The Costs of Waterfront Unreliability in 1988

Occasional Paper

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The Costs of Waterfront Unreliability in 1988

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FOREWORD

Submissions to the Inter-State Commission's inquiry into a waterfront strategy suggested that the costs caused by unreliability of the waterfront were likely to be substantial. This paper reports the results of research by the Bureau into the quantification of those costs.

The analysis of the costs to importers and exporters was based on a postal survey of importing and exporting firms. The cooperation of those firms is much appreciated. I especially thank the following industry organisations for giving their endorsement to this survey: the Australian Chamber of Commerce, Australian Chamber of Manufactures, Australian Meat and Live-stock Corporation, Business Council of Australia and the Metal Trades Industry Association. The additional assistance provided by the Australian Chamber of Manufactures in organising a workshop to discuss the issues with Bureau representatives is also gratefully acknowledged.

Information on ship delays was provided by ScanCarriers, Australia New Zealand Europe Container Service, ACTA, Columbus, Australian National Line, Australian Wheat Board and New South Wales coal companies. Further data on stevedoring operations were provided by Conaust. Their valuable assistance is appreciated. I would also like to thank the many companies that were willing to discuss waterfront issues with Bureau representatives.

A study team led by Mr Neil Gentle prepared the paper. Members of the study team were Mr Günther Haselberger, Mr Matthew James, Mr Neil Kelso, Mr Bogey Musidlak and Mr Tim Winn.

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July 1990

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ABSTRACT

Waterfront unreliability affects costs principally by increasing freight rates, financing costs for exporters and inventory costs for importers. A less direct effect, but one no less important, is the impact of forgone exports on national welfare.

This paper primarily examines the costs of waterfront unreliability in Australia in 1988 drawing on information provided by shipping companies and on the results of a survey of importers and exporters. It makes no attempt to estimate the extent to which the costs of waterfront unreliability might be reduced or the costs of the measures required to reduce them.

Costs to national welfare due to delays to exports are estimated to have been $131 million to $146 million in 1988 and were primarily due to excess financing costs and increments to freight rates. Costs to national welfare due to delays to imports are estimated to have been $513 million to $534 million in 1988. The major costs were for import inventory and its storage and for additional freight costs passed on by shipowners. Based on the opinions of exporters responding to the survey, in the absence of waterfront and shipping delays in 1988 export sales could possibly have been $1250 million to $1500 million higher implying a further cost to national welfare of $210 million to $314 million. The paper concludes that in 1988 the total cost to national welfare of waterfront unreliability was an estimated $850 million to $1000 million, reflecting the high contemporary interest rates in Australia.

Current waterfront reform initiatives are addressing many of the factors contributing to waterfront unreliability. However, it is unlikely that the costs of waterfront unreliability can be reduced to zero. This is because it would be prohibitively expensive to do so and because not all of the sources of delay are within the control of waterfront service providers.

SUMMARY

This paper examines the impact on costs and economic welfare of unreliability on the Australian waterfront during 1988. Estimates of costs arising from delays to ships and cargo were derived from surveys of exporters, importers and ship operators undertaken by the Bureau of Transport and Communications Economics.

The Bureau's estimates suggest that in 1988 unreliability in waterfront performance had the following impacts:

	Increase in export costs ($ million)	*Increase in import costs ($ million)*	*Decrease in national welfare ($ million)*
Freight rates	50–75	151–172	180–216
Finance costs	146	272	356
Storage costs		42	42
Truck queues	20	33	45
Air freight	10	15	21
Total	226–251	513–534	644–680

These estimates include effects of some delays whose primary cause lay outside the port, for example, the truck driver blockade of the port of Sydney.

In addition, views expressed in the survey of exporters suggested that export sales forgone because of waterfront unreliability could have represented a further loss to Australian national welfare of $210 million to $314 million in 1988.

Ship delays have fallen from the levels experienced during the latter part of 1988, largely because the surge in imports apparent at that time has ended. Additionally, in June 1989, the Government announced a comprehensive waterfront reform program aimed at enhancing competitive pressures, and facilitating measures to improve the efficiency of port operations and arrangements to maximise flexibility and responsiveness to user needs. Consequently current costs of waterfront unreliability may be somewhat lower than those reported in this paper.

Shipping schedules

Shipowners usually base their schedules for the Australian coast on the port productivity they expect will normally be achieved. Schedules may be quickly amended in the event of disruption at any port and the pattern of some future calls may be altered to avoid bunching of arrivals. Some port calls may be omitted if owners wish to ensure that their ships arrive in certain overseas ports during the time slots when they have priority in cargo handling.

On the basis of berth working time and crane productivity differences between Australian and European ports, the Bureau estimated the annual cost to shipowners of normal delays (delays for which allowance is made in liner shipping schedules) on the Australian coast to lie between $45 million and $55 million.

Departure from container and ro-ro ship schedules

The Bureau examined in detail records of liner shipping voyages covering over a quarter of Australian port calls during the second and fourth quarters of 1987 and 1988. The average net time lost per port call compared with planned schedules varied markedly both from port to port and quarter to quarter. The longest delays were in Sydney, ranging from an average of 1.5 days in the second quarters of 1987 and 1988 to over 2.7 days in the fourth quarter of 1988. Shipping companies indicated around 40 per cent of time lost was due to congestion, 25 per cent to industrial action and 10 per cent to labour shortage.

The estimated costs of departure from planned schedules for container and ro-ro vessels were in the range $84 million to $89 million for 1987 and $96 million to $102 million for 1988.

Delays to bulk ships

Different industry sources confirmed that the Bureau estimate of two days' average port delay for grain shipments was realistic and provided information about coal freight differentials arising from expected delays in New South Wales. On that basis estimates for delay costs in those sectors in 1988 would be about $16 million for grain exports and $36 million for New South Wales coal exports.

The remaining ships calling at Australian ports incurred an estimated annual cost of around $22 million due to delays arising from industrial disputes.

Total shipping delay costs

The Bureau's best estimate for total delay costs to shipping in 1988 ranges from $200 million to $250 million. Of these costs $151 million to $172 million fell on imports and $50 million to $75 million on exports. In both cases such costs can be expected to be reflected in increased freight rates.

Sea-based exports

Respondents to the BTCE survey reported their annual sea-based exports to be $12 900 million in 1988 or 36 per cent of total exports carried by sea that year. Up to two-thirds of all respondents used LCL (less than container load) consignments some of the time. Over one-third of those using FCL (full container load) consignments sometimes sent part-filled containers in order to avoid delays in LCL depots.

Shorter transit times for exports

Seventy per cent of respondents stated that shorter transit times for overseas delivery would improve their competitiveness and just over half that their costs of finance would be reduced.

As virtually all exports are paid for *after* despatch to the purchaser, exporters bear the financing cost for any excess transit time between the producer's store and loading aboard ship. Survey respondents suggested that transit lead times could have been about seven days less if the risk of shipping and waterfront delays in Australian ports were negligible. The Bureau estimated excess financing costs on various trade routes to total $146 million in 1988.

Potential for increased exports

Survey responses suggested that in 1988 exports could have increased by up to $1500 million (or by about 4 per cent) if the risk of waterfront and shipping delays in Australian ports were negligible. However, individual expectations are necessarily speculative and subject to alternative interpretations.

The Bureau adjusted the survey responses for the effect of price changes derived from the survey data and trade elasticities presented in the economic literature. On the basis of the adjusted responses it seems probable that exports might have been $1250 million greater in 1988 if, as a consequence of negligible waterfront delays to cargo, Australia had had a longstanding reputation as a reliable supplier.

Specific delay problems for exporters

Exporters were most concerned about late ship departures, industrial disputes, port congestion, truck queues and container unavailability delaying their consignments.

Sixty per cent of exporters experienced at least one delay of more than five days to their consignments between January 1988 and March 1989. Of these, two-thirds said they incurred specific costs and one-fifth that they lost contracts as a result of shipping and waterfront delays in their worst quarter. The greatest proportional burden of lengthy disruptions fell on the small and the lower medium size exporters.

Airfreight was used for critical goods by about one-half of exporters during the quarter of their most serious delays. Over three-quarters of them were still using airfreight for that purpose in mid 1989.

Some potential effects of improved reliability in importing

Respondents to the BTCE importer survey received sea-based imports worth $5200 million in 1988 or 16 per cent of total import value carried by sea. They estimated that if shipping and waterfront delays were a negligible risk the value of imports in inventory could have been reduced by about 12 per cent. Nationally, this would have produced interest and storage savings of around $272 million and $42 million respectively.

The average lead time for orders for all importers would have fallen around 20 per cent if shipping and waterfront delays were a negligible risk. Around 70 per cent of importers said their competitiveness would then improve, and around 40 per cent expected sales would expand.

Specific delay problems for importers

Importers were most concerned about industrial disputes, late ship arrivals, port congestion, truck queues, customs clearance, labour shortages and LCL consignment unpacking.

A larger proportion of importers than exporters expressed major concern about the contribution of truck queues to delays to their consignments. The Bureau estimates the cost in 1988 of truck queues at about $53 million of which $33 million was a cost to imports. The cost of delays to imported LCL consignments was estimated at around $14 million.

Normally FCL and non-containerised import cargo can be expected to be available the day after the scheduled sailing from the port and LCL cargo five days after. Cargo becoming available for collection later than these times was defined as being delayed. Given this definition, 65 per cent of respondents said that they had a delay of more than five days to at least one consignment between January 1988 and March 1989. Problems were seen to be more concentrated upon Sydney than in the case of exporters.

The average longest delay to imported cargo ranged from 24 days in the March 1989 quarter to 30 days in the March 1988 quarter. Importers' average longest delays were 7 to 12 days longer than those reported by exporters for the same quarters. Since shipping delays would be similar for both importers and exporters this suggests that the clearance of containers from the wharf area constituted a major problem for importers.

Seventy-six per cent of importers with substantial delays to cargo said that they incurred specific costs. One-half reported the loss of contracts or of orders to supply goods as a result of waterfront delays, one-third reduced or suspended

production (62 per cent of these did not subsequently make good that loss), and one-third cancelled orders for domestically sourced goods.

While just over three-fifths of importers used airfreight for critical goods during the quarter of their most serious cargo delays, only half of these still used airfreight for this purpose in mid 1989.

Both the incidence and severity of additional cost burdens were much greater than for exporters.

Waterfront unreliability and national welfare

Total direct costs of waterfront delays to exports in 1988 were estimated at between $226 million and $251 million. Although these costs are paid in the first instance by exporters, they are ultimately shared by Australian exporters and their foreign customers. The Bureau estimated that probably around 58 per cent of these costs were borne by Australians.

The estimates of $1250 million to $1500 million in forgone export sales suggest that there might have been a further impact on national welfare of between $210 million and $314 million.

Costs of delays incurred by importers in 1988 were estimated at between $513 million and $534 million. It is probable that these costs fell entirely on Australians.

The total costs of waterfront unreliability to national welfare were therefore in the range $850 million to $1000 million. Many components of these costs are sensitive to the level of interest rates, consequently the estimated effect of delays upon national welfare was likely to be particularly large under the high interest rates of the late 1980s. It is improbable that the costs of unreliability can be reduced to zero because of the inherent variability in demand for services and because the origin of some disruptions lies beyond the control or influence of providers of waterfront services.

Importers are likely to benefit more than exporters from any improvement in waterfront reliability and hence the possibility exists that the short-run balance of payment effects of improved reliability might be negative.

Opportunities to improve waterfront reliability

The In-Principle Agreement negotiated under the auspices of the Waterfront Industry Reform Authority provides for the introduction of enterprise employment, award restructuring, work force rejuvenation and improved training. The most important of these are enterprise employment and award restructuring with their major impact on stevedoring in capital cities where the major costs of waterfront unreliability were incurred in 1988.

These measures should make it possible to deploy resources much more efficiently and effectively. Increased resources provided to the Trade Practices

Commission and the Prices Surveillance Authority will assist the former to monitor adherence to the Trade Practices Act and the latter to ensure that the benefits of improved efficiency are passed on to waterfront users.

Electronic data interchange systems offer the prospect of fewer delays due to documentation problems, more efficient payment procedures and more accurate and timely information about progress with the processing of individual consignments.

Greater attention is being placed on the performance of port authorities and their responsiveness to the needs of port users. A number of port authorities are restructuring their pricing policies to provide incentives for more efficient use of berths, or facilitating improvements where existing commercial relationships have not produced efficient outcomes.

Ship delay costs form a minor proportion of the costs of unreliability. The case for new investments by port authorities and stevedores may benefit from consulting cargo owners more closely about their preparedness to pay more for increased capacity and improved reliability.

Agreements between stevedores and shipping companies to link charges to the turnaround time of ships have the potential to improve general productivity standards and expedite action to resolve problems.

CHAPTER 1 INTRODUCTION

The costs incurred in moving freight across the Australian waterfront and the effect these costs have on Australian trade are a major motivating factor driving the current movement for waterfront reform. The waterfront and the land transport system supporting it are part of a complex system upon which our imports and exports depend. The direct costs of the waterfront (including stevedoring, towage, pilotage and port charges) are by no means small, being estimated at $2300 million in 1986–87 by the Bureau (BTCE 1988b). Nevertheless waterfront costs are only a small proportion of the value of the commodities being traded and on average were 1.7 per cent of the value of imports and 2.6 per cent of the value of exports in 1986–87. The proportion is larger for low value bulk commodities being, for example, 8.3 per cent of the f.o.b. value of coal in 1986–87 (BTCE 1988b).

Many individuals and organisations making submissions to the Inter-State Commission's Waterfront Strategy Inquiry commented that the costs of delays to ships and cargo are much more important than the charges paid for the supply of waterfront services. For example, the Importer/Exporter Panel in its final report to the Commission expressed the view that the costs of the unreliability of the waterfront borne by cargo owners were at least as great as their direct costs (Importer/Exporter Panel 1987). This view was not based on hard data but was more in the nature of the Panel's intuitive feel for the magnitude of the likely costs. Estimates of the indirect costs presented by other parties making submissions to the Commission were similarly order of magnitude estimates or were limited to specific examples. For example, the Association of Australian Port and Marine Authorities estimated the cost of delays to ships and cargo to have been $300 million in 1986–87 but did not include estimates of lost sales and some of the other costs examined in this paper (ISC 1988b).

Other reports since then have commented on the impact of waterfront unreliability. In a report on the export potential of processed foods, Austrade listed Australia's poor reputation as a supplier as one of the factors inhibiting export expansion. Poor transport was, among other things, said to contribute to this poor performance (Australian Trade Commission 1989). The Australian Manufacturing Council noted in a recent report (1989) that waterfront unreliability affected the international competitiveness of Australian manufacturing companies and cited one multinational company that had decided to locate a

plant in Singapore rather than Sydney because of unsatisfactory past experience of Sydney as a port.

Effect of unreliability on costs

Unreliability generally refers to variability in delivery time, but in analysing waterfront unreliability cargo owners tend to refer to the effect of delays to planned delivery times and shipowners to delays to planned schedules. It is these delays that cargo owners and shipowners strive to protect themselves against.

In this context there are two types of delays which need to be considered. First, there is the general poor performance of the waterfront perceived by waterfront users. This can involve moderate delays to advertised shipping schedules or delays normally experienced in unpacking LCL (less than container load) containers at depots. Cargo owners take precautions against these 'normal' delays by such measures as holding higher inventory levels, adopting longer lead times when ordering, or, for high value items, using airfreight to avoid the waterfront entirely. Shipowners typically take account of historical port performance in the preparation of ship schedules. Costs to both cargo owners and shipowners are increased by these precautionary measures. They may be passed on to consumers, or may result in reductions in trading activities.

The second type of delay involves major unanticipated disruptions. It is usually far too expensive for port users to protect themselves against these events and one-off responses are adopted to suit the specific circumstances. Cargo owners may use air transport temporarily or reorganise production schedules and in extreme circumstances may lay off workers. Interest costs will continue to accrue on goods left idle. The disruption to cash flow may cause short-term problems. During some disruptions, shipowners have bypassed affected ports and used land transport to reposition cargo. Such responses can be costly to both shipowners and cargo owners and may lead to freight rate rises at the next review. More recently shipowners unsuccessfully proposed a surcharge for Sydney imports and exports to compensate them for the costs of congestion at Sydney and Botany Bay.

Effect of unreliability on sales

The costs imposed by waterfront unreliability outlined in the previous section represent direct costs incurred by port users and are, in principle, able to be estimated. Possibly a more important effect is on sales of traded goods and on their prices. The Lancastrian view of goods is relevant here. In this view goods are defined as bundles of characteristics for which consumers have preferences. Traded goods in this framework not only have the physical characteristics normally associated with them but also have the additional characteristic of reliability of delivery time. Purchasers will generally prefer a good delivered on time rather than an identical good with an unreliable delivery time.

Poor delivery performance will be reflected in lower prices. If the price offered by the buyer is too low the sale may be lost as it is no longer profitable. If delivery is haphazard the purchaser may not be willing to take the risk at all.

Because lost sales are events which never occurred, their value is difficult to estimate with any accuracy. The effect of reduced prices on economic welfare is also difficult to quantify as its estimation requires knowledge of demand and supply elasticities, a topic subject to considerable uncertainty and controversy.

For some commodities the timing, and hence reliability of transport, is crucial. This is particularly so for perishable and seasonal products. Seasonal products can include such things as fashion goods designed for a particular season or goods purchased for a particular occasion such as Christmas. If these goods miss the season for which they were purchased sales may be lost, made at greatly reduced prices, or the goods may be held over to the next suitable season. Some items such as quality fruit and vegetables for particular markets can attract premiums during a narrow span of time when no alternative supplies are available. Unreliable transport can be compensated for by the use of longer lead times to ensure on-time arrival or by the use of a more reliable mode, usually airfreight. Both approaches can add to costs.

Perishable products present a serious problem for exporters and importers. If the product does not arrive before its expiry date it is unlikely that the product can be sold at all. Particular examples include chilled beef and many horticultural products. Airfreight is used on some occasions, and even regularly for some highly valued products. For most products the shipper has no financially viable option but to rely on sea transport. If the normal undelayed transit time is close to the expected life of the product, exports can be a marginal and risky proposition. The cost of delays is obviously large in such circumstances.

Even for non-seasonal goods, reliable transport has become increasingly important. Reliability has become especially important when associated with 'just in time' manufacturing techniques. This increased emphasis on reliability would have been one of the factors contributing to the more prominent role of air transport for Australia's imports and exports over the last decade, and to the greater attention being given to waterfront performance.

SCOPE OF THE STUDY

The study had the objective of estimating the costs to the economy in 1988 of waterfront and shipping delays. The discussion in the preceding section indicates that some of these costs are particularly difficult to estimate. An estimate of the cost of lost sales, based on the perception of exporters, is included, but it is unlikely that any precision can be claimed. There would be a natural tendency for exporters to overemphasise their difficulties but this would be somewhat offset by the exclusion from the analysis of companies not currently involved in international trade, but which could become involved if the waterfront were more

reliable. These latter companies can not easily be identified and their inclusion would have added significantly to the costs of the study.

The period subject to analysis, 1988 with some cost components examined for 1987 and early 1989, preceded the implementation of the waterfront reform strategy. As such the results of the study provide a snapshot of the costs of unreliability at that time. The costs at the present time are likely to be less than those estimated in the paper. For example, the first six-monthly report of the Waterfront Industry Reform Authority (1990) shows that ship delays, with few exceptions, declined progressively from mid 1989 to March 1990.

The estimates presented in the paper are for the total costs of waterfront unreliability. No attempt has been made to estimate by how much these costs could have been reduced if particular courses of action were taken or the costs of the measures applied to achieve such reductions.

In this context two points should be made. The first is that the study estimates the cost of unreliability irrespective of the source of the delay. Some delays to ships and cargo originate from problems outside the waterfront. Although these delays contribute to the costs of unreliability, the waterfront reform process is unlikely to influence the extent of these disruptions, but might increase the waterfront's flexibility to reduce the costs caused by them. The second point is that not all waterfront delays are the result of industrial disputes. Problems with documentation, equipment breakdowns, truck queues and bad weather are but a few of the other factors contributing to unreliability. Because of these factors it is improbable that any reform program could reduce the costs of unreliability to zero.

Information for the study was obtained from a wide range of sources. Data on shipping delays in 1987 and 1988 were obtained directly from shipping companies. Importers and exporters were surveyed to obtain information on their direct costs as a result of delays in 1988 and early 1989 and exporters were asked for their opinions on the extent of lost sales due to waterfront unreliability. Supplementary information was obtained from discussions with industry bodies and individual importers and exporters. A workshop of manufacturers was held to explore issues raised by a number of importers and exporters.

A broad definition of the waterfront has been used. As well as the normal port activities involved in handling ships and cargo it includes operations in container depots (where LCL consignments are packed or unpacked) irrespective of their location and allows for land transport links whose performance affects and is affected by waterfront activities.

Structure of the paper

Chapter 2 of the paper discusses the causes of delays in general terms, not so as to allocate blame, but to show how in a highly interactive system like international sea transport with many independent players there are plenty of

opportunities for things to go wrong. The chapter concludes with a brief discussion of current reform initiatives which should improve waterfront reliability.

Chapter 3 examines the costs to ship operators of delays to international trade on the Australian coast. The chapter focuses on the costs to liner ship operators, but also examines the costs to the operators of other ship types.

Chapters 4 and 5 report the results of the surveys of exporters and importers respectively. The direct costs to exporters and importers are presented together with information on the nature of delays encountered and on who bears the greatest burden of these delays.

Chapter 6 also uses data from the surveys to develop the welfare costs of waterfront and shipping delays. The incidence of the direct costs of waterfront and shipping delays is also discussed. The chapter concludes with a brief discussion of general equilibrium effects.

The concluding chapter summarises the costs and draws together some policy implications of the study.

CHAPTER 2 DELAY PROBLEMS — THEIR CAUSES AND CURRENT INITIATIVES TO REDUCE THEM

Except where private facilities are being used, the transit of cargo through the waterfront may involve half a dozen or more processes and participants in a variety of different contractual arrangements.

The final report of the Industry Task Force on Shore-Based Shipping Costs (1986) identified two distinct and independent systems operating in the transport chain from ship-side to consignee or consignor to ship-side:

- a system for moving cargo between the ship and the terminal controlled predominantly by the contract between the ship operator and the stevedore; and
- a system for moving cargo between the terminal and the consignee or consignor's premises controlled by arrangements between an importer or exporter and road or rail transport operator.

The absence of any direct commercial link between the stevedore and the importer or exporter, or agent, in land transport operations was seen as a major contributory factor to the proliferation of extensive truck queues and the resulting occurrence of demurrage costs.

This is just one indication of the way in which the efficient movement of goods through the waterfront can be affected by inadequate coordination or communication which leads to avoidable delays.

A delay in this context is time lost in transport due to unpredicted events. Import delays may be defined as the time from when a consignment was expected to be available for collection until the time the cargo was actually available for collection by the importer. An export delay may be defined as the time from the scheduled sailing time of the ship which was chartered, or on which space was booked by or for the exporter, until the time the ship carrying the cargo actually sailed from the loading port.

Even the expected time of availability of import cargo or expected sailing time of ships carrying export cargo may include some 'normal' delay built into it, the costs of which may be important. However, the main problem facing importers and customers of Australian exporters is usually the uncertainty in delivery time rather

than the overall transit time. For exports, even if the transit time is certain, the longer that time is the greater are the costs faced. If goods are sold on a f.o.b. basis delays prior to loading are a cost to the exporter.

Delays may result from a variety of factors that can relate to the ship, wharf activities, local delivery, freight consolidation or other operations. As well, delays may result from industrial disputes or other events not directly involving waterfront activities. Since the parties involved in the waterfront transport chain are inherently interdependent, noticeable delays in a single activity can compound into complex problems with far-reaching consequences. Bottlenecks may remain in the system for quite some time after steps are taken to normalise the situation in the area initially affected.

All delays impose costs on port users. These costs are discussed and estimated in later chapters. This chapter focuses on the causes of delays to overseas shipping and cargo and the way their effects can ripple through the entire transport chain. The chapter concludes with a brief discussion of current initiatives to reduce delays.

IMPORTING AND EXPORTING ACTIVITIES

The handling of ships and cargo during port calls depends on pilots and employees of port authorities, towage operators, ships' agents, customs agents, freight forwarders, rail and road transport operators, stevedores and government agencies such as the Australian Customs Service. The activities of these providers of services are described in an earlier Bureau publication (BTE 1986b).

Tables 2.1 and 2.2 outline the sequence of activities involved in the import or export shipping process. Further complexity is often added to the listed activities by the need to comply with a number of disparate deadlines when making bookings for the services required from different providers while a ship is in port. Inattention to this administrative detail may result in a longer time in port than anticipated.

In some ports particular tidal conditions will also be required for berthing and unberthing. There may be another wait because insufficient labour is available to attend to all current shipping needs when the ship arrives, not enough cargo handling equipment is in proper working order, or industrial action is causing disruption somewhere in the transport chain.

Figures 2.1 and 2.2 indicate the physical flow of cargo through the waterfront. Associated with the physical flow of cargo is a flow of information, up to now usually in the form of paper documents of various kinds. If the flow of information is disrupted in any way then so too is the physical flow of goods. The flow of documents is illustrated and discussed further in appendix I which also describes the financial arrangements for payment for Australian imports and exports. Because there are interactions between different parties at different stages, it is possible for disruption in one particular activity to affect the efficiency of all service

TABLE 2.1 IMPORT SHIPPING PROCESS

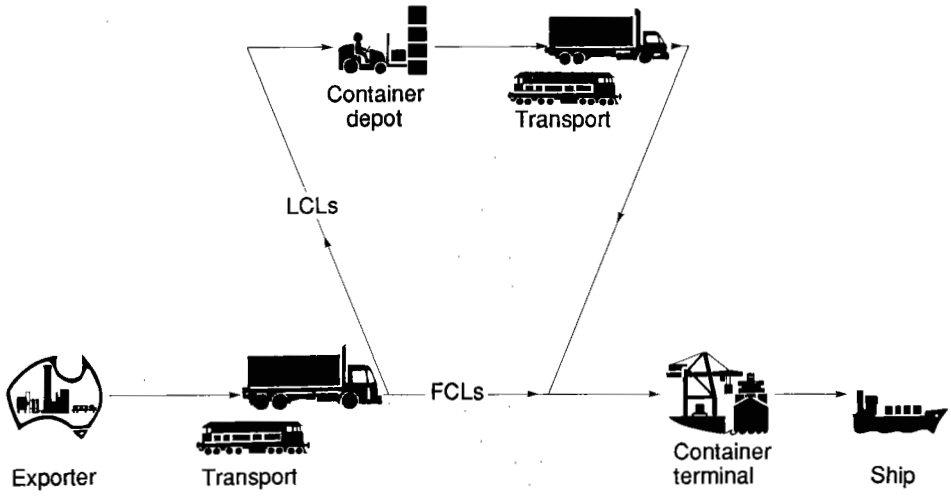
Importer places order for cargo.
Importer receives documents from overseas supplier.
Forwarder or agent prepares documentation for clearance.
Notification is received from ship's agent of charges payable.
Ship operator applies for berthage, towage and pilotage.
Berth is allocated by port authority.
Vessel operator gives notice of arrival to authorities.
Vessel arrives outside first port of call and awaits clearance.
Ship is boarded by various authorities for inspection.
Ship is piloted through port to allocated berth.
Ship towage and mooring are completed.
Agent gives cargo details to container terminal and depot.
Customs and quarantine lists are passed to terminal or stevedore.
Ship is unloaded with certain containers held for inspection.
Forwarder or agent pays shipping, port and handling fees.
Forwarder or agent pays for duty, fumigation and inspection.
Forwarder gives customs release to land transport operator.
Forwarder gives detailed account to importer.
LCLs are transferred to depot or FCLs moved to destination.
LCLs are unpacked and stacked at depot.
Uncollected cargo is moved to bond store for later delivery.
LCL cargo is delivered from depot to importer.
Empty containers are returned to parks for maintenance and storage.

Source BTE (1986b).

TABLE 2.2 EXPORT SHIPPING PROCESS

Exporter receives and processes order from overseas buyer.
Exporter or forwarder books space with shipping agent.
Exporter or forwarder obtains necessary permits.
Forwarder advises of cargo receiving requirements.
Exporter pays port and other charges.
Ship's agent sends bill of lading to forwarder or exporter.
Manifests are prepared and lodged with customs and ports.
Land transport operator collects and delivers container.
Ship's agent confirms stevedoring contract.
Arrangements are made for ship departure, pilotage and towage.
Voyage and broad cargo details are advised to shipping line.
Cargo loading list is given to container terminal or depot.
Customs and quarantine lists are passed to terminal or stevedore.
LCL cargo is received and consolidated by depot.
Container is transferred to container terminal and stacked.
Containers are loaded onto the vessel.
Final export cargo receipts are checked for terminal and customs.
Final check is made on vessel stability calculations.
Vessel receives final customs clearance.
Ship departs berth.
Advice of departure is given to shipping company and next port.
Manifests are completed and sent to customs and ports.
Ship's agent prepares voyage account for exporter to pay.

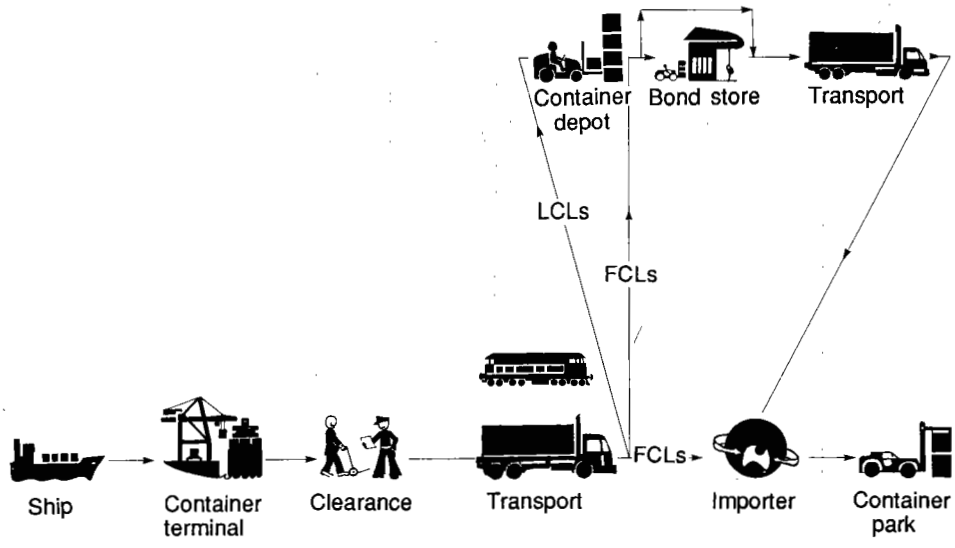
Source BTE (1986b).



Note LCL Less than container load.
FCL Full container load.

Source BTCE (1986b).

Figure 2.1 Flow of export container cargo through the waterfront



Note LCL Less than container load.
FCL Full container load.

Source BTE (1986b).

Figure 2.2 Flow of import container cargo through the waterfront

providers, and for a lack of communication in a particular instance to lead to major delays. In addition the pursuit of a strategy which optimises the position of one participant at a given time may be to the significant detriment of other participants in the overall chain.

Cargo movements on Australia's waterfront can be divided into the major components of shipping, cargo handling at the wharf, and cargo delivery and collection. The following discussion examines the nature, causes and consequences of delays which occur within these categories.

SHIPPING DELAYS

Importers and exporters plan much of their production and distribution systems on the basis of expected ship schedules. If ship operators are unable to maintain published schedules, manufacturing activity may have to be hastily rearranged, or alternative sources sought for some products. Persistent unreliability may cause importers and exporters to incorporate longer lead times and larger inventories into their overseas transactions or to examine the viability of airfreight for high value cargo.

Shipowners usually base their schedules for the Australian coast on the productivity they normally expect to be achieved in Australian ports. It appears that there is no standard allowance for delays other than minor delays in the creation of sailing schedules.

It is common for shipowners to experience difficulty in maintaining published schedules. Often published schedules are amended significantly especially as delays during one voyage can necessitate changes to schedules for later voyages. Disrupted shipping schedules may arise from a range of factors. The most important, alone or in combination, are industrial disputes, inflexibility of working conditions leading to labour shortages, equipment failures or malfunctions, port congestion and weather conditions.

Delays may arise from events well away from the port which reduce or stop cargo being made available for loading. For example on 10 August 1989 the *Newcastle Herald* (1989a) reported that ships had been delayed for up to two weeks off the coast of Newcastle. Not only had industrial disputes reduced production at coal mines in the Hunter Valley but poor weather also prevented ships from entering port.

Port congestion over an extended period of time can result in serious delays to ships. For instance, the Australia to Europe Shipping Conference in its submission to the Prices Surveillance Authority inquiry into the proposed congestion surcharge for Sydney reported that its container ships had average berthing delays of 30 hours in 1988 and 34 hours in 1989 (AESC 1989).

Congestion can be caused by insufficient berth capacity, the breakdown of major pieces of cargo handling equipment, work practices, or industrial disputes

preventing the operation of tugs, the provision of pilots or linesmen, or the allocation of wharf labour. Two of the three container cranes at Sydney's Glebe Island Terminal were out of action for nearly all of 1989 after metal fatigue problems were diagnosed. This placed added pressure on all terminals at Sydney and Port Botany and exacerbated port congestion.

Recurrent labour shortages in Sydney and Brisbane were given as factors contributing to congestion in those ports early in 1989. Inflexibilities in the deployment of labour can also contribute to congestion during periods of high demand and can extend the time needed to clear backlogs after any major disruption or dispute.

When congestion is especially severe or when major delays have already been experienced on the Australian coast, some port calls may be omitted as ship operators attempt to reduce the deviation from published schedules. In some overseas ports ships may only have priority in cargo handling during specified regular time slots. One ship operator advised the Bureau that in other countries it was the normal expectation that schedules would be maintained and that Australian port calls were omitted if necessary to satisfy those expectations.

The costs of repositioning cargo can be high when port calls are missed. Importers may suffer extensive delays in the process. An illustration of what can happen is provided by revised arrangements made in early 1989 when a container vessel was due to leave Sydney after discharging cargo on 5 February to visit Melbourne, Adelaide and finally Brisbane by 16 February. Because of delays in Sydney, the ship left there still fully laden on 7 February, bypassed Melbourne, and unloaded in Adelaide for rail shipment of the Sydney bound cargo (Egan 1989). The ship then reached Melbourne on 14 February and Brisbane on 19 February.

WHARFSIDE HANDLING DELAYS

At conventional berths, unless labour has been booked at least a day beforehand it will not be possible to begin loading and unloading cargo once a ship berths. Even then it is possible that labour will not be immediately available because it has already been allocated to other ships or because there are work practices which may restrict flexibility of labour deployment during a shift, to work on one task or one ship only.

The Sydney Ports Authority within the Maritime Services Board of New South Wales maintains a computerised Port Management System which includes particulars of ship waiting times before berthing, time at berth and the reasons for any delays. In a submission to the Prices Surveillance Authority, the Sydney Ports Authority indicated that in 1988–89 container and roll on, roll off (ro-ro) ships were idle at berth at the Sydney ports for about 30 per cent of total port time (Maritime Services Board 1989).

TABLE 2.3 CAUSES OF DELAY IN SYDNEY PORTS IN 1988–89

	Botany Bay		*Sydney*	
Cause	*Delay (hours)*	*Share of total delay (per cent)*	*Delay (hours)*	*Share of total delay (per cent)*
No labour booked	4 211	63.4	226	6.1
Labour disputes (non-MSB)	635	9.6	1 279	34.5
Facility breakdown (non-MSB)	431	6.5	45	1.2
Vessel repair	389	5.9	217	5.8
Weather	279	4.2	7	0.2
Awaiting master's instructions	243	3.7	1 022	27.6
Cargo unavailable	33	0.5	670	18.1
Other	426	6.4	239	6.4
Total	6 647	100.0	3 705	100.0

Note Numbers may not add to totals due to rounding.

Source Maritime Services Board (1989).

Table 2.3 shows the major causes for delay in both Sydney and Botany Bay. In evidence before the Prices Surveillance Authority the Maritime Services Board indicated that, for the most part, delays listed as 'no labour booked' occurred because the ship's agent was aware that there was no labour available to be booked. Similarly causes attributed to 'awaiting master's instructions' were also due to the unavailability of labour. Thus approximately 70 per cent of delays were due to the unavailability of labour either because it was otherwise deployed or because of labour disputes.

In its submission, the Sydney Ports Authority also indicated that the average number of containers, as measured by 20-foot equivalent units (TEUs), handled per berth hour occupied had declined over the two previous years. The Authority suggested that this was due to a combination of various factors including industrial disputes, outdated rostering arrangements, poor work practices, shortage of labour, poor productivity and restrictive maintenance practices. Where productivity is declining and schedules remain unaltered, there must be persistent delays to cargo.

Australasian Ships and Ports (1989) reported that during 1988 in Brisbane there was an average shortage of 80 labourers on 270 days out of 363 while in Sydney on average there were 94 labourers lacking on 219 days and in Melbourne on average there were 155 labourers lacking on 144 days. While the Inter-State

Commission was undertaking its waterfront inquiry employers were not prepared to recruit any new staff under the conditions of employment then applying. They stated that any apparent shortages were artificially created by restrictive work practices which prevented the attainment of normal productivity standards or the use of casual labour for peak workloads.

The Commission concluded (ISC 1989a) that the elimination of some work practices would allow a reduction in work force sizes of up to 30 per cent. These work practices restricted employers in their ability to choose the best employee to undertake a task and to move employees between functions. The Commission also stated that further labour productivity improvements would result from a greater reliance upon overtime rather than requirements to pay for a full shift even when only a small part of a shift was worked, and the working of three shifts a weekday and on weekends.

In most Australian ports, as in many overseas ports, just two shifts are worked because of the overtime expense that would attach to the working of a midnight shift. Consequently any delay due to handling productivity being lower than expected will be augmented by this regular downtime.

Analysis of data on cargo handling performance at different ports on the route used by the Australia New Zealand Europe Container Service (1989a, b) indicates that both crane productivity and crane utilisation in Australian ports is significantly less than that achieved in most overseas ports on its schedule.

In the busiest overseas ports often three and even four cranes will be deployed in an attempt to turn a ship around within eight hours. Highly skilled crane drivers operate cranes assigned to them whenever they are on duty, and the best of these are able to command very high earnings even by waterfront standards.

In contrast, in Australia usually one or two cranes are used to handle containerised cargo. This may be the limit of economic provision of cranes for typical Australian throughputs. The operation of these cranes is shared on a roster basis by all those qualified to drive them, and there are further restrictions on their continuous operation by one driver during a shift. Time lost for changeover of drivers or slow lift rates for working cranes will therefore lead to longer delays than would occur overseas.

Furthermore, older ships past their economic lifetimes on other routes have sometimes been switched to service Australian ports. They may not be designed for efficient stowage, but delays would impose lower costs on these ships than on newer ships for which the capital costs have only partially been amortised.

As evidenced by the withdrawal from service of two of the three container cranes at Glebe Island Terminal for most of 1989, cargo handling delays may also be due to a lack of operational wharfside equipment. In the most efficient overseas ports, special attention is paid to establishing a comprehensive program of preventive maintenance to ensure that all important equipment is available when required and that breakdowns are rare.

Even where container cranes are operating at maximum capacity, problems may arise because the unavailability of other equipment in working order or some other logistical difficulty prevents the clearance of cargo from the wharf as speedily as it can be unloaded. In addition if a significant proportion of export cargo arrives after the published deadlines it may not be possible to implement the most efficient loading sequences.

In Europe and North America, shipping lines have quickly switched large volumes of cargo away from ports whose performance they considered unsatisfactory. Large distances between ports and the concentration of importers and many exporters in the vicinity of the port cities have limited the scope for inter-port competition in Australia to much lower levels than that commonly observed in foreign countries (BTCE 1989). In an environment of limited competition other measures need to be adopted to provide incentives for improved efficiency. Pricing policies of port authorities can help do this. Suggestions along these lines are being implemented by some port authorities and are discussed in BTCE (1989) and Joy (1989).

It is clear from the foregoing that issues of waterfront unreliability are inextricably linked to issues of waterfront productivity and efficiency.

INTERFACE DELAYS

While the contractual arrangements for the loading and unloading of a ship involve just two parties, those for bringing export cargoes to the wharf and delivering import cargoes to consignees may involve hundreds of parties. Consequently there is always the potential for major delays to an individual consignment if chaotic conditions govern the processing of all cargo in a port at a particular time.

For instance, the surge of imports in late 1988 led to docks at various times being laden with much cargo waiting to be shifted and there were publicised cases such as the seven weeks it took early in 1989 for a consignment of torch batteries to be unloaded, unpacked and delivered from the ship to the importer (Morrison 1989). Extensive delays to individual consignments off-loaded in Melbourne for rail transfer to Adelaide are cited in support of attempts to increase the level of South Australian cargo loaded or unloaded at Port Adelaide.

Associated with every ship call in a port is a series of contracts between importers or exporters and land transport operators either to deliver consignments to the wharves, or to arrange the collection of full containers (FCLs) from terminals or less than container load (LCL) cargo from depots.

Provided that customs and quarantine requirements have been met, FCLs are normally made available for collection on the day after the ship's departure and are held for up to three days in free storage before being moved into bonded storage. In some terminals FCLs are made available when unloaded and before the ship departs. Containers which have cargo for several importers (LCLs) are sent to a depot for unpacking.

Before containerisation cargo owners were able on some occasions to have access to their cargo at the waterfront. As a result of the agreements surrounding the introduction of containerisation, except where private facilities are in operation all handling of cargo at the waterfront is by Waterside Workers' Federation labour assigned by stevedores. This means that if there is congestion at a port and priority is given to the turnaround of ships, importers waiting for cargo will be powerless to expedite land-side processing and will suffer extensive delays.

During its waterfront inquiry, the Inter-State Commission was told that terminal operators were continuing to give absolute priority to ship turnaround. If an item of cargo handling equipment operating at the wharfside broke down it would immediately be replaced by another which had been assigned to loading and unloading trucks irrespective of the length of the truck queue at that time.

According to stevedores, the greatest portion of FCL cargo is usually collected on the final day of free storage. When a number of ships have berthed at about the same time there is generally a major upsurge in land-side collection demand a few days later. Long truck queues form at terminal gates well before the start of the first shift and may persist until the early afternoon.

The persistence of truck queues has been regarded as an endemic problem in Sydney and Melbourne for several years. The Industry Task Force on Shore-Based Shipping Costs (1986) highlighted the need for improvement in the levels of service at the interface between stevedores or depots and importers or exporters.

The Task Force stated that problems were compounded by a large number of uncoordinated but highly competitive road transport operators, by rail systems seen as inflexible and unresponsive through a shortage of equipment and a lack of market sensitivity, and by differing receival and delivery capacities and hours of business between stevedores and importers or exporters. The lack of a direct commercial link between terminal and importer or exporter was seen as a major contributory factor to extensive truck queues.

In some overseas ports much greater emphasis has been placed on developing efficient inter-modal links because these can be the key to attracting further traffic through the port. Shipping lines have been able to set door-to-door rates for customers by reaching agreements on container volume and transit time performance with rail operators and by developing interests in road transport. The shipping lines thereby maintain control of the total transport task and avoid fragmentation of responsibility.

Notices of cargo availability are published regularly in the *Daily Commercial News,* so both consignees and truck operators will be aware of when cargo is available for collection, although not of the extent of queuing at any particular time. In most instances if truck drivers are caught in a major queue at one of the few entry points to a terminal, demurrage can be claimed from the importer or

exporter for all or nearly all of the time involved. At times drivers may not have alternative work which can pay as much as demurrage.

The morning shift for waterside workers has traditionally begun at 0730 hours. However, truck drivers usually clock on around 0630 or 0700 to fit in with the needs of manufacturing industry. While they are prepared to work until the late afternoon or early evening, importers are rarely interested in receiving cargo after the middle of the afternoon because of the high minimum payments associated with any overtime and the uncertainty of cargo arrival times. Such a mismatch of working times and employment conditions leads to regular major morning peaks of activity and mid afternoon lulls.

A number of steps have been taken at different terminals and depots to try to mitigate the problem of truck queues. At some depots there has been a flow-on effect from productivity incentive schemes introduced to expedite packing and unpacking and to make cargo available to importers earlier. In some terminals, extra labour and equipment have been assigned to load and unload trucks in the early part of the shift, or clerical staff have started processing documentation earlier. Continuous working arrangements have been instituted in places.

The Stevedoring Industry Review Committee reported agreement in 1988 that land-side operations could start at 0630 hours on the day shift to match truck drivers' hours (ISC 1988a). Such a change has been recommended as part of the plan to tackle truck queues in the Port of Melbourne (Joint Industry Project 1990). Although these early starts have not been implemented, they are expected to be a feature of some Enterprise Based Agreements concluded as part of the waterfront reform program.

Sometimes separate lanes have been set aside for import and export transactions and opportunities provided for paperwork to be checked and rectified if necessary before a truck reaches the terminal gate. It may be possible to book some time slots or to arrange for an evening bulk run of some large consignments. The planned introduction of a waterfront electronic information system offers the prospect of more efficient processing of documentation, earlier notification of changes in cargo status and better means of assessing truck queue severity before departure.

Nevertheless the fragmentation of land-side operations and the absence of direct commercial links between the terminal operator and the exporter or importer mean that major truck delays continue to occur and lead to increased costs for both importers and exporters.

CURRENT INITIATIVES TO REDUCE DELAYS

The discussion in this paper focuses on conditions as they were in 1987 and 1988. To place the analysis in context mention should be made of current initiatives to reform the waterfront. These initiatives are centred on changing

employment arrangements, enhancing competitive pressures and improving port authority efficiency.

Employment arrangements

Perhaps the most important outcomes of the current reform process will be an increase in labour flexibility and rejuvenation of the work force through the retirement of older workers and the recruitment of younger ones. The In-Principle Agreement for waterfront reform negotiated between the unions and the waterfront employers under the auspices of the Waterfront Industry Reform Authority recognises the importance of reliability in its clause 17.2 where it says 'The parties are committed ... to the need to ensure reliability of performance in the interests of users, employers, employees and all others who are dependent upon the flow of exports and imports and in the interests of the national economy' (Waterfront Industry Reform Authority 1989).

The In-Principle Agreement provides for the introduction of enterprise employment, award restructuring, and improved training. Arrangements for the settling of disputes, for supplementary labour and for the maintenance of cargo handling equipment are also included in the Agreement.

Enterprise employment

Under current employment arrangements, stevedoring labour is employed on an industry basis with employment numbers and allocations to individual enterprises subject to agreement between employers and unions. Under enterprise employment arrangements, individual enterprises will be responsible for establishing their own recruitment and training programs, determining their own labour requirements and work arrangements. These changes have the potential to increase the flexibility of response to variable demands and unforeseen circumstances.

Award restructuring

Award restructuring is designed to give greater flexibility to labour arrangements. The measures agreed to include the elimination of impediments to multi-skilling and commitment to a broadening of the range of tasks which a stevedoring industry employee may be required to perform. Award restructuring and the introduction of enterprise agreements are the most important aspects of the In-Principle Agreement as they have a major impact on the stevedoring arrangements in capital cities where most of the problems of waterfront unreliability occur.

Dispute settling arrangements

Many waterfront labour disputes are potentially resolvable without delaying ships or cargo. This issue is addressed directly by the In-Principle Agreement. The parties agreed to the need for arrangements which would allow work to continue while dispute settling procedures were being followed. Implementation of these arrangements would contribute significantly to the reduction of industrial disputes

as a cause of disruption to the flow of cargo. The proposed amalgamation of unions involved in waterfront activities can also contribute to less disputation.

Maintenance
The availability of stevedoring equipment in working order when required is an important component of a reliable industry. Non-availability of equipment can have a damaging effect on ship turnaround times and the servicing of truck queues. The In-Principle Agreement addresses the flexibility of these arrangements by providing for the introduction of enterprise preventive maintenance programs designed to improve enterprise performance and reliability.

Supplementary labour
The In-Principle Agreement allows for employers to hire labour to other companies, and for the creation of a supplementary labour list for each enterprise and provides the opportunity for the establishment of commercial pools of supplementary labour.

Enhanced competition

Both the Trade Practices Commission and the Prices Surveillance Authority have been given increased resources to ensure that the provisions of the Trade Practices Act are met and that the benefits of reform are passed on to waterfront users. Recent Prices Surveillance Authority inquiries into the proposed Sydney congestion surcharge, harbour towage and stevedoring charges are examples of increased waterfront involvement by these bodies.

Port authority efficiency

Port authorities can influence reliability by their own activities and through their intervention in activities within the port.

Port pricing
Previous work of the Bureau (BTCE 1989) and Joy (1989) has shown that the use of rentals rather than cargo charges to recover port authority costs of berth facilities would provide increased incentive for the efficient use of those facilities. The incentive for stevedores to turn ships around quickly would also be increased. Some port authorities (Maritime Services Board of New South Wales, Port of Melbourne Authority, Geelong Port Authority and Portland Port Authority) are moving in this direction.

Pricing reform has also resulted in more realistic charges for area hire. An outcome has been that importers have greater incentive to remove cargo from the port area quickly with beneficial effects on the efficiency of the use of port facilities.

Role as facilitators
Port authorities can play an important role in improving reliability. They have the opportunity to intervene when existing commercial relationships fail to achieve

an efficient outcome. A particularly useful example in this context is the Port of Melbourne Authority's role in facilitating an agreed approach to the tackling of truck queue problems in the Port of Melbourne. It is unlikely that any of the port users directly involved in the issue would have been able to promote improved arrangements as successfully (PMA-VRTA 1989; Joint Industry Project 1990).

Other initiatives

Contractual arrangements between stevedores and shipping companies
The contractual arrangement between the stevedore and the shipping company can also influence the reliability of stevedoring operations. In overseas ports some shipping companies have performance agreements with terminal operators. Such agreements have been generally absent in Australian ports, although the Prices Surveillance Authority reported (1990, 87) that 'some terminals have introduced productivity arrangements with shipping lines whereby charges are related to the efficiency with which cargo is exchanged. Penalties may be invoked for poor performance'. A stevedore whose fee depends on the speed with which a ship can be turned around is more likely to minimise delays than a stevedore whose fee is independent of performance.

Electronic data interchange
Wider adoption of electronic data interchange (EDI) is an example of cooperation among waterfront participants to increase business efficiency and overcome problems which hinder the smooth flow of cargo through the waterfront. Many importers and exporters commented to the Bureau that problems with documentation often caused delays. The establishment of an effective EDI system provides a means of overcoming many documentation problems by avoiding the need to re-key data and present papers in person. It also facilitates arrangements for earlier decision making by customs officials, enables the instantaneous provision of information about changes in cargo status or problems affecting the waterfront, and creates an environment in which payments can be made electronically close to the time when a service is provided or an obligation has to be met.

CHAPTER 3 COSTS TO SHIP OPERATORS OF WATERFRONT UNRELIABILITY

Waterfront unreliability, both ongoing and that associated with major disputes or severe congestion, imposes costs on ship operators and charterers. An earlier estimate of the cost of delays to liner shipping put the cost at $95 million in 1980–81 (Stubbs 1982), or about $166 million in 1987–88 dollars. The direct costs of delays were then estimated to be $73 million, based on an estimated ship operating cost of $24 000 per day. The indirect costs of delays (such as extra port charges, extra steaming time or transport costs of diverted cargoes) were put at 30 per cent of the direct costs. In total, delay costs at the Australian end were estimated at about 5.5 per cent of the total cost of liner seafreight in and out of Australia.

In March 1989 the cost of delays to liner shipping was stated to be $15 million per month (*Australasian Ships and Ports* 1989). This was based on an average delay of ten days on the Australian coast for each of the fifty or so liner ships involved, at a cost of approximately $30 000 per ship per day. Neither the *Australasian Ships and Ports* analysis nor that by Stubbs mentioned how ship delays were defined.

Waterfront unreliability is especially important for liner shipping because liner freight rates incorporate a premium for the frequency and regularity of scheduled services. The Bureau examined liner shipping voyages on the Australian coast in the second and fourth quarters of 1988, before and after the truck blockade of the port of Sydney in September 1988. Voyages in the same two quarters in 1987 were also examined for comparison purposes.

The voyage data used in the analysis were supplied by several container shipping groups. In so far as the voyage schedules have some in-built allowances for minor delays, then delay costs based on departure from planned schedules alone will understate the full costs of Australian waterfront delays to ship operators. This chapter provides estimates of costs from both the in-built allowances in schedules and the inability to maintain schedules because of waterfront unreliability.

SOURCES OF COSTS

Delays due to waterfront unreliability result in increased costs to shipowners, and may be compounded by the effects of missed tides or lost bookings for facilities. Delays to a particular vessel may also affect the schedules of later voyages by vessels of the same line or conference. This is because these voyages may be rescheduled to avoid bunching at subsequent ports.

Additional costs may include:

- cost of chartering additional ships to replace capacity lost by delayed ships;
- fuel and other costs associated with any diversion from the scheduled route or departure from the optimal steaming speed;
- extra port charges, such as tonnage charges or berth hire;
- extra tug costs from cancellation charges, waiting time, or the need to switch berths;
- additional storage or refrigeration costs;
- additional stevedoring costs, for example, from payments for labour booked but not used or because delays in entering port reduce available working time in a shift;
- additional container-related costs, such as leasing costs and the cost of repositioning shortshipped containers on the berth;
- additional administrative overheads such as communications costs and the management costs involved in minimising the effects of delays and revising schedules; and
- land transport costs for diverted cargo (depending on the terms of the bill of lading).

The control that ship operators have over these costs varies with the type of costs. Once a decision is made to enter a port in which delays occur the ship operator has only limited control over direct port-related costs such as port authority, tug and stevedoring charges. The ship operator can choose the most appropriate means of avoiding or minimising the effects of disruption. For example, a choice may be made to adopt fast steaming, although this is not always possible and is usually only effective in recovering short periods of lost time. Alternatively additional ships may be chartered or a port may be dropped from the schedule with land transport being used to reposition cargo intended to be loaded or discharged at the missed port. Commercial and technical considerations will determine which measure or measures will be chosen. Factors which are taken into account include the volume of cargo involved and the capacity of the land transport to move diverted cargo. Some examples of avoidance measures adopted in practice are discussed in chapter 2.

DELAYS TO LINER CONTAINER AND RO-RO SHIPS

Voyage data supplied by four liner shipping groups, encompassing 190 voyages and 613 scheduled port calls in Australia by cellular container and ro-ro ships, were analysed to determine the extent of delays. This sample covered almost 28 per cent of port calls by cellular container and ro-ro ships in the periods studied.

The question of how representative the data are is important, especially for Botany Bay where the two terminals have experienced different levels of congestion. The shipping companies providing data use both Botany Bay terminals but tend to use the CTAL terminal more than the NTAL terminal. One company supplying data uses Darling Harbour for its ro-ro services. The data are therefore reasonably representative although there is possibly some bias towards longer delays and hence higher delay costs.

TABLE 3.1 RELIABILITY OF SHIPPING SCHEDULES

		Proportion late		*Days late*[a]	
Port	*Sample size*	*On arrival (per cent)*	*On departure (per cent)*	*On arrival (days)*	*On departure (days)*
Second quarter 1987					
Sydney	39	79	82	3.18	4.59
Melbourne	52	73	83	2.69	3.77
Brisbane	18	72	83	3.94	4.67
Adelaide	10	100	100	3.90	4.20
Fremantle	20	85	95	4.40	4.65
Average		78	86	3.30	4.22
Fourth quarter 1987					
Sydney	42	71	85	2.10	5.00
Melbourne	50	72	70	2.24	3.22
Brisbane	14	100	100	4.36	6.14
Adelaide	6	100	100	3.00	3.00
Fremantle	16	69	81	3.38	3.94
Average		76	81	2.60	4.20
Second quarter 1988					
Sydney	42	60	93	1.12	3.21
Melbourne	53	72	83	2.17	3.08
Brisbane	15	80	93	3.20	4.53
Adelaide	9	78	67	4.22	4.22
Fremantle	17	65	71	3.53	4.12
Average		68	85	2.26	3.48
Fourth quarter 1988					
Sydney	40	63	85	2.08	5.68
Melbourne	48	69	92	3.52	4.38
Brisbane	5	100	100	2.60	4.60
Adelaide	7	86	86	7.57	8.00
Fremantle	13	92	100	7.54	8.23
Average		72	90	3.68	5.51

a. Average over all vessels.

Source BTCE estimates based on data supplied by shipping companies.

Table 3.1 shows the differences between scheduled and actual voyage dates for the four liner shipping groups as a whole due to all causes and not just waterfront unreliability. It shows average days late for arrivals of liner vessels carrying imports and for departures of liner vessels carrying Australian exports. The time at which the schedule used for a yardstick was set is important. The yardstick schedule was defined for companies supplying data as the schedule relevant at the time the ship left the last foreign port before coming to Australia. Delays were then measured as the difference between actual and scheduled times of arrival at and departure from each port. These delays are referred to as unscheduled delays in the following discussion. Table 3.1 gives some idea of the degree to which the yardstick schedule was maintained during the four quarters analysed.

The majority of ships arrived late in Australian ports in the periods studied. Importers faced delays of the order of one to eight days for these ships. Exporters experienced delays in the departures of an even greater proportion of vessels of around three to eight days. Overall, more vessels left Australian ports late than arrived late.

Table 3.2 provides some statistics of the sample of voyages analysed. The data are for delays on the Australian coast from all causes. Time made up in port and between ports on the Australian coast is deducted because it is the net effect of delays on the voyage which is of concern to ship operators and cargo owners. Delays which are beyond the control of waterfront authorities and enterprises, such as shipboard disputes and ship repairs, are deducted later when the costs due to waterfront unreliability are estimated.

The average delays shown in table 3.2 are much lower than the ten days' voyage delay assumed in the estimate from *Australasian Ships and Ports* (1989) noted earlier. The standard deviation, upper quartile and upper decile are measures of the variation in delays. The extent of longer delays in the fourth quarters in both 1987 and 1988 is most evident. It is these longer delays that play the greatest havoc with ship schedules.

TABLE 3.2 STATISTICS OF DAYS LOST BY CONTAINER AND RO-RO SHIPS ON THE AUSTRALIAN COAST

	1987		*1988*	
Statistic	*Second quarter*	*Fourth quarter*	*Second quarter*	*Fourth quarter*
Number of voyages	48	48	48	46
Average delay (days)	3.1	4.5	3.4	4.5
Standard deviation (days)	2.5	3.9	2.6	3.3
Upper quartile (days)	4.3	7.0	5.0	6.1
Upper decile (days)	6.6	8.8	6.6	9.2

Source BTCE estimates based on data supplied by shipping companies.

TABLE 3.3 TIME LOST FROM VARIOUS CAUSES OF WATERFRONT DELAYS TO LINER SHIPS
(per cent)

Cause	*Time lost*
Congestion	39
Industrial action[a]	27
Labour shortage	11
Equipment breakdown	8
Other or not specified	15

a. Includes industrial disputes involving non-waterfront employees which affect waterfront operations.

Source BTCE estimates based on data supplied by shipping companies.

Table 3.3 shows the causes of delays reported by the shipping companies. Industrial action need not involve waterfront unions to cause delays to ship schedules. The Transport Workers' Union dispute in September 1988 and more recent blockades of the Sydney waterfront are notable examples.

The different causes interact in a complex way. For example, one ship may be delayed at the berth for any of a number of reasons such as labour shortages or equipment breakdowns. If, as a consequence of the first delay, a following ship must wait for a berth, its delay would be classed as congestion even though the prime cause may have occurred days or possibly weeks before.

Average waterfront-related delays per port call in the various Australian ports are shown in table 3.4, based on days lost to schedule in ports during the 190 voyages and 613 port calls by ships of the four lines. These are net figures, as days made up in Australian ports have been offset against the days lost, and have been adjusted for non-waterfront delays and for arrival ahead of schedule. The table shows net delays to shipping directly attributable to waterfront unreliability.

The figures confirm the views of Australian importers and exporters contacted in connection with the BTCE survey (see chapters 4 and 5), that Sydney port delays were by far the worst of all Australian ports. One liner group suffered average waterfront-related delays of 4.4 days per call into Sydney in the fourth quarter of 1988, of which 3.5 days on average were due to congestion.

Australian Chamber of Shipping survey

The Australian Chamber of Shipping (ACOS) (1989a) conducted a survey of container ship delays for the three months to the beginning of December 1988. The sample comprised 146 of the 494 ships calling at Sydney and a further 83 ships calling at Brisbane during the period. Out of the 229 ship calls studied, 198 incurred delays totalling 640 ship days.

TABLE 3.4 NET AVERAGE DAYS LOST IN PORTS PER CALL[a]

Period	*Sydney*	*Melbourne*	*Brisbane*	*Adelaide*	*Fremantle*	*Average*[b]
Number of calls in sample[c]	181	210	71	33	74	613
Second quarter 1987 (159 calls)	1.48	0.84	0.57	0.20	0.02	0.84
Fourth quarter 1987 (155 calls)	2.54	0.57	1.45	0.28	0.40	1.24
Second quarter 1988 (163 calls)	1.50	0.71	1.19	0.00	0.56	0.89
Fourth quarter 1988 (136 calls)	2.72	0.73	1.32	0.29	0.43	1.37

a. Delay time is measured as the difference between scheduled and actual times. Time made up and non-waterfront delays have been deducted.
b. Includes other ports visited (Bell Bay, Burnie, and Newcastle).
c. Scheduled port calls only.

Source BTCE estimates based on data supplied by shipping companies.

The BTCE figures for Sydney and Brisbane can be compared with those collected by ACOS for a similar, though not identical period. For Sydney, the BTCE estimated delay of 2.7 days for the fourth quarter 1988 is somewhat lower than the 3.4 days found by ACOS for the three months September to November inclusive. This latter period included the Transport Workers' Union blockade of the Port of Sydney. For Brisbane, the values were 1.3 days (BTCE) and 1.7 days (ACOS).

The ACOS survey found that delays affected 92 per cent of ships calling into Sydney and 77 per cent of ships calling at Brisbane. Overall, 86 per cent of ships were delayed, with 57 per cent of all ships suffering delays of over two days and 71 per cent being delayed over one day.

In both Sydney (including Port Botany) and Brisbane, the delays were fairly evenly divided between berthing delays and delays while alongside.

ESTIMATES OF SHIP DELAY COSTS

The cost of delays to ships will vary with delay time, the numbers of calls by ships at Australian ports, and the cost per ship day. This section presents estimates of the cost of unscheduled delays to liner container and ro-ro ships, the cost of delays to other ship types, and the cost of delays liner ship operators normally allow for when preparing schedules.

Ideally, an estimate of the delay costs would be based on costs actually incurred in adopting the measures to alleviate the costs of delay discussed earlier. The data to estimate costs in this way are not readily available. Instead an approach

is adopted along the lines of Stubbs (1982) which is based on multiplying the daily operating cost of the ship (including capital costs) by a factor to represent the other less direct costs of delays. The methodology and calculations are explained in detail in appendix II.

An alternative measure of the cost per ship day is the revenue forgone as a result of the delay. This would be a measure of the opportunity cost of the ship provided there were revenue-earning opportunities for the ship. However, in a competitive market, the revenue that can be expected to be earned is the operating cost of the ship including a normal return on equity and other capital costs. The measures are therefore equivalent if the definition of operating costs includes a normal return on equity in its estimate of capital costs.

Costs of unscheduled delays for container and ro-ro ships

Two estimates of costs of delays due to departure from planned schedules for container and ro-ro ships are provided in appendix II based on different assumptions about the multiplier. The two estimates are summarised in table 3.5. Conventional ships comprise about one-third of liner vessels (Australian Chamber of Shipping 1989a), but the costs of delays to these vessels are considered later.

The estimated delay cost for liner container and ro-ro vessels in the second quarter of 1988 was in the range $19 million to $20 million, and $29 million to $31 million for the fourth quarter of 1988. These figures are somewhat lower than an *Australasian Ships and Ports* estimate, noted earlier, of the costs of delays to liner shipping of $15 million per month. That estimate included conventional liner ships and assumed an average voyage delay of ten days.

The quarterly cost estimates were grossed up to annual cost estimates by assuming that delays to liner shipping were proportional to the volume of trade carried by liner ships. The grossing up factor derived from the trade figures was

TABLE 3.5 COSTS OF DELAYS TO CONTAINER AND RO-RO SHIPS IN 1987 AND 1988
($ million)

Quarter	*Lower estimate*	*Upper estimate*
Second quarter 1987	15.9	17.0
Fourth quarter 1987	26.4	27.5
Second quarter 1988	18.9	20.2
Fourth quarter 1988	29.1	31.1

Source BTCE estimates.

1.99 times the sum of the quarterly cost estimates. The annual costs estimated by this method were $84 million to $89 million for 1987 and $96 million to $102 million for 1988.

Costs of normal delays to container and ro-ro ships

The costs discussed so far are those incurred as a result of ship operations departing from planned schedules. In addition to these delays there are normal delays for which allowance is made in ship schedules. These normal delays add to the cost of operating ships and should be included in an assessment of the costs of waterfront unreliability. The difficulty lies in determining the performance that could be expected if the normal delays were comparable to world standards.

Appendix II presents details of the methodology used to estimate the costs of normal delays. Briefly the methodology is based on an assessment of the turnaround time that could be expected of Australian terminals if they achieved levels of productivity comparable with European ports. Using this approach a cost of $50 million per annum for container and ro-ro ships was estimated.

Estimate of costs of delays to ships other than container and ro-ro vessels

Of the almost 12 000 Australian port calls by overseas ships in 1988, some 9650 were by vessels other than cellular container or ro-ro ships. Only about 18 per cent of port calls by overseas ships in Australia in 1988 were by liner ships calling at the major ports. Other categories of ships are likely to have different operating costs and to experience delays different from those experienced by liner ships. Furthermore, because these ships do not operate to published schedules, the delays they experience can be best classified as 'normal delays' rather than 'unscheduled delays' as defined earlier in this chapter. The delay costs arise mostly from allowances shipowners build into their contracts on freight rates.

Most of these other ship calls are by bulk ships and tankers. Quite short disruptions to bulk loading can quickly cause a queue of bulk carriers. For instance, in January 1989, about one dozen bulk carriers were held up at Hay Point by industrial action and bad weather (*Daily Commercial News* 1989b). Another strike, by Maritime Services Board personnel, which halted coal loading in the Port of Newcastle on 20 October 1989, resulted in eight bulk ships waiting off the coast by 24 October, and ten by 26 October (*Newcastle Herald* 1989b, 1989c).

Nevertheless for ANL, whose bulk ships represented some 40 per cent of its fleet in 1987–88, bulk carriers experienced only about 20 per cent of the fleet's delays in that year (ANL 1988). The average delay in 1987–88 for ANL bulk carriers was just under 1.5 days. ANL has collected statistics which indicate that bulk ships experience only about 2.3 per cent of delays due to all causes (including vessel mechanical problems and disputes concerning seagoing unions), and only about 0.4 per cent of port and terminal delays in Australia.

Bulk commodities are usually carried in ships operated by the owner of the cargo or in chartered ships. For example, grain exports are typically shipped in vessels chartered on a voyage basis. The charter contract specifies a loading time and the exporter can receive despatch payments for fast loading and must pay demurrage for slow loading.

Delay expectations appear to be built into specified loading rates so that demurrage payments are not a good guide to port delays. The delay costs are more likely to be reflected in the freight rate. Because demurrage payments do not fully cover ship operating costs, shipowners will seek a higher rate if long stays in port are expected.

The responses to the Bureau's survey of importers and exporters indicated that oil and petroleum movements were subjected to only minimal delays because these commodities generally moved through privately owned facilities. Similarly, iron ore exports and coal exports from Queensland ports appeared to suffer only minimal delays for the same reason. Bulk exports which were most likely to experience delays were grains and coal from New South Wales ports.

In 1988, grain exports required about 400 port calls in ships averaging approximately 35 000 deadweight tonnes. These ships have a daily operating cost of US$15 000, or $A20 000 (using an exchange rate of $A1 = US$0.75) (BTCE 1988a). The Australian Wheat Board typically specifies a range of loading ports in its voyage charter contracts. The shipowner can be expected to base freight rates on the port with the worst delay record amongst those specified. The Board commented to the Bureau that an allowance of two days' delay by these shipowners is a reasonable estimate. Assuming an expected two days' delay gives a 1988 delay cost of $16 million for grain shipments.

A New South Wales coal company told the Bureau that in 1988 coal freight rates to Europe were approximately $1.50 per tonne more from New South Wales ports than from Queensland ports despite New South Wales being about 1000 nautical miles closer to the European market by sea. Information provided to the company by ship operators indicated that $0.90 of the $1.50 was due to expected delays in New South Wales ports. The remaining difference was due to the use of flag of convenience ships from Queensland ports and higher loader charges in New South Wales. At that time, flag of convenience ships were unable to carry coal from New South Wales ports, but that restriction has since been removed.

Coal exported to Japan is sold on a f.o.b. basis and no information is available on the effect of delays on freight rates on that route. However it seems reasonable to assume that delay costs associated with coal exports to Japan would be similar to those for coal exports to Europe. Total New South Wales coal exports are approximately 40 million tonnes per annum so that the total estimated annual cost of port delays is $36 million if it is assumed that the $0.90 per tonne applies equally to all coal exports from New South Wales.

The grain and coal shipments discussed above account for approximately 1000 of the 9650 ship calls by other than container and ro-ro ships. Delay costs for the remaining ship calls were assumed to be equal to the costs of delays attributable to industrial disputes. As will be seen these costs are small per ship call but this is consistent with the earlier observation that bulk ship calls generally experience minimal delays. Analysis of the *Daily Report of Ships Delayed by Industrial Disputes* suggests that ships other than container and ro-ro vessels suffered average delays due to industrial disputes of about three hours per port call in the period July 1988 to February 1989 inclusive (Department of Transport and Communications 1988, 1989). At an average delay cost of $20 000 per day, this gives a total cost of $22 million for delays in 1988 to the remaining 8650 ship calls. Although the average delay per ship call is small, the total delay cost is significant. The cost estimated is conservative because it only includes the costs resulting from industrial disputes. No data were available to estimate the costs due to other causes.

Although the total estimated delay cost for ships other than container and ro-ro ships is $74 million it is more realistic to express the estimate as a range to reflect the uncertainty in the assumptions used. A range of $60 million to $90 million is likely to make proper allowance for the probable uncertainty.

Total costs to ship operators

The various costs of delays are summarised in table 3.6. The total of $200 million to $250 million represents 3 to 4 per cent of the $6.5 billion total cost of seafreight for Australian imports and exports in 1988 (ABS 1989d).

Table 3.6 also shows the split up of the costs between imports and exports. This allocation of costs is based on the assumption that all the delay costs for bulk grain and coal carriers are incurred by exports and all the liner shipping delay

TABLE 3.6 SUMMARY OF THE COSTS OF SHIP DELAYS TO SHIP OPERATORS IN 1988
($ million)

Ship type	*Imports*	*Exports*
Container and ro-ro		
Departure from schedule	96–102	0
Normal delays	45–55	0
Total	141–157	0
Bulk grain and coal		40–60
Other	10–15	10–15
Total	151–172	50–75

Source BTCE estimates and information supplied by bulk exporters.

costs are incurred by imports. This latter assumption is made because the liner trades are imbalanced with imports exceeding exports and under these circumstances imports could be expected to bear the delay costs. Delay costs for other ship types were allocated equally to imports and exports.

The effect of delays is more significant for the liner trades. The estimated delay cost of $140 million to $160 million for container and ro-ro ships is 6 to 7 per cent of the total liner freight rate bill of $2.2 billion incurred in 1988 (ABS 1989d). The remaining delay cost of $60 million to $90 million represents a much lower 1 to 2 per cent of the non-liner freight costs. Imports bear a much greater burden of the delay costs (8 to 9 per cent of freight costs) than exports (1 to 2 per cent of freight costs), principally because imports bear the cost of liner shipping delays.

The non-liner trades are mostly concerned with bulk commodities for which transport costs are a substantial proportion of the value of the commodity. Efficiency in waterfront operations for these commodities has always been important. Measures adopted to bring costs under control in much of the bulk trade have also served to improve efficiency. Respondents to the BTCE survey (discussed in later chapters) who trade in bulk commodities tended to have fewer waterfront delay problems, especially if they owned and operated the port facilities through which their commodities moved.

Australian imports and exports are carried predominantly by foreign owned ships, but while the delay costs are initially borne by shipowners they would be passed forward to cargo owners as higher freight rates. The final incidence of the delay costs is clearly important. The incidence depends upon elasticities of supply of and demand for imports and exports. This issue is taken up in more detail in chapter 6.

CHAPTER 4 EXPORTERS AND DELAYS TO THEIR CONSIGNMENTS

This chapter examines the direct financial impact of waterfront unreliability on Australia's exporters. Most of the primary data on which the analysis is based were obtained from responses to the BTCE's 1989 postal survey of exporters (see appendix V), as well as personal interviews and other direct contact with stevedores and trade unions, exporters and industry associations.

The Bureau's survey of exporters examined the extent to which individual exporters use sea or air transport for their consignments, the form(s) in which they present sea cargo for export and what they perceive as the major causes of delays to their consignments. The proportion of current inventory destined for export and the potential effects on supply transit time and export sales levels if the risk of waterfront and ship delays in Australian ports became negligible were investigated. The survey also examined the specific consequences for and estimated costs incurred by exporters who between January 1988 and March 1989 had at least one export consignment delayed for more than five days.

In the analysis attempts were made to isolate differences in effects on small, medium (two groups) and large exporters, in perceptions about performance at individual ports, and in the likely responses of overseas customers to changes in the reliability of Australian ports.

SURVEY RESPONDENTS

There were around 380 written and telephone replies to the 800 survey questionnaires mailed to exporters in May 1989. There was sufficient detail in 342 responses for coding and entry into a database, representing an effective response rate of 43 per cent.

Respondents were asked to mark one or more general business classifications of their activities. Among the 339 who replied to this question there were 271 manufacturers or 80 per cent of respondents. Other classifications were merchants (11 per cent), mineral producers (7 per cent) and rural producers (4 per cent). Of those manufacturing, 85 per cent said that they did not undertake any other type of activity. The 41 respondents who regarded some or all of their activities as falling outside these classifications were largely involved in the further

processing of goods supplied by others (meat processors and winemakers, for instance), or in the marketing or distribution of goods.

Respondents were asked to classify their exports according to a simplified version of the Australian Transport Freight Commodity Classification (ATFCC) scheme. Their responses were analysed on the basis of the ten single-digit groups of the classification scheme. (These single-digit ATFCC groups are shown in table 4.2, below.) A method of allocating export values to individual ATFCC groups for responses nominating commodities from more than one group is described in appendix V.

The value of seaborne exports in 1988 by the 264 respondents supplying this information was estimated at $12 928 million which was 36 per cent of Australia's exports carried by sea that year. Commodities from a single ATFCC group or an exact breakdown into separate groups were given by 81 per cent of these respondents. The total sea exports reported by this group of respondents represented 80 per cent of the survey total. Consequently it is unlikely that the method of allocating those exports listed in more than one group would have a marked effect on the final results.

Table 4.1 shows the Bureau estimates for the value of survey respondents' cargo carried by sea and the national figure in each of five commodity categories. The manner in which the confidential items aggregated in the Australian Bureau of Statistics *Shipping and Air Cargo Commodity Statistics* were allocated to commodity groups is described in appendix V.

TABLE 4.1 SURVEY RESPONDENTS' AND AUSTRALIAN EXPORTS BY SEA IN 1988, BY COMMODITY CATEGORY

		Respondents' exports	
Commodity category	*Australian exports ($ million)*	*Value ($ million)*	*Share of Australian total (per cent)*
Food and related products (0, 1, 4)	7 964	3 531	44.3
Crude materials (2)	14 081	5 044	35.8
Mineral fuels (3)	6 060	773	12.8
Elaborately transformed manufactures (5, 7, 8,)	2 566	1 256	48.9
Processed materials[a] and other[b] (6, 9)	5 342	2 325	43.5
Total	36 013	12 928	35.9

a. Manufactured goods classified chiefly by material.
b. Includes confidential items.

Note Figures in brackets are Australian Transport Freight Commodity Classification item numbers.

Source BTCE estimates based on survey responses; ABS 1989f.

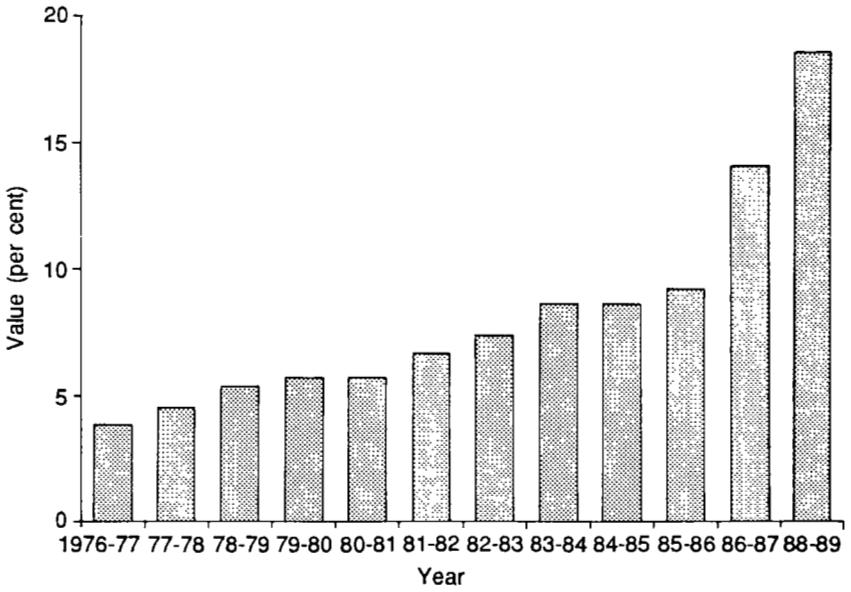
SEA AND AIR TRANSPORT OF EXPORTS

While the value of export cargo carried by sea has continued to increase in real terms, there has been a gradual decline in the proportion of cargo carried by sea from around 95 per cent of value in the late 1970s to around 85 per cent at present (figure 4.1). There is also considerable variation between commodity groups in the proportion carried by sea and this is illustrated in table 4.2.

During initial discussions, industry representatives stated that a number of factors were considered when determining which mode of transport to use. These included:

- physical attributes and packaging needs of goods;
- speed and consistency of delivery performance;
- annual volume of exports;
- customer service levels required;
- likely impact on future business or contracts.

The Bureau therefore included in its survey a section on the extent to which sea and air transport were used. Table 4.3 summarises the responses.



Source ABS (1989f).

Figure 4.1 Proportion of Australian exports carried by air

TABLE 4.2 PROPORTION OF EXPORTS CARRIED BY SEA TRANSPORT IN 1988
(per cent)

ATFCC group	*Proportion of total value*
Food and live animals (0)	96
Beverages and tobacco (1)	98
Crude materials (2)	99
Mineral fuels (3)	100
Animal and vegetable oils (4)	99
Chemicals (5)	77
Processed materials[a] (6)	92
Machinery and transport equipment (7)	55
Miscellaneous manufactures (8)	34
Other[b] (9)	5

a. Manufactured goods classified chiefly by material.
b. Excludes confidential items.

Note Figures in brackets are Australian Transport Freight Commodity Classification item numbers.

Source ABS (1989f).

TABLE 4.3 MODAL CHOICE FOR EXPORTS[a]

Mode	*Proportion of respondents (per cent)*	*Value*	
		Sea ($ million)	*Air ($ million)*
Sea only (111)	32	10 033	0
Sea and air[b] (197)	58	2 903	346
Air only (34)	10	0	361

a. Export values refer only to those 292 respondents who gave an export value.
b. Where respondents gave an export value and no modal split, the average modal split for all exporters using sea transport was assumed.

Note Numbers in brackets are numbers of respondents.

Source BTCE survey responses.

Those using air transport exclusively were asked whether they would consider using sea transport for some consignments if delays were negligible. Of the 34 respondents, 12 said they would consider sea for some consignments if delays were negligible.

About a dozen respondents who used both air and sea transport stated that they would increase the sea component if delays were negligible. Another respondent mentioned that reductions in airfreight rates had facilitated his shift over a period of ten years from 90 per cent reliance on sea transport to 90 per cent use of airfreight. Yet another said that customers in the United Kingdom, Hong Kong and New Zealand would be lost if airfreight was not used.

Modal choice and export volume

For the purposes of comparison, generally four different sizes of exporters were considered, namely small exporters with annual exports of less than $1 million, two groups of medium exporters with exports between $1 million and $5 million and $5 million and $50 million respectively, and large exporters with exports of at least $50 million. The frequencies in table 4.4 indicate how the sea proportion of exports increased as the level of exports rose, and especially as bulk exports became more prominent.

The survey did not seek reasons for the choice of mode, but there are several possibilities. Apart from the fact that bulk exporters are generally found among

TABLE 4.4 SEA TRANSPORT PROPORTION OF EXPORTS, BY EXPORT VALUE
(percentage of respondents)

Export value	*Percentage of export value sent by sea*							
	Nil	*1–19%*	*20–39%*	*40–59%*	*60–79%*	*80–89%*	*90–99%*	*100%*
Less than $1 million (90)	21	7	2	7	11	9	19	24
$1 million — $5 million (81)	5	1	9	4	17	15	17	32
$5 million — $50 million (73)	1	11	1	3	12	3	40	29
More than $50 million (41)	5	0	0	0	0	0	20	76

Notes 1. Numbers in brackets are numbers of observations. The seven respondents who gave annual exports but not sea transport proportions are included.
2. Rows may not add to 100 due to rounding.

Source BTCE survey responses.

the larger exporters, large exporters of non-bulk cargo may be able to exert greater control over their cargo and be less susceptible to waterfront delays. Smaller exporters may also be more likely to export high value goods for which air transport is more suitable. A further possibility is that larger exporters are more likely to ship full container loads, avoiding LCL depots and the delays that were a serious problem during the study period.

COMBINATIONS OF CARGO PACK TYPES

The survey questionnaire listed four different sea transport pack types for consignments and asked which were used. Table 4.5 illustrates the cargo pack types used by respondents and the value of exports corresponding to each combination of pack types. While LCL containers usually comprise around 10 to 15 per cent of containers moving through the Australian waterfront (BTE 1986b), it seems clear that a large proportion of exporters export LCL consignments at least some of the time. Just over 50 per cent of respondents reported that they used LCL alone or LCL and FCL shipments, but they exported only 4.7 per cent of the total seaborne export value reported by respondents who indicated a cargo pack type. As might be expected, it seems that LCL shipments are mainly used by small and medium exporters. This is confirmed by the data in table 4.6.

Just over one-third of those who exported FCL consignments stated that they sometimes sent part-filled containers in order to minimise delays. Two-thirds of them were medium exporters and over a quarter never used LCL consignments. This suggests that the practice of sending partially filled containers as FCLs arises

TABLE 4.5 COMBINATIONS OF CARGO PACK TYPES USED BY EXPORTERS

Pack type	*Number of respondents*	*Proportion of respondents (per cent)*	*Sea exports ($ million)*	*Proportion of value (per cent)*
FCL and LCL	108	35.5	570	4.4
FCL alone	52	17.1	1 938	15.0
LCL alone	50	16.4	32	0.2
Bulk alone	21	6.9	3 409	26.4
FCL, LCL and NBNC	19	6.3	1 636	8.6
LCL and NBNC	11	3.6	12	12.7
FCL and bulk	10	3.3	1 721	13.1
FCL, LCL and bulk	10	3.3	477	3.7
FCL, NBNC and bulk	5	1.6	2 168	16.8
Other combinations	18	5.9	959	7.4
Total	304	100	12 187	100

Notes 1. FCL = full container load; LCL = less than container load; NBNC = non-bulk non-containerised.
2. Numbers may not add to totals due to rounding.

Source BTCE survey responses.

TABLE 4.6 EXPORTERS USING EACH TYPE OF CARGO PACK
(per cent of respondents)

Export value	*FCL*	*LCL*	*Bulk*	*NBNC*
Less than $1 million (72)	49	83	4	17
$1 million — $5 million (78)	74	76	6	15
$5 million — $50 million (71)	86	72	27	20
More than $50 million (42)	64	21	52	24

Notes 1. FCL = full container load; LCL = less than container load; NBNC = non-bulk non-containerised.
2. Numbers in brackets are numbers of respondents who export by sea.

Source BTCE survey responses.

especially in circumstances where small and medium exporters must meet stringent deadlines but are not confident that their production schedules will accommodate the consolidation lead times required for LCL consignments.

EXPORT INVENTORIES

In initial industry interviews, a number of exporters stated that their production processes relied upon the availability of one or more imported parts or components. Without these parts or components, they would either have to reschedule production activity until supplies were again available (and then perhaps make sizeable overtime payments to have work completed on time), or they would have to pay more for locally produced parts or components (and then perhaps incur further expenditure machining or otherwise modifying them for use in production).

One company indicated that it consistently required inventory levels at least 5 per cent higher than those of other branches overseas. Another said that instead of its manufacturing facilities being expanded in Australia, the most logical decision was to establish a new manufacturing plant in the country which was currently the greatest importer of the company's products in the Pacific region. However, there are many factors involved in decisions of this type, many of which are not necessarily related to conditions on the Australian waterfront.

The Bureau's survey sought to establish the extent to which the inventories carried by Australia's exporters were destined for export and how individual customer supply transit times might be reduced if the risk of shipping and waterfront delays in Australian ports were negligible.

The national estimate of export inventory was grossed up from 151 responses using the methodology explained in appendix V. A number of responses were excluded from the analysis as export values rather than export inventory levels

appeared to have been given. The estimated national inventory of exports estimated in this way was $3530 million or 9.8 per cent of the $36 billion seaborne exports in 1988.

Exporters typically produce for a particular shipping date and their export inventories are not affected to the same extent by waterfront and shipping delays as are the inventories of importers. When interviewed one company representative commented that his customers rather than his firm were the ones who had to hold higher inventories as a result of delays. For this reason the Bureau did not explore the possibility of reducing export inventory costs in the survey questionnaire, although an improvement in waterfront reliability would have some effect on the level of inventories required. The largest effect on financing costs is more likely to be through the effect on transit times and this is discussed in the next section.

EFFECTS OF SHORTER TRANSIT TIMES

The BTCE survey asked respondents using sea transport whether shorter transit times for overseas delivery would:

- reduce their costs of finance;
- improve their competitiveness; or
- have little or no effect.

Of the 298 respondents who replied, 70 per cent stated that their competitiveness would improve, 56 per cent that their costs of finance would be reduced and 21 per cent that there would be little or no effect. Over four-fifths of those who expected their costs of finance to be reduced also thought that their competitiveness would be improved. Nearly 77 per cent of medium exporters, just under 70 per cent of small exporters and about 61 per cent of large exporters expected better competitiveness.

Respondents were asked to state the transit time they normally allow from factory to overseas store when supplying their most important customer, and the level to which this could be reduced if the risk of waterfront and ship delays in Australian ports were negligible. These replies were used to calculate excess transit times for major trade routes and the associated excess export transaction financing cost.

As virtually all exports are paid for *after* despatch to the purchaser, exporters have to bear the cost of financing their exports over the additional transit time required on account of ship and waterfront delays in Australian ports.

Table 4.7 summarises calculations of potential average reductions in transit time for exports to different countries or regions. An interest rate of 21 per cent was assumed when converting these average reductions to excess financing costs of annual exports by sea to each of these countries or regions. This was the interest rate implied by importers responding to the question on inventory cost savings (see chapter 5).

TABLE 4.7 COST OF ADDITIONAL TRANSIT TIME DUE TO SHIP AND WATERFRONT DELAYS IN AUSTRALIAN PORTS

Trade route	*1988 sea exports ($ million)*	*Excess transit time (days)*	*Finance cost ($ million)*
New Zealand	1 407	6.8	6
PNG and Pacific Islands	1 175	7.0	5
East and South-East Asia	6 309	7.9	29
Japan and North Asia	12 150	4.5	31
North America	4 498	9.7	25
Middle East	1 953	5.9	7
UK and Europe	7 444	9.2	39
Africa	214	8.0	1
Central and South America	284	8.0	1
Not specified or not available	579	7.4[a]	2
Total	36 013		146

a. Average reduction of just over 20 per cent assumed for this group.

Note Numbers may not add to totals due to rounding.

Source BTCE estimates based on survey responses and ABS (1989f).

Consideration of the country of the most important customer brought to light major differences of opinion about the potential for improved competitiveness. Where the most important customer was in North America, 85 per cent of respondents said shorter transit times would improve their competitiveness. Eighty per cent of those whose most important customers were in East or South-East Asia held the same view.

The North American route is the one respondents believed to have the greatest potential reduction in transit time. The high response for the Asian grouping can be explained by the large 7.9 days (or 21 per cent) potential decrease in transit time. Only 48 per cent of those whose most important customer was Japanese thought that shorter transit times would improve their competitiveness, but this group of respondents also saw least scope for potential reduction in transit time, particularly those exporting from Western Australia. For most other regions the proportion expecting improved competitiveness as a result of shorter transit times was between 60 and 70 per cent.

INCREASES IN EXPORTS FROM IMPROVED WATERFRONT RELIABILITY

There were 279 responses to the BTCE survey question about the expected increase in export sales if waterfront and ship delays were negligible. Over three-fifths of respondents said that they would make no extra sales or that these would be limited to 5 per cent. Around one in five thought that they would increase exports by 15 per cent or more. Table 4.8 classifies responses about expected extra sales according to the level of annual exports.

TABLE 4.8 EXPECTED INCREASE IN EXPORTS IF WATERFRONT AND SHIPPING DELAYS WERE NEGLIGIBLE
(per cent of respondents)

	Expected increase in total exports					
Export value	*Nil*	*5%*	*10%*	*15%*	*20%*	*More than 20%*
Not stated (33)	33	27	15	3	3	18
Less than $1 million (64)	36	28	17	5	8	6
$1 million — $5 million (75)	21	33	23	8	9	5
$5 million — $50 million (67)	28	31	18	7	7	7
More than $50 million (40)	40	35	15	3	5	3
Total (279)	30	31	18	6	7	7

Notes 1. Numbers in brackets refer to numbers of respondents.
2. Rows may not add to 100 due to rounding.

Source BTCE survey responses.

Large exporters were the most pessimistic with less than one-quarter expecting increased exports of more than 5 per cent in the event of negligible waterfront and ship delays. On the other hand over two-fifths of medium exporters and one-third of small exporters were in this category. There may be several reasons for the different patterns of answers.

A total of 245 respondents provided details of current and potential export values as well as the commodities exported. Where respondents reported commodities falling into more than one broad commodity group the expected increases in exports were allocated across groups in the manner discussed in appendix V.

The total national estimate of the expected increases in export sales was obtained from these responses by assuming that, within each broad commodity group, the sample of exporters was representative. This assumption seems reasonable as, overall, the exports reported by survey respondents totalled just over one- third of the total exports reported by the Australian Bureau of Statistics for 1988. The expected increase in export sales within each group was grossed up to a national figure by multiplying it by the ratio of total annual exports for the group as reported by the Australian Bureau of Statistics to the exports reported by respondents.

The Australian Bureau of Statistics aggregates all confidential items and includes them under ATFCC item 99. The sum of the confidential items was subtracted from the total for single-digit item 9 to avoid bias during the grossing up of the survey responses. The sum of the confidential items was distributed, to the extent

possible, among the single-digit ATFCC groups by the method discussed in appendix V. The residual confidential items which could not be allocated were assumed to have a proportional gain in exports equal to the average gain for all other exports.

Table 4.9 summarises results of the calculations. The total potential gain in export sales estimated by this method is $1506 million or 4.2 per cent of the total seaborne exports of just over $36 billion in 1988.

It is probable that respondents generally would be more likely to overstate than to understate the expected increase in export sales. This suggests that the results may overestimate the effect on sales. On the other hand, the Bureau surveyed only existing exporters and no attempt was made to survey firms which might export if conditions were more favourable. A survey of this group would have increased costs substantially and the additional results are likely to have been very speculative. Omission of this group would result in the estimates understating the expected increase.

It is possible that when survey respondents were formulating their expectations about potential export expansion they may have assumed that export prices would remain constant. However, improved waterfront reliability would reduce the cost of supplying exports and at the same time buyers of Australian exports would value them more highly and be prepared to pay higher prices. The interaction of these two effects would result in either an increase or a decrease in price. Respondents assuming no price change would, depending on the

TABLE 4.9 EXPECTED INCREASE IN EXPORTS IF WATERFRONT AND SHIPPING DELAYS WERE NEGLIGIBLE

Commodity category	*Sea exports 1988 ($ million)*	*Unadjusted gross increase*		*Adjusted gross increase*	
		Value ($ million)	*Proportion (per cent)*	*Value ($ million)*	*Proportion (per cent)*
Food and related products (0, 1, 4)	7 964	504	6.3	333	4.2
Crude materials (2)	14 081	210	1.5	132	0.9
Mineral fuels (3)	6 060	269	4.4	296	4.9
Elaborately transformed manufactures (5, 7, 8)	2 566	296	11.5	332	12.9
Processed materials[a] and other[b] (6, 9)	5 342	226	4.2	143	2.7
Total	36 013	1 506	4.2	1 236	3.4

a. Manufactured goods classified chiefly by material.
b. Includes ATFCC 9 and confidential items.

Notes 1. Numbers may not add to totals due to rounding.
2. Figures in brackets are Australian Transport Commodity Classification item numbers.

Source BTCE estimates based on survey responses.

direction of the price change, overstate or understate the potential increase in export sales. This issue is discussed in more detail in chapter 6 and a method of adjusting the increment in export sales reported by survey respondents to take account of changes in price is presented in appendix VI. The adjusted values are also shown in table 4.9. The total of the adjusted values is most likely a lower bound for the expansion in exports which would result from a reduction of waterfront and shipping delays to negligible proportions.

MAJOR CAUSES OF DELAYS TO EXPORT CONSIGNMENTS

Often there is more than one reason why a particular export consignment has been delayed. The large number of links in the transport chain increases the likelihood of unsatisfactory coordination at some critical point and makes it possible that even customs agents or forwarders will not be certain about the cause contributing most to a particular delay.

Perceptions about why delays occur may have an important influence on behaviour. Consequently the Bureau included a question asking exporters to indicate in order of severity the five major reasons for delays they experienced to their export consignments.

There was an opportunity for respondents to write in their own reasons if they were not covered by the nine listed. A small number of respondents indicated that they could not answer the question as they had not experienced delays. Others stated that they did not have direct dealings with the waterfront and hence that they would either have to rely on what others supervising their cargo had told them, or that they would not answer for this reason. Not all of those who replied listed five reasons.

The five reasons mentioned most by respondents and the percentage of respondents listing each reason as the most important are shown in table 4.10.

TABLE 4.10 PERCEIVED CAUSES OF MOST SERIOUS DELAYS TO EXPORT CONSIGNMENTS

Cause	*Proportion of respondents (per cent)*
Late ship departures	38
Industrial disputes	33
Port congestion	10
Truck queues	5
Container availability	4
Other	8
Total	100

Note Numbers may not add to total due to rounding.

Source BTCE survey responses.

The extent of exporter concern about the first four causes was just as pronounced when the frequency of mention of particular causes of delay (irrespective of ranking) was analysed.

There was a noticeable difference in the way that Melbourne and Sydney were viewed by exporters. Exporters using Sydney reversed the ranking of industrial disputes and late ship departures. The pronounced effect of the Transport Workers' Union blockade in September 1988 would have contributed to these perceptions.

Several respondents based in Adelaide or Brisbane related the difficulties that they had when sending consignments by rail to Melbourne or Sydney. Details of lost or damaged goods were given, and mention was made of the two or three weeks they often had to wait before their cargo was at sea.

Respondents using FCL consignments regarded late ship departures as the main cause of serious delays to their cargo. Those using LCL but not FCL consignments put industrial disputes first and late ship departures second. This suggests that the extra handling required for processing of LCL cargo increases the vulnerability to industrial disputes. Several LCL users made strong mention of their difficulties in obtaining containers, of significant losses due to pilferage or of being told only at the last minute that they would not be securing space aboard vessels.

Both small and large exporters ranked industrial disputes as the most important cause of delays whereas medium exporters put late ship departures first. Unlike other groups large exporters ranked port congestion ahead of late ship departures, possibly reflecting different problems in bulk ports.

WORST QUARTER BETWEEN JANUARY 1988 AND MARCH 1989

In the preceding sections the focus was on delays and resultant costs in general. The BTCE survey also examined what exporters do when faced with specific problems which have arisen in the course of their operations.

Respondents were asked whether they had experienced delays of more than five days in the despatch of their export consignments between January 1988 and March 1989. Those who had were asked to indicate the quarter in which the most serious delays had occurred and the port most affected. Then followed questions about the impact on their production and employment arrangements and their contracts, as well as the length of delays and any additional costs incurred.

Of the 308 respondents using sea transport for their cargo 59 per cent indicated that they had experienced a delay of more than five days to an export consignment during the 15 months under consideration. Several of the 24 respondents who had suffered such delays but did not indicate a worst period stated that either they had no detailed records of delays (one said that the company concentrated on selling its product rather than keeping records) or that it would take too long to extract the relevant information from them.

Nevertheless 140 respondents gave a single period in which they had experienced their most serious delays. The proportion nominating each quarter is listed below.

First quarter 1988	14 per cent
Second quarter 1988	10 per cent
Third quarter 1988	19 per cent
Fourth quarter 1988	29 per cent
First quarter 1989	29 per cent

A further 19 respondents listed two or more quarters. In September 1988 there were major disruptions on the Sydney waterfront due to a Transport Workers' Union owner-driver blockade. The responses appear to reflect the congestion which followed in the aftermath of that dispute and another involving customs officers, as well as the strong surge in imports at about this time.

More respondents who were users of FCL consignments reported delays of more than five days than users of LCL consignments (65 per cent of those using FCL alone compared with 44 per cent of those using LCL alone). This may reflect the reduced information available to LCL consignors once their cargo is accepted by a depot for packing.

Delay experience during the study period was related to the volume of exports with 47 per cent of small exporters reporting delays of more than five days compared with over 60 per cent of other exporters. This suggests that the incidence of delays is closely related to the number of non-bulk consignments being processed (or to the exposure to risk of delay).

All but one large exporter experiencing delays indicated that additional costs were incurred as a result, whereas around three-fifths of medium exporters and one-half of small exporters did so. This may reflect the nature of information that is collected and retained about individual transactions or differences in perception about what constitutes an additional interest cost.

Expected increase in exports appears to be strongly related to delay experience. Figure 4.2 illustrates this by showing that almost all the respondents who expected an increase of at least 10 per cent if waterfront and shipping delays were negligible had experienced delays of more than five days during the study period. Those anticipating lower increases had experienced fewer delays. This contrast supports contentions made by many respondents that continued unreliability in delivery of exports undermines business reputations and opportunities for expansion of trade.

LONGEST DELAYS TO EXPORT CONSIGNMENTS

Respondents who experienced a delay of over five days between January 1988 and March 1989 were asked to give both the average and longest delay to consignments in the quarter with the most serious delays, as well as the number

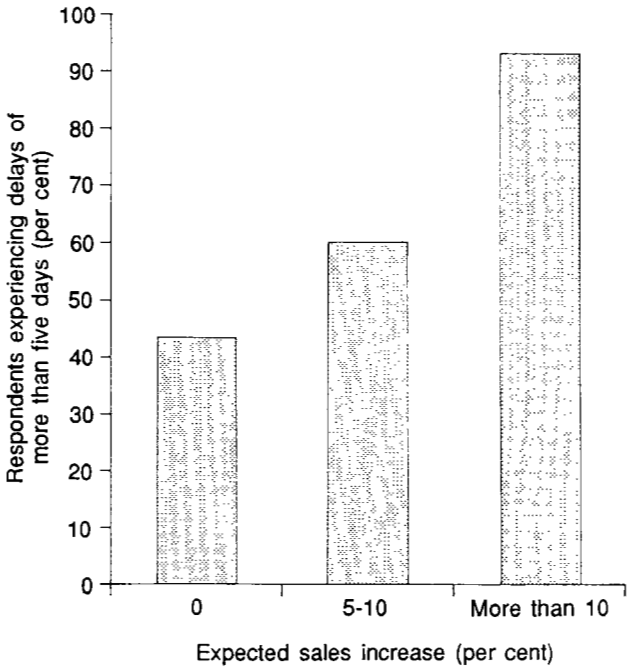
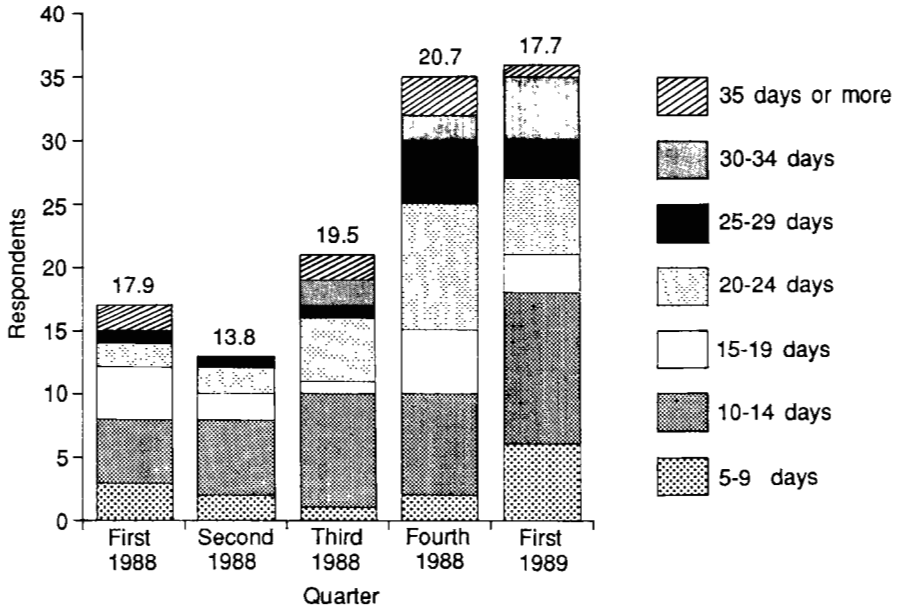


Figure 4.2 Expected increase in export sales if waterfront delays were negligible, and delay experience



Note Numbers indicate average longest delay.

Source BTCE estimates based on survey responses.

Figure 4.3 Distribution of longest delays for exporters

of consignments delayed and the number not delayed. Due to the inconsistencies between answers supplied it was possible to analyse in detail only the answers relating to the longest delay.

Several respondents pointed out that while the effects of unpunctual export delivery were often not felt immediately, instances where the consignees were greatly inconvenienced could lead to an instant termination of the business relationship. Another mentioned that exporters could be obliged to airfreight vital goods if a customer's stockpiles were running low, or to undertake expensive advertising to maintain retailer confidence and continued market presence if shortages occurred from time to time.

In addition the longer the delay in the despatch of a consignment the greater will be the disruption to an exporter's anticipated cash flow. Some exporters may not be well placed to withstand extended financial pressure, especially if future sales are put in jeopardy or if failure to meet contract terms leads to reduced prices.

Figure 4.3 illustrates the distribution of the longest delay reported by respondents for their worst quarter between January 1988 and March 1989. The average longest delay was in all cases greater than the median longest delay reflecting the slight skewing of each distribution towards the most extensive delays.

Except where the most serious delays were in the second quarter of 1988 the majority of respondents reporting delays of more than five days stated that they had more consignments delayed than they had not delayed. Nineteen of the 140 respondents indicating a single worst quarter also reported that every one of their consignments was delayed in that quarter, but it is possible that others fell into this category and did not indicate this clearly.

TABLE 4.11 PORTS HAVING THE MOST SERIOUS DELAYS FOR EXPORTERS BETWEEN JANUARY 1988 AND MARCH 1989

(per cent)[a]

	Number of ports used		
Port	*1*	*2*	*3*
Sydney	61	50	41
Melbourne	54	36	40
Brisbane	17	26	12
Fremantle	40	0	6
Adelaide	0	0	0
Other	29	0	7

a. Proportion of respondents using a single port who experienced delays of more than five days or, if more than one port was used, for each port, the ratio of nominations as port most affected to frequency of use.

Source BTCE survey responses.

Table 4.11 shows which ports were described by exporters reporting delays of more than five days as worst affected in the five quarters under review. Sydney was regarded as the most affected port, but Melbourne was also perceived as experiencing severe delays. The responses made it clear that delays in Sydney were felt most strongly in the fourth quarter of 1988, and showed that Melbourne exporters regarded delay conditions as getting progressively worse over the 15-month period.

Other features of the responses made about their worst quarter by respondents who suffered at least one delay of more than five days over this period were:

- 66 per cent said that they had incurred specific costs as a result of the delays;
- 21 per cent, mainly medium exporters, stated that they had lost contracts or orders due to the effects of waterfront delays;
- 17 respondents stated that they had reduced or suspended production as a result (12 in the last two quarters) and only four of these had been able to make up lost production;
- ten respondents indicated that they had cancelled orders for domestically sourced inputs as a result of delays;
- three respondents said that they had stood down workers due to the effects of waterfront delays.

These respondents were also asked whether they anticipated any additional adverse effects on future sales from delays during their worst quarter. Of the 174 who replied, 16 per cent did not anticipate any additional adverse effects, 29 per cent expected a lot, and 55 per cent not much. Several of those in the last group made the point that 'some' adverse effects was the best description of their situation. The greatest proportion saying they would be affected very adversely (41.5 per cent) nominated the first quarter of 1989 as the period during which they experienced their most serious delays.

Of the respondents experiencing delays longer than five days 87 (48 per cent) used airfreight for critical goods, the highest proportions doing so in the second and third quarters of 1988 (86 and 65 per cent respectively). Of these respondents 77 per cent added that they were still using airfreight for critical goods. The answers about anticipated additional adverse effects given by those who used airfreight for critical goods were not much different from the overall pattern. Much higher proportions of small and medium exporters used airfreight for critical goods than did large exporters. This may reflect the size of consignments and the long-term nature of contracts fulfilled by large exporters.

COSTS RESULTING FROM SERIOUS DELAYS TO EXPORT CONSIGNMENTS

In order to establish who faced the greatest problems as a result of delays, the ratios of costs incurred as a consequence of delays to the values of exports were examined for the quarter in which respondents reporting delays of more than five days had their most serious delays. It proved possible to calculate the ratio of delay costs to value of exports in 85 of the 121 cases.

The worst ratios occurred predominantly in the fourth quarter of 1988 and the first quarter of 1989. Table 4.12 illustrates the large extent to which the most severe additional cost burdens fell upon those whose exports translate pro rata into the small and lower medium categories. One exporter commented that the cost of truck queues and of returning empty containers was regularly between 2 and 5 per cent of the total cost of the consignment and that this was making the operation non-viable.

Where additional costs exceeded 1 per cent of export value there were two predominant causes. In 16 of the 34 examples the cost of air transport either formed by far the greatest part of the additional cost or contributed over 40 per cent as the first or second element. On 12 other occasions, this role was played by extra interest costs.

TABLE 4.12 RATIO OF DELAY COSTS TO VALUE OF EXPORTS
(per cent of respondents)

	Additional cost						
Export value[a]	*Nil*	*0.5–1%*	*1–2%*	*2–3%*	*3–5%*	*5–10%*	*More than 10%*
Less than $0.25 million (21)	10	14	24	14	10	19	10
$0.25 million — $1.25 million (20)	20	15	25	5	10	15	10
$1.25 million — $12.50 million (22)	41	41	9	0	9	0	0
More than $12.50 million (22)	86	9	0	0	5	0	0
Total (85)	40	20	14	5	8	8	5

a. Export value for quarter or quarters in which the delay was experienced.

Notes 1. Numbers in brackets refer to numbers of respondents.
2. Rows may not add to 100 due to rounding.

Source BTCE survey responses.

The results above show that when the most severe disruptions occur the greatest burden appears to fall on small and lower medium exporters who would be least financially able to withstand a major setback. These are also among the exporters who expect the greatest increases in overseas sales from improvements in waterfront reliability.

Several respondents mentioned the administrative time and telephone call expense required to sort out difficult problems, and the further complications which arose if new documentation had to be arranged because the ship originally expected did not load their cargo. Small exporters are more likely to have the rest of their operations disrupted by such emergencies.

Although the costs faced by exporters as a result of a delay may be only a small proportion of export value they will often represent a major increase over anticipated transport and freight costs and hence greatly affect profits and future competitive prices. As one respondent indicated, it appears that trading relationships on a total package rather than lowest price basis can only be developed after many years of satisfactory service.

SUMMARY

There has been a continual increase in the proportion of exports carried by air transport since 1976-77. There are many reasons for this, but it is clear that some exporters presently using air transport would move at least some of their exports to sea transport if the reliability of the waterfront were improved.

While only a small proportion of exports, as measured by value, was exported as LCL consignments, over two-thirds of exporters made use of LCL facilities at some time during 1988. About one-third of those exporting FCL consignments sometimes export partly filled containers as FCL consignments to avoid the delays anticipated in container depots.

The total inventory of exports was estimated to have been $3530 million in 1988, or 9.8 per cent of the total seaborne exports in that year. This estimate is more likely to be an overestimate than an underestimate.

Waterfront and shipping delays added an estimated average of seven days to the transit times of Australian exports in 1988. This added an estimated $146 million to the financing costs of Australian exporters. The high level of interest rates contributed to the magnitude of this sum.

Exporters estimated that if waterfront and shipping delays were negligible they could have expanded their export sales by $1506 million per annum. When adjusted for probable price effects, this sum reduces to $1236 million. Those estimating the largest percentage increases had generally experienced serious waterfront and shipping delays.

Exporters perceived that the major causes of delays were:

- late ship departures;
- industrial disputes;
- port congestion;
- truck queues; and
- container availability.

Sydney exporters gave greater emphasis to industrial disputes, most probably because of their experience of the truck blockades of the Sydney waterfront in September 1988. Small exporters appear to have had more difficulty with container availability than larger exporters. Large exporters were more concerned about industrial disputes and port congestion, reflecting the different problems occurring in bulk ports. Adelaide and Brisbane exporters faced additional problems with unreliable rail connections to Melbourne and Sydney respectively.

Around 60 per cent of exporters experienced delays of more than five days during the 15 months from January 1988 to March 1989. About two-thirds of these exporters incurred costs as a consequence of these delays and about one-fifth lost contracts as a consequence.

The longest delays during the 15-month period ranged from an average of 13.9 days for the second quarter of 1988 to 20.7 days for the third quarter 1988.

Over 80 per cent of exporters experiencing delays of more than five days during the period under review anticipated at least some adverse effects on their business arising from the delays.

About half of the exporters experiencing serious delays resorted to air transport for critical goods as a consequence. Of these nearly 80 per cent were still using air transport in the middle of 1989.

The cost burden of delays appears to fall most heavily on the smaller exporters. More than a quarter of those with exports under $1 million in their quarter of most serious delay gave their delay costs as greater than 5 per cent of their export value.

CHAPTER 5 IMPORTERS AND DELAYS TO THEIR CONSIGNMENTS

This chapter examines the direct financial impact of waterfront unreliability on Australia's importers. Most of the primary data for analysis were obtained from responses to the BTCE's 1989 survey of importers (see appendix V), as well as personal interviews and other direct contact with stevedores, customs agents and trade unions, importers and industry associations.

The Bureau's survey of importers examined the extent to which individual importers use air and sea transport for their consignments, the nature of their sea transport arrangements, the pattern of their import cargo collections and what they perceive to be the major causes of delays to their consignments. The potential effects on inventory and on ordering lead times of having a negligible risk of ship and waterfront delays in Australian ports were explored. The survey also examined specific consequences and possible additional costs arising from delays of more than five days in the scheduled times of import cargo availability during the period from January 1988 to March 1989.

In the analysis attempts were made to isolate differences in effects on small, medium (two groups) and large importers and in perceptions about performance at individual ports, and to make comparisons with corresponding results for exporters.

SURVEY RESPONDENTS

Around 420 written and telephone replies were received after 800 survey questionnaires were mailed to importers in May 1989. There was sufficient detail in 369 responses for coding and entry into a database, giving an effective response rate of 46 per cent.

Respondents were asked to mark one or more general business classifications of their activities. There were 213 manufacturers (58 per cent), 187 wholesalers (51 per cent) and 106 retailers (29 per cent) among the 365 respondents who answered this question. Of the manufacturers 48 per cent stated that they did not engage in other activities while 43 per cent were also involved in wholesaling. Just over half those involved in retailing were also involved in wholesaling. The 38 respondents who felt that some or all of their activities lay outside the three

classifications mentioned above were mainly involved in the distribution of goods or the provision of services.

As for exports, respondents were asked to classify their imports according to a simplified Australian Transport Freight Commodity Classification (ATFCC) scheme.

Information about both the value of sea-based imports and commodity group was provided by 295 respondents. Their sea-based imports in 1988 were worth $5213 million which is 16 per cent of Australia's imports by sea for that year. Of these respondents, 54 per cent indicated that their imports were within a single one of the ten single-digit ATFCC groups. Their imports represented 55 per cent of the survey total. This proportion is about two-thirds that recorded in the exporter survey reflecting the greater diversity generally observed in importing.

If respondents reported imports that were in two or more commodity groups, the value of imports carried by sea was apportioned in accordance with the percentages established through information provided on survey forms and direct further contact (see appendix V).

Table 5.1 shows estimates for the value of survey respondents' cargo in each of seven commodity categories carried by sea and the national figure in each case.

TABLE 5.1 SURVEY RESPONDENTS' AND AUSTRALIAN IMPORTS BY SEA IN 1988, BY COMMODITY CATEGORY

		Respondents' imports	
Commodity category	*Australian imports ($ million)*	*Value ($ million)*	*Share of Australian total (per cent)*
Food and related products (0, 1, 4)	1 999	259	12.9
Crude materials (2)	1 507	546	36.2
Mineral fuels (3)	1 824	5	0.3
Chemicals (5)	3 921	683	17.4
Processed materials[a] and other[b] (6, 9)	7 102	903	12.7
Machinery and transport equipment (7)	13 179	1 839	14.0
Miscellaneous manufactures (8)	3 840	978	25.5
Total	33 372	5 213	15.6

a. Manufactured goods classified chiefly by material.
b. Includes confidential items.

Notes 1. Numbers may not add to totals due to rounding.
2. Figures in brackets are Australian Transport Freight Commodity Classification item numbers.

Sources BTCE estimates based on survey responses; ABS (1989f).

SEA AND AIR TRANSPORT OF IMPORTS

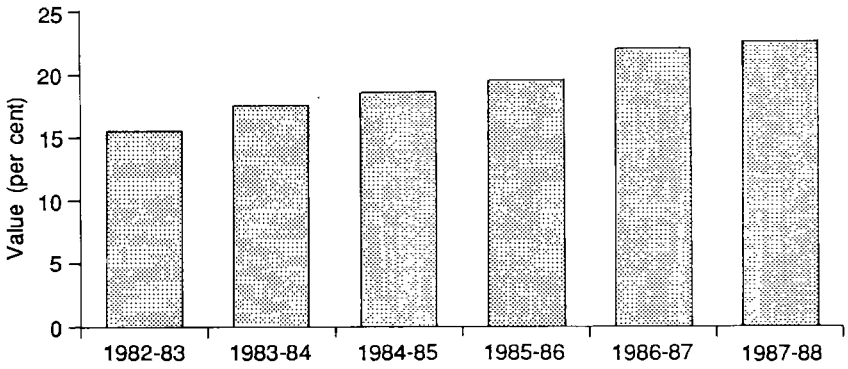
National statistics on the value of import cargo carried by sea and air were not published regularly until 1982. Since then the proportion carried by sea has declined from around 84 per cent by value to around 77 per cent. Figure 5.1 shows the change in the proportion carried by air transport over six years.

Table 5.2 indicates the extent to which the proportion of imports carried by sea varies from commodity category to commodity category. While sea transport is overwhelmingly dominant in fewer categories than for exports, a much greater proportion of elaborately transformed manufactures (ATFCC groups 5, 6 and 7) is brought in by sea than is exported that way.

Early in the study a number of importers stressed the extent to which their activities were dependent on a reliable supply of products, parts or components. For many, particular items were vital to their production processes and their ability to supply export markets. Often several extra months' supply was kept in inventory in case of prolonged difficulties in obtaining deliveries, and even then it was sometimes necessary to fly in materials or products when the alternative could mean losing contracts or temporarily halting production.

The BTCE survey contained a question on the extent to which sea and air transport are used. Table 5.3 summarises the responses.

Both the responses and the import values of those relying on air transport alone were concentrated in the categories for machinery and transport equipment and miscellaneous manufactures. Nine of 32 respondents using air only said they would consider using sea transport for some consignments if delays were negligible.



Source ABS (1989f).

Figure 5.1 Proportion of Australian Imports carried by air

TABLE 5.2 PROPORTION OF IMPORTS CARRIED BY SEA TRANSPORT IN 1988
(per cent)

ATFCC group	*Proportion of total value*
Food and live animals (0)	88
Beverages and tobacco (1)	99
Crude materials (2)	97
Mineral fuels (3)	100
Animal and vegetable oils (4)	100
Chemicals (5)	81
Processed materials[a] (6)	89
Machinery and transport equipment (7)	72
Miscellaneous manufactures (8)	63
Other[b] (9)	24

a. Manufactured goods classified chiefly by material.
b. Excludes confidential items.

Note Figures in brackets are Australian Transport Freight Commodity Classification item numbers.

Source ABS (1989f).

TABLE 5.3 MODAL CHOICE FOR IMPORTS[a]

Mode	*Proportion of respondents (per cent)*	*Value*	
		Sea ($ million)	*Air ($ million)*
Sea only (107)	29	1 406	0
Sea and air[a] (230)	62	3 834	790
Air only (32)	9	0	113

a. Includes imports of three respondents who did not indicate commodity groups and excludes imports of four respondents who did not state percentage carried by sea.

Note Numbers in brackets are numbers of respondents.

Source BTCE survey responses.

One company wrote that it had increased its use of airfreight by over 200 per cent in two years because of a string of serious delays to sea cargo. Another indicated that whenever waterfront problems appeared imminent its divisional purchasing managers would decrease sea transport of cargo by two-thirds.

As for exporters, importers were placed into one of four size categories if they stated their annual imports. Table 5.4 shows that small importers are much more

TABLE 5.4 SEA TRANSPORT PROPORTION OF IMPORTS, BY IMPORT VALUE
(percentage of respondents)

	Percentage of import value carried by sea						
Import value	*Nil*	*1–19%*	*20–39%*	*40–69%*	*70–89%*	*90–99%*	*100%*
Less than $1 million (77)	17	4	4	8	9	19	39
$1 million — $5 million (98)	4	1	7	2	19	40	27
$5 million — $50 million (116)	6	3	0	4	16	45	26
More than $50 million (31)	0	3	6	0	13	55	23

Notes 1. Numbers in brackets are numbers of observations.
2. Rows may not add to 100 due to rounding.

Source BTCE survey responses.

likely to be totally reliant on air transport than importers importing more than $1 million per annum.

Overall the value of imports brought in by sea was 77 per cent of imports by small importers, 83 per cent of imports by both groups of medium importers, and 86 per cent for large importers.

COMBINATIONS OF CARGO PACK TYPES

The BTCE survey questionnaire asked respondents if they used any of four listed cargo pack types for their consignments. Of those who used sea transport, 332 marked at least one box, with:

- 81 per cent importing FCLs;
- 67 per cent bringing in LCLs;
- 14.5 per cent receiving non-bulk non-containerised cargo; and
- 14 per cent receiving bulk cargo.

Both LCL and FCL consignments were imported by 52 per cent of those answering the question.

Table 5.5 lists the most common combinations of sea cargo pack types used by survey respondents not totally reliant on air transport. Table 5.6 shows the extent to which there were different rates of use of the four sea cargo pack types according to the level of annual imports.

The usage pattern differed from that for exports in several respects. In each category a larger proportion of importers than exporters used FCL consignments. Small and medium importers were somewhat less likely to employ LCL shipments

TABLE 5.5 COMBINATIONS OF CARGO PACK TYPES USED BY IMPORTERS

Pack type	*Number of respondents*	*Proportion of respondents (per cent)*	*Sea imports[a] ($ million)*	*Proportion of value (per cent)*
FCL and LCL	141	42.5	1 551	29.6
FCL alone	67	20.2	812	15.5
LCL alone	41	12.3	48	0.9
FCL and bulk	17	5.1	587	11.2
FCL, LCL and NBNC	17	5.1	389	7.4
FCL and NBNC	9	2.7	985	18.8
Bulk alone	8	2.4	108	2.1
FCL, LCL and bulk	8	2.4	33	0.6
Others	24	7.2	724	13.8
Total	332	100	5 236	100

a. Excludes four respondents who gave an import value but did not indicate percentage of imports by sea.

Notes 1. FCL = full container load; LCL = less than container load; NBNC = non-bulk non-containerised.
2. Numbers may not add to totals due to rounding.

Source BTCE survey responses.

TABLE 5.6 USE OF CARGO PACK TYPES, BY VALUE OF IMPORTS
(per cent)

Import value	*LCL*	*FCL*	*Bulk*	*NBNC*
Less than $1 million (63)	75	59	11	11
$1 million — $5 million (95)	72	82	12	13
$5 million — $50 million (109)	61	90	16	12
More than $50 million (31)	45	97	23	35

Notes 1. FCL = full container load; LCL = less than container load; NBNC = non-bulk non-containerised.
2. Numbers in brackets are numbers of respondents who import by sea.

Source BTCE survey responses.

than their export counterparts. Almost all large importers received FCL consignments and nearly half had LCL consignments. In contrast large exporters were much more likely to be involved with bulk cargoes: around two-thirds sent FCL consignments, and only one-fifth sent LCL consignments.

Similarly to exports, over two-thirds of importers used LCL consignments some of the time, but a much greater proportion of the total cargo was imported by those

using both LCL and FCL consignments. The greater diversity in imports compared with exports may encourage greater use of LCL consignments.

Importers of LCL consignments face additional delay problems in container depots. Delays to import consignments in container depots and the costs of those delays are examined in appendix IV.

COLLECTION OF CONSIGNMENTS

There were major differences of opinion expressed about the collection of consignments during the Bureau's initial contacts with importers and service providers. Stevedores claimed that the problem of truck queues was exacerbated by the practice of importers availing themselves of the maximum free wharfside storage time and consequently bunching their attempts to collect containers. Some sources claimed that customs agents delayed payment of customs duties and other fees until the last moment and placed the funds on the short-term money market in the interim. Others criticised terminal operators for not paying enough attention to the land-side clearance of containers and for being prepared to transfer forklifts away from this task if any of those loading and unloading ships broke down.

The BTCE survey of importers therefore asked everyone who used sea transport to indicate what proportion of consignments was picked up on the day of availability, one day afterwards, two days afterwards, three to seven days afterwards, and even later. Normally FCL and non-bulk non-containerised cargo is available for collection the day after the discharging ship has sailed again. In some terminals, containers are available for collection on the day of discharge, although the free storage period does not commence until the ship departs.

Table 5.7 shows the distribution of the proportions of total sea cargo each group of importers said they collected on the first day of availability.

The table suggests that although the larger the importer the more likely was a start to collection on the first day of availability, the greater proportion of cargo was still awaiting collection at the end of that day.

Generally stevedores charge for storage of FCL containers after the third day and place these into bond after seven days. A few importers alleged that often no allowance was made if industrial disputes had made collection impossible for part of the free storage period.

The survey responses indicated that 51 per cent of importers collected some of their cargo on the third day of availability, 39 per cent still had cargo outstanding after that day and that 12 per cent still had cargo to collect after seven days of availability. The proportion of respondents collecting cargo after the first week of availability rose from 10 per cent for small importers to 13 per cent for large importers, but this represented only 1.2 per cent of sea-based cargo value.

It was evident that the speed with which cargo was cleared varied with the commodity group. In the three groups encompassing processed materials, machinery and transport equipment and miscellaneous manufactures there were

TABLE 5.7 PROPORTION OF SEA CARGO COLLECTED ON FIRST DAY OF AVAILABILITY
(percentage of respondents)

	Percentage of cargo value collected						
Imports	*Nil*	*1–29%*	*30–59%*	*60–79%*	*80–89%*	*90–99%*	*100%*
Less than $1 million (61)	36	5	8	2	8	13	28
$1 million — $5 million (94)	22	13	9	10	12	12	23
$5 million — $50 million (106)	19	16	17	11	6	13	18
More than $50 million (31)	16	26	16	13	13	6	10

Notes 1. Figures in brackets are numbers of respondents.
2. Rows may not add to 100 due to rounding.

Source BTCE survey responses.

TABLE 5.8 COLLECTION OF SEA CARGO, BY COMMODITY CATEGORY
(per cent)

	Day of collection				
Commodity category	*1st*	*2nd*	*3rd*	*4th–7th*	*After 7 days*
Processed materials[a]	22.2	22.4	27.0	28.3	0.1
Machinery and transport equipment	71.7	18.3	8.7	1.2	0.1
Miscellaneous manufactures	47.5	23.2	15.4	9.5	4.5

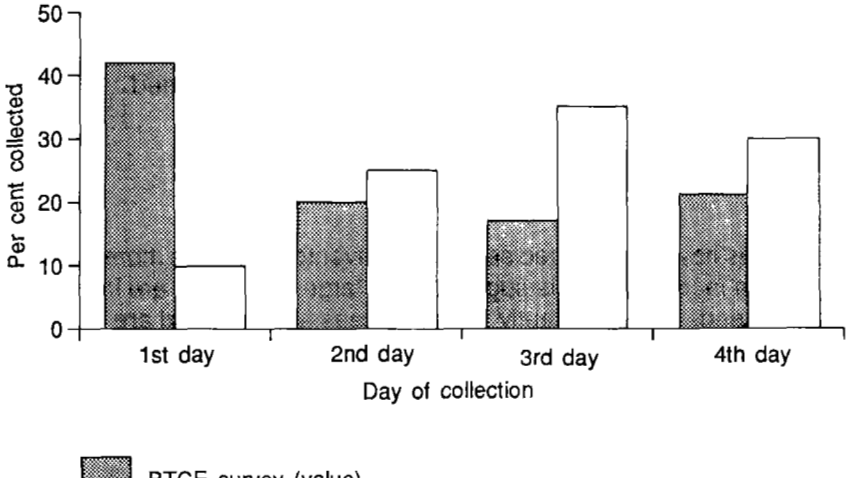
a. Manufactured goods classified chiefly by material.

Note Rows may not add to 100 due to rounding.

Source BTCE survey responses

respectively 25, 39 and 62 respondents whose imports were in a single group and who gave sufficient information to enable calculation of how much cargo they collected and when it was collected.

Table 5.8 illustrates how the patterns of collection vary especially in the early collection of the high value machinery and transport equipment.



Source BTCE estimates based on survey responses and Joint Industry Project (1990).

Figure 5.2 Collection of import consignments

There is a major difference between survey respondents and stevedores in perception of collection performance. Figure 5.2 illustrates the proportions of cargo survey respondents said were collected on each day compared with information published by the Joint Industry Project (1990). The difference in the basis of measurement and in coverage (cargo value for all ports in the BTCE survey and number of containers in Melbourne only by the Joint Industry Project) means that the two sets of data are not strictly comparable.

Table 5.8 suggests that there is a tendency to collect the more highly valued cargo early, so the differences between the two reports for the first day may be overstated. Nevertheless the differences are striking. Survey respondents may have been optimistic about their collection performance. Alternatively they may define the day of availability as the day on which customs clearance is obtained and duties paid and for many consignments this is on the second or third day after ship departure.

EFFECT OF WATERFRONT UNRELIABILITY ON INVENTORY AND LEAD TIMES FOR ORDERS

In initial industry discussions it was stressed that importers had to maintain significantly greater inventories because they could not rely on shipments arriving by a given critical date. The BTCE survey therefore asked importers to indicate

what their current levels of inventory in parts and components and in finished products were, the extent to which these could be reduced if the risk of ship and waterfront delays were negligible, and the resultant interest and storage savings, if any. It also examined what proportion of inventory was imported.

Imported percentage of inventory

Table 5.9 shows how the imported segment of inventory became more prominent as import value increased. This suggests that larger importers are in a position to meet their needs more efficiently from overseas sources, and are better able to support higher inventory levels to ensure continuity of production and distribution. It may also suggest that for the smaller importers importing may be only a relatively minor part of their business activities. Large importers may be more vulnerable to disruption of normal activities in the event of a prolonged period of waterfront unreliability.

Manufacturers with only a small proportion of imports in their inventories may still have major problems if those items are critical to their production processes. One respondent was considering increasing lead time for ordering to five months because the failure of critical components to arrive had severely disrupted activities, even though they constituted less than 10 per cent of the finished product.

Anticipated reductions in inventory levels

Table 5.10 shows the estimated level of import inventory in each of the seven commodity categories at the time of the survey. Also shown is the anticipated reduction in import inventory levels if waterfront and shipping delays were negligible. Where respondents to the survey indicated imports in more than one single-digit ATFCC group inventory, interest savings and storage cost savings were allocated to commodity groups in the manner described in appendix V.

Oil companies responding to the survey reported that they experienced only minor delays because they owned and controlled their own waterfront facilities. This explains the zero expected reduction in the category of mineral fuels.

The national potential interest savings were estimated as $272 million which implies that on average respondents faced an interest rate of 21 per cent. This suggests that much of the cost of waterfront unreliability is related to the current high level of interest rates. The national potential storage cost savings were estimated to be $42 million.

TABLE 5.9 IMPORTED PERCENTAGE OF INVENTORY, BY VALUE OF IMPORTS
(percentage of respondents)

	Percentage of inventory					
Import value	*1–19%*	*20–39%*	*40–59%*	*60–79%*	*80–99%*	*100%*
Less than $1 million (60)	53	17	17	7	5	2
$1 million — $5 million (89)	12	28	17	17	19	7
$5 million — $50 million (105)	8	10	12	21	31	18
More than $50 million (30)	7	0	10	20	50	13

Notes 1. Numbers in brackets are numbers of respondents.
2. Rows may not add to 100 due to rounding.

Source BTCE survey responses.

TABLE 5.10 IMPORT INVENTORY LEVELS AND POTENTIAL REDUCTIONS IF WATERFRONT AND SHIPPING DELAYS WERE NEGLIGIBLE, BY COMMODITY CATEGORY

			Potential decrease in inventory	
Commodity category	*1988 imports ($ million)*	*Existing inventory ($ million)*	*Value ($ million)*	*Proportion (per cent)*
Food and related products (0, 1, 4)	1 999	400	74	19
Crude materials (2)	1 507	531	111	21
Mineral fuels (3)	1 824	385	0	0
Chemicals (5)	3 921	492	50	10
Processed materials[a] and other[b] (6, 9)	7 102	2 644	355	13
Machinery and transport equipment (7)	13 179	4 217	446	11
Miscellaneous manufactures (8)	3 840	1 614	231	14
Total	33 372	10 282	1 267	12

a. Manufactured goods classified chiefly by material.
b. Includes ATFCC 9 and confidential items.

Notes 1. Figures may not add to totals due to rounding.
2. Figures in brackets are Australian Transport Freight Commodity Classification item numbers.

Source BTCE estimates based on survey responses.

Lead times

Respondents were also asked for the normal lead time they used when ordering goods from overseas for delivery by sea transport and the level to which this could be reduced if the risk of ship and waterfront delays were negligible. Table 5.11 indicates the difference that this would make to individual importers in the four groupings according to value of annual imports.

The proportion of small and medium importers who stated they could reduce their lead time by 20 days or more was nearly double that for large importers. At the same time nearly one-third of small importers would continue operating in the same manner as at present while just over one-sixth of medium and large importers would not reduce their lead time.

As the time of payment for purchases from overseas sources is generally closely linked to the sailing time of the vessel which carries the cargo in question, substantial reductions in lead times will be reflected in a significant lowering of the number of days during which financing costs must be borne before goods are available for use in Australia.

For the respondents who indicated both a current and potential lead time, the overall average lead time of 91 days was expected to fall to 74 days in the absence of waterfront delays, a reduction of nearly 19 per cent.

TABLE 5.11 POTENTIAL REDUCTION IN SEA TRANSPORT LEAD TIMES FOR ORDERING CONSIGNMENTS BY SEA IF WATERFRONT AND SHIPPING DELAYS WERE NEGLIGIBLE
(percentage of respondents)

	Change in lead time (days)					
Import value	*Nil*	*1–9*	*10–19*	*20–29*	*30–39*	*40 or more*
Less than $1 million (55)	31	9	18	13	24	5
$1 million — $5 million (89)	18	10	20	16	24	12
$5 million — $50 million (106)	18	13	26	21	15	7
More than $50 million (30)	17	30	30	3	20	0
Total[a] (308)	20	14	23	15	20	7

a. Includes 28 respondents who did not include an import value.

Notes 1. Numbers in brackets are numbers of respondents.
2. Rows may not add to 100 due to rounding.

Source BTCE survey responses.

TABLE 5.12 AVERAGE POTENTIAL REDUCTIONS IN LEAD TIMES FOR IMPORT ORDERS CARRIED BY SEA

Current lead time range (days)	*Average current lead time (days)*	*Average anticipated lead time (days)*	*Reduction in average (per cent)*
1–30 (17)	28	22	21
31–60 (77)	53	42	21
61–90 (111)	85	68	20
91–120 (62)	110	92	17
More than 120 (41)	173	144	16

Note Numbers in brackets are numbers of respondents.

Source BTCE estimates based on survey responses.

Current lead times were grouped in 30-day intervals and compared with what could be expected in the absence of waterfront and ship delays. The longer the current lead time the more likely respondents were to indicate no change. The average lead time was expected to fall by around 20 per cent in each group whose current lead time is under 90 days and slightly less in the other two groups. Table 5.12 summarises these data.

The BTCE survey asked which of four listed consequences of shorter lead times would apply. The percentage of respondents indicating each option are listed below:

Sales would expand	42 per cent
Able to switch from Australian to foreign suppliers	6 per cent
Competitiveness would improve	68 per cent
Little or no effect	30 per cent

Almost half of the small importers believed that shorter lead times would have little or no effect on their operations. They would still save on interest costs.

MAJOR CAUSES OF DELAYS TO IMPORT CONSIGNMENTS

Importers were asked to indicate up to five factors which were prominent in causing the most severe delays to their consignments. They could number a list of possible causes or indicate others which applied to them. The list was developed from industry discussions and covered late ship arrivals, port congestion, customs clearance, storage delays, documentation, quarantine delays, truck queues, port equipment breakdown, industrial disputes, port labour shortages and bond store delays. Table 5.13 lists the reasons mentioned most

as the major cause of delays and gives the proportion of respondents listing each reason as the most important. The cause attracting most responses in the write-in category was the unpacking of LCL containers.

The first four causes were the same as for exporters but with the ranking of industrial disputes and late ships reversed. This probably reflects the greater importance to exporters of reliable ship schedules. A much larger proportion of importers than exporters listed truck queues as a major cause of serious delays to their consignments. The cost of truck queues is examined in appendix III.

As for exporters, there were major differences in relation to ports used, amount of imports and use of FCL or LCL consignments. Those who used Sydney but not Melbourne placed greater emphasis on industrial disputes (42 per cent) and ranked port congestion ahead of late ship arrivals. This probably reflects the aftermath of the Transport Workers' Union dispute in Sydney in September 1988. On the other hand importers using Melbourne but not Sydney ranked late ship arrivals and industrial disputes equally (29 per cent) and then port congestion (13 per cent).

Several importers based in Adelaide or Brisbane commented that the railing of containers from Melbourne or Sydney respectively routinely added two to three weeks to the waiting time for their consignments.

Importers who used only sea transport considered late ship arrivals to be the main cause of delays (36 per cent) ahead of industrial disputes (25 per cent). Those using both air and sea listed in order industrial disputes (31 per cent), port

TABLE 5.13 PERCEIVED CAUSES OF MOST SERIOUS DELAYS TO IMPORT CONSIGNMENTS

Cause	*Proportion of respondents (per cent)*
Industrial disputes	30
Late ship arrivals	23
Port congestion	17
Truck queues	9
Customs clearance	6
Labour shortages	6
Other (write-in category)[a]	6
Other categories	4
Total	100

a. Causes supplied by respondents mainly concerned the unpacking of LCL consignments.

Note Numbers may not add to total due to rounding.

Source BTCE survey responses.

TABLE 5.14 PERCEIVED MAJOR CAUSES OF DELAYS TO CONSIGNMENTS, BY IMPORT VALUE AND PACK TYPE
(per cent of respondents)

Group	Late ship	Port congestion	Customs clearance	Truck queues	Industrial disputes
Import value					
Less than $1 million (57)	28	18	9	5	30
$1 million–$5 million (94)	23	14	5	5	29
$5 million–$50 million (107)	20	18	4	11	36
More than $50 million (31)	29	23	3	10	23
Pack type					
FCL and LCL (170)	16	19	5	12	30
FCL but not LCL (93)	37	15	5	6	28
LCL but not FCL (45)	20	16	9	4	33

Note Numbers in brackets are numbers of respondents.

Source BTCE survey responses.

congestion (19 per cent), late ship arrivals (18 per cent) and truck queues (10 per cent). The difference in perception may be due to closer attention being paid to shipping schedules by those who are totally reliant on supplies through that means.

Table 5.14 illustrates differences in perception according to annual value of imports and to whether one or both of FCL and LCL consignments were used.

These responses suggest that truck queuing problems are noticed in proportion to the number of FCL containers to be collected, and that customs (and documentation) problems are most troublesome to those with infrequent waterfront contacts. One respondent remarked that a procedures manual would be extremely useful to those importers who have only a few transactions each year.

When frequency of mention, irrespective of ranking, was analysed, the same factors as shown in table 5.13 emerged as the major factors and in the same order of importance. The only change was that documentation went ahead of port labour shortages in frequency of mention as a cause of serious delay.

WORST QUARTER BETWEEN JANUARY 1988 AND MARCH 1989

Initially FCL and non-containerised cargo can be expected to be available the day after the discharge ship is scheduled to sail from the port and LCL cargo five days after. As for exporters, the Bureau examined what importers do when faced with specific problems arising from severe delays.

Where respondents, during the period from January 1988 to March 1989, had import consignments delayed for more than five days outside the norms mentioned above they were asked to nominate the quarter when the most serious delays occurred and the port affected the most. Further questions asked about any impact on their production, employment arrangements and contracts to supply goods and sought details of delays and any additional costs incurred.

Of the 337 respondents using sea transport for some or all of their import cargo, 65 per cent indicated that they had experienced a delay of more than five days to an import consignment during the 15 months under consideration. Their combined 1988 value of cargo transported by sea amounted to 89 per cent of sea import value for all survey respondents.

Only 34 per cent of small importers had such delays, but 72 per cent of medium importers and 84 per cent of large importers were affected.

A single quarter was given as worst by 176 of the 218 importers who experienced delays longer than five days. The proportion nominating each quarter is given below:

March quarter 1988	15 per cent
June quarter 1988	10 per cent
September quarter 1988	10 per cent
December quarter 1988	33 per cent
March quarter 1989	32 per cent

A further 27 respondents mentioned two or more quarters.

Table 5.15 illustrates the circumstances in which the ports most affected were named, and highlights the manner in which problems were seen to be particularly concentrated upon Sydney. For example, over three-quarters of importers who used just Sydney had a delay of more than five days during this period. Of the 210 importers who indicated a port worst affected, 61 per cent named Sydney, 29 per cent Melbourne, 5 per cent Brisbane, 4 per cent Fremantle and 2 per cent some other port.

Table 5.16 shows the distribution of the ports described as most affected in each of the five quarters. No matter when importers suffered their worst delays, over half stated that Sydney was most affected in that quarter, the highest proportion in the September quarter of 1988.

Over three-fifths of importers with FCL but no LCL consignments reported a delay greater than five days whereas less than two-fifths of those with LCL but no FCL consignments did. This contrasts with the data in appendix IV which indicate that importers of LCL consignments often faced substantial delays especially in Sydney during the fourth quarter of 1988. It is possible that the worst problems arose from delays to ships and to the clearance of containers from the waterfront, particularly after the surge in imports and the truck blockade of the Sydney waterfront in September 1988. The difference in reported delay experience may

be a result of importers who use LCL consignments exclusively receiving fewer consignments and therefore being less exposed to risk of delay during the period under review.

TABLE 5.15 PORTS HAVING THE MOST SERIOUS DELAYS FOR IMPORTERS BETWEEN JANUARY 1988 AND MARCH 1989

(per cent)[a]

	Number of ports used		
Port	*1*	*2*	*3*
Sydney	77	58	63
Melbourne	39	32	22
Brisbane	50	11	4
Fremantle	27	25	5
Adelaide	25	0	0
Other	50	25	7

a. Proportion of respondents using a single port who experienced delays of more than five days, or if more than one port was used, for each port the ratio of nominations as port most affected to frequency of use.

Source BTCE survey responses.

TABLE 5.16 LONGEST DELAYS EXPERIENCED BY IMPORTERS BETWEEN JANUARY 1988 AND MARCH 1989

(frequency)[a]

Port	*First quarter 1988*	*Second quarter 1988*	*Third quarter 1988*	*Fourth quarter 1988*	*First quarter 1989*
Sydney	16	10	12	30	34
Melbourne	4	5	4	19	17
Brisbane	2	0	1	5	1
Fremantle	2	0	0	1	4
Adelaide	0	0	0	0	0
Other	1	1	0	0	1

a. Number of respondents who experienced delays of more than five days if only one port were used or, if more than one port used, number of nominations as port most affected.

Source BTCE survey responses.

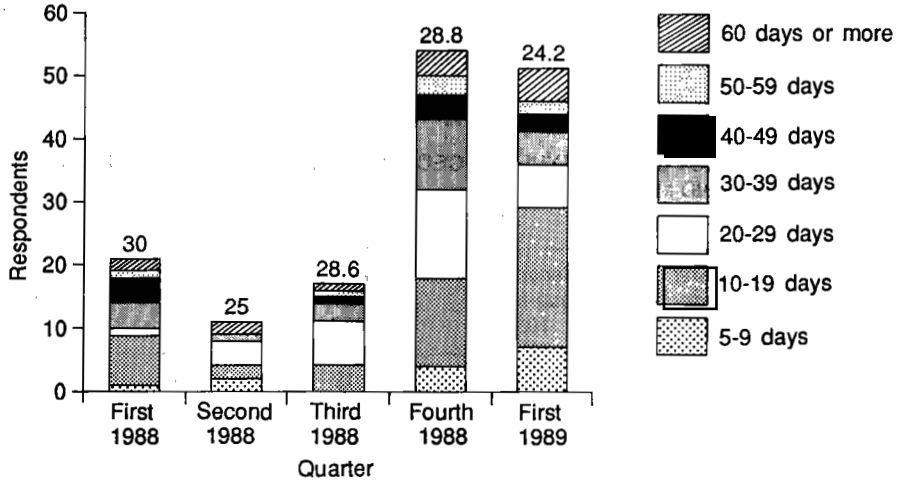
LONGEST DELAYS TO IMPORT CONSIGNMENTS

A large number of respondents whose import consignments were delayed more than five days beyond the date originally anticipated gave answers for average delays which were inconsistent with information given about the number of consignments delayed, the number not delayed and the longest delay. As a result only the answers relating to longest delays were examined closely.

One medium importer pointed out that in circumstances when very long delays (up to 12 weeks) were common, sometimes a 'last in, first out' policy was instituted by stevedores to maintain some clear space near the wharfside. When this occurred, consignees did not necessarily receive their goods in the order they most needed them.

Figure 5.3 shows the distribution of the longest delays experienced by respondents in their worst quarter and the averages of these longest delays. Except in the March quarter of 1988 when it equalled the median, the average longest delay was some four to eight days greater than the median, reflecting the further spread of the largest observations.

Because the unpacking of LCL consignments introduces an additional element to the processing of some cargo after the discharging ship has sailed, average delays to import consignments can be expected to be greater than those to export consignments. It appears from the seven to 12 days' difference generally present that the clearance of containers from the wharf environs can constitute



Note Numbers indicate average longest delay.

Source BTCE estimates based on survey responses.

Figure 5.3 Distribution of longest delays for importers

a severe problem for importers. The additional cost of financing cargo they are unable to collect in this extra period after the departure of the discharging ship would often exceed 1 per cent of its value. Appendix IV contains an analysis of LCL import delays and an estimate ($14 million) of the costs of those delays in 1988.

CONSEQUENCES OF DELAYS TO IMPORT CONSIGNMENTS

Much larger proportions of importers experienced particular adverse consequences as a result of delays to their consignments than did exporters. Details of the specific costs incurred by 76 per cent of the respondents who experienced delays greater than 5 days are discussed in the next section.

Nearly one-third of importers whose cargo was so delayed said that they had reduced or suspended production due to waterfront delays in the period of the most serious delays. Of these 62 per cent did not subsequently make good the lost production, with over half the net losses in production being between $10 000 and $100 000. Orders for domestically sourced inputs were cancelled by 34 per cent of these importers.

Exactly half of the importers with serious delays to their cargo reported the loss of contracts or orders to supply goods on account of those delays. The value of the lost contracts lay mainly between $10 000 and $100 000.

Table 5.17 summarises the distribution of these direct losses stemming from waterfront delays to cargo. Six per cent of importers who experienced delays of more than five days stood down workers due to the effects of waterfront or shipping delays. The fourth quarter of 1988 had the greatest number of these instances.

TABLE 5.17 DIRECT LOSSES AS A RESULT OF DELAYS TO IMPORT CONSIGNMENTS
(percentage of respondents)

	Loss			
Category of loss	*Less than $10 000*	*$10 000– $100 000*	*$100 000– $500 000*	*More than $500 000*
Net production (44)	23	52	23	2
Contracts (108)	18	57	21	4

Note Numbers in brackets are numbers of respondents who suffered a loss and indicated its extent.

Source BTCE survey responses.

Just over 60 per cent of respondents used airfreight for critical goods during the period of their most serious cargo delays. This proportion remained fairly steady from quarter to quarter but the proportion of these respondents who then continued to use airfreight for critical goods varied greatly. Overall 52 per cent continued to use airfreight for this purpose but this included more than four-fifths of those who used airfreight in the third quarter of 1988 and around three-fifths who did so in the next two quarters.

A much higher proportion of exporters continued to use airfreight for critical goods than did importers. This suggests the prospect of loss of contracts if delivery schedules are not met is a more serious problem for exporters and that once they experience an improvement in reliability through the use of air transport they are often prepared to pay substantially more for that quality of service to keep customers satisfied.

Respondents were also asked whether they anticipated any additional adverse effects on future sales stemming from the effects of delays during their worst period on their reputation as a supplier. There were 212 responses, 17 per cent anticipating no such effects, 63 per cent some and 20 per cent expecting a lot of additional adverse effects. Large importers were least pessimistic about major future adverse effects.

COSTS RESULTING FROM SERIOUS DELAYS TO IMPORT CONSIGNMENTS

Importers who experienced delays greater than five days between January 1988 and March 1989 were asked whether they incurred costs as a result of those delays and if so, what were the level and type of costs incurred. Sixty-four per cent gave numerical estimates of the delay costs they incurred and a further 12 per cent said that they incurred delay costs, but gave no estimates of those costs. Some of the latter stated their nature, mainly interest, storage and air transport costs.

One large importer said that occasional delay costs could be absorbed within an operation of his scale, but expected that small importers could be very badly affected.

In 133 cases it was possible to calculate the ratio of delay costs to the import value of goods for that period. No attempt was made to adjust the answers if some cargo was normally brought in by air so these ratios understate the impact of sea transport delays.

On 15 occasions the delay costs exceeded 10 per cent of import value, and they were between 5 and 10 per cent on 14 occasions. Delay cost ratios of more than 5 per cent were reported most frequently for the December 1988 and March 1989 quarters. These quarters were also those nominated most by respondents as the worst quarters for serious delays during the period under examination. The largest proportion of respondents reporting delay cost ratios above 5 per cent was for the March quarter of 1988 which also had the highest average longest delay.

TABLE 5.18 RATIO OF DELAY COSTS TO VALUE OF IMPORTS
(per cent of respondents)

Import value[a]	*Delay cost*						
	Less than 0.5%	*0.5–1%*	*1–2%*	*2–3%*	*3–5%*	*5–10%*	*10%*
Less than $0.25 million (20)	0	5	25	10	5	15	40
$0.25 million — $1.25 million (41)	20	15	20	7	5	17	17
$1.25 million — $12.5 million (51)	35	27	18	12	2	6	0
More than $12.5 million (20)	85	10	0	0	0	5	0
Total (132)	33	17	17	8	3	11	11

a. Import value for the quarter or quarters in which the delay was experienced.

Notes 1. Numbers in brackets are numbers of respondents.
2. Rows may not add to 100 due to rounding.

Source BTCE survey responses.

Table 5.18 shows the extent to which the most severe delay cost burdens were incurred when the value of cargo imported in a particular quarter was less than $1.25 million. Most of the small volumes were brought in by respondents whose annual imports were between $1 million and $50 million. This was the case for 23 of the 29 respondents whose delay cost ratio was at least 5 per cent, and ten of the 15 whose ratio was at least 10 per cent. The table shows that those importing small or medium volumes appear to be at greatest risk of sustaining extensive delay costs as a result of shipping and waterfront delays. Both the incidence and severity of additional direct cost burdens are much worse for importers than for exporters.

Where the delay cost ratio exceeded 1 per cent of import value, there were three main causes. In 30 of the 66 examples, interest costs either formed all or by far the greatest part of the additional cost, or contributed over 40 per cent as the major or second largest element. On 23 occasions this role was played by air transport costs, and on 11 by the 'other costs' category which turned out to be a mixture including lost sales and the payment of overtime or penalty rates.

Interest costs were less prominent than air transport costs for delay cost ratios of at least 5 or 10 per cent. It was also evident that when the delay cost ratio was high, many respondents reported very long delays to their cargo in that period.

This suggests that the greatest difficulties arise when critical goods are running low and a decision is taken to bring them in by air, when large sales contracts are lost or when extra labour costs are incurred in order to catch up lost production time.

Several importers mentioned that in the garment or fashion industries retailers often insisted on cancellation clauses which were activated in the event of delays. The only way to prevent the loss of an order might be to make price concessions and to pay for advertisements apologising for the late arrival of catalogue items. An alternative of relabelling garments might add five or ten per cent to costs.

It is understandable that lengthy delays create disproportionate problems for those with smaller and medium volumes but the reasons why these should have involved medium importers almost exclusively are not clear. In an earlier section it was noted that small importers often had only a very small proportion of imports in inventory, so it is possible that they find it easier to obtain substitute supplies locally in the event of delays. Many small importers appear to be involved primarily in distribution and would not face additional costs because they have no vulnerable production processes.

SUMMARY

As for exports there has been a continual increase in the proportion of imports carried by air transport since 1982-83. There are many reasons for this, but it is clear that some importers presently using air transport would move at least some of their imports to sea transport if the reliability of the waterfront were improved.

While only a small proportion of imports, as measured by value, was imported as LCL consignments, between around one-half of large importers (those importing more than $50 million per annum), two-thirds of medium importers (those importing between $1 million and $50 million per annum) and about three-quarters of small importers (those importing less than $1 million per annum) made use of LCL facilities at some time during 1988. In contrast to exporters, almost all large importers made use of FCL consignments during 1988.

Large importers were more likely to commence collection of their containers on the first day of availability, but tended to collect a smaller proportion on that day than other importers. The more valuable the cargo the more likely it was to be collected during the three free storage days. Importers tended to have a more optimistic perception of how soon cargo is collected than port authority records show. This could reflect a different interpretation of when cargo becomes available.

The total inventory of imports was estimated to have been $10 300 million in 1988, or 31 per cent of the total seaborne imports in that year. This is about three times the relative inventory level estimated for exporters. Importers expected that a reduction in waterfront and shipping delays to negligible levels would allow them to reduce their inventory levels by 12 per cent. This reduction would have resulted

in interest savings of $272 million and storage savings of $42 million in 1988. Inventories of imported goods tended to be a higher proportion of total inventory for large importers than for small importers.

Overall, lead times for ordering goods from overseas could have been reduced by 17 days or by 19 per cent in the absence of waterfront delays in 1988. The percentage reduction appears to be relatively insensitive to the length of lead time.

Importers perceived that the major causes of the most serious delays to their consignments were:

- industrial disputes;
- late ship arrivals;
- port congestion;
- truck queues;
- customs clearance; and
- labour shortages.

Sydney importers gave greater emphasis to industrial disputes, perhaps because of their experience of the truck blockades of the Sydney waterfront in September 1988. Small importers appeared to have more difficulty with customs clearance than larger importers, and the greatest concern about truck queues was expressed by importers who import more than $5 million per annum. Adelaide and Brisbane importers faced additional problems with unreliable rail connections from Melbourne and Sydney respectively.

About 65 per cent of importers experienced delays of more than five days during the 15 months from January 1988 to March 1989. About three-quarters of these importers incurred additional costs as a consequence. One-half of importers experiencing such delays during the 15-month period lost contracts as a result.

The longest delays during the 15-month period ranged from an average of 24.2 days for the March quarter of 1989 to 30 days for the March quarter of 1988. These delays were from seven to 12 days longer than those reported by exporters.

Over 80 per cent of importers experiencing delays during the period under review anticipated at least some adverse effects on their business arising from the delays.

About 60 per cent of importers resorted to air transport for critical goods because of waterfront delays. Of these nearly one-half were still using air transport in the middle of 1989, which is much less than the proportion of exporters continuing to use airfreight.

The cost burden of delays appeared to fall most heavily on medium importers. About one-half of those importing small consignments incurring delay costs indicated that these costs were equivalent to at least 5 per cent of their import

values in the quarter or quarters during which they experienced their most serious delays. Overall, both the incidence and severity of additional direct cost burdens were much worse for importers than for exporters.

CHAPTER 6 NATIONAL WELFARE COSTS OF WATERFRONT UNRELIABILITY

The previous three chapters have concentrated on the direct effects of waterfront unreliability on ship operators, importers and exporters. These direct costs will ultimately be shared between Australians and foreigners as the costs of waterfront unreliability will be reflected in the prices paid by importers and received by exporters.

Exporters may avoid the effects of waterfront unreliability by setting up manufacturing plants in other countries to bypass waterfront difficulties. There are other reasons for doing this such as taxation advantages and the benefit of locating production facilities closer to potential customers. Equally waterfront problems will encourage some Australian manufacturers and service providers to obtain components and other inputs from local suppliers rather than from imports (especially if they have adopted 'just in time' manufacturing techniques).

This chapter examines the distribution of the direct costs to exporters of waterfront unreliability between Australians and foreigners. This analysis is then expanded to estimate the impact of forgone export sales on national welfare. The national welfare costs of delays to imports are then assessed and finally the general equilibrium effects are briefly discussed.

DISTRIBUTION OF THE DIRECT COSTS OF DELAYS TO EXPORTS

The direct costs of waterfront delays to exports in 1988 include the following: financing costs of $146 million (see chapter 4), truck queuing costs of $20 million (see appendix III), increments to seafreight rates of $50 million to $75 million due to delays to ships (see chapter 3) and additional airfreight costs paid by exporters avoiding waterfront delays (assumed to be $10 million). The total direct costs were therefore taken to be $226 million to $251 million.

Figure 6.1 illustrates the effect of waterfront and shipping delays on the market for exports. The effect of eliminating the direct costs would be a shift in the supply curve from S_1 to S_0. The direct costs are represented by the area P_1ABP_2.

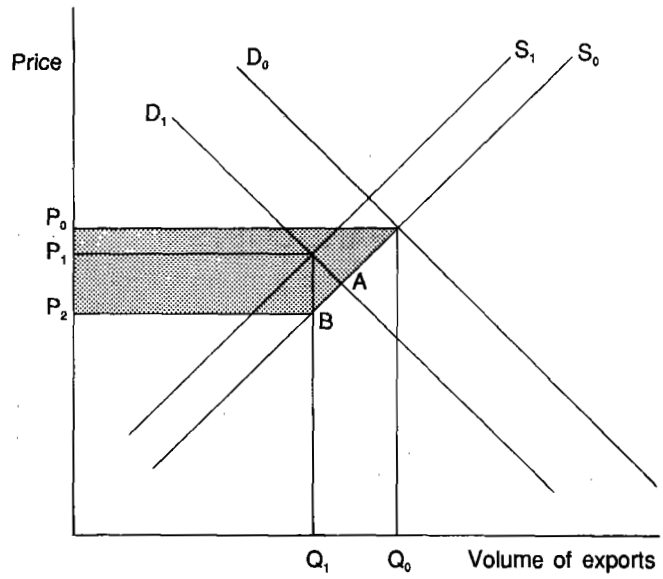


Figure 6.1 Effect of waterfront unreliability on the market for exports

Although these costs are paid in the first instance by exporters, they are ultimately shared by Australian exporters and foreign buyers. The shares depend on the export supply elasticity and the export demand elasticity. Cassidy (1980) showed that the proportion borne by Australian exporters is given by:

$$\beta = -E_d/(E_s - E_d) \qquad (1)$$

where ß is the proportion borne by Australian residents, E_d is the price elasticity of demand for Australian exports, and E_s is the price elasticity of supply of Australian exports.

In chapter 3 ship delay costs were estimated for liner (container and ro-ro) ships, bulk ships and others separately. For bulk carriers delay costs were individually estimated for coal shipments ($36 million) and grain shipments ($16 million) as these were the export bulk commodities most affected by waterfront problems. The costs for grain carriers were allocated to food and live animals (ATFCC group 0) and the costs for coal carriers to mineral fuels (ATFCC group 3). The remaining direct costs were allocated to the ATFCC groups in proportion to the increase in export sales expected as a result of negligible waterfront delays by respondents to the Bureau's survey. This method was chosen because the survey responses suggested that those incurring the higher proportional costs of unreliability expected the larger proportional increases in export sales with elimination of delays.

The proportion of the direct costs borne by Australians was then estimated from the above equation using the values for elasticities chosen in appendix VI. An estimated $138 million or a median 58 per cent of the total direct cost of delays to exports was calculated as incurred by Australians. This estimate takes no account of the effect of waterfront unreliability on the demand for exports and therefore represents a lower limit to the costs of waterfront unreliability borne by Australian exporters. The next section extends the analysis to include the impact of forgone export sales on national welfare by considering the effect of a shift in the export demand curve.

NATIONAL WELFARE EFFECTS OF DELAYS TO EXPORTS

This extension of the analysis is speculative to some extent in that the answers depend both on the opinions of exporters about what might happen in a hypothetically completely reliable environment, and on the elasticities of supply of and demand for exports, a topic on which there is little agreement among economists.

Foreign buyers of Australian exports would face lower inventory and other costs if waterfront and shipping delays were reduced. This would be reflected in increased preference for or reduced aversion towards Australian exports from foreign buyers which is equivalent to a movement of the demand curve from D_1 to D_0 in figure 6.1.

The previous section considered the effect of delays on the supply curve. The equilibrium export prices resulting from the elimination of waterfront and shipping delays are determined by the interaction of supply and demand curve shifts. In figure 6.1 this interaction is shown as resulting in an increase in price (to P_0 compared with P_1), but it is quite possible that a decrease may occur. The impact on national welfare of delays to exports is shown by the shaded area in figure 6.1.

Respondents to the survey may have estimated their expected export increases on the basis of no price change. If so their estimates would tend to overstate or understate the increase they may be able to achieve depending on whether the price increases or decreases. Appendix VI provides details on how the estimates can be modified to allow for this effect. In this interpretation, survey respondents are assumed to have considered only their own response to improved reliability, and to have ignored the effect of competition for resources that would bid up factor prices when industry output expands.

The assumption that no respondents took account of price changes has plausibility. Another possible assumption, that all respondents did take account of the price change, is likely to overstate the costs of unreliability. Estimates were made of the impact on national welfare using both approaches.

TABLE 6.1 ESTIMATED LOSS IN NATIONAL WELFARE DUE TO EXPORT DELAYS

Commodity category	*Demand elasiticity*[a]	*Supply elasticity*[a]	*1988 exports ($ million)*	*Change in exports ($ million)*	*Change in national welfare ($ million)*
Food, beverages and related products (0, 1, 4)	–4	2	7 964	333	138
Crude materials (2)	–4	2	14 081	132	53
Mineral fuels (3)	–4	5	6 060	296	63
Elaborately transformed manufactures (5, 7, 8)	–10	10	2 566	332	36
Processed materials[b] and other[c] (6, 9)	–4	2	5 342	143	57
Total			36 013	1 236	348

a. Long-run elasticities of export supply and demand.
b. Manufactured goods classified chiefly by material (approximates 'simply transformed manufactures').
c. Includes confidential items.

Note Figures may not add to totals due to rounding. Figures in brackets refer to ATFCC groups.

Source BTCE estimates based on survey responses; ABS (1989e, 1989f, 1990).

Table 6.1 gives the results of calculations based on expected increases in export sales adjusted for the effect of price changes. The methodology developed in appendix VI was used for these calculations. The overall estimate of approximately $348 million for the loss in national welfare may understate the actual value in so far as some exporters may have taken price changes into account when formulating their expectations.

The impact on national welfare was also estimated on the assumption that all respondents took account of possible price changes. The result of $452 million almost certainly overstates the potential national welfare effect of the shifts in the export supply and export demand curves.

The estimates of $348 million and $452 million include the $138 million previously derived for the impact on Australian welfare of the direct costs to exports of waterfront unreliability. Subtracting this latter amount gives a range of $210 million to $314 million for the estimated impact on national welfare of the adverse export demand shift induced by waterfront unreliability.

The Bureau's survey was designed for businesses which are current exporters. Some responses were received from companies which were once exporters, but stopped because of difficulties encountered. There will be others who have never exported but which might if waterfront and shipping delays were substantially reduced.

The survey did not seek responses from either group because that would have increased survey costs significantly without necessarily obtaining reliable answers to what would have been very hypothetical questions to many respondents. The omission of these groups in itself suggests that the estimated increase in export sales and national welfare is understated to some extent. This would be offset somewhat by the probability that exporters responding to the survey were more inclined to overstate than to understate their subjective estimate of potential increases in export sales.

The estimates of the impact on national welfare of forgone export sales are dependent on the values of the elasticities of supply and demand assumed for the calculations. The reasons for choosing the particular values adopted are discussed in appendix VI. There is considerable disagreement among economists about the size of trade elasticities and values recommended in the literature can vary from much less than those used in this analysis to several times as large. Other researchers could, with the same data, but different elasticities, arrive at very different estimates of the impact on national welfare.

The major changes in welfare occur for primary commodities and processed materials (mainly 'simply transformed manufactures'). The 'elaborately transformed manufactures' do not show up significantly in this analysis. This is largely a consequence of the neoclassical framework upon which national welfare calculations are based.

A fundamental assumption of this framework is that all factor markets clear so that an expansion in one industry requires a reduction of resources consumed by other sectors of the economy. Given the persistent significant levels of unemployment in the economy it seems that this assumption may not be totally valid. In actuality the welfare gain from expansion of 'elaborately transformed manufactures' might therefore exceed that calculated above and could be as much as the wages earned by those additional employees drawn from the pool of unemployed.

NATIONAL WELFARE EFFECTS OF DELAYS TO IMPORTS

If waterfront and shipping delays were reduced, import volumes would increase through two mechanisms. First, reduced waterfront and shipping delays would effectively lower the price of imported goods to Australian consumers. Demand for imports, as substitutes for domestically produced goods, could be expected to increase as a consequence. Second, imports also form an important input to the production of many goods including export goods. An increase in imports would therefore be an inescapable corollary of the increase in exports discussed in the previous parts of this chapter.

The elimination of waterfront and shipping delays would have two effects on the price of imports. First, there would be a direct effect on the costs of inventories and storage costs and a reduction in truck delay costs. There would also be freight cost savings from ship operators passing on savings in delay costs and from a switch from air transport to sea transport for some imports. The freight rate savings from the modal switch from air to sea could be large as airfreight rates are four to ten times seafreight rates, but there would be some offsetting costs as the use of sea transport would require the holding of additional inventory and longer transit times. In addition there would be some administrative savings because of the reduced need to trace late consignments and to make alternative arrangements.

Second, purchasers of imports would find them more desirable, and would perceive the effect of a reduction in delays as an improvement in quality relative to domestically sourced goods. This effect may not be as large as the first as measures adopted by importers to overcome the problems of delays would serve to shield final consumers from those problems. In this analysis it is assumed that the welfare effects are equal to the sum of the direct costs only.

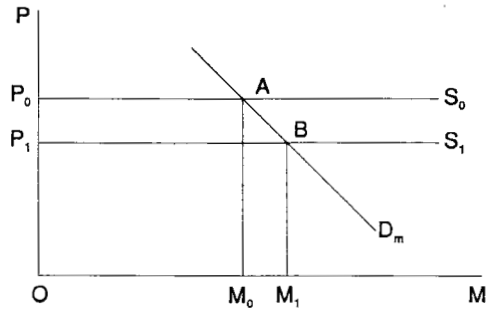
It seems plausible to treat all of these potential savings as welfare gains to Australia. The 'small country' assumption is likely to hold for imports (that is, the supply curve can be treated as horizontal as illustrated in figure 6.2a).

Chapter 5 provides estimates of savings in inventory and storage costs based on what respondents to the Bureau's survey expected would result from the elimination of waterfront and shipping delays. These potential savings totalled $314 million in 1988. In chapter 3 total ship delay costs falling on imports are estimated to have been $151 million to $172 million in 1988. In appendix III truck queuing costs incurred by importers are estimated to have been $33 million in 1988 and a value of $15 million for the cost of additional airfreight seems reasonable. This brings the total estimated cost to $513 million to $534 million.

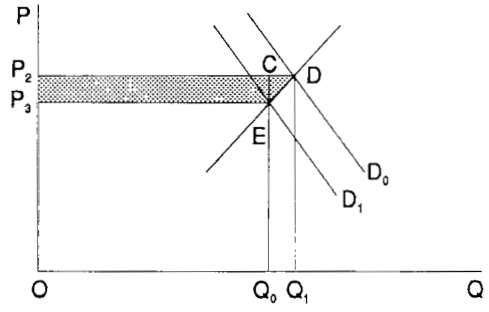
GENERAL EQUILIBRIUM EFFECTS

The foregoing discussion has focused on the welfare effects on the producers of exports and the consumers of imports. The effects of waterfront unreliability also work their way through other sectors of the economy. This section looks briefly at how the other sectors are affected.

Figure 6.2 illustrates the effect of improved waterfront reliability on imports and import competing industries. Improved reliability would reduce the costs to importers and, assuming these reductions are passed on to consumers of imports, consumers will perceive a reduced price for imports. The consumption of imports would increase and consumers' surplus will increase by the amount P_0P_1BA in figure 6.2a due to the movement in the supply curve from S_0 to S_1. This surplus was estimated to be $513 million to $534 million in the previous section.



(a) Market for imports



(b) Market for local import competing goods

Figure 6.2 Effect of improved waterfront reliability on the markets for imports and import competing goods

As a consequence of the increased imports there would be a reduction in demand for the output of import competing industries. In figure 6.2b this is shown by an inward shift of the demand curve from D_0 to D_1. The price of import competing goods would fall and the shaded area in figure 6.2b would be transferred to consumers from producers.

A similar analysis based on figure 6.1 could be undertaken for the export market and the domestic market for exportables. That analysis would show a transfer from domestic consumers of exportables to producers of exportables.

There would be some second-round effects as the exchange rate adjusted to restore the external balance. These second-round effects would also be predominantly transfers between producers and consumers.

Improved waterfront efficiency can be expected to increase national income. This would result in increased demand for non-tradeables as well as the effects discussed above.

Resources would be transfered from import competing industries to the production of exportables and non-tradeables.

The analysis in this chapter has focused on the direct impact on national welfare of delays to exports and imports. The discussion has shown that the net welfare effects elsewhere in the economy are small, with the major effects being predominantly in the form of transfers between consumers and producers.

CHAPTER 7 CONCLUSIONS

The analysis set out in this paper reflects conditions as they were in 1988. The Inter-State Commission (ISC) Waterfront Strategy Inquiry was in progress at that time, but the Government's reform program announced in June 1989 had not been established. The costs estimated in the paper and the problems mentioned by respondents to the Bureau's survey of importers and exporters have since been addressed within the reform process, although agreement has by no means been achieved on all of the issues. Measures to improve reliability are not without cost so estimates of unreliability costs in this paper probably represent upper limits to the benefits obtainable from waterfront reform. The estimates of costs to Australians of waterfront unreliability in 1988 are summarised in table 7.1.

The Commission estimated the direct long-run benefits of its proposed reform package to be $500 million per annum. The Commission also gave an estimate of $120 million for the indirect cost savings. The Commission's estimate of indirect costs was limited to the effect of ship delays on freight rates, and the effects of unreliability on inventory costs and insurance premiums, but the estimates presented in this paper for the same cost components are substantially above the ISC figures. The Commission acknowledged that its estimate of indirect costs was conservative (ISC 1989a).

TABLE 7.1 NATIONAL WELFARE COSTS OF WATERFRONT UNRELIABILITY IN 1988[a]
($ million)

Category	*Cost*
Cost to exporters	131–146
Impact of forgone export sales	210–314
Cost to importers	513–534
Total	854–994

a. Costs borne by Australian residents only.

Source BTCE estimates based on survey responses and data supplied by shipping companies.

It is improbable that the costs of waterfront unreliability could be reduced to zero. There are two reasons for this. First, it would either be infeasible or prohibitively expensive to provide for all sources of demand variability in the supply of waterfront services. For example, it is technically feasible to supply sufficient port and terminal facilities so that no ship has to wait for service even in peak demand periods, but the cost of this level of provision would be too high to be warranted.

Second, some of the more serious disruptions to the waterfront have been a consequence of events beyond the control of the providers of waterfront services. It is significant that many of the examples of delay caused by industrial disputes mentioned by respondents to the Bureau's survey involved unions with no direct involvement in the loading or discharging of cargo. The quarters that respondents to the survey reported as having the most serious delays included the fourth quarter of 1988 during which waterfront delays in Sydney occurred mostly as the aftermath of the truck blockade of the waterfront, compounded by a surge in imports. Neither of these events were within the direct control of waterfront service providers or unions.

A further point should also be made. While an improvement in reliability would improve the attractiveness and hence sales of Australian exports, the attractiveness of and hence volume of imports would also increase. The costs shown in table 7.1 suggest that importers are bearing the greater burden of the costs of waterfront unreliability. This suggests that importers would benefit more from an improvement in waterfront reliability than exporters. The possibility therefore exists that the short-run balance of payments effects, if any, may be negative. Nevertheless, the results of the analysis presented in this paper indicate that a policy to improve waterfront reliability has more than sufficient justification without considering any balance of payments effects.

A large proportion of the costs estimated in this paper are time dependent costs in the form of financing costs for exporters and of importers' inventories. Shipowner costs would also include a significant element of financing cost as capital costs are a large proportion of ship operating costs. These time dependent costs are sensitive to the level of interest rates, so that the high costs of waterfront unreliability, reported in this paper, are in large part a reflection of high interest rates.

The results of this study have made it clear that the costs of waterfront unreliability are high. It is also clear that because there will always be variability in the level of trade and in ship arrival patterns, the waterfront will need to develop greater flexibility so that any deleterious effects of the inherent variability in demand will be minimised.

Perhaps the most important outcome of the current reform process will be an increase in labour flexibility. The In-Principle Agreement for waterfront reform negotiated between the unions and the waterfront employers under the auspices of the Waterfront Industry Reform Authority has many clauses which directly address the need for flexibility. Specific areas addressed include the introduction

of enterprise based employment, award restructuring, improved training and improved dispute settling procedures. The enhanced roles of the Trade Practices Commission and the Prices Surveillance Authority will increase competitive pressures and this should encourage improved reliability.

In chapter 2 the comment was made that there is a degree of overlap between reliability and productivity. Certainly an increase in waterfront productivity and operational flexibility would create additional capacity in existing facilities and this increased capacity would increase the ability of a facility to meet peak demands.

The results of the analysis in this paper indicate that ship delay costs represent 25 per cent of the costs of waterfront unreliability. The benefits of delay-reducing investments within a port will be much greater than the reduction in the ship delay costs usually included in the evaluation of port investments. This implies that the optimal port capacity may be more than that suggested by a consideration of shipowner interests alone. When new investments are being considered port authorities and stevedores may need to consult cargo owners more closely on their willingness to pay higher charges for increased capacity and the improved protection against delays that this would give.

APPENDIX I FINANCING OF AUSTRALIAN IMPORT AND EXPORT TRANSACTIONS

Because Australia forms only a small portion of the world market, foreign sellers are usually able to demand immediate payment from Australian importers upon despatch of the goods sought. The importer will either have to draw a bill of exchange to the value of the goods being supplied or, where the security of a bank guarantee of payment is required, to establish an irrevocable documentary credit through an Australian bank.

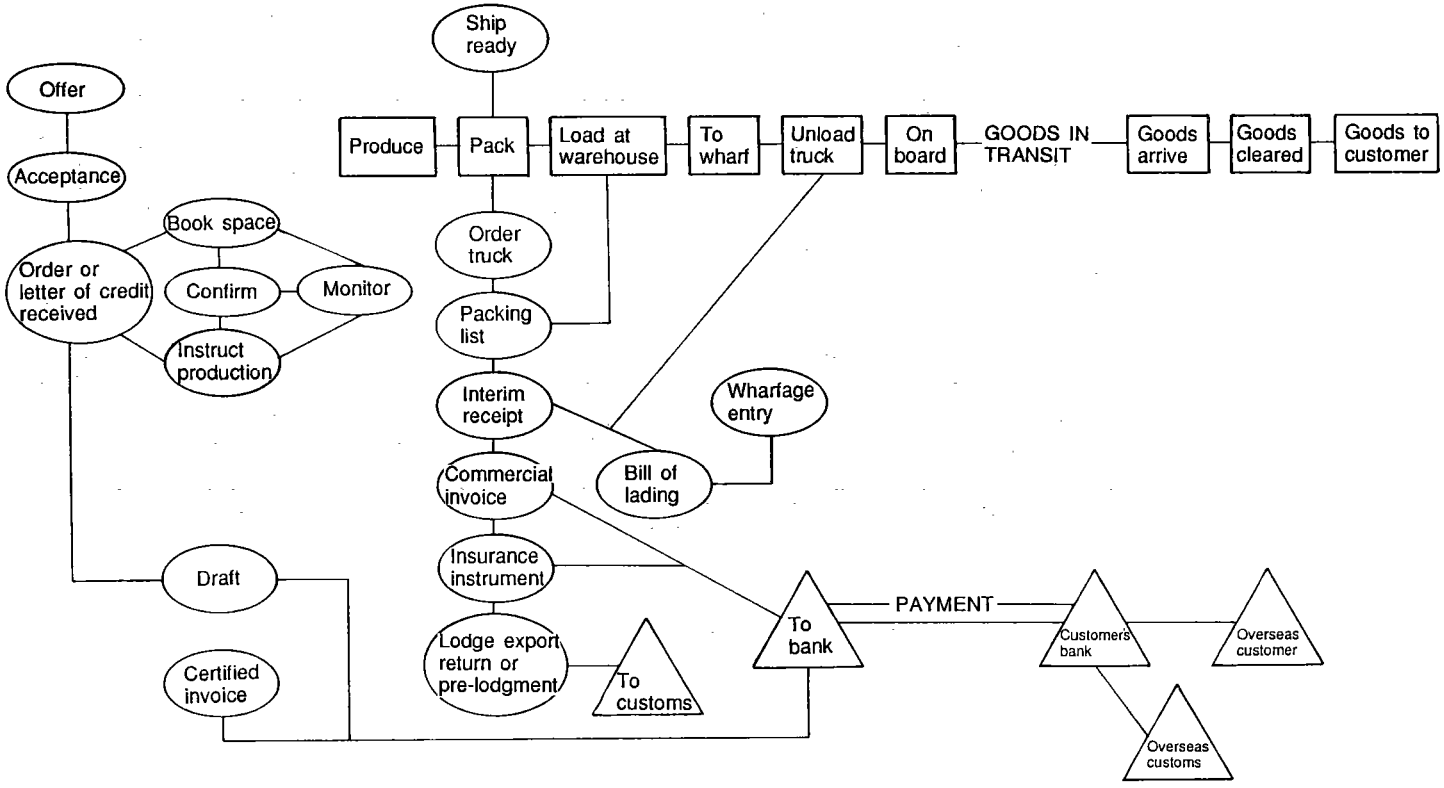
An importer who signs acceptance of a bill of exchange assumes liability for satisfying the terms of payment. If a documentary credit has been arranged, once it is satisfied that it holds all the properly completed documentation associated with the import transaction, the Australian bank undertakes to remit payment through a specified overseas bank as required.

As soon as the goods are on board ship the seller either sends the complete documentation including the bill of lading and the bill of exchange to the importer for acceptance, or lodges this material with the correspondent bank overseas which will make the actual payment. In the latter case, these documents are despatched by air mail to the importer's bank in Australia.

As a result payment for imports will usually be effected while the goods are en route to Australia, and any delay on the Australian waterfront causes the importer to carry financing costs for a correspondingly longer period before distribution and sales activity can commence.

The conditions of contracts vary in the export trades depending on long established custom, possible needs to match credit terms offered by overseas competitors, or the relative strength of buyers and sellers in the particular market at a given time.

Some exporters will be able to obtain the protection of irrevocable letters of credit. These may even be mandatory because of import licensing or foreign exchange controls in the purchaser's country. On other occasions, a bill of exchange or a revocable letter of credit (allowing the purchaser to renegotiate completely if certain terms of the contract are not met) will be the medium through which payment is obtained.



Source Adapted from Australian Institute of Export (1984).

Figure I.1 Flow of goods and documents for export transactions

Payment may be 'at sight' or 'upon presentation of documents', or it may be guaranteed a certain fixed time after receipt of the shipping documentation by the buyer or the buyer's bank. For instance, in the processed food industry, 90–day credit terms are very common for Australian exports to the Middle East, Europe and North America (Australian Trade Commission 1989).

In practice, it is possible for all exporters to collect payment once full shipping documentation has been received in the country of import. Australian banks will make a discounting adjustment if the bill of exchange or the letter of credit falls due a specified time after acceptance or presentation.

If there is a delay in loading the goods in Australia, the export documentation will be despatched later than anticipated, and there will be a corresponding delay in the time at which the buyer formally endorses the bill of exchange or the buyer's bank is required to make payment under the terms of the letter of credit. In other words, the exporter continues to bear the burden of financing the goods for an extra period equivalent to that of the delay.

There may be additional consequences for exporters unable to make a shipment on time. It is possible that the bill of exchange or letter of credit stipulates a final day for payment. In that case further negotiations may be necessary to preserve the original purchase agreement, and the purchaser may be in a position to seek a downward adjustment of price. Fresh documentation will have to be prepared in these circumstances.

If the contract contains specific penalty clauses for late delivery the importer will be certain to invoke these. Furthermore, if the exporter is chartering a vessel, additional costs for demurrage will be incurred unless the agreed period made allowance for such a possibility.

Figure I.1 illustrates the typical flow of goods and associated documents in the course of export trading transactions.

APPENDIX II METHODOLOGY FOR THE ESTIMATION OF SHIP DELAY COSTS

This appendix presents the methodology adopted for estimating the costs of ship delay costs to ship operators. As more detailed data are available, and as delays are more significant for container and ro-ro ships, the methodology focuses on these vessels. Two types of delay costs are analysed. The first is the cost of delays measured by departures from published schedules (unscheduled delays). The second is the cost of delays for which allowance is made when schedules are planned (normal delays).

Ideally an estimate of the costs of unscheduled delays would be based on the costs actually incurred by shipowners, such as the costs of fast steaming, chartered ships, additional port charges and land transport costs for diverted cargo. The data needed to proceed in this way are not readily available, and even shipping companies find this a complex task as indicated in the Australia to Europe Shipping Conference submission to the Prices Surveillance Authority inquiry into the proposed congestion surcharge for Sydney (AESC 1989).

Instead, the estimate of the costs to liner ship operators of waterfront unreliability was made by applying a typical cost per ship-day (including capital costs) to the average number of days' delay per ship call at the various major Australian ports and the numbers of calls by container and ro-ro ships at these ports. A multiplier was then applied to this estimate of the direct cost of operating ships to take account of the indirect costs such as additional land transport costs.

The total delay cost therefore depends on the total number of ship calls, the average delay per ship, the operating cost per ship-day and the multiplier to allow for the indirect costs.

NUMBERS OF SHIP CALLS

Table II.1 shows the numbers of overseas ship arrivals in 1987 and 1988 for the Australian mainland capital city ports. Numbers of ships by type for Australia as a whole, and total overseas ship calls by port are from published Australian Bureau of Statistics data (ABS 1989f). Calls by coastal shipping are not included in these figures.

TABLE II.1 NUMBERS OF OVERSEAS SHIP CALLS AT MAINLAND CAPITAL CITY PORTS IN 1987 AND 1988

Port	*First quarter 1987*	*Second quarter 1987*	*Third quarter 1987*	*Fourth quarter 1987*	*First quarter 1988*	*Second quarter 1988*	*Third quarter 1988*	*Fourth quarter 1988*
All ships								
Sydney	402	425	469	452	485	463	479	450
Melbourne	347	401	363	402	385	387	336	384
Brisbane	244	261	278	273	244	260	306	315
Adelaide	96	119	102	92	93	97	90	109
Fremantle	289	273	264	271	219	271	253	266
Container ships[a]								
Sydney	121	128	141	136	146	139	144	135
Melbourne	128	147	134	148	142	142	124	141
Brisbane	62	67	71	70	62	67	78	81
Adelaide	14	17	15	13	13	14	13	16
Fremantle	49	46	45	46	37	46	43	45
Ro-ro ships[a]								
Sydney	35	37	41	39	42	40	41	39
Melbourne	38	44	40	44	42	43	37	42
Brisbane	25	26	28	28	25	26	31	32
Adelaide	16	19	17	15	15	16	15	18
Fremantle	16	15	15	15	12	15	14	15

a. Estimate.

Source ABS (1987, 1989f).

The most recent ABS statistics for ship calls by type of vessel at the various ports are annual figures for 1986–87 (ABS 1987). Estimates of the quarterly numbers of ship calls by port by type of vessel for 1987 and 1988 were obtained by using the proportions of vessels by type from the 1986–87 annual figures and the overall numbers of ship calls to these ports in these quarters from ABS cargo statistics (ABS 1989f).

COST PER SHIP-DAY

The president of the Australian Chamber of Shipping in December 1988 put the holding cost of a large modern container ship at between US$30 000 and US$50 000 per day (Australian Financial Review 1988). The largest vessels tend not to be used in the Australian trades. The Chamber submission to the Prices Surveillance Authority inquiry into the proposed Sydney congestion surcharge contained estimates based on $A41 000 per ship-day for container vessels, of which the cost of containers was $14 000 per day (ACOS 1989b).

Costs calculated from data supplied by two of the four liner groups varied from around $16 300 per day for small ships of under 600 TEU to about $37 000 per day for large ships of about 2500 TEU.

The major cost elements of ship operating costs (capital and bunkers) can be described with reasonable accuracy by a relationship of the form (BTE 1982):

$$C = K S^a$$

where C is the operating cost, K is a constant, S is a measure of ship size (for example, deadweight tonnage, slot capacity), and a is an exponent.

With acceptable accuracy for this analysis it can be assumed that the total daily direct operating costs can be represented by a similar relationship. The above costs reported by shipping companies imply an exponent of 0.57. Using the above formula an average sized ship of 1300 TEU, which was assumed for this analysis, would incur a daily operating cost (including capital costs) of $25 000.

ALLOWANCE FOR INDIRECT COSTS

The Australia to Europe Shipping Conference (AESC) submission to the Prices Surveillance Authority inquiry into the proposed Sydney congestion surcharge provides some recent information on the costs of delays to ships in the Conference (AESC 1989). The data in the submission were used to develop the ratio of the total costs incurred by a delayed ship to the direct operating costs of an undelayed ship (including capital costs). This ratio was then used as the multiplier, referred to earlier, required to estimate ship delay costs from ship direct operating costs.

The submission states that two members of the Conference, ANZECS and ANL, lost a total of 105 days in Sydney during the analysis period and that ScanCarriers made up all time lost through fast steaming. The time made up by ScanCarriers ships was 32 days. A total delay of 137 days was therefore claimed by the AESC in its analysis. The average size of ANZECS and ANL ships delayed was 1880 TEU but that of ScanCarriers ships was not stated. The cost per day of an 1880 TEU ship is, according to the relationship presented earlier, $31 400 or US$23 550 (assuming $A1 = US$0.75). The total direct operating cost of the 137 days' delay is therefore estimated at US$3.226 million. This is equivalent to US$74.62 for each of the 43 236 laden TEUs the AESC said were handled by these ships during the analysis period. The delay costs identified in the submission are given in table II.2.

The ratio of total delay costs to the direct operating costs is therefore around 1.76 in this case. The amount in table II.2 for container leasing costs differs from that estimated in the AESC submission. The AESC submission attempted to identify actual leasing costs, but to keep the analysis on a consistent basis it was assumed that the leasing costs were equivalent to the leasing charges that would have been incurred during the time the ship was delayed. The average delay per ship call identified in the AESC submission was 2.76 days for ANZECS and ANL ships and the daily leasing cost was US$5.22 per TEU. There were 15 empty containers for 100 laden containers on the European trade in 1988–89 (Maritime

TABLE II.2 COSTS OF SHIP DELAYS REPORTED BY THE AUSTRALIA TO EUROPE SHIPPING CONFERENCE
(US$ per laden TEU)

Cost component	*Cost*
Cost of chartered ships[a]	73.40
Additional port costs	5.07
Additional land-side costs	11.24
Fast steaming costs	16.24
Container leasing costs[b]	16.57
Additional shift	9.00
Total	131.52

a. Includes bunkers costs.
b. Differs from the AESC estimate (see text).

Source AESC (1989).

TABLE II.3 MULTIPLIERS FOR ESTIMATING UNSCHEDULED SHIP DELAY COSTS

Period	*Assumption 1*[a]	*Assumption 2*[b]
Second quarter 1987	1.46	1.36
Fourth quarter 1987	1.51	1.45
Second quarter 1988	1.48	1.39
Fourth quarter 1988	1.57	1.47

a. Multiplier increases linearly with delay time to a maximum of 1.76 at four days.
b. Multiplier increases linearly with delay time to a maximum of 1.76 at six days.

Source BTCE estimates based on AESC (1989) and voyage data supplied by shipping companies.

Services Board 1989). The average leasing cost incurred as a consequence of ship delays, per filled container, is therefore given by:

US$5.22 x 2.76 x 1.15 = US$16.57

The ratio, or multiplier, of 1.76 derived from AESC data was relevant to a period of severe congestion. It is unlikely that a multiplier of this magnitude would be appropriate for periods when delays are less severe. The Bureau modelled delay costs based on results derived from the Bureau's BTESHIP model of ship operating costs (BTE 1987). Only some of the delay costs could be modelled but the results suggested that delay costs tend to increase linearly with time for delays of moderate length.

On the basis of this result it was assumed that the value of 1.76 was a maximum value and that the multiplier increased linearly with delay time from zero when there was no delay to the maximum value of 1.76. The delay time at which the multiplier is assumed to reach a maximum value is important. Two alternative assumptions were made, the first that the maximum value was reached for a delay of 6 days and the second that the maximum value was reached for a delay of 4 days.

For each of the four quarters average multipliers were calculated for both assumptions. This was done by assigning a multiplier value for each of the voyages analysed and taking a weighted average of the multipliers. In this way variations in delays were taken into account in estimating the costs of delays. The resulting quarterly multipliers are shown in table II.3.

The cost of unscheduled ship delays could now be estimated using the ship numbers presented in table II.1, the average delay per ship shown in table 3.4 and the average daily delay cost obtained by multiplying the daily operating cost of $25 000 for the 1300 TEU ship assumed for the analysis by the multipliers in table II.3. The results of the calculations are shown in tables II.4 and II.5.

TABLE II.4 ESTIMATED COST OF UNSCHEDULED DELAYS TO CONTAINER AND RO-RO SHIPS IN 1987[a]

	Sydney	*Melbourne*	*Brisbane*	*Adelaide*	*Fremantle*	*Total*
Second quarter 1987						
Number of calls	165	191	93	36	61	
Average delay per call (days)	1.48	0.84	0.57	0.20	0.02	
Cost of delays						
Assumption 1[b] ($ million)	8.9	5.9	1.9	0.3	–	17.0
Assumption 2[b] ($ million)	8.3	5.5	1.8	0.2	–	15.9
Fourth quarter 1987						
Number of calls	175	192	98	28	61	
Average delay per call (days)	2.54	0.57	1.45	0.28	0.40	
Cost of delays						
Assumption 1[b] ($ million)	16.8	4.1	5.4	0.3	0.9	27.5
Assumption 2[b] ($ million)	16.1	4.0	5.2	0.3	0.9	26.4

a. Based on daily operating cost of $25 000.
b. Daily delay cost per ship obtained by multiplying $25 000 by the corresponding multiplier in table II.3.
– Rounded to zero.

Note Figures may not add to totals due to rounding.

Source BTCE estimates based on tables II.1 and II.3 and data supplied by shipping companies.

TABLE II.5 ESTIMATED COST OF UNSCHEDULED DELAYS TO CONTAINER AND RO-RO SHIPS IN 1988[a]

	Sydney	*Melbourne*	*Brisbane*	*Adelaide*	*Fremantle*	*Total*
Second quarter 1988						
Number of calls	179	185	93	30	61	
Average delay per call (days)	1.50	0.71	1.19	0.0	0.56	
Cost of delays						
Assumption 1[b] ($ million)	9.9	4.9	4.1	0.0	1.3	20.2
Assumption 2[b] ($ million)	9.3	4.6	3.8	0.0	1.2	18.9
Fourth quarter 1988						
Number of calls	174	183	113	32	60	
Average delay per call (days)	2.72	0.73	1.32	0.29	0.44	
Cost of delays						
Assumption 1[b] ($ million)	18.6	5.2	5.9	0.4	1.0	31.1
Assumption 2[b] ($ million)	17.4	4.9	5.5	0.3	1.0	29.1

a. Based on daily operating cost of $25 000.
b. Daily delay cost per ship obtained by multiplying $25 000 by the corresponding multiplier in table II.3.

Note Figures may not add to totals due to rounding.

Source BTCE estimates based on tables II.1 and II.3 and data supplied by shipping companies.

COSTS OF NORMAL DELAYS

The costs calculated so far are those incurred due to the deviation from planned schedules. Ship operators typically plan their schedules on the basis of expected port performance. These expectations take into account events that occur frequently and extend the turnaround time of ships. These events constitute the 'normal' delays. Although departures from schedule are observable, normal delays are not usually observable and are consequently much more difficult to estimate.

In chapter 2 the comment was made that issues of unreliability were strongly linked to issues of productivity. This suggests that normal delays may be estimated by comparing actual productivity levels with levels that could be expected if delays were negligible and working arrangements more flexible. This was the approach adopted in this appendix.

ANZECS provided the Bureau with data on the performance of ports included in its schedule. These data constitute reliable information on port productivity and delays on a consistent basis. The AESC submission to the Prices Surveillance Authority inquiry into the proposed Sydney congestion surcharge provided further information for Sydney for 1988 (AESC 1989).

Three measures of performance were used to develop a standard of performance against which normal delays in Australian ports could be estimated. These measures were:

- containers moved per net working hour;
- ratio of net working time to berth time; and
- time waiting for a berth.

In practice shipowners are most interested in the total time a ship is in port, and how the stevedore allocates resources to achieve a satisfactory turnaround time is of lesser concern. By comparing values for the three measures in Australian ports with those achieved overseas it is possible to make an estimate of what would be considered a reasonable ship turnaround time for a given volume of cargo. Such turnaround times will understate to some extent achievable performance because they are based on average overseas performances and not on best overseas performance.

Container movements per net working hour are generally lower for Australian terminals compared with those achieved in European ports visited by ANZECS ships. ANZECS has specified contract rates with European terminal operators which are typically 25 or 30 containers per net working hour. These were the rates chosen for what should be achievable in Australia under efficient operating conditions. A rate of 30 containers per net working hour was chosen for Sydney because data in the AESC submission to the Prices Surveillance Authority indicate that this figure has been achieved on many occasions in the period 1984 to 1987 (AESC 1989). A value of 25 containers per net working hour was chosen for all other ports.

The ratio of net working time to berth time varies considerably from port to port but tends to be lower for Australian ports. The European ports in the ANZECS data had ratios varying from 0.54 at Genoa (which was experiencing congestion at the time) to 0.78 at Rotterdam, Zeebrugge and Tilbury and had a weighted average of 0.69. Australian ports had a weighted average ratio of 0.64 and a range from 0.56 at Fremantle to 0.75 at Melbourne. The European average of 0.69 was chosen as being a reasonable measure of berth utilisation. For Melbourne and Adelaide which both experienced ratios in excess of 0.69, the ratios achieved in practice were retained.

The time ships waited for a berth was negligible for some European ports in 1989 according to the ANZECS data. However, Genoa was subject to congestion during the period reported in the ANZECS data and experienced an average berthing delay of 12.5 hours. The average for all European and Mediterranean ports in the ANZECS sample was 3.7 hours per call or 3.0 hours if Genoa was excluded. In Australian ports the average time spent waiting for a berth varied from 3.0 hours for Adelaide to 33.8 hours for Sydney. A time of 3.0 hours was assumed to be a reasonable and achievable figure for this analysis.

The figures obtained above for each of the three performance measures were then used to estimate a target port time for the mainland Australian ports. The

TABLE II.6 CALCULATION OF EXCESS PORT TIME

Port	TEU per call[a]	Average port time[a] (hours)	Standard TEUs per net hour	Net working time per berth time	Standard port time (hours)	Excess port time (hours)
Sydney	897	116.3	30	0.69	46.3	69.9
Melbourne	720	69.2	25	0.75	41.4	27.8
Brisbane	600	81.6	25	0.69	37.8	43.9
Adelaide	233	22.9	25	0.73	15.8	7.1
Fremantle	357	56.1	25	0.69	23.7	32.4

a. Sydney data are for 1988 and data for the other ports are for 1989.

Source AESC (1989); ANZECS (pers. comm.).

TABLE II.7 CALCULATION OF NORMAL DELAY COST IN 1988

				Second quarter		Fourth quarter	
Port	Excess port time (hours)	Weighted delay[a] (hours)	Normal delay (hours)	Number of calls	Normal delay cost ($ million)	Number of calls	Normal delay cost ($ million)
Sydney	69.9	50.4	19.5	179	5.5	174	5.3
Melbourne	27.8	17.3	10.5	185	3.0	183	3.0
Brisbane	43.9	30.3	13.6	93	2.0	113	2.4
Adelaide	7.1	3.6	3.5	30	0.2	32	0.2
Fremantle	32.4	12.0	20.4	61	2.0	60	1.9
Total					12.6		12.8

a. Departure from schedule delays weighted by number of ship calls.

Note Figures may not add to totals due to rounding.

Source BTCE estimates based on data in tables II.5 and II.6.

actual average time spent in these ports by ANZECS ships was contained in the data made available to the Bureau. The difference between the actual average and the target time gave an excess time in Australian ports. The difference between this excess time and the deviation from schedule calculated earlier provides a measure of the normal delays allowed for when ship schedules are planned. Table II.6 summarises the calculations of the excess port time. When the estimates of normal delays in each of the mainland capital city ports are applied to the data in table II.5 the cost of normal delays for the June and December quarters of 1988 total $25.4 million, or a total of approximately $50 million for the whole year. The calculations are shown in table II.7.

APPENDIX III COST OF TRUCK DELAYS

Trucks delivering or collecting cargo may face delays in waiting for service (queuing delays) or in being loaded or unloaded (service delays). Both types of delay extend the truck's turnaround time. Importers and exporters incur significant additional costs in the waiting time charges for trucks queuing at the road receival or dispatch areas of container terminals and depots. This happens especially in Sydney and Melbourne which in 1987–88 accounted for about three-quarters of Australia's seaborne container traffic (ISC 1989b). For example, a queue of about 200 trucks was reported at a Sydney terminal in October 1989 (*Daily Commercial News* 1989e).

Trucks typically begin queuing early each working day, sometimes as early as 4.00 a.m. according to one Sydney depot operator, well before loading and unloading of trucks starts at 7.30 a.m. Queues may form at other times for a number of reasons including equipment breakdowns, industrial disputes, and peaks in the pattern of vessel arrivals or in the pattern of arrivals of trucks due to consignees' delivery time preferences. Importers are often reluctant to receive containers or LCL cargo into store after about 3.00 p.m. because substantial minimum overtime wage payments would be incurred and cargo arrival is uncertain.

Truck queues at Australian container terminals and depots have long been a cause for concern. The New South Wales Cargo Facilitation Committee has stated that 'the almost random development of truck queues is one of Sydney's major congestion problems and a costly one' (*Daily Commercial News* 1989b).

A working party set up by the Committee and the New South Wales Road Freight Transport Industry Council (NSWRFTIC) estimated queuing costs at $8.7 million for Sydney ports in 1986. It estimated that savings of $5.8 million could be made by reducing average queuing time to 30 minutes, or $2.8 million by reducing average queuing time to 1 hour (BTCE 1988b).

Initial estimates in 1989 by the Port of Melbourne Authority and the Victorian Road Transport Association indicated the savings achievable by a one-third reduction in truck queuing time to be some $13 million per annum in Melbourne. This comprised $7 million in direct truck costs, $5 million in interest costs on containerised goods, and $1 million in interest costs on the capital investment in the trucks involved (*Daily Commercial News* 1989d). A more recent study has

estimated annual potential savings in Melbourne at $21 million (Joint Industry Project 1990).

Firms which responded to the Bureau's survey of exporters and importers and those interviewed during the study provided examples of truck queuing delays. A Sydney-based firm incurred a cartage cost of $1450, being mostly truck waiting time, for the collection of two containers. Yet another firm considered that demurrage could be 50 per cent of normal cartage costs in Melbourne, and has experienced up to 8 hours' truck queuing time for the collection of its imports.

A major Melbourne-based manufacturer informed the Bureau that its demurrage costs were about $100 000 per annum, and that its drivers have, on occasion, waited up to 12 hours without collecting their cargo. According to one survey respondent, trucks are often turned away from the queues at about 2.30 p.m. and have to return the next day. These trucks may not receive priority on the second visit, and sometimes three visits may be necessary before containers can be collected. Another survey respondent reported many futile trips to pick up containers which had been block stacked.

A fundamental problem, noted in a previous Bureau report (BTE 1986b), is the lack of a direct commercial relationship between the terminal operator and the truck operator or consignee. There is no direct financial penalty for the terminal operator for the delay costs its operations impose on truck operators, although there may be an indirect cost in the congestion which may be caused at the terminal if import containers are not dispatched quickly enough, or in ship delays if export containers are received late.

If a truck has no alternative work available, then the opportunity cost of the truck of waiting in a queue is zero (the Joint Industry Project identified a number of categories of social costs involving drivers and their families). Under the contracts normally in force importers and exporters will be billed for most or all of the waiting time. The suggestion has been made that some truck operators may be exploiting the demurrage system by 'organising' queues when work is not available elsewhere (*Daily Commercial News* 1989f).

EXTENT OF DELAYS

A 1986 survey of truck operators found that average truck turnaround times in Sydney were 83 minutes overall, a slight improvement from 89 minutes in 1984. Turnaround times in 1984 varied from just over half an hour for deliveries to Darling Harbour to just over 2 hours for collections from CTAL in Botany Bay (NSWRFTIC 1987b).

A Sydney retailer provided to the Bureau details of its carriers' average waiting times in March and April 1989 at various facilities in Sydney, which were 2 hours 20 minutes at the NTAL Botany Bay terminal, 5 hours 50 minutes at CTAL, 4 hours at White Bay and 45 minutes at Glebe Island. The average waiting time,

weighted by terminal throughput, implied by these times is approximately 3.3 hours.

An exporter respondent to the Bureau's survey reported truck waiting times over the period March 1988 to March 1989 which were on average 0.83 hours in excess of normal allowances by carriers for delivery to various terminals in Melbourne. Nearly half of a large sample of containers were delayed, and between 4 and 5 per cent had to be returned to the depot after being turned away from the wharves.

The Joint Industry Project in Melbourne cited surveys of truck queues at Melbourne terminals during 1989. The turnaround time averaged 2.34 hours for imports and 1.41 hours for exports. The overall average turnaround time was 1.88 hours (Joint Industry Project 1990). Of these turnaround times the average queuing time was 78 per cent for imports and 63 per cent for exports.

COST OF TRUCK DELAYS AT PORT TERMINALS

Several importers and exporters interviewed by the Bureau indicated that the charges for truck waiting time were in the range $35 to $45 per hour for a semitrailer in 1989. It has been reported that truck operators in Sydney were being paid up to $50 per hour waiting time (*Daily Commercial News* 1989f). An average charge to importers and exporters of $40 per hour for truck waiting time was assumed for this analysis.

The average turnaround time assumed for Melbourne was 1.88 hours which is the time estimated in the 1989 survey of Melbourne truck operators referred to above. The estimate of Sydney truck turnaround time of about 1.5 hours for 1986 is probably too low an estimate for 1988 as 1986 was a period of relatively low trade volumes through Sydney. The time of 3.3 hours estimated for early 1989 is probably too high to be representative of 1988 as early 1989 was a period marked by congestion in the ports of Sydney and Botany Bay. An intermediate time of 2.5 hours was chosen as being a realistic estimate of 1988 truck turnaround times.

Australia's seaborne trade involved total container movements (international and coastal, loaded and empty) of about 1.5 million TEUs in 1987–88 (ISC 1989b). Sydney handled some 505 000 TEUs and Melbourne about 616 000 TEUs in 1987–88 (port authority annual reports).

About 87 per cent of containers pass the wharfgate by road rather than by rail (BTCE 1988b), and about 90 per cent of the containers involved are 20-foot boxes (Department of Transport and Communications, pers. comm.). It was assumed that 87 per cent of the 236 000 empty containers travel by road and are carried two TEUs per truck, and that laden 20-foot containers travel one per truck. On this basis, over 1.1 million truck movements were required at container terminals in 1988, including about 372 000 in Sydney and about 466 000 in Melbourne.

(The Melbourne figure is for trucks arriving randomly. The Joint Industry Project survey of truck movements found that 73 per cent of containers were moved by trucks arriving randomly. Of the remaining 27 per cent, 19 per cent were moved by bulk runs, 6 per cent were moved by trucks using a vehicle booking system and 2 per cent by other means. These 27 per cent moved by other than randomly arriving trucks are assumed to experience zero delay times.)

Using the above estimates for truck movements, truck hourly delay cost and average delay times, the direct cost of truck queues at container terminals is estimated to have been approximately $37 million per annum for Sydney. The Joint Industry Project estimated the cost to have been about $31 million per annum for Melbourne. The resulting cost of truck waiting time in Sydney is about $100 per TEU, and about $80 per TEU in Melbourne.

In 1988 the average truck turnaround time at the Adelaide terminal was 21.2 minutes (*Cargo Systems International* 1989), which with a throughput of some 33 000 TEU in the port, would involve truck waiting costs of about $0.5 million. Truck delays at Fremantle were stated to be costing $3 million per annum (*Daily Commercial News* 1989g). No information was available for Brisbane. Allowing $3.5 million for Brisbane the nationwide direct cost to importers and exporters of truck queues at container terminals in 1988 is therefore estimated to have been around $75 million.

The evidence suggests that the $75 million is a conservative figure. The cost of queuing at container depots where LCL boxes are packed and unpacked would add to this figure. LCL containers comprise only about 10 per cent of TEUs (BTCE 1988b), but generate more truck movements per TEU than FCL containers.

The estimate of $75 million includes the cost of the time to load or unload trucks. Some acceptable level of turnaround time needs to be assumed so that net delay costs can be estimated.

A truck turnaround time of 30 minutes for Sydney was described as an acceptable delay by the NSWRFTIC (1987a). If that level of service were achieved truck delay costs would be reduced by $30 million in Sydney.

The Joint Industry Project (1990) proposed a package of 12 measures to solve the truck queuing problem in Melbourne. No single measure was considered capable of achieving a significant saving in the cost of truck queues. The Melbourne package called for changes in all sectors of the waterfront involved in the land–sea interface, but the main thrust was on the development of a centralised booking system, payment of customs duty before ship arrival and improved and standardised documentation. The Joint Industry Project estimated the package would achieve a saving of $20 million per annum.

The cost of truck delays is therefore estimated to be $53 million ($20 million for Melbourne, $30 million for Sydney and $3 million for Fremantle). This estimate does not include the cost of truck delays at container depots and assumes that

truck turnaround times at ports other than Sydney, Melbourne and Fremantle are less than 30 minutes.

The truck delay costs of $53 million can be split between importers and exporters using data provided by the Joint Industry Project. Of the $31 million estimated for Melbourne truck delay costs, $19.6 million were incurred by importers and $11.4 million by exporters. Applying the same proportions to the national total of $53 million gives $33 million for importers and $20 million for exporters in 1988.

These truck delay costs could potentially be eliminated but there would be costs in implementing the measures to reduce the severity of truck queues. For Melbourne, these costs are estimated to be an initial capital cost of $1.5 million and an annual cost of $3.5 million (Joint Industry Project 1990). There is no publicly available cost of remedial measures for other ports. An estimated net cost of $50 million to $60 million per annum would allow for the uncertainties in the costs of truck queue remedial measures and the costs of truck queues at container depots.

APPENDIX IV COST OF DELAYS TO IMPORT LCL CONTAINERS

Importers of less than container load (LCL) consignments responding to the BTCE survey expressed general concern about the delays they experienced in receiving their cargo from container depots. Not only is their cargo subject to the same delays experienced by importers of full container loads (FCL), but it is also subject to additional and sometimes extended delays in unpacking at container depots. Exporters of LCL cargo were less critical of LCL arrangements in their survey responses.

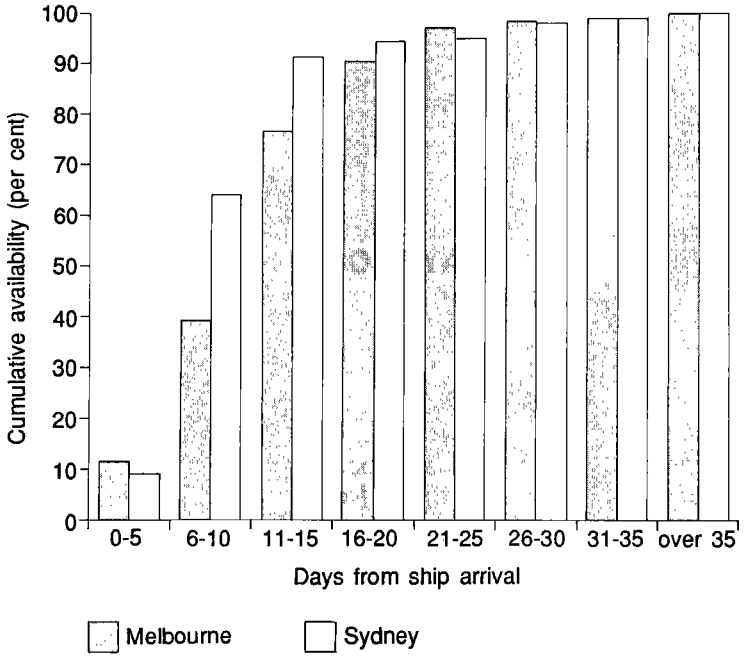
This appendix presents an analysis of the delays to LCL imports in Sydney and Melbourne in 1987 and 1988 and estimates the costs of those delays to importers and shipowners. Data were not available to estimate the corresponding costs for LCL exporters.

LCL CONTAINER AVAILABILITY

The first stage of the analysis was to develop distributions of the time from ship arrival to the time containers were available for collection. This was done using data published in the *Daily Commercial News*. The major source of data was the publication of a notice of cargo availability which appears in the *Daily Commercial News* either on the day of availability or the day before. Container serial numbers are listed under the ship name and voyage number.

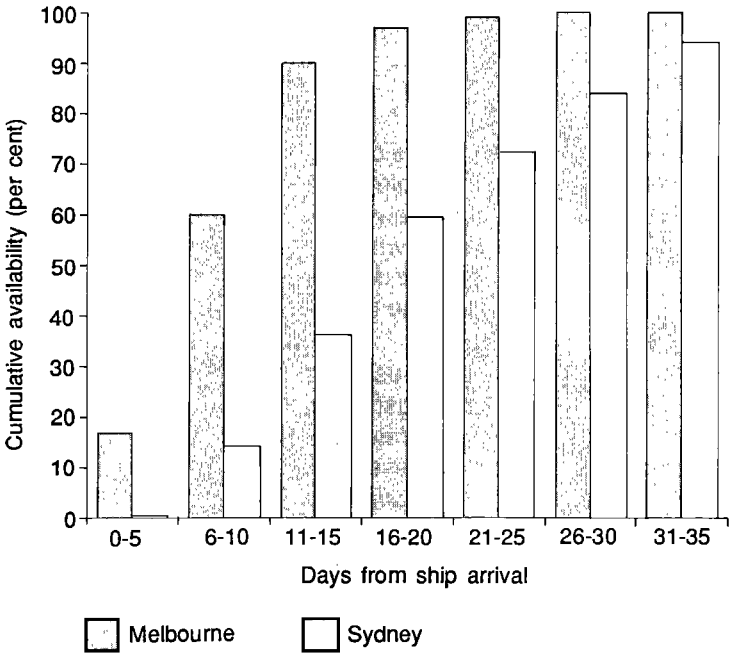
The *Daily Commercial News* also publishes lists of 'Vessels in Australian ports' which give vessels' dates of arrival amongst other information but do not include the voyage number. To crosscheck the date of arrival with the voyage number, it was necessary to consult the lists of 'Vessels due in Australian ports' or 'First port of call' (also published in the *Daily Commercial News*), which give approximate dates of arrival for particular voyage numbers, and ensure that these tallied with the actual dates of arrival. The time elapsed between the vessel's arrival and the date of advertised availability could then be calculated for each container.

A sampling approach was taken. For both Sydney and Melbourne, one weekly period from each month in the second and fourth quarters of 1987 and 1988 was



Source BTCE estimates based on data published in the *Daily Commercial News*.

Figure IV.1 LCL container availability in the second quarter 1987



Source BTCE estimates based on data published in the *Daily Commercial News*.

Figure IV.2 LCL container availability in the fourth quarter 1988

studied. The weekly figures in each quarter were aggregated for each port resulting in sample sizes ranging from 763 to 1130 containers and averaging 854.

Table IV.1 shows details of the distribution of container availability times for the four quarters. Although in Melbourne in each quarter at least three-quarters of containers were unpacked within 15 days, the situation in Sydney progressively worsened to the point where only just over one-third of containers were unpacked in 15 days in the fourth quarter of 1988.

Some caution should be used in the use of figures from the 'tails' of the distribution, where small numbers of containers were involved. Where there were multiple voyage numbers for different legs of a multi-stage voyage a certain amount of judgment was often necessary to decide whether or not to attribute particular voyage numbers to a particular ship arrival date. Table IV.2 shows the sample sizes and the average times for LCL cargo to become available.

The improvement in Melbourne's performance relative to Sydney's is illustrated in more detail in figures IV.1 and IV.2 which compare Sydney's and Melbourne's cumulative availabilities of LCL consignments for the second quarter 1987 and the fourth quarter 1988.

TABLE IV.1 LCL CONSIGNMENT AVAILABILITY IN 1987 AND 1988
(per cent of containers)

Range (days)	*Second quarter 1987*	*Fourth quarter 1987*	*Second quarter 1988*	*Fourth quarter 1988*
Melbourne				
0–5	11.5	15.5	12.0	17.0
6–10	28.0	42.0	37.5	43.0
11–15	37.0	22.5	25.5	30.0
16–20	14.0	8.0	13.5	7.0
21–25	7.0	9.0	10.0	2.0
26–30	1.0	2.0	1.0	1.0
31–35	0.5	1.0	0.5	–
Over 35	1.0	–	–	–
Sydney				
0–5	9.0	5.0	4.0	0.5
6–10	55.0	29.0	30.5	14.0
11–15	27.5	42.0	21.0	22.0
16–20	3.0	16.0	7.0	23.0
21–25	0.5	2.0	6.0	13.0
26–30	3.0	1.0	10.5	11.5
31–35	1.0	1.0	8.5	10.0
Over 35	–	4.0	12.0	6.0

– Rounded to zero.

Source BTCE estimates based on information published in the *Daily Commercial News*.

TABLE IV.2 AVERAGE TIMES FOR LCL CONSIGNMENTS TO BECOME AVAILABLE IN 1987 AND 1988

Period	Sample size	Average time (days)
Melbourne		
Second quarter 1987	1 130	12.4
Fourth quarter 1987	763	11.2
Second quarter 1988	785	11.9
Fourth quarter 1988	853	9.9
Sydney		
Second quarter 1987	875	10.3
Fourth quarter 1987	831	14.5
Second quarter 1987	768	20.1
Fourth quarter 1988	828	21.5

Source BTCE estimates based on information published in the *Daily Commercial News*.

COST OF DELAYS TO LCL CONTAINERS

The major direct cost to importers is the interest on the working capital tied up in goods delayed, although there will be extra administration costs and there may be additional cartage costs. There will also be indirect costs such as profit forgone from sales delayed or lost because of the delays. The direct cost is given by the following equation:

Direct cost = Number of LCLs delayed x Average delay (days)
x Average cost per LCL per day delayed

Shipowners also incur costs through the non-availability of their containers for other cargoes. The equation for calculating the costs is identical to that given above, except that the average cost per LCL per day delayed will represent the cost of delaying the container rather than the cost of delay to the contents of the container.

Number of LCLs delayed

Liner Freight Services estimated that 17 400 LCLs were discharged in Sydney in 1987, down from 33 900 in 1977 (International Forwarders' Association 1988). The number of TEUs discharged in 1986–87 was 238 675 in Sydney (Maritime Service Board 1989) and 272 093 in Melbourne (ISC 1988c).

It was assumed that the proportion of LCLs to FCLs imported into Melbourne was the same as for Sydney. The number of LCLs discharged in Melbourne was therefore estimated as:

Melbourne LCLs = 17 400 x 272 093/238 675 = 19 836

Since the volume of inwards cargo rose by 12.7 per cent in 1988, the numbers of LCLs for 1988 were also taken to be that much greater. The numbers for any quarter were then taken to be proportional to the volume of inwards cargo for that quarter.

For the periods studied, the proportions of LCLs delayed were calculated from the estimated distributions of LCL container availability, and for the intervening periods estimates were derived by interpolation.

Average delay

In estimating the cost of delays it was assumed that 5 days from the time the ship leaves the berth was the limit of satisfactory performance for unpacking containers.

The berth time for container ships in the Australia to Europe Shipping Conference was 3.6 days in Sydney during 1988 and 2.6 days in Melbourne during 1989 (AESC 1989) (equivalent 1988 data for Melbourne were not available). The total time from ship arrival to container availability that represents the limit of acceptable performance as defined above, was therefore assumed to be 8.6 days for Sydney and 7.6 days for Melbourne. These times were rounded up to 9 days for Sydney and 8 days for Melbourne. The average delays in excess of these times are shown in tables IV.3 and IV.4.

TABLE IV.3 COST OF DELAYS TO LCL CONTAINERS IN MELBOURNE IN 1987 AND 1988

Period	*Total LCLs*	*LCLs delayed*	*Average delay[a] (days)*	*Delay cost*	
				Importer[b] ($'000)	*Shipowner[c] ($'000)*
1987					
First quarter	4 700	3 600	6.0	860	150
Second quarter	4 900	3 700	6.0	884	155
Third quarter	4 900	2 900	6.3	727	127
Fourth quarter	5 400	3 100	6.7	827	145
Total[d]	19 800	13 300		3 298	577
1988					
First quarter	5 300	3 200	7.1	882	158
Second quarter	5 500	3 500	7.5	1 019	183
Third quarter	5 500	3 200	6.6	820	147
Fourth quarter	6 100	3 400	5.6	739	133
Total[d]	22 400	13 300		3 461	620

a. Average excess delay for delayed containers.
b. Based on an interest rate of 21 per cent.
c. Based on a container leasing cost of $6.96 per day.
d. Figures may not add to totals due to rounding.

Source BTCE estimates based on information published in the *Daily Commercial News* and BTCE (1988b), ABS (1989f) and AESC (1989).

TABLE IV.4 COST OF DELAYS TO LCL CONTAINERS IN SYDNEY IN 1987 AND 1988

Period	Total LCLs	LCLs delayed	Average delay[a] (days)	Delay cost	
				Importer[b] ($'000)	Shipowner[c] ($'000)
1987					
First quarter	4 100	1 700	6.4	433	76
Second quarter	4 300	1 700	6.4	433	76
Third quarter	4 300	2 400	7.6	721	126
Fourth quarter	4 700	3 350	8.7	1 160	203
Total[c]	17 400	9 150		2 748	480
1988					
First quarter	4 400	3 200	11.9	1 479	265
Second quarter	5 000	3 750	15.1	2 199	394
Third quarter	4 900	4 000	14.7	2 276	408
Fourth quarter	5 300	4 700	14.2	2 592	465
Total[d]	19 600	15 650		8 546	1 532

a. Average excess delay for delayed containers.
b. Based on an interest rate of 21 per cent.
c. Based on a container leasing cost of $6.96 per day.
d. Figures may not add to totals due to rounding.

Source BTCE estimates based on information published in the *Daily Commercial News* and BTCE (1988b), ABS (1989f) and AESC (1989).

Average cost per day

An average interest rate of 21 per cent was assumed. This was the rate implied by the answers of importers responding to the BTCE survey question about potential inventory cost savings in the event of negligible risk of waterfront and shipping delays. The average value of cargo per TEU was based on data for 1985–86 contained in a previous Bureau paper (BTCE 1988b) and was converted to 1987 and 1988 values using the import price index (ABS 1989a). This gave a value of $69 200 per container for 1987 and $67 500 per container for 1988.

Shipowner costs were assumed to be the leasing costs of containers. The Australia to Europe Shipping Conference said in its submission to the Prices Surveillance Authority inquiry into the proposed Sydney congestion surcharge that these costs were US$5.22 per day or $A6.96 per day (assuming an exchange rate of $A1 to US$0.75).

Total cost of delays

The total direct costs of delays in the ports of Melbourne and Sydney are shown in tables IV.3 and IV.4 respectively.

The total costs for Sydney and Melbourne of $7.1 million in 1987 and $14.2 million in 1988 represent an additional cost per LCL container of $190 in 1987 and $340

in 1988. This is equivalent to some 0.3 to 0.5 per cent of the average value of the cargo in the containers.

The costs differed markedly between Sydney and Melbourne, especially in 1988. In 1987 the total costs in Melbourne were 20 per cent higher than in Sydney but in 1988 the costs in Sydney were more than twice as high as those in Melbourne. The cost borne by individual importers can be large as can be illustrated by considering the cost per delayed container. This varied from $260 in the fourth quarter of 1987 in Melbourne to $690 in the second quarter of 1988 in Sydney.

Shipowner costs represent a comparatively small proportion (about 15 per cent) of the total costs. The analysis in chapter 6 indicates that probably all of the shipowner costs would be passed forward to importers so that importers would bear the entire cost of delays in depots.

APPENDIX V BTCE SURVEY OF IMPORTERS AND EXPORTERS

In May 1989 the BTCE undertook a national postal survey of importers and exporters as part of the assessment of the costs of waterfront unreliability. The sample frame was developed from a commercial database and survey forms were sent to 800 importers and 800 exporters. For both importer and exporter surveys, survey forms were sent to 250 companies with headquarters in Sydney, 250 in Melbourne and 300 in the rest of Australia. The survey specifications required a complete enumeration of all companies in the database with more than 500 employees and proportional sampling in the other employment categories. Copies of the survey forms are available from the Bureau on request.

The aims of the survey were to obtain quantitative and qualitative primary data which:

- established what importers and exporters perceive to be the major factors causing delays on the waterfront;
- enabled estimates to be made of the costs importers and exporters bear as a result of normal delays on the waterfront;
- indicated the extent and consequences of the most serious delays over a 15-month period;
- identified the impact which shipping and waterfront delays had on ordinary day-to-day business practices; and
- showed the measures taken by importers and exporters to cope with extreme situations.

Responses from 369 importers and 342 exporters were coded and entered into a database for extensive analysis. About 90 other respondents indicated they were no longer importing or exporting, the previous operations had closed down, or that they were importing or exporting so little or so infrequently that they did not regard themselves as qualified to supply any answers in detail.

ALLOCATION OF RESPONSES TO COMMODITY GROUPS

Respondents were asked to state the total value of their exports or imports and which commodity groups their imports or exports fell into. (A simplified version of the Australian Transport Freight Commodity Classification groupings was

provided.) Where respondents imported or exported commodities falling into more than one group, they were asked to list up to five groups in order of importance.

For both importers and exporters, most respondents' commodities fell within just one of the ten ATFCC single-digit commodity groups: food and live animals, beverages and tobacco, crude materials, mineral fuels, animal and vegetable oils, chemicals, processed materials, machinery and transport equipment, miscellaneous manufactures, and activities not elsewhere specified. Where imports or exports did not fit into just one commodity group, two strategies were adopted to allocate proportions of cargo carried by sea to commodity groups. First, one major exporter was contacted to obtain the exact breakdown into the different commodity groups. This actual breakdown was then used in further analysis of the data. In addition, a number of other respondents whose importing or exporting activities spanned several categories were contacted for more detailed information. Taken together with breakdowns provided without prompting by some respondents, this second approach led to the use of the matrix shown in table V.1 for estimating the share of each respondent's sea cargo in each commodity group. For example, a respondent indicating, two export commodity groups would have 80 per cent of the stated export value allocated to the first mentioned commodity group and 20 per cent to the second.

The allocation factors in table V.1 were modified when distributing import inventory levels and the increase in export sales expected with no waterfront delays among commodity groups. This was considered necessary because, for example, it could not be assumed that those exporting goods in more than one commodity group would experience an equal proportional increase in exports across all groups. There were evident differences in the extent of likely increases

TABLE V.1 SEA CARGO ALLOCATION FACTORS FOR IMPORTERS AND EXPORTERS

Number of categories in responses	*Category*[a]				
	1	*2*	*3*	*4*	*5*
1	1.0				
2	0.8	0.20			
3	0.7	0.15	0.15		
4	0.6	0.14	0.14	0.12	
5	0.5	0.14	0.13	0.12	0.11

a. Categories 1,2,3,4 and 5 are those listed in order of importance by respondents to the survey.

Source BTCE estimates based on information supplied by survey respondents.

in different groups. Preliminary proportional increases in exports or inventory values compared with import value were calculated from responses from those respondents exporting or importing goods in only one commodity group. These proportions were then used to weight the factors displayed in table V.1, with the weights being the value of the increases in export values (or the inventory values for the inventory calculations). In other words it was assumed that the experience of single-group respondents carried over to those exporting or importing in several groups.

Of the 295 respondents supplying sufficient information to enable sea imports in each category to be estimated, 158 stated that their imports were within a single group. The sea import total for these respondents was $2877 million, or 55 per cent of total seaborne imports reported by survey respondents. Similarly, sea exports of $9674 million were made by the 208 respondents whose exports were within a single commodity group or ascertained exactly. This represented 75 per cent of estimated total exports by sea by survey respondents. The individual group totals were reasonably sensitive to the allocation factors chosen, but the aggregate estimates for anticipated increase in export sales and inventory values were not. The groups most sensitive to the allocation factors were those with low representation by respondents. These groups were aggregated with other groups of related commodities for reporting purposes. Much more confidence can be placed on the aggregate estimates than on the estimates for the separate ATFCC categories.

MODAL SHARES

Air transport only was used by 34 of the 342 exporters whose responses were coded. Of the remaining 308 respondents, 111 used sea only, 196 used a mixture of sea and air, and one did not indicate the arrangements which applied. Six respondents, with a total of $703 million in export values, indicated that they used both air and sea transport but did not provide the proportions exported by each mode. Rather than lose the other information included in their responses, the average sea proportion was assumed.

Of the 369 importers whose responses were coded, 32 used air transport only, 230 used a mixture of sea and air, and 107 used sea only. Four respondents with total imports of $9 million indicated that they used both air and sea transport but did not provide the proportions imported by each mode. No adjustment was made in view of the small amount involved.

CONFIDENTIAL ITEMS

Many of the national cost estimates made by the Bureau involved proportional scaling of survey data within each of the ten commodity categories. Estimates of national imports and exports by sea within each commodity category were therefore required. This involved estimating the proportion of confidential items in the *Shipping and Air Cargo Commodity Statistics* (SACCS) and Import-Export series published by the Australian Bureau of Statistics (ABS).

Both the SACCS and Import-Export data are based on the same Australian Customs Service returns. The former are classified according to the date of arrival or departure of a vessel or aircraft, while the latter are entered for the month after ABS receives them following processing by Customs. Confidential items often involve imports or exports where there are just one or two participants. These are aggregated and included in the final category in published statistics.

The SACCS data were the primary source of actual import and export particulars for this study because information is provided about mode of transport. However, the SACCS publication includes more confidential items than the other ABS publications on imports and exports. These other ABS publications ABS (1989e, 1990) were used to allocate as many of the items which were included in the SACCS confidential items as possible. The Australian Bureau of Agricultural and Resource Economics (ABARE 1989) and the Bureau of Mineral Resources (1989) publish statistics of mineral exports including estimates of the exports of minerals, such as bauxite, which are included in the confidential items of ABS statistics. These estimates were used in the allocation process.

The allocated confidential items were split between air and sea transport using SACCS data for similar commodities. Because the data came from different sources, total exports and imports were incorrect after the allocation of the confidential items. The increments to the separate categories were scaled to adjust each total to the correct value.

GROSSING UP OF SURVEY RESULTS TO OBTAIN NATIONAL ESTIMATES

Where national estimates were required, survey totals or estimates within each commodity group were available from the responses received. National estimates for each commodity group were obtained by scaling up by the proportion of national sea imports or exports within the group to the survey respondents' sea imports or exports within that group. The overall national estimate was then obtained by adding the ten commodity group estimates.

APPENDIX VI CALCULATION OF THE NATIONAL WELFARE EFFECT OF WATERFRONT UNRELIABILITY ON EXPORTS

Waterfront unreliability increases the costs of supplying exports and reduces the attractiveness of Australian products for foreign buyers. This appendix presents a simple partial equilibrium model to analyse the impact of both effects on national welfare.

The effect of waterfront unreliability on foreign buyers can be viewed as reducing the price they are willing to pay for Australian exports. This approach is derived from the work of Lancaster (Tirole 1988). In this approach, goods are defined as bundles of characteristics for which consumers have preferences. The Lancastrian view is that the price consumers are willing to pay depends on the characteristics embodied in a particular good and the ranking they give to those characteristics. The characteristics can include such things as quality, colour, location, availability and so on.

For many Australian exports, an important characteristic is the reliability of supply. Waterfront unreliability can diminish this characteristic and foreign consumers can be expected to value Australian exports less than competing exports from other countries. A reduction of waterfront and shipping delays to negligible proportions could therefore be expected to be reflected in a shift in demand. This is illustrated in figure VI.1 by a move in the demand curve from D_1 to D_2.

In addition exporters incur costs of waterfront delays through financing costs, truck queuing costs and additional freight costs through ship delay costs passed on to freight rates and through the use of airfreight to avoid waterfront delays. The elimination of these costs is represented by a move in the supply curve from S_1 to S_2 in figure VI.1.

DEVELOPMENT OF THE THEORY

In the presence of waterfront and shipping delays, the price received by exporters for the exported good is OP_1 in figure VI.1 and the quantity shipped is OQ_1. The area P_2FEP_1 represents the costs of delays incurred by exporters. These costs can be estimated from data supplied by shipping companies and survey

respondents. The price difference ($OP_1 - OP_2$) can be estimated as the ratio of these costs to the value of exports.

The final equilibrium after both the demand and supply curves shift is at A with price OP_3 and quantity OQ_3. In figure VI.1 OP_3 is shown as being larger than OP_1 but it could also be smaller. The analysis needs to allow for this possibility. This can be checked by first considering the effect of the supply curve shift alone and by assuming no price change. Exports would under these conditions increase from OQ_1 to OQ_2. The proportional change in volume (and value since there is no price change) is given by:

$$(OQ_2 - OQ_1)/OQ_1 = E_S(OP_1 - OP_2)/OP_1 \qquad (1)$$

where E_S is the long-run elasticity of export supply.

The increase in export value found in this way can be compared with the increase expected by respondents to the survey. If the reported value is larger the final price, OP_3 will be larger than OP_1 and vice versa.

It is by no means clear that respondents to the survey took account of the price change when formulating their expectations about the potential increase in export sales. If they did not, they would have reported an anticipated increase in export sales volume of $OQ_4 - OQ_1$. This would overstate the increase if OP_3 is larger than OP_1 and understate it if OP_3 is less than OP_1.

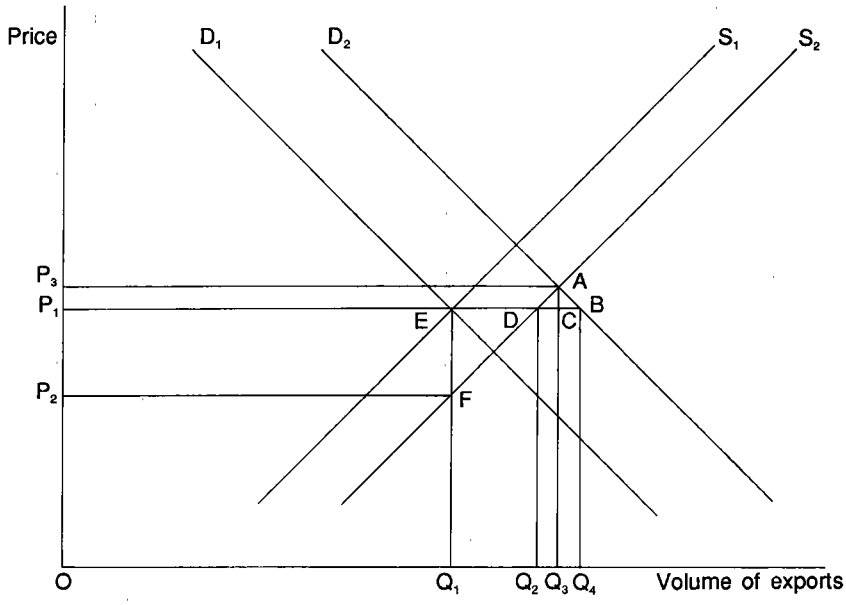


Figure VI.1 Effect of eliminating waterfront delays on export prices and volumes

The actual increase in value is given by the sum of $(OQ_3 - OQ_1)OP_1$ and $(OP_3 - OP_1)OQ_3$. For analysis purposes it is more convenient to consider only the increase in excess of that resulting from the supply curve shift, that is the increase relative to the area OQ_2DP_1 in figure VI.1. Relative to this export value the expected increase reported by respondents not taking account of the price change is $(OQ_4 - OQ_2)OP_1$ while the actual increase is $(OQ_3 - OQ_2)OP_1$ plus $(OP_3 - OP_1)OQ_3$.

Now

$$(OP_3 - OP_1)OQ_3 = (OP_3 - OP_1)[OQ_2 + (OQ_3 - OQ_2)] \quad (2)$$

and

$$(OP_3 - OP_1) = (OQ_3 - OQ_2)OP_1/OQ_2E_s \quad (3)$$

and from the triangle ADB it can be shown that

$$(OQ_3 - OQ_2) = (OQ_4 - OQ_2)E_s/(E_s - E_d) \quad (4)$$

where E_d is the long-run elasticity of demand for Australian exports.

$$\text{Let } E_s/(E_s - E_d) = K \quad (5)$$

which gives

$$(OP_3 - OP_1)OQ_3 = K(OQ_4 - OQ_2)OP_1(1 + \alpha)/E_s \quad (6)$$

$$\text{where } \alpha = (OQ_3 - OQ_2)/OQ_2 \quad (7)$$

and α can be found from the reported increase by use of equation 4.

The total actual increase is then given by

$$\text{Actual increase} = (OQ_4 - OQ_2)OP_1\, K[1 + (1 + \alpha)/E_s] \quad (8)$$

$$= (OQ_4 - OQ_2)OP_1[(E_s + 1 + \alpha)/(E_s - E_d)] \quad (9)$$

The actual increase can then be found from the reported increase by multiplying the reported increase by the factor in square brackets in equation 9.

The next stage of the analysis is to estimate the price change relative to OP_1. The increase in export value in excess of that estimated as due to the shift in the supply curve will have two components. The first component is that due to an expansion in volume and the second is that due to the change in price.

Let ß be the proportional increase in export value in addition to that due to the supply curve shift with no price change. Let ß be relative to the area OQ_2DP_1.

$$\text{Then } ß = [(OP_3 - OP_1)/OP_1 + (OP_3 - OP_1)(OQ_3 - OQ_2)/(OP_1\, OQ_2) + (OQ_3 - OQ_2)/OQ_2] \quad (10)$$

Now

$$(OQ_3 - OQ_2)/OQ_2 = E_S(OP_3 - OP_1)/OP_1 \qquad (11)$$

Therefore

$$[E_S(OP_3 - OP_1)/OP_1]^2 + (E_S + 1)(OP_3 - OP_1)/OP_1 - \beta = 0 \qquad (12)$$

The proportional price increase $(OP_3 - OP_1)/OP_1$ can then be found by solving this quadratic equation.

The total change in national welfare (the area P_2FAP_3) can now be estimated from the supply elasticity, the value of the original exports and the price difference $OP_3 - OP_2$. ($OP_3 - OP_1$ is found from the solution to equation 12 and $OP_1 - OP_2$ is found from the estimation of the costs incurred by exporters.)

VALUES OF THE ELASTICITIES

Estimation of supply and demand elasticities is by no means a topic on which economists agree. For the purpose of this analysis, values which were considered plausible were chosen from the range of values available in the literature.

The long-run price elasticity of demand for Australian exports is especially subject to debate. The ORANI model, for example, uses a value of –20 for most primary commodities but makes a major exception for wool for which a value of –1.3 is used (Dixon, Parmenter and Rimmer 1983; Cronin 1985). These are very much higher than empirically derived long-run elasticities. For example, Jonson, McKibbin and Trevor (1980) quoted a value of -0.12 for the long run aggregate demand elasticity for Australian exports and Hickman and Lau (1973) estimated a value of –0.74. Gordon (1986) reported the results of nine previous studies of export demand elasticities, one of which was that by Hickman and Lau (1973), and seven had results in the range –0.02 to –0.74.

The remaining estimate reported by Gordon (1986) of –4 is by Stoeckel (1978), but this was not an econometrically derived result. Stoeckel argued that the econometrically derived results were implausibly low. Based on an assessment of Australia's share in world trade and export supply elasticities for the rest of the world he concluded that –4 would be a more plausible value for the export demand elasticities for agriculture and mining exports. Similarly, on the basis of some comments of Harberger, Jonson, McKibbin and Trevor (1980) suggested that –2 was a lower bound for the long-run export demand elasticity.

Cronin (1983) commented that demand elasticities estimated 'from carefully derived analyses of individual commodity markets are usually smaller than those used by the IAC'. After making separate analyses for beef and coal, Cronin said he considered the most plausible values for the long-run export demand

elasticities are about –4 for both rural products and minerals. Cassidy (1981) cited a range of -1.66 to –2.66 derived by McDougall and commented that these estimates were thought to be biased downwards. These elasticities were derived for exports transported by liner shipping.

On balance it seems that a value of –4 for all commodity groups would be more plausible than the rather large value of –20 used in ORANI. For this reason a value of –4 was used for all commodity groups except for elaborately transformed manufactures for which a value of –10 was assumed.

A range of opinions have also been expressed about price elasticities of supply. The commodities subjected to the most attention have been rural products and minerals. Pandey, Piggott and MacAulay (1982) estimated the value of the long-run aggregate farm supply elasticity to lie between 0.6 and close to 1.0 depending on the assumptions made. Lloyd (1983) noted that empirical studies rarely resulted in values greater than one for the long-run aggregate production supply elasticity. However, the export supply elasticity exceeds the production supply elasticity since it is a weighted function of the production supply elasticity and the domestic demand elasticity (Pandey, Piggott and MacAulay 1982).[1]

Data in the Input-Output Table for 1983–84 (ABS 1989c) indicate that exports of food and wool comprise about 30 per cent of Australian production of these commodities. Using this information plus a value of –0.2 for the domestic price demand elasticity (Tweeten 1967), 1.0 for the production supply elasticity (Pandey, Piggott and MacAulay 1982; Lloyd 1983) and 0.5 for the price transmission elasticities gives a value of 1.9 for the export supply elasticity. This was rounded to 2 for use for the ATFCC group of food and live animals, which is mainly agricultural output.

The next major commodity for which empirical results are available is minerals. Cronin (1983) commented that ORANI used a supply elasticity of infinity for minerals, that is, changes in supply can occur without changes in price. Cronin argued that expansion of mineral supply generally incurred higher costs through the use of lower quality ore, increased inland transport costs and so on. This suggests a much lower elasticity of supply. He also cited overseas empirical work which estimated supply elasticities to be in the range 0.2 to 2.0 and reported a particular result for coal of 5. More recent evidence discussed by Freebairn (1989) also indicates that a plausible value for coal is 5. On the basis of the

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1. An increment in exports can be achieved by either increasing Australian production or by decreasing Australian consumption, or some combination of these. Formally we should take account of both effects by defining the export supply elasticity as:

   $E_X = E_S\,(S/X)\phi_{SX} + E_C\,(C/X)\phi_{CX}$

   Where E_S is the elasticity of production supply, E_C that of consumption demand, S is Australian production, C is Australian consumption and X is Australian exports. The ϕ are the price transmission elasticities.

available information a value of 2 was chosen for crude materials and a value of 5 was chosen for mineral fuels (mainly coal).

Simply transformed manufactures (STMs) also depend to a large extent on inputs from the rural or mining industries. Expansion of STM exports would require increased production of rural or mining products, or diversion from exports of rural or mining products. Hence STMs are likely to experience some constraints inhibiting increased production, and so expansion is likely to incur increased marginal costs. A value of 2.0 was therefore assumed for those exports.

The final group of commodities is the elaborately transformed manufactures (ETMs). For the most part production of these commodities can be expanded with no increase in long-run marginal costs, especially in the current environment where there is a pool of unemployed labour and a high degree of capital mobility. In general, factor inputs are unlikely to be constrained, except perhaps for some categories of highly skilled labour. Moreover, exports of ETMs are small relative to Australian domestic demand, so that the export supply elasticity for ETMs is likely to be very much greater than the production supply elasticity. For this reason a high value of 10 was chosen for the supply elasticity of these commodities.

The elasticities chosen for the single-digit broad categories of export commodities are summarised in table VI.1.

TABLE VI.1 PRICE ELASTICITIES OF EXPORT SUPPLY AND DEMAND ASSUMED FOR NATIONAL WELFARE CALCULATIONS

ATFCC classification		*Demand elasticity*	*Supply elasticity*
0	Food and live animal	–4.0	2.0
1	Beverages and tobacco	–4.0	2.0
2	Crude materials	–4.0	2.0
3	Mineral fuels	–4.0	5.0
4	Animal and vegetable oils	–4.0	2.0
5	Chemicals	–10.0	10.0
6	Processed materials[a]	–4.0	2.0
7	Machinery and transport equipment	–10.0	10.0
8	Miscellaneous manufactures	–10.0	10.0
9	Other	–4.0	2.0

a. Manufactured goods classified chiefly by material (approximates simply transformed manufactures).

Source Cassidy (1981); Cronin (1983, 1985); Dixon, Parmenter & Rimmer (1983); Lloyd (1983).

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Abbreviations

ABS	Australian Bureau of Statistics
ACOS	Australian Chamber of Shipping
AESC	Australia to Europe Shipping Conference
AGPS	Australian Government Publishing Service
ANL	Australian National Line
ANZECS	Australia New Zealand Europe Container Service
BTCE	Bureau of Transport and Communications Economics
BTE	Bureau of Transport Economics
IAC	Industries Assistance Commission
ISC	Inter-State Commission
NSWRFTIC	New South Wales Road Freight Transport Industry Council
PMA	Port of Melbourne Authority
VRTA	Victorian Road Transport Association
WIRA	Waterfront Industry Reform Authority

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ABBREVIATIONS

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACOS	Australian Chamber of Shipping
AESC	Australia to Europe Shipping Conference
AMC	Australian Manufacturing Council
ANL	Australian National Line
ANZECS	Australia New Zealand Europe Container Service
ATFCC	Australian Transport Freight Commodity Classification
Austrade	Australian Trade Commission
AWB	Australian Wheat Board
BMR	Bureau of Mineral Resources
BTCE	Bureau of Transport and Communications Economics
BTE	Bureau of Transport Economics
BTESHIP	A model of ship operating costs
CTAL	Container Terminals of Australia Limited
DCN	Daily Commercial News
DTC	Department of Transport and Communications
EDI	Electronic data interchange
ETMs	Elaborately transformed manufactures
FCL	Full container load
f.o.b.	Free on board (purchaser pays carriage charges and so on from point specified)
IAC	Industries Assistance Commission
ISC	Inter-State Commission
LCL	Less than container load
MSB	Maritime Services Board of New South Wales
NTAL	National Terminals of Australia Limited
NSWRFTIC	New South Wales Road Freight Transport Industry Council
NWT	Net Working Time
PMA	Port of Melbourne Authority
PSA	Prices Surveillance Authority
ro-ro	Roll-on roll-off
SACCS	Shipping and Air Cargo Commodity Statistics

STMs	Simply transformed manufactures
TEU	20-foot equivalent units
TPC	Trade Practices Commission
VRTA	Victorian Road Transport Association
WIRA	Waterfront Industry Reform Authority