

Harbour Towage: An Analysis of Industry Performance

Occasional Paper

This Paper analyses the economic efficiency of the harbour towage industry in Australia. It follows an earlier BTCE Paper which described the structure and operation of the industry. Analysis includes overseas comparisons, a cross-section model of towage charges and a study of industrial agreements. A survey of the harbour towage industry obtained the views of shipping lines, ships' agents, major shippers and port authorities. Extensive discussions were also held with representatives of these groups and other industry participants.

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Harbour Towing

An Analysis of Industry Performance

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ABSTRACT

This Paper analyses the economic efficiency of the harbour towage industry in Australia. It follows an earlier BTCE Paper which described the structure and operation of the industry.

Analysis by the BTCE includes overseas comparisons, a cross-section model of towage charges and a study of industrial agreements. A survey of the harbour towage industry obtained the views of shipping lines, ships' agents, major shippers and port authorities. Extensive discussions were also held with representatives of these groups and other industry participants.

The performance of the harbour towage industry is considered in the areas of towage charges per tug, the number of tugs used for individual ship movements and service quality. It is concluded that the main opportunities to improve efficiency include crew levels and tug booking arrangements. Increased flexibility in work practices and operating arrangements is identified as a priority area.

Factors affecting the performance of the harbour towage industry are also considered. It is concluded that prospects for creating effective competition in the industry are limited and that port authority intervention in towage services may increase economic efficiency. The roles of consultation and industrial negotiations are also described.

FOREWORD

This Paper presents the findings of a Bureau of Transport and Communications Economics (BTCE) study of the economic efficiency of the Australian harbour towage industry. It forms the second stage of a two-stage study of harbour towage services. An earlier BTCE Paper described the structure and operation of the industry (BTCE 1988).

The study of the towage industry is part of the Bureau's ongoing research program in the maritime area. Future projects will include further work on waterfront activities.

This Paper was prepared by a study team led by Mr K. Starr. Members of the team were Mr B. Musidlak, Mr T. Vo and Mr N. Wuest. Mr G. Haselberger assisted in the processing of survey results.

Many individuals and organisations contacted during the course of the study provided extensive information on the harbour towage industry. The Bureau would like to thank these individuals and the representatives from the towage operators, port authorities, trade unions, shipping lines, shippers, ships' agents, pilots, industry associations, tug construction companies, government departments and foreign embassies for their assistance.

M. R. Cronin

Bureau of Transport and Communications Economics
Canberra
March 1989

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EXECUTIVE SUMMARY

This Paper examines the performance of the harbour towage industry in the areas of charges per tug, number of tugs used for individual ship movements and service quality. It incorporates the results of a comprehensive BTCE survey of shipping lines, ships' agents, major shippers and port authorities. Major areas of concern identified by users include the level of towage charges (including cancellation fees) and tug booking arrangements. The potential of competition, port authority regulation, consultation and industrial negotiations to promote improved industry performance is also discussed.

CHARGES PER TUG

The basic towage charge per tug varies between ports and generally increases with greater ship size in a particular port. The basic charge per tug across all ship sizes varies from around \$1000 to more than \$16 000, with the charge per tug for a 30 000 GRT ship falling between \$2500 and \$4000 in the majority of ports.

Several major factors contribute to the current levels of towage charges per tug in Australian ports. Crew costs are the largest component of charges, representing around 50 per cent of total charges. The operators' gross margin comprises around 20 per cent of charges in overall terms.

The majority of Australian harbour tugs have a crew of five or six, although around 25 per cent of harbour tugs are operated by crews of four or eight. This variation does not reflect any obvious differences in work requirements. Crew sizes as low as three have been achieved in several overseas countries.

Local and overseas experience indicates that a maximum crew size of four is technically feasible for harbour towage work under Australian operating conditions. On the basis of 1988 crew levels and wages, the introduction of a maximum crew size of four for harbour towage work would result in on-going savings in crew costs of at least \$13 million per annum and potential reductions in towage charges of between 5 and

25 per cent in individual ports. However, any redundancy payments to displaced crew members would initially limit reductions in total towage costs and charges.

In order to provide towage services on a 24-hour basis on any day towage operators generally employ around 1.8 to 2.0 crews per tug at the busier Australian ports. This appears to be comparable with or lower than numbers of crews in other developed countries where 2.0 to 2.5 crews per tug is the most common arrangement. The total number of tug crews has been reduced at seven Australian ports in the last five years with approximately 75 crew members accepting redundancy packages. There are opportunities to significantly improve crew utilisation in some smaller ports through practices such as inter-port transfers of crews and greater use of casual employees.

The aggregate wages (excluding some allowances) of tug crew members for harbour towage work average around \$44 000 per annum. These earnings are high relative to average earnings in Australia but any assessment of their reasonableness must take account of the duties, employment conditions and skill requirements of crew members.

Utilisation rates for tugs in Australian ports are limited by the constraints of ship movement patterns and the service quality requirements of shipping lines. Tug numbers have been rationalised at five ports in the last five years and there may be scope for further reductions in several ports.

Publicly available financial statements for 12 harbour towage subsidiaries indicate that seven of these operators are earning rates of return which are well above the all-industrials average. There are major fluctuations in the profitability of individual operators from year to year.

Users and port authorities have expressed concern about other aspects of towage charges, especially cancellation fees. There appears to be scope for greater flexibility in the application of these fees in some ports.

NUMBER OF TUGS USED

Some users have suggested that there is frequent over-servicing of ships by towage operators. In the majority of cases, the number of tugs used for a particular ship movement is essentially determined by the pilot or the harbour master. Towage operators have no direct role in determining the number of tugs used.

Around 60 per cent of the survey responses for individual ports indicated that the number of tugs used for individual ship movements was always appropriate. Approximately 33 per cent stated that too many tugs were used in the handling of ships in some circumstances. About 7 per cent of responses indicated that the number of tugs used was too low in some cases.

Users identified the major factors contributing to over-servicing as over-cautious attitudes of pilots and harbour masters, inappropriate or inflexible port authority guidelines and long tug booking lead times. Tug rosters also influence the requirements of pilots and harbour masters. A review of port authority guidelines in conjunction with users and increased flexibility in operating practices may facilitate a reduction in over-servicing in various ports.

Elimination of perceived over-servicing in a port would reduce towage charges for the affected ships. However, it would not significantly affect total towage payments by lines unless it enabled a restructuring of towage operations or there was a reduction in the operator's margin. Opportunities to reduce the number of tugs would be mainly limited to some of the 12 ports which have more than two tugs.

SERVICE QUALITY

Tug specifications and the availability of tugs at nominated booking times are generally satisfactory in most ports. The major area of user dissatisfaction with the quality of towage services involves tug booking arrangements.

Users particularly criticised the booking lead times for weekend work. They are often required to forecast weekend ship movements to within one hour of actual arrival or departure up to two days or more ahead. The relatively long booking lead times for weekend work appear to be related to the call-out system for crew attendance outside ordinary hours.

In some ports booking times for weekend work can be altered without penalty provided that changes are notified by specified times on the Saturday or Sunday. There appears to be scope to extend these more flexible arrangements to other ports and to investigate further ways of reducing notice periods.

Around two-thirds of survey responses for individual ports indicated that the provision of towage services for less than 24 hours per day for 7 days per week was unacceptable or unfeasible. However, there

may be scope to achieve savings in towage costs by reducing the hours or days of towage services in some smaller ports.

FACTORS AFFECTING PERFORMANCE

The available evidence indicates that competition in the harbour towage industry is inherently weak. There is little direct competition between towage operators. Most ports are serviced by a single operator, the industry is highly concentrated on a national basis and there are various co-operative arrangements between the major operators. Potential competition is limited by significant barriers to entry. Tenders are used by several port authorities but their impact on competition appears to be limited by factors such as economies of scope and long contract periods. Users are unable to effectively negotiate with towage operators on charges and operating practices.

Towage operators are subject to formal economic regulation by port authorities in 21 Australian ports. This regulation includes contracts with operators, licensing and procedures for review or approval of towage charges. There appears to be significant variation in the efficiency of existing port authority regulation.

Some port authorities indirectly influence towage charges through their service quality stipulations such as hours of tug availability. There is a need for continuing review of these operating requirements to ensure that appropriate combinations of charges and service quality are achieved.

Work practices and employment conditions have a major impact on towage charges and service quality. Recent experience in the towage industry indicates that negotiations to alter work arrangements may involve trade-offs between earnings, employment conditions and work practices.

There appears to be scope to extend the more flexible working arrangements already operating in some ports to other ports. Negotiations in areas such as roster arrangements and the employment of casual labour may also facilitate a closer matching of working arrangements to port user requirements. Greater user involvement in these processes, through consultative mechanisms, is necessary.

PROMOTING IMPROVED PERFORMANCE

The provision of harbour towage services by a single operator in most Australian ports reflects the limited number of ship movements in

Executive Summary

these ports as well as scale and indivisibility factors. It seems unlikely that divestiture into smaller operations would lead to a more efficient industry structure or effective competition.

Where the prospects for establishing effective competition in the harbour towage industry are limited, positive intervention by port authorities may be the only avenue to promote increased economic efficiency. An appropriate regulatory system would involve consideration of crew levels, work practices, tug specifications and service quality as well as towage charges. To be efficient, such regulation would need to provide incentives for operators to minimise the costs of towage services and ensure that the greater part of the cost savings was passed on to users.

The need for port authorities to take wider responsibility in ensuring that commercial services within their ports are provided and priced efficiently has been widely supported during recent inquiries into the waterfront industry.

CHAPTER 1 INTRODUCTION

The performance of the harbour towage industry is an important consideration for users of towage services, port authorities and government bodies concerned with Australia's international competitiveness. It involves both towage charges and quality of service aspects which impact on ship operating costs and shippers' costs.

Aspects of performance were briefly discussed in the recent BTCE Information Paper on harbour towage services in Australian ports (BTCE 1988). The structure and operation of the industry were described and information on cost structures and towage charges was presented.

Harbour towage services are provided in 49 Australian ports. The major functions undertaken by harbour tugs in port areas include manoeuvring of ships through navigation channels, turning ships in swinging basins and assisting ships on and off berths.

The users of towage services are shipping lines, ships' agents and shippers. Port authorities and pilots essentially determine the number of tugs used for individual ship movements. Regulation of towage services is undertaken by some port authorities. The provision of towage services involves the towage operators and tug crews.

Most Australian ports are serviced by a single towage operator and on a national basis there are three major operators. Howard Smith, Adelaide Steamship and Brambles have interests in around 80 per cent of the harbour tugs in Australia. In many ports towage services are operated by joint ventures. There are approximately 1300 crew members employed on harbour tugs in Australian ports.

The harbour towage fleet currently comprises 116 tugs. There is significant variation in the power of individual tugs and only 12 ports have more than two tugs. The introduction of more powerful tugs, a decline in the number of ship calls and technological innovations such as bow thrusters have resulted in a significant decline in the number of tug jobs at most Australian ports in recent years.

INDUSTRY PERFORMANCE

This Paper examines the performance of the harbour towage industry in Australia. It identifies the major issues in the areas of towage charges, tug usage and service quality. Factors affecting performance are also discussed.

Various objectives can be used in considering the performance of the harbour towage industry. The discussion in this Paper mainly focuses on economic efficiency, which has two aspects. Technical efficiency is concerned with producing a given output of goods or services at the lowest cost. Allocative efficiency is based on the maximisation of community welfare through the production of the optimal mix of goods and services.

Safe handling of ships is the fundamental reason for the provision of harbour towage services. This objective is not considered in detail in this Paper as industry participants generally consider that safety standards are adequate. None of the users or port authorities contacted during the study criticised the safety standards of the harbour towage industry. Their concerns related to the industry's efficiency.

PREVIOUS STUDIES OF PERFORMANCE

Over the last five years the performance of the harbour towage industry in Australia has been considered in studies undertaken by the Australian Chamber of Shipping (ACOS), the National Bulk Commodities Group and the Importer/Exporter Panel. These industry groups represent shipping lines, ships' agents and shippers. A brief summary of the findings of these studies is provided in the recent Information Paper (BTCE 1988, 1-2).

Each of the studies concluded that the harbour towage industry was inefficient in some respects and that charges were too high. The major areas of concern included:

- . over-use of tugs relative to the requirements of ships
- . inflexible crew structures and excessive crew levels
- . unavailability of crews at certain times
- . delays for ships awaiting tugs
- . excessive lead times for booking of tugs
- . monopoly control of towage services
- . improper matching of tugs to the towage task

- . inadequate consultation between towage operators and users.

Towage operators disagreed with some of the conclusions in these studies. They indicated that certain practices were inherent in the towage industry. The methodology used in some of the studies was also criticised.

The areas of concern raised by the industry groups were also included in the initial submissions and evidence presented to the Inter-State Commission (ISC) during its waterfront investigation. Towage matters were raised in 18 submissions by shippers, shipping lines, port authorities, industry associations and State governments. In addition to the areas covered in the earlier studies, concerns were expressed about:

- . crew earnings
- . low tug utilisation
- . the level of operators' profits
- . cancellation charges
- . surcharges for ships with bow thrusters.

The Australian National Maritime Association (ANMA), on behalf of the major towage operators, provided a submission which identified factors affecting towage charges (Australian National Maritime Association 1988, 29-39). These factors included tug capital costs, crew costs and tug utilisation rates. ANMA also made several recommendations to increase efficiency through measures such as greater consultation, more rigorously controlled tug booking arrangements and the resolution of anomalies in work practices and crewing structures.

The ISC's preliminary findings on the waterfront were released in September 1988. The Commission considered that there was a need for port authorities to review their arrangements with towage operators (Inter-State Commission 1988a, 116). Anomalies in several areas of towage operations were noted:

- . arbitrary rostering of tugs of differing capacities;
- . lack of consistent allowances for bow and stern thrusters; and
- . general difficulties experienced by ships' masters in negotiating appropriate towage assistance.

Towage services were also considered in the Industries Assistance Commission's report on coastal shipping (Industries Assistance Commission 1988, 71-72). The Commission reported that some submissions had identified problems of over-use of tugs, variations in

charges between ports, excessive crew sizes and excessive numbers of crews.

STUDY METHODOLOGY

The results of these studies and submissions by industry participants indicate that there is dissatisfaction with various aspects of the performance of the harbour towage industry in Australia. However, the Bureau concluded that more comprehensive data were required for the consideration of specific issues in the harbour towage industry. The BTCE's study of the industry's performance therefore included:

- . examination of practices at overseas ports;
- . cross-section analysis of towage charges in Australian ports;
- . analysis of publicly available financial statements for towage operators; and
- . study of industrial agreements and working conditions.

Extensive discussions were held with a broad range of industry participants and a variety of published data were obtained from Australian and overseas sources.

In addition, a survey of port authorities and the users of harbour towage services in Australian ports was undertaken. Survey forms were sent to 124 shipping lines, ships' agents and major shippers as well as 32 port authorities (including harbour masters and government departments) that administer ports with harbour towage services. Maximum coverage of the industry was obtained by sending the survey forms to all members of relevant industry associations as well as to other organisations identified through industry journals and directories.

Port authorities were included in the survey as they generally have significant information on the operation of towage services in their ports, particularly in cases where regulatory activities are undertaken. In addition, the activities and responsibilities of port authorities mean that their perspectives on towage services may differ from those of users.

A mail survey was undertaken in view of the large number of potential respondents. The survey forms were despatched in September 1988. Where companies had branch networks, forms were generally sent to head offices in the first instance. Different forms were sent to users and port authorities because of the different responsibilities of the two groups.

The survey questions addressed all of the major aspects of towage services raised in previous studies and there was provision for comments on any other areas that respondents wished to address. The survey forms for both groups covered the following specific areas:

- . towage charges per tug
- . number of tugs used for individual ship movements
- . tug specifications
- . availability of tugs
- . tug booking arrangements
- . information provided to towage operators
- . consultation
- . hours and days of tug operation.

In the case of port authorities, some additional information on regulatory powers and practices was also sought. The survey forms are reproduced in Appendix I.

The overall response rate for users was 58 per cent. A total of 158 completed survey forms were received from head offices and branches of the 72 user organisations which responded. The response rate for port authorities was 88 per cent.

The analysis of the survey results in the following chapters is based on the number of respondents or the number of responses to individual survey questions. The term respondent refers to an individual who answered a particular question on a survey form. For some questions respondents were asked to provide answers for each of the ports through which their company or office traded or handled shipping movements on a regular basis. Because different responses were possible for the different ports covered by a respondent, the analysis of the survey results for these questions is based on the responses provided for individual ports. The number of individual port responses for a particular question may therefore exceed the number of respondents.

CHAPTER 2 TOWAGE CHARGES PER TUG

The total expenditure on towage services by shipping lines generally reflects the impact of the charge per tug and the number of tugs used for each ship movement. This chapter covers the charges per tug in terms of basic towage charges and other aspects such as surcharges. The number of tugs used is considered in Chapter 3.

LEVEL OF BASIC TOWAGE CHARGES

Most towage schedules specify the charges per tug for basic towage services and additional charges for aspects such as waiting time (BTCE 1988, 41-44). The relative importance of the individual components will be affected by the circumstances of each ship movement. Levels of charges vary between ports and basic service charges per tug in a particular port are usually based on the gross registered tonnage of the ship being assisted.

The basic towage charge per tug job in Australian ports varies from around \$1000 to more than \$16 000 across all ship sizes (BTCE 1988, 45). The range for a 30 000 GRT ship is from \$1500 to \$10 700 per tug, with the charge per tug in the majority of ports falling between \$2500 and \$4000.

The survey of the towage industry undertaken by the BTCE included a question which asked participants to provide an assessment of the level of basic towage charges per tug in the ports where they operated. The basis for the assessment was an efficient operator earning a reasonable rate of return. The survey results provided comprehensive data on the views of users (shipping lines, ships' agents and shippers) and port authorities. The responses of users and port authorities followed a similar pattern.

Around 47 per cent of responses for individual ports indicated that basic towage charges per tug were high and a further 16 per cent classified them as very high. Approximately 35 per cent of responses classified charges in individual ports as reasonable and 2 per cent indicated that they were low.

Several industry participants contacted during the study suggested that data on towage charges in overseas ports would provide a useful benchmark for the assessment of charges in Australia. A comparative study of this type was not undertaken for several reasons. Differences in factors such as port characteristics, traffic levels and sizes of ships handled, mean that operations in individual ports may not be directly comparable. Variations in the structure of towage charges may also make it difficult to undertake comparisons on a consistent basis. In addition, international comparisons are impeded by the volatility of exchange rates, although this particular difficulty might be lessened by the use of purchasing power parities.

FACTORS AFFECTING THE LEVEL OF CHARGES

Some information on the determinants of towage charges per tug in Australian ports was presented in Information Paper 27 (BTCE 1988, 29-46). Data for a small group of ports and operators indicated that the major factors were the operator's margin, tug depreciation charges, crew costs and tug utilisation rates.

Following this initial work, a cross-section model was constructed in order to examine further the major factors contributing to variations in towage charges per tug between ports. The following explanatory variables were tested in the model:

- . average bollard pull per tug in each port, as a proxy for tug capital costs which in turn are the basis for depreciation charges and the operator's margin;
- . aggregate wages (including area allowances) for a tug crew in each port which reflect the impact of several factors including crew size; and
- . number of ship calls in each port, as a proxy for the number of tug jobs.

These variables explained 83 per cent of the variation in basic towage charges per tug in 17 ports with comparable towage schedules. Some of the remaining variation may be explained by differences in the characteristics of individual ports. The model is described in detail in Appendix II.

Survey respondents who described basic charges per tug in a particular port as high or very high were also asked to identify the major contributing factors. Most of these respondents provided two or more reasons. The main factors identified were:

- . crew levels too high (41 per cent of respondents);

- . low tug utilisation (40 per cent of respondents);
- . crew earnings too high (35 per cent of respondents); and
- . lack of competition between towage operators (22 per cent of respondents).

Other factors identified by respondents included restrictive work practices and high capital costs for deep-sea capabilities. Each of these factors was cited by no more than 10 per cent of respondents.

The major determinants of basic towage charges per tug are discussed in greater detail in following sections.

Competition and operators' margins

Competition in the Australian harbour towage industry is generally weak.¹ Economic theory suggests that a lack of competition in an industry may be associated with excessive factor rewards (for example, high profits or high wage levels), technical inefficiency or inappropriate combinations of service quality and price.

Rates of return based on accounting data have commonly been used to assess whether companies in particular industries are earning high profits. This approach is subject to some practical difficulties but is acceptable for the preliminary scrutiny of industries (Kay 1987, 139).

Financial statements for 12 tug operating subsidiaries, which handle around three-fifths of ship calls requiring towage assistance, were obtained from returns lodged with several Corporate Affairs Commissions. This information was used to calculate net earnings before interest and company tax (EBIT) to total assets. The figures for the six years to 1986-87 are presented in Table 2.1. For some operators they include earnings from activities such as salvage and launch operations in addition to harbour towage. The available data suggest that operators' EBIT represents around 20 per cent of towage charges in overall terms, although there is substantial variation in the figures for individual operators.

A comprehensive assessment of an industry's profitability requires an analysis of its characteristics, the assets employed, the risk profile, growth prospects and capital structures. As detailed information on these aspects is not readily available, inter-industry comparisons based on the data in Table 2.1 are indicative only.

1. Competition is discussed in detail in Chapter 5.

TABLE 2.1 NET EARNINGS BEFORE INTEREST AND COMPANY TAX TO TOTAL ASSETS FOR SELECTED TOWAGE SUBSIDIARIES, 1981-82 TO 1986-87^a

(per cent)

| Towage subsidiary | Year | | | | | | Annual average over period |
|--|---------|---------|---------|---------|---------|---------|----------------------------|
| | 1981-82 | 1982-83 | 1983-84 | 1984-85 | 1985-86 | 1986-87 | |
| Coastal Tug & Barge ^b | 2 | 2 | 2 | 2 | 3 | 4 | 3 |
| J. Fenwick & Co | 14 | 11 | 12 | 15 | 13 | 11 | 13 |
| J. Fenwick (Newcastle) | 27 | 13 | 13 | 19 | 19 | 16 | 18 |
| Gladstone Tug Services ^b | 14 | 26 | c | 26 | 24 | 14 | 21 |
| Hedland Marine Services | 15 | 12 | 12 | 12 | 13 | 7 | 12 |
| Nth Queensland Marine Towage ^b | 9 | 2 | 4 | 7 | 8 | 8 | 6 |
| North Western Shipping & Towage ^b | 15 | 15 | 18 | 22 | 27 | 22 | 20 |
| Pt Lincoln Tugs ^b | 1 | 1 | 1 | 4 | 6 | 6 | 3 |
| Queensland Tug & Salvage | 23 | 33 | c | 37 | 20 | 20 | 27 |
| Stirling Marine Services ^d | 26 | 21 | 11 | na | 12 | 10 | 16 |
| Wallace Tugs | 24 | 15 | 23 | 29 | 32 | 35 | 26 |
| Waratah Towage | 23 | 12 | 12 | 26 | 21 | 17 | 19 |

a. EBIT excludes extraordinary. Total assets are the sum of current assets, non-current assets, fixed assets (depreciated historic cost) and in some cases investments.

b. Earnings are net of commissions paid to related companies.

c. Full year figure not available due to change in accounting basis from calendar year to financial year.

d. Formerly Elder Prince Marine Services.

na Not available.

Sources Corporate Affairs Commission records.

There are some difficulties in identifying benchmark levels of profitability against which earnings in a specific industry can be assessed. The most common method is to use measures of average industry profitability as the base. The available information for

industrial companies (excluding companies engaged in primary industry or finance) in Australia indicates an average annual figure of around 10 per cent for EBIT to total assets in nominal terms over the six years to 1986 (Reserve Bank of Australia 1988).

It has been suggested that the Reserve Bank profitability measure is an inappropriate basis for comparison due to the inclusion of non-interest bearing credit in the asset base of industrial companies. The towage industry is a net provider of trade credit while for industrial companies as a whole 16 per cent of assets are financed by trade creditors. It could be argued that these assets should therefore be excluded from the capital base of the profitability measure where a comparison is undertaken. On this basis, the ratio of EBIT to assets for industrial companies (other than those engaged in finance or primary industry) over the period from 1981 to 1986 would increase to nearly 12 per cent.

Table 2.1 indicates that there are major fluctuations in profitability from year to year and significant differences in average profitability for individual towage operators. The average figures for EBIT to total assets over the six years are well above the all-industrials average in seven cases, with figures between 16 and 27 per cent. These subsidiaries account for around 60 per cent of the ship calls handled by the 12 operators. A further two towage subsidiaries have earnings close to the all-industrials average. The three remaining subsidiaries, which account for only 12 per cent of the ship calls handled by the 12 operators, have earnings well below this level.

The financial statements lodged by towage subsidiaries were also used to calculate net earnings before company tax (EBT) to shareholders' funds which is another commonly used measure of profitability. These data indicated that eight subsidiaries had earnings well above the all-industrials average. However, the relevance of this measure for comparative purposes is limited by the very high gearing of some towage subsidiaries which is facilitated by parent company guarantees of borrowing performance.

The data on EBIT to total assets provide some evidence that a significant number of towage subsidiaries are earning above-average profits. However, the data do not cover all towage subsidiaries and some of the accounts include inter-subsidiary borrowings and commissions. In addition, the earnings of several towage subsidiaries are below the all-industrials average. The variation in rates of return indicates that factors other than competition affect the profitability of towage operations in individual ports.

Tug utilisation

Utilisation rates for tugs in Australian ports are limited by the constraints of ship movement patterns and the service quality requirements of shipping lines. Table 2.2 indicates that over 60 per cent of Australian ports with harbour towage services had less than one ship movement per day on average in 1986-87. The average utilisation rate for each tug rarely exceeds three jobs per day in the large ports and is less than one job per day in many outports (BTCE 1988, 10-12). A tug job typically takes between 1.0 and 1.5 hours in most Australian ports.

There are generally peaks and troughs in numbers of ship movements at the busier ports over any 24-hour period and there may also be seasonal variations at individual ports. Provision of sufficient tugs to ensure adequate service quality (in terms of waiting times) at peak periods means that there are excess tugs during off-peak periods. Reductions in tug numbers to improve overall utilisation could result in longer ship delays during peak periods. The survey results indicate that such a reduction in service quality is generally unacceptable to shipping lines and agents (see Chapter 4).

Another factor limiting tug utilisation is the need to provide adequate towage capacity for the largest ships visiting a port. If additional tugs cannot be obtained on a regular basis from a nearby port and the largest ships account for a small proportion of ship calls, their requirements may contribute to low tug utilisation.

Several survey respondents indicated that other factors were also contributing to low utilisation rates at some ports. In particular, it was claimed that the relatively low level of traffic at Hobart could be handled satisfactorily with four tugs rather than the current fleet of six. Towage operators contacted during the study indicated that in at least one other port the number of tugs specified by the port authority or major shipper exceeded the minimum number necessary to provide the required level of service.

Options to reduce overall tug numbers at some ports through greater co-ordination of operations in adjacent ports were also raised by survey respondents. For example, it was suggested that more frequent movements of larger tugs between Whyalla, Port Bonython and Port Pirie and co-ordination of operations at Kwinana and Fremantle would enable towage services in these ports to be provided by fewer tugs.

TABLE 2.2 NUMBER OF SHIP CALLS INVOLVING TOWAGE ASSISTANCE AT INDIVIDUAL AUSTRALIAN PORTS, 1986-87

| <i>Annual ship calls involving assistance</i> | <i>Ports</i> | | <i>Average daily ship movements^b</i> |
|---|---------------|--------------------------------------|---|
| | <i>Number</i> | <i>Per cent of total^a</i> | |
| 1-100 | 20 | 41 | 0.3 |
| 101-200 | 10 | 20 | 0.7 |
| 201-300 | 5 | 10 | 1.3 |
| 301-400 | 4 | 8 | 1.9 |
| 401-500 | 3 | 6 | 2.4 |
| 501-1000 | 3 | 6 | 3.6 |
| >1000 | 4 | 8 | 9.0 |

a. Figures do not add to 100 due to rounding.

b. Estimated by dividing average annual number of ship movements for ports in each category by 365.

Source BTCE estimates based on published port authority data and amendments advised by industry sources.

The introduction of more powerful tugs by operators over the last decade has resulted in reductions in the numbers of tugs in some larger Australian ports. Other changes such as improved locations of tug bases have also permitted reductions in some cases. Major developments in the last five years include:

- . one tug removed from Geelong
- . one tug removed from Melbourne
- . one tug laid up in Brisbane
- . one tug laid up in Gladstone
- . one tug laid up in Fremantle.

With the exception of salvage work, opportunities to increase the utilisation of existing harbour tugs are limited. At 11 Australian ports the tug fleet includes units that are capable of undertaking deep-sea towage and salvage activities as well as harbour towage duties (*Ship & Boat International 1987*, 5). Operators consider that these multi-purpose tugs provide the most efficient means of undertaking the complete range of salvage and deep-sea towage activities in the Australian environment.

The available evidence indicates that there is scope to reduce tug numbers in several ports without significantly affecting service quality. However, in most Australian ports any reduction in tug numbers would adversely affect the quality of towage services.

Crew levels

Total crew costs represent around 50 per cent of towage charges in overall terms. Crew levels and crew earnings therefore have a significant impact on charges. More than 60 per cent of survey respondents who described basic charges per tug in a particular port as high or very high considered that one or both of these factors contributed to high towage charges.

Crew levels can be considered in terms of crew size and the number of crews required to operate a tug that is available on a 24-hour basis.

Crew size

Information on crew sizes on Australian harbour tugs is presented in Table 2.3. The majority of tugs have a crew of five or six, with crews of four or eight also being relatively common. The variation in crew sizes on the larger tugs does not appear to reflect any obvious differences in work requirements at individual ports. Industry sources indicate that the variation is the outcome of the historical development of the towage industry on a State basis and industrial negotiations concerning arrangements in individual ports.

TABLE 2.3 CREW SIZES ON AUSTRALIAN HARBOUR TUGS, 1988

| <i>Crew size</i> | <i>Number of tugs</i> | <i>Bollard pull range (tonnes)</i> |
|------------------|-----------------------|------------------------------------|
| 2 | 1 | 6 |
| 3 | 3 | 10-28 |
| 4 | 17 | 10-30 |
| 5 | 47 | 10-52 |
| 6 | 32 | 27-62 |
| 7 | 4 | 41-55 |
| 8 | 12 | 36-75 |

Source BTCE (1988, 52-60).

Crewing arrangements on tugs in overseas ports often differ from those in Australia. The available information on crew sizes in Europe, North America, Asia and the Pacific is presented in Table 2.4. The data indicate the predominant arrangements at the major ports in each country for tugs with bollard pulls generally ranging between 20 and 50 tonnes. There may be higher or lower crew sizes in a small number of instances.

Table 2.4 indicates that crew sizes as low as three have been achieved in several overseas countries. In the United States towage operations in some ports are carried out by two or three crew members during alternating watches.

TABLE 2.4 PREDOMINANT CREWING ARRANGEMENTS FOR HARBOUR TUGS AT MAJOR PORTS IN SELECTED OVERSEAS COUNTRIES, 1988

| <i>Country</i> | <i>Crew size</i> | <i>Crews per tug</i> |
|----------------|------------------|----------------------|
| Europe | | |
| Belgium | 4-5 | na |
| Denmark | 4 | 2.0 |
| Finland | 4-5 | 2.0 |
| FRG | 3-4 | 3.3-3.7 |
| Netherlands | 3 | na |
| Norway | 3-4 | 2.0 |
| Sweden | 4 | 1.8-2.2 |
| United Kingdom | 4-6 | 2.0-2.5 |
| North America | | |
| Canada | 3-4 | 2.5 |
| United States | 4-6 | 2.0 |
| Asia-Pacific | | |
| Japan | 5-6 | 1.5 |
| New Zealand | 4-6 | <2.0 |
| Singapore | 5 | 3.0 |

na Not available.

Sources Aarts (1984, 1988). Lindenau (1986). Swan (1984). Troup (1988). Foreign embassies (pers. comm. 1988). Overseas towage operators (pers. comm. 1988).

There have been significant reductions in crew sizes in various overseas countries in recent years. For example, the introduction of new tugs in the New Zealand port of Whangarei has been accompanied by a reduction in crew sizes from seven to four since late 1987.

Operations in individual ports may not be directly comparable as a result of differences in factors such as traffic levels, tug equipment and port characteristics. However, the data in Table 2.4 do suggest that crew sizes in a significant number of Australian ports are high by international standards.

Australian towage operators have recently moved to reduce crew sizes at various ports. As part of the March 1987 National Wage Case decision, the Australian Conciliation and Arbitration Commission set out a Restructuring and Efficiency Principle under which a 4 per cent second tier wage increase could be obtained in return for agreed alterations of work practices. The Tug Operators' Committee proposed a maximum crew size of five for harbour towage work, eight for free running voyages or contract tows and ten for emergency work. Operators also proposed the restructuring of crewing through the introduction of a 'General Purpose Hand' classification for all ratings.

The subsequent agreements between towage operators and trade unions included reductions in crew numbers at Yampi Sound and Port Walcott. The towage operators have since continued their efforts to have a maximum crew size of five for harbour towage work in all Australian ports. This would affect around 40 per cent of the harbour towage fleet. A reduction of 172 positions throughout Australia has reportedly been proposed by the operators (*West Australian* 1988, 20).

Overseas experience indicates that major reductions in crew sizes may require alterations to tug equipment and operating practices as well as additional training for tug crews (Lindenau 1986). For example, the reduction in crew sizes from 4 to 3 in Hamburg required:

- . installation of engine control room and winch control devices on main deck;
- . installation of improved towing winches;
- . changes in distribution of work between crew members including involvement of engineer in winch operation and handling of towing gear during mooring and unmooring;
- . installation of two radar units;
- . changes to pilot house structure;

- . re-positioning of operational instruments and control units; and
- . provision of remote control for fire fighting pump.

In this case, there was agreement on a permanent reduction in crew size to three after a trial period of 18 months safe operation.

Reductions in crew sizes may involve significantly higher tug capital costs. For example, the construction cost for a tug operated by a crew of three in Bremen is reportedly 20 per cent higher than the cost for a conventional unit (Troup 1987, 9). Factors such as the level of crew wages may therefore affect the optimal combination of crew size and tug capital in a particular port.

The discussion of local and overseas operations suggests that a crew size of four is technically feasible in Australian ports at present. On the basis of 1988 crew levels and wages, it is estimated that the introduction of a maximum crew size of four on Australian tugs for harbour towage work would result in on-going crew cost savings of at least \$13 million per annum or around 25 per cent of existing crew costs. If these savings were fully passed on to users, there would be reductions in towage charges of between 5 and 25 per cent in individual ports. However, any redundancy payments to displaced crew members would initially limit the reductions in total towage costs and charges.

Number of crews

Towage operators generally employ around 1.8 to 2.0 crews per tug at the larger Australian ports to provide towage services on a 24-hour basis on any day. This reflects the entitlement of tug crews to paid leave of 168 days per annum which in turn is mainly based on the leave and holiday provisions that are generally available in the Australian community (BTCE 1988, 37). Factors such as illness, long service leave and work outside harbour limits result in the employment of 2.3 crews per tug in at least one of the largest ports. There are three crews per tug at Kwinana to provide a 24-hour emergency response service.

Inter-port transfers of individual crew members and other practices enable towage services to be provided with less than 1.8 crews per tug in some small Australian ports. Such practices are feasible as the low levels of ship movements at these ports mean that the tugs may not be operated for several days during the week.

The number of crews required in a particular port may be affected by tug utilisation rates. Some increase in utilisation could be achieved without additional crew requirements but at a certain point increased

utilisation would require a larger number of crews. Similarly, inter-port variations in the number of crews per tug may reflect differences in utilisation rates rather than variations in efficiency.

Information on the numbers of crews employed on tugs in overseas ports is presented in Table 2.4. In most of the countries surveyed there are two or more crews per tug. The lower figure in New Zealand appears to reflect flexible port company labour arrangements.² There are more than three crews per tug in the FRG where crew members on duty remain on board the tug at all times.

In recent years the total number of tug crews has been reduced in some Australian ports. This development reflects factors such as the introduction of more powerful tugs which have enabled operators to provide towage services with fewer tugs and hence lower numbers of crews. The reductions over the last five years, totalling approximately 75 crew members, have included:

- . 3 crews in Geelong
- . 1.8 crews in Melbourne
- . 1.5 crews in Brisbane
- . 1 crew in Gladstone
- . 1.5 crews in Fremantle
- . 1.5 crews in Kwinana
- . 1 crew in Sydney.

Some changes to work practices that could improve crew utilisation were proposed by the major towage operators as part of the restructuring and efficiency review following the March 1987 National Wage Case decision. The priority areas identified by operators included:

- . incorporation of a specified number of buckshee days in the annual leave available to crews³;

-
2. Tugs in New Zealand ports are generally operated by port companies. There are between 1.0 and 1.7 permanent crews per tug in individual ports with reliefs drawn from other areas of port company operations.
 3. Buckshee days are days when crews are rostered for duty but are not required to attend due to an absence of towage work.

- . provision for crews to continue working short-handed until replacement personnel could be provided;
- . provision for crews to be available for relief work if their tugs were laid up;
- . removal of restrictions on the transfer of crews between tugs or working positions and on the type of general maintenance that could be carried out in various working hours; and
- . increased flexibility in recalling crews for duty and accepting changes in orders.

The subsequent agreements between the towage operators and trade unions for individual ports included various changes in work practices. Leave arrangements were altered in over 20 ports and in several cases a number of buckshee days were included in the 168 days of annual leave. Arrangements for crews to work short-handed during the temporary absence of one rating were agreed upon in 16 ports. There were also specific changes in some ports to increase the flexibility in recall of crews knocked off for the day, movement of crews between tugs and the interchange of tugs in the case of breakdown or when ships have special towage requirements.

In view of the leave conditions generally available in the Australian community and the requirement for 24-hour service in the towage industry, the employment of 1.8 to 2.0 crews per tug at the busier ports appears to be reasonable. However, Table 2.2 indicates that there are many ports with very low traffic levels where the employment of 1.8 or more crews per tug does not appear to be warranted. There are opportunities to significantly improve crew utilisation in some smaller ports through practices such as inter-port transfers of crews and greater use of casual employees.

Crew earnings

The Tugboat Industry Award specifies an aggregate wage system under which there are all-inclusive wages incorporating base rates for work performed during ordinary working hours and additional amounts for work outside ordinary hours (BTCE 1988, 33-34). The definition of ordinary hours varies between ports but they generally involve eight hours during the period between 0700 and 1700 on weekdays.

In February 1988 the base rates for ports covered by the Tugboat Industry Award varied between \$20 025 per annum for a deckhand and \$33 556 per annum for a tug master. Annual aggregate wages for a deckhand ranged from \$25 532 in Geraldton to \$44 130 in Melbourne while the range for a tug master was from \$39 016 in Darwin to \$72 824

in Melbourne. There are also significant additional payments for meals and travel and where other activities such as firewatch duties are undertaken. Separate pay rates are applicable for work outside harbour limits. Special allowances are paid in some ports.

Information on average aggregate wages for tug crew members at selected Australian ports is presented in Table 2.5. The data indicate the range of average wages on an all-ports basis and within each of the three major port categories. The average aggregate wage for a tug crew ranges from \$32 700 in Geraldton to \$52 500 at Melbourne.

A national average aggregate wage can be estimated by using data for most Australian ports with tugs stationed on a permanent basis. This average of \$44 000 per annum excludes the additional payments for items such as meals and travel that were noted earlier.

The aggregate wages of tug crews are higher than the average earnings of the Australian workforce. In late 1987 average annual earnings in Australia were around \$24 900 on an all-industries basis and \$27 000 in the transport and storage sector (Australian Bureau of Statistics 1987, 10).⁴ However, any assessment of whether tug crew earnings reflect excessive factor rewards must take account of the duties, employment conditions and skill requirements of tug crews.

Many survey respondents considered that crew earnings were high in relation to the hours actually worked by the crews. In the larger ports crews rostered for duty are required to be on the tug during ordinary hours, with work such as maintenance being undertaken if there are no ship movements. Attendance at all other times is on the basis of crews being called out to handle specific jobs. Notice of call-out must generally be given well in advance (see Chapter 4). Tug crews are required to be available for duty on 197 days per year but they may be on the tugs for fewer days if they are not called out on weekends. In the less busy ports, crews may not be on the tug on some weekdays if there are no shipping movements and maintenance work is not required. Crews rostered on duty are available to work up to 18 or 20 hours on a continuous basis to provide towage services at any time of the day or night when there are shipping movements.

4. Figures are based on average weekly earnings for full-time, adult, employees in November 1987. Earnings include ordinary time, overtime earnings and various allowances but exclude leave loadings.

TABLE 2.5 AVERAGE AGGREGATE WAGES FOR TUG CREWS
AT SELECTED AUSTRALIAN PORTS, FEBRUARY
1988

(\$ per annum)

| <i>Ports</i> | <i>Average aggregate wage^a</i> |
|-------------------------------|---|
| Capital city ports | |
| Adelaide | 43 100 |
| Brisbane | 44 000 |
| Darwin | 35 000 |
| Fremantle | 42 800 |
| Hobart | 36 700 |
| Melbourne | 52 500 |
| Sydney | 43 300 |
| Specialised bulk ports | |
| Abbot Point | 35 400 |
| Cape Cuvier | 45 200 |
| Hay Point | 46 400 |
| Port Hedland | 47 300 |
| Westernport ^b | 48 900 |
| Yampi Sound | 35 600 |
| Outports | |
| Bundaberg | 34 200 |
| Geelong | 51 100 |
| Geraldton | 32 700 |
| Launceston | 34 700 |
| Newcastle | 42 000 |
| Whyalla | 36 700 |

a. Includes base rates and additional amounts for work outside ordinary hours. Excludes meal and travel payments, area allowances and work-as-required payments. Covers Category 1 and Category 2 tugs.

b. Excludes average payment of \$13 300 for firewatch duties.

Sources BTCE (1988). Individual port schedules to Tugboat Industry Award.

In contrast to the numbers of hours and days that crews are on the tugs or available for duty, the time spent handling ship movements is often relatively low. This reflects the low number of ship calls in many ports, particularly the outports. Table 2.2 shows that well over 70 per cent of ports average less than two ship movements per day. As previously mentioned, most tug jobs in Australian ports take between 1.0 and 1.5 hours.

During the second tier wage negotiations following the March 1987 National Wage Case decision, the major towage operators stated that many crews were paid in excess of the work currently performed. They indicated that, in the majority of ports, the actual proportion of work outside ordinary hours was less than the level incorporated in the aggregate wage system. This reportedly reflected the decline in towage activity since 1982 when most of the proportions currently specified in the Tugboat Industry Award were calculated.

The relatively high average earnings of tug crews could be cited as evidence of excessive factor rewards. As noted earlier, any assessment of tug crew earnings should include consideration of job requirements.

OTHER ASPECTS OF TOWAGE CHARGES

In addition to commenting on the level of basic towage charges per tug, 50 per cent of survey respondents identified one or more other aspects of towage charges per tug which were unsatisfactory. Around 65 per cent of these respondents commented on cancellation fees. Charges for tug tow lines were cited by around 20 per cent of these respondents and overtime surcharges were identified by 18 per cent. Several other aspects of charges were mentioned by smaller numbers of respondents.

Consideration of these fees and surcharges is closely related to the overall structure of towage charges. A towage operator in a particular port requires a specific amount of revenue to cover total costs and the gross margin. Components such as overtime surcharges contribute to the operator's total revenue. If total revenue is significantly reduced through the removal of some fees or surcharges, towage operators could be expected to recoup the lost revenue through higher charges in other areas.

The demand for towage services is highly price inelastic because towage requirements are determined on safety grounds by pilots and port authorities. A variety of structures of towage charges may therefore be consistent with allocative efficiency. However, specific

charges also raise issues such as the encouragement of efficient ordering practices by users, which keep down towage operators' costs, and equity considerations.

Comments by towage operators contacted during the study and some published information indicate that several principles are used to determine the structure of harbour towage schedules in Australia (Bauman 1988, Australian National Maritime Association 1988). The factors include:

- . ability to pay (based on size of ship);
- . impact of large ships on total power (and hence tug capital) required in a particular port;
- . costs associated with specific operations for each user (for example, period of tug attendance); and
- . equitable recovery of the costs of providing towage services.

The impact of these principles on the structure of towage schedules is reflected in specific fees and surcharges which are discussed below.

Cancellation fees

Where a tug in attendance is not used or a tug booking is cancelled, a fee of up to 100 per cent of the scheduled charge may be applied. Cancellation fees were the subject of frequent comment by users. Although the levels of these charges were of some concern, it appears that the conditions under which they are imposed by towage operators were the major problem.

Lines and agents indicated that it was difficult to avoid cancellation fees in many cases. This reflected the requirement to provide accurate booking times well in advance of ship movements outside ordinary hours and the impact of unpredictable factors such as weather conditions, mechanical breakdowns and cargo handling rates. It was noted that in some ports the towage operators were flexible and reasonable in applying cancellation fees.

Many users also felt that cancellation fees should not be incurred if tugs did not attend the ship. This reflected the view that crews were not paid on a per job basis and that no fuel was consumed if the tug did not leave its berth.

In principle, cancellation fees are a valid component of towage schedules. They facilitate the efficient utilisation of tugs and crews by encouraging the provision of accurate information on ship movements. One survey respondent noted that the removal of

cancellation charges in one Australian port had resulted in additional tug operating costs through the ordering of tugs when it was unlikely that they would be required. A charge for cancellations when the crew attended was then introduced as a result of this experience. The level of cancellation fees should reflect the short-run impact of booking cancellations on operators' costs and effects in areas such as crew costs and tug capital requirements.

Under current conditions factors beyond the lines' control may result in the application of cancellation fees. There appears to be scope for greater flexibility in the application of these fees in some ports. The related issue of tug booking arrangements is discussed in Chapters 3 and 4.

Provision of tow lines

Some respondents considered that towage operators applied charges for the use of the tug's tow lines even when the ship carried suitable lines. It appears that the ultimate decision as to the acceptability of a ship's lines effectively rests with the tug master. Industry sources indicate that it is not possible to use a ship's lines for towing when omni-directional tugs are using modern techniques of working with a winch over the bow.

Other respondents indicated that any charges for tug lines should be included in basic service charges and that separate fees should not be applied. Although efficient pricing principles indicate that separate charges should be levied for discrete services of this type, the charges are relatively low (less than \$100) and inclusion in basic service charges may provide some advantages in terms of a simplified schedule and user satisfaction.

Overtime surcharges

Basic service charges vary according to the time of day and time of week in more than 20 Australian ports. Some survey respondents indicated that this was inappropriate as the components of tug operating costs such as crew payments do not vary on this basis.

Under current circumstances, the component for work outside ordinary hours is generally based on past conditions in individual ports. If the structure of crew wages were reviewed on a regular basis, changes in the proportion of towage operations outside ordinary hours would potentially be reflected in operators' costs. It could be argued that the absence of overtime surcharges may encourage increased ship movements outside normal hours and result in pressure from tug crews to review these components. However, times of shipping movements are

unlikely to be significantly affected by the presence or absence of these surcharges.

Movement to a single scale of towage charges in each port would simplify the schedules and make it easier for users to assess towage payments. If overtime surcharges promote efficient towage operations, it is unclear why they are not applied in all Australian ports as the major factors affecting costs are generally similar. There appears to be some merit in the view that overtime surcharges should be reviewed.

Other aspects

Other unsatisfactory aspects of towage charges per tug identified by survey respondents included:

- . meal hour surcharges
- . surcharges for thruster-equipped ships
- . minimum rates per ship movement irrespective of the number of tugs used
- . surcharges for shifting ships between berths
- . insufficient time allowed before application of detention charges
- . firewatch
- . charges for inter-port movements of tugs

Some information on the reasons for certain surcharges was provided by towage operators contacted during the study. For example, the surcharges for movements between berths are based on the increased time for tug attendance as both berthing and unberthing operations are undertaken. Similarly, surcharges are applied to thruster-equipped ships in certain circumstances as towage operators consider that these ships should make a financial contribution towards ensuring the continuing availability of towage capacity which they sometimes require. However, it might be argued that thruster surcharges deter the efficient development of alternatives to tugs.

Firewatch was criticised by a group of users, towage operators and port authorities. This service has been provided at two of the eight Australian ports with throughput of crude oil and petroleum products exceeding one million tonnes per annum. It has been a significant component of tug operating costs at these ports. The absence of firewatch at most of the ports handling crude oil and petroleum products suggests that this service is not considered to be a cost-effective means of maintaining port safety. Industry sources indicate that past attempts to withdraw firewatch have not been actively supported by users when faced with the threat of industrial action.

In December 1988 the firewatch service at Kwinana was replaced by an emergency response service for Kwinana and Fremantle. The new arrangements are subject to a twelve-month trial period.

Most of the aspects of charges discussed in this section relate to a small number of ports. Assessment of these aspects requires consideration of the pricing principles used by towage operators and the operating environment in individual ports. Comments by users suggest that a review of these fees and surcharges would be desirable in some ports.

CHAPTER 3 NUMBER OF TUGS PER SHIP MOVEMENT

The discussion in Chapter 2 covered towage charges per tug. In most ports the total towage charge for a particular ship movement is also affected by the number of tugs used. Operators in some of the smaller ports apply flat rates regardless of whether one or two tugs are used.

As noted in Chapter 1, previous studies have identified the number of tugs used for individual ship movements as a major concern of users. In particular, a significant number of users have claimed that there is over-use of tugs relative to the requirements of ships. The number of tugs per ship movement is therefore considered separately in this chapter while other factors affecting service quality are discussed in Chapter 4.

Over-servicing is defined as the use of more tugs than is necessary to safely and expeditiously assist a ship in a particular set of circumstances. Under-servicing involves the use of fewer tugs than is necessary in a particular situation. Claims of over-servicing or under-servicing arise when users' views of the appropriate number of tugs for a ship movement differ from the number actually used. Users' views are generally based on the perceptions of ships' masters.

DETERMINANTS OF NUMBER OF TUGS USED

In the majority of cases, the number of tugs used for a particular ship movement is essentially determined by the pilot or the harbour master. Pilots are usually port authority or State government employees although there are also some private operations.

A significant number of port authorities issue guidelines on the number of tugs to be used for individual ship movements. These guidelines generally reflect the recommendations of pilots.¹ They are based on the tonnage or length of ships and may also specify

1. Guidelines for ship movements in Melbourne, Geelong and Westernport are issued by the Port Phillip Sea Pilots.

allowances for factors such as bow thrusters. Guidelines were issued in 14 of the 33 ports covered in port authority responses to the BTCE survey.

Towage operators have no direct role in determining the number of tugs used for individual ship movements. However, their decisions in areas such as tug characteristics and operating procedures have an indirect impact on the number of tugs used.

A variety of factors affect the number of tugs required for a particular ship movement. The main factors include:

- . ship characteristics such as size, type of rudder, propulsion system, power and reliability of thrusters and sensitivity to wind conditions;
- . human factors including the training and experience of the ship's master, the pilot and the tug master(s) and the familiarity of the ship's master with the port;
- . port characteristics such as the size and depth of navigation channels, swinging basins and berths;
- . variable factors including weather and sea conditions, tides, other traffic in the port and whether adjacent berths are clear; and
- . tug characteristics such as bollard pull, manoeuvrability and line handling equipment.

Under ideal circumstances all of these factors would be assessed and tugs would be ordered just prior to the ship's arrival or departure. In practice the tug requirements specified by pilots and harbour masters may be adjusted in response to only some of these factors due to institutional constraints and tug booking arrangements.

SURVEY OF TUG USAGE

As previous studies indicated that users perceived over-servicing to be a major issue, the BTCE survey included several questions on the number of tugs used for individual ship movements. Respondents were asked to indicate whether the number of tugs used for individual ship movements was:

- . always appropriate
- . greater than needed in particular circumstances
- . lower than needed in particular circumstances.

Where over-servicing or under-servicing was identified, respondents were also asked to indicate the port(s), the circumstances (for example, ship type or size) and the factors causing the imbalance.

The survey data did not identify the proportion of total ship movements that were perceived to be subject to over-servicing or under-servicing. This reflected the absence of detailed assessments of the appropriateness of tug numbers for each ship movement.

As the survey obtained the views of users and port authorities, the findings reflect the judgements of these industry participants. There are insufficient data for the BTCE to make objective assessments when the professional judgements of ships' masters, pilots and harbour masters differ.

Table 3.1 summarises respondents' overall assessments of the number of tugs used for individual ship movements at each port. Most users commented on practices at more than one port. Users provided comments on the 49 ports with harbour towage services while port authority responses covered 30 ports.

APPROPRIATE TUG NUMBERS

Around 60 per cent of responses for individual ports indicated that the number of tugs used for individual ship movements was always appropriate. This was the predominant response for most of the specialised bulk ports and outports. In 10 of these ports, all responses were in this category. In a further 26 ports, the majority of responses indicated that the number of tugs used for individual ship movements was always appropriate.

There were significant differences in the overall responses of users and port authorities. Around 62 per cent of users' responses indicated that the number of tugs used was always appropriate whereas 45 per cent of port authority responses were in this category.

OVER-SERVICING

Approximately 33 per cent of responses for individual ports indicated that too many tugs were used in some circumstances. Around 33 per cent of users' responses and 27 per cent of port authorities' responses were in this category.

These comments particularly related to capital city ports, with 52 per cent of the responses for these ports being in this category compared

TABLE 3.1 SURVEY RESPONDENTS' ASSESSMENTS OF TUG USAGE AT INDIVIDUAL PORTS

(number of responses)

| <i>Port</i> | <i>Number of tugs always appropriate</i> | <i>More tugs than needed in some circumstances</i> | <i>Fewer tugs than needed in some circumstances</i> | <i>Total responses</i> |
|-------------------------|--|--|---|------------------------|
| Abbot Point | 5 | 0 | 0 | 5 |
| Adelaide | 3 | 9 | 1 | 13 |
| Albany | 5 | 0 | 2 | 7 |
| Ardrossan | 2 | 0 | 1 | 3 |
| Brisbane | 11 | 12 | 0 | 23 |
| Bunbury | 7 | 3 | 0 | 10 |
| Bundaberg | 3 | 1 | 0 | 4 |
| Burnie | 5 | 1 | 0 | 6 |
| Cairns | 2 | 2 | 0 | 4 |
| Cape Cuvier | 2 | 1 | 1 | 4 |
| Dalrymple Bay | 3 | 0 | 0 | 3 |
| Dampier | 4 | 1 | 0 | 5 |
| Darwin | 2 | 1 | 0 | 3 |
| Devonport | 2 | 1 | 0 | 3 |
| Esperance | 4 | 0 | 3 | 7 |
| Fremantle | 8 | 5 | 0 | 13 |
| Geelong | 11 | 3 | 0 | 14 |
| Geraldton | 5 | 4 | 0 | 9 |
| Gladstone | 11 | 0 | 0 | 11 |
| Hay Point | 4 | 1 | 0 | 5 |
| Hobart | 3 | 3 | 0 | 6 |
| Kwinana | 7 | 3 | 0 | 10 |
| Launceston/ Bell Bay | 1 | 4 | 1 | 6 |
| Lucinda | 3 | 1 | 0 | 4 |
| Mackay | 2 | 4 | 1 | 7 |
| Melbourne | 15 | 10 | 0 | 25 |
| Mourilyan | 2 | 1 | 0 | 3 |
| Newcastle | 4 | 7 | 0 | 11 |
| Port Bonython | 3 | 0 | 1 | 4 |
| Port Giles | 2 | 0 | 1 | 3 |
| Port Hedland | 7 | 2 | 1 | 10 |
| Port Kembla | 3 | 5 | 0 | 8 |
| Port Lincoln | 4 | 0 | 1 | 5 |
| Port Pirie | 5 | 0 | 0 | 5 |

TABLE 3.1 (Cont.) SURVEY RESPONDENTS' ASSESSMENTS OF TUG USAGE AT
INDIVIDUAL PORTS
(number of responses)

| <i>Port</i> | <i>Number of tugs always appropriate</i> | <i>More tugs than needed in some circumstances</i> | <i>Fewer tugs than needed in some circumstances</i> | <i>Total responses</i> |
|--------------------|--|--|---|----------------------------|
| Port Stanvac | 2 | 1 | 0 | 3 |
| Port Walcott | 3 | 3 | 3 | 9 |
| Portland | 5 | 4 | 2 | 11 |
| Sydney/Port Botany | 10 | 20 | 2 | 32 |
| Thevenard | 3 | 0 | 2 | 5 |
| Townsville | 5 | 2 | 0 | 7 |
| Wallaroo | 4 | 0 | 1 | 5 |
| Weipa | 4 | 0 | 0 | 4 |
| Westernport | 10 | 1 | 0 | 11 |
| Yampi Sound | 3 | 0 | 0 | 3 |
| Other ^a | 6 | 0 | 1 | 7 |
| Total | 215 | 116 | 25 | 356 |

a. Ports with one or two responses. Includes Eden, Gove, Groote Eylandt, Port Latta and Whyalla.

Source BTCE survey.

with only 23 per cent of the responses for other ports. Over-servicing of some ships was reported in a total of 30 ports. This was the most frequent response for Sydney/Port Botany, Brisbane, Adelaide, Newcastle, Port Kembla, Mackay and Launceston/Bell Bay.

Respondents who identified over-servicing in a particular port were asked to specify the number of excess tugs in each case. In virtually all instances they indicated that one tug more than necessary was used.

Information on the circumstances in which over-servicing occurred was also sought from users and port authorities. Individual respondents frequently mentioned more than one circumstance. The circumstances most commonly cited by respondents who identified over-servicing were:

- fair weather conditions (49 per cent of respondents)

- . ships with manoeuvring aids such as bow thrusters (38 per cent of respondents)
- . ships of a particular type or size (37 per cent of respondents)
- . ships head-out on departure (29 per cent of respondents)
- . swinging manoeuvres (17 per cent of respondents).

The comments by users and port authorities indicated that over-servicing often occurred when there was a concurrence of two or more of these circumstances. For instance, some users considered that smaller ships which are head-out on departure in fine weather conditions generally require only one tug although two tugs are often specified by the pilot or harbour master. Similarly, it was stated that a ship with bow thrusters could sail with no tug assistance in these circumstances but there is a requirement by the pilot or harbour master to always have tug assistance in some ports.

Causes of over-servicing

The circumstances in which over-servicing is perceived to occur are closely related to the factors regarded as causing imbalances between the number of tugs ordered and required. Users indicated that over-servicing mainly resulted from over-cautious attitudes of pilots and harbour masters, inappropriate or inflexible port authority guidelines and long lead times for tug bookings.

Attitudes of pilots and harbour masters

Approximately 75 per cent of the users who identified factors which cause over-servicing considered that over-cautious and inflexible attitudes of pilots and harbour masters contributed to the ordering of unnecessary tugs.

As previously mentioned, pilots and harbour masters essentially determine the numbers of tugs to be used for individual ship movements in most cases. The flexibility to order additional tugs at short notice is limited by tug booking lead times. As discussed in a later section, the number of tugs to handle a particular ship movement must be specified in advance. Unforeseen changes such as a deterioration in weather conditions during the intervening period may affect the level of towage assistance required. Pilots and harbour masters may therefore specify additional tugs at the outset in order to avoid the risk of lengthy ship delays due to insufficient towage assistance. A number of serving and retired pilots interviewed during the study confirmed that too many tugs were used on occasion because of the requirements of the tug booking system.

Perceived over-servicing may reflect differences of judgement by ships' masters (or owners' representatives) and pilots or harbour masters in some instances. There are variations in the training and experience of these groups. A master will have a detailed knowledge of the capabilities of his ship but may not have a comprehensive understanding of the conditions at a port that he does not frequently visit. In contrast, a pilot or harbour master will have a thorough understanding of the local factors which affect ship handling in his port.

There are also differences in the decision-making perspectives of the two groups. A ship's master is primarily concerned with the safety of his ship and its efficient operation. The perspective of pilots and harbour masters also places a high emphasis on the safety of other ships and installations in the port. For example, the blocking of a shipping channel following an accident may impose social costs on the broader community which substantially exceed the private costs incurred by the shipowner.

Port authority guidelines

Around 27 per cent of users who identified factors which cause over-servicing indicated that port authority guidelines were a contributing factor. This reflected both the provisions in the guidelines and the flexibility with which they were applied.

Some users commented that various port authority guidelines did not take adequate account of technological factors such as bow thrusters which increase the manoeuvrability of ships. The survey form distributed to port authorities included a question on the frequency with which guidelines were reviewed and the factors which were considered. Port authorities generally indicated that guidelines were reviewed on an ad hoc basis in response to changes in ship characteristics or port operating conditions.

The comments by users also indicated that there was significant variation in the application of the guidelines in individual ports. In some cases pilots and harbour masters implement the guidelines in a flexible manner and fewer tugs than indicated are used in favourable circumstances. In other ports the guidelines are considered to be minimum requirements under all conditions and pilots or harbour masters will not allow fewer tugs to be used. Users often stated that guidelines in the latter ports were based on worst-case scenarios (for example, high winds or ships' masters who are unfamiliar with the port) and that fewer tugs than specified should be allowed when conditions are favourable.

Respondents who reported over-servicing in Sydney/Port Botany frequently mentioned the inflexible attitude of pilots towards the Maritime Services Board (MSB) guidelines. In oral evidence to the ISC, MSB officers expressed concern that the current guidelines were being applied inflexibly. It was stated that there was a need to review pilotage and towage requirements to ensure that assessments of risk were realistic and that unnecessary costs were not imposed on users. Requirements by many overseas authorities were considered to be less stringent.

Tug booking lead times

Around 19 per cent of users who identified factors which cause over-servicing considered that tug booking lead times were a contributing factor. As noted earlier, these arrangements encourage cautious ordering practices by pilots and harbour masters in some circumstances.

Up to 18 hours notice for tug bookings may be required for work outside ordinary hours on weekdays and notice of up to two days or more may be required for ship movements on weekends. During ordinary hours in the busier ports, tug crews are aboard the tugs and alterations to bookings can often be made with two or three hours notice. However, at other times, or in some smaller ports, crews may not be available unless the tug has been booked by the specified time. Booking arrangements are discussed in detail in Chapter 4.

The relatively long tug booking lead times for work outside ordinary hours mean that factors such as weather conditions may change significantly between the lodging of the booking and the nominated ship movement time. As tugs often cannot be obtained at short notice, this encourages over-ordering in some cases. If conditions closer to the time of the ship movement are more favourable, the prospect of substantial tug cancellation fees may discourage alterations to the initial bookings.

Tug roster systems

Tug roster systems have been identified as a factor affecting the provision of appropriate towage assistance (Inter-State Commission 1988a, 116). Although only 5 per cent of users who identified causes of over-servicing cited these arrangements, tug rosters also influence the requirements of pilots and harbour masters.

In ports with more than one tug, jobs are generally allocated to individual tugs in a fixed cyclical order. As discussed in Chapter 4, this mainly reflects the crew roster system and the allocation of

individual crews to specific tugs. In most cases it is not possible to order specific tugs for a particular ship movement and the tugs which will be rostered for the job are not known at the time of booking.

Uncertainty about the capabilities of the tugs that will be provided encourages the ordering of additional tugs in some cases, particularly where there is significant variation in the power or manoeuvrability of individual units. For example, a pilot or harbour master may require two large omni-directional tugs for a particular ship movement. However, if there are also one or more small tugs in the port, three tugs may be ordered to ensure adequate towage assistance as the combination of a small tug and a large tug, or two small units, would be insufficient. A number of pilots contacted during the study confirmed that their requirements are often based on the least powerful and least manoeuvrable tugs as they cannot predict which tugs will be provided for a particular job.

Port authority guidelines are also affected by the tug roster systems and capabilities of the tugs in the port. Given that specific tugs cannot always be assigned to particular ships, the guidelines may be based on the smallest tug(s) in the fleet.

Reducing over-servicing

There appears to be some scope for increased flexibility in attitudes towards tug usage by some port authorities and pilots, particularly in those ports where tug usage guidelines are considered to be minimum requirements in all conditions. It may be appropriate to consider a review of some port authority guidelines in conjunction with users. In view of the direct and indirect effects of tug booking lead times and roster systems, increased flexibility in these areas also has considerable potential to reduce the incidence of over-servicing in some ports.

A number of users have suggested that in some cases better procedures could be established to resolve differences of opinion on tug usage. Facilities such as the ship handling simulator at the Australian Maritime College in Launceston could possibly assist in resolving matters of a technical or physical nature.

The elimination or reduction of perceived over-servicing would reduce towage charges for the affected ships. However, towage operators' costs and hence total payments by lines and agents in a particular port will only decline if tugs or crews are removed from the port, the wage component for work outside ordinary hours is reduced or the

operator's margin is reduced. If the level of perceived over-servicing in a port is reduced and the towage operator's costs are unchanged, the operator may seek to maintain the margin through an increase in the charge per tug job.

Certain ship manoeuvres require a minimum of two tugs and hence it is unlikely that numbers of tugs could be reduced in ports with only one or two tugs. Potential reductions would therefore be mainly limited to some of the 12 ports which have more than two tugs. However, in the absence of detailed data on the proportion of total ship movements subject to perceived over-servicing in individual ports, it is not possible to estimate potential reductions in numbers of tugs or crews.

UNDER-SERVICING

Around 7 per cent of responses for individual ports indicated that insufficient tugs were used for some ship movements. This involved 17 ports, of which 15 were bulk ports or outports generally served by either one or two tugs. In virtually all cases it was stated that there was one less tug than needed or that a more powerful tug was required. Table 3.1 indicates that under-servicing was not identified in a majority of responses in any port.

There were significant differences in the overall responses of users and port authorities. Around 5 per cent of users' responses indicated that insufficient tugs were used in certain circumstances whereas 27 per cent of port authority responses were in this category. This variation may partly reflect differences in the port coverage of the responses of the two groups.

Under-servicing was generally considered to occur in conditions of high winds or other inclement weather, especially when a large ship required towage assistance. When weather conditions make it difficult for ship movements to proceed safely in the smaller ports, ships may be required to wait until the weather improves.

Comments on under-servicing in ports with a single tug often indicated that the number of ship movements in the port did not warrant the deployment of a second tug. However, where the bollard pull and manoeuvrability of the current tug were regarded as seriously inadequate, users and port authorities often suggested that a more powerful replacement should be obtained.

OVERVIEW OF TUG USAGE

The available data indicate that some over-servicing or under-servicing occurs in many Australian ports. Assessment of the appropriateness of the number of tugs used for a particular ship movement involves subjective judgements by pilots, harbour masters and ships' masters on the basis of technical considerations and professional experience. It is therefore not possible to objectively quantify the frequency of over-servicing and under-servicing.

In almost all ports over-use or under-use of tugs occurs in specific circumstances. Measures which promote increased flexibility in the attitudes of pilots and harbour masters, tug booking arrangements and tug roster systems offer the greatest scope to reduce over-servicing.

Under-servicing occurs in adverse weather conditions in smaller ports and reflects the high cost of providing greater towage capacity in these ports. Opportunities to economically replace inadequate tugs may have increased with the removal in November 1988 of restrictions on the importation of second-hand tugs.

CHAPTER 4 SERVICE QUALITY

Although charges are the most obvious area in which towage services affect the costs incurred by shipping lines, service quality aspects may also have a significant impact. Daily operating costs of ships in the Australian trades range between \$7000 and \$30 000 and any delays caused by towage services may therefore markedly increase the lines' costs. Shippers may also incur additional costs in areas such as increased requirements for working capital.

This chapter covers the quality of service provided by the harbour towage industry. It considers the availability of tugs, the days and hours of towage operations, the accuracy of information provided to towage operators, the impact of tug booking arrangements on shipping operations and the adequacy of the tugs in individual ports.

The BTCE survey of users and port authorities included sections on each of these aspects of service quality. Respondents were also able to make additional comments in their general remarks on the harbour towage industry.

AVAILABILITY OF TUGS

The ability of towage operators to provide tugs at the times specified in bookings is an important component of service quality. The BTCE survey therefore included a question that asked participants to indicate the extent to which tugs were available when required in the ports where they regularly operated. Around 37 per cent of respondents replied that tugs were always available when required and 62 per cent considered that they were available on most occasions. The remaining respondents indicated that tugs were sometimes available when required.

Respondents who stated that tugs were not always available identified two main reasons for unavailability in the ports concerned. Engagement of tugs on other ship movements at the time (particularly in capital city ports) was cited in 46 per cent of these responses. A further 36 per cent identified requirements under the Tugboat Industry

Award for crew rest periods. Other reasons cited by respondents included tug booking arrangements and industrial disputes.

Unavailability of tugs due to other ship movements is related to the peaks and troughs in harbour towage activity in the busier ports. Towage operators have attempted to increase tug utilisation rates in the larger ports by catering specifically for periods of moderate peak activity. This approach is designed to reduce costs associated with idle time but ship delays can be experienced at times of absolute peak demand for tugs.

The Tugboat Industry Award specifies hours of duty and rest periods for tug crews although there are variations in the arrangements in individual ports. Minimum breaks of at least six hours are generally required for each crew between cessation of duty on one day and commencement of duty on the next day. There are also provisions for meal breaks at specified times of the day and in some cases after five hours of continuous duty. In all ports, tug crews are entitled to receive a break from work of 8 or 10 hours after being continuously on duty for 18 or 20 hours, provided that they complete any towage work which they have started. In most ports employers may request that crews continue to work but are required to pay penalty rates.

On any day there is generally one crew rostered for a particular tug. Although crews are required to be available for duty at all hours, unavailability of tugs in a port may result from the combination of the physical exhaustion provisions of the Award and heavy use of tugs at a particular time of the day. For example, where towage work for the day starts very early in the morning, knock-off of crews after 18 hours of continuous duty may mean that sufficient tugs are not available late in the evening. This may result in delays of several hours to ship movements.

Some respondents indicated that the availability of tugs was also affected by booking lead times as there were often no mechanisms for bringing bookings forward should weather conditions improve or faster ship turnaround be achieved. Tug booking arrangements are discussed in detail in a later section.

During the course of the second tier wage negotiations, towage operators sought to alter certain work practices which affected tug availability. The subsequent agreements between towage operators and trade unions modified arrangements in over 25 ports.

In seven ports, the Tugboat Industry Award already stipulated that crews would work at least one job shorthanded if a rating were absent.

This flexibility was extended to a further 16 ports (including Sydney/Port Botany and Melbourne). In each of five ports, official stop work meetings of different trade unions were to be co-ordinated in order to minimise disruption to normal work and to ensure that there was no inconvenience to shipping.

Increased flexibility in rostering was achieved in a small number of ports. In four cases crews would be prepared to move from a disabled tug to another tug in the fleet, including one that was laid up but kept in good working order. Crews in two ports would break a roster to service ships just after midnight or stay on to perform towage work until other crews came on duty after a rest break. Where particular ships required tugs of specific power, these would be made available in three ports. In four instances, changes of orders would be accepted out of hours if the crews were already present for other towage work.

In two ports steps were taken to ensure that jobs were finished earlier in specific circumstances. Tugs in Port Kembla would no longer have to return to base after finishing a job if there was further work available for them in the inner harbour area. In Port Adelaide tugs would steam to moorings near Outer Harbour on the previous day if they were required for a ship movement early in the morning. The installation or upgrading of tug pens has decreased waiting times at three other ports.

There appears to be scope for extending the most flexible crew working arrangements to ports where tug availability is currently constrained by less flexible arrangements. A close examination of user needs in individual ports may identify further opportunities to improve availability in specific circumstances.

HOURS AND DAYS OF TOWAGE SERVICES

Several towage operators contacted during the study indicated that the costs of providing towage services in some ports could be reduced by lowering the daily hours of tug operation or declaring one or two tugless days per week. These changes might enable towage operators to employ fewer crews in some smaller ports or provide a basis for review of the out-of-hours component of the aggregate wage.

Around 60 per cent of individual port responses indicated that the provision of towage services for anything less than 24 hours a day for 7 days a week was unacceptable. A further 8 per cent stated that these proposals were not feasible or would not affect towage costs. Tugless days were supported in 7 per cent of responses and a reduction

in daily hours was supported in 18 per cent, with 4 per cent stating that both proposals were acceptable. The remaining 11 per cent of responses indicated that towage services were currently provided for less than 24 hours per day in the ports concerned.

Around 50 per cent of the respondents who were prepared to consider a reduction in the availability of towage services quantified the decrease in charges that would be necessary to obtain their support. They generally required an offsetting reduction in charges of between 20 and 25 per cent.

Respondents gave two main reasons for the unacceptability of any reduction in tug availability. They stated that, because cargo was being handled 24 hours a day, the services of tugs were required on a similar basis. They also indicated that the tidal nature of some ports meant that tugs were required at all hours in order to avoid lengthy delays to ships. This was considered to be particularly important in the case of large bulk carriers which often relied upon a high tide to safely clear a port.

The comments by respondents appear to reflect a view that any savings in towage charges would not offset the additional costs associated with the extra delays that would result from time to time. Given the unpredictability of cargo handling rates, many users considered that it would not be possible to confidently schedule ship movements during the limited times when tugs would be available.

Users who stated that 24-hour service was not provided in particular ports indicated that this resulted from factors such as unavailability of pilots or onshore labour, restrictions on night movements of ships and crew rest periods. For instance, several respondents stated that for these reasons tugs were often not operated at:

- . Fremantle and Kwinana between 2300 and 0600
- . Geelong between 1900 and 0100
- . Port Bonython between 2200 and 0200
- . Darwin from 2300 to 0500
- . Bunbury from 2000 to 0600.

It was also indicated that tugs were not operated at varying times in 14 other ports.

Despite the general lack of support by users, there may be scope to reduce the hours or days of towage services in some smaller ports with infrequent ship calls or significant periods of low cargo handling

activity during the day. The data in Table 2.2 indicate that 20 ports had less than 100 ship calls in 1986-87 and that these ports averaged one ship movement every three days. In these conditions there appears to be scope to meet users' needs with towage services that are flexibly operated for less than 24 hours per day and seven days per week. A proposal for tugless days during a specified period at one Australian port has recently been accepted by major shippers.

INFORMATION PROVIDED TO TOWAGE OPERATORS

The quality of service that towage operators can provide is affected by the accuracy of the information on ship movement times supplied by lines and agents. The BTCE survey therefore included a question on how often the estimated times in initial tug bookings were within half an hour of actual ship movements. Towage schedules usually specify that detention charges will apply if tugs are kept waiting for more than either half an hour or an hour after the indicated ship movement time.

Around 49 per cent of users who answered this question indicated that the information they provided was always accurate and a further 48 per cent considered that accurate details were provided on most occasions. The remaining users replied that the booking information was sometimes accurate. Approximately 39 per cent of port authorities considered that users always provided accurate information and 61 per cent indicated that they did so on most occasions.

Towage operators contacted during the study were critical of the accuracy of information provided by lines and agents. It was suggested that more attention should be paid to monitoring the progress of cargo handling operations so that agents were more aware of likely ship movement times. Several agents also stated that some users did not notify towage operators of changes in ship movement times as soon as the information was available. Unnecessary attendance of crews may lead to pressure for upward adjustments of aggregate wage entitlements and hence result in higher basic towage charges.

An additional question in the survey asked users to indicate why inaccurate information was provided to towage operators. Respondents generally identified more than one factor. Most of the reasons given for significant differences between actual ship movement times and initial booking times involved factors beyond the control of lines and agents.

Around 70 per cent of respondents who gave reasons indicated that inaccuracy resulted from delays in ship arrival or departure as a

result of weather conditions or mechanical breakdowns aboard ship. Approximately 61 per cent identified the unpredictability of Australian stevedoring services in areas such as handling rates or equipment failures. Other factors cited by respondents included industrial problems (20 per cent), the impact of long booking lead times (16 per cent) and the effect of other traffic in the port area (9 per cent).

TUG BOOKING ARRANGEMENTS

The discussion in previous chapters and in earlier sections of this chapter indicates that tug booking lead times are a major issue for a significant group of users. Dissatisfaction with the frequency of cancellation charges partly reflects the impact of tug booking arrangements. Lengthy advance notice periods and difficulties in obtaining extra tugs at short notice also encourage the ordering of additional tugs to allow for factors such as unforeseen changes in weather conditions.

As part of the BTCE survey of the towage industry, respondents were asked to identify any ways in which tug booking lead times affected the performance of their operations. Around 56 per cent of users who responded to this question advised that there was a negative impact on their operations.

Approximately 49 per cent of users who identified negative effects indicated that they incurred financial losses due to cancellation or re-booking fees. Around 30 per cent nominated ship delays resulting from an inability to bring forward tug attendance when ships were ready to move earlier than originally anticipated. In addition, 53 per cent of the users who identified negative effects considered that with long tug booking lead times it was difficult to accurately predict when towage services would be required. Several respondents suggested that minimum notice periods for work outside ordinary hours should be reduced to no more than four hours.

Notice periods for tug bookings in Australian ports can be broadly considered in terms of weekdays and weekends. A large number of the towage schedules for individual ports specify that tug orders must be lodged by a particular time on the preceding weekday. The most common deadlines for notification of orders are 1500, 1530 and 1600 hours. These bookings generally cover the period to the early part of ordinary hours on the next weekday. With the exception of early work on Monday, notice of up to 18 hours may therefore be required for tug jobs on weekdays.

In many cases there is significant flexibility in work arrangements during ordinary hours. In several States towage schedules specify a two-hour minimum notice period for tug jobs to be carried out in ordinary hours. In other States orders for afternoon work on a weekday must be lodged by midday in some ports but more often a minimum notice period of two or three hours applies throughout ordinary hours. Alterations to tug booking times for ship movements during or outside ordinary hours can be made without penalty if towage operators are advised during ordinary hours and sufficient notice is provided. This flexibility is facilitated by the permanent stationing of crews on the tugs during ordinary hours at the busier ports.

Arrangements for tug jobs at night and in the early morning are less flexible as crews require notice of work outside normal hours of duty. Changes to ship movement times at short notice are therefore more likely to result in cancellation fees or ship delays.

In a small number of ports the same booking arrangements apply for work on weekdays and weekends. However, in most ports initial notice for tug jobs on weekends (including early Monday morning) must be made on the preceding Friday. Lines and agents are therefore required to forecast ship movements up to 66 hours ahead. Longer notification periods may be involved when a public holiday occurs on the Friday or Monday. In some cases such as ship movements from Melbourne to Adelaide, a tug booking time in a particular port must be nominated before the ship has finished cargo operations in the preceding port.

In a number of ports users are able to confirm weekend bookings or amend them without cost provided that they do so by a specified or mutually agreed time on the Saturday. There may also be an opportunity to alter bookings without penalty on the Sunday. However, users might not be able to bring forward the first booking for either day or any bookings on the weekend with the result that ships may still be delayed. In the remaining ports there is no opportunity to alter weekend bookings after the Friday afternoon deadline. A significant number of users stated that they incurred cancellation fees for any alteration of bookings outside ordinary hours in some ports, even if the reason for the delay was an external factor such as the failure of the preceding ship to sail on time.

Where tugs are required to steam from one port to another to carry out a particular job, up to 24 hours notice is typically required. Availability of tugs at the nominated time usually depends on commitments for towage work in the home port.

The survey responses showed that various agents worked to cut-off times which differed from those published in towage schedules. This

suggests that some more flexible informal arrangements have been developed in particular ports or that full awareness of operators' requirements has not always been achieved in day-to-day contact in those ports.

The Tugboat Industry Award does not specify booking lead times. However, several schedules for individual ports require that tug crews receive advance notification of work outside ordinary hours. In some cases the Award states that crews must accept changes of orders without any extra payment. In other ports they are entitled to an extra payment for performing towage work outside normal hours when insufficient notice has been given.

The relatively long tug booking lead times for work outside normal hours in Australian ports appear to be related to the call-out system for crew attendance during these hours. There are rigidities in tug availability when crews require lengthy notice of work outside normal hours of duty.

Some survey respondents commented that tug crews were often unavailable outside ordinary hours despite being on call. They considered that crews were adequately compensated in return for guaranteeing to be available for 24 hours per day.

As noted earlier, there are more flexible working arrangements in some Australian ports under which ships' agents can confirm, or amend without penalty, bookings for weekend work provided that they do so by specified or mutually agreed times. Such arrangements do not appear to have created significant operational problems for the towage companies. There seems to be some scope to extend them to other ports. It may also be appropriate for towage operators and users to jointly investigate further improvements in flexibility for work outside ordinary hours taking into account traffic requirements at individual ports.

TUG SPECIFICATIONS

Inappropriate tug specifications may adversely affect the quality of service provided to users. For example, if tugs in a port are under-powered they may not provide an adequate margin of safety in poor weather conditions and ships may be prevented from moving until weather conditions improve.

The harbour towage fleet has been significantly upgraded in the past ten years, with around 40 per cent of the current fleet being constructed during this period (BTCE 1988, 13). Increases in ship

sizes and the exposed nature of some Australian bulk ports in particular have required specific attention to tug design. However, there have been some complaints that equipment is too elaborate or that too much attention has been paid to salvage considerations, resulting in some tugs being 'over-designed' for harbour towage activities.

The BTCE survey of the towage industry therefore included a question which asked respondents whether the physical specifications of tugs were generally well-suited to the towage task in the ports where they regularly traded or operated. Around 84 per cent of respondents indicated that the physical specifications were generally well-suited to their requirements.

The respondents who indicated that tugs were inappropriate for particular towage tasks also provided information on the unsuitable aspects. Around 62 per cent of these respondents indicated that the tugs did not have sufficient power, with inadequate manoeuvrability also being identified by most port authorities making this response. These responses often involved small bulk ports or other outports with low traffic levels, in conditions of high winds or poor weather. A number of users proposed the replacement of tugs that were not powerful enough to carry out their tasks in adverse conditions.

Around 35 per cent of the respondents who identified unsatisfactory specifications indicated that their dissatisfaction resulted from an inability to order the most suitable tugs for individual ship movements. As noted in Chapter 3, uncertainty about which tugs will be provided also contributes to the ordering of additional tugs in some cases.

Restrictions on the ordering of particular tugs for specific jobs arise from the interaction of crew roster systems and procedures for the allocation of crews between tugs. In order to spread towage work evenly among the crews in a port, tug jobs are allocated to the crews on duty in a fixed cyclical order. Individual crews are allocated to specific tugs and hence the tugs are also deployed in a fixed order. In addition, towage operators consider that the deployment roster promotes a balanced maintenance pattern for the fleet by avoiding persistent heavy use of some tugs.

As a result of this system, it is not possible to order specific tugs and the tugs to be used for a particular ship movement are not known at the time of booking. Although more flexible arrangements have recently been negotiated in several ports, departures from a strict order of work allocation usually occur only in exceptional

circumstances. Where the towage requirements of specific ships in individual ports are not adequately met in some circumstances, local negotiations may facilitate the provision of more appropriate towage assistance.

Around 5 per cent of respondents who identified unsatisfactory specifications indicated that the physical dimensions of the tugs were too large or that the tugs were too powerful for their requirements. In ports where both large and small tugs are operated, the tug roster system may prevent the use of the most appropriate tug(s) for smaller ships.

OVERVIEW OF SERVICE QUALITY

Tug specifications and the availability of tugs at nominated booking times are generally satisfactory in most ports. However, there are rigidities in tug booking arrangements and crew roster systems. These rigidities impose additional costs on users through cancellation or re-booking fees, ship delays and the use of more tugs than is necessary in certain circumstances. The wider application of more flexible arrangements which have already been negotiated in some ports would provide significant benefits to users. It may also be appropriate for towage operators and users to jointly investigate further improvements in flexibility in individual ports.

In most ports users generally require towage services to be available for 24 hours per day and seven days per week. There may be scope to lower towage charges by reducing the hours or days of towage services in some smaller ports with significant periods of low shipping or cargo handling activity.

CHAPTER 5 FACTORS AFFECTING PERFORMANCE

The current performance of the harbour towage industry reflects the attitudes and policies of the various industry participants. Towage operators essentially determine the structure and level of charges, the terms and conditions for the provision of towage services and tug design. Trade unions have significant power in relation to work practices, crew levels and other conditions of service.

Users of towage services have little influence over aspects such as the level and structure of charges and tug booking arrangements. Towage charges normally form a small component of total ship operating costs whereas very high costs may be incurred if ships are delayed. Shipping lines are therefore sensitive to the prospect of industrial action and have not actively supported operators' attempts to contain or reduce labour costs.

There are significant variations in the powers available to port authorities to influence or oversight towage operations and in the extent to which such powers are used. Many authorities affect the provision of towage services through their requirements for tug availability and specifications for the characteristics of tugs or their number. Port authorities generally determine the number of tugs used for particular ship movements either directly through tug usage guidelines or through the requirements of pilots and harbour masters.

The factors which affect the technical and allocative efficiency of the harbour towage industry involve these participants to varying degrees. The major influences on industry performance include the level of competition, port authority regulation, user consultation and industrial negotiations.

COMPETITION

Competition is a major means of promoting efficiency in many sectors of the economy. Where it is weak additional costs may be imposed on users through excessive factor rewards, sub-optimal combinations of inputs or inappropriate combinations of price and service quality.

Competition may take the form of either direct competition between existing operators or potential competition from new entrants. In addition, competitive pressures may be applied by the availability of alternative products or services.

Competition between existing operators

There is currently little direct competition between the operators of harbour towage services in Australian ports. Harbour towage services at individual ports are generally provided by a single operator, the major exceptions being Sydney/Port Botany and Newcastle. In these ports two independent operators provide towage services but there are various co-operative arrangements such as the sharing of some towage work.

The towage industry is highly concentrated on a national basis, with the three major operators accounting for an estimated 80 per cent of the market in terms of the number of ships handled (BTCE 1988, 23). There is also a strong regional concentration in some cases. For example, a Brambles subsidiary is the sole operator of harbour towage services in Tasmania and Adelaide Steamship is the main operator in South Australia. The structure of the industry has become increasingly concentrated over the last 20 years, with the main changes being the acquisition of most remaining port authority and independent operations by the major operators. During 1988 Adelaide Steamship's associate Petersville Sleigh acquired a shareholding of around 20 per cent in Howard Smith and obtained two board positions.

There are various co-operative arrangements between the major towage operators in Australia. Around 54 per cent of the harbour towage fleet is operated through joint ventures (BTCE 1988, 23). The three major operators also formed a joint venture company (ABHO) in the mid-1970s as a means of finding markets for old tugs and promoting overseas towage activities (Howard Smith 1977). However, the company is no longer active.

There is little evidence of open rivalry between the major towage operators, although there may be some competition through the tendering process used in a small number of ports. There may also be competition for the business of new lines or agents in the ports with two operators.

The major operators claim that the existence of multiple operators under competitive conditions in individual ports would result in duplication of facilities, lower tug utilisation and higher charges. Economies of scale and scope are discussed in detail in a later

section. It is also claimed that operators need market power in order to deal with trade unions that have considerable power (Parkin 1988).

The available information on towage operations in overseas ports indicates that direct competition in these ports is also generally limited. There are single operators in many large ports such as Singapore, Amsterdam, London and Antwerp (inner harbour) as well as in New Zealand ports. In those ports with more than one towage operator, there are often co-operative arrangements between the companies. For example, in Hamburg five companies operate 19 tugs under pooling arrangements for job allocation and earnings. Competition for individual tug jobs through variations in charges appears to be most common in North America (*Ship & Boat International* 1988, 45)

Potential competition and barriers to entry

The impact of potential competition on market conduct and performance has long been recognised by economists. More recently, it has been given renewed prominence in the theory of contestable markets. This work indicates that, even where the structure of an industry is highly concentrated, the threat of new entry may promote efficient operations.¹ However, the effectiveness of contestability, especially in restricting monopoly pricing, has been questioned in recent economic literature (Stiglitz 1987).

A pre-requisite for potential competition to be effective is that entry barriers be relatively low. There appear to be significant barriers to entry in the Australian harbour towage industry. These barriers can be considered in terms of economies of scale and scope, sunk costs and institutional and operational barriers.

Economies of scale

Economies of scale exist when a given percentage change in all inputs results in a greater percentage change in physical output. Long-run average costs therefore decline as output increases. Economies of scale occur both within a particular port and through the operation of a national towage fleet in a network of ports.

The provision of towage services in a particular port by a single operator avoids some duplication in areas such as administration, crews, tugs and berth facilities. For example, in 1980 the Trade

1. For a more detailed discussion of potential competition and the theory of contestable markets, see BTE (1985, 219-230).

Practices Commission concluded that joint venture arrangements between Howard Smith and McIlwraith McEacharn in Melbourne resulted in fewer tugs being required to service normal port operations, more efficient tug utilisation and faster servicing of shipping during peak and emergency periods.

The total size of the operator's fleet on a national basis also appears to provide some pecuniary economies of scale. The major operators are able to obtain discounted prices for tug construction and insurance (BTCE 1988, 31 and 40). It is also claimed that fuel costs are lower for a large operation as a result of access to contract rates. In addition, the major towage operators consider that their large size enables them to spread their administration costs over more units of output and to employ specialist staff who contribute to greater operating efficiency (Ross 1984, 5).

The multi-port activities of the major towage operators facilitate the movement of tugs between ports to ensure the best matching of towage capacity to requirements (Australian National Maritime Association 1988, 37). The rotation of older tugs to the smaller ports enables the major operators to minimise capital charges in these ports. Multi-port operations also provide some diversification of port-related risk as the profitability of towage operations in a particular port may vary significantly on an annual basis due to variations in traffic. A single port operator would be significantly affected by a major change in the port whereas the wider spread of a major operator's activities would cushion the impact of developments in a particular port.

Market size and economies of scale also affect the competitive strategies of incumbent operators and new entrants. As towage services in several outports are provided by small operators, a new entrant could become established in one or more of these ports without directly confronting the major towage operators. However, entry into the towage industry on a significant scale would involve expansion into ports that are currently served by one or more of the major operators.

The harbour towage market in Australia is small and the number of tug jobs appears to be declining in most Australian ports (BTCE 1988, 10). The number of tug jobs is essentially determined by shipping traffic and the requirements of pilots and port authorities with the result that towage operators cannot expand the total size of the towage market in a particular port through pricing or other strategies. Introduction of additional tugs into a port by a new entrant would

therefore dilute the revenue received by the incumbent and result in excess capacity in the short run. Unless towage charges were increased significantly, financial losses would probably be incurred by the operators. The imbalance between the demand for towage services and capacity provided would have to be removed in order to obtain an efficient towage service.

A new entrant in a particular port would eventually have to drive the existing operator from the port, enter into a co-operative arrangement or withdraw from the market. The major operators are well established, have long experience in the industry and are associated with major corporate groups. Maritime activities are a key component of the corporate strategies of several of these groups. A new entrant would therefore face the prospect of a strong competitive response from a well-positioned incumbent in most cases. It has been suggested that greater opportunities for new entrants to replace existing operators could be created by the use of tendering systems (see below).

Economies of scope

Economies of scope exist when a single firm can provide a certain level of output for each product or service at a lower cost than could a combination of separate firms each producing a single product or service (BTE 1987, 152). They arise from the sharing or joint utilisation of inputs.²

Economies of scope in Australian harbour towage appear to arise mainly from the sharing of inputs where several ports are located in a relatively small area. For example, the existence of the same operator at Melbourne, Geelong and Westernport permits the permanent stationing of only two tugs at each of the smaller ports as additional tugs can be sent from Melbourne when required. The contract for the provision of towage services at Westernport specifies that two operational tugs must be stationed in the port at all times. If a different operator obtained the towage contract at Westernport the company would either have to provide three tugs or reach an agreement to hire tugs from a rival operator in Melbourne in order to ensure the presence of two operational units in the port at all times.

Similar economies in the use of tugs owned by a single operator and based in adjacent ports occur at other locations such as northern

2. For a more detailed discussion of economies of scope, see Bailey and Friedlaender (1982).

Tasmania. In addition, six Australian ports which have no permanent tugs are served exclusively by units stationed in nearby ports.

The cost savings associated with co-ordination of towage activities in adjacent ports extend beyond the number of tugs. In Victoria cost savings estimated at \$500 000 per annum have been obtained by replacing separate tug control offices in Geelong and Westernport with a central facility in Melbourne. Similarly, inter-port movements of crew members, for purposes such as replacing personnel on leave, reduce the numbers of employees required by towage operators in some smaller ports. Achievement of these savings appears to be dependent on the presence of the same operator in the adjacent ports.

The economies of scale and scope available to the major operators may be partly offset by any diseconomies of national co-ordination and cost control. In addition, there are probably some benefits of owner management or operation by port authorities or major shippers. For example, an organisation operating a variety of harbour services in a particular port may achieve some economies of scope as a result of improved utilisation of resources such as labour.

Sunk costs

Sunk costs are those costs incurred by a new entrant that would not be recovered if the operator subsequently withdrew from the harbour towage market.

A new entrant into the Australian harbour towage market would incur some sunk costs. It would not be possible to recover certain establishment costs associated with rental contracts for facilities, training of crews and marketing expenses. Withdrawal from the towage market could also involve significant termination payments to tug crews. The resale prices of tugs would probably be lower than the acquisition costs depending on factors such as their age and capacity. There would be costs for brokers' commissions and delivery voyages. Even if tugs were leased by a new entrant, early termination of leases would be expected to result in cost penalties.

Disposal of tugs by an unsuccessful entrant may involve an overseas buyer as the domestic market for second-hand tugs is small. Sale prices in overseas countries could be limited by international variations in preferred tug specifications.

Institutional and operational barriers

Contractual arrangements and licensing by port authorities or relevant State government departments are used in 21 ports. In some instances exclusive licences constitute barriers to entry by new operators.

However, new operators have periodic opportunities to enter nine ports where access is determined on the basis of competitive tenders (BTCE 1988, 66-67).

Access to the towage market in a particular port may be affected by existing commercial relationships between the incumbent towage operator and the users of towage services. There are also some ownership links between towage operators, shipping lines and ships' agencies. Adelaide Steamship, Howard Smith and McIlwraith McEacharn have agency subsidiaries. These agency operations do not have dominant market shares in the large ports but may handle a large proportion of ship movements in some outports where an associated company is the towage operator. Such links could limit the work available to a new entrant in certain circumstances. However, an existing agency business would also provide the basis for entry by a new operator.

Any new entrant has to marshal substantial financial resources in view of the considerable increases in tug construction costs in recent years and the introduction of more powerful tugs. Acquisition costs for new tugs built in Australia will be further increased by the phasing out of the 20 per cent bounty for local construction. However, the prices of used tugs could be expected to decrease following the removal in November 1988 of restrictions on the importation of second-hand tugs.

A new entrant is unlikely to be able to achieve any competitive advantages through lower crew costs. This reflects the current state of industrial relations in the industry and the operation of the Tugboat Industry Award in most ports.

Provision of towage services in a particular port by a competing operator using tugs based in an adjacent port is highly unlikely in the Australian situation due to the high costs associated with this strategy. Distances between adjacent ports are often substantial and movements outside normal harbour limits involve higher wage levels and in many cases larger crews. The major operators consider that permanent servicing of a moderately busy port from an adjacent facility is not economic unless the steaming distance between the two ports is less than 20 kilometres.

A new entrant may not be able to obtain inputs such as adequate berth facilities in some ports due to the limited supply of such inputs. There could also be difficulties in obtaining sufficient crews or managers skilled in handling aspects of the Australian operating environment such as industrial relations issues.

An incumbent operator with long service in a port and an adequate or good record of performance may be preferred to a new entrant with limited experience in the industry or no exposure to Australian conditions. In these circumstances a user or port authority may forego the potential opportunities associated with a new entrant in order to minimise the risks of poor performance.

Potential entrants

The effectiveness of potential competition is also affected by the number of potential entrants. Under current circumstances, the number of potential entrants with readily available expertise in harbour towage operations appears to be small. The existing port authority and mining company operators are unlikely to expand into other ports as towage is incidental to their main activities. Several independent operators are engaged in limited harbour towage activities or related work such as the movement of barges and other small vessels. However, they are small in number and have limited resources. In addition, two of Australia's three large transport companies already have towage interests.

Direct operation of towage services by a port authority would not increase competition on an on-going basis as there would still be a single supplier of towage services in most cases. However, the prospect of port authority provision of towage services has reportedly been used in negotiations with a towage operator about charges on at least one recent occasion.

Direct involvement in the provision of harbour towage services appears to be unattractive to many public port authorities in Australia. The withdrawal of virtually all of the remaining port authorities from the industry in the 1970s and early 1980s reportedly reflected concerns about a flow-on of towage industry wages and conditions into other areas of their operations. Many authorities also consider that specialist expertise is required to operate towage services and that the most efficient approach is for these activities to be undertaken by specialist private operators. The loss of any potential economies of scale and scope available to multi-port operators could create further disincentives to port authority provision of harbour towage services.

Despite these factors, the Port of Portland Authority has continued to operate harbour towage services at a cost which it considers to be lower than that achievable by a major private operator. This partly reflects opportunities to utilise resources such as labour more intensively due to the variety of activities undertaken by a port authority.

The most likely new entrants in the harbour towage industry are companies with existing maritime interests which provide a basis for diversification or overseas towage operators with appropriate equipment and expertise. P&O Australia has recently expanded its harbour towage activities, although these are still limited to three ports in Western Australia. Overseas towage operators have reportedly expressed interest in tenders for harbour towage services issued by Australian port authorities on several occasions but none of these companies have entered the Australian market.

Buyer concentration

The market power of concentrated suppliers may be constrained if buyers of services exert significant market power. However, shipping lines and their agents have limited influence over towage services in Australian ports. This reflects the fragmented nature of the shipping industry and the absence of alternative towage services in most ports. Individual buyers and their industry associations are thus unable to exert significant market power in negotiations with towage operators on charges and operating practices. However, the lines' requirements in areas such as hours of tug availability have an indirect impact on towage costs.

Another factor limiting the influence of buyers is the role of port authorities and pilots in determining the number of tugs used for individual ship movements. The shipping lines and their agents have little direct control over the quantity of towage services they buy, although factors such as ship design do have an indirect impact on towage requirements. This is in marked contrast to the relationship between buyers and sellers of goods and services in many other markets.

Port authorities provide some constraints on the market power of towage operators through controls over entry by operators in individual ports and review of towage charges. Regulation by port authorities is discussed in greater detail in later sections of this chapter.

Ship-handling aids

In the long run, shipping lines can lower the demand for towage services by investing in ship equipment which reduces towage requirements. The ship-handling aids include bow and stern thrusters, controllable-pitch propellers and flap-type rudders. They have contributed to the general decline in the number of tug jobs in Australian ports in recent years. Although this equipment can be seen as a substitute for towage services, the long lead times mean that it does not influence the short-run behaviour of towage operators.

The precise impact of these factors on future towage requirements will only become clear in the medium to long term when existing ships in the Australian trades are replaced. As noted in Chapter 3, lines and agents consider that the potential of ship-handling aids is not being realised in some circumstances due to port authority guidelines and over-cautious attitudes of pilots and harbour masters. On the other hand, several pilots and harbour masters contacted during the study stated that limited allowances for bow thrusters reflect the inadequate power or unreliability of the thrusters on some ships.

Promoting competitive practices

Local and overseas evidence indicates that competition in the harbour towage industry is inherently weak. In this situation it is desirable to at least maintain and if possible increase the effectiveness of competition in the industry. The Trade Practices Commission reviews proposed mergers and specific market conduct while tendering systems may provide some scope to increase the pressure on incumbent operators from potential entrants.

Trade Practices Commission

Between 1975 and 1981 the major towage operators submitted 11 applications to the Trade Practices Commission for clearance of proposed mergers or other agreements or authorisation of specific conduct.³ These applications involved the ports of Sydney, Port Botany, Newcastle, Port Kembla, Eden, Melbourne and Gladstone.

The Commission declined to authorise proposed agreements which would guarantee identical prices by competing operators in a port or fixed market shares in a port. It also rejected agreements under which additional tugs in a port would be provided by a particular operator. Authorisation applications were rejected because proposals would either eliminate competition between existing operators, substantially

3. Clearance procedures applied from 1974 to 1977. Clearance could be given to proposals which did not substantially lessen competition. Prior to the amendment of the Trade Practices Act in 1977, proposals or agreements with anti-competitive implications could be authorised if they produced significant public benefits which were not otherwise available and which outweighed any detriment. After the amendment of the Act, authorisation was given to merger proposals which might lead to control or dominance of a market as long as they were likely to result in sufficient public benefit. The merger provisions of the Act were further amended in 1986.

lessen competition without providing adequate public benefits, eliminate a potential entrant or raise barriers against potential new entrants.

The major practices accepted by the Commission were certain rationalisation measures in most of the New South Wales ports and pooling arrangements in Melbourne. The benefits from these proposals included more efficient tug utilisation and faster servicing of shipping in certain circumstances.

Towage operators have claimed that additional benefits could be obtained through further rationalisation. For example, a reduction to one operator in Sydney/Port Botany could reportedly permit a 20 per cent reduction in towage charges through better utilisation of a smaller towage fleet and lower administration costs. Although additional rationalisation and co-operative arrangements may provide benefits to users, they would further weaken competition.

Tendering systems

Tendering systems are used to select the operator of towage services in nine Australian ports. In principle, tenders facilitate the entry and exit of operators on a regular basis. Where tendering systems provide exclusive access to the successful tenderer for a specified period, they may increase the effectiveness of potential competition as a new entrant no longer faces the prospect of a vigorous competitive response by the incumbent operator. Tenders based on the provision of a specified quality of service at the lowest price may therefore promote economic efficiency and result in significant benefits for users (Goss 1987, 37-38).

In practice, several factors appear to limit the effectiveness of tendering systems in relation to the towage industry. As noted earlier, there may be significant economies of scope where several ports are located in close proximity to one another. This provides cost advantages to an incumbent operator providing towage services in a group of ports and hence reduces the effectiveness of tenders in individual ports. Several port authorities contacted during the study indicated that this factor effectively precluded other operators from submitting competitive tenders to provide towage services in their ports. One port authority did not call tenders as it considered that there were no viable alternatives to the incumbent. The potential of joint tenders in adjacent ports to alleviate the limitations imposed by economies of scope is raised in Chapter 6.

Although tendering systems facilitate new entry at pre-determined intervals, they generally eliminate competition during the intervening period as the successful tenderer is granted exclusive rights to operate in the port. In some industries this problem can be alleviated by specifying short contract or licence periods. However, in the towage industry an operator generally incurs heavy expenditure on tugs and some sunk costs. A rapid recovery of capital costs may therefore be built into towage charges under a short contract or licence.

Port authorities could overcome this problem by acquiring tugs and using tendering systems to allocate management rights to private operators. This option would probably be unattractive to the majority of authorities as they would be required to outlay substantial funds to acquire the tugs and would need detailed technical knowledge of towage operations to ensure that suitable tugs were purchased. In addition, port authority ownership could preclude the achievement of economies of scale and scope that may be available under the current arrangements.

These factors suggest that there will generally be long contract or licence periods when tenders are used to determine the towage operator in a particular port. The duration of current agreements between port authorities and towage operators in individual Australian ports with tendering systems generally ranges between 5 and 15 years. These long contract periods significantly reduce the impact of tendering systems in promoting effective competition. Further constraints are imposed by the small number of potential entrants and the co-operative arrangements between the major operators.

PORT AUTHORITY REGULATION

In industries where effective competition cannot be established, alternative approaches to promote economic efficiency may be required. Regulation is used in various industries where output is produced by a single, privately-owned supplier. The discussion of regulation of harbour towage services has generally focused on the role of port authorities.

There has been significant discussion about the appropriate role of port authorities in relation to the broad range of activities undertaken in Australian ports. The Webber Task Force supported a wider role for port authorities (Industry Task Force on Shore-based Shipping Costs 1986, 65-66). In evidence presented to the ISC it has been suggested that port authorities should become more involved in areas such as monitoring the performance of providers of port services

and negotiating shorter performance-based leases and licences. The Commission has endorsed the notion of greater port authority involvement in these activities and has also indicated that there is a need for port authorities to review their arrangements with towage operators (Inter-State Commission 1988a, 116-119).

The regulatory approaches available to port authorities include economic regulation of private towage operators and changes to operating requirements for towage services. The appropriate approach in a particular port will depend on specific factors such as towage arrangements in adjacent ports and the expertise available to the port authority. The availability of powers to control or influence towage operations may also have a significant effect. All States have legislation which may be used to affect towage operations but the arrangements vary between States. In some cases specific regulatory powers are delegated to State government departments while in other States they are delegated to individual port authorities.

Economic regulation by port authorities

Towage operators are subject to formal economic regulation by port authorities (or relevant State government departments) in 21 Australian ports (BTCE 1988, 20-22). Regulatory mechanisms in individual ports include contracts with operators, licensing and formal procedures for review or approval of towage charges. Informal consultative procedures exist in some ports where the authorities do not apply formal controls over charges.

Interviews with port authority officers during the study indicated that there is significant variation in the practices of individual port authorities. For example, in the area of towage charges some port authorities require detailed justification of increases based on the submission of operators' costings whereas other authorities accept increases based on movements in the consumer price index or award wages.

The Bureau's survey of the harbour towage industry included a question related to the effectiveness of port authority regulation of towage charges. Respondents were asked to indicate whether the process of approving charges included a specified rate of return for the towage operator. Only 5 of the 10 port authorities which replied that they reviewed towage charges indicated that there was a target rate of return. This suggests that there is significant variation in the extent to which financial data about towage operations are examined by port authorities.

In some cases port authorities have incurred most of the commercial risk, guaranteed the profitability of the towage operation or granted exclusive rights to towage operators for extended periods. These practices may not provide appropriate incentives for operators to maximise the efficiency of towage services from the viewpoint of users.

Port authorities participating in the BTCE survey were also asked to identify the specific benefits of regulation to the users of towage services. They indicated that benefits were obtained through regular monitoring of charges and costs, justification of increases in charges and the guarantee that a towage service would be available in the port. A comparison of towage charges between ports which have regulation and similar ports with no regulation suggests that current regulation is not consistently associated with lower towage charges. As discussed in Chapter 6, there may be forms of regulation which provide incentives to operators to reduce costs and pass the benefits on to users.

Port authority operating requirements

Many port authorities influence towage services through their service quality stipulations such as hours of tug availability. There is a direct relationship between service quality and towage charges.

Several towage operators contacted during the study indicated that port authority requirements were excessive in some cases and resulted in unnecessarily high towage charges. It was claimed that some port authorities required the stationing of more tugs than were necessary to provide the nominated quality of service in their port. Operators also stated that there was excessive firefighting capacity in some ports and that new omni-directional units were sometimes specified when older tugs would provide adequate capability at lower cost.

Port authority requirements for the hours and days of tug availability have a significant impact on towage charges. As noted in Chapter 4, the survey undertaken by the BTCE included a question about the acceptability of reducing the hours of tug operation or declaring tugless days. Two-thirds of responses for individual ports indicated that these proposals were unacceptable or unfeasible, partly because respondents generally assumed that any changes would be implemented in an inflexible manner. In some smaller ports there may be scope to achieve cost savings by reducing the hours or days of towage services.

The contribution of port authority guidelines to over-servicing in some instances was noted in Chapter 3. Significant additional costs

may be imposed on individual users where the provisions of guidelines are not always appropriate and they are applied in an inflexible manner.

These examples indicate the need for continuing review of operating requirements by port authorities. In some ports a better matching of these requirements with users' needs should facilitate lower towage charges.

USER CONSULTATION

In an industry with a large number of competing suppliers, the combinations of price and service quality required by users will generally be provided as a natural outcome of market forces. Where competition is weak there may be inadequate recognition of users' preferences and regulatory processes may still not achieve appropriate combinations of price and service quality. Improved consultation between suppliers, users and regulatory authorities therefore provides another mechanism to increase economic efficiency.

The need for effective consultation between waterfront industry participants has been emphasised in several recent reports. The Webber Task Force supported consultation between port authorities and their clients about proposed changes to port services and charges. It recommended the establishment of consultative bodies in each major port (Industry Task Force on Shore-based Shipping Costs 1986, 65). The Importer-Exporter Panel proposed that port authorities should co-ordinate consultation between users and towage operators at individual ports on a regular basis (Inter-State Commission 1988a, 630). The Panel also recommended regular consultation on broad industry issues affecting towage services between industry bodies representing port authorities, shipping lines, agents and shippers. The ISC has indicated that it strongly supports the upgrading of consultative arrangements (Inter-State Commission 1988a, 107).

There are currently several avenues for consultation on towage matters. Individual users approach towage operators or port authorities on specific matters and representative bodies such as ACOS may be involved when there are issues of concern to a broad range of users. Formal consultative bodies also exist in some ports, one example being the Ports Liaison Advisory Committee in South Australia. Under current arrangements, liaison with trade unions on towage matters is conducted solely by the towage operators.

As part of the BTCE survey of the towage industry, respondents were asked to provide an assessment of the level of direct consultation about towage services between users, towage operators, pilots and port authorities. Around 87 per cent of responses indicated that the level of consultation in individual ports was adequate. The high percentage was somewhat surprising in view of users' complaints about various aspects of towage services that were outlined in earlier chapters. However, this disparity may reflect users' limited expectations about the scope and effectiveness of the present consultative arrangements.

INDUSTRIAL NEGOTIATIONS

The industrial relations activities of the major towage operators are currently co-ordinated on a national basis through the Tug Operators' Committee. This body represented the major operators during the second tier wage negotiations with trade unions following the March 1987 National Wage Case decision. It permits a unified approach to issues which affect the towage industry on a national basis. Tug crews are generally represented by the Seamen's Union of Australia, the Merchant Service Guild and the Australian Institute of Marine and Power Engineers.

Employment conditions for the towage industry are covered in the national Tugboat Industry Award. Although this Award provides a national framework for the aggregate wage system and leave provisions, individual port schedules specify particular conditions which vary in response to local circumstances. Many work practices and conditions such as crew sizes for harbour towage and the employment of casual labour are not specified by the Award. They are determined on an individual port basis through further negotiations.

The impact of crew arrangements and work practices on towage charges and aspects of service quality was discussed in earlier chapters. It was noted in Chapter 2 that crew costs represent around 50 per cent of towage charges in overall terms. These costs essentially reflect the impact of crew sizes, numbers of crews per tug and average crew earnings.

The impact of various work practices and employment conditions on service quality was noted in Chapter 4. For example, the crew call-out system contributes to long tug booking lead times for work outside ordinary hours which in turn result in over-servicing in some circumstances.

Recent experience in the towage industry indicates that improvements in efficiency obtained through industrial negotiations often involve

trade-offs between earnings, employment conditions and work practices. For example, as noted in Chapter 2 changes to specific work practices in more than 25 ports were agreed upon as part of the restructuring and efficiency review following the March 1987 National Wage Case decision. This involved negotiations about local arrangements within a co-ordinated national framework. Similarly, significant reductions in crew levels and the number of tugs at Geelong were achieved after the towage operator negotiated redundancy packages for displaced crew members.

Many of the changes resulting from the restructuring and efficiency review involved the extension to additional ports of more flexible arrangements that were already operating in other ports. However, there is still considerable variation in certain conditions specified in the individual port schedules to the Tugboat Industry Award and in work practices negotiated under local arrangements. Negotiations in areas such as crew sizes, roster arrangements, crew call-out procedures and the employment of casual employees may therefore lead to a closer matching of working arrangements to user requirements in some ports.

It is important to ascertain the views of users where changes significantly affecting the balance between towage charges and service quality are contemplated. Towage operators and port authorities contacted during the study commented that user support is frequently a pre-requisite for the successful implementation of major changes to working arrangements. User involvement in these processes, through consultative mechanisms, is therefore necessary.

Overseas experience indicates that the negotiation of major changes to work practices may be facilitated by the introduction of new arrangements for a trial period. This approach may alleviate any concern over safety issues and allow the detailed evaluation of changes in an atmosphere of co-operation.

STRATEGIC IMPLICATIONS

The harbour towage industry is characterised by rigidities in labour arrangements and by the weakness of competition among towage operators. Stimulating more effective competition through trade practices law and possibly through tendering systems is desirable. However, in most cases effective competition is unlikely to be achieved and alternative approaches to promote economic efficiency will be required. This points to the need for some degree of economic regulation by port authorities in the interest of users, and for pursuit of reform through consultative processes involving port authorities, employers, unions and port users.

CHAPTER 6 CONCLUSIONS

The operational performance of the harbour towage industry, in terms of its major functions of assisting ships on and off berths and through navigation channels, is generally considered to be satisfactory. However, the analysis in previous chapters indicates that there are opportunities to improve the economic efficiency of the industry. Improved efficiency would facilitate lower towage charges and reductions in other costs borne by lines and shippers through fewer ship delays. The main opportunities to improve efficiency and reduce costs to users involve crew levels and work practices such as tug booking arrangements.

Crew sizes generally vary between four and eight at Australian ports, with a crew of five or six being the most common arrangement. There are strong arguments that a maximum crew size of four is technically feasible for harbour towage work under Australian operating conditions. On the basis of 1988 crew levels and wages, the introduction of a maximum crew size of four for harbour towage work would result in on-going crew cost savings of at least \$13 million per annum in overall terms and potential reductions of between 5 and 25 per cent in towage charges in individual ports. However, any redundancy payments to displaced crew members would initially limit reductions in total towage costs and charges. Additional crew cost savings could be achieved in some ports through changes to work practices and greater utilisation of casual employees.

A significant number of towage subsidiaries are earning rates of return which are well above the all-industrials average. The available data indicate that operators' gross margins represent around 20 per cent of towage charges in overall terms.

Long tug booking lead times, particularly for weekend work, are a major concern of users. The negative effects identified by users include high cancellation payments, delays to ships and the ordering of more tugs than is necessary in some instances. Performance in this area could be improved by promoting more flexible work practices.

Over-servicing was identified as an issue by a significant minority of users and port authorities contacted during the study. Their comments suggest that over-servicing occurs in specific circumstances in some ports. Increased flexibility in tug booking arrangements, tug roster systems and the attitudes of port authorities and pilots to tug usage could significantly reduce the incidence of over-servicing.

The level of competition in the harbour towage industry appears to be insufficient to impose effective constraints upon overall profits, wages, work practices and other forms of inefficiency. Under current conditions, there are limited prospects for establishing effective competition between harbour towage operators within each port. The monopolisation of towage in most Australian ports, as in many overseas ports, is frequently a natural outcome of scale and indivisibility factors. The Trade Practices Act does not contemplate the breaking up of established monopolies, nor would divestiture be likely to lead to a more efficient industry structure in this case.

Under current conditions, most harbour towage markets in Australian ports are probably not readily contestable by new entrants. This reflects the impact of factors such as economies of scale, sunk costs and the inflexible labour cost structures facing any new operator. Nevertheless, port authorities could provide some opportunities for any potential entrants by putting out the supply of towage services to competitive tender at regular intervals. Some new approaches to tendering might be considered. For example, the limitations imposed by economies of scope may be alleviated if port authorities jointly issue a single tender for towage services in a group of adjacent ports.

Where effective competition cannot be established, regulation of towage charges by port authorities may increase economic efficiency. However, there are well-known problems in implementing price regulation. Efficiency may decline if the regulator concentrates on approving charges which give no more than an adequate rate of return for the operator and does not assess the appropriateness of the underlying cost structure. In this situation the operator has no incentive to minimise costs if the ensuing savings have to be passed on to users in their entirety. An appropriate regulatory system would therefore involve consideration of crew levels, work practices, tug specifications and service quality as well as towage charges.

Information obtained during the study indicates that there is considerable scope to improve the efficiency of existing port authority regulation. In some States legislative changes may be necessary to facilitate efficient regulation by port authorities.

Operators require some incentives to increase the efficiency of towage services but the greater part of the benefits must flow through to users. One possible approach to achieve this outcome is to allow a higher profit margin to those operators who achieve improvements in efficiency and lower charges to users.

Other issues in industry regulation are also relevant to towage operations. Regulatory authorities may make inappropriate decisions or may be 'captured' by the organisations subject to regulation, particularly where technical expertise is mainly limited to those organisations. The possibility of regulatory capture is likely to be reduced by user representation on regulatory bodies.

Regulation to promote the economic efficiency of towage services, as distinct from addressing safety issues, would involve a significant extension of responsibilities for most Australian port authorities. It would be consistent with the view, expressed by the ISC and groups such as AAPMA, that individual port authorities should accept overall responsibility for the efficiency of port operations.

APPENDIX I FORMS FOR HARBOUR TOWAGE INDUSTRY SURVEY

This appendix presents the survey form sent to shipping lines, ships' agents and shippers and the form sent to port authorities. In most cases the forms were initially despatched to the central offices of relevant organisations under covering letters which outlined the BTCE study and the approach to be used in completing the forms. Many organisations subsequently forwarded copies of the forms to their State or local offices for the preparation of responses in view of the port-specific nature of many questions.

TOWAGE CHARGES PER TUG

1. Please provide an assessment (based on an efficient operator earning a reasonable rate of return) of the level of basic towage charges per tug in the ports where you operate:

| <u>Assessment</u> | <u>Port/s</u> |
|-------------------------------------|---------------|
| Low <input type="checkbox"/> | _____ |
| Reasonable <input type="checkbox"/> | _____ |
| High <input type="checkbox"/> | _____ |
| Very high <input type="checkbox"/> | _____ |

- 1a For those ports where basic towage charges per tug are high or very high, what do you consider are the major contributing factors?

2. Please comment on any other aspects of towage charges per tug (eg surcharges, cancellation fees) which are unsatisfactory and indicate the relevant ports.

| Port | Comments |
|------|----------|
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(iii) Number of tugs lower than needed in particular circumstances. Please indicate the type or size of ship involved and any other circumstances (eg, weather conditions) in which there is under-use of tugs.

| Port | Number of extra tugs needed | Circumstances (Ship type/size, weather, etc) |
|------|-----------------------------|--|
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3a If the number of tugs is greater or lower than needed in some circumstances, what factors (eg tug ordering procedures) cause this imbalance?

AVAILABILITY OF TUGS

5. Are tugs available when required in the ports through which your company trades on a regular basis or in which your office handles ship movements?

- Always
- Most occasions
- Sometimes
- Seldom

5a If tugs are not always available for ship movements when required, please indicate the ports and tick the main times when they are unavailable:

| Port | Weekdays | | Weekends | Public holidays | Other (please specify) |
|------|----------|------------|----------|-----------------|------------------------|
| | day-time | night-time | | | |
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CONSULTATION

8. Please provide an assessment of the level of direct consultation about towage services between tug users, tug operators, pilots and port authorities in the ports through which your company trades on a regular basis or in which your office operates?

| <u>Assessment</u> | <u>Port/s</u> |
|--|---------------|
| Adequate <input type="checkbox"/> | _____ |
| | _____ |
| Not adequate <input checked="" type="checkbox"/> | _____ |
| | _____ |

HOURS AND DAYS OF OPERATION

9. It has been claimed that reducing the hours of tug operation from, say, 24 hours to 18 hours per day, or declaring one or two tugless days per week, would significantly reduce towage costs in some ports. Please identify the ports (if any) in which you consider the introduction of these measures would be acceptable and indicate the appropriate changes.

- 9a If the introduction of any of these measures is acceptable, what minimum reduction in towage charges (per cent) would be required for you to support their introduction? _____ per cent.

Comments: _____



bureau of transport and communications economics

SURVEY OF AUSTRALIAN HARBOUR TOWAGE INDUSTRY - PORT AUTHORITIES

Please answer the following questions for your port. If space is insufficient, please attach additional sheet/s. Published results will not identify responses of individual port authorities.

DETAILS OF RESPONDENT

Name of port: _____

Contact person: _____

Telephone No. () _____

NUMBERS OF TUGS USED

3. Does the port authority issue guidelines on the number of tugs to be used for individual ship movements?

Yes

No

3a If guidelines are issued, how often are they reviewed and what factors are considered in the review process?

4. Please indicate if the number of tugs used for individual ship movements in the port is:

Always appropriate

Greater than needed in particular circumstances

Lower than needed in particular circumstances

4a If the number of tugs is greater or lower than needed in particular circumstances, could you please indicate the nature of the imbalance, the type or size of ship involved and any other circumstances (eg, weather conditions, bow thrusters) in which there is over-use or under-use of tugs).

| Too many or too few tugs? | No. of tugs too many or too few | Circumstances (ship type/size, weather, etc) |
|---------------------------|---------------------------------|--|
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INFORMATION PROVIDED TO TUG OPERATORS

8. Are the tug operators provided with accurate information for ship arrival and departure times (ie estimated times in initial tug bookings within ½ hour of actual ship movements)?

Always

Most occasions

Sometimes

Seldom

8a If information is not always accurate, what are the major reasons for this?

CONSULTATION

9. Is the level of direct consultation about towage services between tug users, tug operators, pilots and the port authority adequate?

Yes

No

9a If consultation is not adequate, what measures would you recommend to improve it?

PORT AUTHORITY REGULATION (EXCLUDES TUG USAGE GUIDELINES)

11. Does the port authority or a relevant Government department have the power to regulate the operation of towage services and/or charges in the port?

Yes

No

11a If yes, please identify the relevant legislation or by-laws.

12. To what extent does your port authority regulate towage operations in the port? (More than one mechanism may be applicable.)

Tender to select operator

Contract for operator

Licence for operator

Review or approval of charges

Other (please specify) _____

No controls If you ticked this box, please go to Question 15.

13. If there is regulation of towage operations in your port, what are the specific benefits of regulation to users of towage services?

APPENDIX II CROSS-SECTION ANALYSIS OF TOWAGE CHARGES

In the Bureau's initial work on the harbour towage industry it was noted that the major determinants of the levels of towage charges at individual ports are tug utilisation rates, crew costs, the operator's margin and tug depreciation charges (BTCE 1988, 29-45). This conclusion was based on cost data for towage operations at three ports, financial data for three towage subsidiaries and discussions with various towage operators. A more comprehensive examination of the determinants of the variations in harbour towage charges in Australian ports was subsequently made on the basis of cross-section analysis of towage charges at a much larger group of ports.

DEPENDENT VARIABLE

Under ideal circumstances, a model of towage charges would explain variations in average towage payments per ship at individual ports. However, comprehensive data on actual payments are not readily available. Basic service charges per tug for ships using their own power were therefore used in the analysis.

The basic service charge per tug in each port is generally based on the size of the ship being assisted. It may therefore vary significantly for different ships in a particular port. For example, in Melbourne the basic service charge per tug for the largest ships is 48 per cent higher than the charge for the smallest ships (BTCE 1988, 42).

The dependent variable was the basic service charge per tug for a 30 000 GRT ship. In ports where towage schedules were based on summer deadweight tonnage the category corresponding to 30 000 GRT was derived using a standard conversion table. The performance of the model did not change significantly when it was tested by using charges for another ship size as the dependent variable.

The basic service charge per tug in each port was obtained from the towage schedules applicable in early 1988. The number of ports that could be included in the analysis was limited by the need for broadly

comparable schedules. As a result the large group of ports with basic service charges that varied according to the time of day and time of week was excluded. Ports where no tugs were permanently stationed were also excluded as their towage schedules incorporated significant cost factors that were unique to this group.

A total of 17 ports with schedules of charges that did not vary according to the time of day were included in the analysis. These ports are listed in Table II.1. They include capital cities, specialised bulk ports and outports.

TABLE II.1 PORTS AND TOWAGE CHARGES INCLUDED IN CROSS-SECTION ANALYSIS

| <i>Port</i> | <i>Basic service charge (\$ per tug)</i> |
|----------------|--|
| Abbot Point | 8 250 |
| Bundaberg | 7 616 |
| Hay Point | 6 000 |
| Mackay | 4 240 |
| Westernport | 4 150 |
| Port Hedland | 3 955 |
| Dampier | 3 909 |
| Port Walcott | 3 785 |
| Townsville | 3 374 |
| Geelong | 3 030 |
| Brisbane | 2 970 |
| Gladstone | 2 689 |
| Melbourne | 2 550 |
| Port Kembla | 2 516 |
| Newcastle | 1 838 |
| Sydney | 1 795 |
| Groote Eylandt | 1 450 |

Sources Industry sources. Towage schedules.

EXPLANATORY VARIABLES

The explanatory variables used in the analysis were initially derived from the factors identified in BTCE Information Paper 27. Although several other variables were tested, no additional variables were

incorporated in the final model as the explanatory power of the initial variables was high.

Average bollard pull

The available information indicates that the operator's gross margin and tug depreciation charges are significant components of the charges for harbour towage services. Both of these components are related to the undepreciated historic costs of the tugs in each port (BTCE 1988, 29-33). A variable representing the capital costs of tugs was therefore included in the analysis.

Information on the acquisition prices for tugs was not readily available. The average bollard pull per tug in each port was therefore used as a proxy measure for tug capital costs.¹ Data on bollard pull were obtained from the BTCE Information Paper on harbour towage services.

Aggregate wages

Total aggregate wages for a tug crew are also a major component of towage charges in each port and were therefore included in the analysis. This variable incorporates the impact of crew size, the composition of crews in terms of the classifications of individual members and allowances for work outside ordinary hours.

The Tugboat Industry Award specifies an aggregate wage system under which there is a base rate for work performed during ordinary hours and an additional amount for work outside ordinary hours. The base rate for a particular crew classification on a specified category of tug is the same in all ports but the additional amount for work outside ordinary hours varies between ports.

Data on aggregate wages were obtained from the individual port schedules of the Tugboat Industry Award. Area allowances and work-as-required payments were added to the aggregate annual wage rates. These figures excluded additional payments for work outside the harbour and some other allowances.

Number of ship calls

The schedule of towage charges per tug in a port is determined on the basis of total revenue requirements and the number of tug jobs. The number of ship calls was used as a proxy for tug jobs.

1. Bollard pull represents the force that can be exerted on a static object by a tug.

Data on ship calls at individual ports are collated by ACOS. However, the figures include visits by ships such as fishing vessels and some coastal ships which do not use tugs under normal circumstances. The ACOS data were therefore adjusted to exclude these ships. The adjustments were made on the basis of advice from the relevant port authorities.

Specification search

The Box-Cox transformation was used to estimate the model coefficients because this estimation method allows the data to determine the appropriate functional form.²

EMPIRICAL RESULTS

Details of the model are presented in Table II.2. The form of the model, with the basic service charge per tug (C) as the dependent variable, is:

$$C^* = 0.059B^* + 0.69W^* - 0.080S^* + 0.64$$

where

$$C^* = \frac{C^{\lambda-1}}{\lambda} \text{ and } B^* = \frac{B^{\lambda-1}}{\lambda} \text{ etc}$$

The model is satisfactory in terms of explanatory power and overall reliability. All explanatory variables are highly significant and together they explain around 83 per cent of the variation in towage charges between ports.

All explanatory variables have the expected signs. The model results indicate that in ports with larger tugs and/or higher aggregate wages the charge per tug tends to be greater. In ports with a higher frequency of ship calls, the charge per tug is likely to be lower (other things being equal).

The results of the cross-section analysis provide empirical support for the findings presented in Information Paper 27. Variations in harbour towage charges between ports mainly reflect the three variables which in turn are related to towage costs per tug job and the operator's margin.

2. For a detailed description of the Box-Cox transformation, see Judge et al (1985).

TABLE II.2 MAXIMUM LIKELIHOOD ESTIMATES FOR MODEL OF TOWAGE CHARGES
USING BOX-COX TRANSFORMATION

| <i>Coefficients and tests</i> | <i>Values</i> |
|--|---------------|
| Model coefficients | |
| Average bollard pull per tug (B) | 0.059 (5.2) |
| Aggregate wages per tug crew (W) | 0.69 (3.7) |
| Ship calls (S) | -0.080 (-7.0) |
| Constant | 0.64 (1.8) |
| Other statistical tests and values | |
| R^2 | 0.83 |
| \bar{R}^2 | 0.79 |
| F-statistic | 20.6 |
| Box-Cox transformation parameter (λ) | -0.51 |

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