# BTE Publication Summary

## **The Pricing of Port Services**

## **Occasional Paper**

This paper examines price setting policies and practices of port authorities in Australia. It provides a description of the port industry and an overview of pricing practices, then assesses these practices against various criteria, notably financial balance, economic efficiency and equity. Areas in which an improved outcome might result from the application of economic principles are identified.







Occasional Paper 97

# THE PRICING OF PORT SERVICES

DEPARTMENT OF TRANSPORT & COMMUNICATIONS

bureau of transport and communications economics

AUSTRALIAN GOVERNMENT PUBLISHING SERVICE, CANBERRA

C Commonwealth of Australia 1989 ISSN 1032-0539 ISBN 0644 10258 6

This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without written permission from the Director Publishing and Marketing, AGPS. Inquiries should be directed to the Manager, AGPS Press, Australian Government Publishing Service, GPO Box 84, Canberra, ACT 2601.

Printed in Australia by R. D. RUBIE, Commonwealth Government Printer, Canberra

## ABSTRACT

Pricing of the services provided by port authorities is an important element of the operation of the waterfront. The decisions of port authorities have implications for the operational efficiency of the ports, for the operations of stevedores, towage operators, and other providers of services within ports, and for investments in ships, as well as in port facilities.

This paper examines price setting policies and practices of port authorities in Australia. It provides a description of the port industry and an overview of pricing practices, then assesses these practices against various criteria, notably financial balance, economic efficiency and equity. Areas in which an improved outcome might result from the application of economic principles are identified.

Current pricing practices rely heavily on general charges on cargo and price changes often involve general increases to existing pricing structures. This paper proposes basing port prices on the costs of efficiently providing the various services to port users. Individual services would be costed, with realistic allowances included for an appropriate rate of return on capital reflecting the 'opportunity costs' of occupying space and facilities.

This may lead to a redistribution of the initial burden of port charges. However, because port users can be expected to adjust their own prices, most groups of users may not experience significant changes in the share of port costs they bear. The major effects of a reform of port authority pricing are likely to be on the port authorities themselves. Cost based pricing will require the information needed to make better decisions about particular services and facilities to pursue the efficient operation of the waterfront.

## FOREWORD

This paper presents the findings of a Bureau of Transport and Communications Economics study of the price setting practices of Australian port authorities. The paper assesses these pricing practices against various criteria, principally economic efficiency and equity. It identifies various areas where a better outcome, for port users and for the port authorities themselves, could be achieved by changes proposed in the report.

A study team led by Mr Neil Gentle prepared the paper. Members of the team were Mr Ian Bickerdyke, Mr Matthew James and Mr Neil Kelso.

During the course of the study many individuals and organisations provided information on port authority pricing. I would like to thank those representatives of port authorities, port users, industry associations and government departments for their valuable assistance.

> M. R. CRONIN Research Manager

Bureau of Transport and Communications Economics Canberra October 1989

		Page
ABSTRACT		111
FOREWORD		v
SUMMARY		xiii
CHAPTER 1	INTRODUCTION	1
	Background	1
	Scope of the paper	3
CHAPTER 2	INDUSTRY DESCRIPTION	5
	Port authorities	5
	Users of port authority services	14
	Bargaining power of port authorities	17
	Cost structures	21
CHAPTER 3	PRICING PRACTICES	23
	Price setting	23
	Price comparison	24
	International comparison	40
	Trends in port prices	42
CHAPTER 4	ASSESSMENT OF PRICING POLICIES	45
	Financial performance	45
	Economic efficiency	52
	Equity	62
	Other objectives of pricing policies	63
CHAPTER 5	DIRECTIONS FOR CHANGE IN PORT PRICING	
	PRACTICES	65
	Directions for change	65
	Impacts of change	81
	The pace of change	87
CHAPTER 6	CONCLUSION	89

		Page
APPENDIX I	PORT CHARGE NOMENCLATURE AND REVISED	
	PORT TARIFF STRUCTURE	93
	Existing price structures	93
	Development of new price structures	95
APPENDIX II	ASSET VALUATION AND PORT PRICING	101
	Asset valuation and depreciation	101
	Rate of return	106
	Assets requiring large increments to	
	capacity	107
	Investment mistakes	108
APPENDIX III	COST STRUCTURES	109
REFERENCES		115
ABBREVIATIONS		121

- -

ABBREVIATIONS

## TABLES

		Page
2.1	Types of port administration and basic statistics, 1986-87	6
2.2	Port authority responsibilities	12
2.3	Cost structures for ship and navigation infrastructure and cargo transfer infrastructure	22
3.1	Comparison between major ports of common ship based charges, 1988	26
3.2	Comparison between major ports of common cargo based charges, 1988	28
3.3	Estimated 1986 port charges for a 30 000 GRT vessel loading grain	34
3.4	Estimated 1986 port charges for a 25 000 GRT container vessel	36
3.5	Estimated 1986 port charges for a 60 000 GRT vessel loading coal	37
3.6	Estimated 1986 port charges for a 20 000 GRT vessel unloading phosphate	38
3.7	International port characteristics and prices, 1986	41
3.8	International port prices	42
3.9	Historic main charges for selected ports	43
4.1	Financial targets and dividend requirements of major Australian port authorities, 1988–89	46
4.2	Financial performance of selected port authorities, 1986–87	49
		ix

		Page	
4.3	Rate of return for selected port authorities on a historical cost basis, 1986-87	50	
4.4	Sources of revenue for selected port authorities, 1986-87	56	
5.1	Estimated real pre-tax rates of return on total assets in the Australian corporate sector	75	
5.2	The proposed Maritime Services Board of NSW pricing structure	80	,
I.1	Model tariff structure	97	
II.1	Guidance on revaluation methods for assets of government business enterprises	103	
11.2	Port of Melbourne Authority: major balance sheet items at 30 June 1988 in historical cost and current cost accounting terms	104	
11.3	Port of Melbourne Authority: difference between historical and revalued cost of non-current, non- monetary assets	105	
11.4	Port of Melbourne Authority: rate of return in historical cost terms and current cost accounting terms, 1987-88	106	
III.1	Expenditure per port authority employee, 1987-88	110	
111.2	Cost structure for ship and navigation infrastructure and cargo transfer infrastructure	112	

х. Х

## FIGURES

		Page
3.1	Variations in wharfage charges for selected bulk commodities, 1988	31
5.1	The effect of the proposed Port of Melbourne Authority charges on the least cost choice of moving containers	
	through Adelaide or Melbourne	83

## SUMMARY

Micro-economic reform of government business enterprises is a current concern of Commonwealth and State governments. Pricing is a important issue in this process. Proper pricing gives management the correct signals to set economically efficient levels of output and service quality.

In 1986-87 Australian port authorities had revenue of \$758 million, employed approximately 8500 people (or about a third of the estimated total waterfront labour force), and paid \$224 million in salaries and wages. Port authorities also have considerable influence over waterfront development and operations in the private sector. As owners of waterfront land and the port aquatory, they control the provision of facilities and specify operating conditions. The Inter-State Commission regards the efficiency of port authority services as being as important to waterfront reform as the reform of stevedoring operations.

Port authority charges generally fall into two broad categories: charges on ships and charges on cargo. Charges on ships are generally based on ship size - either tonnage or length - per unit of time. They may be levied for the use of nautical facilities in the approaches to a port, for the use of facilities within a port, or for berth hire, under a wide variety of names. In Australia, charges on cargoes are principally wharfage charges per tonne, usually at higher rates for higher value commodities, or per container, varying with the size and type.

Most Australian port authorities operate in near-monopoly positions for both institutional and geographic reasons. Most imports are destined for our major cities which are also our major ports. Many of our non-bulk exports originate from or are directed through these same port cities by State oriented rail and road networks. Centralised control and lack of port autonomy in some States also hinders interport competition.

Lack of competition has allowed port authorities to retain their traditional pricing structures in the face of changing circumstances. Current port prices often appear to bear little relation to the costs of providing facilities and services. This has adverse implications for both the efficiency of allocation of resources and the technical efficiency of the port industry.

Australian port authorities rely more heavily than many overseas ports on cargo charges. Wharfage and other charges on cargo transfer are estimated by the Inter-State Commission to yield 43 per cent of port authority revenue overall. Bureau analysis suggests that services to cargoes give rise to a much smaller percentage of port authority expenses, which are largely fixed costs. The marginal costs of cargo transfer are, to the port authority, practically zero. Wharfage charges are essentially a tax on cargo throughput.

A more efficient allocation of resources could be achieved, within ports, between different ports, and between ports and the rest of the economy, if the demands for particular services and facilities were met at prices related to the opportunity costs of providing them: that is, to the value, in alternative uses, of the resources involved in providing the services and facilities. Reform of port authority pricing structures to more closely reflect opportunity costs would imply the use of rentals, rather than a combination of rentals and wharfage, to recover the costs to the port authority of the provision of leased facilities and berths and their associated storage areas.

Shippers have welcomed the significant proposed reductions in wharfage charges by the Maritime Services Board and the Port of Melbourne Authority. However, the idea that shippers as a whole would benefit is possibly misplaced. Market forces will determine the final incidence of the burden of port charges. Vessel operators have stated, as one would expect, that they will pass on to shippers the proposed increases in ship related charges. Most shippers may notice little difference in their overall freight and port costs, but shippers using privately owned facilities who previously paid wharfage charges to the port authority would be better off, although rentals for leased port land would be expected to increase with more realistic asset valuations.

More appropriate port prices would affect levels of demand for particular services and facilities within ports and between ports. Port users' choices would then give the port authority more accurate signals as to the type of facilities and equipment to provide. Cost based pricing, together with more realistic asset valuations, would provide a better basis for investment decisions and asset management.

#### Summary

Vessel operators can be expected to more actively seek ways to reduce their costs in ports by selecting the most cost-effective facilities and, in the longer term, ship technology. Vessel operators may also have to reassess their most profitable pattern of port calls, especially for ships with relatively small volumes of cargo to transfer. By increasing the costs of a port visit relative to land transport costs, reformed pricing may make cargo centralisation marginally more attractive.

More appropriate pricing structures would also help promote higher utilisation and higher productivity of existing berths and terminals, which may reduce the need for spending on additional port infrastructure. Elimination of wharfage and reliance on rentals to recover the port authorities' cargo related costs would greatly increase the incentive for stevedores to increase throughput and to make efficiency enhancing investments.

The use of shorter term leases for stevedores has been suggested as a way to promote competition and efficiency. However, it is the exclusivity granted by leases which confers market power, rather than the length of the lease. Also, if only short term leases were available, this would not encourage efficiency enhancing investment by the stevedores.

Bigger ships and changes in ship and cargo handling technology have made some existing berths obsolete. Prices for inner city waterfront land have soared in our major capital cities. Redevelopment of redundant port land is thus a major issue. Pricing which recognises the market value of assets in alternative uses would assist a port authority to rationalise its asset base.

Objections to current port pricing practices are frequently based on the grounds of alleged large scale cross-subsidisation. Shippers have felt strongly that they have been bearing an unfair share of port costs. For example, the Maritime Services Board of NSW has conceded that there are some areas where it provides no service in return for wharfage revenues. Instances are the wharfage charges on coal, petroleum products and steel products at berths owned or leased by private firms. It seems unlikely that any one group of commercial users is 'cross-subsidising' any other group such that some charges fall below the incremental cost of providing services and facilities to users. However, discriminatory pricing on both ships and cargoes is commonly used to achieve financial balance.

Shippers of coal have complained of the use of profit from Newcastle to make up shortfalls from general cargo handling in Sydney. Adoption

of prices based on costs of providing particular services would seem to imply an end to the practice of uniform pricing for ports controlled by a single administration. This would enhance the potential for competition between ports and, where the ports are subject to commercial discipline, the potential for efficiency gains.

In overall terms, however, reformed pricing practices may not generally alter the near-monopoly positions in which most ports operate. Pressure by governments on port authorities to reduce costs and improve efficiency will be required.

Port pricing requires renewed scrutiny in the context of the Commonwealth government's waterfront strategy. The sea-land interface is a vital link in the national transport system, and improving its efficiency is an essential element of micro-economic reform.

## CHAPTER 1 INTRODUCTION

## BACKGROUND

Most Australian port authorities were established early in the twentieth century. However, many of their pricing structures had their origins much earlier than this. The stability of their pricing systems over such a lengthy period of time is to a large extent due to the near-monopoly position in which most Australian port authorities operate.

As well, ship and cargo handling technology experienced only gradual change up to the 1960s. In contrast, the 1960s was a period of rapid technological change. The development of container technology revolutionised the transport of non-bulk cargo, and the improvement of bulk handling equipment resulted in similarly dramatic changes in the transport of many primary products. The need for major investments in port infrastructure to accommodate these developments was a primary focus of attention by port authorities and port users in the 1960s and 1970s.

Technological changes resulted in structural changes in the operations The development of specialisation in ships had of ports. its the specialisation port facilities. The counterpart in of opportunities for intra-port competition were reduced. The new technology was characterised by a high level of capital investment so that the ratio of fixed to variable costs increased (Arnold 1985).

Pricing was not a major issue during this period. An expansion in capacity and the investments in infrastructure in response to the new technology could be paid for from revenue expected from increased trade, and the existing pricing system was able to satisfy these requirements. In addition geographic and institutional factors inhibited competition between ports so that there were, and still are, only limited market pressures on port authority pricing systems.

The Committee for Economic Development of Australia (CEDA) published an appraisal of port administration in 1977 which criticised some port

1

authority pricing practices (Cumming 1977). The report concentrated on effects Australian the economic ٥f ports having different administrative structures operating under different financial constraints and with differing funding arrangements. The report also highlighted some then existing (or newly resolved) pricing problems such as the selective exemption, wholly or partly, of certain cargoes from wharfage charges in some ports. The report did not comprehensively analyse port pricing issues.

During the 1980s the pace of new investment has declined. Port authorities have changed from organisations concerned with developing infrastructure to ones more concerned with managing existing assets. Port authority pricing has come under increased scrutiny as port users have operated in an increasingly competitive environment.

Port users have presented their views to the Inter-State Commission in its Waterfront Strategy Inquiry. They have expressed concern about the level of charges and also about the extent of cross-subsidisation, especially the subsidising of non-commercial operations of ports from revenue obtained from commercial users. Shippers are concerned about the proportion of revenue derived from cargo rather than from ships.

Port authorities have become aware of the need for pricing reform. Circumstances require a greater emphasis on management of assets, better evaluation of new investments, and increased responsiveness to the needs of users. All of these have impacts on pricing and are in turn affected by an authority's pricing policies. Some port authorities have pricing reviews in progress, notably the New South Wales Maritime Services Board and the Port of Melbourne Authority.

Governments are generally taking a greater interest in the financial performance of their business undertakings. The trend is to encourage government business enterprises to become more commercial. Rate of return targets have been set by some governments to provide incentive for assets to be used efficiently. Port authorities are major business undertakings of State governments and, as such, are finding it necessary to examine their pricing policies.

The Federal government has a national perspective and sees the ports as having an important role in facilitating trade. The establishment of the Waterfront Strategy Inquiry by the Inter-State Commission and the establishment of the Waterfront Industry Reform Authority in response to the Inter-State Commission report are part of the Federal government's approach to improving waterfront efficiency. Port authorities are now seen as having a major role in the promotion of efficiency in Australian ports. Port authorities, as well as other

2

Chapter 1

participants in the waterfront industry, have opportunities to improve their own operations. Pricing policies interact with other port authority operations and are a means by which State governments can pursue improved efficiency in port authority administration.

Attaching such importance to pricing and the commercial role of port authorities is not confined to Australia. Grosdidier de Matons (1986, 260) in discussing the World Bank's approach to the appraisal of port projects commented that 'the port authority's public service duties are best fulfilled by maximising the economic use of its resources for the benefit of the community as a whole, particularly through proper pricing'.

## SCOPE OF THE PAPER

Pricing policies require renewed scrutiny in the context of microeconomic reform, with particular emphasis on the ways in which pricing can assist in the improvement of efficiency of port services and facilities, and in the management of assets.

This paper contributes to this process by providing an overview of Australian port authority pricing policies and practices. The paper examines the markets in which port authorities operate and discusses current pricing practices. It explores the objectives of pricing policies and puts forward pricing principles that are consistent with these objectives. The paper examines the implications of pricing reform for industry participants, but does not predict the level of prices following a reform of current policies.

Some Commonwealth government charges on ships such as Commonwealth light dues and fees for ship surveys are paid when a ship enters port. These charges are independent of port authority pricing practices and are therefore beyond the scope of this paper. However, the level of these charges is indicated where this seems appropriate.

Chapter 2 describes the industry and its institutional arrangements. Current pricing practices are considered in chapter 3 which gives examples of total port charges for various ship sizes and cargo types. Chapter 4 discusses the objectives of pricing policy and assesses current pricing practices in terms of these objectives, and in terms of the implications for participants in the port industry. Chapter 5 discusses principles for pricing that would achieve the objectives set out in chapter 4. It also addresses the implications of proposed pricing reforms for industry participants. Chapter 6 concludes the report with a brief overview of the possible effects of a reform of port authority pricing.

## CHAPTER 2 INDUSTRY DESCRIPTION

Port authority pricing is strongly influenced by the structure of the waterfront industry and the bargaining powers of the industry participants. The major participants as far as port authority pricing is concerned are the port authority as provider of the services, vessel operators, stevedores and cargo owners as consumers of the services, and State governments who provide the legislative framework within which port authorities operate.

This chapter describes the port authority's role in the waterfront industry and the implications of the industry structure for port authority pricing. The first part of the chapter describes the various administrative arrangements and the services provided by port authorities. In the second part of the chapter, the demand for port authority services is discussed. Various sub-sectors involving the different user groups are identified and described. The third part of the chapter draws on the earlier section in a discussion of the market power of the port authorities. Finally, the implications for port authority pricing of the issues raised in the chapter are discussed.

## PORT AUTHORITIES

Waterfront activities were estimated to have cost users \$2314 million in 1986-87 (BTCE 1988a). Port authority revenue is shown in table 2.1 to have totalled \$758 million in the same year. This total includes income from investments and the provision of other services not directly related to the servicing of ships or cargo. Port authorities employed approximately 8500 people or 33 per cent of the estimated total waterfront labour force of 26 000. These port authority employees earned an estimated \$224 million (BTCE 1988a).

The importance of port authorities to the waterfront is greater than the financial and employment numbers suggest. As owners of the property rights over the port aquatory – areas of water, and the water column and bottom beneath (Goss 1987, 14) – port authorities have considerable influence over port development and operations. They exercise this influence through decisions on the type and location of

			Cargo t ('00	onnage O t)			
Administrative body	Port		In	Out	Number of employees	Revent (\$'000	enue 200)
New South Wales				·			_
Maritime Services Board	Port Jackson	6	824	6 898	3 249 <sup>a</sup>	300 03	32 <sup>a</sup>
	Botany Bay	6	840	2 039			
	Bass Point		0	241			
	Catherine Hill Bay		0	1 201			
	Newcastle	6	001	32 831			
	Port Kembla	5	999	11 861			
and the second	Trial Bay	· . · ·	203	-0			
1. A second sec second second sec	Twofold Bay		79	795			
Victoria							
Port of Melbourne Authority	Melbourne	5	277	4 753	1 521 <sup>a</sup>	105 20	07 <sup>a</sup>
	Westernport		504	13 335			
· · · · ·	Welshpool		10	159			
Port of Geelong Authority	Geelong	2	312	3 845	184	19 22	25 <sup>b</sup>
Port of Portland Authority	Portland	-	524	1 483	98	786	6 <b>6</b>
Queensland							
Port of Brisbane Authority	Brisbane	6	063	7 157	285	41 83	34
Bundaberg Harbour Board	Bundaberg		109	519	24	1 84	46
Cairns Port Authority	Cairns		456	433	53 <sup>C</sup>	3 51	11
Gladstone Port Authority	Gladstone	8	004	18 644	254	48 81	17

,

6

BTCE Occasional Paper 97

		Cargo t ('00	onnage O t)		
Administrative body	Port	In	Out	Number of employees	Revenue (\$'000)
Queensland (Cont.)	····				
Mackay Port Authority	Mackay	415	1 181	59	3 537
Rockhampton Port Authority	Rockhampton	110	205	8	500
Townsville Port Authority	Townsville	686	1 593	83	6 796
Department of Harbours and Marine	Abbot Point	0	5 720	508 <sup>a</sup>	64 402 <sup>a</sup>
•	Cape Flattery	0	713		
	Hay Point	0	32 553		
	Lucinda	6	396		
	Mourilyan	0	382		
	Weipa	67	8 976		
Western Australia					
Fremantle Port Authority	Fremantle	5 666	8 775	582	42 688
Albany Port Authority	Albany	197	987	25	2 839
Bunbury Port Authority	Bunbury	608	4 319	31	7 720
Esperance Port Authority	Esperance	186	530	17	2 428
Geraldton Port Authority	Geraldton	296	1 744	33	4 459
Port Hedland Port Authority	Port Hedland	267	37 164	31_	7 139
Department of Marine and Harbours	Broome	62	72	305 <sup>a</sup>	12 401 <sup>a</sup>
•	Carnarvon	0	1 207		
	Dampier <sup>d</sup>	141	35 284		

## TABLE 2.1 (Cont.) TYPES OF PORT ADMINISTRATION AND BASIC STATISTICS, 1986-87

 $\checkmark$ 

.

		Cargo t ('00	onnage O t)		
Administrative body	Port	In (		Number of employees	Revenue (\$'000)
Western Australia (Cont.)					
	Port Walcott	31	11 620		•
Private	Barrow Island	0	823	na	na
	Yampi Sound	24	3 705	na	na
South Australia					
Department of Marine and Harbors	Adelaide	2 312	1 856	747 <sup>a</sup>	40 565
	Klein Point	0	791		
	Port Bonython	0	2 022		
	Port Giles	0	230		
-	Port Lincoln	193	1 136		
	Port Pirie	135	822		
	Thevenard	0	1 468		
	Wallaroo	39	486		
Private	Ardrossan	0	1 044	na	na
	Port Stanvac	2 349	840	na	na
	Rapid Bay	0	309	na	na
	Whyalla	1 593	1 088	na	na

## TABLE 2.1 (Cont.) TYPES OF PORT ADMINISTRATION AND BASIC STATISTICS, 1986-87

ω

		Cargo 1 ('00	tonnage DO t)			
Administrative body	Port	In	Out		Number of employees	Revenue (\$'000)
Tasmania						
Marine Board of Hobart	Hobart	1 070	1	566	118	7 397
Burnie Port Authority	Burnie	556		923	60 <sup>C</sup>	6 888
Port of Devonport Authority	Devonport	422		459	66 <sup>C</sup>	5 834
Port of Launceston Authority	Launceston	1 713	3	092	84	10 002
Marine Board of Circular Head	Port Latta	34	1	992	na	na
Northern Territory						
Darwin Port Authority	Darwin	642		101	80	4 888
Private	Gove	735	2	832	na	na
	Groote Eylandt	32	1	497	na	na
Total		69 792	288	697	8 505	758 791

TABLE 2.1 (Cont.) TYPES OF PORT ADMINISTRATION AND BASIC STATISTICS, 1986-87

a. Annual reports do not disaggregate employee numbers or revenue among the individual ports.

b. Estimated from revenue for 18-month period ended 30 June 1987.

c. Excludes airport employees.

d. Administration of Dampier was transferred on 1 March 1989 to the Dampier Port Authority which was established on the same date under the Dampier Port Authority Act. na Not available.

*Sources* Department of Transport and Communications (1988); Association of Australian Port and Marine Authorities (1988); Port authority anual reports; pers.comm.

9

facilities to be provided and through specification of the conditions under which facilities are to be operated. The importance of this role has become more apparent over the last two decades with the development of more capital-intensive cargo handling technology.

## Port administration

The administration of Australian ports rests with a number of authorities, generally under the overall responsibility of State governments. There are three basic administrative forms for the control of ports:

- . State government departments
- . statutory authorities set up under State legislation
- private enterprise

All public ports in New South Wales and South Australia are controlled by a single. State-wide body. In New South Wales it is the Maritime Services Board, a statutory authority, which administers the ports, whereas in South Australia all public ports are administered by the Department of Marine and Harbors. In Queensland and Western Australia government departments administer the minor ports and in Victoria the Port of Melbourne Authority exercises this responsibility; in all three States the major port is administered by an independent statutory authority. In addition in Queensland and Western Australia some ports with large export volumes of one or two commodities are administered by government departments (for example Hay Point in Queensland and Dampier in Western Australia). In Tasmania all the major ports are under the control of independent statutory authorities.

Both forms of administration of public ports have their merits in terms of the requirements of the various States. Administrative arrangements under which a single organisation controls several ports allow coordination of investment decisions. Having independent bodies controlling each port has the advantage that an element of competition may be encouraged in the interests of port users. In his recent report to the New South Wales government Joy (1988) concluded that the ability to coordinate investment decisions by the Maritime Services Board outweighed any advantages that miqht arise from the establishment of independent authorities in the State.

Table 2.1 lists Australian commercial ports which loaded or discharged more than 100 000 tonnes in 1986-87 and their administrative bodies, together with some statistics showing the relative sizes of the various ports in terms of cargo tonnages handled, numbers of employees and revenue earned.

Chapter 2

Privately owned ports have been developed to meet the needs of a particular trade, generally bulk commodities such as bauxite, petroleum and other minerals. They are usually the subject of special State legislation which sets out the conditions for the lease of the site and the companies' operations.

This report is only concerned with the pricing of services at public ports. Privately owned ports, of which currently there are eight around Australia, are operated for the benefit of the companies involved. The sellers and users of the port services are usually one and the same.

## Services and resources provided by port authorities

In the widest sense, the main service provided by a port authority is the overall control and administration of port facilities and equipment involved in the loading and discharge of cargo. This embraces a wide range of responsibilities for the provision of particular services to port users. Table 2.2 sets out the range of responsibilities involved in the operation of a port and indicates those undertaken by the various Australian port administrative bodies. While there are some services undertaken by all the port authorities, regardless of type of administration, others are only undertaken by some of the authorities.

Port authorities are involved in the planning, administration and maintenance of wharves, buildings and other port facilities, the levying and collection of port charges, the provision of supplies to vessels, cargo handling (generally only the provision of cargo handling equipment), berth allocation, dredging, and towage services (not shown in table 2.2). Only one Australian port authority, the Port of Portland Authority, provides towage services.

Responsibility for the control of a port's navigable waters, encompassing provision and maintenance of navigation aids, control of marine safety and the provision of pilotage, may be the sole responsibility of a port authority or may be shared with a State government department. The regulation of intrastate vessels and navigable waters outside port precincts is often the responsibility of a State government department.

Commonwealth government responsibilities with respect to ports include customs, immigration, quarantine, and the regulation of interstate and overseas vessels. Industrial relations in areas such as stevedoring, and the quality control of exports of primary produce, are also the province of the Commonwealth government.

## TABLE 2.2 PORT AUTHORITY RESPONSIBILITIES

	NSW Vic.		Qld			WA			SA	Tas.		NT		
Responsibilities	MSR		PA		PBA	PA	DHM	FPA	PA	DMH	DMH	PA& MB	NSA	DPA
Planning and provision of wharves,														
buildings and other port facilities	X	х	Х		X	х	Х	х	х	Х	Х	х		X
Maintenance of wharves, buildings and		•												
other port facilities	X	Х	х		х	х	Х	х	х	х	х	х		х
Control and administration of wharves,														
buildings and other port facilities	х	. X	х		X	х	х	х	х	х	х	х		х
Cargo handling	-							- X						
Provision of supplies, moorings and so on								·						
for shipping in port	х	Х	х		X	. <b>X</b>	х	X	х	х	х	х		х
Berth allocation	х	х	х		х	х	х	х	х	х	х	х		х
Dredging of channels	х	х	х		х	х	х	х	х		х	х		х
Provision of facilities for, or control														
of, non-commercial craft and other														
non-commercial activities	х	х	х		х	х	х			х	х	х		х
Levying and collecting port rates and														
other charges	Х	Х	х		х	х	х	x	х	х	х	х		х
Control and management of navigable											-			
waters, including pilotage, navigation														
aids and other aspects of maritime safety														
Within port	х	Х	х					х	х	х	х	х		х
State-wide	х	х					х			х	х		х	х

BTCE Occasional Paper 97

12

## TABLE 2.2 (Cont.) PORT AUTHORITY RESPONSIBILITIES

		NSW		Vic.			Q1d			₩A		SA	Τá	15.	NT
Responsibilities		MSB	PMA PA MBV		PBA	PBA PA DHM		FPA PA DMH		DMH	PA& MB	NSA	DPA		
Regulat intrast port pr Provisi service	tion of manning and survey of tate vessels operating outside recincts on of consultancy and advisory es to government and others	x	x		x			×			x	x x		x	
DHM DMH DPA FPA MSB MBV NSA PA PA&MB PBA PBA	Department of Harbours and Marine Department of Marine and Harbors Darwin Port Authority Fremantle Port Authority Maritime Services Board of NSW Marine Board of Victoria Navigation and Survey Authority Port authorities Port authorities and marine board Port of Brisbane Authority	(inclu (SA), E	uding Depart	Harbo nent	urs C of Ma	orpor rine	atior and H	and larbou	Marin Irs (W	e Boa A)	ird o	f Que	ensla	ind)	

Chapter 2

It is useful to classify port authority services into two broad groups. In the first group are the direct services provided by the port authority to broad user groups. In providing these services the port authority assumes responsibility for providing facilities, equipment and labour. Port authorities may also provide a landlord service by leasing out the port's facilities to private operators such as stevedoring companies. As with the provision of direct operating services, the leasing of facilities requires a pricing strategy on the part of the port authority.

Leasing involves the port authority renting its property rights over access to the waterfront to third party tenants, who then operate particular port facilities and sell the services provided by the facilities to vessel operators and cargo owners. The most common form of agreement involves the port authority leasing facilities to shipping lines or private stevedoring companies to operate cargo handling facilities. For example, a private company might lease a container terminal from the port authority and then assume responsibility for the movement of cargo between the vessels and road or rail transport. Access to ports by towage operators is, in many ports, the subject of contractual or licensing arrangements, but these arrangements normally do not require the towage operators to pay any fees for the operating rights.

The pricing of leased facilities is one of the most difficult pricing problems faced by a port authority, due essentially to the fact that the port authority does not have direct control over the final price charged to the users of the facilities. Pricing strategies for leased facilities require consideration separate from, though not unrelated to, the pricing of direct port authority services.

## USERS OF PORT AUTHORITY SERVICES

There are four distinct major groups of users of port authority services:

- vessel operators
- . shippers
- . lessees of port facilities
- users of services and facilities provided under community service obligations

Vessel operators and cargo owners are users of the direct commercial services offered by port authorities. The lessees of port facilities,

Chapter 2

who are intermediate users of port authority services, provide services of their own to other port users. Community service obligations involve the provision of services which port authorities would not offer to the same extent, or under the same conditions, if they considered commercial factors alone.

## Vessel operators

The services received by vessel operators relate to the navigation and berthing services offered by port authorities. These are described in appendix I.

In 1983-84 liner services in Australia involved 58 lines operating 185 ships including 75 container ships, 40 general cargo vessels, 26 ro-ro ships and 16 bulk vessels. The 20 largest liner operators had 107 ships (Bureau of Transport Economics 1986). Shipping conferences play a major role in the Australian liner market, carrying around 71 per cent of the outward liner trade and 66 per cent of the inward trade.

In contrast, many more bulk ships are required to service the trade in bulk commodities. For example, in 1985-86 1470 dry bulk carriers visited Australian ports. A large proportion of bulk shipping is arranged through the charter market. Commodities exported to centrally planned countries are largely carried in the national fleets of those countries (BTCE 1989).

The vessel operators' demand for port services is a derived demand; their demand for navigation and berth services is derived ultimately from the shippers' desire to move cargo in and out of the ports. Consequently, the vessel operators require the port authority's services only because of the revenue they hope to secure from the shippers. In addition the level of charges the port authorities levy on the vessel operators partly determines the charges they in turn impose on their own customers, the shippers.

### Shippers

Apart from classification into exporters and importers, overseas shippers can also be categorised as non-bulk containerised, noncontainerised and bulk. Shippers operating in the coastal trade form a further distinct subgroup. However, the most important distinction in terms of port authority pricing is that between non-bulk and major bulk shippers.

Cargo owners are the ultimate users of the ports, without whom the need for commercial ports would not arise. The relationship between shippers and port authorities depends very much on the type and volume of cargo being shipped. There is only limited direct commercial

interaction between non-bulk shippers and the port authorities. The commercial arrangements for this group of shippers are, for the most part, channelled through intermediaries in the form of vessel operators or their agents, or lessees of port facilities such as stevedores. In terms of numbers, non-bulk shippers form the largest group of users of port authority services. Trans-Tasman Sea trade alone consisted of 3400 Australian exporters and 3900 Australian importers in 1986 (Federal Bureau of Transport Economics & Ministry of Transport, New Zealand 1987).

Major shippers of bulk commodities have much greater commercial contact with port authorities. They commonly own or partly own loading facilities and are often involved with the port authority in the provision of port facilities such as channels and navigation aids. Major bulk shippers frequently arrange shipping for their commodities. They also tend to be few in number.

## Lessees of port facilities

The lessees of port facilities form the third distinct group of users of port authority services. The major participants in the leasing of land and equipment are the stevedoring companies.

There are two categories of stevedoring of non-bulk cargo: conventional stevedoring and that performed at container terminals. Conventional stevedoring companies operate at wharves which are generally common-user facilities owned by the relevant port authority, with no direct charges imposed on the stevedores for the use of the facility. Most container terminals, on the other hand, are built by private companies on land leased from the port authority.

Fourteen container terminals operate in the five mainland capital city ports. Ownership of these terminals is dominated by four groups. Liner shipping interests either control or have a substantial interest in all of these groups. In the smaller ports, terminal operators usually operate as monopolies. A detailed discussion of ownership links in the waterfront can be found in Inter-State Commission (1988b).

Setting the rental of leases to stevedoring companies operating container terminals presents a pricing problem for port authorities rather different from that of the pricing of other facilities. The small number of terminal operators, vertically integrated with other port users, and the fact that leases involve other terms and conditions (relating, for example, to length of lease and performance measures) indicate that it is also one of the most complex areas of pricing policy.

16

## Community service obligations

Governments have given many port authorities responsibilities for functions other than the operation of a commercial port, which may be classified as community service obligations (CSOs). Examples of CSOs include:

- provision of facilities for recreational boating, the fishing industry and public sector marine activities;
- marine safety;
- administration of licensing for boats, their operators and moorings; and
- . foreshore management.

Some CSOs with 'public good' characteristics (for example, marine safety) benefit all those concerned. Other subcategories of CSOs, such as recreational boating, also benefit large numbers of users.

Port authorities recognise that these community service functions impose a net cost which is often met from the revenue of commercial port activities. Financing CSOs in this manner has pricing implications for the other categories of port users.

## BARGAINING POWER OF PORT AUTHORITIES

The bargaining power of port authorities is determined by the economic, political and institutional environment within which port authorities operate and by the policies that port authorities, users and governments adopt towards the market. The dominant position of port authorities is evident in view of their virtual monopoly supply of services and the very low elasticity of demand for these services. These factors alone might suggest that port authorities have few limitations on their pricing policies.

In reality, there are in fact a number of constraints imposed on port authorities, some of which limit quite substantially their exercise of market power. The constraints are discussed below.

## Inter-port competition

In any market, one of the most crucial determinants of market power is the number and size of producers competing for the custom of users. The degree of competition between the sellers of services has obvious effects on their market policies.

In many countries, effective competition between ports is possible and provides many benefits. However, in Australia the necessary conditions for inter-port competition are not generally present.

The most important hindrances to competition are the vast geographic distances between the capital city ports and the fact that port business for non-bulk commodities usually relates to the port city itself, or the immediate surrounding areas (Inter-State Commission 1988a, 141). In principle these drawbacks can be overcome if land transport between the major ports is adequate and efficient enough to handle the large volumes involved, and is able to do so at a reasonable cost to shippers. In most cases the land transport costs between port catchment areas would be very large compared with differences in port charges, not because of inefficiencies in land transport but due mainly to the distance component in the cost equation.

In contrast North American and European ports tend to be more competitive than Australian ports. An important factor contributing to this difference is that a large proportion of the manufacturing industry in those continents is located in regions remote from the ports. Transport costs can therefore be similar to ports which may be hundreds of kilometres apart, thus providing the basis for competition.

In Australia, the most important potential competition between capital city ports would appear to be between Sydney and Brisbane and between Melbourne and Adelaide, for cargoes originating in or destined for the hinterlands of Brisbane and Adelaide respectively (Inter-State Commission 1988b. 349). The majority of South Australian international container cargo is still shipped through Melbourne. while CTAL and Glebe Island terminals in Sydney between them handle approximately half as many Queensland containers as BATL in Brisbane. These factors provide Brisbane and Adelaide with incentives to keep port charges for container cargoes below those of their rivals, taking into account the land transport costs and transit times involved in centralising cargo.

Container traffic has the advantage of being easily transferable by land transport and is therefore the most likely candidate for interport substitution. Container traffic and other types of cargo may be more likely to be the subject of competition between ports when they are seeking new business. Whereas existing port traffic is difficult to divert to competitors, port authorities may be able to provide sufficient incentives to new trading enterprises to attract their cargo.

Geographic barriers limit competition between ports in different States. However, within States distance is not generally as important in preventing competition. Institutional barriers become dominant in

Chapter 2

preventing competition between ports within States. For example, the Maritime Services Board, having control of all New South Wales ports, has the power to prevent investment that would allow competition between ports. In States where ports are controlled by independent port authorities there is usually State government oversight or coordination which would generally serve to inhibit intrastate competition between ports.

Bulk minerals are probably the least susceptible to inter-port competition as they are usually dependent on dedicated port facilities and land transport infrastructure. They may also be subject to agreements with State governments to use specific facilities.

In contrast, bulk grains are potentially subject to significant interport competition. Grain is grown in inland areas which often have transport links to two or more ports. The physical basis therefore exists for competition between ports. For example, the major competition between ports in Victoria is that between Portland and Geelong for grain. Institutional barriers tend to limit the amount of grain which crosses State borders thus reducing the level of actual inter-port competition.

## Inter-modal competition

The availability of competitive supply of services at other ports is not the only potential competition facing individual port authorities. Their market power and pricing policies are also affected by the possibility of losing cargo to other modes of transport. In the case of exports and imports there is air transport, while coastal cargo is potentially at risk to both air and land transport.

In volume terms, Australia's sea ports handle virtually all exports and imports. Air transport tends to concentrate on high value goods and in 1986-87 accounted for around 22 per cent of imports and 14 per cent of exports in value terms (BTCE 1988a).

The types of overseas cargoes which can be transported by either sea or air cannot be simply defined, although cargoes which are definitely captive to sea transport are characterised by low value or by large volumes or physical dimensions that cannot fit into the limited capacity of an aircraft. Where a choice is possible the decision is likely to depend on such factors as overall cost considerations, warehousing, importance of reliability, stock requirements, packaging and internal transport costs. Port charges would appear to be a very minor consideration in the assessment (Federal Bureau of Transport Economics & Ministry of Transport, New Zealand 1987).

The vast majority of coastal cargo comprises bulk materials wholly unsuitable to air transport, only some of which could feasibly be carried by land transport. A possibility for substantial inter-modal competition is Bass Strait cargo where air transport can compete with sea for some forms of non-bulk cargo. This is clearly of importance to Tasmanian ports.

### Countervailing power of users

The market power of a port authority may sometimes be diminished by the effective countervailing power, or bargaining power, of the port users. In theory, the bargaining power of users can operate in the same way as inter-port or inter-modal competition, by placing restraints on the prices charged by a port authority.

The strength of the bargaining power of port users is determined by several factors:

- number of users
- . relative size of users
- . ownership links between different user categories
- . availability of credible alternatives

The number and relative size of users in the various groups was discussed earlier in the chapter. The large number of relatively small non-bulk shippers using Australian ports is not conducive to their possessing bargaining power and it would seem that most non-bulk shippers are unable to influence port charges. Furthermore, as discussed earlier, non-bulk cargo owners have little direct contact with port authorities. However, some large bulk mineral exporters negotiate port charges as part of the agreement establishing their mines.

In contrast, the number of vessel operators carrying non-bulk cargo is small and the number of stevedoring companies operating in Australian ports is very small. These two groups also have a number of ownership links, which increases their influence over the demand for port authority services.

This influence may, however, have little effect on their negotiating positions with port authorities. If there were competition in the supply of port services, vessel operators would be able to exert some influence on port charges as they could negotiate between port authorities, although this would still be limited by availability of cargo or by transhipment costs, or both. Stevedores, on the other hand, are locked in to particular ports by the decisions of vessel operators and by cargo availability, and are thus limited in their options.

In the major bulk ports a reverse situation applies. The number of cargo owners is small (there may only be one) and the number of vessel operators may be large. It does not appear that this has placed bulk cargo owners in a superior position to their non-bulk counterparts. A major reason is that, as noted earlier, bulk mineral exporters have little or no option to move their operations to another port. They are usually locked in to a specific port through their investment in port facilities and the transport infrastructure linking them to the port. Bulk grain exporters have potentially greater flexibility but institutional factors limit the extent to which this potential can be achieved.

The fact is, of course, that competitive supply of port services is unusual in Australia. Most ports operate in monopoly or near-monopoly markets and consequently there is little scope for customers to take their business elsewhere if port charges are unsatisfactory. The lack of credible alternatives for port users outweighs any other factors which might otherwise confer market power upon them.

## Government policies

The ultimate and most effective constraint on the market power of port authorities rests in the legislative and executive powers of the State governments. Governments are able to determine the limits to which port authorities may pursue their policies, including the pricing of their various services.

The policy of State governments towards the port authorities takes account of their own economic, financial, social and political interests. In practice, this means that State governments are unlikely to require port authorities to exploit their market power to the maximum. To do so might be financially attractive, but would certainly cause community resentment and give rise to political problems.

State governments will need to maintain pressures on port authorities to meet their financial targets by improving their efficiency, rather than by exploiting their market power.

## COST STRUCTURES

A port authority's cost structure is an important factor in the analysis of the appropriateness of existing pricing systems and the development of alternative systems. However, it is generally not

possible to obtain from annual reports information which allows satisfactory matching of costs and revenues, nor consistent data across port authorities.

A recent survey of port authorities by the Inter-State Commission (1989b) has produced some consistent income and expenditure data. Appendix III contains an analysis of these data and commentary on some apparent problems with the port authorities' allocation of costs to different activities. With this caveat borne in mind, it is possible to determine the overall range of values in which the cost structures of Australian port authorities fall.

Table 2.3 shows the cost structures for ship and navigation infrastructure and for cargo transfer infrastructure, although the use of historical costs would tend to understate the proportion of costs represented by capital costs. Nevertheless, it gives the broad picture as a background for later chapters.

Appendix III also concludes that the costs of providing ship and navigation infrastructure are independent of cargo throughput and probably only partially dependent on numbers of ships. Cargo transfer infrastructure costs, while more capital-intensive (on a historical cost basis), may have a minor dependence on cargo throughput and ship numbers.

 Cost	Shin and	Caroo
category	navigation	transfer
Labour	30-40	20-30
Materials	10-20	10-20
Capital	40-60	50-70

TABLE 2.3 COST STRUCTURES FOR SHIP AND NAVIGATION INFRASTRUCTURE AND CARGO TRANSFER INFRASTRUCTURE (per cent)

Source BTCE estimates based on Inter-State Commission (1989b) and port authority annual reports.

## CHAPTER 3 PRICING PRACTICES

Australian port authorities levy a range of charges on ships and on the cargoes loaded or discharged from them. This chapter examines the levels of those charges and makes inter-port and overseas comparisons. Some comments on the processes by which prices are set are also made.

Port authorities also influence prices in other sectors of the industry through the issuing of leases waterfront to other The pricing of leases is not discussed in this chapter, participants. nor are prices for those port authority activities not related to shipping. such as property development and the provision of consultancy services.

Commonwealth government charges and some State government charges related to shipping but not directly related to ports are of necessity collected when a ship enters port. These are mentioned in this chapter for comparative purposes.

The nomenclature used for port charges is far from uniform. It is common for similar charges to have a number of terms applied to them and for indentical terms to refer to different charges. The terms used in this paper are those recommended by the Economic and Social Commission for Asia and the Pacific (ESCAP 1987). These are discussed in more detail in appendix I.

## PRICE SETTING

The power to set prices for port authority services is embodied in the legislation setting up each authority. The prices set by each authority require the approval of the Minister or Governor-in-Council. In some States the Minister or Governor-in-Council may alter the charges proposed by the port authority. Legislation also usually allows for charges to be waived or payments made in lieu of charges with the approval of the Minister or Governor-in-Council (Inter-State Commission 1988c, 30).

Until the last few years port authorities generally adjusted prices by across-the-board increases broadly in line with the consumer price
index. Occasionally some charges were reviewed. These reviews were basically 'tidying up' exercises principally involving schedules of wharfage charges. Commodities no longer traded through the port would be removed and new commodities added. The legislative context within which port prices have historically been set has probably contributed to the pricing structures retaining many of their archaic features over a long period of time.

In more recent years governments have taken a closer interest in the financial performance of their business enterprises. Port price increases have generally been less than increases in the consumer price index.

## PRICE COMPARISON

Port authority charges can be conveniently considered in two categories. These are charges on the ship and charges on the cargo. The principal charges on the ship are conservancy charges (in all States except Tasmania and the Northern Territory), port dues and berth hire. The existing Australian port pricing system only partially corresponds with the ESCAP model as discussed in appendix I. Charges which come under the ESCAP definitions of port dues and berth hire are frequently combined into a single charge. This charge is called tonnage in some ports or berthage in others. Some ports levy charges on ships or cargo which are not easily identified as belonging to any particular ESCAP category. For example some Tasmanian ports levy a service charge or ship service charge and some Western Australian ports levy a harbour improvement charge which is based on the amount of cargo handled by the ship while in port.

Tables 3.1 and 3.2 summarise principal ship and cargo based charges respectively for many of the larger Australian ports. The rates in tables 3.1 and 3.2 are published charges but there are circumstances when port authorities are known to give discounts. Such circumstances include the provision of incentives to attract or retain cargo where there is perceived competition with another port.

The columns in table 3.1 have been constructed to reflect the proposed ESCAP nomenclature. It was not always possible to determine from port authority price schedules what was the most appropriate ESCAP category for individual prices. This was overcome to some extent by combining the ESCAP categories of port dues and berth hire. Some of the port fees shown are representative figures calculated to suit the price category in the table. In particular, berth hire fees are usually highest for the first day in port, and decrease thereafter. The extent of the reduction varies markedly between ports. It ranges from 20 per cent at Cairns to 71 per cent at Burnie. At some ports the

initial rate is sustained for longer periods of time before any reductions are made. For example, the initial rate continues at Devonport and Launceston for three days. At other ports there is a minimum charge equivalent to a charge for 24 hours and after that the charge is based on intervals of 6 hours but with no reduction in the daily rate. The basic time period for charging can be 1 hour (for example Westernport), 6 hours (for example, New South Wales ports) or 24 hours (for example, Bundaberg). Total charges for the first full day have been used in table 3.1 to allow comparison on an equivalent basis.

The prices set by Australian port authorities in the port dues or berth hire categories include a component to cover the cost of authority owned berths, although a rebate is given if privately owned berths are used (for example the Maritime Services Board of NSW gives a 20 per cent rebate on tonnage charges if a privately owned berth is used). The charges make no distinction between berths so that in effect a uniform pricing policy applies to this aspect of a port's operation. There is no price incentive for vessel operators to use other than the best available berth even though for some operators a lower quality berth might be suitable.

Other charges, for ancillary services such as mooring, towage and pilotage, are not shown, as these are mostly provided by private operators. As a guide to the size of other charges, some indicative estimates can be provided. Ship mooring and unmooring can cost up to around \$1000. Pilotage in and out of port will be charged for at about \$3000 for a vessel of 30 000 tons, depending on port complexity. Harbour towage and berthing can involve anywhere from \$2000 upwards (BTCE 1988b). Port crane hire might be \$5000 per day, while lighting could be \$50 a night. Storage of cargo costs around \$1 per tonne per day on port property.

Also not shown in the first table are the Commonwealth government charges on vessels using Australian waters and ports. Commonwealth light dues were \$0.53 per ton of net registered tonnage (NRT) for three months. The Commonwealth Minister for Transport and Communications announced a new charging formula on 1 June 1989. The new formula provides for a sliding scale of charges varying from \$0.63 per NRT for ships up to 5000 NRT to \$0.33 per NRT in excess of 50 000 NRT. The oil pollution levy for oil tankers is presently \$0.017 per NRT payable every three months at the first visited Australian port. The Quarantine Act refuse disposal charge is \$30 per vessel per day and \$2 per crew member per day up to a maximum of \$1000.

It can be seen from table 3.1 that charge rates vary considerably between ports. Conservancy averages around \$0.30 per ton of gross registered tonnage (GRT) for six months, with Queensland having the highest charge at \$0.996 while Tasmania and the Northern Territory have no charge. Once paid, the charge covers all visits to the relevant State during the defined period. In addition, in Victoria ships which only carry exports are charged only one-third of the scheduled conservancy dues. Berth hire charges average about \$0.11 per GRT for the first day in port but vary from \$0.02 per GRT at Hay Point to \$0.28 per GRT at Department of Marine and Harbours ports in

· · ·	State		· ·
	conservancy		Other
	charge	Berth hire	port
н 1	(\$/GRT-	charge <sup>a</sup>	dues
Port	½ year)	(\$/GRT-day) <sup>0</sup>	(\$)
NSW ports (4)	0.1985	0.0684	-
Melbourne	0.4626	0.0751	approx. \$500/day
Westernport	0.4626	0.2064	
Geelong	0.4626	0.0480	53.00
Portland	0.4626	0.07608_	255.00/day(min) <sup>5</sup>
Brisbane	0.9960	6.70/m-day <sup>g</sup>	-
Bundaberg	0.9960	0.1050	-
Cairns	0.9960 <sup>T</sup>	0.1585	-
Gladstone	0.9960 <sup>T</sup>	0.1253	ĥ
Mourilyan	0.9960	0.10	-
Lucinda	0.9960 <sup>T</sup>	0.10	-
Mackay	0.9960	0.110	-
Townsville	0.9960 <sup>T</sup>	0.1380	-
Ábbot Point	0.9960	0.0700	-
Hay Point	0.9960	0.02	-
Weipa	0.9960	0.26/t cargo <sup>1</sup>	-
Fremantle	0.2280	0.0776	-
Albany	0.2280	0.1164	0.143/t cargo
Bunbury	0.2280	0.1500	0.14/t cargo
Esperance	0.2280	0.0720	0.20/t cargo
Geraldton	0.2280 <sup>T</sup>	0.0760	0.20/t cargo
Port Hedland	0.2280	0.0960	-
Carnarvon	0.2280	0.2800	-
Dampier	0.2280	0.2800	-

## TABLE 3.1 COMPARISON BETWEEN MAJOR PORTS OF COMMON SHIP BASED CHARGES, 1988

- - - -

Port	State conservancy charge (\$/GRT- ½ year)	Berth hire charge <sup>a</sup> (\$/GRT-day) <sup>b</sup>	Other port dues (\$)
<del></del>	F		
Port Walcott	0.2280'	0.2800	-
SA ports (8)	0.2718	0.0864	
Hobart	k	0.04531	325.00
Burnie	k	0.0660	146.00/3 day <sup>1</sup>
Devonport	k	0.1000	-
Launceston	k	0.0263	143.00/3 day <sup>m</sup>
Darwin	-	0.0720	0.48/GRT pa <sup>n</sup>
Average <sup>0</sup>	0.4457	0.1110	
Median <sup>0</sup>	0.2718	0.0864	-

TABLE 3.1 (Cont.) COMPARISON BETWEEN MAJOR PORTS OF COMMON SHIP BASED CHARGES, 1988

a. Incorporates port dues as defined by ESCAP (1988).

b. Rate for the first day only for ships of at least 20 000 GRT.

- c. Berth rent (a charge to place cargo on the wharf, additional to wharfage). The actual charge varies from \$176/day to \$2140/day depending on the berth.
- d. Port charges.
- e. Berth facilities charge plus wharf charge. An appropriated berth charge based on ship length is charged in addition to the \$225/day.
- f. Published rates are for shorter periods (Queensland, 30 days and Western Australia, two months) and have been increased to equivalent charges for six months to make them comparable to other entries.
- g. Charge based on vessel length, not gross registered tonnage.
- h. A separate harbour improvement charge applies, based on deadweight tonnage and draft, to cover dredging for coal facilities. The rate per ton is negotiated with coal companies.

i. Rate based on cargo tonnage moved, not gross registered tonnage.

- j. Harbour improvement charge.
- k. No conservancy charge.
- Service charge.
- m. Ship service charge.
- n. Port dues.
- o. Includes values for four New South Wales and eight South Australian ports as well as the values for the other individual ports.
- GRT Gross registered tonnage.
- No charge.

Source Port authority schedules.

	Grain	Coal	Iron	Timber	Phosphata	Petroleum <sup>a</sup>	Unspe	cified	Container	
Port	out	out	out	in in	in in	in in	In	Out	(\$/TEU)	
NSW ports	1.78	0.58	1.07	3.55	1.09	4.20	3.55	2.29	62.30	
Melbourne	1.20	1.20	3.20	3.20	2.05	3.15	3.20	2.95	80.19	
Westernport	2.47	2.47	3.00	3.00	3.00	3.00	3.00	2.47	81.55	
Geelong	1.00	0.97	0.97	1.68	1.68	1.68	1.68	1.51	41.07	
Portland	1.06	1.10	1.10	2.30	1.90	1.90	2.30	2.30	62.56	
Brisbane	1.00	1.50	0.83	1.50	1.24	1.65	1.67	1.67	62.00 <sup>b</sup>	
Bundaberg	1.70	1.70	1.70	1.70	1.70	2.00	1.70	1.70	-	
Cairns	1.47	1.82	1.61	2.16	1.70	2.38	2.38	1.95	44.61	
Gladstone	0.90	0.3097	1.25	1.25	1.25	2.05	1.25	1.25	· · · · · ·	
Mourilyan	0.85	0.85	0.85	0.85	0.85	1.70	0.85	0.85	-	
Lucinda	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-	
Mackay	1.25	1.25	1.25	1.20	1.10	1.40	1.40	1.25	-	
Townsville	1.51	0.80	1.88	2.23	1.86	2.33	2.23	1.88	-	
Abbot Point	na	0.05 <sup>C</sup>	na	na	na	na		na	-	
Hay Point	na	0.104 <sup>a</sup>	na	na	na	na		na	-	
Fremantle	0.53	0.94	2.39	3.59	2.39	2.39	3.59	2.39	41.18	
Albany	1.08	1.80	1.80	3.40	2.10	3.56	3.40	2.14	-	
Bunbury	0.70	0.90	1.10	2.60	1.00	2.95	2.60	2.60	-	
Esperance	0.89	0.95	1.03	2.55	0.95	3.04	2.55	1.70	-	
Geraldton	- 0.80	0.80	0.85	1.00	1.40	3.00	1.70	1.70	-	
Port Hedland	4.25	4.25	0.00 <sup>g</sup>	4.25	4.25	4.60	4.25	4.25	-	
Carnarvon	0.70	1.15	1.15	1.55	1.15	4.35	2.55	2.55	-	
Dampier	0.70	1.15	1.15	1.55	1.15	4.35	2.55	2.55	-	

# TABLE 3.2 COMPARISON BETWEEN MAJOR PORTS OF COMMON CARGO BASED CHARGES, 1988 (\$/tonne)

. . . .

	Grain	Coa 1	Iron ore	Timber	Phosphate	Petroleum <sup>a</sup>	Unspecified		Container out and dry
Port	out	out	out	in	in	in	In	Out	(\$/TEU)
Port Walcott	0.70	1.15	1.15	1.55	.1.15	4.35	2.55	2.55	
SA ports	1.34	2.62	2.62	3.48	2.62	3.84	3.48	2.62	75.00
Hobart	1.45	1.45	1.45	2.88	1.23	2.29	2.88	1.45	42.11
Burnie	1.65 <sup>h</sup>	1.65	1.10	2.76	1.65	2.25	3.20	1.65	49.70
Devonport	1.60	1.60	1.60	3.15	2.42	2.16	3.15	1.60	49.70
Launceston	1.680	1.680	1.680	3.307	3.307	2.348	3.307	1.680	52.185
Darwin	3.50	3.50	3.68	3.68	3.50	4.60	3.68	3.68	-
Average	1.42	1.46	1.52	2.30	1.79	2.66	2.56	2.09	55.71
Median	1.20	1.20	1.25	2.30	1.68	2.35	2.55	1.95	49.70

## TABLE 3.2 (Cont.) COMPARISON BETWEEN MAJOR PORTS OF COMMON CARGO BASED CHARGES IN 1988 (\$/tonne)

a. Rate is for refined petroleum products. Crude oil and bunker fuel often attract a lower rate.

b. \$62.30 for berth; \$59.00 for terminal.

c. Special harbour dues of \$2.26 also apply for coal facility use.

- d. Special harbour dues of \$2.68 also apply for coal facility use.
- f. This is the published rate, but at Kwinana an annual lump sum is paid.
- g. Iron ore is shipped through private facilities at no charge.
- h. Grain is imported, not exported, at this port.
- TEU Twenty foot equivalent unit.
- Commodity rate should be used.
- na Not available.
- Source Port authority schedules.

Chapter 3

Western Australia. Berth hire charges in Brisbane are unique, being based on vessel length rather than GRT. The Brisbane Port Authority has adopted this approach because of a lack of uniformity in measuring GRT. Measurement of ship size is discussed in appendix I. 'Other port dues' are those charges which do not conveniently meet the definitions appropriate to the first two columns of the table. The bases and level of these charges varies markedly between ports.

Wharfage rates vary from a low of \$0.53 per tonne of grain up to \$4.60 per tonne of petroleum. Wharfage dues for particular commodities may vary substantially in percentage terms between ports, as shown in table 3.2. For instance grains are charged between \$0.53 and \$1.78 per tonne for export from recognised grain exporting ports with Western Australian ports having the cheapest rates, as they also have for iron ore. For most commodities, imports are charged at a higher rate than exports, as reflected by the averages shown at the base of the table. Unspecified goods generally attract higher wharfage rates than most specified commodities. Petroleum products attract higher rates than other bulk commodities shown, particularly in Western Australia. The lowest wharfage rates for coal are found at the major Queensland and New South Wales coal ports.

Figure 3.1 illustrates the range of wharfage charges for selected bulk commodities and the relationship between these charges and the value of the commodity. The rates for these bulk commodities are poorly related to the value of the commodity and are therefore not fully consistent with a principle of 'what the market will bear'. Joy (1988) made similar comments about cargo charges in New South Wales.

Containers usually have special wharfage rates based upon the size and type of unit.

Another important port charge is the charge for loading bulk commodities where the loading facilities are owned or operated by the port authority. These charges can form a significant proportion of port authority revenues. For example, in 1986-87 the Maritime Services Board of NSW received over \$94 million from coal loading charges, out of a total operating income of just over \$300 million. By comparison, wharfage charges on all cargoes (including wharfage of \$0.58 per tonne for coal) amounted to just over \$110 million.

In 1986-87 coal loading charges in New South Wales varied from \$3.81 per tonne at Balmain to \$5.32 per tonne at Newcastle (Maritime Services Board, pers. comm.) at a time when steaming coal prices were falling towards \$40 per tonne (Australian Mining Industry Council 1987). Loading charges at that price level constituted some 9 to 13

30



31

Chapter 3

per cent of fob prices, but rates at Newcastle have since been reduced to \$4.81 per tonne. Similarly use of port owned coal loaders in Queensland attracts significant charges, but these are lower than the rates charged in New South Wales by the Maritime Services Board (see table 3.2).

The calculation of charges on ships is generally straightforward. In contrast calculation of charges on cargoes can be complex. Some ports require the use of considerable resources to categorise specific cargoes and to allocate wharfage charges to them.

Discounts are sometimes provided for coastal vessels. For instance at the Port of Melbourne, for coastal vessels berth rent is half the full rate, with wharfage and tonnage set at three-quarters the full rate. At New South Wales ports, coastal shipping receives some wharfage discounts ranging from 22 to 86 per cent for certain commodities. Similar arrangements apply at Fremantle, Westernport and Hobart. However there appear to be no cost reasons for this practice. Most ports also offer discounts for transhipment, that is, the movement of goods from one vessel to another within the port.

The variations in port charge rates appear to be only partly explained by differences in port cost structures and service levels. As will be discussed later, port prices are often only loosely related to costs, other than on a port-wide basis. As well, the relative weights given to charges on ships and to charges on cargoes vary considerably between ports. For the five mainland capital city ports cargo charges (not including cargo handling charges) vary from 30 per cent to some 67 per cent of revenue, while ship charges vary from under 12 per cent to almost 24 per cent.

The lack of inter-port competition discussed in chapter 2 has also had an influence. Competition normally has the effect of keeping prices for similar services at similar levels. The failure of market forces to do this has meant that differences in prices inherited from the past have become magnified.

## Total cost comparisons

Because port facilities vary in capacity and handling rates the total charge at two ports with the same apparent fee structure can be considerably different. For example, if one port has a grain loader that only works at half the rate of that at another port, the port dues fee will double (assuming identical unit charges) as may some other charges, since the ship will take twice as long to load. Similarly, one large tug at one port may be equivalent to two small tugs at another port, or berthing may be easier due to the port layout.

Thus comparisons based on unit prices provide only a partial picture of the total level of charges. Comparisons based on aggregate charges incurred during a typical port visit can take into account varying port capacities.

To illustrate the variations in port charges for some typical ship and cargo combinations, use was made of a Port Charges Model developed by the Department of Transport and Communications. Basic information on 1986 charges at Australian ports is stored within the model, as well as data on port characteristics and handling rates. Examples of the results are shown in tables 3.3 to 3.6.

It was assumed for the calculation of State conservancy dues and Commonwealth light dues that bulk ships made only one visit to the Australian coast during the period for which these charges apply. Container ships typically operate on a regular scheduled service, so they may make two visits during the charge period: it was assumed that two visits were made during the period applicable for Commonwealth light dues and for State conservancy dues except in Queensland and Western Australia where conservancy charges apply for 30 days and two months respectively.

Total 1986 costs at selected ports were estimated for a bulk ship of 30 000 GRT (25 000 NRT and 31 400 DWT) loading 26 690 tonnes of grain (table 3.3). The table shows that while there is considerable variation in unit prices, there is less but still significant (\$47 000 to \$83 000) variability in total charges.

Similarly, table 3.4 represents the estimated charges for a 25 000 GRT (28 000 DWT and 11 000 NRT) container vessel loading 100 TEU and unloading 200 TEU at major ports. Variability across ports is much less than for grain (\$34 000 to \$42 000).

In table 3.5 port charges for a 60 000 GRT (75 000 DWT and 30 000 NRT) Panamax bulk coal vessel loading 55 250 tonnes of coal are depicted. As noted earlier, charges for loading coal from port authority facilities in some ports can add substantially to the costs illustrated in table 3.5.

Finally, table 3.6 presents the costs for a 20 000 GRT (30 000 DWT and 10 000 NRT) phosphate carrier unloading 25 500 tonnes of phosphate. Due to wide variation in unloading rates, ship time can vary greatly, as reflected by the berth hire charges.

(\$)								
Charge	Brisbane	Newcastle	Sydney	Geelong	Portland	Adelaide Port Pirie	Esperance	Fremantle
Government fees Commonwealth				40 000				
light dues State conservancy	13 250	13 250	13 250	13 250	13 250	13 250 13 250	13 250	13 250
dues	4 650	5 956	5 956	4 626	4 626	7 840 7 840	2 280	2 280
Port authority fe Berth hire	es			-				
charge	804	3 078	1 539	1 950	5 706	3 888 6 480	5 100	4 464
Port charge Wharfage	7	, . <del>-</del>		245	355		7 206	_ `
charge	26 690	47 508	47 508	26 690	28 291	34 430 34 430	22 420	13 612
Pilotage fees <sup>b</sup>	7 089	4 436	4 436	5 971	1 770	1 914 1 914	1 940	1 614

TABLE 3.3 ESTIMATED 1986 PORT CHARGES FOR A 30 000 GRT VESSEL LOADING GRAIN<sup>a</sup>

34

BTCE Occasional Paper 97

## TABLE 3.3 (Cont.) ESTIMATED 1986 PORT CHARGES FOR A 30 000 GRT VESSEL LOADING GRAIN<sup>a</sup>

(\$)

Charge	Brisbane	Newcastle	Sydney	Geelong	Portland [Variable]	Adelaide	Port Pirie	Esperance	Fremantle
Other fees						· <u> </u>			
Towage fees	11 880	7 000	7 180	12 120	9 032 <sup>C</sup>	8 112	13 468	6 890	9 760
Mooring and									
launch fees	136	2 148	1 970	3 520	1 792	144	144	971	1 088
Miscellaneous	250	250	250	250	250	250	250	250	250
Total	64 749	83 626	82 089	68 622	65 072	69 828	77 776	60 307	47 458
Cost per tonne	2.43	3.13	3.08	2.57	2.44	2.62	2.91	2.26	1.78

a. 25 000 NRT, 31 400 DWT, loading 26 690 tonnes.

b. Pilotage services are provided by other than the port authority in some ports.

c. Towage service provided by port authority.

GRT Gross registered tonnage.

NRT Net registered tonnage.

DWT Deadweight tonnage.

- No charge.

Source Estimates based on a Department of Transport and Communications model.

TABLE 3.4 ESTIMATED 1986 PORT CHARGES FOR A 25 000 GRT CONTAINER VESSEL<sup>a</sup>

(\$)

Charge	Brisbane	Sydney	Fremantle	<i>Melbourne</i>	Adelaide
Government fees					
Commonwealth light dues	2 915	2 915	2 915	2 915	2 915
State conservancy charge	3 876	2 482	1 900	1 925	3 263
Port authority fees					
Berth hire charge	804	1 700	1 860	1 755	2 700
Port charge	-	-	-	-	-
Wharfage charge	8 140	15 104	13 454	15 134	15 060
Pilotage fees	6 478	4 065	1 614	4 730	1 914
Other fees	: ·	· .	÷.,		
Towage fees	11 880	8 668	8 840	12 120	7 824
Mooring and launch fees	136	2 140	1 088	3 048	144
Miscellaneous	250	250	250	250	250
Total	34 479	37 324	31 921	41 877	34 070
Cost per TEU	172	187	160	209	170
Cost per tonne (13 tonne/container)	13.26	14.36	12.28	16.11	13.10

a. 11 000 NRT, 28 000 DWT loading 100 TEU, unloading 200 TEU with 20 per cent refrigerated.

GRT Gross registered tonnage.

NRT Net registered tonnage.

DWT Deadweight tonnage.

TEU Twenty foot equivalent.

- No charge.

Source Estimates based on a Department of Transport and Communications model.

LOADING CO	AL -									
				(\$)		_				
Charge	Al P	bbot oint	Glad	stone		Hay Point	Newco	astle	K	Port embla
Government fees										
Commonwealth light										
dues	15	900	15	900	15	900	15	900	15	900
State conservancy										
charge	9	300	9	300	9	300	11	910	11	910
Port authority fees										
Berth hire charge Port charge	1	200	10	494	1	200	2	052	4	104
Wharfage charge	2	210	15	321	1	879	32	045	32	045
Pilotage fees	2	880	7	048	7	048	5	620	5	620
Other fees										
Towage fees	33	000 <sup>b</sup>	19	908	24	000	9	672	15	032
Mooring and launch										
fees	1	000 <sup>b</sup>	1	628		-	2	120	2	552
Miscellaneous		250		250		250		250		250
Total	65	740	79	849	59	577	79	569	87	413
Cost per tonne		1.19		1.45		1.08		1.44		1.58

TABLE 3.5 ESTIMATED 1986 PORT CHARGES FOR A 60 000 GRT VESSEL ADTHE COAL &

a. 30 000 NRT, 75 000 DWT, loading 55 250 tonnes of coal.

b. 1988 charges.

GRT Gross registered tonnage.

NRT Net registered tonnage. DWT Deadweight tonnage.

No charge. -

Source Estimates based a Department of Transport on and Communications model.

37

## TABLE 3.6 ESTIMATED 1986 PORT CHARGES FOR A 20 000 GRT VESSEL UNLOADING PHOSPHATE<sup>a</sup>

(\$)

Charge	Brisbane	Newcastle	Geelong	Hobart	Adelaide	Albany
Government fees			- ,	<u> </u>		
Commonwealth light dues	5 300	5 300	5 300	5 300	5 300	5 300
State conservancy charge	3 100	3 970	3 084	-	5 226	1 520
Port authority fees						
Berth hire charge	4 824	2 736	3 120	2 719	19 440	14 880
Port charge	· · ·	-	588	876	·· -	3 443
Wharfage charge	31 620	27 795	45 390	31 365	64 260	48 195
Pilotage fees	5 868	3 252	4 891	1 755	1 914	1 790
Other fees			· .		- 	• •
Towage fees	10 400	6 112	11 720	4 052	7 412	6 120
Mooring and launch fees	136	2 148	3 520	442	144	1 096
Miscellaneous	250	250	250	250	250	250
Total	61 498	51 563	77 863	46 759	103 946	82 594
Cost per tonne	2.41	2.02	3.05	1.83	4.08	3.24

a. 10 000 NRT, 30 000 DWT, unloading 25 500 tonnes.

GRT Gross registered tonnage. NRT Net registered tonnage.

DWT Deadweight tonnage.

No charge.

Source Estimates based on a Department of Transport and Communications model.

T

As the tables each present 1986 estimates for only one commodity, it would be unfair to use the results to identify the cheapest or most expensive ports. Rather, the tables provide an overall guide to total port charges for a representative ship and allow comparison of the relative importance of the various charges.

It can be seen that wharfage charges predominate, followed by Commonwealth light dues and towage fees. Wharfage as a percentage of total port charges is fairly similar for coal and containers, ranging from 24 to 44 per cent for containers and up to 40 per cent for coal. Some Queensland coal ports have low wharfage charges, reflecting the use of private facilities in those ports. Both wheat and phosphate appear to bear particularly high wharfage charges, in the range of 29 to 57 per cent for wheat and 51 to 67 per cent for phosphate.

Containerised cargoes generally bear higher port charges per tonne than bulk cargoes but this is due to different handling technology rather than any particular pricing policy. It is also of interest to note that average charges per container for Brisbane and Adelaide are lower than the charges for Sydney and Melbourne. This probably reflects a marketing tactic of port authorities in Brisbane and Adelaide to attract cargo from Sydney and Melbourne respectively. It was noted in chapter 2 that this container traffic was one of the few areas of inter-port competition in Australia.

However, a great divergence in overall port charges is apparent, even from this small sample of cargo types, ship sizes and ports. For the grain ship, the most expensive port is some 76 per cent more costly than the cheapest; for the coal ship this difference is about 46 per cent, and for the phosphate carrier the difference in port costs is very marked, the most expensive port being more than twice as costly as the cheapest. The variation for the container vessel is only 31 per cent, reflecting a comparatively small spread of wharfage charges.

Reasons for these differences are many. They include differences in the degree of port development required due to the port's physical characteristics, differences in the volume of port trade and in the range and types of cargoes handled, variations in productivity, and the various financial targets specified by the State governments. As well there is the factor of price structures inherited from the past, giving rise to divergences in current costs and prices for particular port services, and thus to the possibility of further price variations for particular vessel and cargo combinations.

## INTERNATIONAL COMPARISON

Comparisons between Australian and overseas ports can be difficult due to variations in nomenclature, price structures and operating practices, but nonetheless some significant differences can be observed.

Many overseas ports receive subsidies for the construction and maintenance of approach channels, breakwaters and navigational aids. Central government and local government funding of these facilities is common in the European Community. In the United States the critical investment for access channels is shared between the Federal government and the State government or port authority. Maintenance dredging is wholly funded by the Federal government. Because of these subsidy arrangements there is no need for conservancy charges in the subsidised ports.

Most ports levy charges on both ships and cargo. However, there are some important exceptions, such as Antwerp, which rely entirely on ship based charges and rents on property.

Table 3.7 indicates typical fees for some major ports in 1986. Examination of the table and comparison with tables 3.1 and 3.2 reveals that wharfage and berth hire fees fall in a similar range to those in Australia but are perhaps slightly lower for overseas ports. However for a proper comparison, an indication of ship size and visit duration is required.

In its submission to the Inter-State Commission, the Australian National Maritime Association (1988) presented some indicative overseas port prices per ship visit for various types of shipping in 1987. These are shown in table 3.8. Australian ports place heavier emphasis on wharfage than those overseas. This is particularly noticeable in the tanker example, where cargo dues are 61 per cent of the total charge compared with around 20 per cent in Europe and Singapore. Dry bulk cargo costs compare more favourably with overseas port costs as long as private facilities are used and port authority wharfage charges are not levied. In container trades only one of the Association's examples is shown in table 3.8. The Association concludes that in container trades, Australian port costs per vessel are about 20 per cent higher than in Europe, 41 per cent higher than in Japan and 91 per cent higher than in Singapore. These comparisons are of course sensitive to exchange rate variations.

A recent study of overseas ports considered that inter-port competition, which has induced some ports to negotiate with users on

40

Port characteristic	Singapore	Auckland	Los Angeles	Gothenburg	Bangkok
Throughput tonnage ('000 t)	120 715	6 474	51 132	23 458	7 627
Number of berths	109	25	30	95	6
Number of staff	7 985	na	697	1 582	6 909
Rate of return <sup>b</sup> (per cent)	18	4	10	6	6
Berth hire (\$/GRT-day)	0.096	0.036	2.3-27.5/m <sup>C</sup>	0.21	-
Port charge (\$)	0.73/GRT pa	ď	-	-	0.22/NRT
Wharfage (\$/tonne)					
Grain out	-	-	0.96	0.91	-
Coal out	-	-	1.13	0.78	-
Phosphate in	_	-	1.38	1.28	-
Petroleum in	-	-	0.47	1.19	-
Unspecified	0.50	-	5,50	0.26	0.06

## TABLE 3.7 INTERNATIONAL PORT CHARACTERISTICS AND PRICES, 1986<sup>a</sup>

a. Currency conversions based on rate of exchange at 30 September 1988.

b. BTCE estimate from port authority annual reports based on expenditure before interest and extraordinary items.

c. Depends on size of vessel with rate increasing with size.

d. Based on GRT. Depends on frequency of visits and type of trade.

GRT Gross registered tonnage.

NRT Net registered tonnage.

- na Not available.
- No charge.

pa Per year.

41

Source Port authority schedules.

Chapter 3

		~~ /						
Charge	Austr	alia	Eui	rope	Singaj	oore	Ja	apan
Tanker (30 000 DWT)	_							
Ship dues <sup>a</sup>	18	300	24	200	7	100		-
Cargo dues	28	700	5	800	2	100		-
Total	47	000	30	000	9	200		-
Dry bulk (100 000 to 150 000 DWT)								
Ship dues <sup>a</sup>	56	300	68	600		-	69	500
Cargo dues		0 <sup>¤</sup>		0 <sup>D</sup>		-		00
Total	56	300	68	600		-	69	500
Container (40 000 DWT)								
Ship dues	48	565	40	322		-		-
Cargo dues (\$/TEU) <sup>C</sup>		380		265		-		-

(\$)

TABLE 3.8 INTERNATIONAL PORT PRICES

a. Includes tugs, pilotage, mooring and other ship dues except agency fees and conservancy charges. Light dues are included for dry bulk carriers and container ships.

b. Assumes cargo is loaded at private facilities and no wharfage is charged.

c. Includes stevedoring charges.

DWT Deadweight tonnage.

TEU Twenty foot equivalent.

No charge.

Source Australian National Maritime Association (1988).

rates charged, is a major reason for some overseas ports having lower levels of charges. Singapore, Los Angeles and Rotterdam were cited as examples of ports which are prepared to discuss rates with shipping companies. As well, there are appeal mechanisms in the United Kingdom and the United States which act to restrain increases in port charges (Rischbieth and Cotton 1987).

## TRENDS IN PORT PRICES

Australian port charges have not shown any substantial price rises in recent years, probably reflecting productivity improvements from the infrastructure developments of the 1970s and increasing ship size, together with a reduced need to fund new infrastructure in the 1980s. Indeed, some rates prevailing in 1988 for certain ports have not changed in several years. Comprehensive time-series data on

Australian port charges were not readily available. However, some limited information on historic port charges for grain shipments was available and is summarised in table 3.9 for three main price categories. The table reveals that while some prices have decreased, most show an increase over time. However, the consumer price index has approximately doubled in the period 1978-79 to 1987-88, so that in real terms port charges have decreased for all of the ports shown, except for New South Wales where there has been a slight increase. The Maritime Services Board of NSW imposed a price freeze in January 1986 which was maintained through 1986-87 and 1987-88.

These trends may be compared with those of freight rates in general, to indicate changes in the relative importances of port charges. However, freight rates are generally more volatile than port prices, reflecting the more competitive environment in which freight rates are set. As a result there is little correlation between trends in freight rates and port charges.

		Berthage	Wharfag (grain)	e charge (\$/tonne)	Ca
Port	Year	(\$/GRT day)	In	Out	(\$/GRT-½year)
Townsville	1974	0.138	1.73	1.40	0.300
	1988	0.121	1.86	1.41	0.996
Mackay	1972	0.110	1.00	0.90	0.300
	1988	0.110	1.40	1.25	0.996
Brisbane	1978	-	0.67	0.62	0.300
	1988	6.70/m-day	1.00	1.00	0.996
NSW ports	1978	0.0326	0.37	0.67	0.10
	1988	0.0684	3.55	1.78	0.1985
Burnie	1984	0.063	2.42	1.60	-
	1988	0.066	1.05	1.65	-
Esperance	1985	0.064	0.80	0.80	0.2175
	1988	0.072	0.89	0.89	0.2280

## TABLE 3.9 HISTORIC MAIN CHARGES FOR SELECTED PORTS

GRT Gross registered tonnage.

No charge.

Source Port authority schedules.

## CHAPTER 4 ASSESSMENT OF PRICING POLICIES

The objectives of a port authority's pricing policies are strongly influenced by the important fact that most port authorities in Australia are public bodies controlled by State governments. The pricing of public sector services will generally be determined using criteria different from those applied in private organisations, due to the wider community interests of governments.

In chapter 2 it was observed that port authorities generally operate in near-monopoly situations and consequently possess substantial market power over the users of port services. However, the fact that ports are under public ownership, and are regarded as providing essential services with widespread effects on the community at large, indicates that the pricing of those services cannot be tied to narrow financial objectives such as profit maximisation.

This chapter assesses port authority pricing from a wide perspective, taking into account the concerns of governments, port users and the port authorities themselves. The objectives of pricing policy are defined and then used as the basis for assessment. These objectives are not necessarily consistent with one another and are unlikely to provide definitive pricing guidelines for port authorities. However, they provide a framework for assessing pricing policies and help to establish the priorities that port authorities face in the practical task of setting tariffs.

## FINANCIAL PERFORMANCE

State governments usually specify that port authorities within their jurisdictions should aim to meet a given financial target each year. This target can be justifiably regarded as the major driving force behind the economic and financial policies of port authorities.

The financial targets for port authorities vary from State to State. The current targets for the five major Australian port authorities are shown in table 4.1.

TABLE 4.1 FINANCIAL TARGETS AND DIVIDEND REQUIREMENTS OF MAJOR AUSTRALIAN PORT AUTHORITIES, 1988-89

Port authority Financial target and dividend requirement Maritime Services Global revenue target with 6 per cent of revenue Board of NSW paid to the State government as a dividend Port of Melbourne Real rate of return of 4 per cent on written down current value of assets<sup>a</sup> Authority Port of Brisbane To be self-financing after 5.5 per cent of gross revenue has been paid to Harbours Marine Fund Authority Department of To match expenditure with revenue overall Marine and Harbors (SA) Fremantle Port Target rate of return after a statutory Authority contribution to the State government of 3 per cent of gross revenue. The Authority is required to declare a dividend to the Minister which may be accepted or varied

a. Based on a 5 per cent real return on equity and a 3 per cent real interest rate and with equal debt and equity financing (Department of Management and Budget 1986).

Source Port authority annual reports and personal communications.

The common theme is that port authorities are expected to achieve at least financial balance. Financial balance requires a set of prices which achieves the full recovery of financial costs from the users of port facilities. Cost recovery, or financial balance, is aimed at allowing port authorities to be self-financing enterprises with no net cost to government budgets. Financial balance by port authorities is consistent with current community views on financial responsibility.

Emphasis on full cost recovery is a fairly recent phenomenon and arose as State governments sought to move port authorities away from reliance on budgetary support. Indeed, some State governments are now expecting port authorities to make a positive contribution to State finances, as well as requiring their revenue to meet operating costs and provide for capital maintenance and expansion. For example, the Queensland government has stated that the philosophy underlying its 5.5 per cent levy on revenue payable to the Harbours Marine Fund is

that the operating deficit of the Department of Harbours and Marine should largely be met by the shipping industry in return for the services provided by the Department to shipping and port authorities. (Queensland Government 1988).

Financial objectives arise from the scarcity of investment funds in the economy and from the desire to ensure that the available funds are used efficiently. If governments in general do not set financial targets for public investment, it is very difficult to measure the financial performance of specific public enterprises from a national viewpoint, and to assess how effectively they are utilising the resources made available to them. The Port of Melbourne Authority now has a target based on a specified real rate of return on capital and the Maritime Services Board of NSW will probably have a similar target in the near future.

The setting of targets for public enterprises involving cost recovery and rates of return on capital encourages a similar philosophy to that which exists in competitive firms, but in a modified form to reflect the wider community interests served by port authorities. Full cost recovery in financial terms requires total revenues from port operations to equal total costs. It is a 'user pays' philosophy, as the users of port services must collectively match the costs incurred by the port authorities. This leaves open for the time being the question of the incidence of port prices on various categories of port users - shippers, vessel operators, consignees, stevedores and so on. Incidence involves not only the relative burdens imposed on various users by the structure of port charges, but also the price elasticities of supply and demand faced by different classes of users, which determine the proportion of charges they can pass on to other sectors of the economy.

The financial balance objective of port authority pricing may be pursued separately from any community service obligations in the port's operations. Cost recovery and rate of return requirements need only be applied to the commercial operations of the port including the facilities and equipment used in those operations.

## Assessment of financial performance

This section assesses the financial performance of port authorities in terms of their financial targets and the implications for pricing policies.

Most port authorities earn sufficient revenue to cover their operating costs, but when capital costs (interest and depreciation) and other non-operating expenditures are included, a significant number incur

deficits. Table 4.2 summarises income and expenditure for some of the larger port authorities. All port authorities report capital charges on a historical cost basis but there are differences in the methods of depreciating fixed assets. For example, the Marine Board of Hobart does not depreciate assets purchased from loan funds, while other port authorities depreciate assets irrespective of the source of funds. While all authorities follow accounting conventions and do not depreciate land, other assets which could also be considered as having exceptionally long lives, such as dredged channels and breakwaters, are depreciated by some authorities but not others.

Table 4.3 provides estimates of rates of return of selected port authorities using data provided in annual reports in terms of operating surplus (before finance charges and extraordinary items) as a percentage of total assets employed. Ports which are required to make a payment to State governments equal to a percentage of revenue generally show this as an expenditure item. This item has been ignored in calculating operating surplus, for the sake of consistency. No other attempt has been made to remove inconsistencies in the treatment of depreciation or other items.

From an economic viewpoint the appropriate rate of return for a port authority should be equal to the rate of return available on alternative investments of equivalent risk in the private sector, as discussed in appendix II. Port investments do carry a degree of risk in that the volume of cargo handled, and therefore revenue, is strongly correlated with general economic conditions. Thus the rate of return on assets should exceed that for long term risk-free investments such as the real long term bond rate.

The financial performance reported on the basis of historical costs deviates quite markedly from the true economic performance of the authority. Port authorities have generally acquired assets over an extended period of time. The historical cost of assets with long lives such as land and other major assets will generally be substantially below values based on prices which are current during the accounting period. Under these circumstances rates of return based on historical cost will overstate the economic performance of the authority. Appendix II contains comparative valuations for Port of Melbourne Authority assets, in which current values are on average 2.3 times historical values. The Curran Report (New South Wales Commission of Audit 1988) derived a similar value for this ratio for Maritime Services Board of NSW assets.

------

		enue 000 )	Expense (\$'000)				6 I	
Port authority	Reva (\$'0		Operat	ting	operat	Von- ting <sup>a</sup>	Surpius (deficit) <sup>b</sup> (\$'000)	
Maritime Services Board of NSW	300	032	166	998	83	347	49 687	
Port of Melbourne Authority	105	207	58	332	64	113	(17 238)	
Port of Geelong Authority <sup>C</sup>	28	838	17	763	3	003	8 072	
Port of Brisbane Authority	41	834	19	807	14	527	7 500	
Gladstone Port Authority	48	817	13	723	20	284	14 810	
Fremantle Port Authority	42	688	36	698	5	174	816	
Port Hedland Port Authority	7	139	5	769	1	502	(131)	
Department of Marine and Harbors (SA)	40	565	26	427	18	508	(4 370)	
Marine Board of Hobart	7	397	5	453		770	1 174	
Port of Launceston Authority	10	002	4	221	5	355	426	
Darwin Port Authority	4	888	5	081	3	696	(3 889)	

TABLE 4.2 FINANCIAL PERFORMANCE OF SELECTED PORT AUTHORITIES, 1986-87

a. Includes finance charges and depreciation, but not abnormal and extraordinary items.

b. Before statutory contribution to consolidated revenue (where applicable).

c. Figures refer to the 18-month period ended 30 June 1987.

Source Port authority annual reports.

	<u>`</u>						
Port authority	Rev (\$ '	enue 000 )	Sur (defi be fin cha (\$')	olus cit) fore ance rges <sup>a</sup> 000)	T as (\$ '	Rate of return on total assets <sup>b</sup> (per cent)	
Board of NSW	300	032	112	399	1 004	549	11.2
Port of Melbourne Authority	105	207	33	406	527	102	6.3
Port of Geelong Authority <sup>C</sup>	28	838	: . 8	109	81	667	6.6
Port of Brisbane Authority	41	834	14	348	135	967	10.6
Gladstone Port Authority	48	817	25	298	240	749	10.5
Fremantle Port Authority	42	688	4	961	60	619	8.2
Port Hedland Port Authority	7	139		924	150	885	0.6
Department of Marine and Harbors (SA) <sup>d</sup>	40	565	11	757	130	712	9.0
Marine Board of Hobart	7	397	1	764	44	921	3.9
Port of Launceston Authority	10	002	2	800	46	780	6.0
Darwin Port Authority	4	888	(1 7	743)	46	653	(3.7)
-			-				•

## TABLE 4.3 RATE OF RETURN FOR SELECTED PORT AUTHORITIES ON A HISTORICAL COST BASIS, 1986-87

a. And before extraordinary and abnormal items.b. Based on asset values at the end of the financial year.

Revenue and surplus are for the 18-month period ended 30 June 1987. Rate of return is estimated on an annual basis. с.

d. The Department of Marine and Harbors in South Australia prepares its accounts on a cash basis with the exception of depreciation.

Source Port authority annual reports.

The economic income is the sum of the net operating income plus the change in value of the authority's assets during the accounting period. The change in asset values can be measured in nominal or real terms depending on whether rates of return are to be reported in nominal or real terms. Change in value in nominal terms is the difference between the value of the asset at the beginning of the period, measured in beginning-of-period prices, and the value of the asset at the end of the period, measured in end-of-period prices. Change in value in real terms requires all values to be estimated in prices current at one point in time.

Data are available for both the Port of Melbourne Authority and the Maritime Services Board which allow estimates of rates of return after a revaluation of fixed assets to reflect current replacement costs. The Port of Melbourne Authority produces financial statements in current cost accounting terms as well as historical cost terms. It includes rate of return calculations in its annual reports on a basis of depreciated replacement costs of its fixed assets and real values of finance revenues and charges. The written down current cost of assets and deferred expenses totalled \$1100 million at 30 June 1988, compared with total assets of \$525 million in the historical cost balance sheet. The operating profit in historical cost terms, after abnormal items but before finance charges and extraordinary items of \$36.5 million, became a loss of \$5.8 million, principally due to increases in depreciation expense and abnormal items, in current cost accounting terms. In 1987-88 the Authority's rate of return on total assets was a profit of 6.9 per cent based on historical costs, but this became a loss of 0.6 per cent when based on current costs.

Similarly the Curran Report estimated the effect of revaluing the assets of the Maritime Services Board. Non-current assets were revalued from \$791.5 million to \$1623.9 million as at 30 June 1987, increasing total assets from \$1004.6 million to \$1837.0 million. Estimates of financial results on a commercial basis reduced operating surplus after finance charges from \$49.687 million to \$18.224 million, reflecting increased depreciation and provisions for long service leave and annual leave. The effect was to reduce the rate of return on total assets, after finance charges, from 4.9 per cent to 0.99 per cent. On a before-finance-charges basis the reduction would be from the 11.2 per cent shown in table 4.3 to 4.4 per cent.

The current values of the non-current assets of both the Port of Melbourne Authority and the Maritime Services Board are in excess of twice the historical values. Table II.3 in appendix II shows that for the Port of Melbourne Authority the ratio of current to historical

costs exceeds 2.0 for land, buildings, improvements to land and dredged assets. These represent the major assets for virtually all port authorities and it is probable that if other port authorities were to revalue their assets similar ratios might be obtained. It is also notable that the real rate of return for both the Maritime Services Board and the Port of Melbourne Authority before finance charges and extraordinary items is some 6 to 7 percentage points below the rate of return based on historical costs.

If it can be assumed that the historical costs of non-current assets reported by other port authorities are similarly about half of the current values, then it seems that the real rate of return achieved by most port authorities is less than the long term real bond rate. Given that an appropriate rate of return for port authorities would in fact include a risk premium above that, it is apparent that the present rate of return achieved by many port authorities is inadequate. A possible conclusion from this is that port authority prices are too low. However, a move to an improved pricing system can encourage efficiency gains, which could offset any price increases which would have been required to allow for increased asset valuations.

## ECONOMIC EFFICIENCY

A second major objective of port authority pricing is to seek a pricing system that produces an efficient outcome. To achieve efficiency in an economic sense requires the achievement of both allocative efficiency and technical efficiency.

## Allocative efficiency

Allocative efficiency is concerned with the optimum allocation of resources. A port would be allocatively efficient if sufficient resources were allocated to individual port services and facilities so that users' demands were met at prices related to marginal costs. If the prices of services do not reflect the costs of provision there may be a misallocation of resources, with some services underutilised and others overutilised. The extent of misallocation of resources will depend on the degree to which demand is responsive to price. If demand is inelastic (unresponsive) the degree of misallocation will not be as great as if demand were elastic (responsive).

## Technical efficiency

Technical efficiency is concerned with producing the largest output from a given collection of inputs. If port authority services were produced and administered at the lowest possible cost and were as fully utilised as possible, a port would be technically efficient.

The minimisation of costs is essentially achieved through the implementation of policies unrelated to direct pricing policies. The removal of institutional barriers (including obsolete work practices), efficiency audits, and the setting of financial performance targets are all examples of methods that might promote internal efficiency in the ports. However, there are a number of possible ways in which the port authority's pricing strategies might influence technical efficiency and these are considered in a later section.

## Assessment of allocative efficiency

Allocative efficiency can be assessed in terms of the allocation of resources to ports in total, allocation among ports, and the allocation among competing services within a port.

## Allocation of resources to ports

There are two major effects pricing can have on the allocation of First, the setting of financial targets may resources to ports. influence the resources made available to port authorities. In the absence of cost based pricing and rate of return targets, investment decisions are often based on technical efficiency criteria. The pricing structure and the associated accounting framework make it difficult to attribute revenue and costs to particular facilities. There is a tendency to base investment decisions on the lowest-cost option of providing a desired service. A consideration of whether the service should be provided at all may not be included in the assessment. A pricing structure unrelated to costs can therefore lead to investment distortions. Port users have claimed that this has occurred and have suggested that there is considerable overinvestment in some facilities such as container terminals.

Second, allocative efficiency will be important when there are alternative uses, not related to the operation of a port, for assets currently devoted to port or port related use. When development pressures and land prices are high, as in Sydney particularly, and in other major cities to a lesser extent, management of land will increasingly be a major area of concern to port authorities.

If users are unable or unwilling to pay prices based on the full economic costs of facilities, including market values for land, then there will be an opportunity cost in continuing to use this land for port purposes. Joy (1988) highlighted the particular problems of land values in Sydney. Some land values on Port Jackson are so high that investment in berth improvements could not be justified by charges that vessel operators and stevedores would be prepared to pay.

## Allocation of resources among ports

In States where one authority or department administers several ports it is common practice to set uniform charges across all ports. It is unlikely that the operating costs of these ports are identical. If prices were related to costs, exporters and vessel operators would have some incentive to choose the lower cost facilities and thus enhance efficiency. A particular example is South Australia where many of the ports exporting wheat are reasonably close and therefore potentially competitive. (Clearly, the choice of port involves more than port prices: land transport costs and relative voyage times are also important factors.)

Basing prices on the market or replacement cost of assets in Port Jackson, especially for land, could result in greater use of Botany Bay and in the long run perhaps Newcastle or Port Kembla for non-bulk cargo in New South Wales. Joy (1988) argued that port operational land in Port Jackson should be valued, for an interim period of up to 20 years, at no more than the cost of new reclaimed land at Port Botany. He noted that the immediate application of 'next-door' values (related to adjoining land) in Sydney's Port Jackson would lead to pressures for unjustified expansion at Port Botany.

While generally there is little competition between ports, there are some circumstances such as those in South Australia and New South Wales where pricing could be used to provide information to users as to the most efficient ports. Inappropriate pricing policies in such circumstances can lead to investment decisions which may be incompatible with the most efficient allocation of resources between ports.

## Allocation of resources within a port

For most port facilities, fixed costs are a large proportion of total costs. Marginal costs are low and generally below average cost. The analysis in appendix III indicates that capital costs are the major component of the costs of providing common port authority services. The analysis also suggests that labour costs are also largely nonattributable to specific services to cargo and ships. A major pricing problem the ports face is how to cover these fixed costs. In a competitive market joint and common costs present no difficulties. Kolsen (1980), in discussing this issue, highlighted the role of the market in setting appropriate prices. $^1$ 

Producers in non-competitive markets usually charge 'what the market will bear'. Ports have traditionally adopted this approach by setting ship related charges based on the size of the ship (usually based on GRT) and by setting charges on cargo related to the value of the cargo.

Unlike many overseas ports Australian ports place a heavy reliance on cargo charges. Table 4.4 summarises this for the major capital city ports.

Wharfage charges are an inappropriate way to recover port authority costs for two reasons. First, the analysis of port authority cost structures in chapter 2 and appendix III indicates that port authority costs are generally unrelated to the amount of cargo handled by a port. The Maritime Services Board of NSW (1989), for example, has acknowledged that it receives about \$45 million per year from some organisations which use their own facilities and for which no service is provided by the Board in return for the wharfage revenue received. Wharfage, being not specific to any particular facility, cannot influence the behaviour of port users and cannot be used to influence allocative efficiency within a port.

Second, Joy (1989) identifies wharfage when paid by stevedores who have exclusive use of a berth or terminal as an important factor reducing intra-port competition. Port authority revenue from leased facilities comprises a rental component paid by the lessee and

1. The competitive market can solve the problem of pricing to recover joint costs via the mechanism of price adjusting to demand until the market is cleared. Prices of the various joint products settle at levels where the quantities demanded equal the various quantities produced in the joint process (where the proportions of the joint products cannot be varied). The quantities of joint products to be sold depend on the level of production at which the joint cost, including normal profit, equals the sum of the prices of the joint products. Similarly, a competitive market can determine the prices of products produced in a common process, where the proportions of the outputs may be varied by the producer. It does this by relating the ratios of their prices to the inverse of the production of others. Production settles at a level at which the sum of these prices equals the cost of production, including normal profit (Kolsen 1980).

Source of revenue	Percentage of revenue <sup>a</sup>							
		В	РМА	PBA	SA	FPA		
Charges on ships	11.	6	13.3	23.6	19.6	19.7		
Charges on cargo	43.	0	67.4	51.7	56.3	30.2		
Charges on services	8.	7	19.3	24.7	9.8	18.9		
Handling of cargo	36.	6	-	-	14.3	31.1		
Total	100.	0	100.0	100.0	100.0	100.0		

TABLE 4.4 SOURCES OF REVENUE FOR SELECTED PORT AUTHORITIES, 1986-87

a. Only revenue derived from servicing ships or cargo is included. Main revenue sources excluded are rents and interest.

MSB Maritime Services Board of NSW.

PMA Port of Melbourne Authority.

PBA Port of Brisbane Authority.

SA Department of Marine and Harbors (SA).

FPA Fremantle Port Authority.

- No charge.

Note Components may not add to 100 due to rounding.

Sources Port authority annual reports.

wharfage paid on cargo handled. The benefits to the lessee of increased throughput are lower under this pricing structure compared with a structure where all port authority revenue from the facility is gained from rents. The incentive to increase the utilisation and throughput through competitive pricing and service levels, and to improve the efficiency of the facility, is correspondingly attenuated. Because under this pricing structure leased facilities are less likely to be operated at maximum efficiency, additional facilities may be constructed by the port authority to cope with unsatisfied demand. Under these circumstances the pricing structure can have an influence on allocation of resources within the port.

As Joy put it, 'the way in which a port authority prices its tenancies to stevedores has the greatest single effect on port efficiency. If a port tries to collect a rent and then collect a large toll in the form of wharfage on every tonne handled it removes the dynamic efficiencypromoting incentive for its tenant' (in Ships and Ports 1989). The emphasis on cargo charges also means that port authorities are unable to estimate, with reasonable accuracy, the profitability of each facility. Allocation of resources, and investment decisions generally, are based on incomplete information and are therefore unlikely to be efficient.

Current pricing structures with their emphasis on wharfage and the lack of distinction between which berths are used provide little incentive to vessel operators to choose a berth most appropriate to Similarly when vessel operators make decisions on their operations. vessel acquisition, either through charter or purchase, port charges can be expected to play a part in the evaluation process. Port charges which do not reflect with reasonable accuracy the economic cost of the service provided may result in vessel choices which do not make optimal use of port facilities. For example, the Maritime Services Board considers that low ship charges have resulted in some ships with low unloading rates being chartered to call at the Botany Bay bulk liquids berth (Joy 1988). More appropriate pricing would provide greater incentive to choose a ship with faster unloading capacity.

## Cross-subsidisation

Many users criticise the pricing policies of port authorities because they are thought to lead to extensive cross-subsidisation. It is important in this context to distinguish between cross-subsidisation and price discrimination.

The economic definition of a pricing system free of cross-subsidies requires that no group of users is charged less than the incremental cost of supplying them. When financial balance is to be achieved. an equivalent criterion is that no group of users is charged at more than its stand-alone costs (Faulhaber 1975). The stand-alone criterion is relevant when there are common costs present in the supply of services. The supply of port authority services is generally characterised by low incremental costs so that it is unlikely that users are paying less than these costs. Channels and navigation are required either directly or indirectly by a11 facilities commercial users of a port. It is difficult to conceive of a group of commercial users which could go it alone and pay less than at present. Thus it seems unlikely that any group of commercial users is crosssubsidising any other group of commercial users. In many ports noncommercial users are not paying the incremental costs of the services they receive and some element of cross-subsidy towards them may be involved.

While the degree of cross-subsidisation as defined in economic terms is likely to be small, price discrimination is certainly widely practised by port authorities. In the presence of economies of scale, marginal costs are below average costs so that prices need to exceed marginal costs if financial balance is to be achieved. Pricing systems which set prices above marginal costs based on 'what the market will bear' or on Ramsey pricing principles (where price in excess of marginal cost is inversely related to the consumer's elasticity of demand) are examples of price discrimination.

Port authority services generally have high capital costs and low short run marginal costs. Some assets such as navigational aids and shipping channels have marginal costs close to zero and are more akin to pure public goods (which can be consumed by any individual without reducing the supply available to others). Conservancy charges and light dues charged for the services provided by such assets are often levied on a periodic basis. This is equivalent to a two-part tariff in which the usage related component (to recover variable costs) is zero and the access component (to recover fixed costs) is set to recover at least the full cost involved. The degree of cost recovery varies among port authority assets but it is unlikely that prices are below marginal costs for most services.

## Discrimination between import, export and coastal cargoes

Discrimination between export, import and coastal cargoes appears to have little basis in port authority costs. It does appear to be partly the result of an inherited tradition that port authorities should support local industries. However, the ability of port authorities to influence the level of trade by pricing is limited. It would appear that an objective of encouraging exports by lower wharfage rates is unlikely to be effective, and in today's ethos of economic rationalism it is hardly a role which port authorities should attempt.

There is some evidence that the practice of levying lower charges on coastal cargoes has its origins in the last century. Corkhill (1977) comments that port authorities in England in the latter part of the nineteenth century commonly adopted a pricing strategy of charging what the market would bear. At that time it was argued that coastal cargoes were not able to support the same level of charges as overseas travelled cargoes which had considerably longer distances. Historically, coastal cargo services might have been subject to competition from other modes of transport and could have been expected to exhibit a higher elasticity of demand for port services. In the context of Ramsey pricing, customers with high demand elasticities would attract lower prices.

.\_\_\_\_

However, Australian coastal cargo is largely captive to sea transport because of the distance involved, route characteristics (for example, Bass Strait) or cargo type. Discrimination in favour of coastal cargo by port authorities is unlikely to affect modal shares. It should be noted that the Port of Melbourne Authority in its recent review of its pricing structure proposes to remove all discrimination between imports, exports and between coastal and overseas cargoes.

#### Congestion

Where the demand for port facilities exceeds port capacity, congestion may become a problem. Some congestion has occurred in 1989, brought about by the increase in imports. Sydney and Brisbane have been It can be argued that when congestion occurs especially affected. port charges should be raised to a level that rations demand to the available capacity of the port facility and hopefully clears the market. In this way available capacity is rationed to those who value it most and are prepared to pay the congestion surcharge to benefit Conversely, in cases where excess capacity from use of the port. exists, pricing policies can theoretically be used to encourage the use of the excess capacity. However, the rationing of scarce facilities, or encouraging the use of excess capacity, through pricing policies again depends on the demand for port authority services being sensitive to price changes. If it is not, such pricing policies will have only limited effects on demand but will of course add to port authority revenue if there is excess demand, thus helping to fund capacity expansion.

Joy (1988) in his review of the Maritime Services Board of NSW has recommended the use of congestion surcharges at certain underpriced facilities to reduce excess demand and to test the market for increased capacity, in terms of the users' willingness to pay.

## *Community service obligations*

Community service obligations (CSOs) are services provided at government direction for the benefit of the community as a whole or specific community groups. The prices charged for CSOs generally fail to recover fully the costs of providing the services (BTCE 1988c, 2). Port authority CSOs may include the provision of facilities for pleasure craft and fishing fleets, landscaping of port foreshores and the maintenance of historical waterfront facilities.

Examples of elastic demand for port services are hard to find but may apply to some CSOs such as port facilities for small pleasure craft. In this case, boat owners paying charges less than marginal cost will be encouraged to overconsume port services. If relevant port charges were set to reflect costs, some pleasure craft operations might be

excluded from the market and a more efficient allocation of port resources would follow.

The Bureau (BTCE 1988c) noted that a key condition for the existence of a CSO is that in the absence of a direct or indirect government requirement for the provision of the service the service would be terminated, reduced in quality or higher prices charged. It has been indicated to the Bureau that vessel operators are generally not concerned at port authorities performing activities such as landscaping. However, they are concerned that the level of funding for CSOs derived from the revenue obtained from commercial operators is seldom disclosed in annual reports.

Other ways in which CSOs can be funded include direct payments (subsidies) by governments and more indirect methods such as the acceptance of lower dividends or target rates of return, or writing down the value of the assets to reflect the discounted stream of future obligations (BTCE 1988c, 10). These indirect methods have the disadvantage of reducing the transparency of subsidisation.

CSOs would generally appear to represent a small proportion of expenditure for most port authorities. The main issue is that they be clearly identified and that the method of funding be stated in annual reports.

## Assessment of technical efficiency

There are some technical efficiency implications of the current pricing structure. In a competitive environment the relationship between prices and costs is more apparent. But in chapter 2 it was shown that port authorities generally operate in markets in which there is little evidence of competition. This has given port authorities considerable freedom in the setting of prices. This freedom has meant that there has been only limited pressure to control costs and little incentive to relate prices for services to the costs of providing them. For most port authorities the method of keeping accounts has meant that there is little information on the level of costs of operating individual facilities. However, there are initiatives by some authorities (for example, the Port of Melbourne Authority and the Maritime Services Board of NSW) to establish profit centres so that costs and revenue of individual facilities can be matched.

A port's technical efficiency may be influenced by the pricing policies it adopts, in several ways. First, the structure of charges could be designed to encourage higher productivity of port facilities.
For example, charges which are based on the time involved in the use of facilities may be effective, particularly if heavy penalties are imposed for excessive delays on the part of users. If such charges were applied to berthing or cargo handling this could improve the utilisation of port facilities and raise port productivity. In the longer run such policies might influence the choice of vessel used in particular trades. The use on the Australian coast of chartered tankers with low discharge rates, cited earlier, is an example of inappropriate ship and berth charges leading to congestion at the Port Botany bulk liquids berth.

The relatively low ship charges make port calls by ships with low volumes of cargo to load and discharge more attractive. Each ship call normally involves several hours of unproductive berth time while the ship is being made ready for stevedoring after arrival and made ready for departure after stevedoring is completed. Data provided by the Australia New Zealand Europe Container Service (ANZECS 1988a, 1988b) indicated that this time was of the order of five to ten hours This unproductive berth time means that a depending on the port. pricing system which encourages ships with low volumes of cargo to load and discharge reduces berth utilisation. However, allocative efficiency would be attained if vessel operators were charged the true opportunity costs, even if they still found it profitable to load and discharge small volumes of cargo.

Second, pricing policies of port authorities can improve technical efficiency if they can be used to help avoid excess capacity developing at port facilities. Excess capacity occurs when existing plant is not used to its full potential, or can occur temporarily when investment 'lumpiness' means that new plant capacity exceeds traffic demand at the time of installation. Its consequence is usually higher average costs which may be passed on in the form of higher prices. Pricing policies can only cause excess capacity (or conversely only help eliminate excess capacity) if demand for relevant facilities is sensitive to price changes. The effect of high wharfage charges on cargo passing through leased facilities, discussed earlier, is an example of the effect of pricing on technical efficiency.

A third way in which port authority pricing policies may be related to technical efficiency is through the method by which price increases If charges for some or all port authority services are determined. and facilities are increased on the basis of a 'cost plus' formula this will not on its own be conducive to the minimisation of costs. In situations of monopoly or high market power, there is ample scope the and toleration of internal for the padding of costs inefficiencies, particularly if it is known that any cost increases

can be assuredly passed on to port users in the form of increased charges. Consequently, it would be prudent to accompany cost based pricing policies with other measures, such as the imposition of price  $caps^2$ , which create pressures to reduce costs.

## EQUITY .

The need for the basis of charging to be equitable is of concern to the users of port services, as is evidenced by the National Bulk Commodities Group submission (1988) to the recent Inter-State Commission Waterfront Strategy Inquiry. It may also be important to port authorities and governments to have some degree of fairness in the port pricing structures, if only for the reason that there are fewer grounds for criticism from the users and the community as a whole.

The major difficulty with an equity objective for port pricing policies is that there is no single definition of how the concept of equity is perceived; it can mean different things to different people. A common notion of equity is that there should be an equal treatment of equals and that customers in a market should pay according to the benefits they receive from the service.

The question of incidence of charges is closely related to equity, as the actual burden of port charges will not only depend upon where the charge is levied in the first instance, but will also depend on the degree to which the users so charged can pass on these charges to other users or customers in the prices they charge for their services. The degree to which charges can be passed on depends on the relative elasticities of demand for, and supply of, the services available within the port.

In a previous paper the Bureau noted that available results suggested that the major proportion of international transport costs (including port costs) was borne by Australian importers (80 to 90 per cent) and

62

<sup>2.</sup> A price cap formula restricts a government business enterprise from raising prices in any year by more than CPI - X. That is, the maximum price increase is constrained to be less than the increase in the consumer price index by at least the amount specified by X. The approach is designed to force authorities to improve efficiency rather than relying on price increases to achieve financial balance. Victorian port authorities are already subject to this form of constraint on price increases.

exporters (60 to 80 per cent) (BTCE 1988a). For many equity issues, such as the balance between cargo and ship based charges, alterations to current pricing structures may have little effect on which groups ultimately bear the burden of the charges, despite the heated debate which may take place when such changes are mooted.

In the Curran Report (New South Wales Commission of Audit 1988) it was estimated that, on a commercial basis, losses of \$23.3 million in Port Kembla are covered by surpluses generated in Port Botany and Newcastle. Maritime Services Board pricing practices which produce this result are counter to the notion of equity discussed earlier. In this instance this inequity is not redressed by incidence effects.

The practice of levying charges on a periodic basis rather than a usage basis for conservancy, and also Commonwealth light dues and the oil pollution levy which, while not port authority charges, are port related, also has equity implications not redressed by incidence effects. Periodic charging obviously benefits vessels making frequent use of port facilities, and disadvantages those which make only one or two port visits within the period for which the charge applies. Coastal vessels thus gain greater benefits for the amount they pay than do overseas trading vessels, especially those on voyage charter as is common in bulk trades. In 1985-86 interstate and intrastate trading vessels contributed less than 1 per cent (\$0.35 million out of \$36 million) of the amount collected for Commonwealth light dues (National Bulk Commodities Group 1988).

As well, these periodic charges are generally levied only on trading vessels, with fishing vessels, defence and State government vessels, pleasure craft and other non-trading vessels generally not charged. Cross-subsidisation is probably not involved, as the marginal costs of navigation aids and buoys are zero or close to zero, but it is regarded as inequitable by those users who pay, such as members of the National Bulk Commodities Group.

## OTHER OBJECTIVES OF PRICING POLICIES

Simplicity in pricing structure provides obvious benefits to both the port authority and the port users. For the former, there are administrative efficiencies to be gained from a port charging system that avoids complex price variations for small differences in cargo type, size and other characteristics. Similarly, the users of port services will save time and be more satisfied in their dealings with the port authorities if pricing policies and structures are concise and easy to understand. The heavy reliance on cargo charges in many Australian ports has resulted in a complex charging system which can be difficult to understand and administer.

An objective of assisting economic development through low port charges, especially for exports, is based on the relationship between the ports and the rest of the economy. Governments may wish to adopt port pricing policies designed to have an effect on economic activity within the port's catchment area and so promote exports. However, from an economic perspective, it is preferable and more effective for governments to promote economic development through direct grants or subsidies, rather than by tampering with the price mechanism of service providers.

# CHAPTER 5 DIRECTIONS FOR CHANGE IN PORT PRICING PRACTICES

The previous chapter has outlined some of the areas where current pricing practices are inconsistent with the normal objectives of pricing policy. This chapter identifies in broad terms an approach which, if adopted, would result in pricing practices more consistent with economic theory. Practical constraints are taken into account, where a strict application of economic theory may be unrealistic.

The chapter also considers the impact a more rational pricing system may have and outlines recent initiatives towards pricing reform being undertaken by port authorities and State governments.

## DIRECTIONS FOR CHANGE

In economic terms the power of a pricing system is the influence it can have on the behaviour of economic agents. It is important, therefore, in recommending changes to existing pricing systems that behavioural aspects are considered. There is little point in making a change to a pricing system if the change has no effect on the decisions of providers or consumers of the relevant services. The following discussion places some emphasis on this aspect.

## Financial balance

Economic theory suggests that when prices are set equal to marginal costs of production, then under certain conditions economic efficiency is maximised, in the sense that no-one can be made better off without someone else being made worse off by any change in resource allocation (Pareto optimality). The conditions under which such an optimum could be reached are not in practice achievable. In chapter 2 it was argued that the major services provided by port authorities are characterised by a high level of fixed costs which implies decreasing average costs. Setting prices equal to marginal costs would result in authorities incurring ongoing financial losses.

The difference between marginal and average costs can be met either by subsidies from governments, by the use of two-part tariffs, or by

adoption of average cost pricing. The subsidy approach is generally not favoured by governments. A number of factors have contributed to this. Generally fiscal constraints on State governments have meant that they have increasingly looked to their statutory authorities to achieve improved financial performance to reduce their budgetary impacts. There has also been an increased expectation that statutory authorities should be more commercial in their operations in the interest of economic efficiency. Furthermore the distortions in the economy resulting from the additional taxes required to finance the subsidy may possibly more than offset any efficiency gains through marginal cost pricing, especially in view of the analysis in the previous chapter which concluded that the efficiency loss from the achievement of financial balance is small.

## Pricing principles

The pricing principles which follow from the analysis in this paper are similar to those developed at a pricing and cost recovery seminar held in 1979 (Federal Department of Transport 1980). These principles can be expressed in the port context as follows:

- . Where an increment of activity by a user imposes a marginal cost on the port authority the user should pay that cost.
- . Where the use of a facility deprives another potential user of access (congestion) the user should pay a rent for the amount and time of occupancy of the facility. The user should never be charged on the level of activity or throughput obtained from the facility because this reduces the incentive to get the maximum out of it, as demonstrated by Joy (1989).
- . The marginal costs incurred by a port authority for each increment of throughput of cargo (or for each additional ship) are usually low so that the charges described above are unlikely to generate enough revenue for financial self-sufficiency. The port authority must impose additional charges to achieve this. These additional charges should be designed to have a minimal effect on the demand for port services.

The first two principles indicate a move to charges based on the costs of providing individual port services (cost based charges), rather than general charges aimed at meeting the port authority's overall revenue target. Most writers favour this approach (Centre for Transport Policy Analysis 1988; Heggie 1974; Joy 1988). The arguments in favour of cost based pricing rest on its potential influence on the behaviour of participants in the port industry (cargo owners, vessel operators and port authorities). In this context the costs used in setting prices are the economic or opportunity costs of the resources

consumed in providing the services. Introduction of improved pricing practices will need to be accompanied by other pressures such as performance targets and the setting of price caps to ensure potential efficiency gains are achieved.

The cost structure of the major port authority services was discussed in chapter 2. It was shown that generally the fixed costs were a large proportion of the total costs and that, for the most part, port authority costs were not related to the amount of cargo moving through the port. The costs recovered according to the first principle will be a small proportion of total costs. The most important issue in port pricing is that of covering the costs in excess of marginal For the reasons discussed by Joy (1989) the most efficient costs. method for covering the costs of leased premises is by means of rentals rather than a combination of rentals and wharfage charges. Similarly rentals for the time of occupancy of berths are the most efficient method for recovering berth costs. Whether the charge is levied on the stevedore or the ship is not important because the efficiency incentives provided by the use of rentals rather than wharfage will be present no matter which party is charged. Similarly, charges for the storage of cargo on common-user berths could be levied on either the stevedore or the cargo owner. In practice, a charge levied on the stevedore would be administratively simpler for the port authority.

The most difficult issue is charging to recover the other costs above marginal costs. These are predominantly costs associated with channels, breakwaters, navigational aids and other facilities for ships. These costs are joint and common costs, unattributable to particular ships or individual activities in the port. Pricing to recover these costs must be designed so as to minimise any negative effects it might have on demand and efficiency. Two basic approaches are often suggested by economists. These are the use of Ramsey prices and two-part tariffs. Both approaches require that each user cover marginal costs, but differ in the manner of charging for costs in excess of marginal costs.

Under Ramsey pricing the portion of the price above marginal cost is set in inverse porportion to the user's price elasticity of demand. The prices set according to Ramsey pricing principles will be low for those users most responsive to price changes and higher for those less responsive. The objective is to minimise the reduction in demand as a result of setting prices above marginal cost.

The elasticities which need to be known for setting Ramsey prices are extremely difficult to measure and consequently Ramsey pricing in its

pure form is not a practical tool for port authorities. The concept of minimising the effect on demand is a useful one in developing alternative approaches.

In principle, the costs above marginal costs could be recovered by charges on either cargo or ships. Cargo based charges are normally based on the volume of cargo, but usually at higher rates for higher valued commodities. Given that value based charges would often involve uneconomic costs of administration and compliance, charges at higher rates for higher valued commodities may provide a practicable approximation to the Ramsey principles. For ships, the charge is usually based on gross registered tonnage (GRT). A uniform charge per ship would be clearly unsatisfactory as it would unnecessarily deter small ships from using the port. A charge based on ship earning capacity is a much more attractive approach. Such an approach would provide incentive for efficient use of ships and port facilities and would not unduly favour one size of ship compared with another.

In the past port authorities often chose net registered tonnage (NRT) for setting ship based charges as it was meant to be a measure of the earning capacity of the ship. In more recent times NRT has been replaced with GRT mainly because NRT has become less reliable as an indication of earning capacity. Length of ships and draft are often suggested as bases for charging for berth and channel use respectively because these measures are said to be more closely related to the cost of provision than GRT or NRT. However, the theory of Ramsey pricing treats the fixed costs as sunk costs and uses the pricing system to recovery these costs with minimum distortion to allocative efficiency. This suggests that earning capacity and its proxies have a better theoretical foundation in meeting efficiency criteria. In any case there is usually a good correlation between length, draft and GRT.

For most trades and ship types the elasticity of demand for port services is likely to be low and the use of a charge on GRT is unlikely to produce significant distortions. However, there may be some particular operations which are sensitive to increased ship based charges. Port authorities may need to modify the rate per GRT for these particular ships. The proposed Port of Melbourne Authority (1989a, 1989b) pricing reforms highlighted cruise ships as a ship category which apparently had a higher elasticity of demand than other ship categories.

The other pricing approach, two-part tariffs, requires that each user pay a lump sum as a type of entry fee (or annual charge) to cover fixed costs and a separate charge to cover the marginal cost of each service consumed. As noted in chapter 4 conservancy dues have the

characteristics of a pricing system of this type. The marginal costs are close to zero, so once the lump sum charge is paid no further charges are levied during the specified time period. However, it was argued earlier that this approach can give rise to some equity issues between different classes of ship operators.

As noted earlier, when new investments are requested by port users a different basis for charging may be appropriate depending on the type of investment requested. Heggie (1974), for example, suggests that if vessel operators request that a channel be deepened then the costs of the channel could be recovered by levying a surcharge on all ships benefiting from the deeper channel. Where a particular trade requests the channel deepening then the charge could be based on the volume of cargo benefiting from the investment. The dredging of Newcastle harbour is a specific example. This approach is consistent with the equity principle of paying according to the benefits received.

The second principle relates to congestion charging which was discussed in chapter 4. Congestion in that context referred to excess demand for port facilities by port users. Congestion can also occur because of excess demand for access to port assets by non-users. The most important example is that of land for which demand can be extremely high in some of the capital city ports. Port users can expect to have to pay a charge for the use of this land which demonstrates that they value access to it at least as much as alternative users. The question of land values is taken up later in this chapter.

In chapter 2 it was shown that with few exceptions (principally grains) cargo owners have little choice of port. Differences in port charges are unlikely to influence the port they choose. While a change to a cost-based pricing system would result in some charges, especially cargo-based charges, declining and other charges increasing, the overall difference in costs faced by cargo owners may not be large. A reformed pricing system is unlikely to affect the choice of port by most cargo owners.

As Joy (1988) has noted vessel operators are prepared to pay quite large sums of money in land transport costs to centralise cargo on specific ports. Any changes to port charges per ship visit resulting from a reformed pricing system are likely to be small per unit of cargo for most ships relative to land transport costs between ports so that a cost based pricing system would have little impact on the ports chosen for most ships. The possible effects where some competition presently exists are discussed in more detail later in the chapter.

Vessel operators are likely to pass forward to cargo owners increased ship charges resulting from a reformed pricing structure, in the form of increased freight rates for trade passing through ports adopting pricing reform. This has implications for the continuance of the pan-Australian freight rate, common in liner trades, especially if some ports adopt pricing reforms while others do not.

A reformed pricing system may have some influence on vessel operators' choice of ship technology. In the short run it is unlikely that port charges would have a great deal of influence on this choice. In the long run a pricing system which fully recovered the costs of services provided for ships is much more likely to influence a choice of technology which optimises overall system costs.

Some evidence for this is given by Corkhill (1977) who commented that one of the criticisms of tonnage measurements has been the influence various measurement systems have had on ship design. Generally the design approaches have been to reduce NRT and hence port charges based on this measurement, while maintaining effective cargo carrying capacity. This suggests that choice of ship technology can be sensitive to port charges, especially if port users requesting the provision of a specific facility are expected to pay fully the costs of the facility. They are then more likely to make an optimum choice in terms of the balance between port investments and ship technology.

Even though vessel operators are likely to pass forward the increases in ship based charges so that the burden of these increases will fall largely on cargo owners, rational vessel operators would respond to the higher charges by seeking out those facilities and operating procedures which would reduce the charges levied by port authorities on their ships. This would, of course, provide relevant signals to port authorities on where their resources are best directed. In the longer run productivity enhancing investment in port facilities by stevedores and port authorities would become more attractive. Overall, at the micro-economic level within the port many changes which improve efficiency could occur.

A cost based pricing system requires that port authorities know what their costs are. Many authorities are presently unable to obtain this information in other than aggregated terms. A number are developing systems which will provide this information. A requirement to achieve a target rate of return on investments also implies that port authorities would need to take account of prices and costs when investments are being evaluated. Thus a rational pricing system is an important component of the driving force for improved port authority efficiency.

70

Users, by their choice of facilities and equipment, would also provide port authorities with better information on the adequacy of the facilities and equipment they provide. Equipment breakdowns can have major effects on berth productivity. If the port authority is responsible for the provision and maintenance of equipment such as at common-user berths, it will need to adjust its berth hire charges during the period of a breakdown to reflect the reduced service provided to the ship, otherwise the port authority would have reduced incentive to provide reliable equipment. Cost based pricing can therefore also provide incentives to the authority to adopt maintenance and equipment replacement policies which improve berth efficiency.

Another example where a move to cost based pricing would result in important changes is the practice of setting uniform tariffs for ports with different cost structures, which may occur when a port authority or government department controls more than one port within a State (Joy 1988; New South Wales Commisssion of Audit 1988). This differs from price discrimination (wherein users are charged different prices according to their price elasticities of demands for services or other criteria). Here, users are charged the same price regardless of the costs of providing the service or the quality of service provided in the different ports. The major ports of New South Wales controlled by the Maritime Services Board and the South Australian ports controlled by the Department of Marine and Harbors have such uniform tariff schedules.

This has led to pressures in New South Wales for separate port authorities for Newcastle and Port Kembla. Joy (1988) concluded that a pricing system based on costs, with separate profit centres for Newcastle and Port Kembla, would resolve this issue and that separate port authorities for Newcastle and Port Kembla were not a prerequisite for this policy to be adopted. However, the New South Wales has recently announced the establishment of three government subsidiary corporations of the Maritime Services Board to administer the ports of Newcastle, Port Kembla and Sydney-Port Botanv These corporations will eventually be given full respectively. autonomy (Financial Review 1989).

When individual ports can set prices based on their own cost structures, the potential for inter-port competition should be enhanced, and given that ports are subjected to commercial discipline by State governments, this should yield efficiency gains. There is some evidence that where investment and pricing are not subject to commercial discipline, competition between ports can lead to overprovision of infrastructure or excessive costs.

#### Cross-subsidisation and CSOs

The more accurate measurement of costs required for a cost based pricing system would allow cross-subsidisation of one class of user by another class of user to be identified, and eliminated where this were thought desirable. The previous chapter has argued that the extent of cross-subsidisation in ports is fairly minor, as most users would be paying enough to cover the relatively small short run marginal costs involved in the provision of many port services. The most likely example of cross-subsidisation would occur in relation to community service obligations (CSOs) which are to some extent funded by commercial port users.

The improved information required by a cost based pricing system allows the costs of CSO related services to be more accurately identified. These non-commercial services could be funded directly from consolidated revenue if the 'user pays' principle was thought undesirable or inapplicable. However there is evidence that for some CSOs, commercial users are more concerned that the extent of this cross-subsidisation be identified, rather than entirely eliminated, so that the issue is also one of transparency, which can be enhanced by cost based pricing.

## Asset valuation

The recovery of capital costs is especially important in the setting of prices for port authority services. As noted in chapter 4 most port authorities base their accounts on historical asset costs. This generally leads to a divergence between the reported financial performance and the economic performance of the authority. Commercial practice is for non-current assets to be revalued at appropriate times. If port authorities are to adopt a more commercial approach to their operations then they too will need to revalue their assets on a regular basis.

There are also good economic reasons why assets should be revalued. Primarily this is to ensure that the reported costs of assets employed by a port authority more closely reflect the opportunity cost to society of employing resources in port applications rather than some alternative use. Appendix II gives a more detailed discussion on asset valuation and depreciation.

There is evidence that some port assets are greatly undervalued at present, and that if replacement costs or opportunity costs were used, considerable increases in charges for the use of those assets would be required to achieve a commercial rate of return. A more likely outcome is that port authorities would have to examine the performance

72

of their assets more critically. Those assets found to be underperforming or unused would be disposed of or consolidated so that the asset base would be more appropriate to the demand expected for the authority's services.

The issue of what value should be placed on channels and breakwaters is a contentious one. In particular, a properly maintained channel will not physically depreciate over time. It may well become obsolescent through economic or technical factors. The period of time over which payments should be levied for channels and breakwaters and what rate of return should be obtained are the subject of considerable debate. The resolution of this debate is beyond the scope of this paper. In principle, if a channel is recorded in a port authority's asset register it should be expected to earn a rate of return like any other asset.

Land deserves separate consideration. Port authorities often had land vested in them at no cost, or else had obtained it in the past at costs which bear no relationship to current values. However, the opportunity cost of using land for port authority purposes can be high, particularly for land located close to the central business districts of major cities. In these circumstances port authoritites should seek to earn a target rate of return on the use of port land which reflects the fact that port use is at least as valuable as any alternative use. If port users are unwilling to pay charges which achieve a target rate of return then clearly welfare can be improved by releasing the land for alternative uses where appropriate rates of return can be achieved.

The port of Sydney is a particular example where, at current pricing levels, a number of facilities would be unable to earn a satisfactory rate of return if waterfront land were valued at market prices. According to Joy (1988) limitations in transport links with the port would prevent these facilities achieving potential throughputs and would limit their ability to achieve adequate rates of return at market valuations of land. Inevitably these facilities would need to be transferred to Botany Bay or elsewhere but Joy argues that at present levels of trade new investment in Botany Bay may not be able to be justified.

Under these circumstances, when existing fixed assets reach the end of their economic lives it is unlikely that they will be replaced at their present sites. For these facilities the valuation methods presented in appendix II need some modification. Although some of these facilities will be replaced, they are likely to be replaced at a new site in Botany Bay. While it may be infeasible for them to earn

an adequate rate of return on realistic land valuations at their present site they should be able to earn an adequate rate of return on the basis of a lower value site. Joy (1988) suggests this approach in recommending that for rate of return purposes facilities in Sydney harbour should have land valued on the basis of similar reclaimed land in Botany Bay. If an adequate rate of return cannot on be earned this valuation basis the facility should not be replaced at all. In these circumstances the asset should be valued at its net realisable value.

Port authorities may wish to reserve land for future port use. If there is demand for an alternative use of the land there will be a market value for it and this should be reflected in its valuation in the authority's asset register. The port authority has the option to lease out the land until it is required for port use.

An important issue is how capital costs are reflected in port authority prices. Appendix II summarises some of the literature on this point. The calculation of the optimal amortisation of capital costs is very severe on data (Parmenter & Webb 1976). However, Parmenter and Webb suggest a rule of thumb which is a reasonable approach for durable assets with avoidable costs per unit of output which increase over time relative to the marginal costs of the system. The rule suggested is that the allocation of the capital costs over time should be on a declining rather than a constant basis and that the first year amortisation allowance should exceed that given by a constant annuity.

#### Rate of return

Rates of return are important from two points of view: from the standpoint of the port authority's investment policy, and from the standpoint of 'dividend' payments to State governments by port authorities.

In principle the target economic rate of return should equal the pretax rate of return achieved elsewhere in the economy for investment of equivalent risk. The concept of an economic rate of return is discussed in appendix II. Investments in port development should only be undertaken, from an economic point of view, when the expected economic rate of return equals or exceeds the rate of return target. In appendix II it is argued that port investments are not risk-free. This conclusion is derived from the fact that port throughput and hence revenue is strongly correlated with general economic conditions. Target rates of return should therefore include a premium above the risk-free rate of return.

-----

The rate of return in the corporate sector provides a guide to the setting of rates of return for port authorities. Estimates of corporate rates of return are available from several sources, all taking different approaches. A sample of these is illustrated in table 5.1. It is apparent that the different approaches lead to very different estimates.

However, there is agreement on the need for inflation adjusted (or real) estimates of the rate of return. Estimates of rates of return based on historical cost would be an unsatisfactory basis for developing benchmarks for government business enterprises.

A percentage levy on revenue, as is current practice in New South Wales, Western Australia, and for the Port of Brisbane Authority, is, in effect, a tax on port users rather than a reward for investment.

			Estimated r	rate of return			
<i>Source of</i> <i>estimate</i>		Period	Minimum	Average	Max imum		
Department of Finar	nce 1	1967-68 to					
		1985-86	4.0	7.4	11.6		
Department of Finar	nce 2	1967-68 to					
		1985-86	4.4	11.2	16.7		
Swan		1966-67 to					
		1982-83	3.4	5.9	7.8		
Cronin 1		1968-69 to					
		1982-83	7.5	10.4	12.7		
Cronin 2		1968-69 to					
		1982-83	6.8	10.2	12.3		
Cronin 3		1968-69 to					
		1982-83	4.8	10.7	13.8		

TABLE 5.1	ESTIMATED REAL	PRE-TAX R	ATES OF	RETURN	ON	TOTAL	ASSETS	IN
	THE AUSTRALIAN	CORPORATE	SECTOR					

(per cent)

*Note* These estimates differ in respect to:

 data sources (for example, National Accounts, company reports, sharemarket data);

 coverage (the Swan results, quoted in Department of Finance (1987), refer to large quoted companies; the others refer to the entire private corporate sector); and

. the conceptual basis for inflation adjustment.

Sources Cronin (1985); Department of Finance (1987).

Already there is a movement away from levies based on a percentage of revenue towards dividends based on rate of return as the basis for port authorities' contribution to consolidated revenues.

Achievement of target rates of return is not, in a largely uncompetitive environment, a sufficient indication of operational efficiency. In the absence of government price controls, target rates of return can be met merely by increasing prices. Other measures are necessary to ensure that port authorities have incentives to reduce costs as well as using the pricing system to achieve rate of return targets. These could include specifying target levels of performance to be achieved by port authorities, or setting price cap formulas to be adhered to, or some combination of these.

## Investment policy

There is a strong linkage between pricing, asset valuation, rate of return targets and investment policies. With current port pricing practices it is not possible to match revenue with the costs of providing specific services. It therefore becomes extremely difficult to determine whether a particular asset is earning a target rate of return. Port managements are unable, for many assets, to know which assets are performing satisfactorily and which ones are not. Asset management becomes much more difficult.

Perhaps more seriously, when revenue and costs cannot be associated unambiguously with specific assets, it becomes difficult to adequately evaluate proposed investments. If it is not known what revenue an asset is likely to generate it is not possible to know the rate of return that can be expected from the investment. The management of the port is then unable to determine whether the proposed investment is better from a commercial viewpoint than some alternative use of the port's resources. A related issue is that when a port authority is largely dependent on wharfage for revenue it becomes difficult for the authority to focus the pricing system to recover the costs of an investment from the beneficiaries of that investment.

Joy (1987) commented that the Port of Melbourne Authority investment appraisal procedures were technically sound but were vulnerable to judgments about revenue and external factors. He also commented that the procedures tended to be aimed at minimising costs rather than maximising profit. Similar comments apply to virtually all port authorities.

The Centre for Transport Policy Analysis (1988) also points to the direct relationship between pricing and investment. It was noted that investment evaluation in Australian ports is based on discounted cash

flow techniques using revenues accruing to the port authority as the only benefit from the investment. While it is debatable whether the revenues attributable to the investment can be adequately identified, it is clear that a port's pricing policy has a major influence on the port's investment behaviour. An implication is that if the port's pricing policy has deficiencies, then so too will its investment policies.

In the private sector funds are only committed to new investments when they are expected to achieve an adequate rate of return. Port authorities are now expected by State governments to adopt commercial practices and therefore should adopt similar investment rules to the private sector.

When a port user requests a new or expanded facility the port authority has two alternatives. It can require the users benefiting from the new facility to pay charges for its use which would achieve the port authority's target rate of return. If the users are unwilling to pay these charges then there is little justification for the investment to proceed. Alternatively, the port authority can instead allow the user to construct the facility using the user's own funds subject to whatever operational requirements are necessary for efficient port operation. Since port authority costs are not affected, the cost of the new facility would not be reflected in port authority prices. The choice of approach would depend on the type of facility and issues such as whether the user will have exclusive access to it.

### Leasing policy

Port authority leasing practices currently involve long leases (20 to 25 years typically) and often involve asset valuations which seriously underestimate the value of the property being leased. Container terminal operators in major ports are generally in an oligopoly position, and towage operators have a monopoly in most ports. Port users and some port authorities have expressed concern that long leases have resulted in reduced quality of service and high prices (Inter-State Commission 1988a).

It has been proposed (Goss 1987) that short term leases (about five years) be adopted by port authorities to encourage so-called serial competition between contenders for the right to operate port services using port facilities. Such an approach would have implications for port authority investment, given that the shorter the lease period involved the less intermediaries would be willing to make capital investments in facilities. Specialised equipment and infrastructure

may have to be provided by port authorities rather than by the operators.

In the Australian market there is doubt as to the effectiveness of short term leases in reducing an operator's market power. It is the exclusive use of the facility conferred by the lease that facilitates market power, not the length of the lease. With the small number of stevedores and terminal operators in Australia it may be difficult to develop competition for the renewal of short term leases. In some of the larger ports the potential tenderers for the lease may already hold a lease in the port. Competition would not be enhanced if they were successful.

Joy (1989) identified the practice of relying on both rental revenue (collected from lessees) and wharfage revenue (collected from cargo owners) to recover port authority costs of providing leased facilities as an important factor reducing technical efficiency. Achievement of technical efficiency would be enhanced if wharfage charges on cargo passing through leased facilities were substantially reduced or preferably eliminated and port authority costs were recovered through rental charges alone. As Joy put it, 'Pay me a fixed rent which covers our costs and go your hardest to maximise your own profits by lifting throughput' (in Ships and Ports 1989).

Adoption of the recommendations of the Inter-State Commission (1989), to prevent the transfer of leases and to allow termination of leases on the grounds of poor lessee performance, would also contribute to improved efficiency.

## Tariff simplification

Current port tariff schedules are often complex and time consuming to administer, particularly in regard to wharfage charges, which exhibit a great range of rates varying with commodity and by trade (export, import or coastal). There are differences between ports in terms of categories of charges levied, terminology used, levels of charges (in both relative and absolute terms) and in the range of wharfage categories, as discussed in appendix I.

Savings in administrative costs to both port authorities and users would accrue from the simplification of tariff schedules. As well, any increase in the uniformity of classifications and in the general comparability of tariff schedules would be of benefit to port users and policy makers alike in decision making.

## Current initiatives

As noted in chapter 1, port authorities and governments have, in recent years, become aware of the need for pricing reform in ports in order to promote efficiency. The general thrust of reforms under way is consistent with the directions for change outlined earlier in this chapter. In particular, the Port of Melbourne Authority and the Maritime Services Board of NSW are actively pursuing the reform of their pricing practices and policies.

Joy (1988) has reviewed the administration of the Maritime Services Board and recommended, among other things, the adoption of cost based pricing, the 'unbundling' of prices, a user pays and cost recovery approach to pricing, the phasing out of commodity based charges, and the use of congestion surcharges where appropriate, especially at some underpriced facilities. He recommends that wharfage rates be related to a particular berth rather than to commodity, and that berth hire vary with the service quality available at that berth. Individual Maritime Services Board ports should be given the opportunity to set prices independently, depending on their costs, and to negotiate tailor-made packages for particular trades.

All assets should be priced to earn a target rate of return, based on true market values of the assets (with some exceptions relating to land in Sydney), and dividends to the State government should be based on a return on net assets. (This latter approach could be somewhat generous to State governments if a significant proportion of a port authority's assets were funded from retained earnings.) Joy sees pricing reform as an element in reducing the total revenue requirements of the port authorities, increasing pressures to reduce costs and rationalise assets.

The Maritime Services Board (1989) has recently published a proposed new structure for pricing in New South Wales ports. The plan is for a phased restructuring which would eventually result in the elimination of harbour rates (wharfage). The proposed new structure is illustrated in table 5.2.

The proposed new berth hire charge would be paid by stevedores for the use of common user berths. The Board estimates that at the end of phase 1 ship based charges would contribute 17 per cent of total revenue compared with the present 11 per cent. This would cover 51 per cent of the cost of providing navigation services. Harbour rates would fall from 42 per cent of total revenue to 30 per cent principally as a result of a reduction in revenue from private berths. Harbour rates would be based on volume of cargo rather than commodity

Existing structure		Proposed structure
Charges on ships Harbour and light rate	)	
Tonnage rate Pilotage	)	Navigation services charge Pilotage
Charges on cargo Harbour rate Storage charge	 	( Berth hire ( Restructured harbour rate or wharfage <sup>a</sup> Absorbed in berth hire
Other main charges Site rental Loading charge (crane hire)	)	Site rental <sup>a</sup> Loading charge <sup>a</sup>

# TABLE 5.2 THE PROPOSED MARITIME SERVICES BOARD OF NSW PRICING STRUCTURE

a. No structural change.

Source Maritime Services Board (1989).

type. Ultimately ship based charges would contribute 24 per cent of revenue, and lease and other contracts 33 per cent (4 per cent at present).

The Port of Melbourne Authority is also working towards the reform of its pricing practices, and participated in the development of the ESCAP model port tariff described in appendix I. The Authority (1989b) has recently announced its proposed new pricing structure, based on the ESCAP model, and featuring greatly reduced emphasis on wharfage charges (from 86 per cent of revenues to 33 per cent), increased tonnage charges on vessels (from 9 per cent of revenues to 39 per cent) and increased berth hire charges (from 5 per cent of revenues to 28 per cent). Charges would be cost based and service specific. The Authority now produces financial reports on a current cost accounting basis, as well as its traditional historical cost based financial statements. This 'rate of return reporting' values non-monetary assets at written down current cost (either replacement cost or indexed cost), and takes into account gains and losses from holding monetary assets and liabilities in order to estimate real finance charges and revenues.

Some other port authorities are also moving, at varying speeds, in directions not inconsistent with those advocated in this report.

# IMPACTS OF CHANGE

The implications of reforms in port pricing policies can conveniently be discussed in terms of the participants in the industry.

## Users

An important issue is whether pricing reform will be revenue neutral. More rational asset valuation would increase the revenue requirements of a port authority but this could be offset in some States by a move from a dividend policy based on a proportion of revenue to a target rate of return on equity. A rationalisation of the asset base by disposing of underperforming assets is also a likely consequence of a more commercial approach. Joy (1988) argues that pricing reform should be acompanied by efficiency gains so that rather than being revenue neutral, pricing reform should result in a reduced revenue The Port of Melbourne Authority (1989a, 1989b) proposal is target. designed to be revenue neutral with the Authority undertaking to make up any shortfall in achieving its target rate of return, through efficiency gains. This approach has merit in that both the port authority and users share in the costs of adjustment.

In capital city ports with high value waterfront land the rationalisation of the asset base is likely to result in a reduction in the number of conventional berths available to ship operators. At times of peak demand some additional waiting time for berths may result. Provided ship costs are incorporated into the assessment of the number of berths to retain, overall system costs should be closer to optimal.

The current structure of port authority charges involves a strong emphasis on charges on cargo. Cargo charges have been used as a general source of revenue usually unrelated to any specific service provided by the port authority.

It would initially appear that a move from cargo based to ship based charges would result in a redirection of costs away from cargo owners. However, for most cargo owners the incidence effects discussed earlier will mean that, as a group, they will bear much the same burden of total port charges after the change as before. Some individual cargo owners may face changed levels of total port and freight costs, depending on the pricing policies of shipping companies and the facilities they choose to use. For example, the Maritime Services Board (1989) estimates that in New South Wales ports grain and coal

exporters will pay less overall, while container movements will attract increased charges.

Many bulk export commodities are sold on an fob basis. For those commodities the wharfage charge falls on the exporter in the first instance. As noted earlier many bulk exporters have complained that they receive no clearly identified service from the port authority for this charge. A shifting of the burden for port authority revenue towards ship based charges would of course reduce this perceived inequity. Some of the increase in ship charges would be reflected in reduced fob prices.

In some ports bulk cargo owners use private facilities and pay no or little wharfage. These users will bear the burden of increased ship charges (through incidence effects) but will not have offsetting lower wharfage charges. The impact will be similar for cruise and passenger ship operators. They will bear the full cost of increased ship based charges but as they carry little cargo they will not have any offsetting reductions. Fares would increase as a consequence. Of course those not presently paying wharfage have benefited from the generally low charges on ships in the past.

Similarly ships with relatively small cargo volumes to load and discharge will attract the higher ship charges but not gain as much from the lower wharfage charges as ships with larger volumes of cargo. There may be some financial advantage in reducing the number of port calls to increase the volume of cargo handled at each port. Land transport would be used to centralise the cargo. As a case study the Bureau made a preliminary examination of the possible effects of the Port of Melbourne Authority's (1989a) proposed changes on the relative costs of container ships calling at Melbourne and Adelaide. Data supplied by the Australia New Zealand Europe Container Service (ANZECS) in submissions to the Inter-State Commission (ANZECS 1988a, 1988b) were used to estimate average berth time, container working time and port time. The results are presented in figure 5.1. Details of the calculations are available from the Bureau.

Three possible ship call patterns were examined for a 29 000 GRT ship. They were a single call to Melbourne (berthing at East Swanson Dock) with rail transport used to carry Adelaide containers between Adelaide and Melbourne, a single call to Adelaide with Melbourne containers carried by rail and calls to both Adelaide and Melbourne. Figure 5.1 illustrates the combinations of Adelaide and Melbourne containers for which each of these port call patterns incurs the least financial cost. The results are sensitive to the rail freight rate (an estimated Melbourne-Adelaide rate of \$330 per container was used in



83

the Bureau's analysis). Other ship sizes and Melbourne berths may also give different numerical results.

The major effect illustrated in figure 5.1 is that the Port of Melbourne Authority pricing proposals would increase the number of combinations of Adelaide and Melbourne containers for which a single call to Melbourne or Adelaide incurs the least financial cost. The restructured charges therefore favour centralisation of cargo.

An important question is whether, in practice, the change in relative costs is likely to have a significant effect. In 1987-88 Adelaide handled approximately 24 000 overseas containers from about 90 ship This was an average of 267 containers per ship, well within calls. the region in figure 5.1 for sustaining calls to both Adelaide and Melbourne. The ANZECS data on which the analysis was based included two-port calls which handled 141 and 162 containers, respectively, in Adelaide and 343 and 450 containers, respectively, in Melbourne. These volumes are still within the two-port call region but relatively close to the single Melbourne call region. It appears that only a small number of ship calls are likely to be affected by the Port of Melbourne Authority changes and these are most likely to be at the expense of Adelaide, given current ship loading patterns and voyage frequencies.

An ultimate aim should be for wharfage charges to reflect only those port authority costs directly attributable to cargo handling and storage. However, such a change is unlikely to occur rapidly. There appears to be no case for the continuation of the discrimination between import, export and coastal cargoes during the transition period. It is not related to costs, and it has only negligible influence on trade behaviour. Removal of this form of discrimination would be of some small benefit to importers and, depending on the extent to which cargo charges have been transferred to ship charges, it may have only a minor effect on exporters and shippers of coastal cargo.

Simplicity of the pricing system is a desirable characteristic. The implication for users of an unnecessarily complex system is that the aggregate level of charges they can expect to pay is difficult to predict and it is also difficult to compare charges between ports. Where inter-port competition exists it is not always possible for users to compare charges between ports and make rational decisions on which ports to use. The complexity of charging is most evident in wharfage charges.

84

Lessees of port facilities could face higher lease charges following a revaluation of assets and reduction of wharfage charges. In the longer term, the increased incentives for intra-port competition and technical efficiency, brought about by the improved pricing policies, should be of benefit to port users.

If some port authorities adopt a reformed pricing system and others choose not to, there would result a much wider disparity in port charges on ships than now exists. Under these circumstances it would be more difficult for liner operators to maintain a pan-Australian freight rate.

As port authority charges are low in proportion to the value of the goods passing through the port, it is unlikely that a redistribution of charges would have any significant effect on the prices of traded goods. The boating public and fishermen, as port users, could face increased charges for the use of port facilities if crosssubsidisation by commercial users were eliminated.

#### Port authorities

Cost based pricing would increase the ability of port authorities to control costs when used in conjunction with performance indicators, leading to improved technical efficiency. Cost based pricing, together with more realistic asset valuations, would provide a better basis for investment decisions.

The establishment of accounting profit centres would assist port authorities to develop a more commercial approach to their activities. Comparison of costs and revenues for a particular facility would simulate to some extent the functioning of a competitive market. As pointed out by the Centre for Transport Policy Analysis (1988) a port authority faced with a facility for which revenue fails to cover costs has a clear choice between either increasing prices or reducing costs.

Additional action would be required by governments to provide pressures on port authorities similar to those provided by competitive markets. Rate of return targets have been popular approaches and more recently price cap formulas have been suggested as a more effective approach.

A shift from cargo based charges towards ship related charges would reduce or eliminate the necessity for port authorities to use discriminatory pricing on cargoes, as between commodities and between trades, improving user perceptions of equity. The transparency of charges based on costs would improve the ability of port authorities to justify their charges, and the necessity for price changes.

A logical outcome of cost based pricing is that ports with different cost structures should have different tariff levels, rather than uniform schedules as often applies now when a single authority controls several ports. Within each port, simplified tariff structures should yield some administrative savings.

The practice of relying on charges on cargo, rather than setting charges in relation to the costs they are intended to cover, has efficiency implications for port authorities. The charging system and the accounting system which supports it do not allow port authorities to relate costs and revenues accurately to specific services. Port management therefore has difficulty in monitoring the performance of individual assets. This affects decisions on where resources should be directed to reduce costs. The same set of circumstances also influences investment decisions. Inadequate information on costs and revenues affects the accuracy of forecasts regarding the performance of proposed assets.

## Government

In the current economic environment there are strong incentives for governments to require their statutory authorities to achieve financial balance in their commercial operations. While most port authorities do achieve financial balance they do so on the basis of historical costs. When assets are revalued to more accurately reflect their opportunity costs, port authorities will need critical management of the asset base to achieve the financial targets set for them.

Governments are also concerned that resources be used efficiently. However, the structure of port prices and the inadequacies in port authority costing systems is such that it is difficult to monitor the effectiveness of port investments and the efficiency with which port assets are used. Port authorities generally operate in a noncompetitive environment. This lack of competition reduces the incentive for port authorities to bear down on costs. Rate of return targets should be supplemented with other measures to ensure that cost based pricing does not become 'cost plus' pricing.

Governments have, in the past, also been concerned with the role of ports in economic development. One aspect of this has been discrimination against imports in favour of exports with respect to wharfage charges (which currently provide the bulk of the revenues of most port authorities). This discrimination is in effect a disguised trade tariff but since port charges are low in proportion to import values it is unlikely to have any significant effect on import levels. This unnecessary increased complexity of the charging system is unlikely to be of any significant benefit to exporters.

To sum up, State governments would benefit from the reform of port authority pricing in a number of ways. They would have a better basis for port development and investment policy via better inputs to studies of costs and benefits, and would have the potential to enforce improved operational efficiency in ports via better cost control.

For the Commonwealth government, the reform of port authority pricing would be an important step in the process of micro-economic reform and would enhance the potential for the increased efficiency of the sealand interface.

# THE PACE OF CHANGE

Joy (1988) in his review of the Maritime Services Board of NSW advocated a gradual shift to new pricing structures, with fair notice and full explanation to users. The Port of Melbourne Authority advised in February that its new pricing structure would come into force on 1 July 1990 (subject to government approval), to allow users time to prepare for the new structure. It has since then decided to phase in the new pricing structure over a three-year period. Similarly, subject to government approval, the Maritime Services Board is adopting a phased approach to its reform program.

While gross registered tonnage is a convenient measure on which to base ship based charges it may not adequately reflect elasticities of demand for port authority services. Port authorities may need to modify prices for trades or ship types which experience indicates may be subject to significantly higher elasticities of demand. This suggests that adequate time should be allowed before major changes are implemented to ensure these issues can be discussed with users and necessary modifications made to the pricing schedule.

The rate at which change can be implemented depends on how fast the participants in the waterfront industry can adapt. Port authorities will need time to establish new costing systems and to estimate the costs on which prices are to be based. The previous section discussed the impact of changed pricing structures in a general way. Specific proposals for pricing reform would need individual assessment of impacts to give some guide as to how rapidly a changed pricing structure could be introduced. Consultations with users would be necessary to better understand the impacts.

87

Earlier it was noted that basing asset valuations on replacement cost would very likely result in a rationalisation of the asset base. Users may need some warning of this type of change if it would require a modification of their operational patterns.

In general it is preferable for change to be as rapid as possible so that the beneficial effects can be achieved quickly, particularly while the current environment favouring micro-economic reform is maintained.

## CHAPTER 6 CONCLUSION

A fundamental conclusion of this paper is that prices for port authority services which reflect the costs of providing them will encourage improved port efficiency. Efficiency is also enhanced by setting prices so as to achieve a commercial rate of return on assets, valued at market values or replacement costs.

Prices based on the costs of efficient provision of particular services and facilities would encourage an economically efficient outcome in the market for port services, by requiring the user to pay the cost of resources consumed.

A restructuring of port tariffs in the way suggested in chapter 5 would in general have minimal effects on aggregate port throughput in Australia as a whole, because of the inelastic nature of the demands of port users for port services and facilities. However, when there is a choice between facilities or between ports, a change in price structure would cause changes in demand for particular port services and facilities, as users reviewed the costs and benefits of using alternative facilities or competing ports.

A restructured pricing system would involve significant reductions in cargo based charges, and corresponding increases in rentals and ship related charges. As vessel operators and stevedores are likely to be able to pass forward to shippers much of any increase in charges, the overall incidence of port charges upon shippers might not change to any marked extent. However, some groups of users would experience significant reductions in costs and others would face increases. For instance, the pricing strategy announced by the Maritime Services Board of NSW will lead to significantly decreased charges on exports of coal and grain and on imports of petroleum, but increased charges on both imports and exports of containerised cargo. These changes are the first phase of a proposed five-phase program of reform and represent only a partial move towards a desirable pricing structure.

An increase in rental charges for berths would possibly affect the choice of port facilities by vessel operators, and in the longer term may have some influence on their choice of vessel design and equipment. There may be some rescheduling of port calls for ships which normally load or discharge small volumes of cargo at specific ports.

Reductions in wharfage charges, which act as a toll on throughput, in part offset by increased berth charges and lease rentals, would give lessees of berths and terminals enhanced incentives to increase throughput. This should lead to more intensive utilisation of berths and land facilities by stevedores, giving port authorities the ability to meet growing demand with existing facilities. In some instances the disposal of surplus land for alternative, more highly valued, use may be possible.

Because of the high fixed costs of port facilities, the setting of prices universally equal to marginal costs is not practicable where financial balance must be achieved. Two-part tariffs or, perhaps, Ramsey pricing could be adopted to ensure that financial targets set by State governments are achieved with a minimal loss of economic efficiency. In practice, the elasticities of demand required for setting Ramsey prices are extremely difficult to measure.

The setting of ship based charges in proportion to gross registered tonnage is an approach that can deliver a significant proportion of the efficiency benefits possible from Ramsey pricing. However, port authorities may need to modify any such price structure in the light of experience, to take account of any significant responsiveness of individual trades or ship types to ship charges.

Measuring asset values on the basis of market value or replacement cost, rather than on historical cost, would facilitate the determination of the true costs of providing various port facilities and services. When operational efficiency is actively pursued, prices set to achieve a rate of return on assets equal to the opportunity cost of capital will help to ensure an appropriate level of investment in ports. Similarly, contributions to State consolidated revenues should reflect the opportunity cost of the equity or capital contributed by State governments, rather than be levies on revenue or other means of using ports merely as revenue raising devices.

The port authorities themselves would feel a major impact from a reform of their price structures, policies and practices. The setting of cost based and service specific prices would require a better knowledge of costs than most port authorities currently have. Port

authorities would also acquire better information about evolving user needs and improved monitoring of the adequacy of different facilities. Such information would assist in achieving improvements in cost control, operational efficiency, asset management and investment decisions. This in turn would provide the basis for a more commercial and pro-active stance by port authorities in the overall operation and management of the sea-land interface of the Australian transport system.

## APPENDIX I PORT CHARGE NOMENCLATURE AND REVISED PORT TARIFF STRUCTURE

This appendix outlines the terminology used by port authorities in charging for the services provided to vessel owners and shippers. The terminology can be confusing and inconsistent between ports. This is followed by a summary of the proposed ESCAP (Economic and Social Commission for Asia and the Pacific) tariff structure which incorporates a consistent nomenclature. The ESCAP structure has strong support among port authorities and forms a convenient basis for examining existing and proposed pricing structures.

# EXISTING PRICE STRUCTURES

#### Charges on the ship

Most vessel charges are based on some measure of the ship's size. The most common measure is gross registered tonnage (GRT) which is the volume (measured in units of 100 cubic feet) of the spaces within the ship's hull and enclosed above deck available for the carriage of cargo, stores, fuel, passengers and crew. Net registered tonnage (NRT) another common measure, is GRT less the space required for operating the ship. Deductions include accommodation for master and crew, some water ballast spaces and propelling machinery spaces. NRT is intended to give an idea of the earning capacity of a vessel (Corkhill 1977).

These tonnage measurements were orginally developed in the last century and have been modified on various occasions since then. However, there is a lack of uniformity in the interpretation of the rules for calculating GRT and NRT. Furthermore, there is doubt that the measures are truly representative of size or earning capacity of a ship. There are complaints also that the measurement rules have had adverse effects on ship designs (Corkhill 1977). A revised measurement system was established in 1969. This system known as the Universal Measurement System (UMS) has a simple unambiguous method for measuring gross tonnage (UMS gross). The method of calculating net

tonnage (UMS net) is simpler than the previous system but is still subject to some differences in interpretation (Corkhill 1977).

Ports are generally intending to move the basis of ship charges to UMS gross. Many ports throughout the world moved from NRT to GRT as a transition phase prior to the introduction of UMS gross. The main reason for the adoption of UMS gross for port charges is that there is a better correlation between GRT and UMS gross than between NRT and UMS net. A transition based on GRT (for older ships) and UMS gross (for newer ships) would result in fewer anomalies (Corkhill 1977).

Using these tonnage definitions, a range of charges are levied by governments and port authorities. The following paragraphs outline these charges with the common terms used and the pricing basis.

## Commonwealth light dues

These are charges levied by the Commonwealth government for the provision and maintenance of lights, beacons and other navigational aids in Australian coastal waters. The current level of charge is \$0.53 per NRT for three months. A revised formula providing lower charges for larger vessels is to be implemented.

#### Conservancy

This charge is for the use of general nautical facilities in the approaches to a port. It is levied sometimes by State governments and sometimes by port authorities. Other terms used are State tonnage duty or harbour and light rate. It is usually based on GRT and applies for several months.

## Port dues

These are charges for the use of nautical facilities within the port including channels, navigational aids, vessel traffic control, emergency services and marine security. Other terms used include harbour and light dues and tonnage rates. In some ports conservancy and port dues are combined into a single charge. GRT is often a basis for the charge.

## Pilotage

-3

A charge levied for the provision of pilotage services including ancillary services such as launch or helicopter, labour and shore based facilities. It may be a flat fee or dependent on GRT.

## Tug services

A charge for the provision of towage services into or out of the port or between berths within a port. Again, it may be a flat fee or based on GRT. Usually provided by private operators in Australian ports.

Appendix I

## Mooring-unmooring

A charge for tying up a vessel and its later release. This service is sometimes provided by private operators. Charging may be based on GRT, or set as a flat fee.

# Berth hire

A charge levied for the use of the berth. Other terms used include harbour dues (Weipa), berthage (South Australia), and tonnage rates (several ports in Queensland and Western Australia). In some ports only a single charge is levied for berth hire and tonnage, based on GRT.

## Charges on cargo

#### Wharfage

This is a general revenue charge levied on cargo. There are usually no specific costs that wharfage is supposed to cover. Wharfage is also referred to as harbour dues in some ports, and is usually based on cargo type, tonnage and often on type of trade (import, export or coastal).

#### Storage

This is a charge for the storage of cargo beyond a specified basic time period. It is usually charged on the basis of cargo tonnage and time.

### Ancillary charges

There are several services provided and charged for by port authorities such as cleaning, water, electricity, telephone, garbage collection and gangway watch.

## Other charges

Port authorities are involved in a number of activities which are not included in the above discussion. Services directly related to commercial shipping activities include leasing of facilities to stevedores and hiring of cargo handling equipment. Other activities not involving traditional port functions include property development, management services and consultancy. This latter group of activities are generally undertaken in competitive markets and, provided they contribute to port authority revenue, are outside the scope of this paper. The remaining group of activities include the provision of non-commercial facilities such as marinas and recreational facilities.

## DEVELOPMENT OF NEW PRICE STRUCTURES

The current pricing structures have been in place for most of this century. However, these structures were examined by ESCAP which found

that Australian and Asian ports have a wide variety of charging structures which vary in terms of nomenclature, complexity and service definition (ESCAP 1984). Subsequently, a Model Port Tariff Structure was developed to promote common billing procedures, enhance efficiency and identify revenue to cost relationships. While the model defines the tariff structure for charges, it does not suggest any price levels. The model framework is based upon four key elements, namely the product and service group, charge components, charging systems and identification of cost elements (ESCAP 1987, 1988). These are depicted in table I.1. Recommended charge components and systems are shown in the table along with possible cost element categories.

The proposed service and facility groups are:

- navigation
- . berth
- cargo operations
- other business

#### Navigation services

The navigation group includes all services and facilities necessary for a ship to move from the open sea (or from a location in the port) until it is stationary and secure in the port area, and similarly for ships leaving the port.

A major type of navigation service provided by the port authority to the ship is the provision of general nautical facilities in the approaches to the port (for example, the provision of lights), and within the port. The latter would include the provision of channels, vessel traffic control, emergency fire services, breakwaters, pollution control and marine security.

The other major navigation services that may be provided by the port authority are pilotage and the tying up of vessels. Pilotage includes the provision of a pilot and all ancillary matters such as labour, launch (sometimes helicopter) and shore facilities. The tying up of a vessel and its subsequent release involves the provision of berthing lines and tying the vessel up to the wharf. In certain cases a launch is required to ferry the shipboard lines from the vessel to the wharf during docking and conversely from the wharf to the vessel upon departure.

# Berth services

The berth group covers all services and facilities made available by the port authority to a ship because of its location at that berth (or anchorage).

Service group	Purpose of charge	Charging system				Possible cost elements			
		Basís	Units	Payer	Recipient	Capital	Operating	Maintenance	Overhead
Group 'A'								·····	
Navigation	Conservancy	Ship size	GRT	Ship	Port	Х	х	х	х
	Port dues <sup>a</sup>	Ship size	GRT	Ship	Port	Х	х	х	х
	Pilotage	Ship size	GRT	Ship	Port	Х	х	х	х
	-	and time	Hours		Pilots				
	Tug services	Ship size	GRT		Owners	Х	х	х	х
	-	Tug time	Hours		Tug	Х	X	х	х
	Mooring	Ship size	GRT	Ship	Port		Х		x
Group 'B'									
Berth	Berth hire	Ship time	Hours	Ship	Port	Х		х	х
	Wharfage <sup>b</sup>	Cargo and	Tonnes	Cargo	Port	X	X	x	x
	Ancillary <sup>C</sup> services	Amount	Various	Ship	Port		X		x

-----

# TABLE I.1 MODEL TARIFF STRUCTURE
Service group	Purpose of charge	Charging system				Possible cost elements			s
		Basis	Units	Payer	Recipient	Capital	Operating	Maintenance	Overhead
Group 'C'						·		·	
Cargo	Stevedorage	Cargo size	Tonnes	Shipping	Service	X	X	X	X
operations		and mass	or type	line	provider				
	Wharf	Cargo size	Tonnes	Shipping	Service	X	Х	X	X
	handling	and mass	or type	line	provider				
	Extra	Cargo size	Tonnes	Shipping	Service		Х		X
	movement	and mass	or type	line	provider				
	Storage	Cargo size	Tonnes	Consignor	Service	X	Х	X	X
		and mass	+ hours	Consignee	provider				
	Packing	Cargo size	Туре	Shipping	Service		Х		Х
				line	provider				
	Special	Cargo size	Туре	Shipping	Service		Х		Х
	handling	or handling		line	provider				
		type							
	Equipment or	Usage time	Hours	Stevedore	Owner of	X	X	X	Х
	service or				equipment o	r		i.	
	facility				service or				
	hire		-		facility				

TABLE I.1 (Cont.) MODEL TARIFF STRUCTURE

## TABLE I.1 (Cont.) MODEL TARIFF STRUCTURE

Service group		Charging system				Possible cost elements			
	Purpose of charge	Basis	Units	Payer	Recipient	Capital	Operating	Maintenance	Overhead
Group 'D'								<u></u>	
Other	Real estate	Various	Various	Hirer	Port	Х			
business	licensing	Various	Various	User	Service provider		X		
	Management or consultancy	Various	Various	User	Service provider		X		X

a. Includes use of channels, traffic control, security, emergency fire and pollution control services, breakwaters.

b. Includes use of berth, fendering, channel depth, rail, roads, fencing, lighting, stacking area, pollution control and worker facilities.

c. Includes cleaning, water, electricity, telephone, garbage and security.

Source ESCAP (1987).

Use of the berth and all associated facilities and services includes berth or anchorage, fendering, channel depth alongside and in the approaches to the berth, worker facilities, rail facilities, roads, fencing, lighting, stacking area and pollution control.

The provision of various services by the port authority at the berth includes berth cleaning, water, electricity, telephones, garbage removal and security.

#### Cargo operations

Cargo operations encompass facilities and services utilised in the handling of cargo through the port. The handling of cargo from ship to wharfgate (and vice versa), stacking and sorting, the storage of cargo and the packing or unpacking of containers and unit loads are all examples of services classified under this category. These operations are generally carried out in Australia by private operators, although some port authorities provide cargo handling services (Fremantle, for example).

Port authorities are more directly involved in the provision of equipment, facilities and services for the various cargo handling operations described above. This usually involves the hiring or leasing of such port equipment and facilities as cranes, gantries, forklifts, storage areas and other plant, and various port services such as security, emergency services and firefighting.

#### Other business

The 'other business' group includes all other port authority facilities and services not covered above. Ports are involved in a wide diversity of business operations not directly related to the provision of shipping or cargo handling facilities. Examples are leasing of port facilities, property matters (not related to a berth), management services and consulting.

Four cost elements were identified in the ESCAP study. The capital cost element includes total annual cost of fixed installations subject to total cost, interest rate and service life. Operating cost elements associated with a service or facility are generally easily estimated, as are maintenance cost elements. Finally, the overhead cost element could be used to spread non-directly attributable costs among various tariffs according to port authority policy.

## APPENDIX II ASSET VALUATION AND PORT PRICING

This appendix discusses the arguments for using revalued rather than historic costs for port authority assets as the basis for port authority prices. Issues of rates of return and depreciation of assets are also addressed.

## ASSET VALUATION AND DEPRECIATION

The economic concept of the value of an asset is opportunity cost. That is, the value of an asset is the benefit forgone by not using the asset in its next best alternative use. If a perfectly competitive market existed for the asset then the opportunity cost would be equal to its capitalised value or the present value of the future stream of net benefits. The economic concept of asset valuation is therefore forward looking and is not necessarily related to any financial transactions involved in the purchase of the asset.

In contrast, accounting practices adopted by most port authorities value assets at historical cost. Assets are valued at the cost at which they were acquired. Some assets were acquired at little or no cost and are therefore recorded as having little value. For example the New South Wales Commission of Audit (1988, appendix A3) noted that the Maritime Services Board valued wetlands sites at \$1 each. An accounting approach based on historical cost is therefore concerned more with the financial transactions involved.

Use of historical costs for durable assets can lead to anomalies. Similar assets purchased at different times will be recorded in the authority's asset register at different values. If straight line these depreciation is assumed, assets will incur differing depreciation charges even though they would have equal replacement values. The Commonwealth Department of Finance (1988a, 3) has commented that 'Valuation of assets on the purely historical basis will inject an element of arbitrariness into a rate of return comparison due to differences in longevity of assets and in the relative inflation rate of different assets'.

While it may not be possible to fully reconcile accounting and economic approaches to asset valuation it is possible to substantially close the gap between the two approaches. Accounting standards provide for the revaluation of non-current assets and it is normal commercial practice to do so although the frequency and extent of revaluations would vary between firms and between different categories of assets.

The reform package for Commonwealth government business enterprises provides for enterprises to revalue non-current assets at least every five years. However, in commercial practice the frequency of revaluation may be related to the rate at which values change. Peat, Marwick, Mitchell Services (1984) reported to the Independent Inquiry into Aviation Cost Recovery that commercial practice at that time was to revalue assets at three-year intervals. Inflation levels were then higher than present levels.

The appropriate method of revaluing assets depends on a number of factors such as whether there is a market for the type of asset being revalued. The Commonwealth Department of Finance has provided guidelines to Commonwealth government business enterprises on valuation methods. These are summarised in table II.1. Generally the valuation method adopted should be designed to ensure that the estimated value of the asset is as close as possible to the economic value of the asset (that is, the asset's opportunity cost).

While historical costs are appropriate for some purposes, such as monitoring use of funds, the use of economic values, or approximations to them, gives a much more accurate view of the cost to society of using those assets.

Some idea of the magnitude of revaluation effects can be gained by examining the financial statements of the Port of Melbourne Authority, which has 'rate of return reporting' based on current cost accounting principles as well as the traditional financial statements based on historical costs. Table II.2 shows the values for major balance sheet items in both historical cost and current cost accounting terms for the Port of Melbourne Authority as at 30 June 1988.

The rate of return reporting balance sheet item 'equity' was due largely to the 'current cost reserve' which stood at \$590.952 million at 30 June 1988. The current cost reserve had a balance of \$497.780 million at the beginning of the financial year, the increase being largely due to 'restatement of non-monetary assets-fixed assets' which contributed \$115.179 million. Gains and losses from holding monetary assets and liabilities, both monetary and non-monetary, also contributed to changes in the current cost reserve to a minor extent.

## Appendix II

	BUSINESS ENTERPRISES	
Ass	et category	Revaluation method
1.	Land and buildings General purpose buildings	Market valuation for land and improvements <sup>a</sup>
	Special purpose buildings	Market valuation for the land and as for category 3 below for the improvements
2.	Assets used in operations, which would be replaced by similar assets and for which there is a secondary market	Market value
3.	Assets used in operations but for which there is no secondary market or where reference to an available secondary market would be inappropriate:	
	Assets which would be replaced by modern or new assets with the same gross service potential	Lower of current replacement or reproduction cost of a modern or new asset adjusted for the age and condition of the existing asset
	Assets which would be replaced by assets with a different gross service potential	Current replacement cost of the equivalent gross service potential obtainable from the most appropriate modern asset adjusted for the age and condition of the existing asset
4.	Assets which have no usage value or which are for sale as at balance date, or both	Net realisable value
5.	Assets subject to a finance lease	Revaluation method as per categories 1 to 4 above depending on the type of asset

TABLE II.1 GUIDANCE ON REVALUATION METHODS FOR ASSETS OF GOVERNMENT

a. Values for land and improvements to be separately identified.

Source Department of Finance (1988b).

.

hard here it is a second s TRANSPORT & COMMENCIALIONS 103

Item	Historical cost	Rate of return reporting
Equity	120 093	694 571
Current liabilities	78 034	78 034
Non-current liabilities	326 318	326 318
Deferred revenue	795	3 101
Total	525 240	1 102 024
Current assets	54 713	55 291
Non-current assets	437 559	1 013 765
Deferred expenses	32 968	32 968
Total	525 240	1 102 024

TABLE II.2 PORT OF MELBOURNE AUTHORITY MAJOR BALANCE SHEET ITEMS AT 30 JUNE 1988 IN HISTORICAL COST AND CURRENT COST ACCOUNTING TERMS

(\$ 000)

Source Port of Melbourne Authority Annual Report 1987-88.

Table II.3 lists values of the various categories of the Port of Melbourne Authority's non-current, non-monetary assets in both historical cost and written down current cost terms. The largest proportional revaluation occurred in dredged assets, which rose from 16 per cent to over 23 per cent of non-current, non-monetary assets.

The effects on the accounts of revaluing assets are thus seen to be very great indeed, with corresponding impacts on cost and rate of return calculations, and hence on price setting.

The other aspect of asset valuation is depreciation, which is the difference in value at the beginning and end of an accounting period. It reflects the change in service potential of the asset, which can occur through physical deterioration, obsolescence or change in demand for the outputs of the asset.

From an economic perspective depreciation would best be estimated by revaluing the asset at the end of each accounting period. However. this is usually not a realistic approach. In practice a range of methods are available to allocate the net depreciable cost of an asset over its remaining useful economic life. Preferably the method

## Appendix II

	Written down value at 30 June 1988				
Asset	Histori		ical Revalued cost cost		Ratic
Land	145	381 <sup>a</sup>	343	998	2.37
Buildings	134	923	276	442	2.05
Improvement to land	23	996	55	625	2.32
Dredged assets	69	442	236	525	3.45
Plant and equipment	38	159	71	226	1.87
Office furniture and fittings	1	467	2	114	1.44
Motor vehicles	1	915	2	183	1.14
Capital works in progress	13	501	13	942	1.03
Leased plant and equipment	6	783	9	718	1.43
Total	435	567	1 011	773	2.32

TABLE II.3 PORT OF MELBOURNE AUTHORITY: DIFFERENCE BETWEEN HISTORICAL AND REVALUED COST OF NON-CURRENT NON-MONETARY ASSETS (\$ 1000)

a. Based on cost or revaluations at 30 June 1983.

Source Port of Melbourne Authority Annual Report 1987-88.

selected should allocate the net depreciable value of the asset to each period in accordance with the consumption of service potential during the period. For many assets, a straight line depreciation might be appropriate. However, some port assets can only be provided in large units. These types of assets may exhibit a pattern of use increasing with age such that they are underutilised in the early years. If the service potential of the asset declines with use then a depreciation pattern which is low when the asset is new and increases with time would be more appropriate than the commonly used straight line depreciation.

Depreciation charges are an important part of rate of return calculations. A depreciation method which is aligned reasonably closely with the consumption of service potential would also ensure that rate of return calculations would more accurately reflect the economic performance of the asset.

	Histori c (\$'C	cal ost 00)	Rate of return reporting (\$'000)
Assets	525	240	954 075 <sup>a</sup>
Revenue	122	082	118 710
Less			
Operating expenses	65	047	62 640
Abnormal items	5	313	21 252
Depreciation and amortisation	15	272	40 632
Net revenue <sup>b</sup>	36	450	(5 814)
Rate of return (per cent)		6.9	(0.6)

TABLE II.4 PORT OF MELBOURNE AUTHORITY: RATE OF RETURN IN HISTORICAL COST TERMS AND CURRENT COST ACCOUNTING TERMS, 1987-88

a. Average assets in service (written down current cost).b. Before finance charges and extraordinary items.

Source Port of Melbourne Authority Annual Report 1987-88.

Table II.4 shows how the Port of Melbourne Authority's rate of return for the year 1987-88 was affected by the increases in depreciation expense and depreciation adjustments (abnormal items were largely depreciation related), as well as by the increase in asset values, when calculated in current cost accounting terms.

## RATE OF RETURN

There are two aspects of rate of return to be considered: the basis on which rate of return is to be calculated; and the appropriate level of the rate of return to be set as a target.

A recent paper by the Commonwealth Treasury (1988) proposed the use of pre-tax, pre-financing economic rate of return as the basis for measuring the performance of government business enterprises. Economic rate of return is the proportion that economic income forms of the market value of the entity or its assets. Economic income includes both the annual revenues net of operating expenses and the change in the market value of durable assets over the period (the economic depreciation). A change in market value based on prices current when the market value of the asset is estimated (that is, at

Appendix II

the beginning and end of the accounting period) gives the rate of return in nominal terms. A real rate of return can be obtained by adjusting the beginning-of-period asset values to end-of-period price levels or vice versa for comparison with a target expressed in real terms.

The economic approach to deciding the appropriate rate of return is to take an opportunity cost approach. The opportunity cost in these circumstances is the rate of return that could be obtained from investing the funds in an alternative asset in the economy with an equivalent risk.

There are two relevant points to be made. First, the target rate of return should be based on the use to which the funds are put. The source of the funds is not relevant for target rate of return determination.

The second point relates to what is meant by risk. Risk, as usually understood by economists, consists of the product of two factors. The first factor is the variability of the asset's returns compared with the market rate of return. In statistical terms this factor is the ratio of the standard deviation of the asset's rate of return to the standard deviation of the market rate of return. The second factor is the correlation between the asset's rate of return and the market's rate of return (Kolbe, Read & Hall 1984, 69).

The product of these two factors is usually referred to as the 'beta' of the asset. The value of beta is used to derive a risk premium that an asset should be expected to earn above the risk-free rate of return (usually assumed to be the long term bond rate).

Port authority assets generally earn income which varies in much the same way as the level of trade. This in turn is related to the state of the economy. Therefore, the rate of return achieved by port authorities in general-purpose ports is likely to be correlated with the market rate of return and it is reasonable that the target rate of return set for port authorities should include a premium for risk.

## ASSETS REQUIRING LARGE INCREMENTS TO CAPACITY

Many port assets, such as berths, can only be provided in large indivisible units. Because of this they are often established in advance of the demand which would fully use their capacity. For assets of this type it may not be possible to earn a target rate of return in a particular year on the value of the asset even if a depreciation schedule based on units of use were used. Under these

circumstances it is not reasonable to expect 100 per cent cost recovery in each period. The Department of Finance (1988a) suggests that the appropriate approach is to specify an average target over a period of years rather than yearly targets. Three years was considered a reasonable time period for this purpose.

## INVESTMENT MISTAKES

Where a mistake was made in the purchase of an asset then the economic value of the asset is less than its replacement value. As long as the revenue received from the asset covers the avoidable cost of its operation it is worth retaining. According to Kolsen (1980) the correct price is that which recovers revenue greater than avoidable cost and which rations quantity demanded to the capacity of the asset. If the asset cannot earn a target rate of return on its replacement value then this would provide a signal to the port authority that the asset should not be replaced at the end of its economic life. In these circumstances the value of the asset is its net realisable value which would generally be less than its replacement cost. The poor investment decision is then reflected in the asset value rather than in a lower target rate of return.

## APPENDIX III COST STRUCTURES

The structure of the costs of providing port authority services is an important factor in analysing the prices charged for them. Annual reports of most port authorities provide little insight into cost structures. For example Victorian ports categorise expenditure into services, administration, maintenance and depreciation while the Maritime Services Board of NSW categorises expenditure into port management, waterways management, administration, depreciation and financial charges. Although some, such as the Fremantle Port Authority, provide expenditure information in considerable detail, it is not possible to obtain from annual reports consistent data across port authorities.

A recent source of more consistent data is that produced by the Inter-State Commission (1989b). The Commission surveyed port authorities and requested income and expenditure in the following categories:

- ship and navigation infrastructure, which includes channel maintenance, provision of navigational lights and marks, provision of moorings and other shore services to ships;
- cargo transfer infrastructure, which includes the provision and maintenance of any port authority owned facilities and equipment at leased-out berths, and all equipment and facilities hired out, and wharves, backing land and sheds made available at common-user berths (including their construction and maintenance);
- complementary services which are activities undertaken by a port authority to service its own needs and enhance the attraction to vessels calling at the port (ship repair engineering and electrical services are included in this category);
- shipping services, which include towage, pilotage, berthing lines and launch services and bunkering (these can be undertaken, regulated or licensed by the port authority);
- other activities undertaken by the port authority, which include the provision of stevedoring, cartage and depot services,

watchmen, provision of recreational boating and fishing facilities, regulation of recreational boating and fishing, foreshore management, off-waterfront property construction, maintenance and management; and

 administration, which includes the usual administrative functions as well as interest and depreciation.

Employee numbers in each of these categories were also requested. The data published by the Inter-State Commission allowed estimation of expenditure per employee for each of the above categories for different types of ports. These are shown in table III.1.

The Commission commented that some authorities had difficulty in allocating costs or staff numbers to the different categories. This is evident in table III.1, especially in the complementary services category where some expenditures per employee are much less than normal wage levels. Some particularly high expenditures per employee probably represent capital expenditure in some ports in those expenditure categories. The high levels in administration reflect interest and depreciation expenses, allocated to this category in the survey.

Port category na	Ship and vigation	Cargo transfer	Comple- mentary service	Ship service	Other activity	Admin.
Primary gateway	44.6	80.7	3.5	476.9	44.1	243.0
Other gateway	56.9	52.7	128.2	45.8	69.0	127.1
Multipurpose 172.4		41.4	67.4	60.6	230.8	133.3
Major bulk with						
Some non-bulk	84.7	46.5	25.8	71.4	319.6	55.6
Little non-bul	k 87.7	389.8	18.9	60.6	86.2	313.0
Minor bulk	50.0	120.5	0	142.9	50.0	222.2
All ports	62.6	101.7	16.4	138.6	122.2	188.4

TABLE III.1 EXPENDITURE PER PORT AUTHORITY EMPLOYEE, 1987-88 (\$'000)

Source Inter-State Commission (1989b).

Appendix III

The pricing of port authority services is mostly focused on the Commission's categories of ship and navigation infrastructure and cargo transfer infrastructure. The Bureau examined these categories for the gateway ports (the mainland capital city ports) to develop a better understanding of cost structures. Annual reports for these ports provided information on the value of port assets and depreciation in terms of historical costs. These values and depreciation were allocated to ship and navigation infrastructure and cargo transfer infrastructure. Some asset types, such as channels and wharves and jetties, presented no difficulties. Land and buildings can be used for several of the activities specified by the Commission. Generally it was assumed that cargo transfer infrastructure was the dominant use for these assets, and all of the land value was allocated to this category. This would tend to overstate the capital associated with caroo transfer infrastructure. Depreciation was allocated to the two categories in proportion to the asset values, where no other information was available.

Both the Maritime Services Board of NSW and the Department of Marine and Harbors in South Australia control several ports. The Maritime Services Board, in its annual report, provides a break-up of real estate values between the different ports under its control. This was used as a base for allocating asset values to Sydney and Botany Bay. For South Australia it was arbitrarily assumed that 50 per cent of assets in value terms were located in Adelaide.

The opportunity cost of capital was assumed to be 10 per cent per year and this proportion was allocated to each of the categories.

Asset values and depreciation used in the analysis were based on historical costs. Asset values based on historical costs generally represent a gross underestimate of the economic value of the asset. Despite the arbitrary method of allocating asset values and depreciation to the different categories, it seems reasonable to conclude that the result will still underestimate the economic value of the capital employed in each category.

In a previous study (BTCE 1988a) the Bureau estimated that employees in port related services (mainly port authority employees) earned close to \$28 000 each in 1986-87. If an additional 40 per cent is added on to this estimate to allow for wage increases and overheads such as holidays, long service leave, superannuation and sick leave the 1987-88 annual wage costs per employee are close to \$40 000. The amount in excess of \$40 000 in table III.1, for gateway ports and for the categories of ship and navigation infrastructure and cargo

transfer infrastructure, was assumed to represent purchases of materials and equipment and of services from contractors.

Using these assumptions the results presented in table III.2 were obtained.

The results are presented in percentage ranges to indicate that the data used in the analysis were not fully reliable. Given the errors in the use of historical costs it is likely that the capital costs are understated. Nevertheless the results indicate that cargo transfer infrastructure, and ship and navigation infrastructure to a lesser extent, are capital-intensive.

The costs associated with ship and navigational services tend to be independent of the number of ships or the volume of cargo transferred. In the definition of the category provided by the Commission (1989b) the only item likely to depend on ship numbers was the supply of water and electricity for ships. The costs of this can be expected to be a small proportion of the total costs. The incremental cost to the port authority of using the infrastructure is likely to be small.

The marginal costs to the port authority of customers using cargo transfer infrastructure are likely to be higher than for the use of ship and navigation infrastructure. The berthing of ships and the loading and discharge of cargo may cause a need for maintenance by the port authority. However, the main incremental costs will be borne by stevedores. Only a small proportion of port authorities' costs in this category will depend on cargo throughput.

The data did not permit a similar analysis to be performed for the other categories. However, some comments can be made.

Cast	Chin and	
category	navigation	transfer
Labour	30-40	20-30
Materials	10-20	10-20
Capital	40-60	50-70

# TABLE III.2 COST STRUCTURE FOR SHIP AND NAVIGATION INFRASTRUCTURE AND CARGO TRANSFER INTRASTRUCTURE

(per cent)

Source BTCE estimates based on Inter-State Commission (1989b) and port authority annual reports.

Appendix III

The complementary services category has the highest employment, according to the Inter-State Commission data. The average for all ports is 28 per cent of total employment, and for primary gateway ports is 41 per cent and for major bulk ports which handle some nonbulk cargo is 50 per cent. It appears that complementary services tend to be labour-intensive.

The services provided in the ship service category, such as pilotage, berthing lines and launch services, require a moderate amount of capital principally for launches. It is likely that these services are less capital-intensive than the shipping and navigation infrastructure and cargo transfer categories. The operating costs are also more likely to be proportional to the level of ship movements.

The other category is a mixture of regulatory activities (which tend to be labour-intensive), non-commercial activities (which can be capital-intensive) and commercial activities unrelated to waterfront services.

## REFERENCES

## Abbreviations

AGPS	Australian Government Publishing Service
ANZECS	Australia New Zealand Europe Container Service
BTCE	Bureau of Transport and Communications Economics
BTE	Federal Bureau of Transport Economics
ESCAP	Economic and Social Commission for Asia and the Pacific

Association of Australian Port and Marine Authorities (1988), Waterfront Strategy: A Submission to the Inter-State Commission Inquiry, Sydney.

Australian Bureau of Statistics (1987) *Exports of Major Commodities* and their Principal Markets, Australia, cat. no. 5423.0, AGPS, Canberra.

Australian Mining Industry Council (1987), *Minerals Industry Survey* 1987: Survey Conducted by Coopers and Lybrand, Canberra.

Australian National Maritime Association (1988), Submission to the Inter-State Commission Concerning its Waterfront Strategy Inquiry, Melbourne.

ANZECS (1988a), Submission by the Australia New Zealand Europe Container Service to the Inter-State Commission Waterfront Strategy Inquiry, March.

\_\_\_\_(1988b), Submission to the Inter-State Commission Waterfront Strategy Inquiry, November.

Arnold, J. (1985), *Port Tariffs: Current Practices and Trends*, World Bank, Washington, DC.

BTCE (1988a), *Economic Significance of the Waterfront*, Information Paper 29, AGPS, Canberra.

\_\_\_\_(1988b), *Harbour Towage Services in Australian Ports*, Information Paper 27, AGPS, Canberra.

\_\_\_\_(1988c), Community Service Obligations and Corporate Planning in Government Business, in *Round Table Meeting: Government Business Enterprises*, ed. BTCE, Canberra.

\_\_\_\_(1989), Characteristics and Cost Structure of the Bulk Shipping Fleet, Occasional Paper 93, AGPS, Canberra.

Bureau of Transport Economics (1986), A Study of Liner Shipping Services into and out of Australia, vol. 2, Report 60, AGPS, Canberra.

Centre for Transport Policy Analysis (1988), Port Pricing and Shore-Based Shipping Costs: A Report Prepared for Transport Tasmania, University of Wollongong.

Corkhill, M. (1977), *The Tonnage Measurement of Ships: Towards a Universal System*, Fairplay Publications, London.

Cronin, M. R. (1985), Economic and Revenue Implications of Tax Reform in the Corporate Sector, in *Reform of Business Taxation*, ed. D. J. Collins, Australian Tax Research Foundation, Sydney.

Cumming, W. (1977), An Economic Appraisal of Australian Port Administration, Committee for Economic Development of Australia, Melbourne.

Department of Finance (1987), The Choice of Discount Rate for Evaluating Public Sector Investment Projects: A Discussion Paper, Canberra.

\_\_\_\_(1988a), Rate of Return Reporting for Government Business Enterprises - A Conceptual Approach, in *Round Table Meeting: Government Business Enterprises*, ed. BTCE, Canberra.

\_\_\_\_\_(1988b), Draft Guidelines for Asset Valuation in Government Business Enterprises, in *Round Table Meeting: Government Business Enterprises*, ed. BTCE, Canberra.

Department of Management and Budget (1986), *Public Authority Policy* and Rate of Return Reporting, Information Paper 1, Melbourne.

Department of Transport and Communications (1988), *Port Authority Cargo Movements Australia 1986-87*, AGPS, Canberra.

ESCAP (1984), ESCAP Port Tariff Review, Bangkok.

References

(1987), Model Port Tariff Structure, Bangkok.

\_\_\_\_(1988), Report of the Third Expert Group Meeting on Port Tariff Structure 23-25 May 1988 Fremantle, Australia, Bangkok.

Faulhaber, G. R. (1975), Cross-Subsidization: Pricing in Public Enterprises, *American Economic Review*, 65:966-77.

Federal Bureau of Transport Economics & Ministry of Transport, New Zealand (1987), *Review of Trans-Tasman Shipping*, AGPS, Canberra.

Federal Department of Transport (1980), *Transport Pricing and Cost Recovery Seminar: Papers and Proceedings, Canberra, 17-18 July 1979*, AGPS, Canberra.

\_\_\_\_(1981), Australian Port and Marine Administration Directory, AGPS, Canberra.

Financial Review (1989), NSW Port System to be Split, 6 April, 10.

Goss, R. O. (1987), *Port Authorities in Australia*, BTE Occasional Paper 84, AGPS, Canberra.

Grosdidier de Matons, J. C. (1986), Economic and Financial Appraisal of Port Projects at the World Bank: A Review of Policy and Practice, *Maritime Policy and Management*, 13:4, 259-75.

Heggie, I. (1974), Charging for Port Facilities, *Journal of Transport Economics and Policy*, 8:no. 1, 3-25.

Inter-State Commission (1988a), *Waterfront Investigation: Preliminary Findings and Discussion Papers*, vol. 2, *The Evidence to Date*, AGPS, Canberra.

\_\_\_\_(1988b), Waterfront Investigation: Preliminary Findings and Discussion Papers, vol. 4, Industry Structures, AGPS, Canberra.

\_\_\_\_(1988c), Waterfront Investigation: Preliminary Findings and Discussion Papers, vol. 5, Waterfront-Related Activities, AGPS, Canberra.

\_\_\_\_(1989a), Waterfront Investigation: Conclusions and Recommendations, vol. 1, AGPS, Canberra.

\_\_\_\_(1989b), *Waterfront Investigation, Special Studies*, vol. 1, AGPS Canberra.

Joy, S. (1987), *The Port of Melbourne: Future Prospects and Problems,* Ministry of Transport, Melbourne.

\_\_\_\_(1988), *Maritime Administration in New South Wales*, Report to the Minister for Transport, Hyland Joy & Associates, Sydney.

\_\_\_\_(1989) *Potential for Increased Competition*, Report prepared for the Inter-State Commission, Hyland Joy & Associates, Sydney.

Kolbe, A. L., Read, J. A. Jr, & Hall, G. R. (1984), *The Cost of Capital: Estimating the Rate of Return for Public Utilities*, MIT Press, Cambridge Mass.

Kolsen, H. M. (1980), Efficient Resource Allocation: Theory and Practice in Transport Industries, in *Transport Pricing and Cost Recovery Seminar: Papers and Proceedings, Canberra, 17-18 July 1979,* ed. Department of Transport, AGPS, Canberra.

Maritime Services Board of New South Wales (1989), *Port Pricing: A New Deal*, Sydney.

National Bulk Commodities Group (1988), Submission to Inter-State Commission Waterfront Strategy Inquiry, Melbourne.

New South Wales Commission of Audit (1988), *Focus of Reform: Report on the State's Finances* (C. P. Curran A.O., Chairman), Sydney.

Parmenter, B. R. & Webb, L. R. (1976), Amortisation and Public Pricing Policies, *Australian Economic Papers*, 15:11-27.

Peat, Marwick, Mitchell Services (1984), Asset Valuation Consultancy, in *Aviation Cost Recovery: Report of the Independent Inquiry*, AGPS, Canberra.

Port of Melbourne Authority (1988), Pricing Policy Review, Melbourne.

\_\_\_\_ (1989a), New Pricing Structure, PMA Position Paper for Seminar of Port Users to be Held on Tuesday, 21st March, 1989, Melbourne.

\_\_\_\_(1989b), Pricing Structure and Rates, A Paper Outlining the Port of Melbourne Authority's Proposed New Pricing Structure and Level of Rates, August 1989, Melbourne.

Queensland Government (1988), Queensland Government Comments on the Inter-State Commission's Preliminary Findings of the Waterfront Inquiry, Brisbane. Rischbieth, I. & Cotton, M. (1987), Overseas Ports Visit - June 1987, Federal Department of Transport, Canberra.

Ships and Ports (1989), Ports-A Critical View, 1:no. 7, 18-19.

Treasury (1988), Economic Income and Rate of Return Reporting, in *Round Table Meeting: Government Business Enterprises*, ed. BTCE, Canberra.

## ABBREVIATIONS

ANMA	Australian National Maritime Association
ANZECS	Australia New Zealand Europe Container Service
BATL	Brisbane Amalgamated Terminals Limited
BTCE	Bureau of Transport and Communications Economics
CS0	Community service obligation
CTAL	Container Terminals Australia Limited
ESCAP	Economic and Social Commission for Asia and the Pacific
GRT	Gross registered tonnage or gross register ton
NRT	Net registered tonnage or net register ton
UMS	Universal measurement system