Port Interface Cost Index

Report

Ports have been a major focus of the Australian Government's reform program. The Waterfront Industry Reform Authority was responsible for reform of the stevedoring industry, completing its work in October 1992. The BTCE has developed a new port interface cost index in response to the 'Warehouse to Wharf' report of the House of Representatives Standing Committee on Transport, Communications and Infrastructure. It includes port and related charges (port authority, towage and pilotage charges), stevedoring charges, customs brokers' fees and land transport charges. This Paper describes the development of the index and presents initial estimates of costs. Future values will be published at intervals of six months.

Subject
Series
Date
A to Z
Search
Results
Print
Exit
GO BACK

Bureau of Transport and Communications Economics

Report 84

PORT INTERFACE COST INDEX

Australian Government Publishing Service, Canberra

ISSN 1034-4152
ISBN 0 644 32737 5

Printed for AGPS by Better Printing Service, 1 Foster Street, Queanbeyan NSW 2620

FOREWORD

Ports have been a major focus of the Australian Government's reform program. The Waterfront Industry Reform Authority was responsible for reform of the stevedoring industry, completing its work in October 1992. Reform of harbour towage was undertaken by the Shipping Industry Reform Authority.

The links between the various segments of the waterfront and how they operate as a system were investigated by the House of Representatives Standing Committee on Transport, Communications and Infrastructure in its inquiry into the efficiency of the interface between sea ports and land transport. One of the Committee's recommendations was that the Bureau should develop an index of the costs of moving containers through a port, and the costs involved in the movement of containers between the port and the warehouse. This paper describes the development of the index and presents initial estimates of costs. The index value for the second half of 1992 was published in the June quarter 1993 issue of the BTCE's bulletin, *Transport and Communications Indicators*. Future values will be published at intervals of six months.

Although not reflected in costs included in the index, the quality of service experienced by port users can have a significant impact on their costs. The project was therefore extended to examine quality of service issues. The paper reports on two aspects of waterfront service quality: the time for less than container load (LCL) cargo to become available, and preliminary results on the ability of liner shipping to operate in accordance with published schedules.

The Bureau received assistance from a wide range of organisations and individuals in the development of this study. Assistance provided by the Customs Brokers Council of Australia in facilitating a survey of customs brokers was especially helpful. Road transport associations in all mainland States provided assistance in developing contacts with carriers operating in the ports, and this assistance was very much appreciated.

The Bureau is particularly grateful for the support of the Association of Australian Ports and Marine Authorities, which facilitated helpful comments from individual port authorities. The Maritime Services Board of New South Wales, Port of Melbourne Authority, Department of Marine and Harbors in South Australia and the Fremantle Port Authority assisted the Bureau by providing data on individual

ships entering their ports. These data were important inputs into the development of key parameters necessary for the index.

The assistance of Gee Con in supplying data on LCL cargo availability is also gratefully acknowledged. Many other individuals assisted the Bureau in the study, including respondents to the customs brokers' survey. For various reasons they can not be identified individually. Their assistance is nevertheless very much appreciated.

The study was led by Neil Gentle assisted by Anthony Carlson. Anita Scott-Murphy assisted with statistical and econometric aspects. Elizabeth Lowden and Malcolm Penglase extracted and analysed data for the liner shipping reliability part of the study. The Research Manager, Dr Leo Dobes, provided overall supervision for the study.

M. Haddad
Director

Bureau of Transport and Communications Economics
Canberra
September 1993

CONTENTS

		Page
FOREWORD		iii
SUMMARY		xi
CHAPTER 1	**INTRODUCTION**	1
	Background	1
	Structure of the index	4
CHAPTER 2	**PORT AND RELATED CHARGES**	7
	Parameter selection	7
	Ship based charges	10
	Cargo based charges	15
	Empty teus	16
CHAPTER 3	**CHARGES FOR LAND BASED SERVICES**	19
	Charges for customs brokers' services	19
	Charges for road transport	22
CHAPTER 4	**INITIAL VALUE OF THE INDEX**	25
	Individual port costs	25
	National average costs	26
	Comparison with 1991 estimates	26
CHAPTER 5	**QUALITY OF SERVICE**	29
	Introduction	29
	Conceptual framework	29
	LCL cargo	30
	Liner shipping schedules	31
CHAPTER 6	**AVAILABILITY OF LESS THAN CONTAINER LOAD CARGO**	33
	Method	33
	Results	34
	Container depot market shares	36

		Page
CHAPTER 7	**CONCLUSIONS**	39
APPENDIX I	**CUSTOMS BROKERS SURVEY FORM**	41
REFERENCES		45
ABBREVIATIONS		47

FIGURES

		Page
2.1	Size of container ships calling at Botany Bay (July to December 1992)	8
2.2	Number of teus exchanged per ship call for ships in the range 15 000 GRT to 20 000 GRT visiting Botany Bay (July to December 1992)	9
3.1	Customs brokers' fees for import FCL containers	20
3.2	Customs brokers' fees for export FCL containers	21
6.1	Cumulative proportion of LCL containers available for each day after ship arrival, 19 January to 8 February 1993	34
6.2	Cumulative proportion of LCL containers available for each working day after ship arrival, 19 January to 8 February 1993	35
6.3	Market shares of Melbourne LCL depots, 1993	36
6.4	Market shares of Sydney LCL depots, 1993	37

TABLES

		Page
2.1	Indicative vessel size and teus exchanged	9
2.2	Ship based charges, per visit	11
2.3	Ship based charges, per teu	11
2.4	Cargo based charges	16
2.5	Empty teu costs	17
3.1	Range of fees charged by customs brokers	21
3.2	Customs brokers' fees by State	22
3.3	Road transport charges for the metropolitan movement of shipping containers	23
4.1	Shore based shipping costs, July to December 1992	26
4.2	Shore based shipping costs, 1991 and 1992	27
5.1	ATAC and WIRA port performance indicators	30
5.2	Pre-EBA and post-EBA scheduled days in port	31
6.1	LCL depot performance, 1987 and 1988	35
6.2	LCL depot performance, 19 January to 8 February 1993	35
6.3	Concentration in the LCL depot market	37

SUMMARY

The BTCE has developed a new port interface cost index in response to the 'Warehouse to Wharf' report of the House of Representatives Standing Committee on Transport, Communications and Infrastructure. It includes port and related charges (port authority, towage and pilotage charges), stevedoring charges, customs brokers' fees and land transport charges. The index will be published every six months.

The initial results show that Adelaide and Fremantle had the lowest shore based shipping costs during the second half of 1992. This was principally due to lower road transport costs to and from warehouses in those cities.

SHORE BASED SHIPPING COSTS, JULY TO DECEMBER 1992
($/teu)

Port	*Import*	*Export*
Fremantle	610	540
Adelaide	584	514
Melbourne	679	608
Sydney	743	642
Brisbane	621	575
All ports	684	603

teu Twenty-foot equivalent unit container

Source BTCE estimates.

Melbourne had the lowest port and related charges per container for imports and the second lowest for exports. In contrast, Sydney had the highest port and related charges for import containers and the lowest port and related charges for exports. The lower charges for all containers exchanged in Melbourne and export containers in Sydney, reflect higher container exchanges per vessel in those cities compared with the other ports.

Importers face higher total costs than exporters, mostly due to more complicated customs clearance procedures compared with exports. In Sydney, exports are also less costly to move across the waterfront because of significantly lower wharfage charges for exports.

In general there has been a reduction in the total costs of moving international containers from warehouses through the Australian waterfront. The extent of the overall reduction between 1991 and 1992 varies from 5.1 per cent for containers imported into Sydney to 11.3 per cent for containers exported from Melbourne.

The cost index does not measure waterfront quality of service. But quality of service is at least as important to port users as costs. One measure of this is the time taken for less than container load (LCL) cargo to become available after ship arrival. International container depots unpacking LCL containers now provide a much better quality of service than before the implementation of the Government's reform program. On average, cargo is now available in five to seven days from ship arrival compared with more than ten days during the best periods in 1987 and 1988.

A better measure of port performance is the ability of liner shipping to operate in accordance with published schedules. An index to measure this is to be developed to complement the cost index. Because liner shipping is dependent on the reliability of other service providers, the index is expected to provide an overall measure of port service quality.

Preliminary work on the liner shipping index has shown that liner operators have reduced their planned days in port by almost half a day per port call. The Bureau intends to publish a more complete analysis as part of its ongoing research into the effects of the Government's reform program.

CHAPTER 1 INTRODUCTION

BACKGROUND

Over the past eight years, the Australian waterfront has been an important focus of the Government's micro-economic reform agenda. At the outset, the reforms were directed primarily at the performance of the traditional port operators: stevedores, towage suppliers, and port authorities.

These reforms have produced significant gains in labour productivity on the waterfront. But how has the waterfront and its interface with land transport performed as a system?

As early as 1988 the Bureau of Transport and Communications Economics (BTCE) foresaw the importance of ensuring that the reforms being accomplished on the waterfront were translated into reform along the whole transport chain:

> Reduced waterfront costs, provided they are reflected in reduced charges to shippers and consignees of cargo, can in principle provide a direct stimulus to trade as well as the benefit of the lower costs faced by importers and exporters. (BTCE 1988, p. 54)

The House of Representatives Standing Committee on Transport, Communications and Infrastructure (HORSCOTCI) adopted a similar approach in its inquiry into the efficiency of the interface between sea and land transport. The Committee highlighted the need to treat the waterfront as part of an integrated chain; that is, from the port to the warehouse:

> Links to and from the waterfront — the interfaces with other means of transport — are equally important to the overall efficiency of Australian freight transport. Yet these links have not been subjected to the exhaustive inquiry process that the stevedoring industry has endured. Without an efficient network of linkages between the waterfront and other means of transport, the benefits arising from the waterfront reform process may be dissipated. (HORSCOTCI 1992, p. 1)

In its report the Committee recommended that the Bureau 'produce a six monthly Port Performance Indicator on sea/land transport interface efficiency' (HORSCOTCI 1992, p. 101). The Committee based its discussion of the

proposed indicator on the estimates of shore based shipping costs contained in the Bureau's submission to the inquiry (BTCE 1992). It referred to correspondence with the Bureau concerning the feasibility of the indicator in which the Bureau indicated that an index based on the estimates of shore based shipping costs was feasible and of value. The Committee concluded that 'such indicators are probably the best indication of improvements in the efficiency and reliability of the interface' (HORSCOTCI 1992, p. 99).

The Committee saw two functions for the index:

> First, it would assess whether change in interface efficiency is occurring. If efficiency were found not to be improving, the indicator will be used to pin-point where inefficiencies remain.... Second, the indicator would be a measure by which an assessment of whether the improvements in interface efficiency were being passed on to users in the form of lower costs. (HORSCOTCI 1992, p. 100)

The Commonwealth Government, in its response to the Committee's report supported the development of the index. It stated that it would 'seek to ensure that wherever possible data requirements in this area are rationalised to guard against duplication of reporting for this and other indicators of performance in the ports area' (Cook 1992, p. 7).

Development of the index

In developing the index, the Bureau consulted with industry groups and other participants in the waterfront industry. As a result of these consultations and the comments by HORSCOTCI, it became clear that the index should satisfy two criteria. The index should:

- provide a simple, understandable measure of shore based shipping costs; and
- allow identification of areas where performance is improving and areas where there may be some problems.

The waterfront is an amalgam of diverse and complex operations. A single index cannot capture the full extent of these complexities. Simplicity requires that elements chosen for inclusion in the index focus on the essential operations of the waterfront.

One example of the application of this principle is the exclusion of packing and unpacking charges for less than container load (LCL) cargo at international container depots and the transport and customs brokers' fees associated with LCL cargo from the index.

The Prices Surveillance Authority (PSA) does not monitor LCL depot charges. The PSA (1990) argued that depots have become much more competitive following deregulation. The evidence supports this argument. Many of the

depots manned by Waterside Workers Federation members have closed or plan to close. Entry of new operators is now easier following the easing of regulatory constraints under section 17(b) of the *Customs Act 1901* (Commonwealth). In addition there are no obvious economies of scale that may cause significant barriers to entry. The number of new entrants is evidence of the ease of entry. The enhanced competition in this part of the industry reduces the need for monitoring.

A second reason for excluding LCL depot charges is that LCL containers are only a small proportion of the total number of containers handled. The Melbourne truck survey (Arup Transportation Planning 1992) and an analysis by the BTCE (described in chapter 6) on the time for LCL container cargoes to become available indicate that LCLs comprise only about 3 per cent of all teus (twenty-foot equivalent units) exchanged in both Sydney and Melbourne.

Simplicity has also been sought by focusing the index on container ships calling at container terminals. A major thrust of the waterfront reform process has been on the stevedoring industry. Although there is some stevedoring of bulk cargoes, stevedoring of general cargo is the main activity of the industry. But most of Australia's important general cargo trades are containerised. An index focused on the containerised trades has more relevance than would an index based on non-containerised cargo. Also, port and land transport activities associated with bulk trades tend to be controlled by few participants who are often the owners of the cargo. They are not characterised by the diverse groups and the associated complexities that characterise the containerised trades.

If all components of port performance are to be monitored properly, the index should be disaggregated as much as possible. This suggests that separate indices should ideally be developed for each port. Although this is done in this report, some care needs to be exercised in comparing the costs of the different ports. Different operating circumstances of the different ports will influence the costs measured by the index and the degree of improvement that can be expected.

The quality of the service provided by the waterfront is as essential to its performance as its costs. Previous work by the BTCE (1990) estimated that poor reliability of the waterfront cost the community up to one billion dollars in 1988.

Costs of poor service quality do not show up directly in the index. A low cost port is not necessarily consistent with acceptable service quality. For example, a berth with a high occupancy rate may have low unit operating costs, but congestion can result, with excessive delays to both ships and cargo.

For this reason the Bureau examined two specific measures of service quality. These are the ability of liner ships to maintain published schedules on the Australian coast, and the time for LCL cargo to become available. Both of these were found to be indicative of poor reliability in 1988 (BTCE 1990).

STRUCTURE OF THE INDEX

The index is intended to measure the average cost of moving a container (measured in teus) through a port. It is designed to capture the most significant costs involved in these movements.

There are other services that are provided to ship operators and cargo owners in the normal course of importing and exporting, but the cost of these other services are generally small when compared with those included in the index. The additional complexity involved with their inclusion in the index would not be offset by any added understanding of changes in costs.

The services included in the index are:

- pilotage;
- towage;
- port authority services:
  - tonnage;
  - berth hire;
  - mooring/unmooring;
  - wharfage;
- State government services:
  - conservancy;
- Commonwealth government services:
  - Marine Navigation Levy;
- stevedoring;
- customs and quarantine clearances by customs brokers; and
- road transport.

Most of these services are provided on the basis of a charge per container. However, some are provided and charged on the basis of the ship. Pilotage, towage and some of the port authority services are provided on this basis.

Ship based charges are reported in this paper on the basis of the total cost per ship as well as a cost per teu. The cost per teu estimate is used in the index.

The index is the sum of the separate average costs per teu for each of the components listed above. The one exception is the Marine Navigation Levy. This charge, once paid, is valid for three months. During this time the ship may make more than one visit to the Australian coast and visit more than one port on each

visit. Rather than attempt to estimate the number of teus exchanged during the currency of the charge, the charge per visit to the Australian coast is reported separately from the index.

Sources of data

Publicly available sources of data have been used where practical. These sources are mostly in the form of price schedules (for example, for port authorities and towage operators). The other form of publicly available information is the use of Prices Surveillance Authority stevedoring price monitoring results.

The prices of road transport and customs brokers' services are not accurately reflected in publicly available schedules. For these services, direct contact with industry participants was required to develop an adequate understanding of the level of prices or charges.

Treatment of empty containers

Ships exchange both loaded and empty containers. But empty containers moving through a port are not always associated with cargo imported or exported through that port. For example, empty containers imported through Sydney could be land-bridged by rail or road to Brisbane to service the export trade through that port.

There are two cost components associated with empty containers. First, there are the ship based charges levied by State governments, port authorities, towage operators and pilots that are independent of the volume of cargo exchanged. Secondly, there are the cargo based charges levied by port authorities and stevedores.

The costs incurred on empty containers are initially paid by ship operators. Ultimately, these costs will be reflected in freight rates. But as the empty container movements may be part of a complex repositioning activity, it would be conceptually incorrect to allocate all the costs incurred in moving the empty containers through a port to loaded containers moving through the same port. For this reason only the costs associated with loaded containers are included in the index. However, the cost of empty containers are not ignored.

Ship based charges in the index are allocated equally to all containers exchanged. That is, each loaded and each empty teu is allocated an equal proportion of the ship based charges. Both the ship based charges and the cargo based charges for empty containers are then reported separately from the index.

CHAPTER 2 PORT AND RELATED CHARGES

Port and related charges are those charges involved in bringing a vessel into port and discharging and loading cargo. The port and related charges included in the index are those levied by State governments, pilots, towage operators, port authorities and stevedores.

PARAMETER SELECTION

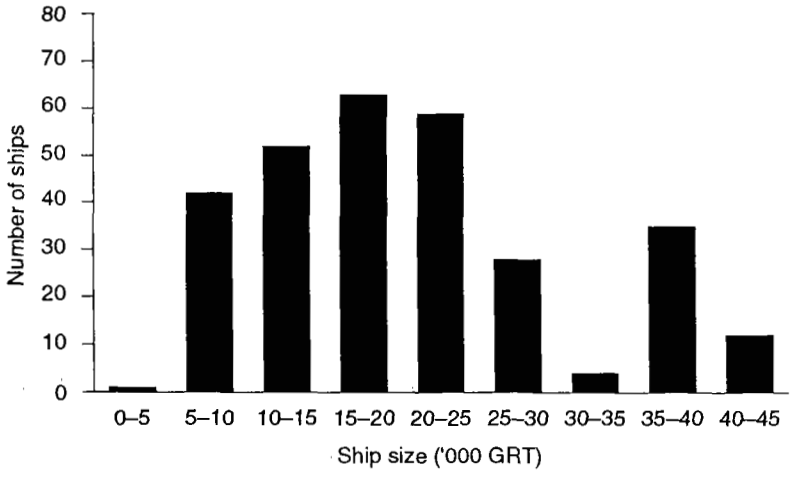
Calculation of port and related charges depends on two important parameters: ship size and number of teus exchanged.

The indicative vessel

The estimate of shore based shipping costs presented in the Bureau's submission to the 'Warehouse to Wharf' Inquiry (BTCE 1992) was based on a ship size of 25 000 GRT (gross registered tons). This size was chosen to allow direct comparison with the costs estimated for the Webber Inquiry (BTE 1986). However, a representative ship is one that has a size similar to a significant proportion of ships using the port. A non-representative ship could have costs that are not a satisfactory indicator of cost trends. There is no reason to expect that the 25 000 GRT vessel chosen for the earlier studies would still be representative of ships calling at Sydney and Melbourne or any of the other mainland capital city ports.

Port authorities in Sydney, Melbourne, Adelaide and Fremantle provided data on ship calls. These data allowed the estimation of the distribution of ship size for each of these ports. The data also permitted estimation of the distribution of teus exchanged for Sydney, Melbourne and Adelaide.

The distribution of ship size was bi-modal for each of the ports. Figure 2.1 illustrates the distribution estimated for Botany Bay for the period July 1992 to December 1992. The major modal range for this distribution is 15 000 GRT to 20 000 GRT. A specific ship was selected to simplify choice of net registered tons (NRT) and to facilitate discussion with towage companies on the number of tugs required.The particular ship selected from this range (the *Bunga Bidara)*



Source BTCE estimates based on data supplied by the Maritime Services Board of New South Wales.

Figure 2.1 Size of container ships calling at Botany Bay (July to December 1992)

had a size of 17 215 GRT and 8372 NRT and was selected because ships of this size were the most frequent callers at Botany Bay in the size range 15 000 GRT to 20 000 GRT during this period. An identical procedure was used for Melbourne, Adelaide and Fremantle.

The Bureau was unable to obtain actual ship call data for Brisbane. A distribution of sizes of ships calling at Brisbane was obtained from schedules published in the *Daily Commercial News*. Distributions developed in the same way for Sydney and Melbourne were found to broadly reproduce the distributions obtained from actual ship call data provided by port authorities. There is therefore some confidence that the distribution obtained for Brisbane is reasonably representative of all ships calling at Brisbane container terminals.

Table 2.1 shows the indicative vessel size chosen for each port. Ships were generally selected from the mode of the distribution of ship sizes. The vessel chosen for each port is significantly smaller than 25 000 GRT. Consequently, any comparison of the present index with earlier Bureau estimates of Sydney and Melbourne shore based shipping costs will not be entirely valid.

Expected number of containers exchanged

Charges levied on liner vessels are estimated as a rate per teu. This estimation required information on the expected number of teus exchanged by the indicative vessel at each port call.

The number of teus exchanged per visit varies markedly. For ships in the range of 15 000 GRT to 20 000 GRT calling at Botany Bay, the number of teus

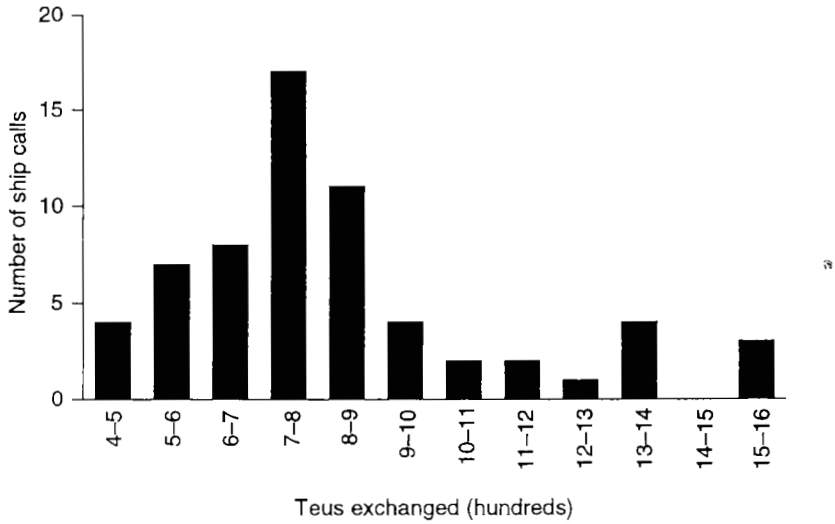
TABLE 2.1 INDICATIVE VESSEL SIZE AND TEUS EXCHANGED

Port	Indicative vessel size		Mean teus exchanged	Empty teu ratio[a]
	GRT	NRT	(teus)	(per cent)
Fremantle	17 215	8 372	385	16
Adelaide	13 488	6 126	418	18
Melbourne	17 215	8 372	682	14
Sydney	17 215	8 372	826	15
Brisbane	20 325	7 769	485	26

GRT Gross registered tons
NRT Net registered tons
a. Ratio of empty teus to total teus exchanged.

Sources BTCE estimates based on data supplied by port authorities in Sydney, Melbourne, Adelaide and Fremantle, WIRA (1992), Lloyd's Register of Shipping (1992), *Daily Commercial News*, various editions.

exchanged per visit during the period from July 1992 to December 1992 varied from 400 to 1549. The mean was 826. The distribution was reasonably symmetrical with the mode being in the range 700 to 800 (see figure 2.2). The mean number of teus exchanged (826) is therefore representative of the number of teus exchanged for ships in this size range. The mean number of teus exchanged by ships in the modal size range was also selected for Melbourne and Adelaide.



Source BTCE estimates based on data supplied by the Maritime Services Board of New South Wales.

Figure 2.2 Number of teus exchanged per ship call for ships in the range 15 000 GRT to 20 000 GRT visiting Botany Bay (July to December 1992)

Because the Fremantle Port Authority was unable to supply the number of teus exchanged per ship call, the mean number of teus exchanged as reported in the WIRA statistics was selected (WIRA 1992). No adjustment was made to this number as the mean size of ship calling at Fremantle container terminals was in Fremantle's modal range of 15 000 to 20 000 GRT.

Similarly, the mean of the distribution of vessel sizes obtained for Brisbane was in the same size range as the mode so that the mean number of teus exchanged for Brisbane derived from the WIRA (1992) statistics was used for the index.

The number of teus exchanged per ship call for the selected ship size is shown for each port in table 2.1.

Number of port calls

The number of Australian port calls that a vessel makes per year depends upon the service that the vessel is employed in. A vessel employed on the European, North American and Asian services will tend to make four, eight and ten visits per year, respectively. For the index, ten visits per year was assumed for the purpose of calculating the appropriate level of Commonwealth and State Government charges.

SHIP BASED CHARGES

Port and related charges can be categorised according to who initially pays the charge, or according to whether the charge is levied on the ship or the cargo. The method of categorising depends on how the results are to be used.

Charges levied on the ship will eventually be reflected in the freight rate. The final distribution of the charges to importers and exporters depends on the elasticities of demand and supply of the commodity being carried. That is, the final distribution of the ship based charges is generally not related to the initial incidence of the charges. Therefore categorising the charges in accordance with who pays them initially would not be helpful in understanding the impact of the charges. Further discussion on this point may be found in BTCE (1989).

Recent changes in approaches to port pricing have resulted in a shift in emphasis from charges on cargo to charges on the ship. Categorising the charges on the basis of whether they are levied on the ship or the cargo would reflect these changes and the current debate on port pricing. Charges in the index have therefore been classified as being ship or cargo based.

The components of ship based charges are: State government charges, berth hire, tonnage, pilotage, towage, and mooring and unmooring. The total charges for these services are shown in table 2.2. The charges are also shown in table

2.3 on a cost per teu basis. It should be noted that although they are shown on a cost per teu basis in table 2.3 and in the index, the charges are not levied in this way. Nor are ship based charges incorporated into freight rates according to average costs per teu.

Normal operating conditions were assumed: that is, fair weather, no delays, and no repositioning.

TABLE 2.2 SHIP BASED CHARGES, PER VISIT

($ per visit)

	Fremantle	*Adelaide*	*Melbourne*	*Sydney*	*Brisbane*
State government	527	4 107	1 915	..	3 719
Berth hire	..	..	8 413	..	1 347
Tonnage[a]	2 133	1 805	10 157	9 296	..
Pilotage	5 068	2 236	5 486	3 732	5 766
Towage	10 240	11 340	7 170	9 772	10 440[b]
Mooring[c]	1 406	..	2 350	4 448	320
Total	19 374	19 488	35 490	27 248	21 592
Marine Navigation Levy	1 612	1 238	1 612	1 612	1 512

.. Not applicable
Note Figures may not add to totals due to rounding.
a. Navigation services charge in New South Wales.
b. Includes a $60 per tug line charge.
c. Includes unmooring charge and launch hire.

Sources BTCE estimates based on ship call data supplied by port authorities, WIRA (1992) and price schedules of port authorities, towage operators and pilotage service providers.

TABLE 2.3 SHIP BASED CHARGES, PER TEU

($ per teu)

	Fremantle	*Adelaide*	*Melbourne*	*Sydney*	*Brisbane*
State Government	1.40	9.80	2.80	..	7.70
Berth hire	..	..	12.30	..	2.80
Tonnage[a]	5.50	4.30	14.90	11.30	..
Pilotage	13.20	5.40	8.00	4.50	11.90
Towage	26.60	27.10	10.50	11.80	21.50
Mooring[c]	3.60	..	3.50	5.40	0.70
Total	50.30	46.60	52.00	33.00	44.50

.. Not applicable
Note Figures may not add to totals due to rounding.
a. Navigation services charge in New South Wales.
b. Includes a $60 per tug line charge.
c. Includes unmooring charge and launch hire.

Sources BTCE estimates based on ship call data supplied by port authorities, WIRA (1992) and price schedules of port authorities, towage operators and pilotage service providers.

State government charges

The application of State government charges varies from State to State, particularly in regard to the time period for which they apply. Technically, State government charges should be applied to all cargo exchanged within the State. In practice, container ships rarely call at more than one port in any State. Consequently, all State charges are allocated in the index to containers exchanged at the capital city port.

State charges are usually levied on a flat GRT basis and are payable only once during a specified period. The time period varies from a charge for each visit in South Australia to six months in Victoria. From 1 January 1993 the charge in South Australia changed to a sliding scale per visit during each six-month period.

Berth hire

The Port of Melbourne Authority (PMA) charges a flat $239 per hour calculated to the nearest one-tenth of an hour rounded up. The Port of Brisbane Authority (PBA) charges by the vessel length (per metre) for the first 24-hour period and then for each 12-hour interval or part thereof. Berth time in Melbourne was estimated using the mean exchange rate (19.4 teus per berth-hour) for ships in the range 15 000 GRT to 20 000 GRT[1] calling at Swanson Dock from July to December 1992. Berth time in Brisbane was estimated using the mean exchange rate reported by WIRA (1992) (25.6 teus per elapsed berth-hour) for all ships calling at Brisbane during the September quarter of 1992.[2]

The Fremantle Port Authority (FPA) levies a berth hire charge on each container exchanged. That is, it is a cargo based charge.

In Botany Bay, there are no berth hire charges at Brotherson Dock as both National Terminals (Australia) Limited (NTAL) and Container Terminals Australia Limited (CTAL) operate their berths under long-term lease from the Maritime Services Board of New South Wales (MSB).

There are no berth hire charges in Adelaide for the container terminal.

Tonnage

Tonnage refers to those port authority charges levied on the size of the ship as measured in GRT.

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1. This range encompasses the indicative vessel selected for Melbourne.
2. Only the mean exchange rate for all ships could be used because distributions of ship sizes and teus exchanged were not available for Brisbane.

In both Sydney and Melbourne, tonnage is a flat dollar per GRT charge. In Sydney the charge is referred to as a navigation services charge. In Adelaide and Fremantle a time component is incorporated into a dollar per GRT charge. The PBA does not levy a tonnage charge, but instead levies a harbour dues charge for each container exchanged, which is a cargo based charge.

Pilotage

Pilot services in Brisbane are provided by the private company Brisbane Marine Pilots Pty Ltd, but the charges levied for this service are statutory charges. Pilotage charges are on a stepped per GRT basis, with a minimum charge of $618.

Since 1 September 1992, pilotage services in Botany Bay have been provided by the Sydney Ports Pilot Service Pty Ltd. These services were previously provided by the MSB. It was agreed that pilotage would not increase for three years. However, the rates set at that time have remained unchanged since January 1986. Charges are calculated on the GRT of the vessel and are subject to minimum and maximum rates.

In Melbourne, pilotage services are provided by the Port Phillip Sea Pilots Pty Ltd, a private company. In Adelaide and Fremantle the service is provided by the port authority. The charges in Melbourne and Adelaide are based on the size of the ship as measured by GRT. In Fremantle a flat charge is levied which depends on the service provided.

Towage

The number of tugs required by a ship to enter and leave a port depends on weather conditions and whether the ship has bow thrusters. Good weather was assumed for the purposes of the index. The use of bow thrusters generally reduces tug requirements by one. Towage companies and port authorities commented that most ships visiting container terminals did not have bow thrusters. For this reason, towage charges were estimated on the assumption that the indicative vessel for each port did not have bow thrusters. With the exception of Melbourne, two tugs in and two tugs out was suggested as being normal for the indicative vessel with no bow thrusters. In Melbourne two tugs in and one tug out was suggested as the norm.

For each port, towage charges are based on the size of the vessel as measured by GRT. The charges are specified on a per tug basis, but in Botany Bay the price for a third tug differed from the price for the first two. Tug companies publish their charges and it is believed that ship operators generally pay the published rates. The published rates were therefore used for estimating the index. Published rates have remained unchanged in some ports since 1990.

When using a tug, a vessel has the option of providing its own tow line or one supplied by the tug in service. The Bureau was informed that these tow lines are costly to replace. Consequently, in Botany Bay and Brisbane, tug operators charge a separate fee for the provision of a tow line. However, although advertised in Botany Bay, historically this charge has not been levied and has not been included in the index.

Mooring and unmooring

In Botany Bay, mooring and unmooring services are provided by Stannard Bros Launch Services Pty Ltd. The published charges provided to the Bureau were divided into a charge for normal operating hours (0800h to 1559h) and overtime hours (1600h to 1959h). For the index, overtime rates are taken as the indicative charge since the peak demand for the mooring and unmooring services occurs in the early morning and late evening. These peaks reflect the operations of the stevedores. The early morning peak reflects demand for vessels to be positioned ready for the stevedoring day shift, while the late afternoon and evening peaks coincide with the completion of the stevedoring operations. The charge given reflects the upper limit of the mooring charges.

Stannard Bros charges separately for the use of launches and for two crew per launch. Both charges are hourly rates. One-and-a-half hours and one hour were taken as indicative for mooring and unmooring operations, respectively.

In Melbourne the port authority provides mooring services based on the length of the vessel and the dock used. Vessels over 150 metres pay a higher charge than shorter vessels. The indicative vessel used in the index for Melbourne is over 150 metres and typically uses Swanson Dock. Mooring charges were therefore based on these parameters. Launch services in Melbourne are charged on an hourly basis. The PMA provided the Bureau with the actual charge for a recent visit of the indicative vessel for use in the index.

In Adelaide, mooring and launch service charges are included in the tonnage charge as long as the service is provided during normal hours. It was assumed that the service was provided during normal hours. From January 1993 port charges in South Australia were restructured, with mooring and launch service charges being included in a new harbour services charge.

In Fremantle, mooring and unmooring services are provided by the port authority at a flat rate. The charge includes the provision of launches.

Marine Navigation Levy

The Marine Navigation Levy is a Commonwealth charge on all vessels greater than 1000 NRT. Valid for three months, it is charged on a stepped per NRT basis and is payable to the Australian Customs Service (ACS) at the first port of call in Australia.

In the index the levy is reported separately from the port and related charges. In principle, the charge could be allocated to all containers exchanged by the ship during the three-month charging period. However, the indicative ships used in the index have different voyage patterns which impose some difficulties for the allocation process. Because the levy represents reasonably significant ship based costs (see table 2.2), the Bureau believes that it should be identified but reported separately from the index.

CARGO BASED CHARGES

Cargo charges are those port authority charges levied on the cargo. Stevedoring charges are also cargo based charges, but are reported separately from port and related charges in the index. Wharfage is the most important of port authority cargo based charges.

Wharfage

Wharfage is a charge on cargo and is payable by cargo owners. Typically these charges have been related to the value of the cargo. However, for containerised cargo the charge is set on a flat rate per teu. At all ports, separate wharfage charges are set for loaded and empty containers.

The MSB differentiates between exports and imports for loaded containers, with the charge for export loaded teus being $55 compared with $98 for import teus. Both Fremantle and Adelaide encourage land-bridging through their ports by giving discounts on wharfage for land-bridged containers. These discounts are not relevant to the index, which is concerned only with containers originating in or destined for the metropolitan areas of the port cities.

From 1 January 1993 Adelaide removed the wharfage charge for empty containers.

Table 2.4 indicates the total wharfage charges for empty and loaded teus.

Stevedoring

Stevedores charge for the loading and discharge of ships. The charges for loading and discharging containers at container terminals are currently being monitored by the Prices Surveillance Authority. The PSA reports the average revenue per teu received by the terminal operators subject to monitoring. The PSA results are aggregated across all terminals.

The Bureau decided to use the results of PSA monitoring for use in the index. Although there is certain to be variation between ports and operators, the reported figure allows the relative importance of stevedoring in the index to be

TABLE 2.4 CARGO BASED CHARGES

Component	*Fremantle*	*Adelaide*	*Melbourne*	*Sydney*	*Brisbane*
Total cargo based charges ($ per visit)[a]	21 631	28 615	34 084	61 295	26 202
Stevedoring ($/visit)[b]	73 150	79 420	129 580	156 940	92 150
Wharfage ($ per teu)					
Loaded (import)	49.20	79.00	55.00	98.00	26.00
Loaded (export)	49.20	79.00	55.00	55.00	26.00
Empty	16.00	13.10	16.00	35.00	9.00
Other ($ per teu)					
Loaded	14.46[c]				42.00[d]
Empty	2.24[c]				5.25[d]
Total ($ per teu)					
Loaded (import)	63.66	79.00	55.00	98.00	68.00
Loaded (export)	63.66	79.00	55.00	55.00	68.00

a. Excludes stevedoring and includes empty teu charges.
b. Includes empty teu charges, and excludes Statutory Tonnage Levy.
c. Berth hire.
d. Harbour dues.

Sources Port Authority price schedules, PSA (1993), table 2.1, BTCE estimates.

measured and the movement of stevedoring charges relative to other services to be monitored.

The PSA's estimate of stevedoring revenue for the second half of 1992 was $190 per teu (PSA 1993), excluding the Statutory Tonnage Levy for redundancies.

Other cargo based charges

Two ports levy cargo based charges in addition to wharfage. Brisbane levies harbour dues instead of the tonnage charge levied in other ports. Berth hire charges in Fremantle are cargo based instead of ship based as in other ports.

Both of these charges are higher for loaded teus than for empty teus. These charges are summarised in table 2.4.

EMPTY TEUS

The index is constructed on the basis of costs that can be directly attributed to loaded teus. Costs per teu for ship based charges are estimated by dividing the total costs by the total number of teus (loaded plus empty) exchanged. The index therefore does not include the proportion of costs relating to the movement of empty containers. In addition there are port authority and stevedoring charges

associated with the handling of empty containers. These empty teu costs are borne by the ship operator initially, but are eventually reflected in freight rates.

The empty teu costs are reported in aggregate in table 2.5.

TABLE 2.5 EMPTY TEU COSTS

($ per visit)

Component	*Fremantle*	*Adelaide*	*Melbourne*	*Sydney*	*Brisbane*
Ship based charges	3 170	3 124	4 579	4 190	5 609
Cargo based charges	1 149	878	1 408	4 445	1 796
Stevedoring	11 970	12 730	16 720	24 130	23 940
Total	16 289	16 731	22 707	32 765	31 345

Source BTCE estimates based on tables 2.1, 2.3 and 2.4.

CHAPTER 3 CHARGES FOR LAND BASED SERVICES

CHARGES FOR CUSTOMS BROKERS' SERVICES

Customs brokers provide a wide range of services to importers, and, to a lesser extent, to exporters.

The customs broker's role is described by the Customs Brokers Council of Australia (CBCA) as being a 'facilitator skilled in helping clients find the most cost-effective ways to move trade consignments around the world. ... A customs broker's responsibilities include determining the proper classifications and dutiable value of goods and being aware of customs clearance regulations, import/export prohibitions and restrictions in legislation administered by the Australian Customs Service' (CBCA 1992, p. 2). Customs brokers also provide a number of specialist services such as provision of advice on documentation requirements and sales tax rulings.

This wide range of services and the varying complexity of the tasks results in a correspondingly wide range of charges for clearing a consignment. The Customs Brokers Council produces a suggested price schedule, but in practice the market is competitive and prices are set according to demand and supply conditions. After discussions between the BTCE and the Customs Brokers Council, the Council suggested that the best method of obtaining data on prices was by means of a survey. The Customs Brokers Council provided advice on the survey and provided the addresses of 40 customs brokers throughout Australia.

The survey questionaire (appendix I) sought information on the minimum, typical and maximum fees charged by brokers for the clearance of an FCL (full container load) container. The survey was designed to obtain the proportion of clients charged these fees.

Respondents were given approximately two weeks to return the survey form. At the end of this period a reminder was sent to non-respondants. At the end of the period specified in the reminder notice, non-respondents from States in which the number of responses was low were contacted by telephone. Of the total of 40 forms mailed to brokers, 29 (73 per cent) were returned. Despite this good overall response rate, there were few responses from South Australia and

Western Australia, and they were aggregated to protect the confidentiality of respondents.

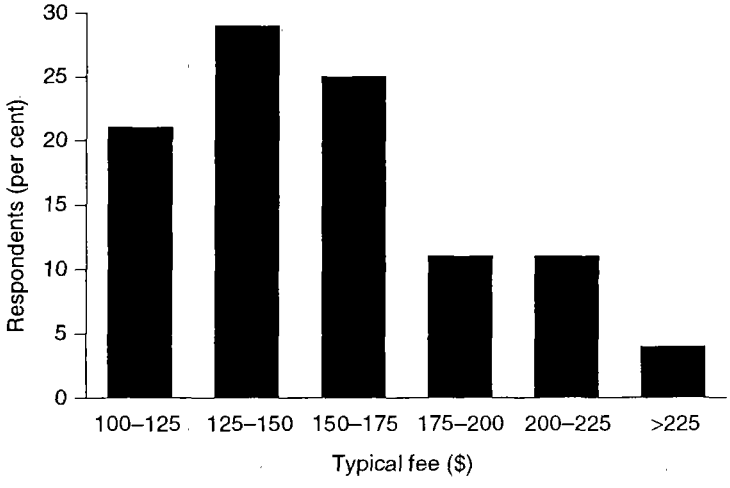
Results of the survey of customs brokers

The survey of customs brokers was used to obtain estimates of minimum, typical and maximum rates charged to clear FCL containers, and the proportion of clients that faced these charges. However, for many customs brokers, the minimum fee was close enough to the typical fee to cause the ranges specified for these fees to overlap. This meant that the proportions reported by respondents could not be effectively interpreted.

A further problem was that a single consignment may include more than one container. In some cases respondents gave figures for multiple container consignments, while other respondents based their information on single container consignments. Charges per container for multiple container consignments can be significantly less than charges based on a single container consignment.

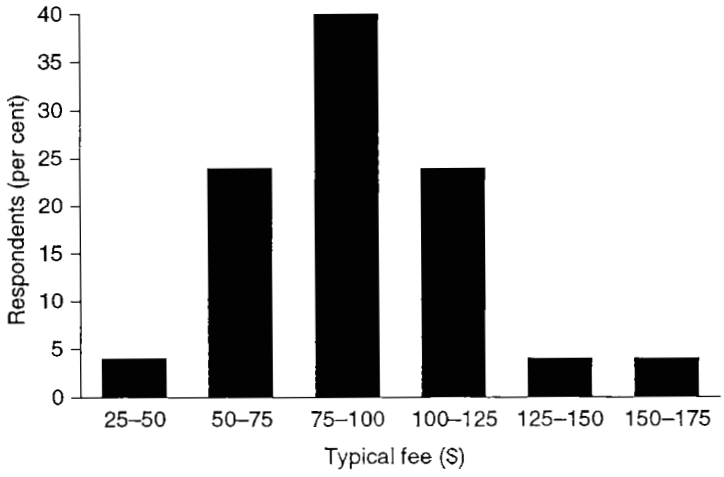
Fortunately the majority of the reported typical fees fell within a reasonably narrow range so that confidence can be given to the results of this part of the survey. A distribution of typical import fees is shown in figure 3.1 and export fees in figure 3.2. A question on the composition of the fee assisted in ensuring that the results reflected the provision of similar services.

The maximum fees reported encompassed a range from $150 to $1600 per import container and from $65 to $1000 for export containers. The proportion of containers attracting the maximum fee reported by some respondents was



Source February 1993 BTCE survey.

Figure 3.1 Customs brokers' fees for import FCL containers



Source February 1993 BTCE survey.

Figure 3.2 Customs brokers' fees for export FCL containers

TABLE 3.1 RANGE OF FEES CHARGED BY CUSTOMS BROKERS

($ per teu)

	Minimum	*Typical*	*Maximum*
Import			
Minimum	15	100	150
Mean	92	150	532
Maximum	175	260	1 600
Export			
Minimum	30	45	65
Mean	67	88	203
Maximum	100	155	1 000

Source February 1993 BTCE survey.

inconsistent with the proportions attracting the typical and minimum fees. The result range for the minimum, typical and maximum fees for the sample as a whole is shown in table 3.1.

Table 3.2 summarises the results for the different States. Although the minimum, typical and maximum fees are shown in the table, it is only the typical fee which is used. This is considered to be more representative of the price for brokers' fees and is also the most reliable result that can be derived from the survey.

TABLE 3.2 CUSTOMS BROKERS' FEES BY STATE
($ per teu)

	Minimum	*Typical*	*Maximum*
Import			
New South Wales	93	147	673
Victoria	91	156	531
Queensland	101	143	592
South Australia and Western Australia[a]	86	141	581
Export			
New South Wales	66	89	180
Victoria	64	91	392
Queensland	85	97	185
South Australia and Western Australia[a]	67	71	248

a. To protect commercially sensitive information, the responses from customs brokers in South Australia and Western Australia were aggregated.

Source February 1993 BTCE survey.

CHARGES FOR ROAD TRANSPORT

Road transport is used to move containers to and from terminals from a wide range of origins and destinations. These can be in the metropolitan area, intrastate (non-metropolitan) and interstate.

The index includes prices for movements of containers between a metropolitan warehouse and the terminal but excludes non-metropolitan and interstate movements.

Metropolitan movements are the most important as far as numbers of containers are concerned. For example, the Melbourne truck survey (Arup Transportation Planning 1992) showed that 88 per cent of import containers were destined for metropolitan areas and 50 per cent of export containers originated in the metropolitan area.

Also, metropolitan road transport trips are much shorter than country or interstate trips and are therefore more sensitive to changes in the efficiency of the interface. The prices of the longer country and interstate trips would tend to be dominated by the line-haul component of their costs and an index including these trips may not adequately reflect conditions at the interface.

Since the proportion of these longer country and interstate trips is likely to differ significantly between ports, the comparability of the individual port indices would

be reduced. In any case, data on the origins and destinations of containers carried by road transport are not available for ports other than Melbourne.

The road transport charge for import containers is taken to be the current price to move a container[1] from a terminal to a customer's warehouse, wait for the container to be unpacked and to return the empty container to a container park. Prices were also sought for the reverse operation for export containers.

At each port, except for Melbourne, the price schedule and the time taken was the same for both exports and imports. At Melbourne, export movements tended to be shorter on average than import movements.

One hour was allowed for waiting at the terminal and at the customer's warehouse for all ports except Sydney. Road transport operators in Sydney consider that 1.5 hours represents a more appropriate waiting time at the warehouse and this additional time is reflected in the higher total road transport charges for Sydney (see table 3.3).

Melbourne operators use distance based pricing schedules. This information was used in conjunction with origin information for exports and destination

TABLE 3.3 ROAD TRANSPORT CHARGES FOR THE METROPOLITAN MOVEMENT OF SHIPPING CONTAINERS

Port	*$/teu*
Sydney	275
Melbourne	
Import	226
Export	220
Brisbane	175
Fremantle	165
Adelaide	127

Note Charge includes the cost of moving a heavy import container from the terminal to the customer's warehouse, waiting for the container to be unpacked and returning the empty container to a container park and vice versa for export containers.

Sources BTCE estimates based on information provided by road transport industry sources in Fremantle, Adelaide, Melbourne, Sydney and Fremantle; Arup Transportation Planning (1992).

1. A heavy container was specified. In the road transport industry a heavy container is one which is over 12 tonnes gross weight. Two light containers can be carried on one truck but only one heavy container. Industry contacts indicated that most shipping containers are in the heavy category.

information for imports (Arup Transportation Planning 1992) to estimate a weighted average road transport charge per import or export teu.

Table 3.3 shows the road transport charges estimated for each port. Charges were generally based on the expected time, including waiting time, to complete the task defined by the Bureau. For Sydney the task was disaggregated more than for the other ports and this may have resulted in the estimated charge being relatively high. Both Sydney and Melbourne are significantly higher than the other ports. This could be expected as the larger size of Melbourne and Sydney may mean longer travel distances. Higher levels of road congestion may also increase travel times in these cities.

CHAPTER 4 INITIAL VALUE OF THE INDEX

This chapter presents an aggregate figure for shore based shipping costs for the period 1 July to 31 December 1992. Costs are based on international FCL containers exchanged at Australia's mainland capital city ports, and are reported on a per teu basis. Comparisons with 1991 costs are also presented.

Costs for both import and export containers consist of four main components: port and related charges; stevedoring charges; customs brokers' fees; and road transport charges. These components were discussed in detail in chapters 2 and 3.

INDIVIDUAL PORT COSTS

The costs estimated for each of the mainland capital city ports are shown in table 4.1. The costs are average costs for an indicative vessel. Because there is considerable variation in the number of teus exchanged per ship, the charges for a particular ship may be significantly different from those shown in table 4.1.

Sydney has the highest total costs for both imports and exports. This is mainly due to the longer waiting time taken for the unpacking and packing of containers at warehouses in Sydney, resulting in higher road tranport costs (see chapter 2).

Importers face higher total costs than exporters, mostly due to the more complicated customs clearance procedures reflected in higher customs brokers' fees. In Sydney, exports are also less costly to move across the waterfront because of the significantly lower wharfage charges for exports.[1] Consequently, Sydney has the highest port and related charges for imports and the lowest port and related charges for exports.

Melbourne has the lowest port and related charges per teu for imports and the second lowest for exports. The lower port and related charges for all containers exchanged at Melbourne and exports in Sydney reflect lower unit charges

1. The differential between import and export wharfage charges in Sydney was significantly reduced on 1 July 1993. The charges fell to $50 per teu for export containers (previously $55) and $65 for import teus (previously $98).

TABLE 4.1 SHORE BASED SHIPPING COSTS, JULY TO DECEMBER 1992
($/teu)

	Fremantle	Adelaide	Melbourne	Sydney	Brisbane
Import					
Port and related charges[a]	114	126	107	131	113
Stevedoring[b]	190	190	190	190	190
Customs brokers' fees	141	141	156	147	143
Road transport	165	127	226	275	175
Total	610	584	679	743	621
Export					
Port and related charges[a]	114	126	107	88	113
Stevedoring	190	190	190	190	190
Customs brokers' fees	71	71	91	89	97
Road transport	165	127	220	275	175
Total	540	514	608	642	575

a. Empty teu charges excluded.
b. Excludes Statutory Tonnage Levy.

Source BTCE estimates. See tables 2.3, 2.4, 3.2 and 3.3 above.

resulting from higher container exchanges per vessel in those cities compared with the other ports (see chapter 2).

NATIONAL AVERAGE COSTS

A national average (mean) cost per teu was estimated by weighting individual port estimates by the number of overseas teus handled. The national average costs, per teu, for the period 1 July to 31 December 1992 were:

- imports $684, and
- exports $603

COMPARISON WITH 1991 ESTIMATES

The Bureau estimated 1991 shore based shipping costs for Sydney and Melbourne in a submission to the HORSCOTCI inquiry into the efficiency of the interface between sea ports and land transport (BTCE 1992). The 1991 estimates were based on a larger ship (25 000 GRT) compared with the indicative ships used in the present paper (17 215 GRT). The 1991 estimates also included some components, such as unpacking charges and LCL containers, which are not included in this analysis.

To ensure a comparability between 1991 and 1992 estimates the following adjustments were made:

- The 1992 costs were recalculated for a 25 000 GRT ship calling at Sydney and Melbourne.

- The PSA (1993) estimates of 1991 stevedoring prices were used. The BTCE (1992) estimates were for new contracts and differ from the PSA (1993) estimates, which were average prices.
- The 1991 road transport costs were re-estimated using 1992 parameters, but with 1991 prices. The major difference is the transport distance, which was 10 kilometres for the 1991 estimates. The distance used in the 1992 calculations is significantly longer (see chapter 3).
- The empty container component was removed from 1991 estimates of port and related charges.

Generally there has been a reduction in the total costs of moving international containers through the Australian waterfront. The extent of the overall reduction between 1991 and 1992 costs varies from 5.1 per cent for Sydney imports to 11.3 per cent for Melbourne exports (see table 4.2).

Port and related charges declined by amounts which varied from 6 per cent for Melbourne imports and exports to 21 per cent for Sydney exports. These apparent decreases are primarily the result of an increase in the number of containers exchanged per ship visit rather than a change in the underlying level of charges. Stevedoring charges decreased by a substantial 22 per cent.

Although customs brokers' fees in Melbourne and road transport prices in Sydney are higher for 1992, as the two sets of figures are not strictly comparable, the estimation procedures for customs brokers' fees and road transport prices have been improved since the 1991 study. The recorded increases may be a result of the improved estimation procedures rather than changes in actual prices or charges.

TABLE 4.2 SHORE BASED SHIPPING COSTS, 1991 AND 1992

($/teu)

	Sydney		*Melbourne*	
	1991	*1992*	*1991*	*1992*
Import				
Port and related charges[a]	156	139	126	119
Stevedoring	244	190	244	190
Customs brokers' fees[b]	150	147	120	156
Road transport[b]	247	275	257	226
Total	797	751	747	691
Export				
Port and related charges[a]	120	96	126	119
Stevedoring	244	190	244	190
Customs brokers' fees[b]	80	89	80	91
Road transport[b]	247	275	249	220
Total	691	650	699	620

a. Excludes empty teu charges.
b. Estimates are not strictly comparable (see text).

Sources BTCE(1992); PSA(1993); Tables 2.3, 2.4, 3.2, 3.3; port authority, towage operators and pilotage companies price schedules.

CHAPTER 5 QUALITY OF SERVICE

INTRODUCTION

The port interface cost index presented in chapters 2 to 4 provides a holistic indicator of the costs of shipping cargo to or from a warehouse through a port. That is, it provides an indicator of the overall costs to users of different port systems in Australia.

Changes in costs alone cannot, however, represent accurately the effects of the Government's reform program. Increased costs may mask improvements in quality — an increase in the cost index could be the result of improved service to shippers — or they could reflect growing inefficiency somewhere in the transport chain. It is also possible for a fall in costs to be accompanied by quality improvements: in this case, efficiency will have increased by more than the changes that are indicated by a cost index alone.

If the progress of port reform is to be monitored meaningfully, an indicator of overall service quality is required to complement the cost index.

CONCEPTUAL FRAMEWORK

Both the Waterfront Industry Reform Authority and the Australian Transport Advisory Council (ATAC) have published waterfront performance indicators (WIRA 1992; ATAC 1992). These indicators were reasonably comprehensive in scope (see table 5.1) and played an important role in monitoring the progress of waterfront reform.

Ports typically operate as a chain of services provided by independent operators. Variations in performance by one service provider can affect the performance of other service providers. For example, delays by pilots or towage operators in bringing a ship into port can result in the underuse of labour allocated to the vessel.

TABLE 5.1 ATAC AND WIRA PORT PERFORMANCE INDICATORS

Primary indicator	*Subsidiary indicator*
ATAC	
Ship turnaround time	Time awaiting berth
	Time at berth
	Time at berth working
	Time awaiting departure
	Total port time[a]
Cargo dwell time	
Port throughput	TEU per working hour[b]
	TEU per gross hour[b]
WIRA	
Shipping performance	Delays whilst along side
	Delays due to industrial disputes
Port	Average berth occupancy
	Arrival entry delays

a. Median and 95th percentile.
b. Median and 5th percentile.

Sources ATAC (1992); WIRA (1992).

Separate measurements of performance variations of individual operations, although valuable for monitoring each operation, are not able to capture how ports and shipping operate as an integrated system.

Ideally, a service quality indicator will reflect the overall performance of a port as a system. Shippers, as ultimate consumers of port services, are concerned with what the system as a whole can deliver, without necessarily being concerned about performance in individual areas of a port's operations (for example, crane rates).

LCL CARGO

One measure of service quality is the time for LCL cargo to become available to importers. The process involves unloading from a ship, transport to an international container depot, customs and quarantine clearance, and unpacking.

LCL depots had a poor reputation for service quality at the time of the Inter-State Commission's waterfront inquiry at the beginning of the Government's consideration of waterfront reform (ISC 1988, pp.186–94). The current quality of service provided by LCL depots is examined in chapter 6.

Although LCL depot performance is important to small importers and exporters, LCL containers comprise a very small proportion of total container movements. The quality of service provided by LCL depots is therefore not necessarily indicative of the quality of service experienced by most shippers.

LINER SHIPPING SCHEDULES

A better indicator of the overall performance of a port as a system is the ability of liner shipping to operate in accordance with published schedules. Liner shipping (essentially scheduled services on specific routes) depends on most links in the port system to provide a reliable service. The synergies of improved crane rates, reduced truck queues, etc., are taken into account in planning schedules. Any changes in the overall efficiency of a port system can therefore be expected to be reflected in tighter schedules.

Table 5.2 presents some preliminary results illustrating the changes in days scheduled in port by liner operators for each of the mainland capital city ports. On average there has been a reduction of almost half a day in planned days per port call between 1990 and 1992. These reductions can be attributed to faster ship turnaround times following the establishment of enterprise based agreements (EBA).

This picture confirms improvements picked up by particular indicators. For example, the average number of teus exchanged per crane hour for the five

TABLE 5.2 PRE-EBA AND POST-EBA SCHEDULED DAYS IN PORT[a]

Port	*Scheduled days in port*	
	Pre-EBA 1990	*Post-EBA 1992*
Fremantle	2.0	1.8
Adelaide	2.5	1.6
Melbourne	2.7	2.2
Sydney	2.6	2.2
Brisbane	2.3	2.0
All ports	2.5	2.1

a. Enterprise based agreements (EBA) marked the formal change from industry employment arrangements to enterprise based employment. EBAs for stevedores at container terminals in the capital city ports were signed by early 1992.

Source BTCE estimates based on liner shipping schedules published in the *Daily Commercial News*.

major container ports increased from 12.8 in 1989 to 20.1 in the September quarter 1992 (WIRA 1992).

Reliability (the extent of variation from scheduled times) is also an important aspect in assessing changes in the quality of service provided by port systems. Shippers' costs (for example, by needing to hold larger inventories or loss of sales) can be influenced by the reliability of liner shipping schedules (BTCE 1990).

The results in table 5.2 are only an indication of liner operators' expectations. Detailed analysis is required of actual days spent in port, compared with the number of days scheduled. The BTCE has obtained some preliminary results in this regard, but considerable work is still required. It is intended to publish a more complete analysis as part of the Bureau's ongoing research into the effects of the Government's reform program.

CHAPTER 6 AVAILABILITY OF LESS THAN CONTAINER LOAD CARGO

During the early stages of waterfront reform, LCL depots[1] were generally considered a poorly performing sector of the waterfront industry (ISC 1988, pp. 186–94). Unpacking prices were high and the time from when a ship berthed to the availability of the cargo was considered excessive. The Bureau estimated the average time for cargo to become available in the second and fourth quarters of 1987 and 1988 for depots in Sydney and Melbourne in a study of the costs of waterfront unreliability (BTCE 1990). The results for the best and worst quarters are shown in table 6.1.

During 1987 and 1988, the LCL depot market was highly concentrated. Only four depots operated in each of Melbourne and Sydney (PSA 1990). Since then, the number of depots in both Sydney and Melbourne has increased, mainly due to lower entry costs following the easing of requirements under section 17(b) of the *Customs Act 1901* (Commonwealth).

METHOD

The length of time for cargo to become available was estimated by comparing the date cargo became available to an importer with the time the ship carrying the container arrived in the port. The analysis covers the period from 19 January to 8 February 1993.

Data on availability for Sydney LCL cargo were made available to the Bureau by Gee Con Services Pty Ltd. Data for the same period for Melbourne were obtained from notices in the *Daily Commercial News*. The sample sizes for the two ports were 809 containers for Sydney and 643 containers for Melbourne.[2]

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1. A LCL depot is a facility where international LCL shipping containers are packed or unpacked.
2. During the period analysed, 24 377 teus were exchanged in Botany Bay and 26 975 in Melbourne. Therefore, LCLs comprised 3.4 per cent of teus exchanged in Sydney and 2.4 per cent of teus exchanged in Melbourne.

Ship arrival dates were obtained from 'vessels in port' notices in the *Daily Commercial News.*

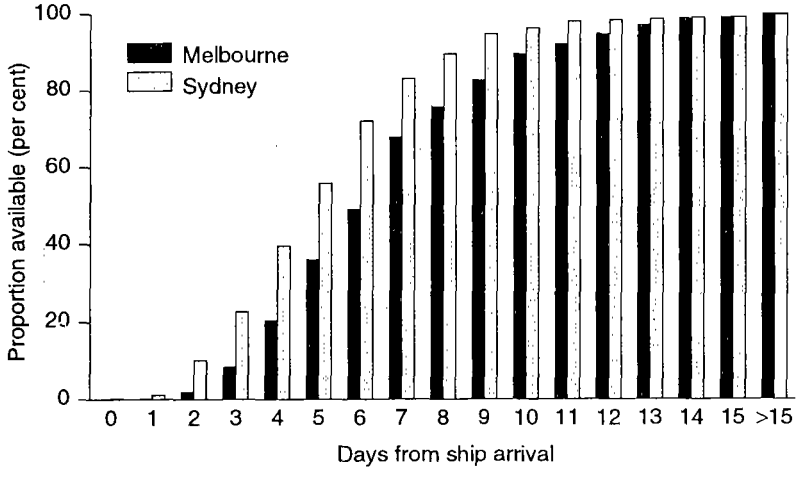
Sometimes cargo from containers discharged from ships in one port is made available in another port. Some intercity land transport is involved in this process and information on the time involved in the land transport task was not available. Inclusion of these containers would distort the results and therefore they have not been included.

The total number of days for the cargo to become available and the number of working days for the cargo to become available are shown in figures 6.1 and 6.2, respectively. The number of working days for the cargo to become availabile gives a more consistent indication of the service quality provided by depots.

RESULTS

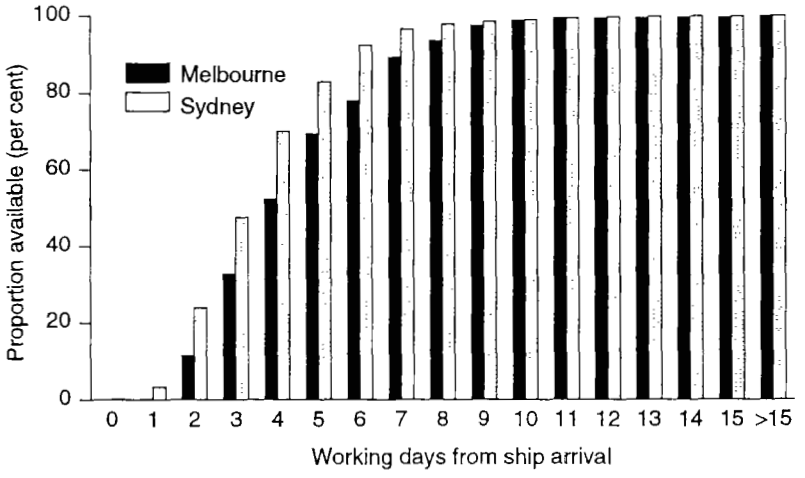
Tables 6.1 and 6.2 indicate a striking improvement in LCL depot performance compared with 1987 and 1988. The mean number of days for containers to become available in Melbourne improved by 30 to 44 per cent. In Sydney, the improvement was even more marked (47 to 75 per cent). However, the performance in Sydney had been especially poor in 1987 and 1988.

The time for 90 per cent of containers to become available is equally striking. The number of days for 90 per cent to become available improved by at least 40 per cent in both Sydney and Melbourne.



Source BTCE estimates based on Gee Con and *Daily Commercial News* data.

Figure 6.1 Cumulative proportion of LCL containers available for each day after ship arrival, 19 January to 8 February 1993



Source BTCE estimates based on Gee Con and *Daily Commercial News* data.

Figure 6.2 Cumulative proportion of LCL containers available for each working day after ship arrival, 19 January to 8 February 1993

TABLE 6.1 LCL DEPOT PERFORMANCE, 1987 AND 1988

Statistic	*Sydney*	*Melbourne*
Best quarter	2nd 1987	4th 1988
Mean (days)	10	10
90 per cent available (days)	15	15
Worst quarter	4th 1988	2nd 1987
Mean (days)	21	12
90 per cent available (days)	>30	20

Source BTCE (1990).

TABLE 6.2 LCL DEPOT PERFORMANCE, 19 JANUARY TO 8 FEBRUARY 1993

Statistic	*Sydney*	*Melbourne*
Days from ship arrival		
Mean (days)	5.4	6.9
Standard deviation (days)	2.6	3.0
90 per cent available (days)	9	11
Working days from ship arrival		
Mean (days)	3.9	4.8
Standard deviation	1.9	2.2
90 per cent available (days)	6	8
Sample size	809	643

Source BTCE estimates based on Gee Con and *Daily Commercial News* data.

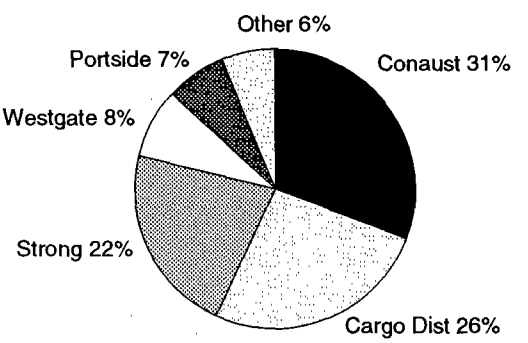
In contrast to 1987 and 1988, Sydney depots now provide a superior quality of service compared with Melbourne. The mean number of days (both total days and working days) from ship arrival to cargo availability is significantly less.[3] This difference in service quality is illustrated in table 6.2, and in figures 6.1 and 6.2. In both figures 6.1 and 6.2, the proportion of containers available is higher in Sydney compared with Melbourne for each day after ship arrival.

CONTAINER DEPOT MARKET SHARES

Container depot market shares estimated for Sydney (ten depots) and Melbourne (eight depots) are shown in figures 6.3 and 6.4. These figures suggest that the market is more concentrated in Melbourne than in Sydney.

Market concentration can be measured by the four-firm concentration ratio (the sum of the shares of the top four firms in the market) or using the Herfindahl–Hirschman index (HHI).[4] The HHI is calculated by summing the squared percentage market shares of all participants in the market under examination. It has the advantage that it incorporates all firms and it gives greater weight to the larger firms.

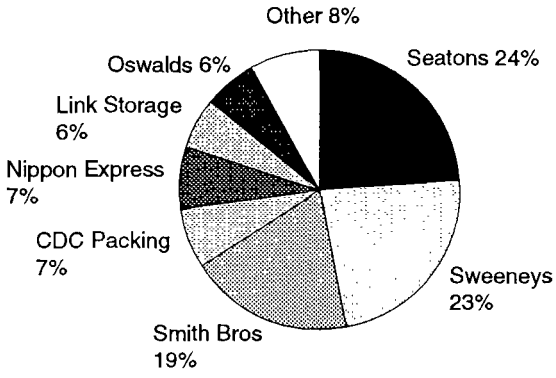
A HHI value close to zero indicates a highly competitive market with a large number of firms. A market with just one firm would have an index of 10 000.[5]



Source BTCE estimates based on Gee Con and *Daily Commercial News* data.

Figure 6.3 Market shares of Melbourne LCL depots, 1993

3. Five per cent level of significance.
4. For a discussion on the measurement of market shares, see Greer (1984) and Scherer (1980).
5. The shares can be measured as proportions instead of percentages, which would give a range for the index from 0 for a highly competitive market to 1 for a market with just one firm.



Source BTCE estimates based on Gee Con and *Daily Commercial News* data.

Figure 6.4 Market shares of Sydney LCL depots, 1993

The US Department of Justice and the Federal Trade Commission (Bureau of National Affairs 1992), in guidelines for examining mergers, divide the HHI into three categories. Markets with a HHI of less than 1000 are considered unconcentrated, between 1000 and 1800 moderately concentrated, and highly concentrated if the HHI is over 1800.

The data in table 6.3 indicate that the depot market has become considerably less concentrated since 1990. On the basis of the US Department of Justice guidelines (Bureau of National Affairs 1992) the market in Sydney can be considered to be moderately concentrated, an improvement from the highly concentrated market in 1990 and earlier. Although the Melbourne market is now less concentrated, it remains in the highly concentrated region. This higher

TABLE 6.3 CONCENTRATION IN THE LCL DEPOT MARKET

Index	Sydney	Melbourne
1990		
Number of firms	4	4
Four-firm concentration ratio (per cent)[a]	100	100
Herfindahl–Hirschman Index[b]	2 590	3 046
1993		
Number of firms	10	8
Four-firm concentration ratio (per cent)[a]	73	87
Herfindahl–Hirschman Index[b]	1 653	2 271

a. Sum of four largest percentage market shares
b. Sum of squared percentage shares of all market participants.

Sources PSA (1990) and BTCE estimates based on Gee Con Pty Ltd and *Daily Commercial News data.*

degree of market concentration in Melbourne may be a contributory factor to the lower service quality evident in the Melbourne market compared with the Sydney market.

However, the degree of concentration in Melbourne does not necessarily indicate that the market is uncompetitive. The PSA (1990) found no evidence of uncompetitive behaviour and for this reason concluded that surveillance of the industry was unwarranted.

The Melbourne and Sydney depot markets are clearly less concentrated now compared with when the PSA examined them in 1990. The results also suggest that the quality of service is much improved and entry is easier following reforms in the industry. For this reason the Bureau does not plan to undertake routine assessment of LCL depot performance as part of its interface cost index work.

CHAPTER 7 CONCLUSIONS

The port interface cost index is based on a representative ship call for each of the mainland capital city ports. Costs per teu include ship based charges, which are set according to characteristics of the ship and not according to the volume of cargo exchanged. For this reason the estimated costs per teu will be influenced by the number of containers exchanged as well as the size of the ship. Changes in the index depend on both the unit prices set by port authorities, towage operators and pilots and the number of teus exchanged. Interpretation of changes in the index need to take account of both of these effects.

Comparisons between costs in 1991 and 1992 show that there has been a decrease in the cost per teu. The major source of the decrease has been in stevedoring and in port and related charges. The decrease in costs per teu for port and related charges between 1991 and 1992 is due almost entirely to changes in the number of teus exchanged. Changes in other components of the index may be associated with improved estimating techniques rather than changes to particular charges.

The port interface cost index, as its name suggests, is designed to monitor the costs of moving containers through the port and its interface with land transport.

Although costs are obviously of importance to port users, the quality of the service received is of at least equal importance. Quality of service cannot readily be captured in a cost index. For this reason quality of service was examined to complement the port interface cost index.

The first quality of service measure examined was the time taken for LCL cargo to become available after ship arrival. This was an issue that was causing difficulties for small importers and exporters prior to the implementation of the waterfront reform program. The performance of LCL depots has improved substantially as a result of the reform program. LCL cargo is now available in 5 to 7 days after ship arrival compared with 10 days in Melbourne and 21 days in Sydney at the end of 1988. This improvement has been accompanied by a significant reduction in concentration in the industry, particularly in Sydney. Increased competition may be a reason for the improved performance of depots in making available LCL containers.

Another quality of service measure is the ability of liner shipping to operate in accordance with published schedules. Uncertainty in delivery time can cause increased costs to both importers and exporters. Although there can be many causes of this uncertainty, most of them will impact on ship turnaround times.

Reductions in ship turnaround times as a result of waterfront reform are reflected in a reduction of 16 per cent in scheduled days in port by liner ships. Additional work is required to complete the analysis of liner shipping reliability. This work will consider issues such as the factors that influence reliability and how different sectors of the industry have responded to changed port performance.

APPENDIX I CUSTOMS BROKERS SURVEY FORM

The following pages contain a copy of the survey form sent to customs brokers. The results of the survey were used to estimate the customs brokers' fees used in the port interface cost index.

SURVEY OF CUSTOMS BROKERS

Information supplied to the Bureau will be kept confidential to the Bureau. Published data will be aggregated so that individual brokers cannot be identified.

The information sought relates to the fees charged by customs brokers for the clearance of FCL containers. Customs duty or quarantine inspection fees charged to importers or exporters by the Australian Customs Service or AQIS are not required.

1. In which State do you operate?

☐	☐	☐	☐	☐
Qld	NSW	Vic	SA	WA

	Imports	Exports
2. What is a typical fee you charge for clearing a FCL container?	$ ☐	☐
Approximately what proportion of FCLs attract a fee in a range of plus or minus $10 of this fee?	☐	☐ %

3. What are the components of this fee?

Basic fee	$ ☐	☐
Customs entry fee	$ ☐	☐
Fee for arranging quarantine inspection/clearance	$ ☐	☐
Other (please specify)	$ ☐	☐

4. What is your minimum (no frills) fee?	$ ☐	☐
Approximately what proportion of FCLs attract a fee up to $20 above this minimum?	☐	☐ %

☐

	Imports	Exports
5. What is your maximum fee?	$	

(It is recognised that the absolute maximum charge is likely to be a rare event. For the purposes of this question the maximum charge is defined as the charge for a FCL which required the most complex clearance encountered in the normal course of business during, for example, the last three months, ie not the most complex ever likely to be encountered.)

Approximately what proportion of FCLs attract a fee between this maximum and $20 less than the maximum?		%

6. Are you willing to assist in updating our datal twice per year by telephone? If so please provide contact number.

If you have any queries about filling in this survey form contact Neil Gentle by telephone on 06 2746735 or by fax on 06 2746816. Thank you for your cooperation

REFERENCES

Abreviations

ATAC	Australian Transport Advisory Council
AGPS	Australian Government Publishing Service
BTCE	Bureau of Transport and Communications Economics
BTE	Bureau of Transport Economics
CBCA	Customs Brokers Council of Australia, Inc.
HORSCOTCI	House of Representatives Standing Committee on Transport, Communications and Infrastructure
ISC	Inter-State Commission
PSA	Prices Surveillance Authority
WIRA	Waterfront Industry Reform Authority

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ABBREVIATIONS

ACS	Australian Customs Service
ATAC	Australian Transport Advisory Council
BTCE	Bureau of Transport and Communications Economics
BTE	Bureau of Transport Economics
CTAL	Container Terminals Australia Limited
DCN	Daily Commercial News
EBA	Enterprise based agreement
FCL	Full container load
FPA	Fremantle Port Authority
GRT	Gross registered tons
HHI	Herfindahl–Hirschman Index
HORSCOTCI	House of Representatives Standing Committee on Transport, Communications and Infrastructure
ISC	Inter-State Commission
LCL	Less than container load
MSB	Maritime Services Board of New South Wales
NRT	Net registered tons
NTAL	National Terminals (Australia) Limited
PBA	Port of Brisbane Authority
PMA	Port of Melbourne Authority
PSA	Prices Surveillance Authority
teu	Twenty-foot equivalent unit
WIRA	Waterfront Industry Reform Authority