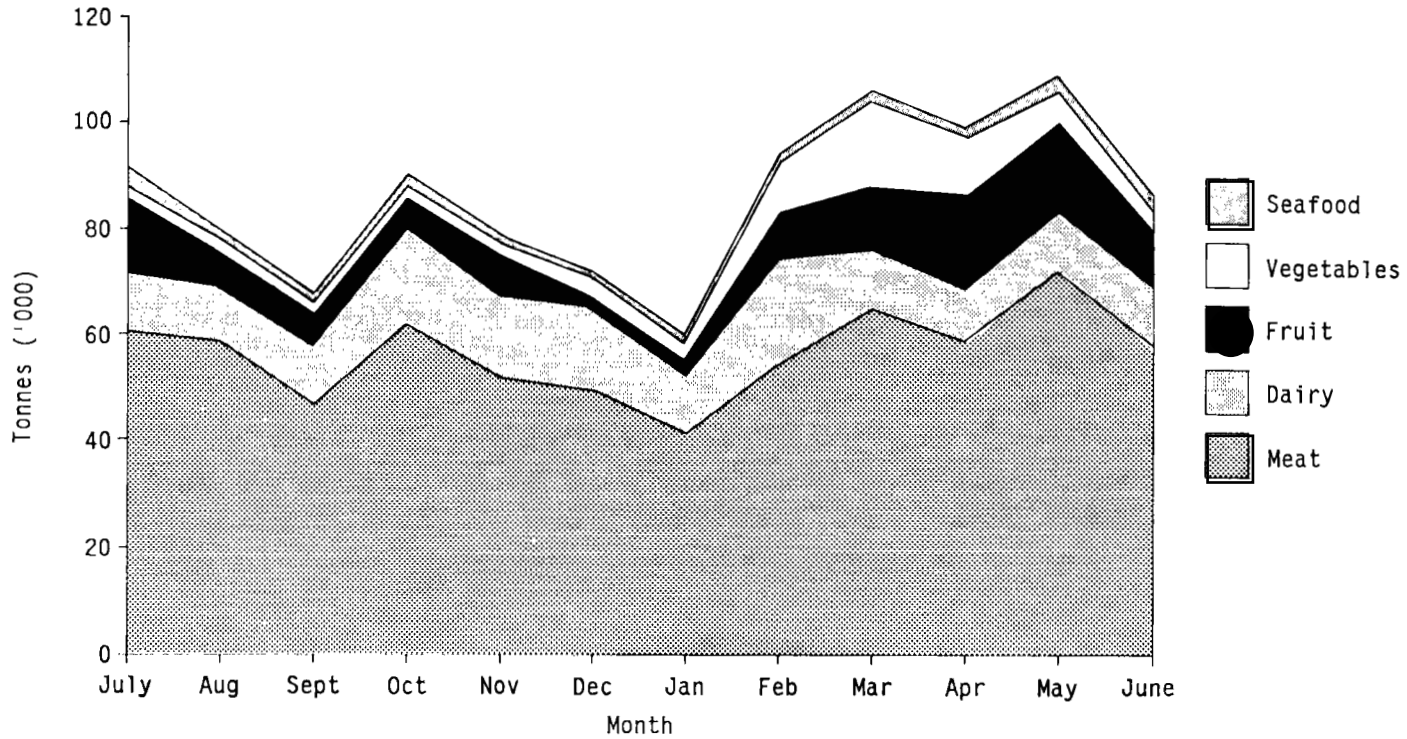
Sources BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

Figure III.2 Seasonal patterns of refrigerated exports, 1983-84



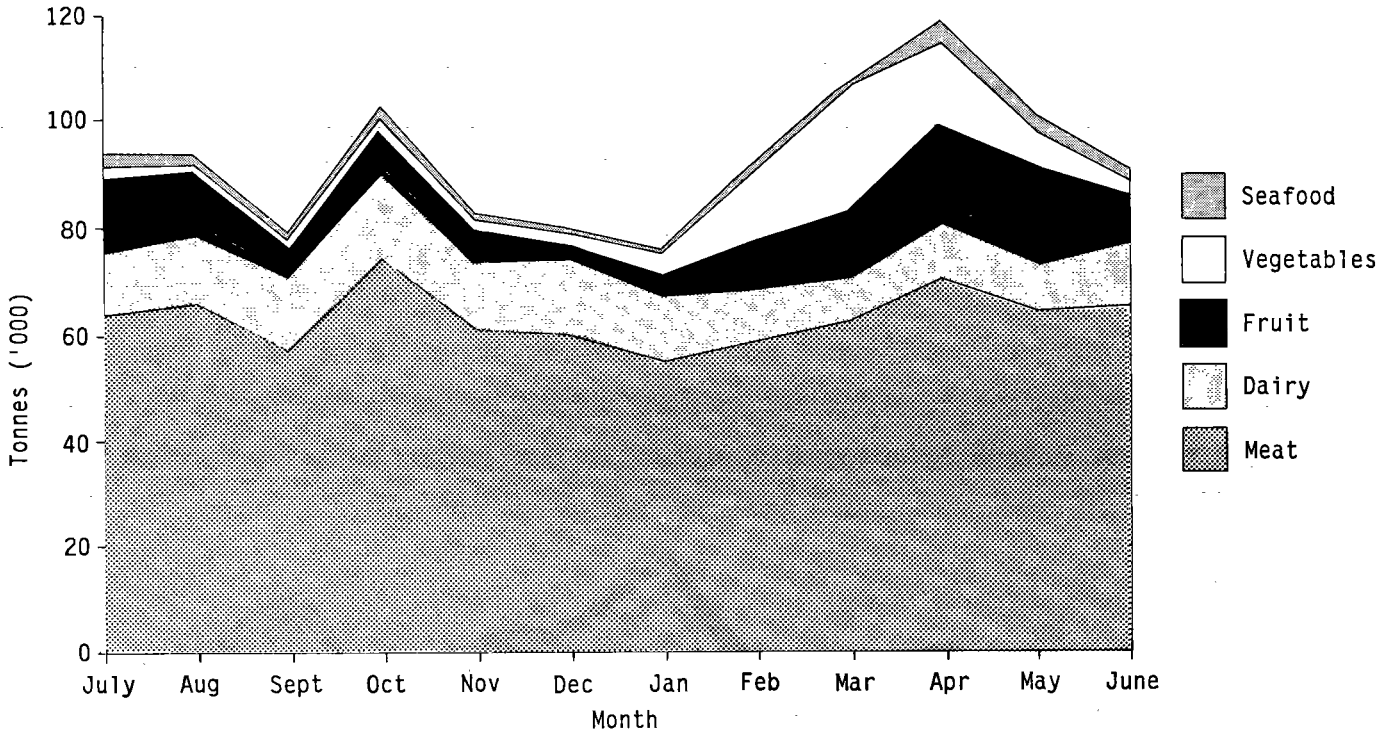
Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

Figure III.3 Seasonal patterns of refrigerated exports, 1984-85



Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

Figure III.4 Seasonal patterns of refrigerated exports, 1985-86



Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

Figure III.5 Seasonal patterns of refrigerated exports, 1986-87

TABLE III.3 EXPORTED REFRIGERATED COMMODITIES: NORTH AMERICA, 1982-83 TO 1986-87

Commodity ^a division	Trade	1982-83		1983-84		1984-85		1985-86		1986-87	
		Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)
Meat	ECNA	277	703	203	542	196	521	241	603	262	693
	WCNA	67	178	60	168	81	229	103	276	120	326
	Total	344	881	263	710	277	750	344	879		1 019
Seafood	ECNA	1	35	1	30	1	20	1	18	1	11
	WCNA	5	135	6	141	3	107	3	85	3	74
	Total		170	7	171	4	127	4	103	4	85
Dairy	ECNA	5	11	3	8	5	10	5	12	4	10
	WCNA	-	-	1	3	-	-	-	1	-	1
	Total	5	11	4	11	5	10	5	13		11
Fruit	ECNA	5	5	4	4	6	6	4	4	4	4
	WCNA	3	3	2	2	5	5	6	5	5	4
	Total	8	8	6	6	11	11	10	9	9	8

TABLE III.3 (Cont.) EXPORTED REFRIGERATED COMMODITIES: NORTH AMERICA, 1982-83 TO 1986-87

Commodity ^a division	Trade	1982-83		1983-84		1984-85		1985-86		1986-87	
		Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)
Vegetables	ECNA	-	-	1	1	1	1	-	-	-	-
	WCNA	-	-	-	-	-	-	-	-	-	-
	Total	-	-	1	1	1	1	-	-	-	-
Total		364	1 071	282	900	297	900	363	1 005	398	1 123

a. Commodity divisions are defined in Appendix I.

- Rounded to zero.

Notes 1. Figures may not add to totals due to rounding.

2. 1986-87 prices.

Source BTCE estimates derived from ABS Shipping and Air Commodity Cargo Statistics.

TABLE III.4 EXPORTED REFRIGERATED COMMODITIES: CHINA SEA, 1982-83 TO 1986-87

Commodity ^a division	Trade	1982-83		1983-84		1984-85		1985-86		1986-87	
		Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)
		Meat	Japan	248	654	182	530	152	476	166	492
	E. Asia	43	99	33	85	33	91	34	94	45	115
	Total	291	753	214	615	185	567	201	586	223	675
Seafood	Japan	23	329	22	280	20	249	20	298	19	240
	E. Asia	1	27	1	23	1	18	1	19	1	12
	Total	24	356	23	303	21	267	22	317	19	251
Dairy	Japan	19	37	23	40	26	50	22	42	23	43
	E. Asia	18	28	28	40	24	36	21	27	27	32
	Total	37	65	51	80	50	86	43	68	50	75

TABLE III.4 (Cont.) EXPORTED REFRIGERATED COMMODITIES: CHINA SEA, 1982-83 TO 1986-87

Commodity ^a division	Trade	1982-83		1983-84		1984-85		1985-86		1986-87	
		Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)
		Fruit	Japan	-	-	-	-	1	1	1	2
	E. Asia	11	9	6	5	10	8	11	9	10	9
	Total	11	10	6	5	11	9	12	11	11	10
Vegetables	Japan	1	1	5	3	2	1	2	1	1	-
	E. Asia	3	2	7	3	4	2	4	2	3	2
	Total	5	3	13	7	6	2	6	2	4	2
Total		368	1 187	307	1 010	273	931	283	984	308	1 013

a. Commodity divisions are defined in Appendix I.

- Rounded to zero.

Notes 1. Figures may not add to totals due to rounding.

2. 1986-87 prices.

3. Japan includes South Korea, while East Asia includes all other China Sea countries.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

TABLE III.5 EXPORTED REFRIGERATED COMMODITIES: EUROPE, 1982-83 TO 1986-87

Commodity ^a divisions	1982-83		1983-84		1984-85		1985-86		1986-87	
	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)
Meat	53	123	26	69	32	82	41	106	43	132
Seafood	11	31	5	24	4	17	3	19	4	36
Dairy	4	11	11	23	14	26	25	42	13	26
Fruit	17	12	12	9	22	16	27	21	31	25
Vegetables	11	8	15	11	22	13	26	11	51	21
Total	96	184	70	136	95	154	121	199	142	240

a. Commodity divisions are defined in Appendix I.

Notes 1. Figures may not add to totals due to rounding.
2. 1986-87 prices.

Source BTCE estimates derived from ABS Shipping and Air Commodity Cargo Statistics.

TABLE III.6 EXPORTED REFRIGERATED COMMODITIES: SOUTH-EAST ASIA, 1982-83 TO 1986-87

Commodity ^a divisions	1982-83		1983-84		1984-85		1985-86		1986-87	
	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)	Quantity (^{'000} tonnes)	Value (\$m)
Meat	30	59	27	53	21	34	19	29	22	36
Seafood	-	3	1	4	-	3	1	3	1	4
Dairy	13	28	14	32	24	47	22	42	20	33
Fruit	44	36	26	21	35	27	38	29	46	34
Vegetables	10	6	12	8	9	5	10	4	8	4
Total	97	131	79	118	88	116	89	107	97	110

a. Commodity divisions are defined in Appendix I.
- Rounded to zero.

Notes 1. Figures may not add to totals due to rounding.
2. 1986-87 prices.

Source BTCE estimates derived from ABS Shipping and Air Commodity Cargo Statistics.

TABLE III.7 EXPORTED REFRIGERATED COMMODITIES: MIDDLE EAST, 1982-83 TO 1986-87

<i>Commodity^a</i> <i>divisions</i>	<i>1982-83</i>		<i>1983-84</i>		<i>1984-85</i>		<i>1985-86</i>		<i>1986-87</i>	
	<i>Quantity</i> (<i>'000</i> <i>tonnes</i>)	<i>Value</i> (<i>\$m</i>)	<i>Quantity</i> (<i>'000</i> <i>tonnes</i>)	<i>Value</i> (<i>\$m</i>)	<i>Quantity</i> (<i>'000</i> <i>tonnes</i>)	<i>Value</i> (<i>\$m</i>)	<i>Quantity</i> (<i>'000</i> <i>tonnes</i>)	<i>Value</i> (<i>\$m</i>)	<i>Quantity</i> (<i>'000</i> <i>tonnes</i>)	<i>Value</i> (<i>\$m</i>)
Meat	73	161	33	77	32	63	48	66	48	72
Seafood	1	2	2	3	1	1	1	1	1	1
Dairy	42	102	41	109	47	124	48	118	33	77
Fruit	7	6	8	6	4	4	10	8	9	6
Vegetables	1	1	3	2	3	2	4	2	1	1
Total	124	271	86	197	88	194	110	195	92	156

a. Commodity divisions are defined in Appendix I.

Notes 1. Figures may not add to totals due to rounding.
2. 1986-87 prices.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

The China Sea region was further categorised by the Japan (which included South Korea) and the East Asia trade. In 1986-87, over 83 per cent of the value of China Sea refrigerated cargoes were exported to Japan (see Table III.4). This is a fall of 17 per cent since 1982-83. The East Asian trade has shown a small increase over the period by value, but a 12 per cent increase in volume.

The Japanese trade was the major trade in the region for all commodity divisions except dairy and fruit. The majority of fruit products were exported to East Asian ports. The fall in exports to the China Sea region was due to fall in meat volumes and in terms of value, meat and seafood products. The fall in the meat volumes was due to the closure of the South Korean meat market.

Table III.8 shows the imported refrigerated goods by origin and commodity division for 1986-87. Europe and New Zealand were the main sources of refrigerated goods, accounting for 45 per cent of imports. Seafood products accounted for nearly half of the imports.

TABLE III.8 IMPORTED REFRIGERATED GOODS: BY TRADE AND DIVISION, 1986-87

Trade area ^a	Meat	Dairy	Seafood	Fruit	Vege- tables	Total
	(tonnes)					
North America	9	513	918	10 342	5 422	17 203
Europe	59	16 247	4 358	4 861	8 247	33 771
South-East						
Asia	0	145	7 446	330	641	8 562
China Sea	21	38	7 311	1 513	4 459	13 341
Middle East	0	49	0	533	528	1 111
South America	0	0	19 299	1 187	44	20 530
Africa	0	4	17 018	192	2	17 216
India	0	0	1 292	1 079	93	2 463
New Zealand	3 396	9 093	8 310	7 992	4 910	33 702
Pacific	0	8	1 056	117	11	1 192
Other	0	0	0	0	0	0
Total	3 485	26 098	67 007	28 147	24 356	149 092

TABLE III.8 (Cont.) IMPORTED REFRIGERATED GOODS: BY TRADE AND DIVISION, 1986-87

Trade area ^a	Meat	Dairy	Seafood	Fruit	Vege- tables	Total
	(\$m)					
North America	-	1	5	9	5	21
Europe	-	71	16	9	6	103
South-East Asia	0	1	49	1	1	51
China Sea	-	-	54	2	6	62
Middle East	0	-	0	1	-	1
South America	0	0	11	2	-	13
Africa	0	1	30	-	-	31
India	0	0	5	1	-	6
New Zealand	6	21	29	17	4	78
Pacific	0	-	6	-	-	6
Other	0	0	0	0	0	0
Total	7	95	205	43	23	373

a. Trade areas are defined in Appendix I.
- Rounded to zero.

Notes 1. Figures may not add to totals due to rounding.
2. 1986-87 prices.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

EXPORT SPACE REQUIREMENTS IN 1986-87

Table III.9 shows the number of TEUs required for the export of refrigerated cargoes to each of the major trade areas for each month during 1986-87. Of the major trade areas, Europe and the Middle East showed considerable seasonal variations in TEU requirements.

Table III.10 shows the refrigerated cargo space, expressed in TEUs, made available for carrying refrigerated cargo to the major trade areas for each month during 1986-87.

Table III.11 presents the estimated number of containers requiring storage at the major ports in Australia in 1986-87.

TABLE III.9 ESTIMATED REFRIGERATED CONTAINER EQUIVALENTS REQUIRED BY MAJOR TRADE AREA, 1986-87
(TEUs)

Trade area ^a	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
North America													
ECNA	1 463	1 738	1 647	1 788	944	1 270	1 109	1 514	1 608	2 092	1 786	1 982	18 942
WCNA	646	615	675	808	745	613	766	673	1 160	867	826	793	9 189
China Sea	2 174	2 184	1 825	2 595	2 670	2 082	1 988	2 173	1 885	2 602	2 380	2 278	26 837
Europe	494	603	594	691	590	487	492	1 426	2 659	2 503	1 776	643	12 961
Middle East	1 573	1 123	548	1 192	547	1 388	1 098	758	535	785	485	468	10 497
South-East Asia	1 029	845	630	1 031	745	497	644	843	868	810	844	747	9 533

a. Trade areas are defined in Appendix I.

Note Estimated TEUs required includes the refrigerated hold space in bulk ships. See Appendix IV for details.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

TABLE III.10 ESTIMATED CARGO SPACE AVAILABLE FOR REFRIGERATED EXPORTS TO MAJOR TRADE AREAS, 1986-87
(TEUs)

Trade area ^a	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
North America													
ECNA	2 972	3 332	2 907	2 198	1 640	1 715	1 834	1 922	2 198	2 371	2 389	3 524	29 002
WCNA	1 394	1 505	1 415	1 598	1 563	1 298	1 684	1 274	1 732	1 540	1 451	1 663	18 141
China Sea	4 628	4 080	4 012	3 934	4 011	4 042	4 033	3 259	3 197	4 282	3 105	3 984	46 567
Europe	2 076	2 123	2 051	2 315	2 030	2 147	2 353	2 066	2 801	2 783	1 996	1 566	26 307
Middle East	1 975	1 466	1 151	1 521	844	1 633	1 376	1 017	768	1 131	641	1 014	14 537
South-East Asia	1 371	1 246	1 069	1 363	1 227	1 343	1 360	1 267	1 149	1 442	1 293	1 240	15 370

a. Trade areas are defined in Appendix I.

Note Estimated TEUs required includes the refrigerated hold space in bulk ships. See Appendix IV for details.

Source BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics.

TABLE III.11 ESTIMATED REFRIGERATED CONTAINER MOVEMENTS THROUGH MAJOR PORTS, 1986-87
(Containers)

Ports	Container type ^a	Month												Total
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
Sydney	I	1 119	1 256	914	1 511	1 688	1 600	1 257	1 900	1 852	1 421	1 858	1 411	17 790
	P	533	407	550	524	683	522	760	781	564	489	492	306	6 609
Melbourne	I	3 986	3 479	3 577	4 573	3 492	4 193	3 533	3 826	3 663	4 297	3 873	4 100	46 592
	P	543	523	621	839	744	693	671	1 170	1 176	1 566	945	652	10 146
Brisbane	I	1 440	1 439	1 243	1 357	1 350	1 349	731	935	1 248	1 397	1 049	1 402	14 939
	P	503	786	447	359	257	109	216	391	479	794	394	580	5 318
Adelaide	I	379	460	261	585	398	334	438	457	288	471	294	267	4 636
Fremantle	I	607	522	510	886	812	720	802	1 035	1 273	969	766	524	9 427
	P	56	68	62	173	91	80	90	77	154	115	130	87	1 184

a. Integral or porthole.

Note Includes containers in the export, import and coastal refrigerated trades.

Sources BTCE estimates derived from ABS Shipping and Air Cargo Commodity Statistics. DoTC (1988).

Table III.12 shows the estimated available holding time for integral and porthole containers at major ports in Australia during 1986-87.

FUTURE EXPORT SPACE REQUIREMENTS

Trade area demand

Using the trade area allocation factors, the requirements for each trade area were calculated and are shown in Table III.13. For most trade areas, the peak demand occurs in February to May, except for the Middle East when the peak season occurs in December and January. Overall, demand is expected to increase in all trade areas except North America in 1989-90, but significantly in the European, China Sea and South-East Asian trades where it is expected to increase by 15.9 and 10.3 and 10.2 per cent respectively since 1986-87.

Port area demand

Table III.14 shows the predicted demand for reefer space in ports in 1987-88 to 1989-90. As expected, the major exporting ports will be Melbourne followed by Brisbane, with their major seasonal peaks occurring between February and April. The table also shows the demand for porthole and integral slots. Overall, estimated demand for containers have increased, mostly through an increase in integral containers.

Table III.15 presents the estimated available holding time for integral and porthole containers at major ports in Australia during 1987-88 to 1989-90.

TABLE III.12 ESTIMATED AVAILABLE HOLDING TIME FOR REFRIGERATED CONTAINERS AT MAJOR PORTS, 1986-87
(days)

Ports	Container type ^a	Month												Total
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	Jun	
Sydney	I	28.8	25.7	30.0	21.3	18.5	20.2	25.6	15.3	17.4	22.0	17.4	22.1	21.3
	P	18.4	24.1	17.2	18.7	13.9	18.8	12.9	11.3	17.4	19.4	19.9	30.0	17.5
Melbourne	I	16.7	19.2	18.0	14.6	18.5	15.9	18.9	15.7	18.2	15.0	17.2	15.7	16.9
	P	29.9	31.0	25.3	19.4	21.1	23.4	24.2	12.5	13.8	10.0	17.2	24.1	18.9
Brisbane	I	31.0	31.0	30.0	31.0	30.0	31.0	31.0	28.0	31.0	30.0	31.0	30.0	37.8
	P	12.8	8.2	14.0	18.0	24.3	31.0	29.9	14.9	13.5	7.9	16.4	10.8	14.3
Adelaide	I	31.0	31.0	30.0	26.4	30.0	31.0	31.0	28.0	31.0	30.0	31.0	30.0	39.3
Fremantle	I	31.0	31.0	30.0	31.0	30.0	31.0	31.0	28.0	27.9	30.0	31.0	30.0	44.4
	P	26.6	21.9	23.2	8.6	15.8	18.6	16.5	17.5	9.7	12.5	11.4	16.6	14.8

a. Integral or porthole.

Note Includes containers in the export, import and coastal refrigerated trades.

Source BTCE estimates.

TABLE III.13 ESTIMATED REFRIGERATED CONTAINER EQUIVALENTS REQUIRED BY MAJOR TRADE AREA, 1987-88 TO 1989-90
(TEUs)

Trade area ^a	Year	Month												Total
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
North America														
ECNA	1987-88	1 476	1 756	1 663	1 805	952	1 282	1 119	1 557	1 626	2 143	1 809	1 997	19 187
	1988-89	1 397	1 658	1 571	1 707	901	1 211	1 059	1 470	1 536	2 025	1 709	1 893	18 139
	1989-90	1 315	1 555	1 475	1 603	847	1 137	996	1 400	1 443	1 923	1 607	1 783	17 083
WCNA	1987-88	664	624	683	817	753	620	775	686	1 193	888	841	808	9 354
	1988-89	628	590	645	771	711	585	732	649	1 127	840	795	764	8 838
	1989-90	613	573	625	748	689	566	708	631	1 102	816	771	743	8 588
China Sea	1987-88	2 199	2 202	1 840	2 613	2 686	2 089	1 994	2 201	1 923	2 644	2 418	2 297	27 106
	1988-89	2 108	2 117	1 767	2 507	2 572	2 001	1 915	2 127	1 850	2 539	2 326	2 215	26 045
	1989-90	2 395	2 401	1 993	2 848	2 942	2 303	2 211	2 423	2 102	2 857	2 615	2 496	29 588
Europe	1987-88	508	619	592	697	594	491	511	1 554	2 949	2 807	2 003	698	14 028
	1988-89	489	602	583	673	569	474	512	1 608	3 121	2 873	1 964	666	14 136
	1989-90	504	622	605	699	596	497	541	1 727	3 383	3 081	2 070	691	15 019

TABLE III.13 (Cont.) ESTIMATED REFRIGERATED CONTAINER EQUIVALENTS REQUIRED BY MAJOR TRADE AREA, 1987-88 TO 1989-90
(TEUs)

Trade area ^a	Year	Month												Total
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
Middle East	1987-88	1 613	1 164	543	1 196	543	1 377	1 097	769	540	793	500	466	10 597
	1988-89	1 549	1 110	534	1 149	531	1 341	1 062	742	523	770	481	458	10 245
	1989-90	1 619	1 161	556	1 202	553	1 398	1 109	776	546	801	502	475	10 695
South-East	1987-88	1 141	928	677	1 097	793	517	692	910	958	887	917	819	10 338
Asia	1988-89	1 103	891	654	1 066	764	504	673	901	929	857	891	803	10 036
	1989-90	1 157	930	682	1 110	797	525	706	952	976	897	933	844	10 508

a. Trade areas are defined in Appendix I.

Note Based on 1986-87 ratios.

Source BTCE estimates.

TABLE III.14 ESTIMATED REFRIGERATED CONTAINER MOVEMENTS THROUGH MAJOR PORTS, 1987-88 TO 1989-90
(containers)

Ports	Container type ^a	Month												Total
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
1987-88														
Sydney	I	1 161	1 306	946	1 573	1 763	1 660	1 308	1 986	1 929	1 488	1 935	1 469	18 528
	P	580	443	594	566	737	556	817	834	601	531	532	329	7 117
Melbourne	I	4 189	3 639	3 745	4 768	3 641	4 348	3 662	4 021	3 872	4 529	4 077	4 294	48 766
	P	590	571	672	904	798	740	718	1 299	1 335	1 813	1 080	723	11 246
Brisbane	I	1 557	1 551	1 338	1 465	1 455	1 455	788	1 008	1 351	1 505	1 132	1 514	16 119
	P	555	860	488	392	280	116	235	425	523	867	430	631	5 808
Adelaide	I	432	513	292	665	454	370	496	513	319	516	327	302	5 202
Fremantle	I	676	582	560	962	881	775	874	1 143	1 429	1 077	845	578	10 378
	P	60	73	67	183	98	86	97	83	167	128	150	97	1 289

TABLE III.14 (Cont.) ESTIMATED REFRIGERATED CONTAINER MOVEMENTS THROUGH MAJOR PORTS, 1987-88 TO 1989-90
(containers)

Ports	Container type ^a	Month												Total
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
1988-89														
Sydney	I	1 144	1 284	933	1 545	1 728	1 634	1 284	1 942	1 889	1 454	1 893	1 436	18 168
	P	551	422	566	538	701	535	779	800	578	505	509	316	6 799
Melbourne	I	4 125	3 592	3 679	4 715	3 595	4 291	3 628	3 978	3 839	4 462	4 010	4 230	48 144
	P	567	545	642	864	765	711	690	1 237	1 272	1 719	1 025	689	10 731
Brisbane	I	1 487	1 486	1 284	1 398	1 397	1 396	761	968	1 292	1 439	1 085	1 453	15 445
	P	525	812	462	370	265	111	222	403	494	819	407	598	5 492
Adelaide	I	421	494	280	639	432	358	484	514	315	514	322	305	5 083
Fremantle	I	652	560	536	918	841	743	842	1 126	1 405	1 042	819	557	10 041
	P	57	70	64	177	93	82	92	79	158	122	142	93	1 230

TABLE III.14 (Cont.) ESTIMATED REFRIGERATED CONTAINER MOVEMENTS THROUGH MAJOR PORTS, 1987-88 TO 1989-90
(containers)

Ports	Container type ^a	Month												Total
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
1989-90														
Sydney	I	1 162	1 305	951	1 576	1 766	1 669	1 311	1 990	1 932	1 485	1 934	1 467	18 553
	P	575	440	590	560	732	553	811	828	599	527	526	329	7 067
Melbourne	I	4 215	3 670	3 756	4 814	3 669	4 388	3 715	4 083	3 947	4 576	4 106	4 322	49 261
	P	589	566	667	898	797	738	717	1 283	1 324	1 794	1 069	716	11 161
Brisbane	I	1 546	1 545	1 330	1 453	1 452	1 455	794	1 009	1 346	1 498	1 124	1 508	16 060
	P	550	853	485	389	278	115	233	422	519	861	427	626	5 761
Adelaide	I	436	511	288	660	450	371	501	540	327	530	334	320	5 270
Fremantle	I	672	581	550	954	872	766	876	1 180	1 469	1 074	838	573	10 405
	P	59	70	66	182	97	85	95	82	164	124	145	95	1 266

a. Integral or porthole.

Notes 1. Based on 1986-87 ratios.

2. Includes containers in the export, import and coastal refrigerated trades.

Source BTCE estimates.

TABLE III.15 ESTIMATED AVAILABLE HOLDING TIME FOR REFRIGERATED CONTAINERS AT MAJOR PORTS, 1987-88 TO 1989-90
(days)

Ports	Container type ^a	Month												Total
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
1987-88														
Sydney	I	27.8	24.7	30.0	20.5	17.7	19.4	24.6	14.7	16.7	21.0	16.7	21.2	20.5
	P	16.9	22.1	16.0	17.3	12.9	17.6	12.0	10.6	16.3	17.9	18.4	28.8	16.2
Melbourne	I	15.9	18.3	17.2	14.0	17.7	15.3	18.2	15.0	17.2	14.3	16.4	15.0	16.1
	P	27.6	28.4	23.4	18.0	19.7	22.0	22.6	11.3	12.2	8.7	15.0	21.7	17.0
Brisbane	I	30.8	30.9	30.0	31.0	30.0	31.0	31.0	29.0	31.0	30.0	31.0	30.0	35.0
	P	11.6	7.5	12.8	16.5	22.3	31.0	27.4	13.7	12.3	7.2	15.0	9.9	13.1
Adelaide	I	31.0	30.2	30.0	23.3	30.0	31.0	31.0	27.2	31.0	29.0	31.0	30.0	35.0
Fremantle	I	31.0	31.0	30.0	31.0	30.0	31.0	31.0	28.1	24.9	30.0	31.0	30.0	40.3
	P	24.7	20.4	21.5	8.1	14.7	17.3	15.4	16.2	8.9	11.3	9.9	14.8	13.6

TABLE III.15 (Cont.) ESTIMATED AVAILABLE HOLDING TIME FOR REFRIGERATED CONTAINERS AT MAJOR PORTS, 1987-88 TO 1989-90
(days)

Ports	Container type ^a	Month												Total
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
1988-89														
Sydney	I	28.2	25.1	30.0	20.9	18.1	19.7	25.1	15.0	17.1	21.5	17.0	21.7	20.9
	P	17.8	23.2	16.8	18.2	13.5	18.3	12.6	11.1	17.0	18.8	19.3	30.0	17.0
Melbourne	I	16.2	18.6	17.5	14.1	18.0	15.5	18.4	15.1	17.4	14.5	16.6	15.3	16.3
	P	28.7	29.8	24.5	18.8	20.5	22.8	23.5	11.9	12.8	9.1	15.8	22.8	17.8
Brisbane	I	31.0	31.0	30.0	31.0	30.0	31.0	31.0	28.0	31.0	30.0	31.0	30.0	36.5
	P	12.3	7.9	13.5	17.4	23.6	31.0	29.0	14.5	13.1	7.6	15.9	10.4	13.8
Adelaide	I	31.0	31.0	30.0	24.2	30.0	31.0	31.0	27.2	31.0	29.1	31.0	30.0	35.8
Fremantle	I	31.0	31.0	30.0	31.0	30.0	31.0	31.0	28.0	25.3	30.0	31.0	30.0	41.7
	P	25.9	21.3	22.6	8.4	15.4	18.1	16.1	17.0	9.4	11.8	10.5	15.5	14.2

TABLE III.15 (Cont.) ESTIMATED AVAILABLE HOLDING TIME FOR REFRIGERATED CONTAINERS AT MAJOR PORTS, 1987-88 TO 1989-90
(days)

Ports	Container type ^a	Month												Total
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
1990-90														
Sydney	I	27.7	24.7	30.0	20.4	17.7	19.3	24.6	14.6	16.7	21.0	16.7	21.3	20.5
	P	17.0	22.3	16.1	17.5	13.0	17.7	12.1	10.7	16.4	18.0	18.6	28.9	16.3
Melbourne	I	15.8	18.2	17.2	13.9	17.6	15.2	18.0	14.8	16.9	14.1	16.2	14.9	15.9
	P	27.6	28.7	23.6	18.1	19.7	22.0	22.7	11.4	12.3	8.8	15.2	21.9	17.1
Brisbane	I	31.0	31.0	30.0	31.0	30.0	31.0	31.0	28.0	31.0	30.0	31.0	30.0	35.1
	P	11.7	7.6	12.9	16.6	22.5	31.0	27.6	13.8	12.4	7.3	15.1	10.0	13.2
Adelaide	I	31.0	30.3	30.0	23.4	30.0	31.0	30.9	25.9	31.0	28.2	31.0	30.0	34.6
Fremantle	I	31.0	31.0	30.0	31.0	30.0	31.0	31.0	27.2	24.2	30.0	31.0	30.0	40.2
	P	25.3	21.1	21.7	8.2	14.8	17.6	15.7	16.4	9.1	11.6	10.2	15.2	13.8

a. Integral or porthole.

Notes 1. Based on 1986-87 ratios.

2. Includes containers in the export, import and coastal refrigerated trades.

Source BTCE estimates.

APPENDIX IV METHODOLOGY FOR THE CALCULATION OF THE UTILISATION OF CARGO SPACE

This appendix outlines the methodology used in assessing the present and future utilisation of refrigerated space by trade area and port. Volumes of refrigerated commodities were obtained from the SACCS data base. For more details see Appendix I.

PRESENT UTILISATION OF REFRIGERATED CARGO SPACE

Refrigerated cargo space is the volume of cargo space available for the use by refrigerated cargoes. This space is measured in TEUs for containerised cargo and insulated hold capacity (cubic metres) for non-containerised cargo.

To determine the utilisation of cargo space, the requirements for refrigerated cargo space were compared to the space available to the major trade areas and at the major ports.

Requirements for cargo space

The requirements for refrigerated cargo space were expressed as the number of containers required to transport a given commodity tonnage. The number of containers required was estimated by converting the commodity tonnages to cubic metres and then to TEU's, using container cubic capacities and stowage factors.

Refrigerated containers provide approximately 25 cubic metres of cargo space. However, there is generally a loss of capacity due to broken spaces and ventilation requirements. For this study, it was assumed that refrigerated containers provided about 21 cubic metres capacity.

The stowage factor is the relationship between the volume of the commodity and its weight, and is measured in cubic metres per tonne. Stowage factors for each of the ATFCC codes were obtained from the Department of Transport and Communications (pers. comm. 1988) and were used with the SACCS data to calculate the number of TEUs required by trade area and month. Refrigerated cargo space in the holds of reefer ships were also converted to TEUs.

The number of containers for a particular group of commodities were calculated as follows:

$$\frac{\text{tonnes x stowage factor}}{21} = \text{number of containers (or part thereof)}.$$

This calculation was carried out for each individual consignment in the SACCS data base, and then the number of containers were summed for each commodity. Table IV.1 presents the details of the stowage factors for the commodity groups 1986-87.

To calculate the number of porthole containers, it was assumed that all commodities with the exception of onions, shipped by conference vessels to North America and Europe, utilised porthole containers. All other cargoes and all cargoes on other trades were assumed to utilise integral containers, except where reference was made to reefer ships.

Availability and utilisation of cargo space

Trade area

Refrigerated shipping space is available either as container slots or insulated hold capacity. The total available refrigerated cargo space for each month and for each trade area were calculated.

Information from the SACCS data base was used to determine the availability of ships providing refrigerated shipping space. For each ship identified as having carried refrigerated cargo, the voyage pattern and destination trade areas were tabulated. This information was supplemented by Lloyd's Voyage Record (Lloyd's 1987b). The available monthly refrigerated capacity of each ship was estimated from the above information and from ship capacity information in Lloyd's Register of Ships (Lloyd's 1987a), Drewry (1988) and other industry sources.

The utilisation of the available refrigerated cargo space to the major trade areas was expressed as a ratio of the number of refrigerated containers required (TEUs), to the number of refrigerated shipping slots available (TEUs). The closer this ratio was to one, indicated the tightness of available refrigerated cargo space.

Cargo space on reefer ships was converted to TEUs by dividing by the approximate capacity of a reefer container.

TABLE IV.1 STOWAGE FACTORS FOR REFRIGERATED
COMMODITY GROUPS

<i>Group</i>	<i>Stowage factors (tonnes/m³)</i>
Beef	1.43
Lamb	3.36
Poultry	1.53
Pork	2.56
Other meat	1.62
Milk	1.63
Butter	1.65
Cheese	1.55
Eggs	1.75
Other dairy	1.62
Fish	1.58
Lobster	2.12
Oyster	1.59
Prawns	1.89
Other seafood	1.78
Apples	2.31
Citrus	1.81
Grapes	2.36
Other fruit	1.88
Onions	1.78
Other vegetables	1.75

Source BTCE estimates derived from Department of Transport and Communications (pers. comm. 1988).

Port

Although only one container can occupy a slot at any one time, many containers can occupy a slot over a period of time. A slot can be used repeatedly as containers are moved out of and into a terminal. Therefore, it is not possible to directly compare the requirement for terminal slots with the fixed number of slots available at any one port.

The availability of slot spaces at ports was derived by multiplying the number of reefer slots available for each container type (porthole and integral) by the number of days of operation of the port for each month. The result was a 'slot day' capacity measure.

Estimates of the number of slots available in a port was obtained from Department of Transport and Communications (pers. comm.). The number of exported and imported refrigerated containers passing through a port, was derived from 1986-87 SACCS data. Estimates of coastal refrigerated container movements were derived from Department of Transport and Communications (1988). From this information, the amount of containerised cargo that would use port facilities was calculated.

The utilisation of refrigerated cargo facilities at ports was primarily concerned with the capacity of container terminals to meet the demand of refrigerated containers passing through a port. This analysis therefore excluded the volumes of cargoes carried on conventional reefer ships.

The utilisation of refrigerated cargo facilities at ports was measured by the potential holding time of a container. This quantity was defined as the average time in days that a container could occupy one storage slot at a port. This potential holding time was estimated by dividing the 'slot-day' measure by the number of containers passing through a port in each month. This provided the utilisation of slots for each month, by each container type through the major ports.

FUTURE REQUIREMENTS FOR REFRIGERATED CARGO SPACE

In assessing the future requirements for refrigerated cargo space, information from a number of sources was obtained.

Forecasts for those refrigerated commodity groups listed in Appendix I were obtained from two sources, the Australian Bureau of Agricultural and Resource Economics (ABARE) and the BTCE. Table IV.2 lists the sources for the refrigerated commodity group forecasts.

ABARE produce annual forecasts for the volumes of rural exports (ABARE 1989). Volumes for those refrigerated commodity exports not supplied by ABARE were estimated by the BTCE. These estimates were obtained by extrapolating the amount of reefer cargo exported by sea between 1983-84 and 1986-87. Commodity stowage factors were then used to determine the TEUs required to export the forecast tonnages by sea.

TABLE IV.2 SOURCES FOR REFRIGERATED COMMODITY
GROUP FORECASTS

<i>ABARE</i>	<i>BTCE</i>
Beef ^a	Pork
Lamb ^b	Other meat
Poultry	Milk
Cheese	Other dairy
Butter	Grapes
Eggs	Other fruit
Fish	Onions
Lobster	Other vegetables
Oysters	
Prawns	
Other seafood	
Apples ^c	
Citrus	

- a. Includes veal.
 b. Includes mutton.
 c. Includes pears.

Allocation by trade area and port

To assess the shipping services required for total refrigerated cargo, the TEU requirement was factored by trade area and by port of loading. The allocation factors calculated in the model are based on the 1986-87 proportion of reefer trade shipped through a port or by trade area, by month and by container type. Allocation factors for the meat trade were adjusted for the 1989-90 forecasts due to the liberalisation of the Korean and Japanese markets.

In estimating the space requirements by trade area, all seaborne refrigerated cargoes were included. Only estimates of containerised cargo movements were used for the port utilisation calculations.

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Abbreviations

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BTE Bureau of Transport Economics
AGPS Australian Government Publishing Service

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ABBREVIATIONS

ABS	Australian Bureau of Statistics
ADC	Australian Dairy Corporation
AESC	Australia to Europe Shipping Conference
AHC	Australian Horticultural Corporation
AMLC	Australian Meat and Livestock Corporation
ANSCON	Australia Northbound Shipping Conference
ASC	Australian Shippers' Council
ATFCC	Australian Transport Freight Commodity Classification
Austrade	Australian Trade Commission
BTCE	Bureau of Transport and Communications Economics
BTE	Bureau of Transport Economics
DoT	Department of Transport
DTC	Department of Transport and Communications
ECNA	East Coast North America
EEC	European Economic Community
IAC	Industries Assistance Commission
Ro-ro	Roll on - roll off
RTW	Round-the-World
SACCS	Shipping and Air Cargo Commodity Statistics
TEU	Twenty foot Equivalent Unit
WCNA	West Coast North America

GLOSSARY

Charter services	Vessels that are contracted by shippers or shipping companies either over a period of time or to ship a specified amount of cargo from a set origin to a set destination over a period of time.
Conference	An association between shipping operators to offer services on a defined route on conditions agreed by members.
Fantainer	An enclosed container which is fitted with a forced ventilation system to circulate fresh air within the container.
Integral container	A refrigerated container with an electric refrigeration unit built in.
Liner service	A shipping service which is operated over a specific route and on a regular scheduled basis.
Porthole container	A refrigerated container that requires an external ventilation system which provides a temperature controlled environment.
Potential holding time	Defined as the average time in days that a container could occupy one storage slot at a port.

Reefers	Specialised refrigerated containers used to transport refrigerated products. See integral or porthole containers.
Reefer ships	A ship specifically designed to carry refrigerated cargo in non bulk form in specialized refrigerated holds.
Refrigerated goods	Products which require controlled environments while in transit.
Ro - ro	A roll on - roll off ship designed to be loaded and unloaded via ramps allowing vehicular access.
Slot	A position on-board a ship or within a port used to store a container.
Stowage factor	Stowage factor is the relationship between the volume of a commodity packed for shipment and its weight. It is measured in cubic metres per tonne.
Twenty foot Equivalent Unit (TEU)	The term is used to describe a 20ft x 8ft x 8ft ISO shipping container, or the number of equivalent twenty foot units.