PORT AUTHORITY PRICING

N Gentle
Research Leader
Bureau of Transport and
Communications Economics
Canberra
Australian Capital Territory

ABSTRACT

Port authority pricing practices have their origins in the late 19th and early 20th centuries. Changes in cargo handling and ship technology and the demands of governments for a more commercial orientation of their statutory authorities have created pressures for reform of port authority pricing.

The major objectives of port authority pricing are identified as achievement of financial balance, economic efficiency and equity. Most port authorities achieve financial balance when accounts are prepared on a historical cost basis. However, if a more commercial approach is taken and assets revalued, financial performance is much less satisfactory.

Port authority pricing practices have little influence on the level of trade through a port but the paper argues that a move to a more rational pricing system is likely to have a major beneficial effect on the behaviour of port authorities themselves as well as influencing the investment and operating decisions of port users within the port.

The paper concludes that basing the prices of services on the costs of providing them would be a major improvement over the present system. Such a principle would lead to a substantial reduction in wharfage charges and increases in ship based charges. Components of prices designed to recover capital costs should be based on depreciated current values of assets. Adoption of such a strategy would encourage improved port authority efficiency and lead to efficient gains through improved asset management and investment appraisal.

INTRODUCTION

Port authority pricing practices have been the subject of criticism over a period of many years. Many pricing practices have their origins in the early part of this century and possibly in the last century. The development of more capital intensive cargo handling facilities and the push by governments for a more commercial approach by their business undertakings has highlighted the need for reform in port authority pricing practices. Indeed at the time of writing the Port of Melbourne Authority (PMA) has proposed a major restructuring of its prices (PMA 1989) and the Maritime Services Board of New South Wales (MSB) was also planning reform of its pricing policies.

This Paper is an overview of work by the Bureau of Transport and Communications Economics in the port pricing area. The Paper provides an assessment of the market for port services and current pricing practices and makes some suggestions on the direction pricing reform should take and the likely impact of change.

THE MARKET FOR PORT AUTHORITY SERVICES

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 a provider of the service, ship owners, stevedores and cargo owners as consumers of the services and state governments who provide the legislative framework within which port authorities operate.

While the port authorities as a group are significant participants in the waterfront in terms of turnover and employment levels their importance to the waterfront is greater than the financial and employment numbers suggest. They have considerable influence over port development and operations which they exercise through decisions on the type and location of 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.

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 significant benefits. However, in Australia the necessary conditions for inter-port competition are not generally present. The most important hindrances to competition are the large 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 (ISC 1988a, 141). Land transport costs between port catchment areas are usually very large compared to differences in port charges.

In contrast North American and European ports tend to be more competitive than Australian ports. An important factor contributing to this difference is that large proportions of the manufacturing industry and of consumer markets 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 (ISC 1988b, 349). Brisbane and Adelaide therefore have an incentive 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.

Geographic barriers limit competition between ports in different states. However, distance is not generally as important in preventing competition within States. Institutional barriers become of increased importance in preventing this form of competition. For example, the Maritime Services Board (MSB) 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 inter-port competition. Grain is grown in inland areas often with 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 inter-port competition for grain exports (Royal Commission into Grain Storage, Handling and Transport 1988).

Countervailing power of 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.

Owners of non-bulk cargo are large in number which is not conducive to bargaining power and they tend to have little influence over the level of port charges. There are only a small number of non-bulk vessel operators and stevedoring companies which suggests they may have greater influence over port charges than cargo owners. However, the concentration of non-bulk cargo origins and destinations in the capital cities and the cost of land transport limits the possible alternatives available to vessel operators and stevedores.

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. But bulk cargo owners are not in a superior bargaining position to their non-bulk counterparts. A major reason is that 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 most ports operate in monopoly or near monopoly markets and consequently there is little or no scope for customers to take their business elsewhere if port charges are unsatisfactory. The lack of credible alternatives for port users outweighs any other factor 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 have no desire to allow port authorities to exploit their market power to the maximum.

PRICING PRACTICES

Port authority prices are conveniently classified as charges on ships or charges on cargo. There is little uniformity in the nomenclature used for the charges, and considerable variation in the basis for some charges among Australian ports.

Ship based charges

State governments in all States, except Tasmania, and the Northern Territory levy a conservancy charge which is designed to cover the cost of channels and navigational

facilities on the approaches to ports. This charge is based on ship's size as measured by gross registered tons (GRT) and is levied for a specific period of time. The period of time varies from 30 days in Queensland to six months in New South Wales. Once paid the ship can make a unlimited number of additional visits without additional charge.

Port authorities also levy a charge usually called a tonnage or berthage charge which is for the use of channels and navigational facilities and berths. The charge is usually based on Gross Registered Tonnage (GRT) and length of stay in the port. Brisbane is an important exception where the charge is based on ship's length instead of GRT. The charge generally involves an initial rate for a specified period of time after which lower rates apply. The initial charge applies for a period of three days in some Tasmanian ports and for shorter periods in most other ports. The basic time period for charging various from one hour at Westernport to 24 hours for ports such as Bundaberg.

It is common for charges in this category to be uniform throughout a port and in South Australia and New South Wales the charges are uniform across all ports within the jurisdiction of the relevant Authority. No distinction is made between high and low cost berths.

In addition there are a range of other ship charges such as harbour improvement charges (based on tonnes of cargo) in Western Australia, berth facilities charge at Geelong, and ship service charge the purpose of which is not clear.

Cargo based charges

The most common cargo charge is the wharfage charge which is based on the amount and type of cargo loaded or discharged. It is a charge on the cargo owner but in most liner trades is incorporated in the freight rate. The charge usually involves discrimination between commodity types, import and export cargoes, coastal and overseas cargo. However, the recent Port of Melbourne Authority (PMA) proposed charges remove these forms of discrimination entirely.

The charges are loosely related to the value of the commodity in question and probably have an even poorer relationship to the elasticities of demand for transport of each commodity. Wharfage is generally a charge which is

unrelated to any specific costs and does not appear to be in return for any specific service. It is more of a general revenue raising charge. Even in the revised PMA pricing system wharfage is described as a charge to recover costs not recovered by any other charge. These were mostly general port overheads not readily attributable to specific facilities but also include some cargo related costs (PMA 1989).

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. 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.

The Bureau estimated charges for a number of ports for typical port calls for the loading of grain, coal and containers. The maximum and minimum aggregate charges for the ports chosen are shown in Table 1. The ratio between maximum and minimum rates are lower for the total charges than for the individual charges. The table illustrates the importance of some charges. Cargo changes tend to be the dominant charge with Commonwealth light dues and towage charges also being very significant.

In summary port authority prices generally exhibit a wide range in the level of individual charges levied. The charges, with the exception of some proposed revised schedules are generally not based on clearly identifiable costs and wharfage in particular is not identifiable with any specific service received by port users.

ASSESSMENT OF PRICING PRACTICES

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 to those applied in private organisations due to the wider community interests of government.

TABLE 1 COMPARISONS OF TOTAL PORT CHARGES FOR SELECTED COMMODITIES, 1985-86

	Grain[a]		*Coal*[b]		*Containers*[c]	
Charge	*Fremantle*	*Newcastle*	*Hay Point*	*Port Kembla*	*Fremantle*	*Melbourne*
Government fees						
Commonwealth light dues	13 250	13 250	15 900	15 900	5 830	5 830
State conservancy charge	1 140	2 978	4 650	5 955	950	1 925
Port authority fees						
Ship based	4 464	3 078	1 200	4 104	1 860	1 755
Cargo based	13 612	47 508	187	32 045	13 454	15 134
Pilotage	1 614	4 436	7 048	5 620	1 614	4 730
Other fees						
Towage	9 760	7 000	24 000	15 032	8 840	12 120
Mooring and launch fees	1 088	2 148	-	2 552	1 088	3 048
Miscellaneous	250	250	250	250	250	250
Total	45 178	80 648	54 927	81 458	33 886	44 792
Unit cost	1.69[f]	3.02[f]	0.99[f]	1.47[f]	169[d]	224[d]

a. 30 000 GRT bulk ship loading 26 700 tonnes of grain.
b. 60 000 GRT bulk ship loading 55 250 tonnes of coal.
c. 25 000 GRT containerships exchanging 200 TEU.
d. $/TEU.
f. $/tonne of cargo.

Source BTCE estimates based on port authority charging schedules and Department of Transport and Construction computer model.

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 current targets for the five major Australian ports are shown in Table 2.

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 of commercial services from the commercial 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. The financial balance objective of port authority pricing may be pursued separately from any community service obligations in the port's operations. This objective is also consistent with current community views on financial responsibility and constraint.

Assessment of financial performance

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 3 summarises income and expenditure for some of the larger port authorities. All port authorities report 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.

Table 4 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.

d. $/TEU.
f. $/tonne of cargo.

Source BTCE estimates based on port authority charging schedules and Department of Transport and Construction computer model.

TABLE 2 FINANCIAL TARGETS AND DIVIDEND REQUIREMENTS OF MAJOR AUSTRALIAN PORT AUTHORITIES, 1988-89

Port authority[c]	*Financial target and dividend requirement*
MSB (NSW)	Global revenue targets with 6 per cent of revenue to the State Government as dividend[a]
PMA (Vic)	Real rate of return of 4 per cent on written down current value of assets[b]
PBA (Qld)	To be self-financing after 5.5 per cent of gross revenue paid to Harbours Marine Fund
DMH (SA)	To match expenditure with revenue overall
FPA (WA)	Target rate of return after a Statutory Contribution 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. Legislation has been introduced to change the basis of dividend to a return on equity, at a rate to be set by the State government. This may be implemented for the 1988-89 financial year.

b. 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.

c. Abbreviations are: MSB (Maritime Services Board); PMA (Port of Melbourne Authority); PBA (Port of Brisbane Authority); DMH (Department of Marine and Harbours); FPA (Fremantle Port Authority).

Source Annual reports and personal communications.

The rate of return based on historical costs does not give an accurate assessment of the economic return of the authority. The economic return is the sum of the change in value of the assets plus net operating income. The change in value can be measured in nominal terms by estimating the values of the assets in prices current at the beginning and end of the accounting period. The change in value in real terms would be the difference in asset values at the beginning and end of the accounting period measured in prices current at a single point in time. Asset values measured in historical costs clearly give no guide to economic returns in either nominal or real terms.

TABLE 3 FINANCIAL PERFORMANCE OF SELECTED PORT AUTHORITIES, 1986-87

Port authority	Revenue $ ('000)	Expense ($'000) Operating	Expense ($'000) Non-operating[a]	Surplus (deficit)[c] $ ('000)
Maritime Services Board	300 032	166 998	83 347	49 687
Melbourne	105 207	58 332	64 113	(17 238)
Geelong[b]	28 838	17 763	3 003	8 072
Brisbane	41 834	19 807	14 527	7 500
Gladstone	48 817	13 723	20 284	14 810
Fremantle	42 688	36 698	5 174	816
Port Hedland	7 139	5 769	1 502	(131)
South Australian ports	40 565	26 427	18 508	(4 370)
Hobart	7 397	5 453	770	1 174
Launceston	10 002	4 221	5 355	426
Darwin	4 888	5 081	3 696	(3 889)

a. Includes finance charges and depreciation, but not abnormal and extraordinary items.
b. Figures refer to 18 month period ended 30 June 1987.
c. Before statutory contribution to consolidated revenue (where applicable).

Source Annual reports.

Data are available for two authorities which allow estimates of rates of return based on a revaluation of fixed assets to reflect current replacement costs. The PMA includes rate of return calculations in its annual reports on a basis of depreciated replacement costs of its fixed assets. In 1987-88 its 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 replacement costs.

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TABLE 4 RATE OF RETURN FOR SELECTED PORT AUTHORITIES ON HISTORICAL COST BASIS, 1986-87

Port authority	*Revenue ($'000)*	*Surplus (deficit) before finance charges[a] ($'000)*	*Total assets ($'000)*	*Surplus return on total assets[b] (per cent)*
Maritime Services Board	300 032	12 399	1 004 549	11.2
Melbourne	105 207	33 406	527 102	6.3
Geelong[c]	28 838	8 109	81 667	6.6
Brisbane	41 834	14 348	135 967	10.6
Gladstone	48 817	25 298	240 749	10.5
Fremantle	42 688	4 961	60 619	8.2
Port Hedland	7 139	924	150 885	0.6
South Australian ports[d]	40 565	11 757	130 712	9.0
Hobart	7 397	1 764	44 921	3.9
Launceston	10 002	2 800	46 780	6.0
Darwin	4 888	(1 743)	46 653	(3.7)

a. And before extraordinary and abnormal items.
b. Based on asset values at end of financial year.
c. Revenue and surplus are for the 18 month period ended 30 June 1987. Rate of return is estimated on an annual basis.
d. The Department of Marine and Harbours in South Australia prepares its accounts on a cash basis with the exception of depreciation.

Source Annual reports.

Similarly the Curran Report (New South Wales Commission of Audit 1988) estimated the effect of revaluing the assets of the MSB. 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 is estimated to be from the 11.2 per cent shown in Table 4 to 4.4 per cent.

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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 achievements of both allocative efficiency and technical efficiency.

Assessment of allocative efficiency

The price elasticity of demand for port services is probably very low so that demand cannot be diverted or increased by the level of prices. At current price levels port authority pricing practices are unlikely to have much influence on the overall allocation of resources to ports.

In States where one authority or department administers several ports it is common practice to set uniform charges across all ports. A particular example is South Australia where many of the ports export wheat, are reasonably close and therefore potentially competitive. It is unlikely that the operating costs of these ports are identical. If prices were related to costs, exporters and shipowners would have some incentive to choose the lower cost facilities and thus enhance efficiency (Royal Commission into Grain Storage, Handling and Transport 1988). Clearly, the choice of port involves more than port prices: land transport costs and relative voyage times are also important factors. While generally there is little competition between ports, there are some limited circumstances such as those in South Australia where pricing could be used to influence the choices of users. Inappropriate pricing policies in these circumstances can lead to investment decisions which may be incompatible with the most efficient allocation of resources between ports.

Unlike many overseas ports Australian ports place a heavy reliance on cargo charges. Although much revenue is derived from cargo charges it is difficult to identify specific services provided in return for these charges. Apart from the recent PMA (1989) proposals there are no specific costs that wharfage charges are intended to recover. Table 5 summarises the reliance on wharfage charges of the major capital city ports.

TABLE 5 SOURCES OF REVENUE FOR SELECTED PORT AUTHORITIES, 1986-87

	Percentage of revenue[a]				
Source of revenue	*MSB*	*PMA*	*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

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

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Sources Annual reports.

The generally poor relationship between prices and costs, as exemplified by wharfage charges, results in poor information to port managers on the economic performance of specific assets. The difficulty in matching revenue and costs means that investment appraisal tends to focus on cost minimisation rather than a more commercial objective of profit maximisation (Joy 1987). As a consequence the allocation of resources to specific facilities is unlikely to be as efficient as it could be under a more rational pricing structure.

While shipowners have only limited options on the choice of port to visit, they have much more flexibility in the choice of ship technology. Current pricing structures with their emphasis on wharfage and uniformity of berth charges irrespective of costs, provide little incentive to shipowners to choose technology which optimises overall system costs rather than ship costs alone. A cost based pricing system would provide increased incentive to shipowners to choose the service or facility which best meets their needs and in the longer run would encourage the choice of technology by shipowners, stevedores and port authorities which optimises overall system costs.

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 cross subsidy requires that the service being cross subsidised is priced at less than marginal cost and some non-subsidised services are priced at above stand-alone costs.

While the degree of cost recovery varies among port authority assets it is unlikely that prices are below marginal costs for most services. While the degree of cross subsidisation as defined in economic terms is likely to be small, price discrimination is certainly widely practiced by port authorities. Allocative efficiency is unlikely to be affected by cross subsidisation.

Assessment of technical efficiency

There are some technical efficiency implications of the current pricing structure. 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 also 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.

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. If such charges were applied to berthing or cargo handling it could improve the utilisation of port facilities and raise port productivity. In the longer run such policies may influence the choice of vessel used in particular trades. However, in general, this approach is likely to be limited in its effectiveness by the fact that port charges form only a fraction of ship costs in port, the cost of ship's time being more significant and providing most of the incentive for the minimisation of delays. Joy (1989) argues that high reliance on wharfage charges reduces the incentive for stevedores to improve the operational efficiency of leased facilities.

Second, pricing policies of port authorities can improve technical efficiency if they can be used to help avoid

excess capacity developing at port facilities. Pricing policies may only cause excess capacity (or conversely only help eliminate excess capacity) if demand for relevant facilities is sensitive to price changes.

A third way in which port authority pricing policies may be related to technical efficiency is through the method by which price increases are determined. Charges based on costs will not on their own be conducive to the achievement of technical efficiency. In a near monopoly market there is ample scope for the padding of costs and the toleration of internal 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, if technical efficiency is to be a major objective it would be prudent to accompany cost based pricing policies with other measures which create pressures to reduce those costs.

The equity objective

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

The question of incidence is closely related to equity as the actual burden of port charges will not necessarily depend upon where the charge is levied in the first instance, but also on the degree to which the users so charged can pass on these charges to other users or customers. 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.

Given that Australian ports are generally characterised by low levels of inter-port and intra-port competition and restricted choice of service provider, and also that port charges are a small percentage of the landed value of goods, it is probable that the great bulk of the incidence of port charges falls on cargo owners. 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 major groups ultimately bear the burden of the charges.

The practice of levying charges on a periodic basis, rather than a usage basis, for Conservancy charges raises an equity issue which is not reduced by the incidence effects discussed above. State conservancy charges are generally levied on a Gross Registered Tonnage basis, covering a period varying from 30 days (Queensland) to 6 months (New South Wales, Victoria and South Australia). Tasmanian ports generally incorporate conservancy in the Tonnage Rates levied for each port use.

The periodic basis of charges 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 charges are current. 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. Cross subsidisation is probably not involved, as the marginal costs of navigation aids and buoys are zero or close to zero.

Apart from the issue of periodic payments the removal of perceived inequities in the charging system is unlikely to have a significant effect on the final incidence of those charges.

Other characteristics of pricing structures

Generally simplicity is a desirable characteristic of pricing structures. Port users benefit from a clearly understood structure and predictable overall charges. Port authorities benefit from the lower administrative costs of a simple system. The long history of current port authority charges has led to an unnecessarily complex system. Wharfage charges, especially, are noted for their complexity.

The 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. Government may wish to adopt port pricing policies designed to have an effect on economic activity within the port's catchment area and promote exports. However, these objectives are more effectively pursued through direct economic grants or subsidies.

DIRECTIONS FOR CHANGE IN PORT AUTHORITY PRICING

In economic terms the power of a pricing system is the influence it can have on the behaviour of economic agents. As noted earlier the elasticity of demand for port authority services is, with few exceptions, very low. 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 providers or consumers of the relevant services.

Cost-based pricing

The most significant proposed change involves a move to charges based on the costs of providing individual port services, rather than relying on general charges to achieve financial balance.

Most writers favour this approach (Joy 1988, Heggie 1974) and the PMA (1989) and the MSB have announced their intention of moving to systems based on this principle. The arguments in favour of cost-based pricing rest on its influence on the behaviour of participants in the port industry. A cost based pricing is unlikely to have any significant effect on port throughput because of the low price elasticity of demand for port services. In the long run it may have some influence on ship owner's choice of technology as a cost-based pricing system is, for most Australian ports, almost certain to result in a much greater emphasis on ship based charges.

A cost-based pricing system in Australian ports will result in higher prices to shipowners (the proposed PMA new pricing structure includes an average increase in tonnage charges of 358 per cent (PMA 1989)). While the elasticities of supply and demand ensure that the burden of these increases will fall largely on cargo owners, a rational shipowner would respond to the higher charges by seeking out those facilities and operating procedures which reduce the charges levied by port authorities on his ships. In the longer run productivity enhancing investment in port facilities by stevedores and port authorities would become more attractive. Overall at the micro level within the port many changes which improve efficiency could occur.

A pricing system based on costs and a requirement to earn a commercial rate of return on assets would encourage port authorities to become more efficient and to be careful managers of the assets under their control. 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 knowledge of costs and the setting of prices to cover them can provide pressure for controlling them. 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 has the potential for providing a driving force for improved port authority efficiency.

The adoption of cost-based pricing, in conjunction with cost control measures and price cap formulae, will contribute to the achievement of the goals of port authority pricing. Financial balance will be easier to achieve when the costs of services are clearly identified, and thus more clearly amenable to management control, especially in an environment of low trade growth, government-imposed price increase limits and financial stringency generally.

Asset valuation

The high proportion of port authority costs represented by capital charges indicates the importance of asset valuations in the setting of prices. Commercial practice is for non-current assets to be revalued regularly. If port authorities are to adopt a more commercial approach to their operations they too will need to revalue their assets on a regular basis.

There are also good economic reasons why assets should be revalued regularly. Primarily this is to ensure that the 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.

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 some port charges would be required to meet those costs. A more likely outcome is that port authorities would have to examine the performance of their assets more critically. Those assets found to be under-performing and under-used would be disposed of or consolidated so that the asset base would be more appropriate to the demand expected for the authority's services. That is, asset

valuations based on market or replacement costs can lead to fairly rapid gains in efficiency.

Land deserves separate consideration. Port authorities often had land vested to them at no cost or else obtained by them in the past at costs which bear no relationship to current values. Land obtained in these ways attracts no financing or depreciation charges. The port authority does not incur any direct costs of owning this land. However the opportunity cost of using land for port authority purposes can be high particularly in land located close to the central business districts of major cities. In these circumstances port authorities should seek to earn a target rate of return on the use of port land to indicate 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.

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 rate of return should equal the rate of return achieved in the private sector for investment of equivalent risk.

It can be argued that port investments are not risk free on the basis that port throughput and revenue are strongly correlated with general economic conditions. Target rates of return should therefore include a premium above the risk free rate of return. Investments in port development should only be undertaken, from an economic point of view, when the expected rate of return equals or exceeds the rate of return target.

Dividends to State governments should be in the form of a rate of return on net equity rather than a percentage levy on revenue, as is current practice in some States. A levy on revenue is, in effect, a tax on port users rather than a reward for investment. Port services are an intermediate good, the demand for which is a derived demand. It is a well established principle in taxation theory that taxation of intermediate goods should be avoided.

Achievement of the target rates of return stipulated by the relevant State governments is not by itself, in a largely uncompetitive environment, an 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 formulae to be adhered to or some combination of these.

Pricing to recover fixed costs

The previous section discussed the level of fixed costs that should be recovered by a port authority's prices. The next issue is how these costs should be distributed among users. 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 fixed costs.

Ramsey prices are derived from the elasticity of demand each user has for the service. The portion of the price above marginal cost is set, according to this principle, in inverse proportion to the user's price elasticity of demand. In practice, elasticities of demand are difficult to measure with any accuracy and instead some proxy is often used.

The proxy chosen should be easy to measure as well as having some logical relation to the elasticities. In practice earning capacity of the ship is a useful proxy. Port authorities in the past often chose NRT as the proxy, it being argued that 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 (Corkhill 1977). Length of ship and draught may have some relationship to the initial capital costs incurred in providing berths and channels. However, these measures are not as strongly related to earning capacity and in turn the price elasticity of demand, the relevant measure for Ramsey pricing (Heggie 1974).

The other pricing approach, two-part tariffs, requires that each user pay a lump sum as a type of entry fee (or periodic charge) to cover fixed costs and a separate charge to cover the marginal cost of each service consumed. Some conservancy dues appear to be based on a system of this type. The marginal costs are close to zero so that once the lump sum charge (based on GRT) is paid no further charges are levied during the specified time period. This approach can given rise to some equity issues between different classes of ship operators as discussed previously. The use of Ramsey type prices would avoid the equity problem while still being consistent with financial balance and efficiency objectives.

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 shipowners request that a channel be deepened then the costs of the channel could be recovered by levying a surcharge on all ships benefitting from the deeper channel. Where a particular trade requests the channel deepening then the charge could be based on the volume of cargo benefitting from the investment.

Cargo or wharfage charges have traditionally been based on price discrimination principles. However, an important result of moving to cost based pricing would be to shift charges more towards ship based charges. Cargo-based charges would be set to recover only those costs directly associated with the movement of cargo. These could include the costs of storage space, cranes (if they are not charged for separately) and possibly all or part of the horizontal surface of berths. The net result of cost-based pricing would be a much smaller proportion of revenue derived from wharfage charges. The need for price discrimination for cargo based charges would be reduced or possibly eliminated. Other approaches are possible. For example, the PMA (1989) has proposed that wharfage be used as a balancing item to recover costs not recovered by other charges (which are cost based). These remaining costs are mostly overheads. Under the PMA proposal wharfage charges are reduced substantially and all forms of cargo discrimination based on commodity or trade are eliminated. Substantially reduced wharfage charges provide the opportunity for a greatly simplified charging system with lower administrative costs.

Leasing policy

Port authority leasing practices currently involve long leases (20 to 25 years typically). The long leases confer a degree of market power on the intermediate suppliers of port services. Port users and some port authorities have expressed concern that long leases have resulted in reduced quality of service and high prices (ISC 1988a).

Goss (1987) among others has proposed that short-term leases (about five years) be adopted by port authorities to encourage so-called 'serial' competition between contenders for the right to provide specific port services. In this way it is considered that the port authority could provide an incentive to improve efficiency and lower prices charged to users.

Such an approach would have implications for port authority investment, given that lessees would be less willing to make capital investments in facilities the shorter the lease period involved. Specialised equipment and infrastructure may have to be provided by port authorities rather than by the operators to make the market for the right to provide the services more contestable.

Nevertheless, the costs and benefits of short-term leases should be considered, as an alternative to long-term leases. An increase in the competitive pressures on lessees would have beneficial effects on the operational efficiency of ports, especially in the area of stevedoring, as well as direct effects on port authority revenues. Factors which influence the feasibility of a move to short term leases include the availability of a sufficient number of potential operators to ensure competitive tendering and whether all potential operators would have equal access to waterside labour. This latter point is relevant under current waterfront labour arrangements but may be of less importance following the outcome of the ISC Waterfront Strategy Inquiry.

Impacts on users

There are implications for users of the inefficiencies arising from current pricing practices. Inefficiencies increase the level of costs that must be met from revenue derived from users. That is, an inadequate pricing system increases the prices paid by users for port authority services on average.

However, the major impact of port pricing reform on port users would be redistribution of charges between different classes of users, the most important example being a move from cargo based charges to ship based charges. An important issue is whether pricing reform will be revenue neutral. More rational asset pricing would increase the revenue requirements of a port authority but this could be offset in some states by a move from 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 which would also serve to reduce the revenue needs of the port authority. The PMA (1989) has indicated that its pricing reform will be revenue neutral and that any shortfall in achieving its rate of return target will be met by efficiency gains. This approach has merit as it indicates to users that the authority is willing to share in the costs of moving to an improved system. However where port authority assets were substantially undervalued, efficiency objectives might not be compatible with continued revenue neutrality.

The move from an emphasis or cargo based to ship based charges might initially appear to result in a major reduction in costs for cargo owners. However, shipowners are able to pass higher ship charges costs on to cargo owners in the form of higher freight rates with the result that the final incidence of the charges may not differ greatly from the current incidence. For bulk commodities subject to wharfage charges and sold fob, reduced wharfage charges may be reflected in lower fob prices as a result of higher port charges on ships and higher freight charges to overseas buyers.

Users would benefit from a greater clarity of the charging system. They would also benefit from improved investment policies of port authorities and improved efficiency generally.

CONCLUSION

The major impact of an improved pricing system would be on port authorities themselves. The improved costing systems required by the reformed pricing system would allow better control of costs. A major outcome would be a better assessment of potential investments and management of existing assets.

A major requirement of pricing reform is to base prices on the costs of providing the relevant services. A downward pressure on costs through performance targets, possibly in combination with price cap formulae is a necessary corollary to cost based pricing. The costs to be recovered should be based on asset valuations which reflect current market or replacement values. Financial payments to State governments should also be based on a commercial approach in the form of a rate of return on net equity rather than a proportion of revenue.

The final incidence of the reform on users may not differ greatly from the current incidence but there are likely to be some users more disadvantaged than others. One possible source arises from the fact that GRT or other measure of ship size is an imprecise proxy for elasticity of demand for port services. Some modifications to the reformed pricing schedules may be required in practice to reflect elasticities which may differ significantly between ship categories or trades.

REFERENCES

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

BTE (1986), A Study of Liner Shipping Services into and out of Australia, Volume 2, Report 60, AGPS, Canberra.

__ & Ministry of Transport, NZ (1987), Review of Trans-Tasman Shipping, AGPS, Canberra.

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

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

ISC (1988a), Waterfront Investigation: Preliminary Findings and Discussion Papers, Volume 2, The Evidence to Date, AGPS, Canberra.

__ (1988b), Waterfront Investigation: Preliminary Findings and Discussion Papers, Volume 4, Industry Structures, AGPS, Canberra.

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

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

__ (1989), Potential for Increased Competition, Hyland Joy & Associates, Sydney.

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

Port of Melbourne Authority (1989), New Pricing Structure: A Final Position Paper Outlining the Port of Melbourne Authority's New Pricing Structure and Level of Rates, Melbourne.

Royal Commission into Grain Storage, Handling and Transport (1988), Volume 3: Supporting Papers, AGPS, Canberra.

Wilson, H. G. (1979), Port Pricing and Investment Planning, The Logistics and Transportation Review, 15: 401-418.