FORCES OF TECHNOLOGICAL CHANGE AFFECTING AUSTRALIAN PORTS

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ABSTRACT: *The paper examines how the cargo handling arrangements at Australian ports have adapted to the challenge of containerisation and questions whether we have taken full advantage of the opportunities which this technological innovation provided.*

It reviews the cargo handling scenario of the early 1960's with conventional cargoes; the developments in ships, berths, equipment, work practices and operational arrangements which have followed containerisation; the institutional changes which have taken place over that period following the National Stevedoring Industry conferences of 1967 and 1977 and then considers the present position of the land-based elements of the shipping task as outlined in the report of the Task Force on Shore-Based Shipping Costs.

The paper concludes that the potential for improved efficiency that was held out for containerisation has not been fully realised. It then outlines the actions now being undertaken by the Federal Government in association with parties in the industry to address the problems outlined in the Task Force Report.

TECHNOLOGICAL CHANGE AFFECTING AUSTRALIAN PORTS

A. INTRODUCTION

Technological innovations in cargo handling methods have had an extensive impact on the institutional arrangements in Australian ports over recent decades. The most significant have been the introduction of bulk handling technologies and the introduction of containerisation. This paper specifically examines the effect of the latter development.

It has often been stated that containerisation has revolutionised the world's transport systems and brought far reaching benefits to all trading nations. This paper examines how the cargo handling arrangements at Australian ports have adapted to the challenge of containerisation and compares this to the prior claims and predictions made in favour of the new technology.

The success of containerisation has usually been viewed in terms of the time taken for a vessel to load or discharge cargo; in terms of the amount of time it spends in port compared with at sea; and in terms of the amount of cargo that has been shifted. In these terms containerisation has brought clear benefits. However, the movement of cargo does not just involve the shipping element and the aim of this paper is to examine the impact of containerisation on the various other elements of the transport chain. The paper considers whether Australia has taken full advantage of the opportunities which containerisation has provided.

The paper reviews the cargo handling scenario of the early 1960's with conventional cargoes; the developments in ships, berths, handling practices and operational arrangements which have followed containerisation; the institutional changes which have taken place over the period and then considers the present position of the land-based elements of the shipping task as outlined in the report of the Task Force on Shore Based Shipping Costs.

The paper concludes that the potential for improved efficiency that was held out for containerisation has not been fully realised. It then outlines the actions now being undertaken by the Federal Government in association with parties in the industry to address the problems outlined in the Task Force Report.

B. CARGO HANDLING ARRANGEMENT PRIOR TO CONTAINERISATION

Prior to containerisation Australian general cargo trades were handled by relatively small conventional vessels. In 1968 these ships made some 300 voyages between Europe and Australia with an average of 12,000 tonnes of cargo and visited 4 or 5 ports (ASIA 1968 p.68).

Round voyages between Europe and Australia took up to 160 days with up to 50% of that time being spent in port; ships spent on average 34 days in Australian waters.

Conventional stevedoring methods provided an effective limit to the size of vessels. On average vessels spent 4.6 days in each Australian port visited, of this 3.8 days were spent stevedoring. With some 1800 tonnes of cargo being loaded and unloaded at each port. Any increase in the size of a vessel worked conventionally would have necessitated an increase in port time, which would not have been cost effective. For a ship operator time in port is unproductive time.

The potential gains in productivity which could be achieved by the greater unitisation of cargoes and improved cargo handling methods were apparent even in the mid 1960's. Shipowners had tried to overcome the problems caused by slow ship turnaround by greater unitisation of cargoes, such as preslinging and palletisation. By these methods Scandia vessels, introduced in the mid 1960's, were able to complete the longer voyages between Scandinavia and Australia in around 120 days compared to 160 days for normal conventional vessels plying shorter European routes.

Over the period 1962-63 to 1966-67 the handling rate for interstate vessels increased from 485 to 776 tonnes per day, a 60% increase and twice that for overseas vessels. This change reflects the higher degree of unitisation and progressive introduction of roll-on/roll-off vessels into Australian coastal trades over the period. The effects are clearly shown in the difference between cargo handling rates for interstate and overseas vessels shown in Figure 1.

Port facilities in Australia reflected the need to handle large numbers of small vessels which turned around slowly. Large numbers of finger type wharves were necessary. These conventional berths could handle between 100,000 and 150,000 tonnes of cargo per year (ASIA 1967, p.23). Wharves were equiped with warehouses providing undercover storage space with weather and security protection. Cargoes were loaded directly from the warehouse on the wharf.

This system meant that individual cargoes were handled many times. General cargo was handled up to 20 times during its movement from the producer to the ship; wool was handled up to 100 times (Senate Evidence 1968, p.1179). As a result of this damage and theft was a major concern of shippers world wide. It was estimated by a United States International Cargo Handling Co-ordination Association committee dealing with cargo loss prevention, that in the 1950's theft and pilferage over the whole transport chain accounted for up to 16% of tonnage carried, with damage accounting for a further 16% (Stapleton, 1981). In Australia the situation was considered to be somewhat better, although still of serious concern.

A substantial workforce was required to handle this cargo at the wharves. In 1969, the last year before containerisation, there were over 18,000 registered waterside workers, handling some 38.7 million tonnes of cargo - at a handling rate of 1.32 tonnes per manhour. (See Figure 2). Even at this stage technological change was having its effects. The combination of increasing use of bulk handling

techniques and unitisations had enabled a reduction in the waterside worker workforce from 25,000 in 1958 to 18,000 in 1969, a 28% reduction, while at the same time total cargo throughput had increased by 67% to 38.7 million tonnes.

C. THE PROMISES OF CONTAINERISATION

Unitisation of cargo was recognised as an effective means of reducing costs by improving ship turnaround times. However, for a long time the introduction of containerisation on long haul routes was retarded by a strongly held belief that full utilisation of available stowage space was essential to maximise the profitability of the voyage (ASIA 1967, p.22). On the other hand while individual packing of cargo into holds enabled full utilisation of space, it was expensive in terms of time, manpower and hence labour costs.

By the mid 1960's there was a growing recognition that the introduction of containers into longer haul routes was necessary to improve the efficiency of cargo handling procedures, improve ship turnaround and reduce costs. This change in attitude is reflected in the growing numbers of inquiries and studies that reported in favour of containerisation during the latter part of the 1960's (Van Den Burg 1975).

In Australia, the move towards containerisation was the subject of a number of investigations, including the 1967-68 Senate Inquiry into the Container Method of Handling Cargoes. Evidence before that inquiry provides a significant insight into what was expected of containerisation at the time and reveals optimism on the part of shipping lines and stevedores.

The then Development Manager of James Patrick and Co. Mr Kucharzewski's evidence to the Inquiry, relied heavily on the recently completed McKinsey Report for the British Transport Docks Board and listed some of the advantages that could be expected. For example, he stated "the potential reductions in transportation costs that the use of containers can bring about are of major importance and can be greater than 50 percent in may cases". Further, "the dramatic reduction in transportation costs will have a major impact on companies trading internationally where products contain a significant transportation cost element". And finally, "labour productivity would increase by more than a factor of 20 and port cost would reduce to one-fifth of the break bulk costs then prevailing" (Senate Evidence 1968, p.2986).

Evidence by shipping lines highlighted the intermodal, door-to-door service concept of containerisation. Mr Gorman of Farrell Lines said his company "would provide by 1970 a total distribution system which will be an integrated, intermodal system approach to transportation and would encompass not only carrying out traditional maritime activity but also co-ordinating activities of many internal modes of transportation services." The Company's plan envisaged "a working relationship with existing motor truckers, railroads and

coastal feeder ships all acting in concert to provide the shipping public with options for through movement of cargo from the exporters warehouse to importers warehouse to obtain maximum transport efficiency at minimum total cost" (Senate Evidence 1968, p.2122-2124).

In its Report the Senate Committee was less optimistic. It was concerned that there had been "an element of haste in introducing the container system to Australia without sufficient time for adequate consultation between the many interests involved" (Senate 1968, p.5). It was concerned that the future planning of ports was not sufficiently far sighted in some instances.

The Committee concluded there were advantages with an intermodal system and that "conceptually, there should be a reduction in the cost of transport of Australia's exports by container operators, both on the sea leg of the operation and on the through transport operation" (Senate 1968, p.75). The Committee noted however that "the percentage reduction (in cost) remains in doubt in relation to varying cargoes" (Senate 1968, p.75).

The Australian Stevedoring Industry Authority also gave a more sober commentary in its 1966/67 report stressing the need for "integration so that the operator retains control of the cargo throughout, and ensures that the cargo flow is such as to meet the needs of necessarily tight schedules".

It also pointed out that "large ports may face the writing off of many berths, particularly those which are not suitable for unit loads. New berthage will have to allow for high rates of cargo throughput rather than provide vast areas of shed storage space", (ASIA 1967, p.22-23).

It is clear from these comments that while containerisation promised benefits of reduced costs to shippers and improved productivity, particularly in the ports, the concept relied significantly on achievement and adherence to a co-ordinated integrated multimodal transport operation and provision of appropriate port infrastructure.

It was also clear that fundamental changes in practices would be necessary to achieve the full benefits of the move to containerisation.

D. CONTAINERISATION IN AUSTRALIA

Having seen what containerisation promised it is now appropriate to consider the situation today, eighteen years later, and review what infrastructure and systems Australia has in place.

In Part B we saw that there were some 300 voyages from Europe to Australia by conventional vessels in the late 1960's. By the mid 1980's we still find that there are a similar number of voyages, but shared by container, other unitised and conventional vessels. Unitised cargoes are transported in about two thirds of the tonnage in less than half of the total number of voyages.

On average these vessels handle around three times the volume of cargo in half the amount of time as the vessels which handled our trade before containerisation. Modern container vessels on the Europe to Australia trade are taking 80 to 90 days to complete a round voyage. These vessels carry 1500 to 2000 teu and range in size generally from 25,000 to 35,000 dwt, although some vessels are over 40,000 dwt and carry about 2,500 teu.

Vessels today are spending an average of only eleven days in Australian waters visiting two or three ports, with 2.2 to 3.4 days in each Australian port. Stevedoring has been estimated to take about 1.75 days to move an average 6,000 tonnes of cargo; a significant improvement on the 1800 tonnes in 3.8 days which was the average prior to containerisation.

Containerised cargo accounts for nearly 60 percent of total non-bulk cargo, although as is shown in Figure 3 this figure is much higher in the major ports.

The main five non-bulk ports of Sydney, Melbourne, Fremantle, Brisbane and Adelaide handle over 85 per cent of total non-bulk cargo movements in Australia and 96 per cent of container tonnage movements (BTE 1986, p.67). Sydney and Melbourne together handle over 80 per cent of the container movements. The growth of containerised cargo movements in relation to other non-bulk cargoes can be seen in Figure 4.

To accommodate the move to containerisation the main Australian ports have been gradually transformed by considerable capital works. There are now eleven purpose built international container terminals in the five main ports.

Prior to containerisation wharves were generally common user facilities at which a great number of stevedoring companies operated.

The concentration of cargo flows into fewer berths has meant that only a few conventional stevedores have made the transition and become container terminal operators. These have generally been those stevedores who are integrated with and have the financial support of much larger organisations with the capacity to make the capital investment in machinery and terminal facilities.

Given the need for a timely and speedy servicing of container vessels at terminals it is not surprising that today, of the five main container terminal owning groups, four are consortia of shipping companies which utilise the ports where the terminals are located.

These container terminals are a central element in the development of containerisation in that their productivity and cost structure are major elements in the total shipping cost of moving goods between Australia and its overseas market.

Containerisation not only influenced the role of the stevedore, but it also resulted in the need for the development of inland infrastructure, primarily the establishment of depots to pack and unpack less than full container load consignments, a task previously undertaken primarily at the waterfront.

The shipping lines' attempts to introduce an integrated door to door service meant that they were instrumental in establishing depots for international cargoes; a function which logically could have been expected to be taken up by freight forwarders and landside operators.

As a consequence three out of the four international depots in Sydney and two out of the four in Melbourne are controlled by shipping line interests. This linkage has had the effect of extending the cost structure of the waterfront into the international depots.

The role of depots has greatly diminished over the years. In the first years of containerisation, depots handled as much as 40 per cent of containerised cargo. This level of activity has fallen continually since the mid 1970's, to a point where only about 10 to 13 per cent of cargo is now handled by depots. This change reflects the cost structure of the depots, the institutional arrangements applying to depot operations and the greater sophistication of importers and exporters in container use.

Not only have we seen a change in the hardware and infrastructure of the shore-based shipping sector, but there have been concurrent significant structural changes in the waterside workforce. The impact of the technological and structural changes is illustrated by the significant reduction in the numbers of waterside workers shown in Figure (5).

It was always envisaged that significant reductions in waterfront manpower would be required to achieve the benefits of containerisation. In general, the negotiations between employers and employees concerning the introduction of containerisation were carried out successfully. This allowed fully containerised operations to commence in Australia with less distruption than in some other countries. However, levies and charges designed to facilitate the reduction of the work force have imposed significant additional costs on cargo handling.

The progressive implementation of permanent employment, and gradual improvement of pension and redundancy schemes following the National Stevedoring Industry Conference of 1966-67, chaired by the then Mr A.E. Woodward QC, provide the backdrop to changes to the labour force during the period of containerisation.

It was inevitable that a sharp reduction in employment opportunities would bring strong union demands for job preservation and retention of existing work practices to protect employment levels. Many of these concerns remain today.

The continuing mismatch of workload and available registered waterside workers led to the need for continuing review of the institutional arrangements in the industry during the 1970's. These culminated in the second National Stevedoring Industry Conference in 1976, chaired by Sir Richard Kirby. This conference led to the present arrangements in the industry with the abolition of the Australian Stevedoring Industry Authority and the abolition of labour pools at major ports. Labour in ports of Brisbane, Sydney, Melbourne, Port Adelaide and Fremantle is now employed by individual stevedores. Labour pooling arrangements continue to operate at other ports.

It is clear from the above that containerisation has brought about or encouraged significant structural changes in the industry. What is in question is how successful the changes in technology, hardware and administrative structures have been in realising the promised benefits.

Overall there have been significant increases in the amount of cargo being handled through Australian ports, both in absolute terms and on a manhour worked basis. Estimates of the tonnes stevedored per man hour for container terminals and other non-bulk berths are shown in Figure (6).

The introduction of containers caused a significant once-off jump in productivity in handling non-bulk cargo. However, since the late 1960's there has been no significant increase in productivity. It has fluctuated around 4.4 tonnes per manhour. In both other non-bulk and bulk cargoes there has been steady improvements in productivity with increases of 340 per cent and 230 per cent respectively in tonnes handled per man hour.

While lack of comparable data limits the ability to make valid comparisons, it is clear Australian container terminals have not, in general, managed to achieve the average loading and discharging rates that have been achieved overseas. It has been claimed that Australian terminals do not normally average more than about 15 containers per hour per crane as against 25 to 40 per hour per crane obtainable in Europe and the Far East (personal communication).

Concerns about the efficiency of Australia's waterfront in handling containerised cargo have been raised on numerous occasions since they first appeared in Australia some 20 years ago.

The first real problems arose in the early 1970's when the Government's decision to reduce all tariffs on imported goods by 25% resulted in an import boom which pushed the then recently developed facilities to their limits, particularly in Sydney. As the boom faded and following heavy investment in new terminal infrastructure, the immediate problems were alleviated. It is interesting to note that even at that stage it was believed that had the productivity of Australian waterfront operations matched those of its overseas trading partners, these problems would not have arisen at all (Summers 1976, p. 5).

Later in the 1970's the Prices Justification Tribunal (PJT 1977) held a series of inquiries into stevedoring charges. In a number of cases it found that not only were the increase requested by stevedores not justified, but that the initial rates were excessive and should be reduced.

The Tribunal also commented adversely on the efficiency of the stevedoring operations, including the comparatively high labour costs and the inability of the companies to resolve their redundancy problems.

In recent years the ability of container terminal operators to pass on their costs has been constrained. This has been the result of increased competition between operators for declining cargo volumes (particularly imports) and increasing participation in Australian trades of non-conference lines which are not tied to any of the existing terminal operators. However, as noted by the BTE it is possible that the current competitive pressures will not continue in the longer term (BIE 1986, p. 183).

The door-to-door service concept inherent in containerisation relies heavily on efficient integration between the shore side and the land transport sector, particularly the road transport sector, for its success. It is this interface where there has been considerable criticism of current Australian arrangements.

The containerisation concept as initially espoused by the shipping lines, such as Farrell Lines, envisaged that one party would co-ordinate the total distribution system. This would be an integrated multimodal system, moving cargo from warehouse to warehouse.

In the early days of containerisation, up to two-thirds of cargo was transported as part of a door-to-door service. However, the competition provided by independent truckers to the shipowner linked carriers resulted in the former becoming dominant in the market place. As they attracted cargo away from shipowner linked carriers, the multi-modal concept broke down.

The breakdown of the original integrated service concept has allowed inefficiencies and bottlenecks to arise. The Industry Task Force on Shore-Based Shipping noted that as a result there were now two independent systems operating in the shore side transport chain

- the system for moving cargo between the ship and the terminal, and
- the system for moving cargo between the importer/exporter premises and the terminal.

There is no contractual or commercial link between the two systems.

E. RECENT INITIATIVES TO IMPROVE WATERFRONT EFFICIENCY

The continuing international recession in the 1980's and its impact on Australia has provided the catalyst for the intensive attention

which has been focussed on shore-based shipping operations over recent years.

In manufacturing industries the introduction of just-in-time production processes and increased use of imported components have highlighted the vulnerability of industry to delays and inefficiencies imposed at the waterfront. Similarly reduced prices for traditional exports have focussed attention on the high costs and unreliability of shore based shipping operations. Improving waterfront efficiency and reliability has been recognised as being a critical factor in achieving international competitiveness.

It was in recognition of these concerns that in July 1984 the Federal Minister for Transport, Mr Peter Morris asked the Bureau of Transport Economics to convene a seminar on shore-based shipping costs. This represented the first occasion that the disparate elements of the industry were brought together to address the totality of the issues.

The Seminar report (BTE 1984) indicates there was a general recognition that not only did the individual areas of the transport chain need to become more productive, but that there was also a significant lack of coordination between these areas which exacerbated the problems.

Individual participants indicated that because of the problems the promised benefits of containerisation had failed to materialise. In some cases importers and exporters were said to be moving away from using containers because of delays at container terminals (BTE 1984, p. 55).

There was a general consensus that further action was required. In September 1984 the Minister for Transport took up that suggestion made by seminar participants that an Industry Task Force should be appointed to look at these matters.

The Industry Task Force on Shore Based Shipping Costs was headed by Mr Ian Webber, Managing Director, Mayne Nickless Ltd and comprised representatives of major groups in the industry.

The aim of the Task Force was to determine practical measures to increase the operational efficiency and lower the costs of the land based elements associated with the movement of cargo by sea.

The Final Report of the Task Force which was released in July 1986, contained broadly based findings and recommendations identifying issues to be addressed by each sector of the industry. These recommendations fell into five main areas

- improvements to productivity and reliability of stevedoring and depot sector by changed management and labour practices

- correction of interface problems between land transport and stevedoring terminals by reallocation of resources and new procedures

- reorientation of port authority activities towards commercial basis and greater responsiveness to client/user needs

- better co-ordination and consultation between land transport services and users

- introduction of industry-wide electronic communication and information system and development of industry productivity and performance measures.

Following release of the Report, the Federal Minister sought public comments on it and held a series of meetings with key participants in the industry to discuss how best to progress the Task Force's work.

On 11 December 1986, the Federal Government announced its waterfront strategy for addressing matters arising from the Task Force report. The strategy involves four bodies under the umbrella of the Inter-State Commission (ISC) finding ways to improve the efficiency, productivity, reliability and industrial relations record of Australia's waterfront :

(1) the Stevedoring Industry Review Committee, comprising senior management and union representatives under the Chairmanship of Sir John Moore. The Committee is examining a range of problems associated with management and work practices in the stevedoring industry

(2) an Industry Committee, under the Chairmanship of Mr Ian Webber, is co-ordinating working parties comprising representatives from all sectors associated with shore-based shipping. These groups are tackling impediments arising from commercial practices, documentation, marketing structures and inadequate communication systems

(3) an Importer/Exporter Panel has been formed consisting of representatives of exporters and importers of rural, mining and manufacturing goods. Its role is to represent the views and present the problems of customer industries whose performance depends on the efficiency of the waterfront and related areas.

(4) and finally the Standing Committee on Transport, which consists of the senior State, Territory and Commonwealth Government officials with responsibility for transport matters, is pursuing both port and railway matters covered in the Task Force's recommendations. These primarily relate to improving the commercial responsiveness of port and rail authorities to user needs.

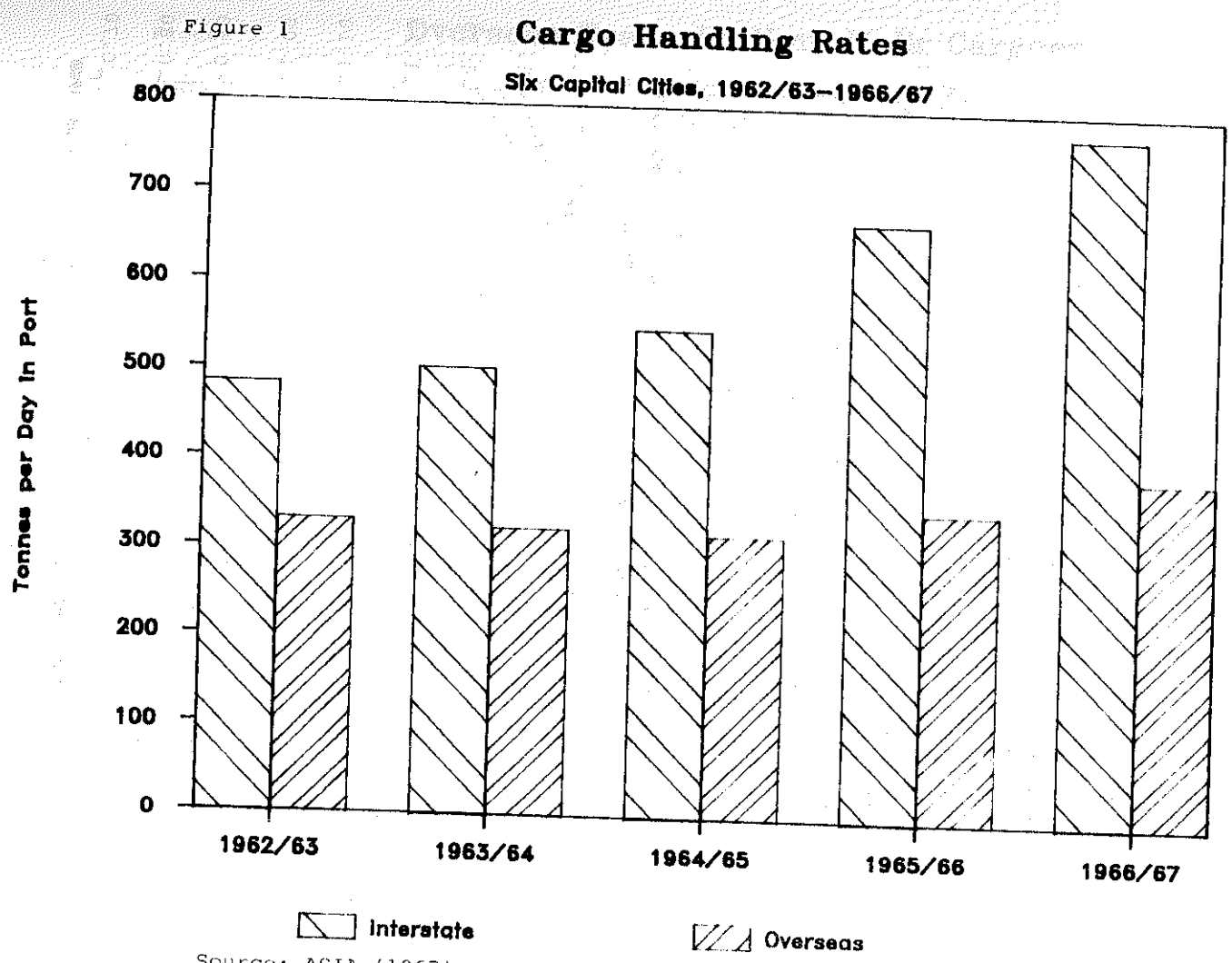
The ISC will monitor the initiatives being undertaken in these groups and will report to the Federal Government on progress and any necessary action at the Governmental level. The Commission will also be preparing a long term integrated plan for the future development of the industry. One of its initial tasks will be to

develop, in consultation with all interested parties, performance indicators which will enable the industry's efficiency to be adequately measured.

F. CONCLUSIONS

The introduction of containerisation has brought about fundamental changes in cargo handling methods for Australia's non-bulk overseas trades. However, the benefits from containerisation have not been as clear cut or as sweeping as anticipated when the move to containerisation was being contemplated. This is reflected in the widespread recognition of the need to improve the efficiency, productivity, reliability and industrial relations record of Australia's waterfront. These issues are the central focus of the Government's waterfront strategy.

Figure 1



Source: ASIA (1967)

Figure 2a

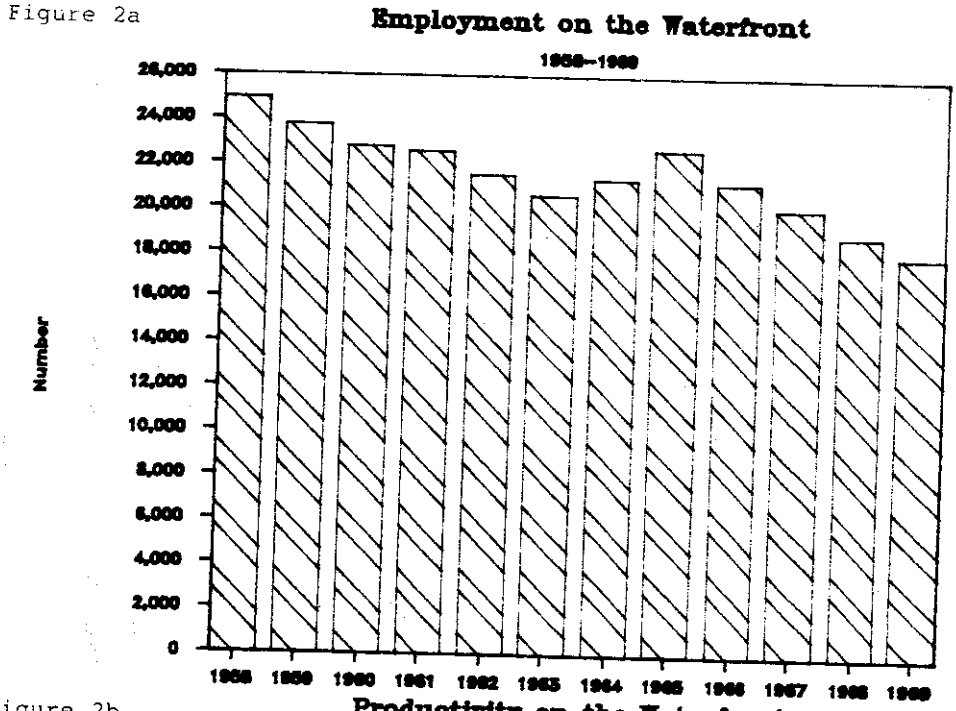
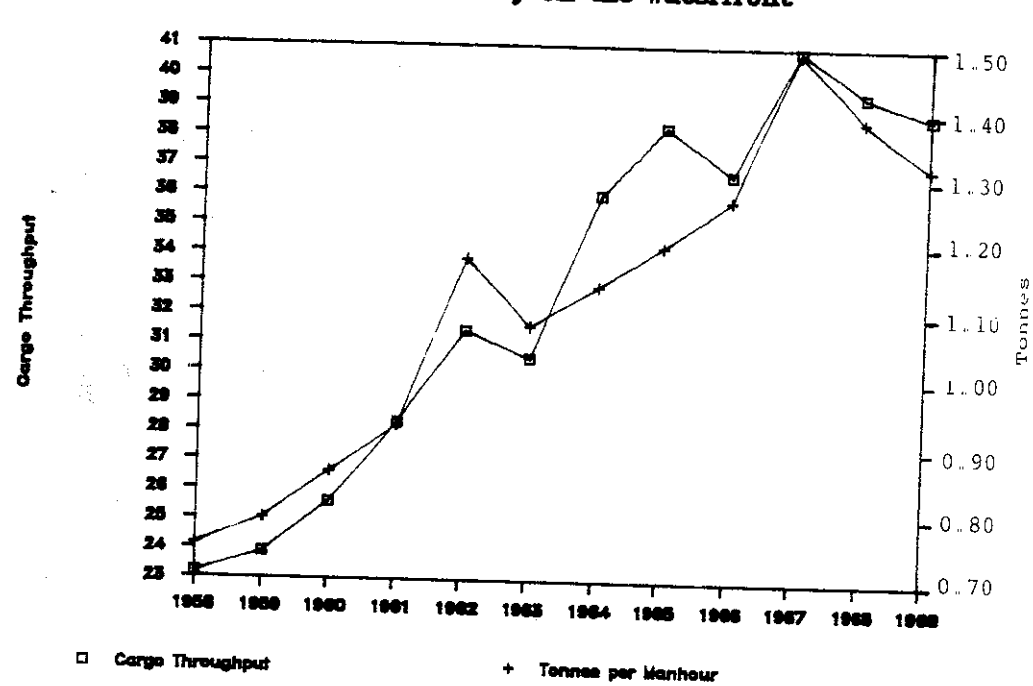
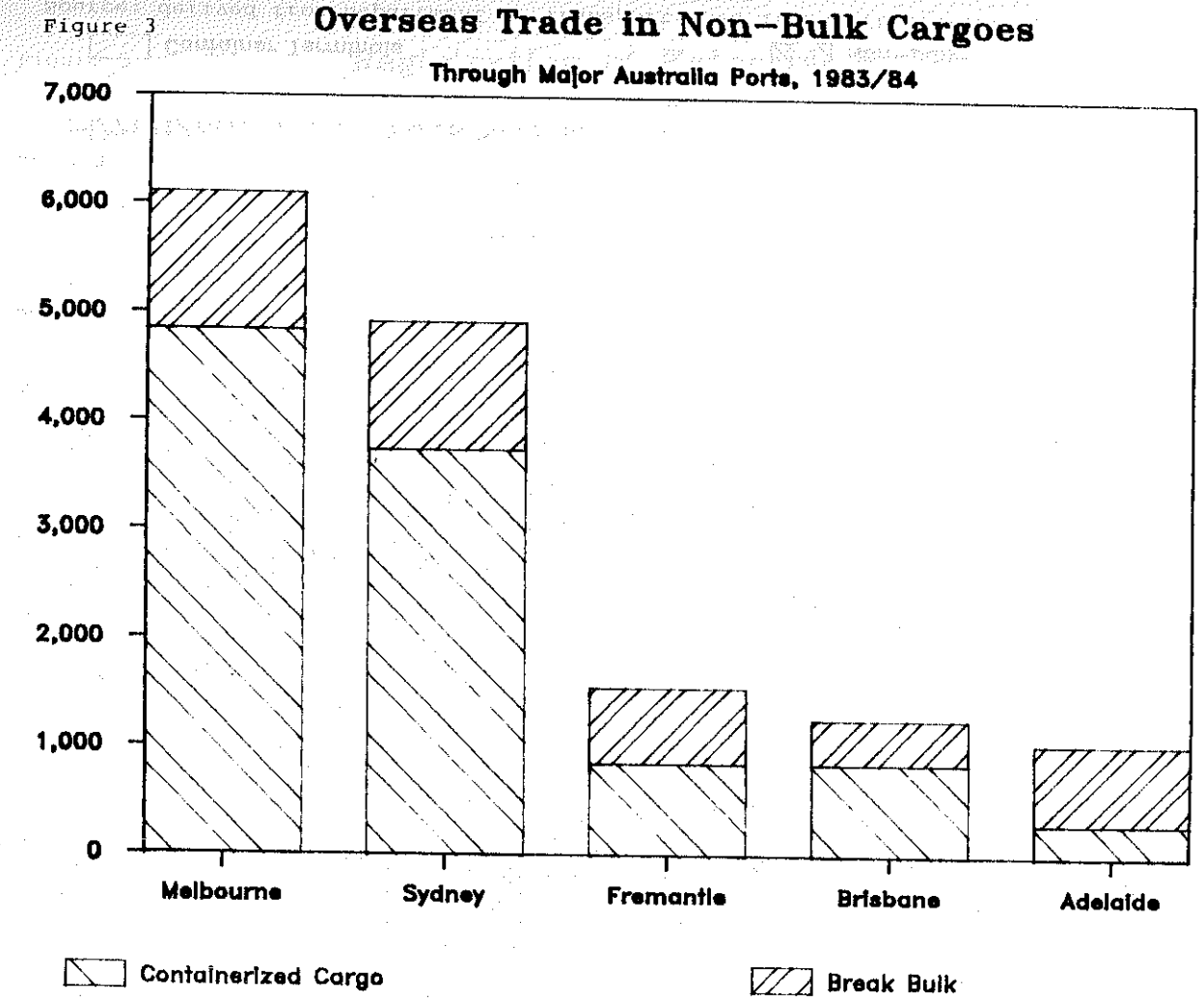


Figure 2b



SOURCE : derived from Department of Transport - Sea Transport Statistics 1977-78 and 1978-79

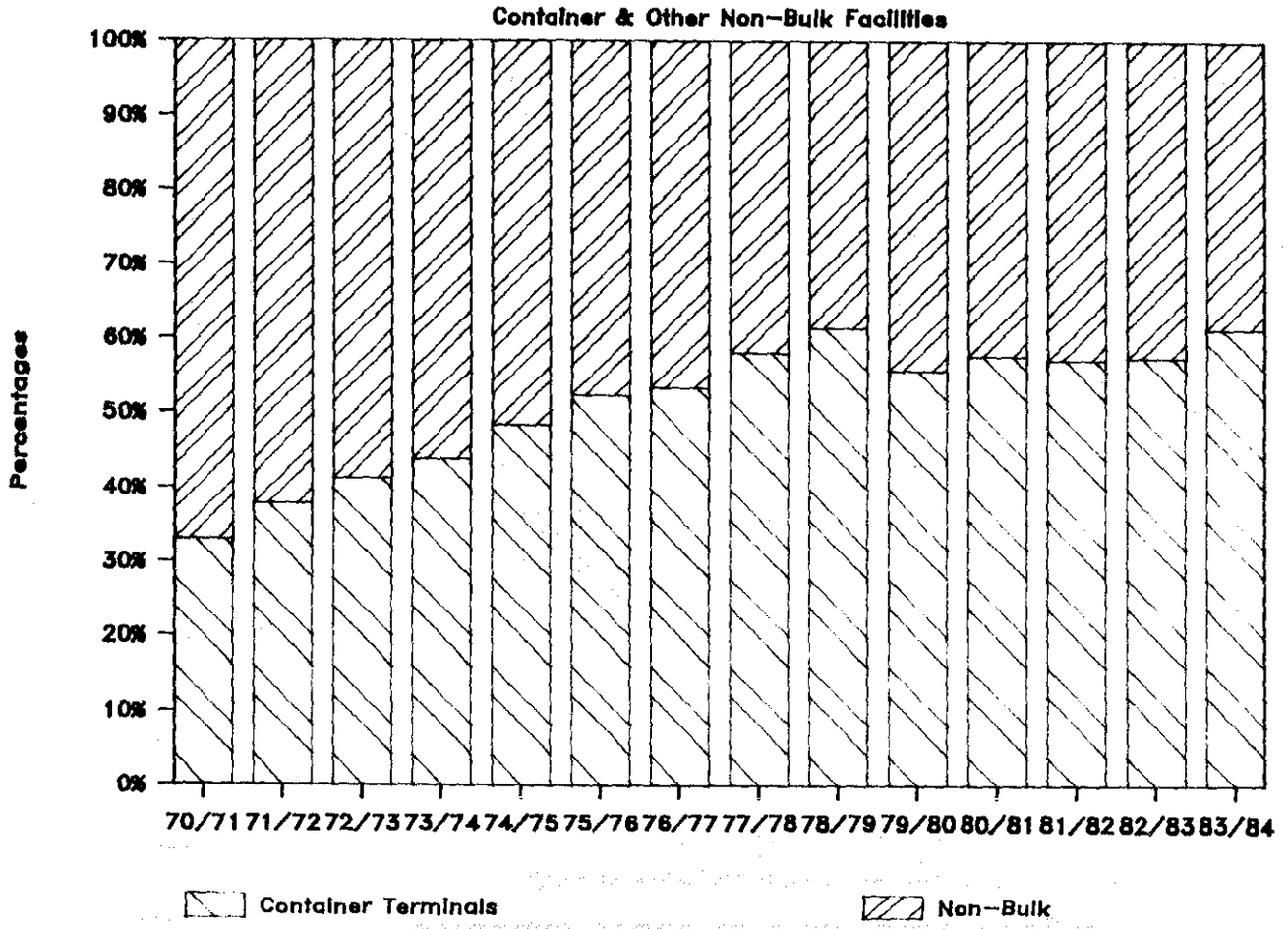
Figure 3



Source: BTE (1986)

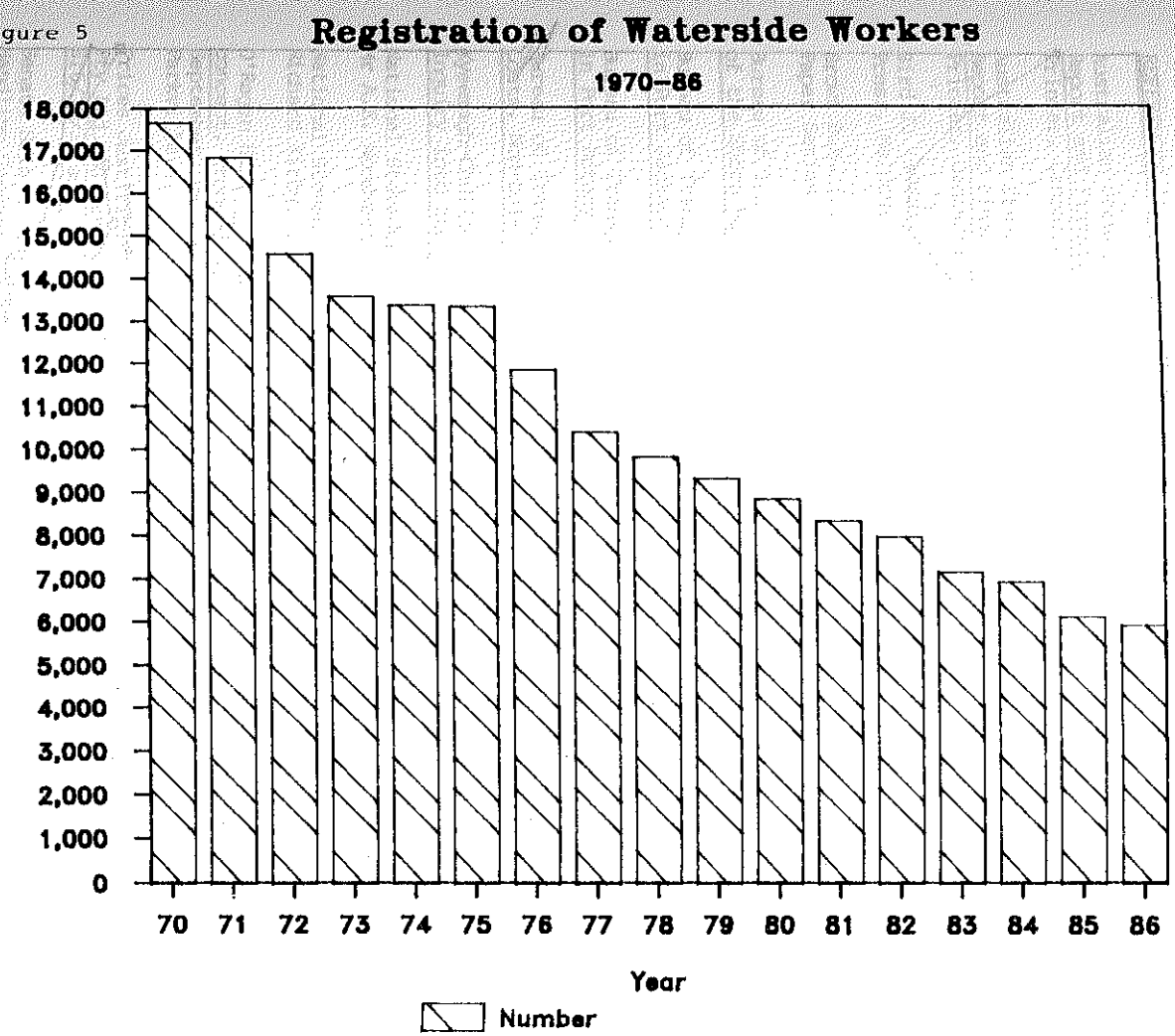
Figure 4

Comparison of Cargo Stevedored



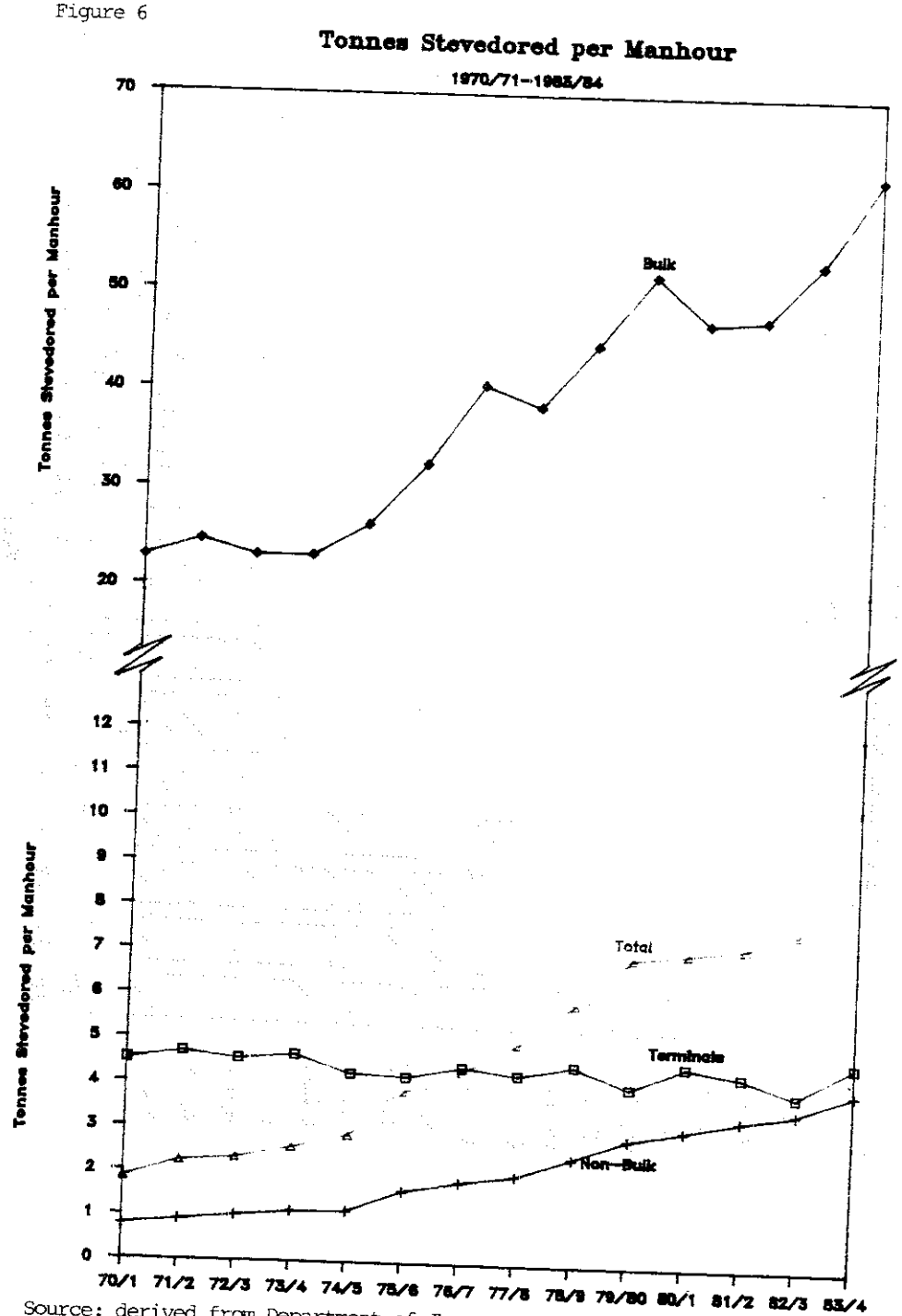
Source: derived from Department of Transport- Sea Transport Statistics

Figure 5



Source: Department of Transport- Sea Transport Statistics

Figure 6



Source: derived from Department of Transport Statistics 1982/83 and Trade and Cargo Review June Quarter 1984

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