Economic Significance of the Waterfront

Information Paper

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Economic Significance of the Waterfront

AUSTRALIAN GOVERNMENT PUBLISHING SERVICE, CANBERRA

© Commonwealth of Australia 1988
ISSN 0158-104X
ISBN 0 644 08275 5

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ABSTRACT

The waterfront plays a vital role in providing services to other sectors of the Australian economy. Its activities and performance have a major impact on export industries and on local industries which are dependent on imports.

The main establishments involved in the waterfront industry are the ports, port-related services, terminals and other stevedoring activities, container depots, bulk terminals, customs agencies and regulatory authorities. This Paper contains data on the size of these establishments and the industry as a whole, and indicates the importance of the waterfront to the national economy.

The economic size of an industry is generally estimated in terms of various output and employment measures. Information on the absolute and relative importance of the waterfront in these terms, and additional data on earnings and capital expenditure are presented.

The waterfront is an important link in the transport chain for exports and imports. One measure of this link is the volume of commodities passing through the ports. The paper presents information on the extent to which the major sectors and industries are reliant on exports and imports.

Another measure of the waterfront's intermediary role is from the perspective of waterfront costs. The significance of waterfront costs to Australian industry is presented in terms of the direct charges for waterfront services and the indirect costs associated with reliability and time.

FOREWORD

This Paper provides an overview of the waterfront and presents findings on its significance to the Australian economy. It is intended to complement the papers prepared by the Inter-State Commission as part of its Waterfront Strategy Inquiry.

The Paper draws on a range of Australian data sources. Extensive use is made of information collected by the Australian Bureau of Statistics and the Department of Transport and Communications.

The work for this study was undertaken by a team led by Mr N. Gentle. Members of the team were Mr I. Bickerdyke, Ms R Lyne and Ms C. Stevensen, with assistance from Mr G Haselberger.

W. J. MERRILEES
Research Manager

Bureau of Transport & Communications Economics
Canberra
August 1988

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SUMMARY

This Paper provides information on the absolute and relative size of the waterfront and generally indicates the importance of the waterfront to the national economy.

For the purposes of this study the waterfront industry is defined as consisting of those establishments involved in the handling of cargo at Australian ports. The services of these establishments include port administration, port-related activities (such as pilotage and towage), stevedoring services, bulk commodity handling, customs agency services and the functions of the customs and quarantine authorities. The definition also covers container depots and bulk storage operations, even though these activities may occur away from the actual waterfront.

The size of the waterfront industry is measured in terms of production, value added, employment, earnings and capital expenditure. The gross output, or production, of the waterfront industry, has been calculated by combining data on cargo throughput with estimates of charges for individual waterfront services. In 1986-87, waterfront production is estimated to have been $2314 million, almost double its value in 1980-81 ($1259 million). As a share of Australian production of goods and services, the waterfront accounts for around half of one per cent.

Waterfront production increased in real terms by 14 per cent between 1980-81 and 1986-87, due mainly to increased activity in bulk cargo services (from $363 million to $858 million) and, to a lesser extent, in port-related services (from $318 million to $632 million). Over the same period stevedoring services increased from $473 million to $653 million so that the stevedoring sector's share in waterfront production declined from 38 per cent to 28 per cent.

The waterfront makes a significant contribution to Gross Domestic Product (GDP) and is comparable in size to a number of other important industries in the economy. On the basis of value added estimates, the

waterfront accounted for between 0.7 and 0.9 per cent of GDP in recent years ($1620 to $1967 million in 1986-87). Value added in the waterfront is a particularly high proportion of production being an estimated 70 to 85 per cent. In contrast, value added is typically around 50 per cent of production in the modal transport industries. The relatively high share of value added in waterfront production reflects the service nature of the industry with a low reliance on intermediate inputs such as materials and fuel.

In 1986-87, waterfront employment is estimated to have been about 26 000 persons. The two dominant sectors are port-related services (9500 persons) and stevedoring (10 000 persons), which together account for more than 75 per cent of total waterfront employment. In 1986-87, employment on the waterfront was 0.46 per cent of total Australian full-time employment.

Aggregate earnings in the waterfront industry are estimated to have been $764 million in 1986-87, which is approximately 0.64 per cent of the total wages and salaries paid to civilian employees in Australia. If this figure is contrasted to the waterfront industry's share in GDP (0.7 to 0.9 per cent), it suggests that the waterfront is relatively capital intensive rather than labour intensive.

Average earnings in the waterfront industry in 1986-87 ranged from around $24 000 for customs agency employees to $33 000 for stevedores and related workers. The waterfront average of $29 612 compares with the Australian industry average of $23 670.

Capital investment in ports has fluctuated considerably during the 1980s. Published data indicate that for most of the 1980s a large majority of investment funds were derived from public sources. The primary focus of investment in recent years has been in the provision of facilities for bulk exports.

Although the size of the waterfront makes it significant in its own right, the national importance of the waterfront lies in the services it provides to other sectors of the economy.

The waterfront has important linkages with other industries. The most important of these is the waterfront's role as a link in the transport chain for imports and exports. One measure of the dependency of an industry on the waterfront is the proportion of an industry's output which is exported. Mining is the major exporting industry followed by agriculture.

On the import side, three quarters of Australian imports are purchased by firms for use as inputs in the production process. Sixty per cent of these imported industrial supplies are capital goods or processed industrial supplies. Manufacturing is particularly dependent on imports with 18 per cent of its intermediate inputs being imported in 1980-81.

Another aspect of the waterfront as a link in the export and import of traded goods, is measured in terms of waterfront costs. Waterfront costs can be classified into two broad categories: direct money costs or charges and indirect costs associated with reliability and time.

Waterfront charges, on average, represent less than 2 per cent of the value of non-bulk imports and less than 3 per cent of non-bulk exports. Waterfront charges for bulk commodities are higher in relative terms at around 4 per cent of total value. Waterfront charges are clearly more significant for lower value bulk commodities and some low value primary products exported in non-bulk form. Reduced waterfront costs, provided they are reflected in reduced charges, can provide a stimulus to trade as well as directly benefiting importers and exporters.

Indirect costs are of major concern to the various users of waterfront services. Shippers and consignees often have to keep inventories of larger than desirable levels due to the unreliability of the waterfront. In addition, delays in importing capital goods and parts can cause disruption to manufacturing industry production. Indirect costs are imposed on ship operators because of inefficient operating practices and unpredictable delays at water transport terminals. These combine to increase ship turnaround times and reduce productivity. Land transport operators have delay costs imposed on them because of lengthy queuing at container terminals.

Some information exists on the magnitude of these indirect costs but further research is required to establish their overall value. It is clear, however, that any stimulation to trade through improvements to waterfront efficiency will result mostly through improvement in reliability and other quality of service factors.

CHAPTER 1 INTRODUCTION

The waterfront is currently the focus of many investigations. In this context the Bureau of Transport and Communications Economics (BTCE) perceived a need to provide an overview of the waterfront and its significance to the Australian economy. This Paper was produced in response to that need and is intended to complement the papers prepared by the Inter-State Commission (ISC) as part of its Waterfront Strategy Inquiry.

In this study the waterfront is defined as consisting of various service establishments involved in the handling of cargo at Australian ports. These include port-related services provided by port authorities, pilotage services, tugboat operations, all stevedoring services and container terminal operations, bulk terminals, customs agency services and the services of the customs and quarantine authorities. The definition also covers bulk storage and container depots even though these operations may occur away from the actual waterfront.

Some areas of operations which are often considered to be part of the shore-based transport sector are excluded; in particular, land transport to and from the port. While it is recognised that land transport plays an important role in the cargo handling chain, it is excluded from this study for two reasons. First, while it has links with the waterfront it also devotes a large part of its operations to non-waterfront activities. Second, it was generally not possible to isolate the specific data required for this study from the total operations of the relevant land transport establishments.

This definition provides a conceptual view of the waterfront as a set of sub-markets. This is an appropriate framework for estimating the size of the industry and its contribution to GDP. However, the performance of the waterfront depends on these sub-markets working together as an operational system. It is this systems aspect that is important when the interactions of the waterfront with other sectors of the economy are considered.

Figure 1.1 illustrates the sub-markets for non-bulk cargo considered in this Paper (a diagram for bulk cargo would be similar). It also outlines in a simplified way the systems aspect of the waterfront by showing the principal relationships between the sub-markets.

The waterfront has undergone major changes over the last twenty years. The advent of containerisation in the late 1960s, major increases in Australia's bulk trades and the decline in coastal shipping have had important influences on the waterfront. These factors have influenced changes in the structure of the waterfront industry. Chapter 2 discusses the current structure of the industry.

The size of the industry is discussed in macro-economic terms in Chapter 3. The chapter also discusses the industry's call on resources and how these have changed in recent years.

The important part played by the waterfront is basically an outcome of it being a service industry. Its level of activity is derived from the activities of other sectors of the economy. One measure of these interactions is the dependence of industries on imports and exports. These issues are discussed in Chapter 4.

The waterfront can affect industry costs in two ways. First, there are the direct costs of waterfront charges on commodities using sea transport. Secondly, there are the indirect costs which result from the quality of the service provided by the waterfront. Chapter 5 examines these costs and considers the possible trade effects of changes in them.

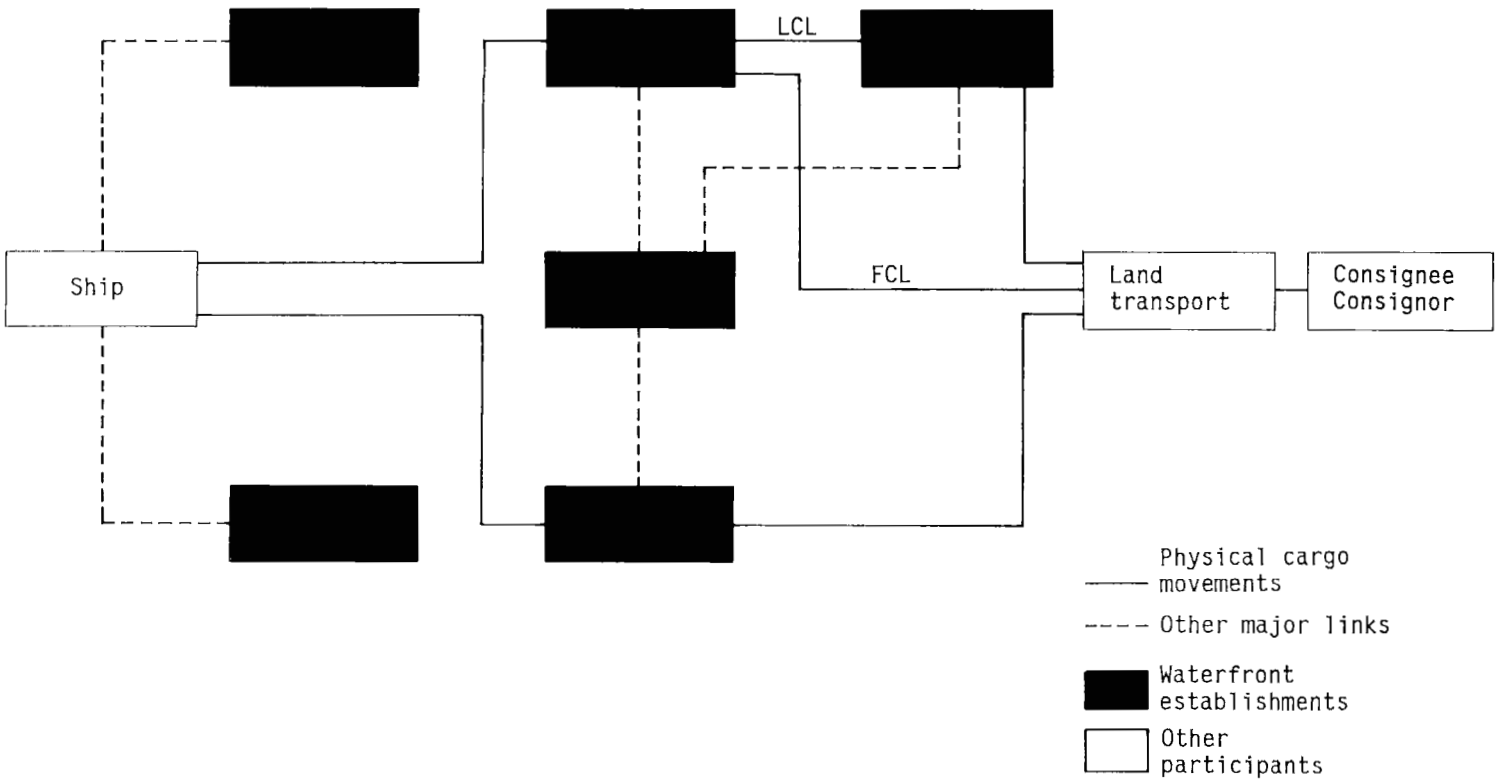

Figure 1.1 Principal waterfront linkages for non-bulk cargo

CHAPTER 2 STRUCTURE OF THE WATERFRONT

Australia has 71 public and private trading ports. In 1985-86, the five major capital city ports of Sydney, Melbourne, Brisbane, Adelaide and Fremantle accounted for 73 per cent of non-bulk cargo movements and 85 per cent of container movements.

The advent of containerisation in the late 1960s increased the dominance of the major capital city ports. The larger ships used in container operations and the faster turnaround times they required meant that fewer port calls were desirable. The large investment needed for container handling equipment provided added incentive to concentrate container activity in the major ports. As a consequence, ports other than the capital city ports for the most part specialise in bulk commodities. The major exceptions are the Tasmanian ports involved in inter-state non-bulk trade.

Containerisation also led to changes in the ownership and control of stevedoring facilities and resulted in a substantial reduction in stevedoring labour requirements.

This chapter discusses the current structure of the waterfront industry, as defined in Chapter 1, and briefly examines how this structure was shaped by the advent of containerisation and other technological changes. In addition, there is a brief discussion of waterfront labour.

PORT-RELATED SERVICES

This sector of the waterfront includes the functions carried out at Australian ports by port authorities, and the services associated with the berthing of ships.

Port authorities

Australian ports operate under one of three basic administrative forms. The most common form of administration is a statutory authority set up by State legislation. These authorities usually

administer a single port but some, notably the Maritime Services Board of New South Wales (MSB), administer several ports.

State government department administration of ports is the other major method of administering publicly-owned ports, with individual State legislation defining the power and authority of the relevant department. Government departments administer minor ports in Victoria, Queensland and Western Australia. All public ports in South Australia are administered by the Department of Marine and Harbors.

Privately owned ports are developed by private enterprise, generally for the loading of bulk commodities. They are usually subject to an agreement with the State Government, which sometimes requires ratification by Act of Parliament.

Port authority functions

A range of functions are carried out by port authorities, depending upon the administrative arrangements. The major responsibilities are:

- control and administration of port facilities;
- maintenance of wharves, buildings and other port facilities;
- cargo handling (but not normally direct stevedoring operations);
- provision of supplies, moorings etc for vessels in port;
- provision of security, fire prevention and shipping movement control; and
- levying and collecting port rates and other charges (primarily statutory charges levied against cargoes and vessels and commercial charges for property leasings and services provided).

In addition, many port authorities are concerned with the planning and provision of wharves, buildings and other facilities and the dredging of channels. For example, the South Australian Department of Marine and Harbors is responsible for maintenance of recreational and fishing fleet wharves. The Port of Melbourne Authority also departed from the traditional functions of port authorities through its development of the World Trade Centre.

Other port-related services

Establishments in this sector of the waterfront provide services associated with facilitating the berthing of ships. They include such services as pilotage, towage, line and launch services and gangway watch.

There are a variety of arrangements for licensing pilots and the provision of pilotage services. Licensing authorities are marine boards (Victoria and Queensland), port authorites (New South Wales, Tasmania and the Northern Territory) or government departments (South Australia). Western Australia has a mixed arrangement where the port authorities at Fremantle, Port Hedland and Dampier license pilots for their ports and the Department of Marine and Harbours licenses pilots for the remainder of the State.

The licensing authority is usually the provider of pilotage services. Exceptions are in Queensland where the Department of Harbours and Marine provides pilotage services and in Victoria where the Port Phillip Sea Pilot Service provides pilotage services for Melbourne, Geelong and Westernport and the port authority provides services for Portland. Private companies and resource companies provide services at some bulk ports.

In all mainland capital city ports except Sydney there is only one operator providing harbour towage services. While a total of 13 operators provide services at Australian ports, ownership is concentrated in only three companies. Howard Smith Ltd, The Adelaide Steamship Co. Ltd and Brambles Industries Ltd are prominent in the provision of harbour towage services with a combined market share of around 80 per cent.

STEVEDORING

Stevedoring is that part of the waterfront involved in the loading and discharging of cargo from ships. It can also include the storage of cargo and the loading or unloading of it from land transport vehicles.

There are two categories of stevedoring of non-bulk cargo: conventional stevedoring and that performed at container terminals. Increasing mechanisation was a characteristic of the non-bulk stevedoring sector of the waterfront even prior to containerisation. However containerisation brought a major qualitative change in non-bulk cargo stevedoring methods.

Conventional stevedoring

Conventional stevedoring companies operate at wharves which are generally common-user facilities owned by the relevant port authority. The port authority allocates berths and associated handling facilities to the shipping companies which then contract a stevedoring company to provide labour and any additional handling equipment to service their ships.

Prior to containerisation there were many stevedoring companies operating in Australian ports. Containerisation led to the diversion of a large proportion of non-bulk freight to container terminals. As the conventional stevedoring market contracted, the number of firms that could be supported by it also declined. Other reasons suggested for the small number of firms in the conventional sector include the difficulty new entrants might have in gaining access to labour and the greater ability of larger firms to provide a reliable service under conditions of variable demand.

There is now a high degree of concentration in the conventional stevedoring industry. Two organisations operate in all five major ports. They are Conaust Pty Ltd (a subsidiary of P & O Australia Ltd) and Patrick Stevedoring Co Pty Ltd (owned by Howard Smith Ltd). A third company, F. G. Strang Pty Ltd operates in Melbourne and Adelaide. The Fremantle Port Authority operates its own stevedoring service although this is limited to wharf handling and excludes shipboard handling.

Container terminals

Container terminals provide the conventional stevedoring functions of loading and unloading vessels and in addition provide storage for containers before loading or after discharge from a vessel. In addition the terminal operator manages the interface with land transport links.

Container terminals require large capital investments for their establishment. In addition, efficient operation of the technology requires a large throughput for each terminal. Such a requirement has ensured that the industry can only support a small number of operators.

Fourteen container terminals operate in the five mainland capital city ports. Ownership of these terminals is dominated by five groups, four of which are controlled by liner shipping interests. The fifth group, James Patrick and Company Pty Ltd, is owned by Howard Smith Ltd which also has an interest in shipping.

The terminal sector is therefore characterised by vertical integration as well as concentration. Several reasons have been put forward to explain the development of vertical linkages. One of the most common is that ownership of stevedoring facilities gives shipowners greater control over the turnaround time of their ships.

DEPOTS

Container depots primarily pack/unpack containers carrying cargo either from a number of individual shippers or to a number of individual consignees (that is less than a container load (LCL) cargo). Occasionally, depots pack/unpack full container loads (FCL) where the consignee/consignor's premises are unsuitable. Depots involved in trans-Tasman trade have different labour arrangements from other international depots. Trans-Tasman depots employ Transport Workers' Union labour while other international depots employ Waterside Workers' Federation (WWF) labour, or a combination of Federated Storemen and Packers Union labour and WWF shipping clerks.

Previous Bureau research (BTE 1986a) suggests that while there is a diminishing role for depots with a world-wide emphasis on FCL cargo, LCL traffic will continue to represent around 10 per cent of total Australian container usage.

In Sydney there are five depots and in Melbourne and Brisbane four firms operate depots which pack/unpack other than Trans-Tasman cargo. Adelaide supports three operators and Fremantle one.

Shipping lines vary in their usage of depots; some preferring to use only one depot in each port, while other lines spread business across two or three depots.

BULK TERMINALS

Export of commodities such as minerals and grains in bulk emerged as a major technological development in the 1950s. This development had two major effects on the structure of the waterfront. First, it removed a large volume of cargo from conventional stevedores and therefore contributed to rationalisation in the conventional stevedoring industry. Secondly, it removed a large volume of work from members of the Waterside Workers' Federation, as the staff of most bulk terminals came under the awards of other unions.

The major commodities handled by bulk terminals are iron ore, coal and grains. Ownership and operation of coal and iron ore loading facilities varies from port to port, often being a combination of producer and public authority. Grain loaders are generally owned and operated by State Government statutory authorities.

REGULATORY AND ADMINISTRATIVE AGENCIES

All cargo entering or leaving Australia requires some form of clearance from the appropriate Government authorities, the major ones

being the Australian Customs Service and Australian Quarantine Authorities.

The Australian Customs Service is an autonomous authority within the Commonwealth Industry, Technology and Commerce portfolio. It has offices located in most Australian ports which are linked by national communications and data processing networks.

Quarantine services within Australia are provided jointly by the Federal and State Governments. The Federal Government is responsible for the legislation, policy, funding and overall co-ordination of quarantine services. The State Governments are responsible for the operational aspects such as provision of quarantine inspectors and facilities necessary to implement the federal legislation.

Customs agents are commonly employed by importers and exporters to arrange clearance of their goods. The services provided by customs agents include:

- preparation of customs entries
- payment of customs duties
- obtaining a customs clearance
- obtaining a cleared quarantine entry
- processing the Bill of Lading through the shipping agents.

There are a large number of customs agents operating at Australian ports, usually on an independent basis. However, some customs agents operate in conjunction with a freight forwarding business or shipping interests.

WATERFRONT LABOUR

The major union involved on the waterfront is the WWF. However, in addition to the WWF there are many other unions represented on the waterfront. These include:

- Amalgamated Metal Workers' Union
- Australasian Society of Engineers
- Australian Foreman Stevedores' Association
- Australian Government Workers' Association
- Australian Workers' Union
- Building Workers' Industrial Union
- Electrical Trades Union

- Federated Clerks' Union
- Federated Engine Drivers' and Firemens' Association
- Federated Ironworkers' Association
- Miscellaneous Workers' Union
- Storemen and Packers' Union
- Transport Workers' Union
- Wharf Supervisors' and Superintendents' Association.

Since the establishment of permanent employment in 1967 waterside workers have, for the most part, been employed directly by stevedoring companies. The number of waterside workers employed in each port (the port quota) and the allocations of employees to employers is the responsibility of Port Co-ordinating Committees and the Federal Co-ordinating Committee. These committees are comprised of representatives of the employers and the WWF. In addition to setting port quotas and allocation to employers, the committees also consider inter-port transfers of employees, redundancies and transfers between employers.

There are several other committees involved with the management of labour issues. These, and other matters involved in waterfront industrial arrangements, are dealt with more fully in a report to be released by the ISC.

CHAPTER 3 SIZE OF THE WATERFRONT INDUSTRY

This chapter contains data on the size of the waterfront and estimates of its significance to the Australian economy. The chapter presents the Bureau's estimates of the relative importance of the waterfront in terms of its contribution to production, national income, employment and earnings. There is also a discussion of the capital resources required by port authorities.

OUTPUT

The various output measures provide the most common method of estimating the economic size of an industry. In this section estimates of the economic significance of the waterfront are assessed by considering its total production and value added.

Waterfront production

In this analysis production refers to the gross output of the industry, defined as the total revenue derived from the provision of waterfront services by establishments classified to the industry. Accordingly, both the intermediate usage of inputs and the value added by the waterfront industry itself are included.

The revenue accruing to the various industry participants was calculated by combining data on cargo throughput with estimates of charges imposed for individual waterfront services. For example, the value of the services offered by the stevedoring sector was arrived at by applying charges per TEU to the total number of containers handled by all the terminals and depots. A detailed explanation of the methodology used to estimate total waterfront charges is set out in Appendix I.[1]

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1. The actual revenue received by waterfront establishments is, for the most part, not separately available from published sources. No information is obtainable on the turnover of individual terminals or depots. In addition, the receipts of the various port authorities in Australia include non-waterfront activities (such as property rental) which cannot always be isolated from total revenue.

Estimates of the value of waterfront production during the 1980s are contained in Table 3.1. The table shows the revenue earned for waterfront services, by broad industry groupings. Total waterfront production was estimated at $2314 million in 1986-87, almost double its value at the beginning of the decade ($1259 million in 1980-81).[2] As a share of Australian production, the waterfront accounts for around half of one per cent.

In real terms, waterfront industry production increased in size by 14 per cent between 1980-81 and 1986-87. The overall increase in production is attributable to the growth in the bulk storage and

TABLE 3.1 WATERFRONT PRODUCTION BY BROAD INDUSTRY GROUPS[a]
($ million)

Services	*1980-81*	*1983-84*	*1985-86*	*1986-87*
Port related services[b]	318	460	597	632
Stevedoring services[c]	473	510	590	653
Depot services[d]	40	42	63	64
Bulk storage and handling[f]	363	585	781	858
Customs agencies[g]	65	77	98	107
Total waterfront	1 259	1 674	2 129	2 314

a. Gross output, equal to the total revenue derived from the provision of waterfront services.
b. Includes charges for navigation, pilotage, towage, harbour and light, tonnage, berthing lines, gangway watch, water and electricity, wharfage and overtime storage.
c. Charges made by establishments for the loading and discharging of vessels. The totals include a very small amount (1 to 2 per cent) charged for handling grain.
d. Charges for the packing and unpacking of LCL cargo.
f. Storage and handling charges at bulk commodity terminals.
g. Customs agency charges for the clearance of goods through customs and quarantine.

Source See Appendix I.

2. These estimates do not include the contribution to the waterfront made by customs officers and quarantine authorities. Personal communications with relevant bodies suggest that the expenditure incurred on waterfront activities by these sectors would add less than 1 per cent to the value of waterfront production.

handling and port related services sectors. Bulk storage and handling grew from $363 million in 1980-81 to $858 million in 1986-87 and increased its share in total waterfront production from 29 per cent to 37 per cent (see Figure 3.1). Similarly the value of port services doubled in size over the same period to $632 million in 1986-87. Its share in waterfront production rose from 25 per cent to 27 per cent.

The recent gains made by these two sectors were partially offset by a decline in the relative share of stevedoring activity in waterfront production (from 38 per cent to 28 per cent between 1980-81 and 1986-87). The relative importance of depot services and customs agency services has remained virtually unchanged.

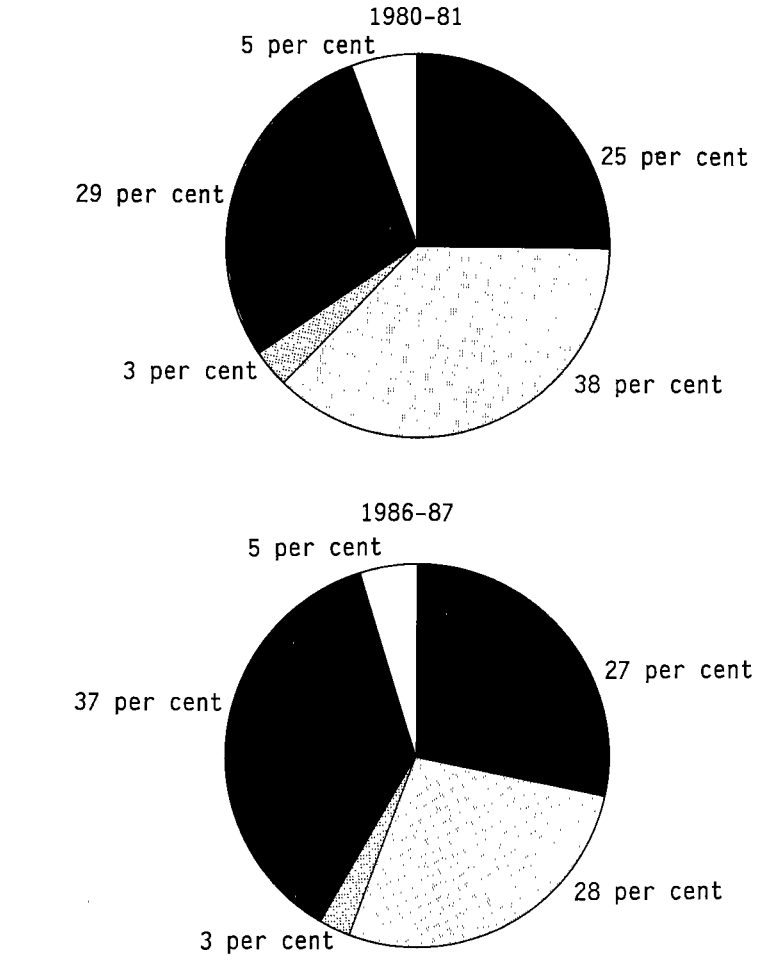
An alternative disaggregation of waterfront production is presented in Tables 3.2 and 3.3, which show the expenditure on waterfront services by user categories. The most notable features in Table 3.2 are the large increase in the expenditure of bulk operators involved in overseas trade (primarily bulk exporters) and the relative decline of the non-bulk sector. Overseas bulk expenditure rose from $372 million in 1980-81 to $1001 million in 1986-87. This large increase, combined with the smaller increase in non-bulk operators' expenditure, reversed the relative importance of the two groups in requiring waterfront services. In 1980-81 the non-bulk operators accounted for 60 per cent of the total expenditure on waterfront services. By 1986-87 their share had fallen to less than half (47 per cent).

Table 3.2 also indicates that coastal shipping operators were responsible for around 19 per cent of the demand for waterfront services in 1986-87 ($448 million), down from 26 per cent in 1980-81.

Table 3.3 shows that the falling share of the non-bulk sector in waterfront production is attributable to a reduction in demand for non-containerised cargo services. The value of waterfront services purchased by containerised cargo users increased from $344 million to $613 million between 1980-81 and 1986-87, while expenditure on non-containersied services barely changed ($471 million compared with $410 million).

Value added by the waterfront

The value of production is a gross measure of output involving the double counting of inputs. Consequently, output calculated according to this definition can be several times the value of the final services produced by an industry.



Source See Appendix 1.

Figure 3.1 Waterfront production by broad industry groups

TABLE 3.2 EXPENDITURE ON WATERFRONT SERVICES BY USER CATEGORY
($ million)

	User of waterfront services				
	Non-bulk operators		*Bulk operators*		
Year	*Overseas*	*Coastal*	*Overseas*	*Coastal*	*Total*[a]
1980-81	560	194	372	131	1 257
1983-84	622	209	666	179	1 676
1985-86	762	229	927	210	2 128
1986-87	863	221	1 001	227	2 312

a. Total expenditure on waterfront services may vary slightly from total waterfront production estimates (shown in Table 3.1) due to differences in classification.

Source See Appendix I.

TABLE 3.3 EXPENDITURE ON NON-BULK WATERFRONT SERVICES
($ million)

Year	*Containerised*	*Non-containerised*	*Total*
1980-81	344	410	754
1983-84	432	399	831
1985-86	582	409	991
1986-87	613	471	1 084

Source See Appendix I.

The calculation of the value added in an industry is the most common procedure adopted when assessing the contribution of the industry to national income. Value added of the waterfront is the total value of the services produced, after deducting the costs of goods and services used up in the process of production (that is the material and service inputs purchased from other enterprises). The two components of value added are the wages, salaries and supplements paid to labour and the

gross operating surplus accruing to the owners of the waterfront establishments.[3]

There is insufficient information available to allow a direct calculation of waterfront value added. Although a reasonable amount of data exist on labour payments in the industry, it is not possible to obtain gross operating surplus values for the various terminals and depots. In addition, the annual reports of the port authorities do not always easily allow disaggregation of receipts into waterfront and non-waterfront activities.

For the purposes of this study, it was estimated that the value added of the waterfront lies within the range of 70 to 85 per cent of overall production. This range was obtained by combining information from a number of sources, but primarily from data in the ABS Transport Industry Survey, 1983-84 (ABS 1986) and the ABS Input-Output tables (ABS 1987a, ABS 1987b), and from personal communications with the stevedoring industry.

Accordingly, in Table 3.4, two estimates of value added are shown for each year. The low estimate is based on waterfront value added being equivalent to 70 per cent of waterfront production, while the high estimate assumes value added accounting for 85 per cent of production. The value added of the waterfront sector was estimated to range between $1620 million and $1967 million in 1986-87. The share of the waterfront in national income has remained fairly stable in the current decade and is equivalent to 0.7 to 0.9 per cent of GDP.

Output of the waterfront relative to other sectors and industries

A further indication of the economic significance of the waterfront can be obtained by comparing its output with other sectors and industries in the economy. In Table 3.5 the production and value added of the waterfront are compared with the modal transport sectors.

The waterfront is a significant component in the transport sector only exceeded, in value added terms, by road freight transport and rail transport.

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3. Gross operating surplus is defined as the excess of output of enterprises over costs incurred in producing that output. The costs incurred are valued before deductions for depreciation, dividends, interest, royalties, land rent payments and direct taxes payable.

TABLE 3.4 ESTIMATES OF WATERFRONT VALUE ADDED AND SHARE IN GDP[a]

	Low estimate[b]		*High estimate*[c]	
Year	*Value added ($ million)*	*Per cent GDP*	*Value added ($ million)*	*Per cent GDP*
1980-81	881	0.71	1 070	0.86
1983-84	1 172	0.70	1 423	0.85
1985-86	1 490	0.72	1 810	0.87
1986-87	1 620	0.71	1 967	0.86

a. Gross domestic product at factor cost.
b. Based on the assumption that value added is equivalent to 70 per cent of total waterfront production.
c. Based on the assumption that value added is equivalent to 85 per cent of total waterfront production.

Sources See Appendix I. ABS (1988a).

TABLE 3.5 WATERFRONT PRODUCTION AND VALUE ADDED COMPARED WITH THE MODAL TRANSPORT INDUSTRIES, 1983-84[a]

		Value added	
Category	*Production ($m)*	*($m)*	*Per cent GDP*
Waterfront[b]	1 676.0	1 297.5	0.8
Modal transport industries			
Water transport[c]	1 238.9	424.3	0.3
Road freight transport	5 187.3	2 267.8	1.3
Road passenger transport	1 528.6	938.5	0.6
Rail transport	3 314.8	1 879.8	1.1
Air transport	2 958.0	1 141.9	0.7

a. The road transport, rail transport, water transport and air transport industries are collectively referred to as the modal transport industries. This definition specifically excludes establishments mainly engaged in providing services to transport.
b. Value added of waterfront is an average of the high and low estimates shown in Table 3.4.
c. International sea transport, coastal and inland water transport.

Sources ABS 1986. BTCE estimates.

An important feature shown by Table 3.5 is the relatively high share of value added in waterfront production. Value added for the modal transport industries averages less than 50 per cent of production, compared with the 80 per cent value added apparent for the waterfront. The relatively high share of value added in waterfront production reflects the service nature of the industry with a low reliance on intermediate inputs such as materials and fuel.

Relative to other industries in Australia, the waterfront is a medium to large sized industry with value added broadly equivalent to such industries as meat products, printing and stationery, and clothing and footwear. The waterfront is also about three-quarters the size of the motor vehicle industry, one of the largest of the manufacturing industries.

EMPLOYMENT AND EARNINGS

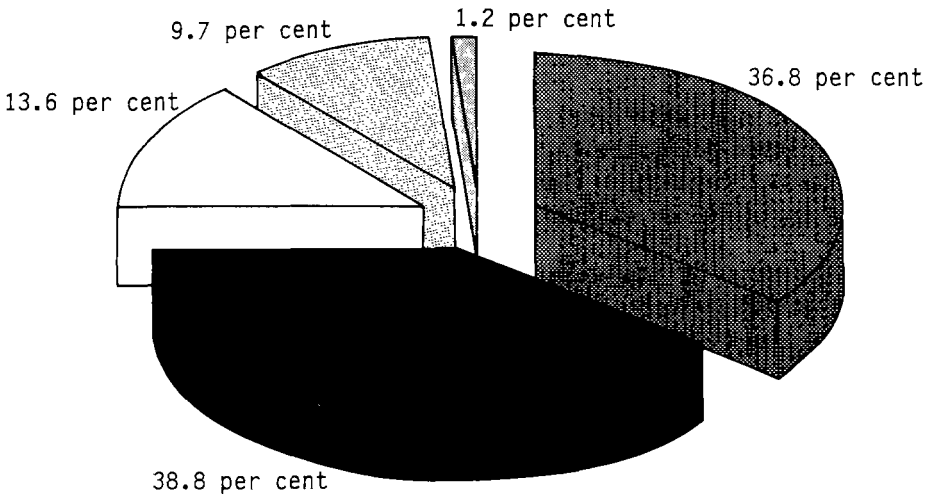
The numbers employed by the waterfront industry provides another indicator of its economic size. In addition, the total and average earnings of waterfront employees can be compared with other sectors and the total economy.

As with the output measures discussed above, data on employment earnings are incomplete and a certain amount of estimating is again necessary to derive waterfront numbers.

Employment

In 1986-87 approximately 26 000 persons were estimated to be employed on the Australian waterfront. This total was mainly derived from sources detailing the number of employees working in individual sectors of the waterfront. In the case of the bulk storage and handling category, however, no information on employment levels are available. Consequently, the number of employees working in this sector was estimated on the basis of the total labour costs incurred.

Details of the numbers employed in the various sectors of the waterfront are shown in Figure 3.2. The two dominant sectors on an employment basis are port related services and stevedoring, which together account for more than 75 per cent of total waterfront employment. Most of the port related services employment (9500 persons) refers to those directly employed by port authorities; the remainder is made up of towage workers (1300 persons) and additional pilots (200 persons) employed by private operators. The stevedoring sector (10 000 persons) includes all workers at conventional berths, container terminals and depots.



Notes 1. Stevedoring sector includes employees at container depots.
2. Percentages may not add to total due to rounding.

Sources ABS (1987c). AAPMA (1988). Australian Custom Service, pers. comm. Australian Quarantine and Inspection Service, pers. comm. BTCE (1988a). BTCE estimates.

Figure 3.2 Waterfront employment, 1986-87

The relatively labour intensive nature of stevedoring and port related services is contrasted by the bulk sector of the waterfront. Although responsible for 37 per cent of total waterfront production, bulk storage and handling only employs around 2500 workers, or 10 per cent of waterfront employment.

Employment on the waterfront in 1986-87 was 0.37 per cent of total persons employed in Australia, which includes both full-time and part-time workers. On a full-time basis only, the Australian waterfront accounted for 0.46 per cent of the workforce.

Employed persons in the waterfront industry are compared with other transport sub-divisions in Figure 3.3. The share of waterfront labour in total transport employment was estimated to be around 7 per cent in 1986-87.

It is notable that the waterfront, which offers services to water transport, has a much greater number of employees than those engaged in services to road and air transport. Employment in the major transport sectors, other than water transport, is mainly located in establishments directly involved in the transportation of freight and passengers.

Earnings

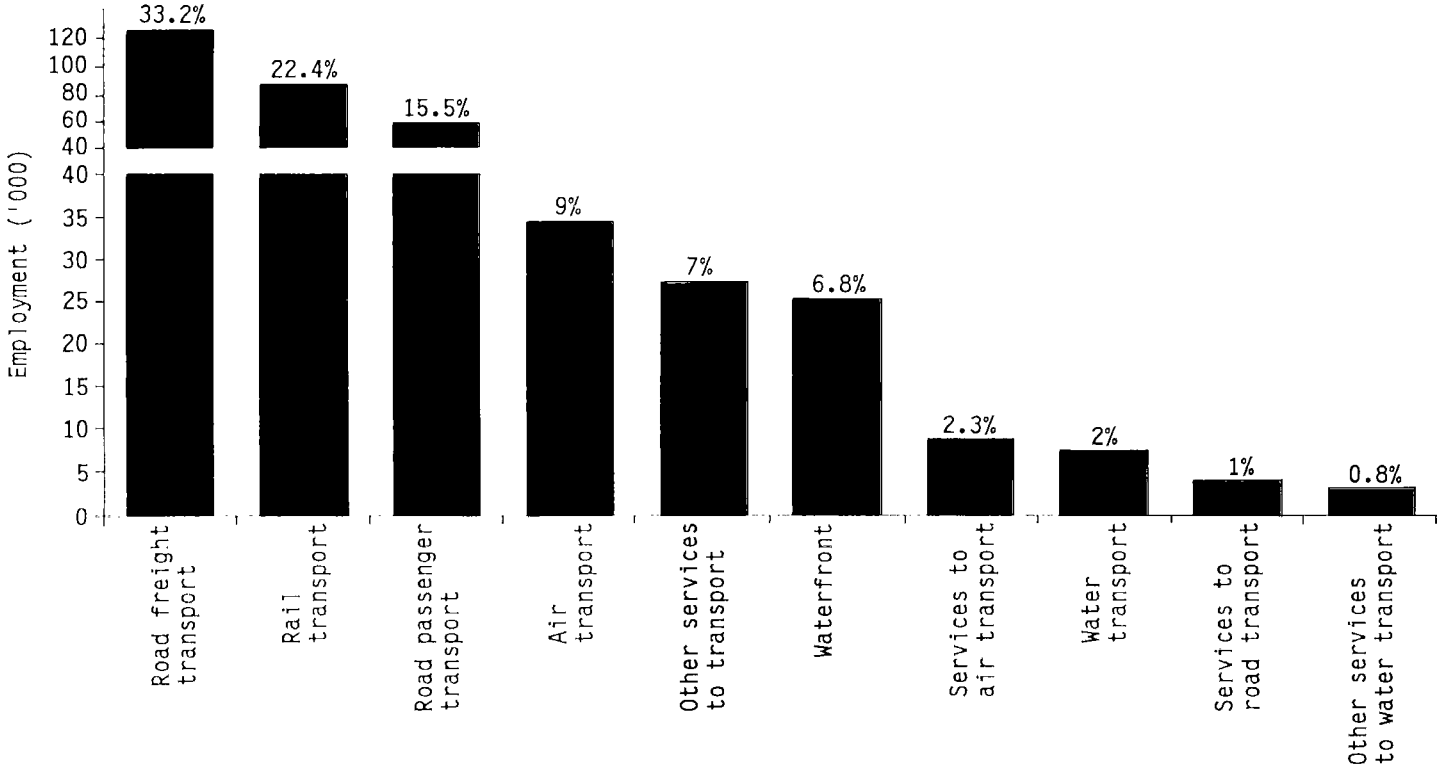
In this section earnings data are presented for waterfront employees as a whole and for registered regular waterside workers. For the majority of waterfront employees, earnings information is sparse and estimates only are presented. However detailed and reliable statistics are available for the registered waterside workers group which currently accounts for slightly over 20 per cent of total waterfront employment.

Total waterfront

Estimates of the earnings of waterfront employees in 1986-87 are shown in Table 3.6. The table includes both aggregate and average data by broad waterfront categories.

Aggregate earnings in the waterfront industry are estimated at $764 million in 1986-87.[4] Around 43 per cent of this total is paid in wages to employees of the stevedoring industry and a further 35 per

4. These earnings statistics exclude labour on-costs and thus cannot be used as a measure of total labour costs in the industry.



Sources ABS (1987d). BTCE estimates.

Figure 3.3 Employed persons by transport sub-division, 1986-87

TABLE 3.6 ESTIMATED EARNINGS OF WATERFRONT EMPLOYEES, 1986-87

Sector	*Average earnings $ ('000)*	*Aggregate earnings ($m)*
Port related services[a]	27 990	266.0
Stevedoring services[b]	33 000	330.0
Customs agencies	24 320	85.0
Bulk storage and handling	29 800	75.0
Customs and quarantine	26 666	8.0
Total waterfront	29 612	764.0

a. Port authority employees, towage employees and pilots not employed by port authorities.
b. Includes employees at container depots.

Sources ABS (1987e). ABS (1987f). Australian Customs Service (Pers. Comm.). Australian Quarantine and Inspection Service (Pers. Comm.). BTCE estimates.

cent to workers involved in port related services. In national terms, waterfront earnings are approximately 0.64 per cent of the total wages and salaries paid to civilian employees. If this figure is contrasted to the waterfront industry's share in GDP (0.7 to 0.9 per cent), it suggests that the waterfront is capital intensive rather than labour intensive.

The average earnings of employees provides a more common yardstick by which to measure the economic significance of the rewards to the labour input. Average earnings for the various sectors in the industry range from slightly over $24 000 for customs agency employees to $33 000 for stevedores and related workers. The waterfront average of $29 612 compares with the Australian all industries average of $23 670 (ABS 1987f).

The estimates of waterfront earnings are partially based on average earnings data for particular categories of workers, supplied by the ABS. Consequently, they may vary slightly from actual earnings in the industry. A study on the economic impact of the Port of Brisbane, however, indicates earnings data similar to those presented in this Paper. The study found that the average earnings of port related employees at the Port of Brisbane in 1985 was just over $30 000.

While there are some differences in the classification to the waterfront employees included in this study these are only of a minor nature (see Morrison and Jensen 1987).

Registered regular waterside workers

Table 3.7 shows the aggregate earnings of registered regular waterside workers over the past ten years. Although rising in nominal terms, the real decline in earnings is demonstrated by the reduction in the share of total Australian earnings from 0.29 per cent in 1976-77 to only 0.14 per cent ten years later. The decline is explained by the fall in numbers of registered regular waterside workers (from 10 386 persons to 5435 persons).

In Table 3.8, the average earnings of waterside workers is divided into those working at permanent ports (currently around 93 per cent) and those working at the non-permanent ports.

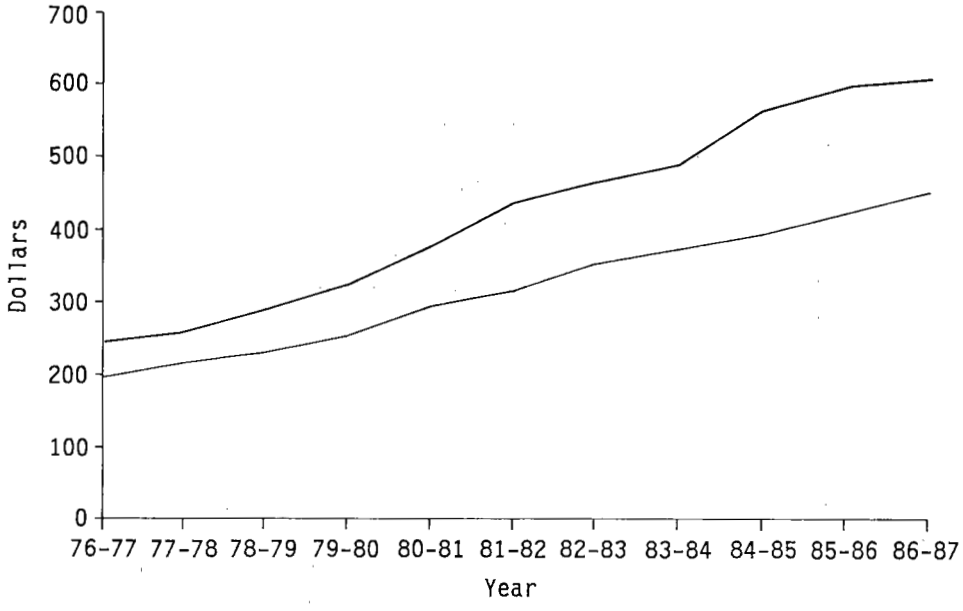
The data presented in Tables 3.6 and 3.8 indicate that relatively high average earnings are received by waterfront employees in general, but particularly by the registered waterside workers employed at the permanent ports and other workers in the stevedoring sector. In contrast to the relative weakening of the aggregate earnings of waterside workers (see Table 3.7), their average earnings have improved against the all industries average in recent years. This is shown more clearly in Figure 3.4. This data confirms that the real decline in the gross earnings of the waterside workers in Table 3.7 is entirely due to the smaller workforce, as their average earnings have improved steadily.

TABLE 3.7 AGGREGATE EARNINGS OF REGISTERED REGULAR WATERSIDE WORKERS[a]

Year	*Earnings ($ million)*	*Share of Australian earnings[b] (per cent)*
1976-77	129.2	0.29
1981-82	172.1	0.22
1986-87	169.5	0.14

a. Earnings of registered regular waterside workers and supplementary labour plus annual leave payments.
b. Wages and salaries of civilian employees as defined in the Australian National Accounts.

Sources ABS (1988a). DoTC (1987a).



Source DOTC (1987a).

Figure 3.4 Average weekly earnings of registered regular waterside workers at permanent ports compared with all industries

CAPITAL EXPENDITURE

The size and pattern of capital expenditure in the waterfront industry provides another indicator of the sector's overall economic importance.

Detailed investment information is available for expenditure on port developments throughout Australia. These data are presented to help measure the significance of capital spending on the waterfront. However, it should be noted that the data will not include all the investment undertaken by enterprises operating in the waterfront industry.

TABLE 3.8 AVERAGE EARNINGS OF REGISTERED REGULAR WATERSIDE WORKERS
($)

Year	Waterside workers		All industries average[a]
	Permanent ports	Other ports	
1984-85	29 338	20 956	20 701
1985-86	31 021	22 083	22 001
1986-87	31 468	22 579	23 670

a. November.

Sources ABS (1987f). DoTC (1987a).

Table 3.9 shows investment in Australian ports between 1981-82 and 1985-86. Total investment fluctuated considerably year by year, as did the relative shares of expenditure incurred by the public and private sectors. However for all years except 1983-84, a significant majority of the investment funds were provided from public sources. The primary focus of both public and private investment in recent years has been with developments associated with bulk exports.

TABLE 3.9 EXPENDITURE ON PORT DEVELOPMENT PROJECTS, AUSTRALIA, 1981-82 TO 1985-86[a]
($ million)

Year	Public sector	Private sector	Total
1981-82	335.4	28.4	363.8
1982-83	316.0	213.1	529.1
1983-84	183.3	218.5	401.8
1984-85	166.0	86.1	252.1
1985-86	220.8	114.9	335.7

a. Includes new berths, reconstruction of berths, harbour and channel deepening, cargo handling facilities, cargo storage, other port infrastructure, ship repair facilities, floating plant, fishing and pleasure craft facilities and other minor works.

Source DoT (1987a).

In Table 3.10, public expenditure on port development projects is compared with public investment in the transport and communications sector and total public investment. The generally downward trend of public port investment is complemented by its decline relative to both public investment in the transport and communications sector and total public investment, although both have stabilised in the last three years.

In Table 3.11 investment on port projects funded from private sources is measured against private investment in transport and in Australian industry as a whole. The large resources devoted to the expansion of private bulk loading facilities in 1982-83 and 1983-84 resulted in port investment gaining relative to both transport sector and national private investment. The lower levels of private port expenditure in the past two years have occurred simultaneously with strong private sector investment growth in both the transport sector and Australia as a whole. Consequently the relative significance of private capital expenditure on the waterfront has declined substantially.

TABLE 3.10 PUBLIC INVESTMENT IN PORTS, TRANSPORT AND COMMUNICATIONS SECTOR AND AUSTRALIA, 1981-82 TO 1985-86

Year	*Public expenditure in ports*[a] *($m)*	*Port investment relative to public investment in transport and communications*[b] *(per cent)*	*Port investment relative to total public investment in Australia*[b] *(per cent)*
1981-82	335.4	7.6	2.9
1982-83	316.0	5.7	2.4
1983-84	183.3	3.2	1.3
1984-85	166.0	2.9	1.1
1985-86	220.8	3.1	1.3

a. Public expenditure on port development projects during each year.
b. Gross fixed capital expenditure by public enterprises and general government.

Sources ABS (1988a). DoT (1987a).

TABLE 3.11 PRIVATE INVESTMENT IN PORTS, TRANSPORT SECTOR AND AUSTRALIA, 1981-82 TO 1985-86

Year	*Private investment in ports*[a] *($m)*	*Port investment relative to private investment in transport sector*[b] *(per cent)*	*Port investment relative to private investment in Australian industries*[c] *(per cent)*
1981-82	28.4	2.7	0.2
1982-83	213.1	21.8	1.4
1983-84	218.5	23.3	1.5
1984-85	86.1	10.3	0.5
1985-86	114.9	7.4	0.6

a. Private expenditure on port development projects during each year.
b. Total new fixed capital expenditure during each year. Includes storage component.
c. Excludes capital expenditure by private enterprises classified to the agriculture, forestry, fishing and hunting, construction and community services industries.

Sources ABS (1987g). DoT (1987a).

CHAPTER 4 LINKAGES BETWEEN THE WATERFRONT AND OTHER SECTORS AND INDUSTRIES

This chapter discusses the interdependence of the waterfront and other sectors and industries in the Australian economy. It seeks to show the importance of the waterfront to Australian industry mainly in terms of the volume of commodities passing through the ports.

The chapter begins with a description of the magnitude of the throughput handled by Australian ports and the importance of sea transport relative to other modes. The second part considers the importance of exports and imports to Australian industry and the vital role of the waterfront as a link in the distribution chain. This is followed by a brief discussion regarding the inputs required by the waterfront industry. The final part of the chapter briefly considers land transport linkages to and from the waterfront.[1]

CARGO MOVEMENTS THROUGH AUSTRALIAN PORTS

As a service industry the waterfront plays a vital intermediary role in the movement of traded goods both between Australia and other countries, and within Australia. This section briefly considers the importance of the waterfront to the national economy in terms of overseas and internal cargo movements.

Overseas trade

Table 4.1 shows the movement of overseas cargo by mode of transport. Exports and imports are classified by sea and air in terms of both volume and value.

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1. The users of waterfront services are also affected by waterfront charges and by various aspects of quality of service, such as speed, reliability, loss and damage. These costs of the waterfront to user industries are discussed in Chapter 5.

TABLE 4.1 VALUE AND VOLUME OF OVERSEAS CARGO BY MODE OF TRANSPORT, 1982-83 AND 1986-87

	Sea		*Air*		*Total*	
Year	*Gross weight ('000 tonnes)*	*Value ($m)*	*Gross weight ('000 tonnes)*	*Value ($m)*	*Gross weight ('000 tonnes)*	*Value ($m)*
Imports						
1982-83[a]	23 624	17 628	85	3 287	23 709	20 915
1986-87	23 304	28 396	102	8 026	23 406	36 422
Exports						
1982-83	174 171	19 640	79	1 565	174 251	21 205
1986-87	239 850	30 830	150	4 934	240 000	35 764

a. 1982-83 was the first year in which the value of imports was classified by mode of transport.

Source ABS (1987h).

In volume terms, Australia's sea ports handle virtually all exports and imports. Air transport handles less than 1 per cent of both import and export volumes. However, because air transport tends to concentrate on high value goods its share of import and export values is much greater. In 1986-87, air transport accounted for around 22 per cent of imports and 14 per cent of exports in value terms.

The size of the overseas trade sector relative to Gross Domestic Product (GDP) has remained steady in recent years. In 1986-87, exports and imports carried by sea transport had values of 11.6 per cent of GDP and 10.7 per cent of GDP respectively.

Coastal trade

In addition to its role as an important intermediary in Australia's foreign trade, the waterfront also plays a significant part in internal trade flows. In Table 4.2, the volume of cargo handled at Australian ports is classified in terms of overseas, interstate and intrastate trade.

TABLE 4.2 SUMMARY OF THE VOLUME OF CARGO AT AUSTRALIAN PORTS BY NATURE OF VOYAGE

Year	*Overseas*	*Interstate*	*Intrastate*	*Total*
		Discharged ('000 tonnes)		
1975-76	30 718	35 993	13 457	80 168
1980-81	26 652	33 502	13 618	73 772
1985-86	21 563	33 494	12 600	67 657
		Loaded ('000 tonnes)		
1975-76	164 540	34 127	13 412	212 079
1980-81	181 114	32 844	13 710	227 666
1985-86	245 217	32 007	12 702	289 926

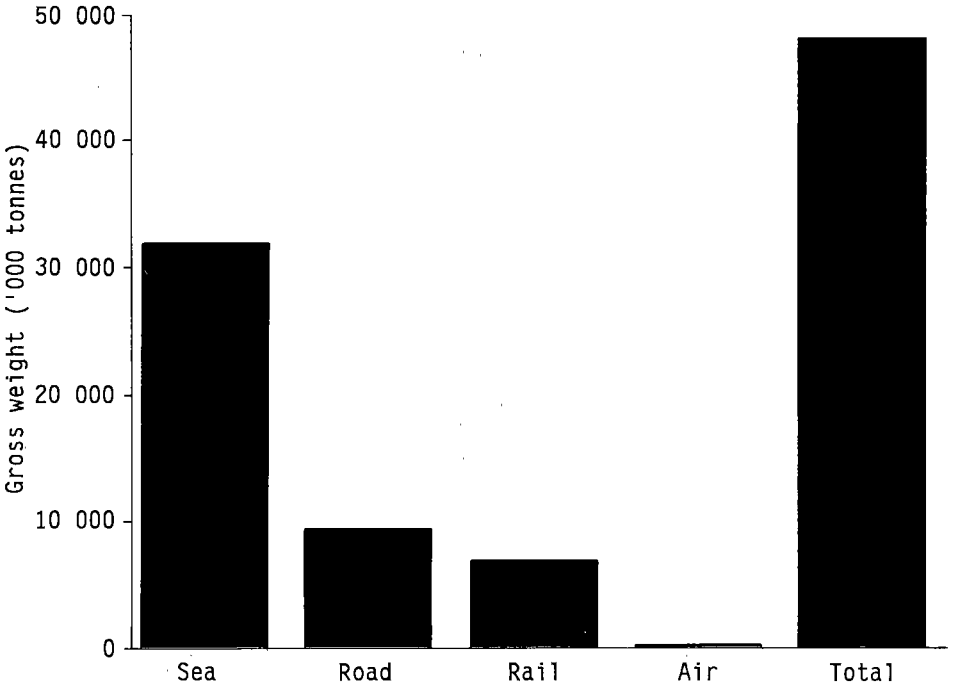
Source DoT (1987b).

The vast majority of coastal cargo by weight is of a bulk nature. In 1985-86, 91 per cent of inter-state sea cargo and 96 per cent of intrastate sea cargo belonged to either the dry bulk or liquid bulk categories.

The volume of total cargo handled at Australian ports increased by over 20 per cent in the ten years to 1985-86. Overseas cargo dominates the cargo handled, increasing its share of the total from around two-thirds in 1975-76 to around three-quarters in 1985-86. The overall predominance of overseas cargo is due to the large volume of exports loaded at Australian ports. However, interstate trade is the most important category for cargo discharged at the ports. In 1985-86, total coastal cargo discharged was more than twice the volume of overseas imports.

The amount of coastal sea trade has remained steady over the ten-year period, although indicating a slight downward trend. An indication of the relative importance of the waterfront to internal trade flows can be seen in Figure 4.1, which shows the volume of interstate trade by mode of transport.

Sea transport carries approximately two-thirds of interstate trade by volume, around twice the amount of road and rail combined. The



Source ABS (1987i).

Figure 4.1 Volume of interstate trade by mode of transport, 1985-86

relative shares of the various transport modes have remained virtually unchanged in recent years. Reliable information on the value of interstate and intrastate trade is unavailable.

INDUSTRIES USING WATERFRONT SERVICES

The services offered by the waterfront are sold to other industries within Australia for use as inputs in their own production processes. In the first instance, all of the waterfront output can be said to be purchased by the various shipping categories; overseas non-bulk, overseas bulk and coastal. However, the demand for waterfront services derives from the shippers of commodities and the cost of using waterfront services is passed on to the shippers in the form of charges. It is the importer or exporter that is directly responsible

for generating the demand for port related services. Consequently, an analysis of industries using waterfront services leads primarily to a discussion of the export and import trade and its participants.

In the first part of this chapter it was noted that the Australian waterfront plays a vital intermediary role in the foreign trade of the nation. In this section the exports and imports of specific industry sectors are analysed to show the relative importance of overseas trade to Australian producers.

The data on exports and the import requirements of Australian industry are useful in showing the degree of dependence of particular industries on the movement of goods across the wharves for orderly production operations. They also indicate which industries are likely to have the greatest concerns about delays, inventory control and other operational matters which depend in part upon cargo movements to and from overseas.

Significance of exports to major sectors and industries

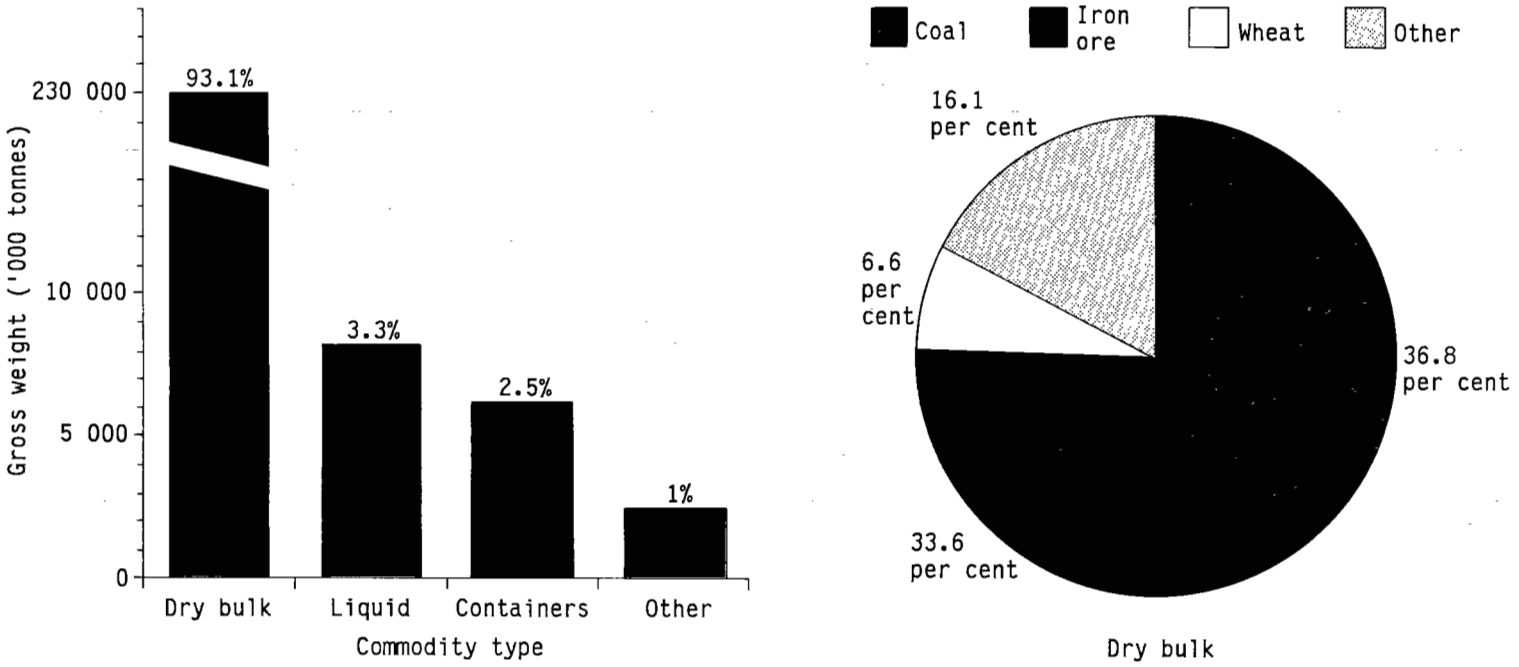
In volume terms, the total cargo handled by the waterfront is dominated by the export of dry bulk commodities. This is shown in Figure 4.2 which classifies the amount of cargo loaded at Australian ports by broad commodity type.

The two major commodity exports, coal and iron ore, are together responsible for 70 per cent of the export tonnage passing through the ports. Non-bulk exports account for only 3.5 per cent of the total volume.

A different picture of the waterfront's significance to particular export industries emerges when exports are considered in value terms. The value of exports for the major economic divisions, and some of the more important sub-divisions, are shown in Table 4.3.

The dry bulk commodities, coal and iron ore, account for most of the value of exports attributed to the mining sector. As a percentage of total exports, mining is responsible for around 40 per cent of foreign exchange receipts. Manufactured exports, as would be expected, have a much higher share in value terms than on a volume basis and have grown substantially in recent years. In 1986-87 they accounted for 29 per cent of total exports.

The significance of the waterfront to the various industry sectors can also be measured by the share of exports in total production. For example, an industry which exports a very large proportion of its



Note Percentages may not add to total due to rounding.

Sources DOTC (1987b). ABS (1987j).

Figure 4.2 Volume of Australian exports by commodity type, 1985-86

TABLE 4.3 EXPORTS BY AUSTRALIAN EXPORT COMMODITY CLASSIFICATION, 1985-86 AND 1986-87[a]

AECC division/ sub-division	*1985-86*		*1986-87*	
	($m)	*(Per cent)*	*($m)*	*(Per cent)*
Agriculture				
Cereals	3 929	12.0	2 801	7.8
Textile Fibres	3 207	9.8	3 871	10.8
Meat	1 701	5.2	2 249	6.3
Other	3 399	10.4	4 143	11.6
Total	12 236	37.3	13 064	36.5
Mining				
Metal ores and minerals	5 003	15.3	4 956	13.9
Mineral fuels	7 977	24.3	7 309	20.4
Total	12 980	39.6	11 166	34.3
Manufacturing				
Metals and metal manufactures	2 718	8.3	3 141	8.8
Machinery and transport equipment	1 612	4.9	2 612	7.3
Chemicals and related products	593	1.8	663	1.9
Other	2 656	8.1	4 037	11.3
Total	7 579	23.1	10 453	29.2
Total exports	32 795	100.0	35 783	100.0

a. These figures include air cargo, which accounted for approximately 9 per cent of the value of all exports in 1985-86 and 14 per cent in 1986-87.

Source Derived from ABS (1988b).

output has a greater interest in waterfront affairs, and a stronger degree of dependence on waterfront activities, than industries which depend on the Australian market for most of their sales.

In Table 4.4, the value of exports is compared with total sales for the major economic groups and some of the sub-divisions. The mining sector has the greatest degree of dependency on overseas markets for sales of its output, with coal being particularly vulnerable to the services provided by the ports. Manufacturing output is for the most part oriented towards the domestic market, although the export share average of 13.8 per cent is significant.

The number of containers holding manufactured goods passing across Australia's wharves is likely to increase in the period ahead, as the manufacturing industry becomes more outward looking and the Government continues to promote structural changes in the mix of export commodities. The link in the chain provided by the waterfront will accordingly grow in importance to the manfacturing sector.

The analysis of the volume and value of exports indicates a further important point regarding the relative significance of the waterfront to the different exporting sectors. The general nature of both agricultural and mining exports (high volume, low value) suggests that the producers in these industries are likely to be concerned about the level of waterfront costs, due to the relatively high proportion of the total value of the bulk products accounted for by transport costs. On the other hand, manufacturing industries exporting commodities with high unit values may be more concerned with the level of indirect waterfront costs. It is the quality of the services offered by the waterfront, such as reliability of delivery and minimisation of loss and damage, which are particularly important to manufacturers.

The significance of imports to Australian industry

The materials used by Australian enterprises to help produce their final outputs are not all obtained from sources in Australia. In most cases industries find it necessary to import part of their inputs from overseas producers. This section discusses the dependence of local industry on the supply of imported materials passing through Australian ports.

In Table 4.5, imports required principally for industrial purposes are shown by broad economic categories for the years 1985-86 and 1986-87. The data indicate that almost three-quarters of Australian imports are purchased by firms for use as inputs in the production process. Most of the imports are of a manufactured nature, with capital goods and processed industrial supplies together worth $16 745 million in 1986-87, equivalent to around 60 per cent of the imports used by industry.

TABLE 4.4 SHARE OF EXPORTS IN TURNOVER OF MAJOR INDUSTRIES, 1984-85

Industry	*Exports ($m)*	*Turnover ($m)*	*Export share (per cent)*
Agriculture[a]	6 229.5	15 436.1	40.4
Mining	9 326.3	16 290.8	57.2
Metalic minerals	2 833.6	5 211.2	54.4
Coal	4 656.7	5 965.3	78.1
Oil and gas	1 664.5	3 875.8	42.9
Manufacturing	13 576.9	98 209.0	13.8
Food, beverages and tobacco	3 853.2	21 008.0	18.3
Chemicals, petroleum and coal products	1 657.6	9 811.0	16.9
Basic metal products	4 510.4	12 439.0	36.3
Other machinery and equipment	1 188.9	9 268.0	12.8

a. Excludes forestry, fishing and hunting.

Sources ABS (1987k). ABS (1987l).

TABLE 4.5 IMPORTS USED AS INDUSTRIAL SUPPLIES, 1985-86 AND 1986-87[a]

	1985-86		*1986-87*	
Economic category	*Value ($m)*	*Share of total imports (per cent)*	*Value ($m)*	*Share of total imports (per cent)*
Food and beverages				
Primary	183.2	0.5	164.0	0.4
Processed	191.7	0.6	195.1	0.5
Total	374.9	1.1	359.1	1.0
Fuels and lubricants				
Primary	588.7	1.7	566.0	1.5
Processed[b]	1 100.1	3.2	815.4	2.2
Total	1 688.8	4.9	1 381.4	3.7

TABLE 4.5 (Cont.) IMPORTS USED AS INDUSTRIAL SUPPLIES, 1985-86 AND 1986-87[a]

Economic category	*1985-86*		*1986-87*	
	Value ($m)	*Share of total imports (per cent)*	*Value ($m)*	*Share of total imports (per cent)*
Capital goods and parts				
Capital goods	7 070.8	20.4	7 268.9	19.6
Parts and accessories	2 986.6	8.6	3 324.9	9.0
Total	10 057.4	29.0	10 593.8	28.6
Transport equipment and parts				
Equipment[c]	1 206.9	3.5	1 609.2	4.3
Parts and accessories[d]	1 307.8	3.8	1 714.5	4.6
Total	2 514.7	7.2	3 323.7	9.0
Other industrial supplies				
Primary	546.7	1.6	586.0	1.6
Processed	8 416.4	24.3	9 475.8	25.6
Total	8 963.1	25.8	10 061.8	27.2
Goods not elsewhere specified[f]	1 379.0	4.0	1 771.6	4.8
Total imports for industry	24 977.9	72.0	27 491.4	74.3
Other imports	9 713.3	28.0	9 530.5	25.7
Total imports	34 691.2	100.0	37 021.9	100.0

a. These figures include air cargo which accounted for around 20 per cent of the value of all imports.
b. Excludes all motor spirits.
c. Excludes all passenger motor cars.
d. Estimate, based on ratio between industrial equipment and non-industrial equipment.
f. Includes commodities subject to a confidentiality restriction and therefore likely to be required by industry.

Source ABS (1988b).

Improvements in waterfront efficiency which reduce delays and lower the costs of importing goods (discussed in Chapter 5) will consequently feed directly into local production benefits. The significance of the waterfront to local industry will, in this case, depend upon the relative importance of imported inputs in the production of final products. It is not possible to accurately gauge the importance of individual imports to industries without a detailed technical knowledge of the production process. However, an indicator of the relative importance of total imports to sectors and industries is their value in relation to other goods and services used in the production process.

Table 4.6 compares the amount of direct imports and local supplies purchased by the major economic sectors in 1980-81.

The manufacturing sector requires both the largest absolute amount of imports and the largest share of imported inputs used in the production process. The relative dependency of manufacturing industries on imports (17.7 per cent) is much greater than the

TABLE 4.6 IMPORTS AND LOCAL SUPPLIES REQUIRED BY MAJOR ECONOMIC SECTORS, 1980-81[a]

	Goods and services purchased by enterprises				
	Imports[b]		*Local supplies*[c]		
Sector	*($m)*	*(per cent)*	*($m)*	*(per cent)*	*Total ($m)*
Agriculture	271.0	6.0	4 221.0	94.0	4 492.0
Mining	512.7	11.6	3 906.9	88.4	4 419.6
Manufacturing	9 216.3	17.7	42 784.0	82.3	52 000.3
Other	5 759.3	10.3	50 057.8	89.7	55 817.1
Construction	1 351.1	10.0	12 139.8	90.0	13 490.9
Transport	1 078.8	16.3	5 539.4	83.7	6 618.2

a. Latest year for which information is available. Import values include duty paid.
b. Goods and services imported directly from overseas suppliers.
c. Goods and services purchased from Australian suppliers. For all sectors, however, some of the inputs required to produce these supplies were in turn imported.

Source ABS (1987b).

dependency of the agricultural and mining sectors with only the transport sector (16.3 per cent) approaching it.

A more detailed examination of the import requirements of the manufacturing sector occurs in Table 4.7. The table shows the supplies purchased by the major manufacturing industries in terms of imported inputs and local supplies. Other industries, such as basic metals and products, import more inputs in absolute value terms than textiles, and clothing and footwear, but are not so dependent on imports relative to Australian supplies.

The data shown in both Tables 4.6 and 4.7 understate the overall dependence of particular sectors or industries on imported supplies. The goods and services purchased from Australian firms have in turn been produced using some inputs originating from overseas. In 1980-81

TABLE 4.7 IMPORTS AND LOCAL SUPPLIES REQUIRED BY SELECTED AUSTRALIAN MANUFACTURING INDUSTRIES, 1980-81[a]

	Goods and services purchased by enterprises				
	Imports[b]		*Local supplies*[c]		
Industry	*($m)*	*(per cent)*	*($m)*	*(per cent)*	*Total ($m)*
Transport equipment	1 145.5	28.1	2 927.6	71.9	4 073.1
Paper, printing etc	765.7	27.3	2 043.2	72.7	2 808.9
Clothing and footwear	428.2	25.4	1 258.0	74.6	1 686.2
Chemicals	920.3	25.0	2 757.9	75.0	3 678.2
Other machinery etc	1 140.3	24.6	3 490.9	75.4	4 631.2
Textiles	358.6	21.9	1 280.9	78.1	1 639.5

a. Latest year for which figures are available. Import values include duty paid.
b. Goods and services imported directly from overseas suppliers.
c. Goods and services purchased from Australian suppliers. For all industries, however, some of the inputs required to produce these supplies were in turn imported.

Source ABS (1987b).

the local products purchased by all Australian industry contained an average of 16 per cent of imported content. This proportion is only slightly higher for the manufacturing sector at 19.5 per cent, although figures for individual industries within the sector range between 7 and 30 per cent (ABS (1987b).

Manufacturing industries are directly and indirectly responsible for a high proportion of total imports required by all Australian industry and are clearly very dependent on waterfront services. In another sense, however, all industries importing materials (particularly ones not available in Australia) are highly dependent on the waterfront, whatever the relative share of imports in total inputs. For example, an industry may absolutely rely on certain imported parts or equipment for its production process, being unable to obtain the product locally, even though its overall ratio of imported inputs to total inputs is insignificant. In this respect, the key role played by the waterfront in handling particular imports is hidden by aggregate value data.

In the widest sense, the importance of imported inputs to the manufacturing sector indicates that any push to increase the amount of Australian manufactured goods sold overseas will in turn involve a larger flow of imported materials into Australia. In these circumstances, increased calls on waterfront services will be made for both the loading and discharging of goods.

GOODS AND SERVICES USED BY WATERFRONT INDUSTRY

The ABS Input-Output tables show the intermediate inputs purchased by an industry in the form of goods and services produced by other industries. This information provides valuable insights into the interdependence of industries.

The tables do not permit the identification of all the flows between 'the waterfront' and other industries as it is not possible to dissagregate the flows by the various sectors. The 'water transport' industry is the nearest category to the waterfront in the relevant input-output tables. This category covers the stevedoring industry and port related services, but excludes customs clearance, some depot handling and bulk storage. On the other hand, water transport includes non-waterfront activities such as establishments engaged in the operation, chartering and leasing of vessels for use in international sea transport, coastal water transport and inland water transport.

Notwithstanding these classification problems, some broad observations can be made on the flow of goods and services between the waterfront industry and other sectors of the economy. This is made possible by combining data in the ABS Input-Output tables (ABS 1987a, ABS 1987b) with information provided by the ABS Transport Industry Survey, 1983-84 (ABS 1986).

In order to produce its gross output the waterfront industry must purchase a certain amount of intermediate inputs produced by other industries to combine with its own primary inputs, such as labour and capital. The total value of these intermediate inputs is apparently very small and therefore of little significance to other sectors of the economy.

It was indicated in Chapter 3 that between 70 and 85 per cent of waterfront production is made up of the value added by labour and capital inputs. Goods and services purchased from other sectors and industries are therefore estimated to account for between 15 and 30 per cent of the value of all the inputs used by the waterfront industry.

In 1986-87, waterfront production is estimated to have been $2314 million (see Table 3.1). Consequently, purchases of goods and services from other industries would be expected to account for between $350 to $700 million. The most important supplier industries to the waterfront would include various energy categories, such as petroleum and electricity. Other materials used by the waterfront sectors would be various stores items (for example, food) and business services such as insurance and equipment hire. In addition, the waterfront industry itself provides some of the intermediate inputs subsequently used by other parts of the same sector.

LAND TRANSPORT LINKAGES

Land tranport provides the link in the chain between exporters or importers and the waterfront. The sector earns a significant proportion of its total revenue from the movement of commodities to and from the ports.2

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2. The source material for this section is taken from BTE (1986a) and BTCE (1988b).

The land transport of ship cargo to or from the waterfront is performed by either road or rail services. A large number of road transport operators carry FCL containers and LCL cargo, whereas rail movements of containers are handled by the various State and Federal rail authorities. Land transport for bulk export commodities is generally carried out by rail, although road transport is also used (sometimes in combination with rail).

There are estimated to be over 50 road transport operators carrying FCL containers in each of the two major ports of Sydney and Melbourne. A substantial proportion of the FCL shipments is performed by only a dozen or so carriers in each port. On the other hand, a very large number of carriers are involved in the cartage of LCL cargo to and from depots for packing and unpacking.

Table 4.8 shows a comparison of the number of import and export containers carried by road and rail for the major container terminals in Australia.

Of those terminals for which a modal split is available, road transport accounted for 87 per cent of all containers moved through the terminals. However, it should be noted that some terminals do not have direct rail access and many containers brought in to a terminal by road may have been moved by rail for the greater part of the journey. Rail transport is the dominant mode for long haul movements involving large numbers of containers, but participates only to a limited extent in similar short haul movements. In 1984-85, land transport costs in Australia associated with the exporting and importing of non-bulk cargo were around $250 million (BTE 1986a).

Bulk cargo is primarily the domain of the railways, although road transport plays a significant role in the movement of grain. Bulk imports are usually destined for locations close to the port for further processing or use in manufacturing and incur low land transport costs.

In 1985-86 the land transport component of shipping overseas bulk cargo to and from the Australian waterfront is estimated at around $2000 million, the vast majority (over 95 per cent) associated with the exporting of commodities (BTCE 1988b). However it should be noted that indirect costs involving the quality of service are not included in the above land transport cost estimates.

TABLE 4.8 BREAKDOWN OF MOVEMENTS OF FULL CONTAINERS THROUGH MAJOR AUSTRALIAN PORTS BY LAND TRANSPORT MODE: IMPORTS AND EXPORTS, 1985

(TEU's)

State and terminal	Imports			Exports			Total		
	Road	Rail	Total	Road	Rail	Total	Road	Rail	Total
NSW									
ANL	75 226	10 246	85 472	47 631	13 689	61 320	122 857	23 935	146 792
CTAL	50 644	11 011	61 655	32 058	14 664	46 722	82 702	25 675	108 377
Glebe Is	32 537	3 362	35 899	21 862	6 796	28 658	54 399	10 158	64 557
Vic									
ANL[a]	75 000	..	75 000	20 000	..	80 000	155 000	..	155 000
Patricks	na	na	43 289	na	na	32 574	na	na	75 863
Seatainer	na	na	57 865	na	na	52 751	na	na	110 607
TOT	25 739	3 322	29 061	21 043	5 069	26 112	46 782	8 391	55 173
F G Strang	na	na	61 000	na	na	42 000	na	na	103 000
Qld									
ANL[a]	13 100	..	13 100	12 100	..	12 100	25 200	..	25 200
BATL	14 756	1 877	16 633	20 064	5 119	25 183	34 200	6 996	41 816
SA									
TOT	na	na	3 700	na	na	4 800	na	na	8 500

TABLE 4.8 (Cont.) BREAKDOWN OF MOVEMENTS OF FULL CONTAINERS THROUGH MAJOR AUSTRALIAN PORTS BY LAND TRANSPORT MODE: IMPORTS AND EXPORTS, 1985

(TEU's)

State and terminal	*Imports*			*Exports*			*Total*		
	Road	*Rail*	*Total*	*Road*	*Rail*	*Total*	*Road*	*Rail*	*Total*
WA									
Fremantle Cargo Services	na	na	31 796	na	na	34 566	na	na	66 362

a. All container movements into and out of the ANL terminal in 1985 were by road as no direct rail access existed at that time.
.. Not applicable.
na Not available.

Source BTE (1986a).

CHAPTER 5 SIGNIFICANCE OF WATERFRONT COSTS

The economic significance of the waterfront lies mainly in its role as a link in the import and export of traded goods. One measure of the strength of this link is the extent to which an industry depends on imports or exports. This issue was discussed in the previous chapter. The approach taken in this chapter is to examine these links from the perspective of the relative size of waterfront costs.

Waterfront costs can be classified into two broad categories: direct money costs and indirect costs associated with reliability and time. This chapter examines these costs and the benefits that might be gained by reducing them. First it examines direct waterfront costs in relation to commodity values and the likely impact of reducing these costs. Second, indirect waterfront costs and the importance of these to other industries are discussed.

SIGNIFICANCE OF WATERFRONT CHARGES TO AUSTRALIAN INDUSTRY

Australian enterprises involved in the exporting and/or importing of goods by sea are faced with various waterfront charges. In this section estimates of current charges are presented, followed by a discussion of the significance of these waterfront charges in relation to both the value of selected individual exports and imports and to total exports and imports.

Indicative waterfront charges

There are three broad categories of charges to be paid by exporters and importers for waterfront services: port and related charges, stevedoring charges and charges for customs entries. Port and related charges are charges resulting from the use of Australian facilities and services in bringing a ship into port (or moving it away from port). Charges are incurred for such items as pilotage, towage, wharfage, the provision of berthing lines and gangway watch services. Stevedoring charges for both conventional and container facilities are generally paid by the shipping companies and recovered from shippers or consignees through freight rates. For example, the charges at terminals for imports cover ship-to-shore handling, shore-to-stack

handling and stack-to-land transport handling, as well as storage for several days. Customs agents charge their clients for arranging customs clearance for their cargoes. The rates actually charged are negotiated with clients and vary between FCL and LCL consignments.

Table 5.1 shows indicative waterfront charges for non-bulk imports and exports (that is, containerised and break-bulk cargo). The data are derived from Bureau surveys, the results of which were published in *Shore-based Shipping Costs, Non-bulk Cargo* (BTE 1986a).

The estimates of waterfront charges presented in Table 5.1 are indicative only and in practice can vary substantially from customer to customer and among service providers. However it is considered that the average amounts shown are sufficiently accurate to measure the significance of waterfront costs to industry users.

Waterfront charges and total trade

Table 5.2 contains estimates of the relative importance of waterfront charges for 1985-86 and 1986-87.

In total, waterfront charges associated with Australia's non-bulk overseas trade amounted to $760 million in 1985-86 and $863 million in 1986-87. These estimates are based on the direct stevedoring costs, the charges for port and related services and the cost of customs agents' services. The direct waterfront charges for Australia's international non-bulk trade in 1986-87 represented around 2.6 per cent of the value of the goods exported and around 1.7 per cent of the value of imported goods.

Based on information in BTCE (1988b) and the report of the Royal Commission into Grain Storage Handling and Transport (1988) waterfront costs for bulk imports and exports were estimated to be an average $3.70 per tonne in 1985-86. Total waterfront costs for bulk commodities in the same year were estimated to have been $925 million or 4.1 per cent of value. These costs include storage and handling costs at the port, stevedoring costs and charges for port and related services.

Waterfront charges for selected exports and imports

As waterfront charges are the same for each container handled, the proportion of waterfront charges to the value of individual commodities will differ markedly, depending upon the value of the commodity per TEU.

TABLE 5.1 INDICATIVE AUSTRALIAN WATERFRONT CHARGES FOR NON-BULK EXPORTS AND IMPORTS, 1984-85
(dollars per TEU)

Waterfront charges	*Exports*	*Imports*
Port and related charges[a]	120	180
Stevedoring[a]	230	230
Customs entries[b]	40	80
Total	390	490

a. The same charges are applicable for both FCL and LCL cargo.
b. Charges applicable for FCL cargo.

Note For FCL and LCL containers it is assumed that the goods are not refrigerated.

Source BTE (1986a).

TABLE 5.2 INDICATIVE WATERFRONT CHARGES IN RELATION TO THE VALUE OF NON-BULK EXPORTS AND IMPORTS, 1985-86 AND 1986-87

Year	*Gross weight ('000 tonnes)*	*Value ($m)*	*Value per tonne ($)*	*Waterfront charges*	
				($m)	*(Per cent of value)*
Exports					
1985-86	8 661	12 012	1 387	350	2.9
1986-87	10 303	16 660	1 617	430	2.6
Imports					
1985-86	7 460	23 559	3 158	410	1.7
1986-87	7 603	25 493	3 353	433	1.7

Sources ABS (1987m). DoT (1987b). BTCE estimates.

Tables 5.3 and 5.4 show indicative waterfront charges incurred in Australia as a proportion of the value of various non-bulk export and import commodities. The commodities listed are among the most important imports and exports in terms of value. Average loads per TEU in 1985-86 were based on stowage factors published in BTE (1986b).

TABLE 5.3 INDICATIVE WATERFRONT CHARGES AS A PROPORTION OF THE VALUE OF NON-BULK EXPORTS, 1985-86[a]

Commodity	*Value per tonne ($)*	*Value per TEU[b] ($)*	*Waterfront charges[c] (per cent of value)*
Textile fibres	3 265	26 500	1.6
Meat and meat preparations	2 324	33 700	1.4
Non ferrous metals	1 104	19 400	2.2
Machinery, equipment apparatus and applicances	7 190	126 500	0.3
Dairy products and eggs	1 508	22 700	2.1
Hides, skins and furskins	913	33 700	1.2
Fruit and vegetables	660	11 600	4.1
Feeding stuff for animals	221	3 900	10.8
Paper, paper board and paper pulp	684	10 900	3.9
Animal fats and oils	543	7 900	5.3

a. Waterfront charges incurred in Australia.
b. Load per TEU estimated according to stowage factors in BTE (1986b). An average load of 14.6 tonnes was assumed if no stowage factor was available.
c. Charges per TEU shown in Table 5.1 were re-calculated at 1985-86 prices.

Sources ABS (1987h). ABS (1987m). BTE (1986b). BTCE estimates.

The data in Tables 5.3 and 5.4 indicate that waterfront charges vary in relative terms, but generally represent no more than 2 per cent of the value of non-bulk imports. Waterfront charges for non-bulk exports are higher in relative terms and more varied. The relatively low proportion of waterfront charges for the selected import commodities is mainly due to the fact that most non-bulk imports tend to be manufactured goods with comparatively high unit values. Non-bulk exports are a mix of high valued manufactured goods and lower valued primary products or partially processed commodities, which accounts for their greater variability in relative waterfront costs.

TABLE 5.4 INDICATIVE WATERFRONT CHARGES AS A PROPORTION OF THE VALUE OF NON-BULK IMPORTS, 1985-86[a]

Commodity	*Value per tonne ($)*	*Value per TEU[b] ($)*	*Waterfront charges[c] (per cent of value)*
Machinery, equipment, apparatus and appliances	11 490	122 300	0.4
Road vehicles and other transport equipment	5 370	57 100	0.9
Printed matter, plastic wares and miscellaneous manufactured articles	3 450	31 500	1.7
Textiles yarns, fabrics, made up articles	5 980	48 600	1.1
Paper, paperboard and articles of paper	1 120	17 900	3.0
Manufactures of metal	3 720	65 500	0.8
Professional/scientific and other apparatus	29 530	519 700	0.1
Articles of apparel and clothing accessories	12 840	147 700	0.4
Plastic materials, resin and cellulose esters/ethers	3 600	40 300	1.8
Coffee, tea, cocoa and spices	2 850	32 800	1.6

a. Waterfront charges incurred in Australia.
b. Load per TEU estimated according to stowage factors in BTE (1986b). An average load of 11.5 tonnes was assumed if no stowage factors was available.
c. Charges per TEU shown in Table 5.1 were recalculated at 1985-86 prices.

Sources ABS (1987h). ABS (1987m). BTE (1986b). DoTC (pers. comm.). BTCE estimates.

Table 5.5 provides equivalent information for the three major bulk commodities of coal, iron ore and grain. Waterfront charges in the table include storage and handling costs at the port as well as stevedoring and other port charges.

TABLE 5.5 ESTIMATED WATERFRONT CHARGES AS A PROPORTION OF THE VALUE OF BULK EXPORTS, 1985-86

Commodity	*Value per tonne ($)*	*Waterfront charges*[a] *($ per tonne)*	*Waterfront charges*[a] *(per cent of value)*
Coal	57.70	4.80	8.3
Iron ore	22.50	0.70	3.1
Grain[b]	170.60	8.42	4.9

a. Includes storage and handling, port charges and wharfage.
b. Wheat, barley, sorghum and oats.

Sources BTCE (1988b). Royal Commission into Grain Storage, Handling and Transport (1988). BTCE estimates.

Waterfront charges per tonne for bulk commodities are much lower than the equivalent charges for non-bulk commodities. However the value per tonne for bulk commodities is also low and this results in a higher ratio of waterfront costs to value.

In sum, waterfront charges for many non-bulk commodities represent a small proportion of cargo value, which limits the potential cost savings to user industries from any improvements in waterfront efficiency. However, waterfront charges are clearly more significant for lower value bulk commodities and some low value primary products exported in non-bulk forms.

BENEFITS OF REDUCED WATERFRONT COSTS

Reduced waterfront costs, provided they are reflected in reduced charges to shippers and consignees of cargo, can in principle provide a direct stimulus to trade as well as the benefit of the lower costs faced by importers and exporters. Reductions in indirect costs through improved quality of service provided by the waterfront can lead to lower inventories and other production costs. Improving this aspect of waterfront performance can also enhance trade. These issues are discussed in more detail in the following sections.

Reduction in direct costs

A reduction in waterfront charges will be reflected in fob or cif prices or a change in both. If the fob price remains unchanged all the benefits accrue to the importing country. Conversely if the cif

price remains unchanged the exporting country gains the benefit. Usually both prices adjust and the benefits are shared by the importing and exporting country. Appendix II examines this issue and in general it appears that Australian exporters and importers would gain the major proportion of the benefits of reduced waterfront costs.

A second effect of reduced waterfront charges is a potential stimulus to trade. The extent of this effect depends on elasticities of demand for and supply of Australian imports and exports as well as the ratio of waterfront charges to the price of the traded good. This effect is analysed in more detail in Appendix II where it is shown that the level of trade is relatively unresponsive to changes in waterfront charges. The low ratio of waterfront costs to value is an important factor in this result. Trade in bulk commodities and low value primary products exported in non-bulk form would be more responsive to changes in these charges.

Reduction in indirect costs

Indirect costs are defined as those costs imposed on waterfront users by quality of service aspects of the waterfront. Indirect costs are incurred mostly through costs of delays, unreliability of delivery time and loss and damage. The first two are the most important aspects of indirect costs. In this context three classes of users are considered: shippers and consignees, ship operators and land transport operators.

Shippers and consignees

These users are mostly affected by the costs of unreliability. Poor reliability increases the costs to consignors and consignees in two important ways. First, inventories have to be kept at larger levels than would otherwise be necessary. The costs of higher inventory levels include the costs of providing storage space as well as the costs of holding larger stocks of goods.

In principle inventory costs associated with unreliability can be estimated but in practice very little data are available. Inventory levels for imported goods are likely to be high as indicated by the level of imports for industrial supplies. These are illustrated in Table 4.5 and are estimated to total $27 500 million in 1986-87. No data were available to the Bureau on the lead time inventories of imported goods normally cover, nor was it possible to estimate the degree to which improved reliability might reduce the level of inventories required. However, submissions to the ISC Waterfront Strategy Inquiry confirmed that inventory levels are maintained at higher than desirable levels in response to perceived poor waterfront reliability.

Manufacturers have a range of strategies available to them other than the maintenance of high inventory levels in response to poor waterfront reliability. Some manufacturers keep inventories below the level that would cover the longer periods of disruption. Instead they respond to import supply disruptions by rescheduling production or, if the disruption is particularly serious, by using air freight to transport critical components. Such measures add to total costs but would not be reflected in inventory costs.

Secondly, unreliability in transport systems can result in loss of markets. The current expansion of 'just-in-time' manufacturing requires reliability in the supply of inputs to each process. Contracts for the supply of inputs often specify a reliability requirement. Markets can be lost if expected unreliability in the transport system prevents these specifications from being met.

Furthermore, as indicated in Table 4.5, capital goods and parts account for 29 per cent of all imports or 40 per cent of total imports for industry. Disruption to the supply of such goods, and other critical imported inputs, could have an effect on costs through possible lost production, which far exceed the cost of the imported item. Other downstream industries might also suffer.

The costs of unreliability can be very high and these are costs which are not borne by the waterfront but by other sectors of the economy. There are very little data available to allow any estimate of what these costs might be. The Importer/Exporter Panel (1987) in its final report to the Inter-State Commission indicated that the cost of unreliability was at least as high as direct waterfront charges. However no data are available to make a realistic estimate of the benefit of improved reliability.

Ship operators

The introduction of containerisation and high capacity bulk terminals resulted in the development and use of large ships for much of Australia's international trade. The cost to operate these ships, including capital costs, can be of the order of $30 000 per day. Port turnaround times are therefore important for the owners of these ships.

Costs can be imposed on shipowners in two ways. First, inefficient operating practices can reduce waterfront productivity so that turnaround times are increased. Secondly, unpredictable delays due to industrial disputes, equipment breakdowns or unfavourable weather conditions can also result in reduced productivity.

Some idea of how ship turnaround time is affected is given in the Australia New Zealand Container Service (ANZECS) (1988) submission to the ISC Waterfront Strategy Inquiry. In its submission ANZECS provided some comparative productivity data for terminals in Australia and Europe used by its ships. Data for one of the Sydney terminals provided information on 59 ships over a 14-month period. Over that time the average time at berth for ANZECS ships was 76.9 hours. Average gross working time (that is time between first and last container lift on or off the ship was 59.8 hours. The average net working time taking into account various delays, such as strikes, was 34.6 hours.

According to ANZECS, its ships are actually worked for no more than 45 per cent of the time the ship is at the berth. However, net working time includes equipment failures, meal breaks and shift changeovers. The actual working time is therefore less than the net working time as defined by ANZECS.

The ANZECS submission includes productivity rates for several European and Australian terminals. Container lifts per hour of net working time were generally higher in Europe than in Australia. For example the best rate in Europe quoted by ANZECS was 42.4 lifts per net working hour at Zeebrugge. The best Australian terminal was the CTAL terminal in Sydney at 26.2 lifts per net working hour. The average number of cranes in use, was not indicated. Other Australian terminals all achieved less than 20 lifts per net working hour.

In another report, the Business Council of Australia (BCA) noted that preliminary data from a study by the International Cargo Handling Co-ordination Association (ICHCA) suggests that Australian container terminals are inefficient by world standards (BCA 1988).

The ICHCA survey indicates that Australia's major container terminals are half as productive as their European counterparts and 40 per cent as productive as many Asian ports. Container terminal productivity is measured in terms of the number of containers lifted on or off the vessel or restowed on the vessel per hour.

On the basis of the ICHCA data, the BCA estimates that raising the efficiency of Australian ports to European levels could result in direct cost savings in charges of $85 million, and indirect cost savings through better utilisation of another $40 to $85 million. Clearly there is scope for significant improvement in terminal productivity in Austrlaia.

Similarly, productivity improvement in bulk terminals can also reduce costs to shipowners. The Royal Commission into Grain Storage, Handling and Transport (1988, Supporting Paper 10) concluded that interruptions to shiploading added up to $1.20 per tonne to ship costs in ports where berth space is in relatively heavy demand. In other ports where capacity is more generously provided, the addition to ship costs is in the region of 20 cents per tonne.

Land transport operators

Truck queues at container terminals are the most obvious affect of indirect costs imposed on land transport. An analysis of truck queues at the CTAL terminal in Sydney by Robinson (1986) provides a good example of the extent of delays and indicates possible contributing factors.

The average queuing time for trucks delivering containers to the terminal during the study period in the day shift was 101 minutes and 116 minutes for trucks picking up containers. On 'bad' days, defined as when trucks queued for more than 90 minutes, the average queuing time increased to 140 and 152 minutes respectively.

In many ways it is not surprising that truck delays at container terminals have become a problem. One effect of containerisation has been the concentration of cargo at fewer berths and the consequential concentration of trucks to deliver and remove that cargo. Truck queues are not necessarily a sign of inefficiency; as an efficiently operated system is almost certain to have queues. The issue is what is the optimum size of queue. This would require an analysis of the trade off between queuing costs and the costs of reducing queue sizes.

Representative truck queuing costs for Sydney ports were estimated in a report prepared by a working party set up by the New South Wales Road Freight Transport Industry Council and the Cargo Facilitation Committee (1988). The working party estimated queuing costs to total $8.7 million in 1986. However, as noted earlier, it is unreasonable to expect queuing to be totally eliminated. The working party therefore estimated potential savings if average queuing time could be reduced to 30 minutes or 60 minutes. These savings were $5.8 million and $2.8 million per annum respectively.

The discussion in the chapter highlights the point made in Chapter 4 that the waterfront derives much of its importance through its linkages with other industries. The issues of reliability and general quality of service may have only a minor impact on direct waterfront costs and efficiency but can have major impacts on industries dependent on imports or exports.

APPENDIX I ESTIMATION OF TOTAL WATERFRONT CHARGES

This appendix briefly sets out the method used to estimate total waterfront charges. The estimation of 1985-86 charges is used as an example.

NON-BULK CARGO CHARGES

The following categories of cargo are assumed for the purposes of estimation:

- containerised cargo
  - overseas
    - : refrigerated
    - : FCL
    - : LCL
  - coastal
- non-containerised cargo
  - overseas
  - coastal.

An explicit assumption in this categorisation is that all coastal cargo is non-refrigerated and is transported in FCLs.

Unit prices

Unit prices assumed for overseas containerised cargo are those recorded in BTE Occasional Paper 80 (BTE 1986a) for 1984-85 increased by the known changes in the case of port-related charges. Unit prices for other sectors were increased in line with the Consumer Price Index (8.4 per cent) and rounded to the nearest $10. An additional $200 per TEU was allowed for refrigerated containers. Charges for coastal containers were assumed to be approximately 20 per cent lower than those charged for export containers.

BTE Occasional Paper 80 (BTE 1986a) included an estimate of $35 per tonne for stevedoring charges for non-containerised non-bulk cargo. To this charge, estimates are required for port related charges and charges for customs entries. It is assumed that these charges are $12 per tonne and $4 per tonne respectively. These assumed charges are consistent with charges per tonne for FCL cargo. The assumed charges are shown in Table I.1.

Refrigerated containers

The following Australian Transport Freight Commodity Classification (ATFCC) divisions were assumed to include all refrigerated cargo:

01 Meat and meat preparations (export only)
02 Dairy products and eggs
03 Fish, crustaceans and molluscs and preparations thereof
04 Fruit and vegetables, sugar cane.

The Bureau report on liner shipping (BTE 1986b) included estimates of the proportion of these commodities which were refrigerated and their stowage factors. The cubic capacity of a refrigerated container was assumed to be 26.84 cubic metres which is the capacity of an overseas refrigerated container used by ANL. Table I.2 summarises the calculations in the derivation of the number of import and export refrigerated containers.

TABLE I.1 ASSUMED UNIT COSTS FOR NON-BULK CARGO, 1985-86

	Unit costs	
Cargo type	*Loaded*	*Discharged*
Containerised cargo ($ per TEU)		
Refrigerated	620	730
FCL	420	530
LCL	1 250	1 400
Coastal	330	330
Non-containerised cargo ($ per tonne)		
Overseas	51	51
Coastal	47	47

Sources BTE (1986a). BTCE estimates.

TABLE I.2 CALCULATION OF THE NUMBER OF REFRIGERATED CONTAINERS, 1985-86

Commodity	*Stowage factor (m^3/t)*	*Container load (t/TEU)*	*Total quantity traded (tonnes)*	*Number of containers*
Discharged				
Dairy products and eggs	1.96	13.7	25 800	1 883
Fish, crustaceans and molluscs	1.52	17.7	38 700	2 192
Fruit and vegetables	2.34	11.5	43 400	3 784
Total			107 900	7 859
Loaded				
Meat and meat products	1.85	14.5	674 942	58 844
Dairy products and eggs	1.78	15.1	131 059	8 692
Fish, crustaceans and molluscs	1.96	13.7	31 813	2 323
Fruit and vegetables	1.92	14.0	297 415	21 276
Total			1 135 229	91 135

Sources ABS (1987h). BTE (1986b). BTCE estimates.

Number of containers

The DoTC publishes data on the gross weight of non-bulk cargo loaded and discharged in containers but does not publish the number of containers. The ABS publishes numbers of containers and their load in revenue tonnes (ABS 1987m). However there is a degree of under reporting of data for this publication so that the number of containers is not accurate. The following procedure was adopted to arrive at the total number of containers handled on the waterfront.

First, revenue tonnes were converted to gross tonnes by using data in ABS (1987m, Table 15, 16) for liner shipping services. This gave 1.63

revenue tonnes per gross tonne for inward cargo and 1.11 revenue tonnes per gross tonne for outward cargo.

Secondly, average loads per container were calculated using ABS data (ABS 1987m, Table 23). This gave containerised cargo in revenue tonnes. Converting this to gross tonnes gave average loads per TEU of 14.6 tonnes for cargo loaded and 11.5 tonnes for cargo discharged.

Coastal cargo containerised was assumed to have a load of 14.6 tonnes per TEU. Table I.3 summarises the estimation of the number of containers.

LCL containers

It was assumed that 10 per cent of non-refrigerated export containers were LCL and 15 per cent of non-refrigerated import containers were LCL.

Total non-bulk charges

The above information on numbers of containers and unit costs allows estimation of total charges for containerised cargo. Non-containerised non-bulk cargo statistics are published in DoT (1987b) and DoTC (1987b). Table I.4 summarises the calculations.

TABLE I.3 ESTIMATION OF NUMBER OF CONTAINERS, 1985-86

Type of cargo	*Total cargo ('000 tonnes)*	*Load per TEU (tonnes)*	*Number of containers*
Loaded			
Coastal	1 184	14.6	81 000
Overseas	6 190	14.6	424 000
Total	7 374	14.6	505 000
Discharged			
Coastal	1 705	14.6	117 000
Overseas	5 091	11.5	443 000
Total	6 796	12.1	560 000

Sources ABS (1987m). DoT (1987b). DoTC (1987b). BTCE estimates.

TABLE I.4 TOTAL NON-BULK WATERFRONT CHARGES, 1985-86

Cargo category	*Number*	*Unit cost ($)*	*Total cost ($m)*
Containerised cargo			
Discharged			
Refrigerated	8 000	730	6
FCL	370 000	530	196
LCL	65 000	1 400	91
Coastal	117 000	330	39
Total	560 000		332
Loaded			
Refrigerated	91 000	620	56
FCL	300 000	420	126
LCL	33 000	1 250	41
Coastal	81 000	330	27
Total	505 000		250
Non-containerised cargo			
Discharged			
Overseas	1 419 000	51	72
Coastal	2 204 000	47	104
Total	3 623 000		176
Loaded			
Overseas	3 420 000	51	174
Coastal	1 254 000	47	59
Total	4 674 000		233
Total			991

Source Tables I.1, I.2, I.3.

BULK CARGO CHARGES

The three major bulk commodities for which data were available are coal, iron ore and grain.

Coal

The data source used is BTCE Information Paper No 26 (BTCE 1988b). Waterfront charges for export coal comprise two parts. The first part consists of stockpiling and loading charges. These costs vary markedly between loading ports. A weighted average was estimated using the throughput of each port as weights. Table I.5 indicates the individual charges and throughputs used.

The weighted average is $2.96 per tonne. This was rounded to $3.00 per tonne. Port charges were estimated to average $1.80 per tonne (BTCE 1988b). Total waterfront charges are therefore estimated to have been $4.80 per tonne in 1985-86.

Iron ore

Charges as reported in BTCE (1988b) were assumed. They are $0.50 per tonne for storage and loading and $0.20 per tonne for port and related services.

Grain

Data from Volume 2 of the report of the Royal Commission into Grain Storage Handling and Transport were used to estimate waterfront costs for grain exports (Royal Commission into Grain Storage Handling and Transport, 1988).

A summary of grain handling costs at ports is given in Table I.6.

TABLE I.5 STOCKPILING AND LOADING CHARGES AND THROUGHPUTS OF MAJOR COAL PORTS, 1985-86

Port	*Stockpiling and loading charge ($)*	*Throughput ('000 t)*
Newcastle	4.98	26 210
Balmain	3.81	4 773
Port Kembla	5.08	8 104
Queensland	1.50[a]	50 798

a. This charge which applies to Gladstone was assumed to apply to all Queensland ports.

Source BTCE (1988b).

TABLE I.6 SUMMARY OF GRAIN HANDLING COSTS AT PORTS, 1985-86

Cost component	*Cost*
Labour ($ per t)	2.01
Fuel, light, power ($ per t)	0.27
Other ($/t)	0.66
Total	2.94
Repairs, maintenance ($/t capacity)	0.35
Depreciation ($/t capacity)	4.47
Interest ($/t capacity)	2.86
Total ($/t capacity)	7.68

Source Royal Commission into Grain Storage, Handling and Transport (1988, Supporting Paper 3).

The costs expressed in terms of dollars per tonne of capacity need to be expressed in terms of dollars per tonne of throughput. Port storage capacity in 1985-86 was 5.767 million tonnes (Royal Commission into Grain Storage, Handling and Transport 1988, Supporting Paper 3). In 1985 total grain exports were 20.6 million tonnes giving 3.6 tonnes of throughput for each tonne of capacity. Therefore capital costs and repairs and maintenance were equal to $2.13 per tonne.

Administration costs

An administration charge of $2.00 per tonne is also levied. It is assumed that the waterfront component of this is given by the ratio of port related storage and handling costs to total storage and handling costs.

The weighted average of total storage and handling costs (weighted by State grain production) is $14.86 per tonne. This gives an administrative charge for port storage and handling of $0.79 per tonne.

Total port storage and handling costs are therefore equal to $2.94 + $2.13 + $0.79 or $5.86 per tonne.

Port disbursements
These charges include Commonwealth light dues, survey fees, conservancy dues, berthage and tonnage rates, pilotage, towage, port improvement dues, mooring costs and gangway watch.

Calculations by the Royal Commission estimated these costs to be $1.05 per tonne for a 31 400 dwt ship and $0.78 per tonne for a 61 500 dwt ship. In 1985 62 per cent of Australian grain exports were in ships of less than 40 000 dwt and 38 per cent were in ships larger than 40 000 dwt (Fearnleys 1986). Using these percentages as weights gives an average cost of port disbursements of $0.95 per tonne.

Wharfage and stevedoring costs
Wharfage charges vary between States and ports. A weighted average value of $1.03 per tonne was estimated for 1985-86. The Royal Commission estimated stevedoring costs to be $0.58 per tonne.

Total waterfront costs for grain
Waterfront costs for grain are summarised in Table I.7.

Other bulk commodities

Total waterfront charges were assumed to be $4.60 per tonne for other bulk commodities exported and imported. This charge consists of $1.00 for port charges and $3.60 for port storage and handling. The $1.00

TABLE I.7 SUMMARY OF WATERFRONT COSTS FOR GRAIN, 1985-86

Cost component	*Cost ($ per tonne)*
Storage and handling	5.86
Port disbursements	0.95
Wharfage	1.03
Stevedoring	0.58
Total	8.42

Sources BTCE (1988b). BTCE estimates. Royal Commission into Grain Storage, Handling and Transport (1988).

for port charges is close to that estimated for grain and is also similar to port charges for coal when special harbour dues are omitted. The change of $3.60 for port storage and handling costs is the weighted mean of port storage and handling costs for coal and grain rounded up to the next ten cents.

Total waterfront costs for overseas trade in bulk commodities

These costs are summarised in Table I.8.

TABLE I.8 TOTAL WATERFRONT COSTS FOR OVERSEAS TRADE IN BULK COMMODITIES, 1985-86

Commodity	*Gross weight ('000 tonnes)*	*Unit cost ($/t)*	*Total costs ($m)*
Coal	90 407	4.8	434
Iron ore	85 864	0.7	60
Grain	21 432	8.4	180
Other	54 955	4.6	253
Total	252 658		927

Source BTCE (1988b). BTCE estimates.

Coastal bulk

There is a substantial movement of bulk cargo around the coast. No data were available on the costs of the individual commodities except for iron ore. For iron ore it was assumed that waterfront costs for the loading port were the same as for exports ($0.70 per tonne) and that unloading costs were more expensive at $1.30 per tonne. Waterfront costs for other commodities were assumed to be more expensive than for iron ore and are detailed in Table I.9 together with total cargo costs.

TOTAL WATERFRONT COSTS

Total waterfront costs are summarised in Table I.10.

TABLE I.9 SUMMARY OF WATERFRONT COSTS FOR COASTAL MOVEMENTS OF BULK COMMODITIES, 1985-86

Commodity	*Gross tonnes ('000 tonnes)*	*Unit cost ($/t)*	*Total costs ($m)*
Iron ore	7 600	2.0	15
Bauxite/alumina	6 600	5.0	33
Petroleum oil	11 400	5.0	57
Petroleum products	6 200	5.0	31
Other	9 500	7.8	74
Total	41 300		210

Sources DoTC (1987b). BTCE estimates.

TABLE I.10 SUMMARY OF TOTAL WATERFRONT CHARGES, 1985-86

Cargo type	*Cost ($m)*
Non-bulk	
Containerised	582
Non-containerised	409
Bulk	
Overseas	927
Coastal	210
Total	2 128

Source BTCE estimates.

APPENDIX II TRADE EFFECTS OF REDUCED WATERFRONT COSTS

This appendix considers the effect of a reduction in waterfront costs. It first considers the distribution of benefits between Australia and our trading partners and then considers the effect on trade.

DISTRIBUTION OF BENEFITS

Apart from possible trade effects there is also the direct benefit of the reduction in costs on existing trade. A change in shore-based costs will be reflected in a change in fob or cif prices or changes in both. If the fob price remains unchanged following the reduction in shore-based costs then all the benefits will accrue to the importing country. Conversely if the cif price remains unaffected then the exporting country gains all the benefits. Usually both prices will adjust and the incidence of the benefits will be distributed between importer and exporter. Cassidy (1981) using the elasticities shown in Table I.1 estimated that the incidence of freight costs on Australian exporters was in the range 60 to 80 per cent and for Australian importers was 80 to 90 per cent. This implies that Australian exporters and importers would gain the major proportion of the benefits of any reduction in waterfront costs.

EFFECT ON TRADE VOLUMES

The effect of reduced waterfront costs on the level of trade can be explored through a formula provided by Bennathan and Walters (1969) to calculate the elasticity of demand for transport. The formula is

$$Et = \frac{fEs\ Ed}{Es - (1-f)Ed}$$

where Et = Elasticity of demand for transport
Es = Elasticity of supply of the commodity in the exporting country
Ed = Elasticity of demand for the commodity in the importing country
f = fraction of final commodity price spent on transport

An equivalent formula can be used to calculate the elasticity of demand for waterfront services. Because the demand for waterfront services is a derived demand the elasticity provided by the formula is also the elasticity of demand for the traded good with respect to the price of waterfront services.

The elasticities used in the following analysis are those reported by Cassidy (1981) and are reproduced in Table II.1. They are broadly consistant with more recent estimates used in the Treasury's forecasting model (Coppel, Simes & Horn 1988).

In Chapter 5 it was estimated that in 1985-86 waterfront costs represented 2.6 per cent of the value of non-bulk exports and 1.7 per cent of the value of non-bulk imports. Using these percentages and the elasticities in Table II.1 gives an elasticity of demand for Australian exports of less than -0.02 and for Australian imports of less than -0.015. For all practical purposes there would be negligible effects on trade on non-bulk commodities due to direct effects of feasible reductions in waterfront costs.

A similar approach to the above can be adopted for the export of grains. Wheat is the dominant grain exported and for this reason elasticities derived for wheat are used as proxies for all grain exports. Estimated elasticities of supply of and demand for Australian wheat are given in the report on Trans-Tasman shipping prepared by the BTE and the New Zealand Ministry of Transport (BTE and Ministry of Transport, New Zealand 1987, Appendix XIV). These give an estimated range for the elasticity of demand for Australian wheat from -4.7 to perfectly elastic. This assumption is also made for this analysis. Elasticity of supply for the total market (domestic plus exports) derived from several sources covered the range 0.85 to 1.47. The elasticity of export supply is usually larger than the elasticity of aggregate supply. For this reason a range of 1.0 to 2.0 was chosen for the elasticity of export supply of wheat.

Using these elasticities and the data in Table 5.5 allows estimation of the elasticity of demand for wheat exports with respect to waterfront costs. This elasticity is estimated to be in the range -0.04 to -0.1. Again the trade response to reduced waterfront costs is small although larger than for non-bulk exports.

For bulk minerals the use of elasticities is not particularly useful. Trade in minerals is characterised by few sellers and few buyers and is often conducted on the basis of long-term bilateral agreements.

TABLE II.1 ELASTICITIES OF SUPPLY AND DEMAND IN AUSTRALIAN TRADE

	Elasticity of	
Direction of trade	*Demand*	*Supply*
Exports	-1.7 to -2.7	0.8 to 1.0
Imports	-0.5 to -1.0	4.0 to 6.0

Source Cassidy (1981).

The effect of reduced waterfront costs on mineral prices and quantities would depend on contractual arrangements, relative bargaining strength and other factors (Smith 1980).

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Abbreviations

ABS Australian Bureau of Statistics
AGPS Australian Government Publishing Service
BTCE Bureau of Transport and Communications Economics
BTE Bureau of Transport Economics
DoT Department of Transport
DoTC Department of Transport and Communications
ISC Inter-State Commission

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ABBREVIATIONS

AAPMA	Association of Australian Port Marine Authorities
ABS	Australian Bureau of Statistics
ANL	Australian National Line
ANZECS	Australia New Zealand Container Services
ASIC	Australian Standard Industry Classification
ATFCC	Australian transport freight commodity classification
BTCE	Bureau of Transport and Communications Economics
BTE	Bureau of Transport Economics
dwt	deadweight tonnes
cif	cost insurance freight
DoT	Department of Transport
DoTC	Department of Transport and Communications
FCL	Full container load
fob	free on board
GDP	Gross domestic product
IOCC	Input Output Commodity Classification
ISC	Inter-state Commission
LCL	Less than container load
MSB	Maritime Services Board
TEU	Twenty-foot equivalent unit
WWF	Waterside Workers' Federation