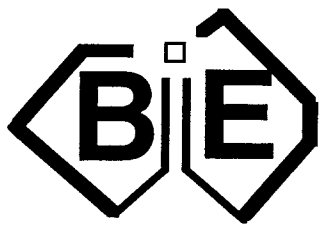

Bureau of Industry Economics

Research Report 38

International comparisons of plant productivity —

domestic water heaters

Australian Government Publishing Service
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Cover photographs:
Aspects of production at the N.Z., Melbourne and U.S. water heater plants (from top).

Provided by:
C. Harris, who is grateful to the employees and managers at the plants for their co-operation.

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Foreword

An important path to higher living standards is sustained productivity growth. Such growth requires that we use our resources more efficiently, by either producing more with the same inputs or the same output with less inputs.

Although it is difficult to compare productivity levels between countries, there is a widely held view that Australian firms are generally less productive than similar firms overseas. Aggregate studies of comparative productivity performance have not been able to address in any conclusive way the factors underlying differences in performance. Although few studies of relative productivity levels in individual plants have been undertaken, they have yielded useful information on the reasons for productivity differences. As a contribution to the Australian debate about our productivity performance, this paper presents the detailed results of a micro-level study of the major factors contributing to productivity differences between two Australian plants and plants in other countries.

An attempt has been made to reduce the complexity of the analysis by comparing plants with similar final products and, where possible, similar production processes. Kodak (Australasia) Pty Ltd agreed to be the first case study, for which the results were published in BIE (1990a). South Australian Brewing Holdings Limited (SABH) suggested that its water heater operations be examined as the second case study. Water heaters are manufactured by SABH in two Australian plants, Rydalmere (Sydney) and Bayswater (Melbourne), and at two overseas plants, Middleville (Michigan, U.S.A.) and Auckland (New Zealand).

The BIE is grateful to the managers and staff at SABH, particularly Ross Wilson and Bruce Kemp for their support, and Graham Hall, Albert Purchase and Andrew Dunn (Sydney), Jim Hughan (Melbourne), Dick Milock, John Rank and Bob Hermenitt (Michigan), and Dick Hansen and Murray Young (New Zealand) for their generous co-operation in providing the detailed information required for the study and organising the visit of the inspection team to the plants. The report also benefited from comments by a steering committee of the Australian Manufacturing Council, comprising Ian Watson, Grant Belchamber, Geoff McGill, Graham Hall and Albert Purchase, and from John Ryan and Ian Monday of the BIE.

The report was researched and prepared by Chris Harris and Alan Madge, with Graham Simmons, Gordon Schmidt, Gareth James and Ilias Mastoris assisting at various stages of the project.

R.G. Hawkins
Director

November 1991

The Report at a glance

- This study by the Bureau of Industry Economics takes a **different tack** on approaching comparisons of productivity and unit cost performance.
  - Rather than examining growth rates between industries, it compares the **productivity and cost levels** of similar plants in different countries.
  - By doing so, the study seeks to pin-point some specific reasons for the observed variations in the performance of the plants involved.
- The study compares the relative performance of **four water heater plants** owned by South Australian Brewing Holdings Ltd. Two of the plants are located in Australia, and one each in the U.S. and N.Z.
- The study finds that the **performance** of the Australian and N.Z. plants in 1989-90 **fell well short of the U.S. plant**.
  - The Australian plants were **disadvantaged by material prices** that were on average 53 per cent higher than in the U.S.
  - Adjusted for hours worked, **labour and capital productivity** in the U.S. plant were 96 per cent and 207 per cent higher than in the small Melbourne plant, and 132 per cent and 571 per cent higher respectively than in the Sydney plant.
  - The **low productivity performance of the Sydney plant** can be attributed largely to **poor work and management practices**, reflecting a history of **adverse management-labour relations**.
- The study suggests that productivity and cost **improvements** at the Australian plants would result from:
  - improved access to material **inputs at world prices and quality**;
  - **better utilisation of labour** through initiatives directed at reducing the extent of unproductive work hours relative to better practices abroad; and
  - **better utilisation of capital** through modifications to plant layout, the organisation of work, and inefficient work and management practices.
- The study suggests that **policy initiatives** aimed at removing barriers to competition in product and input markets, including reform of the labour market, are likely to enhance the performance of the Australian plants.

Executive summary

Improved productivity is an important path to economic growth and higher living standards. At the firm and industry level, improved productivity relative to that in other countries can lead to increases in international competitiveness, subject to performance in areas such as quality, product differentiation, deliverability and customer servicing.

Whereas aggregate comparisons can expose the role of macroeconomic variables, an understanding of the microeconomic factors that affect productivity and unit cost performance requires analysis at a more detailed level. It was in this context that the Australian Manufacturing Council decided to support the BIE to undertake international productivity analyses at the plant level. Factors examined include outputs; quality; labour, capital and material inputs; plant maintenance and setting up; and productivity and cost measures.

The approach adopted for this research has entailed two case studies. Kodak (Australasia) agreed to be the first case study, for which the results were published in BIE (1990a). The product was Ektacolor paper, which is the paper on which colour photographs are printed. S.A. Brewing Holdings Limited (SABH) suggested that its water heater operations be examined as the second case study. Water heaters are manufactured by SABH in two Australian plants, Rydalmere (Sydney) and Bayswater (Melbourne), and at two overseas plants, Middleville (Michigan, U.S.A.) and Auckland (New Zealand).

The production of water heaters involves the fabrication of an inner water tank to which various fittings are appended. The final stages of this process involve the fitting of an outer steel jacket and the insertion of insulating material between the jacket and the inner tank. It is a traditional metal manufacturing industry involving a 'mature' technology.

The main findings are that the U.S. plant had the best productivity and unit cost performance during 1989-90, while the small N.Z. plant generally lagged the performance of the others. The performance of the Australian plants was between those of the U.S. and N.Z. plants, generally somewhat nearer to that of the N.Z. plant.

The better unit cost performance of the U.S. plant reflects its lower material costs and its superior labour and capital productivity performance. There is considerable evidence that the U.S. plant was advantaged by being the major employer in its local labour market, by the relatively harmonious relationship between plant management and local union officials, and by the enterprise focus of industrial relations at the plant.

Although it is possible that the performance of the U.S. plant benefited from its larger scale, the size of the Australian market is such that a plant of U.S. scale located here would need to have a high export propensity for its output to be absorbed. Given the difference between the performance of the Sydney and U.S. plants, such markets could only be gained profitably by an Australian plant if there were large improvements in its productivity and cost performance, and in other areas such as the waterfront that affect exports.

The differing quality and cost of material inputs for the water heater plants is a major theme of this study. The production of water heaters is a materials intensive process. Much (but not all) of the unit cost advantages enjoyed by the U.S. plant reflected its access to less costly and higher quality material inputs.

Reduced protection against imports in product markets accompanied by supporting microeconomic reforms in input markets can lead to increased competition, and pressure to improve workplace efficiency and to lower prices. A secondary measure would be for assessments of anti-dumping applications to give greater weight to the impact of such actions on downstream users and consumers of final products. In addition, regulation in support of competitive outcomes may need strengthening in some oligopolistic industries. The aim of such regulation would be to discourage anti-competitive behaviour by increasing the likelihood that it would be detected, and by increasing the penalties that apply to such behaviour.

Further, consideration could be given to promotion of competitive outcomes by changing the merger test under the Trade Practices Act from one of market dominance to the weaker 'substantial lessening in competition' criterion. Underlying this proposal by the Trade Practices Commission is the view that domestic competition is more beneficial for Australia's economic welfare, through outcomes such as lower prices and more efficient work and management practices, than potential gains from industry mergers and rationalisation. In the BIE's view, the merits of these and other approaches to promoting competition warrant closer examination.

A key feature of the report is the productivity differences between the two Australian plants involved in the study. In many ways, a comparison between these plants provides more insights than a comparison with the U.S. plant. Of the two Australian plants, the Sydney plant is considerably larger, has more mechanised production techniques and more up-to-date capital stock. However, the Melbourne plant's productivity and unit cost performance bettered those of the Sydney plant.

Although other factors play a role, the major reason for this outcome appears to be the differing employer-employee relations at the plants. Whereas industrial relations at the Melbourne plant were relatively harmonious, those at the Sydney plant were much less so. Moreover, there were numerous productivity-depleting work practices at the Sydney plant, such as the relatively high proportion of unproductive standard hours (that is, hours which employees are supposed to work but do not). Much of the

30 per cent of standard hours that were unproductive at that plant reflected work practices not sanctioned by the relevant award, such as overly long meal and refreshment breaks, lengthy toilet breaks, starting work late and finishing work early. These practices were a legacy of past management acquiescence and poor management-labour relations. A related factor was the relatively high number of hours per employee lost at the Sydney plant due to sickness/absenteeism.

It is evident that considerable potential productivity gains could be achieved at the Sydney plant from reform of work practices. Other areas that could be improved include the degrees of labour inflexibility, overmanning and limited job rotation. Indeed, the productivity performance of all plants could be improved by the removal of demarcation barriers between production workers, fitters, electricians, storemen and forklift drivers. Such barriers mean that production workers may not remove hooks used on a paint line and replace them after cleaning, may not load final product into trucks, and may not be trained to drive a forklift, to undertake maintenance, nor to work in a stores area. Job rotation even within production is limited at the Sydney plant. Award restructuring in Australia might eventually lead to reformed work practices and extended career paths in such areas.

There are significant differences in the industrial relations systems between Australia, N.Z. and the U.S. The influence of industrial relations systems in Australia and N.Z. on opportunities for enterprise bargaining and productivity outcomes has emerged as a key issue in microeconomic reform in recent years. Reforms directed at the development of a less centralised system with greater emphasis on enterprise bargaining have been instituted in N.Z. and are in progress in Australia.

Such reform reflects the view that the existing system in Australia has left little scope for flexible outcomes because negotiations have occurred within an environment which limited the scope for enterprise bargaining. A number of factors have been identified as contributing to this including: craft-based union structures which result in a multiplicity of unions at the enterprise level, increase disputes and prevent the realisation of the full benefits from multiskilling; and institutional and attitudinal constraints which support work practices that limit workplace flexibility and substantially reduce productivity.

Of course, enterprise bargaining is not a panacea for poorly performing firms. Although the U.S. plant has an enterprise agreement, the Melbourne plant achieved a similar degree of labour flexibility within Australia's centralised system due to the relatively harmonious relations at the plant, its small size, and the recognition by employees that their welfare was linked to the success of the employer in meeting competition from other plants. However, enterprise bargaining does provide a greater opportunity for direct bargaining between a firm and its employees over work practices, wages and conditions. There are potential gains for the parties to the bargain, and for consumers through lower prices. Whether the distribution of the gains is appropriate for overall welfare depends on the extent of competition in product markets and the level of union power.

To a significant degree, it is the forces of competition in product markets that ensure firms do not grant wage rises which are inconsistent with productivity and conditions in their labour market. However, enterprise bargaining creates considerable risks for firms and employment outcomes in circumstances where unions are strong and firms operate in a competitive market. Indeed, the management of the Sydney plant suggests that the historical experience there is such that the Industrial Relations Commission (IRC) has a vital role to play in enterprise bargaining, in order to ensure that enterprise agreements are not the result of industrial pressure for unreasonable conditions, and that agreements are complied with. These issues are addressed by the enterprise bargaining principle announced by the IRC in October 1991.

Since 1989-90 there have been significant improvements to work and management practices, particularly at the Sydney plant. Management at the plant has shut one of its production areas, improved the layout and reliability of the other production area, and reduced the level of overmanning and unproductive standard hours. Additional reforms have been delayed by the complexity and time required to negotiate an enterprise agreement with the five unions on site.

Finally, in November 1991, agreement was reached between the parties for wage rises of $15 per week for workers at the plant, based on changes in work organisation and the achievement of a productivity target. A further wage rise of $18 per week will be paid when the plant reaches its next productivity target, which further closes the gap between the Sydney and U.S. plants. The agreement is for a one-year fixed term, and excludes any other wage rises awarded by industrial tribunals during that period. The IRC has ratified the agreement as a consent award under the new enterprise bargaining principle.

However, further substantial reforms are possible and desirable. To some extent, progress with such reform seems to have been delayed by the time consuming nature of the processes associated with enterprise bargaining within the Australian system, and the presence of multiple unions on site. Reforms to the industrial relations framework would support more decentralised union structures, facilitate enterprise unionism where favoured by employees, encourage multiskilling across current demarcations for all workers at the plants, and improve the framework for the prevention and settlement of disputes.

However, it is also apparent that legislative/regulatory reform alone is unlikely to be successful in promoting better outcomes. As demonstrated by the differing performance of the Melbourne and Sydney plants, and the Australian and U.S. plants, relationships between employers and employees, and attitudes to work and the organisation of work and production processes, are also critical to the process of achieving advances in productivity and cost performance.

Chapter 1

Introduction

1.1 Background

An important path to economic growth and higher living standards is sustained productivity growth. Put simply, productivity growth means using our resources more efficiently, either producing more with the same inputs or the same output with less inputs. In recent years this topic has been the subject of considerable public debate and research by the BIE and other organisations.

Although it is difficult to compare productivity levels between countries, there is a widely held view that Australian firms are generally less productive than similar firms overseas. Various reasons put forward to explain these differences include: lack of economies of scale; inefficient work and management practices; the age, technology, flexibility and utilisation of the capital stock; poor training and skill formation; government regulation; bad industrial relations and inadequate quality control. The notion here is that there could be scope for cheap, if not free, lunches from better use of resources in the economy through reforms in areas such as the labour market; and the wage determination, training and education, and taxation systems (Lattimore 1990).[1]

Governments, trade unions and managements in Australia have been grappling with these issues in an effort to raise productive performance and improve Australia's international competitive position. It was in this context that the Australian Manufacturing Council (AMC) decided to support the BIE in undertaking international productivity analyses at the firm level. The basic intention of the analyses is not to list the contribution of each factor to productivity differences, but rather to identify the major contributing variables.

If Australia's productivity were increasing faster than in other countries, we might expect our international competitiveness to be improving for a given value of the exchange rate. However, productivity measures do not capture all the factors

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1 Of course, Australia's economic *welfare* is improved also by faster productivity growth abroad, because we can then import cheaper products from our competitors (Baumol *et al.* 1989).

affecting competitiveness. At the firm level, competitiveness is a function not only of physical productivity performance but also of factors such as cost structures, product differentiation, quality, deliverability and customer servicing. The final competitive outcome is an amalgam of these factors and it can therefore be misleading to view one in isolation from the rest.

For instance, there is little comfort, other things being equal, in knowing that Australia's labour productivity is double, say Malaysia's, if our labour costs are three fold. An analysis of productivity must be linked to the underlying cost structure, at the very least, to indicate the importance of particular results.

Even more fundamentally, it should be appreciated that although productivity increases may be an important avenue for improving the economic well being of Australians, they are not the only factors to be considered. Indeed, it is possible to conceive of circumstances where productivity increases could be achieved at the expense of foregone leisure or a deterioration in the environment.

1.2 Methodology

The approach adopted for the research is a series of case studies involving different industries. An attempt has been made to reduce the complexity of the analysis by comparing plants with similar final products and, where possible, similar production processes. Kodak (Australasia) agreed to be the first case study, for which the results were published in BIE (1990a). The product was Ektacolor paper, which is the paper on which colour photographs are printed.

South Australian Brewing Holdings Limited (SABH) suggested that its water heater operations be examined as the second case study.[2] Water heaters are manufactured by SABH in two Australian plants, Rydalmere (Sydney) and Bayswater (Melbourne) and at two overseas plants, Middleville (Michigan, U.S.A.) and Auckland (N.Z.).

The second case study differs from the first in several respects. First, there are two Australian plants. This allows an analysis of factors responsible for productivity differences between plants within Australia. Secondly, the manufacture of domestic water heaters is essentially a metal fabrication industry with a mature technology. Therefore, this industry is more representative of mainstream Australian manufacturing than Kodak's paper finishing operations. Thirdly, the raw materials for water heater manufacture are sourced locally in general, rather than manufactured in-house. Fourthly, water heaters are currently not highly traded internationally, although there is a potentially lucrative market to our north. Finally, government regulation of water heater product characteristics, coupled with

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2 Domestic water heaters are known in the industry as residential mains pressure storage water heaters. They are referred to in the text simply as water heaters.

relatively high shipping costs, have provided substantial 'natural protection' to domestic producers (Chapter 2). However, the latter factors could also have reduced the prospects for exports from Australia.

The Bureau's approach involved the collection of quantitative data on items such as outputs, inputs and utilisation rates and qualitative information on management practices, work organisation, management-labour relations and work practices. This involved detailed questionnaires and personal interviews with a large range of management and employees in the production areas as well as interviews with related areas such as training, maintenance and trade union representatives.

Country data were collected also and discussions were held with employer, labour and government organisations to understand the economic and institutional environment where each of the plants operated. An overview of the salient features of each country's economy and recent economic performance is provided in Harris, Lee and Simmons (1991). This overview provides a backdrop to which the individual plant findings can be related.

The plant comparisons relate to a particular production year and therefore give a snapshot of each plant.[3] The performance of any plant in that year could have been affected by events that distorted the results. For example, the U.S. plant ran at full capacity during the snapshot period, the Melbourne plant was increasing production levels and upgrading work practices/organisation, whereas the Sydney plant was subject to considerable industrial disruption. Where possible, we have drawn attention to the influence of such factors.

1.3 Structure of the report

The report has been structured to cover the various productivity and performance measures and the institutional environment where each of the plants operates. Chapter 2 describes the product and process of manufacturing domestic water heaters, highlighting similarities and differences between the plants under study, and discusses the effects of product regulation in Australia, the U.S. and N.Z.

Chapter 3 provides an overview of industrial relations practices in the countries and plants with which the study is concerned. Selected subjects within the areas of work practices and remuneration, training and education are discussed in Chapter 4.

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3 The data for the Australian and N.Z. plants cover the period 1989-90, whereas those supplied by the U.S. plant cover the calendar year 1989. Only limited data were collected from the relatively small N.Z. plant.

The operations of the plants and their performance according to a range of measures are examined in Chapter 5. The different factors affecting output levels, input requirements and costs at the various plants are outlined and assessed relative to the Melbourne plant.

Finally, the summary and conclusions are presented in Chapter 6.

Chapter 2

The production of water heaters

2.1 The product

The product considered in this study consists of an inner steel water tank, the inside of which is coated with vitreous enamel; either a gas or electric heating unit in the base; and an outer sheet steel casing which contains the inner tank and its surrounding insulation. The insulation material is usually either polyurethane foam or fibreglass. Typical gas and electric water heaters for Australia are shown in Figure 2.1.

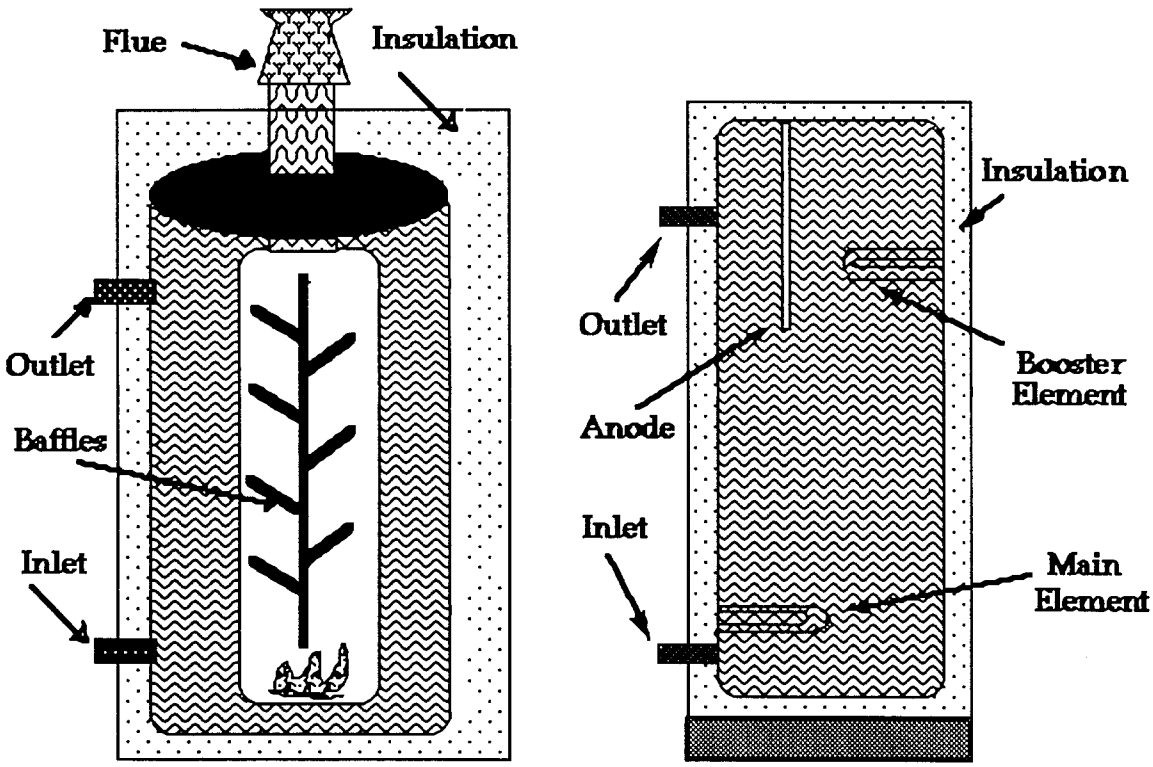
Within this broad product description there is considerable variation. For example, the U.S. plant manufactured over 600 water heater models in 1989, with models differing as to volume, energy source, energy efficiency, shape and other characteristics. The number of models produced by the U.S. plant is expected to decrease in future years with the phasing out of less efficient, fibreglass-insulated models that do not meet new U.S. energy standards. A smaller range of models was produced by the other plants involved in this study. This issue is discussed further in Chapter 5.

2.2 Product demand and supply

2.2.1 Product demand

In the U.S. and Australia, water heater demand has been growing at between 2 and 3 per cent per year during the 1980s. About 70 per cent of this demand is for replacement purposes, with the remainder being supplied to the new housing market. In Australia, most new houses have their water heaters located outside the building, whereas the replacement market, at least for the present, continues to be mainly for water heater models located indoors. In the U.S., the harsh winter conditions prevailing in many areas has led to water heaters being usually placed in the basement of buildings.

Figure 2.1 A schematic representation of gas and electric water heaters



Source : BIE drawing, based on data supplied by the plants.

The high proportion of replacement demand, coupled with the premium most consumers place on having timely supplies of hot water, suggests that demand for water heaters is likely to be price inelastic and only moderately affected by the state of the economy.

2.2.2 Product supply

In the U.S., high internal transport costs have resulted in the development of two distinct markets. One market is centred in the south-west and is supplied predominantly from plants located in California and Mexico. The other market is centred in the north-east. A number of plants located in the north-eastern and southern States of the U.S. supply this market. The U.S. plant examined in this study, which is owned by the Bradford-White Corporation and located in the State of

Michigan, predominantly supplies the north-eastern market. It was acquired by South Australian Brewing Holdings Limited (SABH) in October 1989 for $A30m (White 1991).

U.S. production and supply are dominated by five firms. They are State Industries (plant in Tennessee), Rheem Manufacturing Company (plants in Illinois, Alabama and Mexico), Mor-Flo Industries Inc. (two plants in Tennessee, one in California), A.O. Smith (plants in South Carolina, Washington and Mexico), and Bradford-White Corporation (plants in Michigan and Nevada). The Mor-Flo plant in California is being phased out as its land leases expire. A.O. Smith's facility in Washington is a specialty commercial and tank fabrication plant. Rheem's plant in Illinois is being phased out as its Mexican plant expands production. The plants in Mexico are located just south of the border to take advantage of low wages and duty free entry to the U.S. market.

Despite the relatively small number of firms in the industry, the market is strongly competitive in terms of price and quality. Bradford-White's market share in 1989 was approximately 12 per cent. This proportion increased in early 1991 when its subsidiary with a new plant sited in Nevada resumed manufacturing. On 13 May 1991, SA Brewing Holdings Ltd announced the purchase of Mor-Flo for $US31.65m. The purchase, which is subject to approval by the U.S. Department of Justice, increases the share of the U.S. market held by SABH Ltd to around 30 per cent (White 1991).

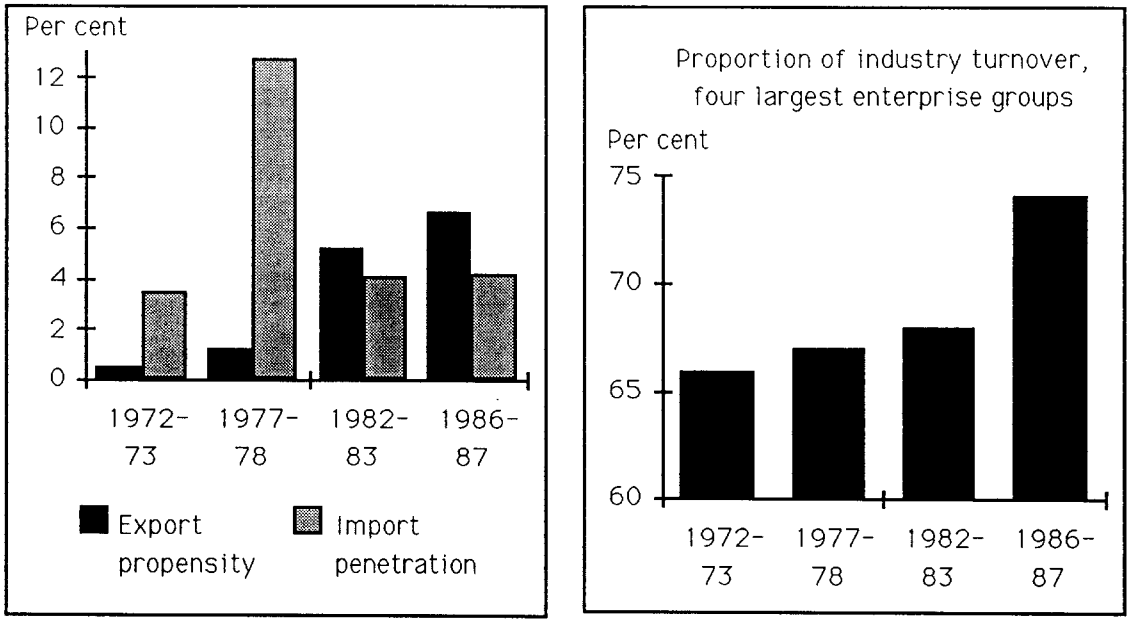
In contrast to the U.S., the water heater markets in Australia and N.Z. have relatively few competing firms. SABH Ltd accounts for approximately 75 per cent of Australian production through its Rheem and Vulcan Divisions, with plants located in Sydney and Melbourne respectively. However, the market power that might be associated with this market share is tempered a little by competition between Rheem and Vulcan for market share, and the presence of alternative supplies from the other Australian producer, Hardie-Dux.

The N.Z. market is supplied mainly by Rheem New Zealand, with the majority of its product range manufactured in Auckland. Some products are imported from Rheem (Australia) while Vulcan (Australia) exports a small number of gas water heaters to the N.Z. market. The N.Z. market comprises both mains and low pressure water heaters. The latter segment of the market is not considered in this study, as it is insignificant in Australia and the U.S.

Imports traditionally have not maintained a significant proportion of the Australian or N.Z. markets, due mainly to significant transport costs for water heaters, and to a lesser extent to product performance regulations that operate to a degree as a non-tariff barrier to trade. There is a view within the industry that this position is likely to change in the future, due to excess production capacity in the U.S., the acquisition of U.S. production facilities by SABH Ltd, and reform of shipping and waterfront inefficiencies in N.Z. and Australia.

Selected indicators for the Australian water heater industry are presented in Figure 2.2. The available data show that the industry's products have been only slightly tradable, although the export propensity of the industry has increased steadily since the early 1970s, reaching almost 7 per cent by 1986-87. In that year, the four largest enterprise groups in the industry, measured on a turnover basis, accounted for almost 75 per cent of the industry's turnover.

Figure 2.2 Selected indicators for the Australian water heater industry



Source : Madge, Bennett and Robertson (1989).

It should be noted that the industry definition employed by the Australian Bureau of Statistics (ABS) in compiling the data shown in Figure 2.2 is broader than that used by this study. The major difference in coverage is that the ABS data include 'instant' water heaters. Nevertheless, the indicators do give the accurate impression that the water heater industry in Australia currently has low international tradability and high concentration.

2.3 Production process

Just as there are considerable variations between the product mix of the four plants considered in this study, there are many differences in the detail of the production processes involved. However, each of the production processes is intensive in its use of materials and involves a technology that has remained essentially unchanged since the introduction several decades ago of vitreous enamel coating for the inner water tank.

In general, production of water heaters involves the fabrication of an inner water tank to which many small parts and fittings are attached as it moves along a production line. Finally, an outer metal jacket is fabricated and fitted, and insulation material is inserted between the inner tank and outer jacket.

In terms of production processes, the large U.S. plant was more integrated and involved more machines operating in parallel than the other plants. A parallel layout can yield significant efficiency gains, because production can continue should one of the machines break down. Of the other plants, the Rheem plant in Sydney had the more modern equipment, the more spacious layout and the more automated production. Its layout was based on that of the independent Rheem plants in the U.S., and involved machines operating in series.

The smaller, Vulcan plant in Melbourne was characterised by older, and often second-hand, purchased equipment which was being upgraded progressively. Much of this plant's less complicated equipment was fabricated in its own workshops. The N.Z. plant, the smallest of those included in the study, had the greatest use of manual handling and the oldest equipment. It also had the highest proportion of work undertaken off-site by subcontractors.

A feature of both the Australian and N.Z sites was their multi-product output. During 1989-90 the Melbourne plant produced electric heaters and dishwashers as well as water heaters, although it was being reorganised to operate on a single-product basis. The Sydney site produced liquefied petroleum gas containers and sheet metal drums in addition to water heaters, whereas the N.Z. plant produced 'Lazer' brand instant hot water units as well as conventional, mains pressure water heaters. Reflecting this multi-product output, some machine presses in the plants produced parts for products other than water heaters. By contrast, and reflecting its access to a much larger market, the U.S. plant was dedicated exclusively to the production of water heaters.

The production process can conveniently be considered under the following headings:

- the fabrication of the inner water tank;
- enamelling;

- final assembly; and
- quality control.

These aspects are discussed below, and a schematic outline of the production process is shown in Figure 2.3.

2.3.1 Fabrication of the inner water tank

The first and central process involved in the manufacture of a water heater is the fabrication of the inner water tank. At Bradford-White's plant in the U.S., and at Rheem's Sydney plant, steel for the fabrication of the inner water tank was delivered in large coils. These coils were produced by BHP Pty Ltd for Rheem and by any of several U.S. steel producers in the case of Bradford-White. The coils are then trimmed and cut to size. Obtaining regular steel supplies of adequate quality has been an on-going problem at Rheem's Sydney plant.

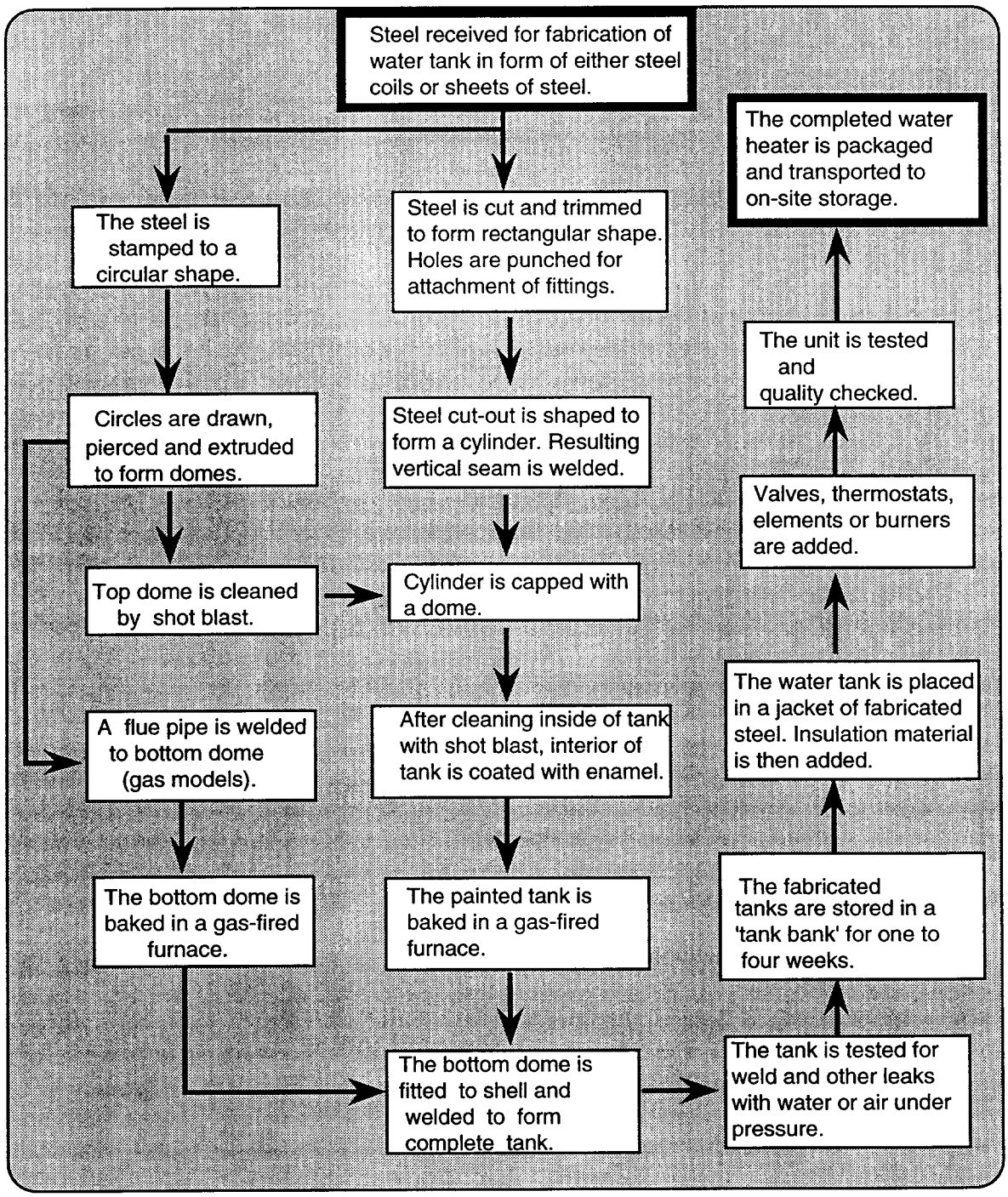
The steel used by the N.Z. plant was purchased pre-cut from Japan, with further cutting being undertaken on site. Steel from N.Z. and Australian producers was not used, due to their combination of higher prices and limited range of product thickness. The steel used by Vulcan in Melbourne was supplied trimmed and cut to size by a subcontractor, who was supplied directly with steel coils by BHP.

In the next stage of tank fabrication, holes are punched for valves, elements and the other fittings that are attached later in the production process. The rectangular steel sheets are then rolled to form a cylinder and the seam is welded. Couplings are welded onto the cylinder, and the dome is fitted and welded into position as the cylinder top.

2.3.2 Enamelling

The inner tank is cleaned by blasting with steel grit, coated with vitreous enamel and dried. Enamel coating ensures a longer expected life for the tank than the galvanised steel used previously. In the next stage, the enamel is fused to the tank in a furnace at temperatures of approximately 860^{o}C. For gas heaters, the base and flue are sprayed and enamelled separately and then welded to the inner tank. For electric water heaters the process is similar, but a flue is not required. After baking, the tank is stored outside the plant until it is required for final assembly.

Figure 2.3 A schematic representation of the production process



Source : BIE drawing, based on data supplied by the plants.

2.3.3 Final assembly

During this stage most fittings are attached, including hot and cold water nipples, the anode, thermostat, and the burner for a gas unit or element for an electric unit. The gas units produced by plants in Australia and N.Z. used fibreglass insulation, as most units are installed outside the premises and the rectangular cross-section of the outer jacket made the use of foam difficult. The fibreglass insulation is placed around the tank and an outer jacket is attached.

The electric units and the U.S. gas units used polyurethane foam insulation. A small number of gas units made at the Sydney plant for internal installation also used foam insulation. The foam is added after the tank is pre-heated to about 40^{o}C. The pre-heating assists the insulation to expand.

2.4 Quality control

In considering quality control practices at the various water heater plants, a distinction can be drawn between practices which can be described as 'reactive', such as inspection, reworking and testing; and 'proactive' practices. The essential idea behind proactive quality control measures is that quality is the responsibility of all. That is, the best way of assuring acceptable quality standards is to build quality control practices into production, rather than to attempt to inspect them in.

Quality control and assurance practices at all plants have both reactive and proactive elements, with the balance being more towards the reactive end of the continuum. However, the Australian plants are showing an increasing use of proactive techniques and a somewhat reduced reliance on inspection to ensure quality standards are met.[1]

2.4.1 Reactive quality control practices

The main structural quality control practices in use at the plants involved:

- checking of steel and other inputs;
- testing of the water tank for weld or other leaks;
- the use of inspectors to check product quality and correct production techniques;

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1 Samson and Sohal (1990) provide an Australian perspective on the strategic status of quality.

- periodic sampling (usually several times a day) of water heaters and their component parts;

- a systematic dismantling of the plant's and rival producers' water heaters for a component by component comparison (usually only once every one or two years); and

- a final assembly line inspection.

Not all of these procedures were carried out by all plants.

Unlike the other water heater plants, there have been no roving inspectors used at the N.Z. plant for the last decade. Inspection at this plant was carried out by foremen and leading hands who received special training for this role. After fabrication, tanks were tested for weld or other leaks by being filled with water under pressure. The gas burner was test fired and a final inspection was carried out at the end of the assembly line for minor faults such as incorrect packaging or labelling. A density check was also carried out morning and evening on the insulating foam used in the plant's electric models.

The U.S. plant appeared to rely on structural methods to ensure quality to a greater extent than the other plants. Bradford-White employed twenty-eight inspectors to monitor quality. These inspectors were assigned to defined production areas of the plant to monitor quality. In addition, other inspectors monitored the quality of purchased items.

Many aspects of quality control at the U.S. plant involved checks by production workers. For example, before the base was pressed on to the enamelled inner cylinder, there was a visual inspection of enamel quality using a flood light. However, the main assessment for leaks was an air pressure test, which was performed after the base was pressed and welded on to the tank cylinder. There was an additional air pressure test during the final assembly phase, after the anode and hot and cold water nipples were attached.

Quality control staff at the U.S. plant reported to the plant Quality Engineer rather than to the Production Manager. This avoided any potential conflict of interest which could arise under the latter arrangement. One of the main functions of the Quality Engineer and his staff was to prepare a statistical report based on warranty claims, which was circulated to relevant personnel on site as well as to the company's head office in Philadelphia. This analysis was an important mechanism by which feedback was obtained from customers.

Reflecting its highly competitive market, the U.S. plant placed a premium on systematically comparing the quality of its products with those of its competitors. To this end, Bradford-White assessed examples of its own and competing products every two years. The water heater models were progressively dismantled and their

parts were compared item by item. An overall quality assessment was also undertaken. On the basis of these analyses, the company regarded its products' quality as being amongst the best in its market.

The structural quality control practices at the Melbourne (Vulcan) and Sydney (Rheem) plants were broadly similar. Both Australian plants used quality inspectors, although at Vulcan the number of inspectors had been reduced from four to one roving inspector, who had the discretion to investigate any part or product. He reported directly to the Production Manager. There were nine quality inspectors at Rheem. At this plant, the inspectors tended to be responsible for a fixed area. For example, designated inspectors checked the first and the last units of a production run, and undertook some random checks of production.

Both Australian plants performed the range of tests (such as the density of foam insulation and enamel quality) required for accreditation by Standards Australia. They also monitored the quality of purchased and manufactured inputs. Other similarities between the two Australian plants included the periodic dismantling of competitors' products; the statistical analysis of warranty reports in a way similar to Bradford-White; final assembly testing of burners in gas models and elements in electric models; the testing of foam levels in electric models; and the use of sampling tests of various kinds.

At Vulcan, sampling tests included the full testing each day of one gas and one electric model selected at random from the production line, a pulsation test to destruction of one tank per week (increased to between two and three tanks per week since 1989-90) and a check on product safety and reliability using a sample of approximately 1 per cent of output. At Rheem, sampling tests included the removal of five packaged water heaters per day for testing, pulsation testing to destruction of six to eight tanks per week, and an annual warranty survey. In the latter assessment, two consecutive months were selected at random, and all heaters which had a warranty claim in those months were investigated. A study was also made of 'first day leakers', that is those units which were returned because they developed a leak in the first six months of operation.

2.4.2 Proactive quality control practices

In contrast to their highly developed structural quality controls, the U.S. plant's proactive measures seemed relatively undeveloped. The plant management had a philosophy of 'getting it right the first time', and considered that it was moving towards ensuring a system of quality assurance through individual employee responsibility, rather than through inspection. However, the BIE inspection team discerned a lack of the type of structural support, such as training programs, which would be associated with an emphasis on proactive measures. This could reflect a difference of some months between the timing of our visits to the U.S. and other plants.

Reflecting a decision by SABH Ltd, the parent company, both Vulcan and Rheem have introduced a quality control system known as QIP (Quality Improvement Process). The program is derived from the analysis of Crosby (1979). The aims of the program are to improve quality at each stage of the production process through encouraging a positive approach to quality, to motivate production workers to take responsibility for the quality of their work, rather than an attitude of 'quality is not my job', and to improve quality through better teamwork, communication, monitoring and feedback.

The system involves an extensive program of training, which is supplied by a consultant. Senior management received the training initially, with a designated company trainer receiving more extensive instruction. In turn, the company trainer instructed production managers and foremen in QES (Quality Education System), whereas production workers were instructed in a less intensive version of QES known as QAE (Quality Awareness Experience). This approach to proactive quality is very much from the top down, but demonstrates to all employees that management is committed to the process.

The introduction of QIP at Rheem led to the use of control charts on machines to provide acceptable measurement tolerances and other information for operators, to inspection of their own work by operators (Rheem hopes eventually to eliminate the use of quality inspectors) and to the use of recording books on a small team 'buddy' basis. The aim is to devolve the responsibility for quality to production teams. At the time of the visit by the BIE inspection team, there were around twenty work groups (consisting of production workers, process engineers, a plant manager and employees with responsibility for product development) assessing all factors at the plant that affect quality.[2]

The implementation of the new quality control system was quite advanced at Vulcan, with each foreman and leading hand responsible for the quality of work undertaken in his or her area. Production workers too were involved, and had taken responsibility for tasks such as quality audits on a sample of parts, using appropriate diagrams and specifications.[3]

In summary, emphasis was being given by management at all the plants to improving the quality of output. However, the BIE inspection team found that the extent of quality consciousness varied within and between production plants,

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2 Similarly, the employee involvement program at Ford Australia is focusing on improved quality, as well as reduced inventory costs and interruptions to the production line (Lever-Tracy 1990).

3 Overseas evidence suggests that work groups are most successful where companies hand pick people for the groups, help them pick projects with measurable goals, provide them with management support, budgets and authorisation to request help from other departments, and disband them when their goals are reached (New York Times 1991).

depending on employee training, morale and language skills. This aspect of production is discussed further in Chapters 3 and 4.

2.5 Regulation

The water heater industry in Australia is subject to a large number of regulations imposed by Federal and State authorities, local councils, Standards Australia (SA), the Australian Gas Association and the Australian Liquefied Petroleum Gas Association. The major standards governing the manufacture and installation of water heaters in Australia are set out below.

Electric

- AS (Australian Standard) 3142, Approval and test specification for electric water heaters;
- AS1056, Storage water heaters, general requirements;
- AS3000, SA wiring rules; and
- AS1308, Electric water heater thermostats and thermal cut-outs.

Once approval of an electric water heater has been received from an appropriate authority, such approval is recognised by electrical authorities in all States. A separate submission (documents only) is required in Victoria for eligibility to connect to special off-peak tariffs, where applicable.

Solar

The standards for solar water heaters are those for electric models, plus:

- AS2712, Solar water heaters, design and construction.

Gas

- AG102, Approval requirements for gas water heaters, Australian Gas Association[4];

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4 In addition to meeting this regulation, gas water heaters and other gas appliances are appraised by the Gas and Fuel Corporation of Victoria and the South Australian Gas Company. This process may involve retesting to some or all of the requirements of AG102.

- AS1056, Storage water heaters, general requirements;
- AG601, Installation code for gas burning appliances[5]; and
- AG209, Australian Gas Association requirements for combination controls.

All Water Heaters

- AS1357, Water valves for use with unvented water heaters; and
- AS3500, National plumbing code.

Following approval, separate submissions are required to:

- the Victorian Metropolitan Board of Works for compliance to By-Law 218;
- the South Australian Engineering and Water Supply for compliance to Plumbing and drainage directions part I; and
- the Queensland Joint Committee for authorisation under the Standard water supply and Standard sewerage By-Laws.

Worksafe regulations in N.S.W. (and similar regulations in other States and in N.Z.) specify a maximum allowable air pressure for testing water heater cylinders of 70 kPa (10 psi). Australian authorities argue that pressures above this limit are unsafe. In contrast, cylinders at the U.S. plant are air pressure-tested at around 275 kPa (40 psi). It has been found in practice that air pressures above 70 kPa are required to detect small pin-prick leaks in water tanks. This being the case, an alternative means of testing has had to be adopted in the Australian plants. The method chosen is hydrostatic (high-pressure water) testing, which is more capital- and labour-intensive than compressed-air testing. The estimated direct cost to the Australian industry is about $A2 per unit, but the industry advises that there are additional cost penalties associated with the use of hydrostatic testing, because the process is a significant production bottleneck.

AS 3500 governs the installation by plumbers of a non-return valve at the cold water inlet to a storage water heater. The small amount of expansion of water during the heat up cycle is therefore relieved through the pressure relief valve (supplied with the heater) into a drainage pipe. In the U.S., non-return valves are not generally required, thus allowing water expansion to dissipate via the cold water inlet pipe.

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5 In addition to complying with the general requirements of AG601, appliances may need to be installed in compliance with local gas fitting rules of most gas utilities. Such rules may have additional or different requirements to those of AG601.

The relief valve supplied in the U.S. (not necessarily as part of the heater) is therefore less complex in design as it only acts as a safety device. The estimated cost penalty of using the more sophisticated valve in the Australian product is approximately $A6 per unit.[6]

Water is distributed throughout Australia at a wide range of pressures, often above 1400 kPa. In the U.S., distribution pressures are generally limited to a maximum of 1050 kPa. Where pressures above this limit are encountered, a pressure limiting valve (generally set at 560 kPa) is fitted at the inlet to the household.

The last two items together create a phenomenon known as pressure pulsation or water hammer in Australian water heaters every time a hot water tap is turned off. That is, the unit is subject to severe pressure pulsation at a high operating pressure. As a result, Australian water heaters must be significantly more robust than the U.S. product. This requires the use of higher gauge steel and special testing procedures (Section 2.4.1). The additional material cost is about $A3 per unit.

It is difficult to estimate the total costs to the Australian industry of such regulatory measures. Based on information supplied by the Sydney plant, there could be a total cost disadvantage to Australian manufacturers of some $A10 to $A20 per unit (corresponding to between 2 and 9 per cent of the retail price, depending on the model). The benefits in terms of product and worker safety and water supply quality are less easily quantified.

In the U.S., the Federal Consumer Products Safety Council and the American National Standards Institute regulate safety standards in the water heater industry. Conformance to these standards is voluntary, but almost all States require compliance with the standards before a product can be sold. In addition, national plumbing codes deal with water delivery (size of line etc.) and pressure and temperature relief requirements.

At the State level, some authorities in the U.S. now require that pressure and temperature release valves be fitted by the manufacturer, as is the practice in Australia, rather than by the plumber who installs the unit. States in the U.S. impose a range of standards for emissions from gas water heaters, and for the maximum temperature to which the water may be heated. At the regional level, local communities are increasingly moving to disallow backflow from water heaters into inlet pipes, as is the practice in Australia.

Regulations in the U.S. dealing with product efficiency include revised energy standards, which have necessitated a switch from fibreglass to the more effective foam insulation for both gas and electric models. Most gas models in Australia and

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6 Additional Water Board regulations in South Australia and Western Australia require the fitting of a cold water relief valve to the cold water inlet to the heater.

N.Z. are for external installation, and are fitted currently with fibreglass insulation. A small percentage of gas heaters manufactured by the Sydney plant for internal installation use foam insulation.

Management at the Sydney plant advises that Federal legislation requires the industry to reduce its usage of chlorofluorocarbons (CFCs) by 50 per cent from the 1988 level by 1 January 1992, and to eliminate their usage entirely by 1 July 1994. CFCs are commonly used as blowing agents in insulating foams. The Australian timetable is in advance of the London revision to the Montreal Protocol and will mean that Australian manufacturers will be ahead of most overseas water heater manufacturers, particularly those based in the U.S. The company argues that this requirement will result in considerable cost imposts being borne by Australian manufacturers in research and development, material and capital costs as the technological implications are resolved.

The Sydney plant suggests, moreover, that since current replacement blowing agents generally involve potential reductions in insulating efficiency, the replacement of CFCs is likely to involve higher energy consumption for the same hot water usage, or increased size of product due to thicker insulation, with potential for less efficient loading and transport economics due to increased bulk. In turn, this will entail increased vehicle journeys and fuel consumption. Preliminary estimates indicate that direct cost penalties of the new requirement are $A5 per unit (excluding development and capital costs).

N.Z. authorities require gas water heaters to comply with Australian Gas Standard AG102, whereas electric water heaters must comply with N.Z. Standard No. 4606. The latter standard is more stringent than the Australian version, because it requires no more than 1.6 kW heat loss from a water heater over a period of one day, versus a limit of 2.2 kW in Australia. The N.Z. regulation effectively requires the use of a layer of foam insulation 50 mm thick, versus the thickness of 25 mm used in Australia.

Thus, the N.Z. producer is disadvantaged slightly in terms of production cost vis-a-vis producers of electric models in other countries, via the requirement for additional foam and a larger external jacket. However, the adoption of a standard for electric models different to that used in Australia seems likely to impede the provision of imported models and to reduce competition in the marketplace. Such factors would tend to benefit the local producer at the expense of the N.Z. consumer, and would decrease the possibility of benefits to Australian producers and consumers from longer production runs to supply the N.Z. market. It would also tend to decrease the possibility of overall gains from specialisation of production between Australian and N.Z. firms.[7]

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7 A detailed evaluation of the impact on Australian manufacturing industry of our free trade agreement with N.Z. is provided in BIE (1989).

An advantage does accrue to the N.Z. manufacturer from the lower pressure at which water is distributed in N.Z. (850 kPa, versus 1400 kPa in Australia). This enables the inner water tank to be constructed from lower gauge steel than that required in Australia. The lower water pressure reflects the extensive use of polybutanol tubing for water distribution in houses, due to the greater ease with which plumbers can install it relative to copper pipe.

An element of the Special Premiers Conference process in Australia is reform that will facilitate the development of a single, national market in Australia. One approach would be to remove inter-state barriers to trade in consumer goods, allowing consumers to choose between products competing on price but made according to different standards. Consumers would be safeguarded by the requirement that manufacturers identify products that did not comply with standards in the State or Territory of sale. In July 1991, the Premiers agreed in principle to this approach and to a target date for implementation of 1 January 1993 (Dodd 1991a).

Such reform is desirable as a means of ending a regulatory burden described in 1990 by the Australian Prime Minister, Mr Hawke, as an 'intolerable' mess (Power 1991). It could be complemented by greater debate on the questions of the appropriate level of regulation, and the most cost-effective form of policy intervention (BIE 1986). To date, the means of implementing an approval recognition process for water heaters has not yet been resolved between Standards Australia, the Water Authorities and water heater manufacturers.

Chapter 3

Industrial relations at the national and plant levels

3.1 Introduction

The first part of this chapter is concerned with outlining the industrial relations systems of each country and highlighting differences between them. The second part provides cameos of the industrial relations environments prevailing at the water heater plants. The aim is to provide a context for the detailed plant level comparison of industrial relations, work practices, training and education, presented in Chapter 4.

3.2 Industrial relations systems

3.2.1 Overview

The industrial relations systems of Australia and N.Z. have been similar for much of the twentieth century, reflecting their common British origins and a tendency for industrial ideas and practices originating on one side of the Tasman Sea to diffuse to the other side. The use of a centralised, semi-judicial framework to settle disputes and to establish wages and conditions is a hallmark of the industrial relations systems in both countries. The traditional framework in the two countries has been questioned recently, and there have been moves on both sides of the Tasman towards a less centralised industrial relations system with a greater enterprise focus. These changes have been more extensive in N.Z. than in Australia.

A more decentralised industrial relations system has evolved in the U.S. Collective bargaining is the means by which disputes are resolved and wages and working conditions are set in unionised plants. However, the majority of the U.S. workforce and most enterprises are not unionised. In these enterprises, wages and conditions or 'the going rate' are determined by the state of decentralised labour markets. By comparison with Australia and N.Z., the role of the government and the judiciary in such matters is relatively small in the U.S.

3.2.2 Australia

Trade unions

The Australian Council of Trade Unions (ACTU) is the peak council of the national union groups. It represents 81 per cent of union members in Australia.[1] Affiliation by unions is voluntary and, although its decisions are not binding on its members, it often makes major employee submissions (such as in National Wage Cases) to the various industrial tribunals.

The Australian workforce has traditionally been thought of as highly unionised. However, the extent of unionisation of the Australian workforce has fallen from 51 per cent in 1976 to 41 per cent in 1990. The latter outcome reflects rates of 31 and 67 per cent in the private and public sectors respectively (ABS Cat. No. 6325.0).

Peetz (1990) concludes that the decline in the unionisation rate was due equally to structural change in the mix of industries and occupations in the economy, and to a reduction in the propensity of employees to belong to unions. The lower membership propensity could be due to the perception, 'that the corporate nature of wage determination under the Accord has reduced the need for rank and file union activity and hence membership' (Lewis and Spiers 1989). The OECD (1990 p. 78) goes further, and suggests in its 1989-90 survey of Australia that the decreased membership could:

> reflect the fact that new employees see little interest in joining unions that are highly fragmented, fraught with internal disputes and more concerned with protecting acquired rights and work practices than addressing emerging needs of their members.

Peetz (1990) considers that, 'unions need to convince workers that they offer real value in a competitive environment', as suggested by Farber (1990) for unions in the U.S.

Amongst manufacturing workplaces, 'closed shops' are not uncommon. That is, employees must be union members or be willing to join a union before they can be offered employment. The extent of unionisation in the manufacturing sector can be overstated, however. A major survey undertaken by the Commonwealth Department of Industrial Relations showed that only 52 per cent of manufacturing workplaces with five or more employees had a union or unions on site. Nevertheless, the union density amongst manufacturing employees, at approximately 61 per cent,

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1 This percentage is calculated as the ratio of the 2.757m members affiliated with the ACTU (information supplied by the ACTU library) to the 3.422m union members in Australia at 30 June 1990 (ABS Cat. No. 6323.0).

was some 7 percentage points higher than the average for all the industries surveyed (Callus *et al.* 1991 p. 246).

The degree of unionisation in manufacturing varies considerably with workplace size. Smaller workplaces often have no unions or only a very limited union presence, whereas a high proportion of workforces at larger workplaces tend to be unionised.

An important feature in Australia is the presence of more than one union at a workplace. There are on average two unions per manufacturing workplace, for workplaces with five or more unionised employees. The average number of unions is over six for workplaces employing more than 500 persons (on an all-industries basis) (Callus *et al.* 1991 p. 246).[2] The presence of multiple unions per workplace reflects the fact that trade unions in Australia have traditionally been organised according to occupation rather than industry (ACTU 1991, D.186; McLaughlin 1990).

There are both costs and benefits for management and employees in dealing with multiple unions. On the negative side, the necessity to coordinate dealings with several unions imposes costs in terms of time and other managerial and employee resources. Moreover, rivalry between unions competing for members in the workplace can take the form of escalating wage and other demands, demarcation disputes and industrial action.

On the positive side, the presence of two or more competing unions can provide a choice for employees in some cases. For example, direct production workers at the Sydney and Melbourne plants considered in this study currently have the choice of joining either the Amalgamated Metal Workers' Union (AMWU) or the Australasian Society of Engineers (ASE).[3] The presence of competing unions can result also in the curtailment of union demands and less industrial action, in situations where elected union officials would otherwise be more prone to take militant action than their members.

Over the past decade or so, Australian trade unions have not shown many signs of consolidation. By June 1990, 85 per cent of Australia's unions had 20 000 or fewer members. This figure was only 3 percentage points less than that for 1975. At the

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2 An earlier survey of approximately 330 Australian workplaces of members of the Business Council of Australia found that there were one or more unions present at 95 per cent of the sites surveyed (Business Council of Australia 1989c). More than 50 per cent of workplaces had four or more unions, 29 per cent had between six and ten unions and a further 6 per cent had more than ten unions with which to negotiate.

3 Since the visit of the BIE inspection team to the plants in late 1990, the AMWU has amalgamated with the Association of Drafting Supervisory and Technical Employees to form the Metals and Engineering Workers' Union, and the ASE has amalgamated with the Federated Ironworkers' Association to form the Federation of Industrial Manufacturing and Engineering Employees.

other end of the size spectrum, there were eighteen unions with 50 000 or more members in June 1990 which represented 55.4 per cent of total union members. This compares with fifteen organisations of similar size in 1975 which accounted for 47.6 per cent of total membership (ABS Cat. No. 6323.0).

However, the possibility now exists under Section 118 of the Industrial Relations Act for a company/companies or a union in an industry to seek a ruling from the Australian Industrial Relations Commission (IRC) that workers should be represented by a single union.[4] For example, the IRC ruled in late 1989 that the Federated Ironworkers' Association (FIA) should represent workers at Southern Aluminium in Tasmania, a greenfield site, following an agreement between the company and union, over competing claims of the AMWU and the Electrical Trades Union. The National Union of Workers applied for, and in early 1990 was granted, coverage at Olex Cables, following a recruitment campaign by the FIA.

The ACTU and the Federal Government have a policy of rationalising trade union structures into industry-based groups by changes to union coverage rules using Section 118 of the Industrial Relations Act. The Federal Government legislated to facilitate this process with the Industrial Relations Legislation Amendment Bill 1990. The essential objective of this Bill is to facilitate union amalgamations and to reduce the number of unions at the enterprise and industry level. The main provisions of the Bill are:

- a phased increase in the minimum membership of registered unions from 1 000 to 20 000 (subsequently amended in the Senate to 10 000);
- unions with a membership fewer than 10 000 can continue to be registered if they show sufficient justification;
- the clarification and streamlining of union amalgamation procedures, to provide guidance for the IRC and the Federal Court; and
- the elimination of the requirement that there be an actual or potential demarcation dispute before the IRC can alter the representative rights of a union.

The amalgamation policies of the Federal Government and the ACTU are beginning to have an effect. Currently, sixty-one separate union amalgamations are planned, involving almost 100 separate unions (Davis 1991a). However, the OECD (1990 p. 78) has suggested that it is not clear whether all or even a majority of the amalgamations will assist the move towards industry or enterprise-based unions. The Business Council of Australia (BCA) argues that the current approach does not facilitate the

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4 As discussed by Dabscheck (1990), a second method of rationalising trade union structures is through the amalgamation provisions of the Industrial Relations Act, Sections 233 to 253.

development of enterprise-based unions because it fails to address the occupational nature of Australia's union structure (BCA 1990).

Some of the amalgamations appear to be motivated predominantly by factional considerations, such as the amalgamation of the ASE and the FIA (which are generally considered to be 'right wing' unions) and the amalgamation of the Building Workers' Industrial Union (BWIU) and the Australian Timber and Allied Industries Union (which are generally considered to be 'left wing' unions). Others, such as the merger between the Federated Rubber and Allied Workers' Union with the Federated Storemen and Packers' Union to form the National Union of Workers, have overlapping industry and enterprise coverage (Sloan and Wooden 1990). Some amalgamations will, however, clearly facilitate the growth of industry unions. For example, five small unions of finance workers are amalgamating to form the Finance Sector Union, which will have approximately 100 000 members (Davis 1991b).

In contrast to current policy, Sloan and Wooden (1990) and Costa and Duffy (1991) recommend that no size limit apply to registered unions for two reasons. First, encouragement of union amalgamations does not necessarily lead to industry unions, as noted above. Secondly, the authors propose a reform strategy directed towards greater contestability in union structures. In such an environment, they view as undesirable any regulation that hinders the development of any type of union. Given that only 1 per cent of enterprises in Australia employ more than 100 persons, it is clear that current minimum size requirements work against enterprise unions.

In response, it might be argued that the removal of a minimum membership requirement could intensify jurisdictional and demarcation disputes. However, such disputes tend to be the product of the craft basis of unionism, rather than of a large number of unions or of small unions as such (Sloan and Wooden 1990).

Employer organisations

In 1977, the Confederation of Australian Industry (CAI) was established as a single national employers' body. Since then, a group of large employers established the BCA, and the Master Builders' Federation, the National Farmers' Federation, the Australian Federation of Construction Contractors, the Metal Trades Industry Association (MTIA), the Australian Bankers' Association and the Australian Chamber of Manufactures have left the CAI.[5] They may appear separately before the main industrial judicial body, the IRC, in matters such as National Wage Cases. The MTIA is the employer body most relevant to the Sydney and Melbourne plants.

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5 The Master Builders - Construction and Housing Association of Australia rejoined the CAI in October 1991.

What is the rationale for the existence of such employer groups? The BCA (1989b p. 30) considers that the craft or occupation basis of major trade unions in Australia and the system of multi-employer awards has shifted the bargaining unit for most terms and conditions of employment away from the enterprise to the award and even national level, with a heavy emphasis on uniformity between crafts and occupations across industries. In its view, the Federal and most State conciliation and arbitration systems have encouraged employers also to organise themselves into associations for purposes of bargaining at award and national levels. As a result, the BCA concludes that most enterprises have negotiated with trade unions about the core terms and conditions of employment through an employer organisation.

However, the opening of the Australian economy to greater international influence and the increase in competitive pressures have in recent years led to the restructuring of large firms into semi-autonomous divisions and greater devolution of management authority to those divisions (Deery and Purcell 1989, BCA 1989b p. 45). This phenomenon has been accompanied to some extent by a move away from multi-employer awards towards enterprise-based awards. As a result, the traditional multi-employer approach facilitated by employer bodies is being displaced steadily, at least in large organisations.

Legal and government infrastructure

The IRC's predecessor, the Conciliation and Arbitration Commission, was established in 1904. Since that time, the Commission and its successor have been an integral feature of the wage-fixing system in Australia. The arbitration proceedings of the Commission are conducted like a court of law, with evidence and submissions taken from all parties. However, the IRC is not bound by the rules of evidence and may inform itself on any matter that it considers relevant. To this extent, its proceedings are more informal than a court.

An award by the IRC is binding on all parties. It usually specifies minimum standards of pay and conditions which an employer must meet or face legal penalties. The existence of multi-employer respondency and roping-in provisions means that employers that are not involved in negotiating an award may be covered automatically if their employees belong, or could conveniently belong, to the relevant union. Appeals against an IRC decision on questions of law are considered by the Federal Court, whereas the High Court deals with appeals on questions of jurisdiction or constitutional matters.

The parties to an industrial dispute are legally obliged to report the dispute to the IRC, which exercises both conciliation and arbitration functions. The IRC has an overriding obligation also to take account of the economic effects and other broader public interest considerations associated with its decisions.

All Federal unions are required to register in order to gain access to the IRC. Registration requirements also operate for large employers and associations of employers. However, registration is a more significant factor for unions because the Act prescribes that a union will not be registered if there is already one in existence to which employees can conveniently belong [Section 189(1)(j) of the Industrial Relations Act 1988]. This stipulation effectively grants exclusive coverage to existing unions, prevents dissatisfied union members from organising an alternative form of worker representation, and leaves open only internal union channels for dissatisfied members to bring about change. The alternative of resignation from the union is not open to dissatisfied employees in firms that are a closed shop (Wooden 1990, Sloan and Wooden 1990, Drago and Wooden 1991).

The process of wage determination

Wages and conditions for non-managerial employees in Australia are determined by various judicial or quasi-judicial tribunals, of which the most significant is the IRC.[6] Decisions by the IRC affect workers throughout the country, whereas the rulings of the State arbitration courts and wage boards apply only to workers covered by State awards. The State bodies have tended to follow the wage-fixing principles adopted by the IRC, except for changes to reflect their specific legislative requirements.

The Prices and Incomes Accord between the Federal Labor Government and the ACTU was implemented in 1983. It was intended initially to provide centralised wage fixation with automatic six-month adjustments corresponding to movements in the consumer price index (CPI). Since then, there have been several versions of the Accord in response to the requirements of economic policy. In 1986, as a result of a fall in the terms of trade and the associated depreciation of the Australian dollar, the IRC discounted the CPI for indexation purposes by 2 per cent, and both the tax cuts promised by the Federal Government and a pay rise based on national productivity were deferred.

The indexation system was abandoned in March 1987, due to widespread concern with the general state of economy and the view that wage increases in line with the CPI were not sustainable in the economic circumstances prevailing at that time. It was followed by a two-tier system. A flat pay rise of $16 per week, paid in two stages of $10 in March 1987 and $6 in February 1988, was available to all workers under the first tier. The second tier of up to 4 per cent depended on work restructuring and efficiency. In particular, measures could be implemented to improve work and management practices, change work patterns, reduce demarcation barriers, and

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6 Minimum rates industrial awards set minimum rates of pay and allow over award payments. Other workers, such as those employed by the Federal Government, are covered by paid rates industrial awards which set total rates of pay and do not allow over award payments. Employees need not be trade union members to be covered by award provisions.

advance multiskilling, training and re-training, and broad-banding (National Labour Consultative Council 1988).

In August 1988, the previous two-tier system was replaced with a similar structure. A 3 per cent pay rise was awarded, payable no earlier than 1 September 1988. The 'second tier' of $10 per week, to be paid at least six months after the first, depended on commitments to enter into discussions on what was termed 'award restructuring'.

Award restructuring aimed to encourage the parties to examine their awards with a view to, among other things:

- establishing skill-related career paths which provide an incentive for workers to continue to participate in skill formation;
- eliminating impediments to multiskilling and broadening the range of tasks which a worker may be required to perform;
- creating appropriate relativities between different categories within the award and at the enterprise level; and
- ensuring that working patterns and arrangements enhance flexibility and meet the competitive requirements of industry.

However, some commentators such as Spooner (1989) and Norris (1989) question whether the August 1988 National Wage Case decision actually resulted in significant restructuring. They point out that workers could achieve wage increases virtually automatically, although negotiations over award restructuring and efficiency and a commitment to a no-further-claims undertaking were required. The IRC Review of award restructuring concluded in May 1989 that, 'progress in some areas is considerable but in the majority it is minimal' (IRC 1989a).

The IRC Review went on to adopt the principle, but not the detail, of a 'blueprint for restructuring' put forward by the ACTU. The 'Kelty Plan', as it came to be known, contained three main elements:

- raising the minimum rate in minimum rate awards to compensate lower paid employees and provide a more 'equitable' base;
- reducing the number of job classifications by broadbanding to six or eight skill levels; and
- providing the means by which upwards mobility occurs through education and training.

The National Wage Case decision of the IRC in August 1989 accepted submissions made by the ACTU and Federal Government on the size of appropriate wage

adjustments (Norris 1990). There was an increase of $10 per week for workers at the basic skills or trainee level, $12.50 per week for semi-skilled workers, and $15 per week or 3 per cent, whichever was higher, at the tradesman level and above (IRC 1989b). The increases had to be applied for on an award-by-award basis, but were accessible from the date of the decision, following examination by the IRC of the proposals for restructuring and the giving of commitments.[7] A second increase in award wages, of the same order as the first, could follow not less than six months after the initial increase. The latter increase had to be applied for. The IRC decision also announced significant increases in the relative pay of low paid workers, to be phased in over two years.

Some flexibility for companies to enter into specific agreements with their workers on wages and conditions at the enterprise level is provided by Sections 115 to 117 of the Industrial Relations Act. These agreements may vary from the outcomes prevailing under the wages system, subject to a full bench of the IRC being satisfied that the public interest is not adversely affected. Section 109 of the Act provides for review on application by the minister (Stackpool 1989). Thus, such agreements can provide some flexibility at the enterprise level, with safeguards against such deals flowing on to other companies.

These sections appear to be little utilised however, and in practice the centralised wage-fixing process has limited the opportunity for employers to bargain directly with unions at the plant or workplace level.[8] This outcome reflects the existence of multi-employer awards, achieved through roping in or common rules, and a concern of the parties and Commission with possible flow-on effects[9] and the implications for national wage guidelines, minimum award entitlements and the stability of the wage-fixing process (Kyloh 1989). Such flow-on effects would seem to be due to the multi-enterprise coverage of unions and awards, a strong sense in the union movement of comparative wage justice and thus concern with wage relativities, and the power of the union movement relative to many individual enterprises.

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7 The Federal Government has provided considerable financial support for the restructuring process. $2.7m was provided for the establishment of four Workplace Resource Centres to assist unions and employers with restructuring. A further $12m was allocated subsequently to restructuring assistance (Spooner 1990, OECD 1990 p. 71).

8 Research undertaken by Rimmer (1989) for the BCA found that although there were nearly 2 000 private sector single employer awards in the mid-1980s, most were more or less mirror images of parent industry or occupational awards with only a slight enterprise focus. Only a small minority of the single employer awards provided for a distinctive code of employment conditions tailored to particular enterprises. Moreover, the BCA study estimated that the 2 000 enterprise awards covered no more than 10 per cent of award employees (BCA 1989b).

9 For example, the inclusion of the thirty-eight hour week in the Metal Industry Award spread rapidly to other awards (Sloan 1989).

Employers with employees covered by minimum rates awards, such as the Australian plants considered in this study, often pay additional, over award wages that are negotiated with unions or employees. However, between 1983 and 1991 the unions have been bound by a 'no extra claims commitment', under which they may not demand additional wage increases from employers above those allowed by the decisions of the IRC (OECD 1990 p. 104). This outcome is an extension of the move by the IRC since 1975 to bring over award payments within its guidelines and, in general, to proscribe over award pay increases (Plowman 1990).

Plowman (1990) concludes that such action by the IRC has contributed to three problems.

- First, it has removed a source of flexibility, hampered employers' capacity to attract labour to isolated areas, and reduced employers' capacity to pay over award payments in return for changed work practices.

- Secondly, although it could have reduced employers' wage bills (and increased employment) it has shielded employers from over award negotiations and could have reduced their capacity to negotiate and their interest in acquiring negotiation skills.

- Finally, the institutionalising of the over award payment in the move to paid rates awards has led to the indexing of former over award payments, and has given it greater prominence in considerations of comparative worth.

There is considerable agreement in Australia that the Accord between the ACTU and the Labor Government has been a success in terms of increased employment and output, due to the reduced real wages[10] and lower strike activity (Beggs and Chapman 1987) that have been delivered. Working days lost per thousand employees due to industrial disputes in Australia declined steeply after 1981 and have continued at a relatively low level thereafter. However, industrial disputes have not disappeared. For example, the level of industrial disputes increased somewhat in the first half of 1988 due to tensions over the wage ceilings that were to be applied in 1988-89 (Kyloh 1989). They increased also in late 1990 and mid-1991 (ABS Cat. No. 6321.0) due to the campaign in the metals industry for the implementation of the latest version of the Accord, and to a dispute over new licensing arrangements in the electrical trade.

Some economic analysts have pointed out that although the Accord has contributed to the achievement of the government's macroeconomic targets, these targets might

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10 This is not necessarily the case for the salaries and benefits of politicians, judges and senior public servants, which increased well beyond the norm established under the Accord for the majority of employees (Burgess 1990).

have been achieved at substantial microeconomic cost. For example, Hale comments (Hywood 1991):

> The fact is that some people deserve to get 20 per cent pay increases when they are in short supply. Some should get no pay increase at all. If you go for the average for everybody - say 5 or 6 per cent - you don't send the right [resource allocation and training] signals.

Moreover, as Borland *et al.* (1990) and the OECD (1990 p. 76) have argued, Australia's centralised award wage arrangements, of which the Accord can be seen as an extension, could have had other microeconomic costs. For example, there is evidence that Australia's wage profiles are 'flat' (that is, wages show very little increase over time with the acquisition of skills) relative to comparable nations.[11] It is suggested that this outcome reflects relatively high minimum award wages and limited career paths, coupled with IRC decisions to award flat rate increases, or combinations of flat rate and percentage increases. Without the effect of minimum award wages, the firm could offer a lower wage during the initial on-the-job training period. However, the minimum wage requirement increases the cost of the training period to the firm. In response, firms tend to involve trainees in production to a greater extent and reduce the extent of on-the-job training in the initial training period (Borland *et al.* 1990).

Other possible microeconomic costs associated with Australia's 'flat' wage profiles include a slowing in the rate of technological diffusion, which would have important implications for the growth of productivity. Central to this view is the belief that workers spread technology throughout industry by their movements from innovative firms. There is also the notion that steeper wage profiles provide an incentive for workers to avoid dismissal, and thus allow economies in the use of resources for supervision (Borland *et al.* 1990).

The latter part of 1991 has seen significant changes in the framework for determining wages in Australia. In October 1991, the Minister for Industrial Relations announced that the Federal Government would legislate to define more clearly the certified agreement provisions under Section 115 of the Industrial Relations Act and to separate them from the conciliation and arbitration system (Davis 1991c). Unions and employers would effectively be able to opt out of the arbitration stream into an alternative in which they would be required to reach fixed-term agreements. Industrial action such as strikes and lockouts would not be permitted during the life of an agreement, but would be permitted under prescribed circumstances during periods in which workplace agreements were being negotiated. The role of the IRC

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11 The flatness of wage profiles could be ameliorated by award restructuring, discussed earlier in this section and in Section 4.3.3.

would be to determine whether decisions to opt out had been reached fairly and with a full understanding of the implications.[12]

Some two weeks after this statement by the Minister for Industrial Relations, the IRC announced its decision in the 1991 National Wage Case. Despite what it considered to be a diversity of opinions, and a failure of the submissions to the proceedings to confront practical problems, the IRC devised an enterprise bargaining principle. The aims of the principle are to:

- place the primary responsibility for achieving successful enterprise bargaining results on the direct parties;

- require parties to abide by mutually agreed outcomes for a set period, and to accept an on-going responsibility for reviewing the effectiveness of their agreement and for its renewal or replacement; and to

- enable the IRC to have a conciliation role in disputes over enterprise bargaining and a role in testing the substance of agreements reached.

The IRC announced that from 1 November 1991, it would be prepared to ratify enterprise bargaining agreements made between parties under Sections 112 (consent awards) and 115 (certified agreements), subject to certain requirements being met. Sections 112 and 115 exclude the IRC from arbitration, but permit it to conciliate. The wage rises available under the enterprise bargaining principle would not be subject to a maximum.

For ratification, the IRC requires that:

- any wage rises be based on actual implementation of efficiency measures designed to effect real gains in productivity;

- agreements set out the specific efficiency measures and wage rises agreed, and clearly distinguish between wage rises based on the productivity agreement and the underlying standard rate of pay. This requirement appears designed to

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12 The passing of legislation along these lines is uncertain at the time of writing (December 1991). The package developed by the Minister for Industrial Relations included a proposal to provide unions pursuing enterprise wage bargains with immunity from legal sanctions while they were negotiating their agreements. It also included a proposal to increase fines that could be imposed by the Federal Court on unions that undertook unauthorised industrial action from $1 000 to $5 000 per day. In November 1991, the ACTU rejected the latter proposal. The ACTU approach reflected resistance from unions such as the Metal and Engineering Workers Union. The national secretary of that union pointed out that the imposition of a $5 000 daily fine could have led to a $5m penalty being imposed on the unions during their 1991 wage campaign in the metals industry (Spiers 1991).

make enterprise bargains visible, so as to reduce the scope for future disputes over what was actually agreed (Stutchbury 1991b);

- agreements be consistent with the implementation of the structural efficiency principle. *Inter alia*, this requirement requires that award arrangements for working hours and for casual, part-time and temporary employees be examined (Stutchbury 1991b);

- agreements not involve reductions in workers' ordinary time earnings or departures from IRC standard hours of work, annual leave or long service leave entitlements. This requirement protects workers from pressure by employers to bargain away certain conditions, but also protects employers from pressure by unions to reduce the standard working week (Stutchbury 1991b);

- agreements be negotiated through all unions in an enterprise, or section of an enterprise, acting together as a single bargaining unit. This requirement should reduce the administration costs involved with several negotiations with different groups of workers in the same workplace, and the scope for wage 'leapfrogging' (Stutchbury 1991b);

- agreements be for a fixed term. They lapse upon expiry unless the parties agree to renew or replace the agreements; and that

- there are no future wage rises during the life of an agreement, apart from any provided for in future National Wage Cases. This requirement distinguishes such agreements from the arbitration system, under which unions and employers traditionally have not been required to abide by mutually agreed bargains for a fixed period.

An alternative approach to ratification of agreements by the IRC is for the parties to agree to increases in over award pay, which will not require endorsement by the IRC.

In line with several employer requests, the IRC agreed also to set up a conference of National Wage Case parties to consider problems with award structures. The IRC said that it might be that the current structure of awards exacerbated some of the difficulties and risks identified in the shift to enterprise bargaining. However, the IRC ruled out a call by some employers for it to examine union coverage.

3.2.3 New Zealand

Industrial relations in N.Z. has evolved in a manner broadly similar to that in Australia. Trade unions are organised predominantly on an occupational basis. Until recently, wage determination and dispute settlement took place in a highly centralised quasi-judicial framework. By international standards, the industrial

relations system as a whole was notable for the high level of involvement by the government, and lack of involvement by individual enterprises, both management and labour (Jones 1991).

However, the introduction of the Labour Relations Act in 1987 by the then Labor Government heralded considerable change. The reforms introduced in that Act, and other associated measures, provided scope for the evolution of an industrial relations system that involved a reduced role for the government and greater flexibility of wage outcomes. In particular, the 1987 Act provided greater scope for agreements at the enterprise level. The changes introduced in 1991 by the incoming National Party Government went considerably further, with the introduction of employment contracts and voluntary unionism.

Trade unions

Approximately 62 per cent of the N.Z. workforce belong to a trade union (N.Z. Government Department of Statistics 1990 p. 457). This proportion is some 20 percentage points higher than for Australia and considerably above that of either the U.K. or the U.S.

Trade unions in N.Z. are organised predominantly on occupational lines, reflecting their craft origins. At the end of 1986 there were 227 registered trade unions, which represented around 500 000 workers (Geare 1988 p. 84). Since 1987, unions must have at least 1 000 members to be registered, compared to the previous limit of fifteen.

In addition to trade unions, which are employee organisations registered under the Labour Relations Act, there are a small number of unregistered worker societies. Registration confers certain advantages, including exclusive coverage and negotiating rights for the relevant occupation or industry. Registration also gives access to procedures for settling disputes through the Labour Court and the N.Z. Arbitration Commission.

Most trade unions have traditionally been affiliated with a peak trade union council, as in the U.S. and Australia. Since 1988, the peak trade union body has been the N.Z. Council Of Trade Unions (the CTU). Unlike its predecessor, the Federation of Labour, the CTU covers both private and public sector employees.

Under legislation enacted in May 1991 by the incoming National Party Government, unions no longer have automatic rights to represent a particular group of workers or a particular type of work. The new legislation provides for voluntary unionism in a way similar to the 'right to work' States in the U.S.

Employer organisations

As in Australia and other countries with centralised industrial relations systems, the existence of peak body employer organisations reflects the need for such organisations in the established legal infrastructure. The major such body in N.Z. is the Employers' Federation. Individual employers affiliate with one of the Federation's four regional divisions. The Federation nominates the employers' representative to the Labour Court and the Arbitration Commission. It has also played a role as the employers' representative in tripartite forums.

Legal and government infrastructure

The long tradition of State involvement in the N.Z. industrial relation framework dates from the Industrial Conciliation Act of 1894. The objective of this Act was to minimise strike activity by providing a framework for the settlement of disputes. Except for the introduction of compulsory unionism in 1935 by the first N.Z. Labor Government, the basic industrial relations framework remained essentially unchanged until 1987. Before the 1987 changes, the N.Z. industrial relations system was characterised by the following features.

- There were a large number of unions relative to the size of the workforce. Some unions had only a very small number of members. Unions were organised mainly by occupation.

- To be registered, unions had to cover workers in the same or related industries. Once registered, unions had exclusive coverage of all workers to whom their membership rules applied. The only avenue for change available to dissatisfied union members was through internal union channels.

- Union membership was effectively compulsory, although there was scope for conscientious objectors to avoid joining a union.

- Wages were negotiated each year in a 'wages round'. This process involved representatives of government, unions and employers establishing wage guidelines for the Arbitration Commission. A pattern of wage increases was then established by a number of key awards, with increases of varying sizes flowing through to the rest of the work force.

- In addition to this primary source of wage increases, employers often faced a second tier of wage claims. Where no award was negotiated, minimum wage laws applied.

- From 1984, arbitration of unsettled interest disputes (that is, disputes concerned with the renegotiation of a collective agreement) by the Arbitration Court was voluntary (Harbridge and McCaw 1990). This provision enabled traditional

relativities between awards to be broken, by giving employers the option to refuse to have the matter referred to arbitration.[13]

Significant changes were introduced by the then Labor Government in the 1987 Labour Relations Act. This Act and subsequent legislation provided mechanisms whereby unions and employers could establish agreements at a more decentralised level. It was now possible, for example, to establish agreements at the level of an enterprise or individual plant within an enterprise. However, only registered unions could initiate an enterprise agreement under the Act. This option was not available to either the employees of an enterprise or the relevant employer.

In more detail, the 1987 Act:

- provided opportunities for existing union coverage of an industry or occupation to be challenged by ballot;
- increased the minimum size of unions to 1 000 and made it easier for unions to amalgamate;
- abolished statutory penalties in favour of civil actions;
- made strikes illegal in cases where legislation provided for procedures to settle disputes; and
- effectively ended second-tier wage increases, by not allowing workers to be covered by both an award and a voluntary, collective agreement.

Voluntary, collective agreements covered around 80 000 workers by 1986. The Government argument against such agreements was that they facilitated only upward wage flexibility (Harbridge and McCaw 1990).

The OECD (1989 p. 45) observed in its 1988-89 survey of N.Z. that the 1987 Act had promoted union amalgamations and had led in at least one major case to an industry agreement which exhibited variation in both regional and plant awards. However, the OECD noted that there were few other bargaining innovations in 1987-88, and that it remained difficult for a company to establish composite agreements at the enterprise level because this process required the agreement of all relevant unions. Other N.Z. commentators suggest that the lack of a labour inspectorate to enforce award provisions after 1987 shifted the labour relations balance substantially towards employers. Moreover, the use of second-tier, over award payments and productivity bonuses by employers before 1987 had facilitated a degree of regional wage flexibility.

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13 Amendments in 1990 permitted compulsory arbitration in cases where one party refused to bargain in good faith.

The industrial relations reforms of 1987 have been overtaken by subsequent legislative changes. Following a change of government in late 1990, the incoming National Party Government enacted new industrial relations legislation in May 1991 with the stated intention of promoting enterprise agreements. The legislation seeks to replace the previous centralised system of awards with civil law employment contracts between employers and employee organisations. The employment contracts may be with individual employees, unions or any other employee organisation, as determined by negotiation between the parties. Employees are to be represented by agents that they may determine, but an employer may refuse to conclude an agreement with a particular agent. The new contracts may eliminate all previous award stipulations, and bind only those parties that consent to them. Thus, the changes open the way for higher or lower wages, depending on the availability of labour with the requisite skills, and for changed conditions of employment in areas such as overtime.[14]

Subject to constraints, employees have the right to strike and employers have the right to lockout if there is no current collective agreement, or if the Labour Court has determined that a new issue exists. Collective employment contracts must contain an effective procedure for the settlement of rights disputes (that is, disputes about the interpretation, application, or operation of employment contracts).

The process of wage determination

Like Australia, for most of this century N.Z. has had a wage setting procedure under which the main arbitration body has the power to raise and lower wage rates. Such a system is unusual by international standards. This situation has changed recently. The last general wage increase in N.Z. occurred in 1984 following a freeze on wages and prices that lasted for two years. In 1986, the Government repealed the regulation under which the general wage increase was made (Geare 1988 p. 310).

During the period from the end of the wages freeze to the introduction of the 1987 Labour Relations Act, wages depended on conditions prevailing in the labour market. At an aggregate level, the N.Z. Government relied on continuing tripartite consultation with employers and unions and tight monetary policy to keep wage outcomes within acceptable limits. An appreciating real exchange rate, reflecting higher real interest rates, assisted in curtailing wage increases to the end of 1988 (Wells 1990).

Since 1988, nominal wage increases have varied from around 4 to 5 per cent per year, somewhat below the rate of inflation. In addition to overall wage restraint since the

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14 However, employment contracts must comply with a minimum wage of $NZ245 per week for workers over twenty, minimum annual leave of three weeks, and five days per year for sick, bereavement or domestic leave (Ross 1991).

early 1980s, there have been important differences between wage settlements across industries, occupational groups, union categories and regions in N.Z. (Harbridge and McCaw 1990).

3.2.4 The United States of America

The industrial relations system in the U.S. differs considerably from those in place in Australia and, until recently, N.Z. In particular, the unionisation rate of the workforce is lower, and wages and working conditions are set by collective bargaining or, in non-unionised plants, by conditions in local labour markets. As in N.Z. and Australia, wages are limited at the lower end by a minimum wage, which in the U.S. is set by Congress.

Trade unions

Trade unions in the U.S. are organised on occupational or industry lines, with the latter being more common. There are over 200 national unions reporting to the U.S. Bureau of Labour Statistics. Some of these are referred to as 'international unions', which means that they have branches in Canada. In addition, there are many small single-firm unions and employee associations. Eligibility for union membership in the U.S. tends to be more restrictive than in Australia and N.Z. For example, foremen and most supervisory staff are generally excluded from union membership.

The unionisation rate in the U.S. is one of the lowest amongst industrialised countries. In 1988, only 13 per cent of the workforce in the private, non-agricultural sectors was unionised (Wachter and Carter 1989). This percentage reflects a steady decline from the 34 per cent that was achieved in the mid-1950s. Farber (1990) concludes that the decline in unionisation (between 1977 and 1984 in his analysis) is accounted for largely by:

- an increase in employer resistance to unionisation, probably due to increased competition in product markets; and by

- a decrease in demand for union representation by non-union workers, due to an increase in the satisfaction of such workers with their jobs and a decline in belief by them that unions are able to improve wages and working conditions.

Very little of the decline is accounted for by shifts in the demographic, occupational and industrial composition of the labour force. While there have been shifts in employment away from relatively heavily unionised blue collar jobs and jobs in manufacturing industries, the decline in the fraction unionised was generally greatest among the most heavily unionised workers (Farber 1990, Wachter and Carter 1989).

Greater employer resistance to unions was not a result of legal changes, but of changed management practices (Wachter and Carter 1989). For example, a 1938 court case, Mackay Radio, allowed firms to hire replacement workers during a strike and to offer them permanent jobs. But until the late 1970s firms rarely used this right, preferring to use managers to replace striking workers temporarily. Since then, there has been greater use of replacement workers who are offered permanent jobs, greater union hostility in disputes, and longer strikes. After a certain duration, and after a critical mass of replacement workers is hired, workers can petition for a new election to decertify the union.

Freeman (1988) suggests that some blame (credit) the Reagan Administration's operation of the National Labour Relations Board and destruction of the Professional Air Traffic Controllers Organisation for inducing an anti-union climate in the business community. However, the fact that union density began falling in the private sector before the Reagan Administration, and that collective bargaining coverage increased in the public sector during the 1980s, would seem to rule out this hypothesis.[15]

On the competition issue, Reder (1988) considers that inroads by foreign competition into U.S. markets has had two important effects. First, it has intensified the effect of domestic inter-regional competition on wages and prices in unconcentrated and/or partially unionised industries. Secondly, it has at least partially overcome the wage-price effects of industry-wide unionisation combined with nation-wide oligopoly in the product markets of major durable goods (such as automobiles, steel and electronic equipment).

Lipsig-Mumme (1989) points out that a crisis in the international competitiveness of such industries elicited a strategic offensive on the part of employers in areas such as the 'Japanisation' of shopfloor relations, technologically justified layoffs, transfer of production to the Third World and Mexico, wage freezes, an increase in contracting out, and sometimes the introduction of two-tier wage systems. In similar vein, Costa and Duffy (1990) conclude that management in the U.S. has not become any more anti-union. Rather, it has become more conscious of the strategic alternatives to unionisation, and is implementing strategies to achieve desired human resource policies.

The peak union organisation in the U.S. is the united American Federation of Labour and Congress of Industrial Organisations (AFL-CIO). This organisation was formed

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15 Lipsig-Mumme (1989) concludes instead that the decline of the U.S. union movement was the result of years of refusal by the union structures at both the peak council and affiliate level to:

> use the margin of strategic influence open to them to protect legislation, political influence and workplace credibility, refusal to leave a place for militancy, refusal to maintain class issues in electoral politics, refusal to do the hard work of organizing the unorganized in a rapidly changing labour market.

in 1955 when the AFL and CIO merged. Ninety-three unions representing approximately 90 per cent of unionised employees were affiliated by June 1987.

The AFL-CIO is a decentralised organisation and plays a lesser role than the ACTU in Australia and the CTU in N.Z. Its main functions are to speak for the labour movement before the U.S. Congress and the other branches of Government, and to represent U.S. labour in international forums and organisations. It is not involved in the collective bargaining process between unions and employers.

Employer organisations

The U.S. has several employer organisations, of which the most important are the National Association of Manufacturers, the Business Round Table and the U.S. Chamber of Commerce. These organisations do not participate directly in the collective bargaining processes. Their activities are generally limited to lobbying Governments on regulatory aspects of industrial relations, and to providing advice to firms on matters relating to industrial disputes.

Legal and government infrastructure

The major laws that govern industrial relations in the U.S. are the National Labour Relations Act (Wagner Act) of 1935, amended in 1947 to the Labour Management Relations Act (Taft-Hartley Act), and the Labour Management Reporting and Disclosure Act (Landrum-Griffin Act) of 1959. These Acts form the framework of what has been termed the 'Labor Accord'.[16]

The 'Labor Accord' is considered to represent an accommodation in which unions accept the right of management to manage within the bounds set by law and collective bargaining. In return, management accepts the right of unions to exist and to negotiate on behalf of unionised workers. Management, however, also reserves the right to resist unionisation where it has not been established. The Government's role under the Accord is that of neutral guarantor, ensuring that employees can decide whether to join a union (and therefore participate in collective bargaining) free from coercion by both employers and unions (Edwards and Podgursky 1986).

The Wagner Act established a labour court system, the National Labour Relations Board (NLRB) which investigates and prosecutes violations of the Acts referred to

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16 An earlier relevant law is the Norris-LaGuardia Act of 1932, which drastically reduced the power of the Federal courts to issue injunctions in labour disputes that would impede union organising. In previous years, employers could claim that unions were acting like labour market monopolies, which were illegal under anti-trust law. The Act also made 'yellow dog' contracts (in which workers agreed not to join a union as a condition of employment) unenforceable in Federal courts.

above. The law is remedial rather than punitive. For example, there are no statutory penalties for the wrongful dismissal of an employee. Rather, the employer involved would be instructed to reinstate the employee, possibly with full or part compensation for loss of wages. The actions of the NLRB are subject to the decisions of the U.S. Supreme Court.

The enactment of the Taft-Hartley Act, despite opposition from organised labour and a veto from President Truman, signalled the end of the period from the Great Depression in which unionists could reasonably hope, and opposing employers fear, that the Federal Government would act to enable unionists to prevail in a confrontation (Reder 1988).

The Landrum-Griffin Act was intended to protect the rights of union members. It includes provisions for the periodic reporting of union finances, and for the regulation of union elections.

In contrast to Australia and N.Z., trade union certification or registration in the U.S. is oriented to the individual plant or department level. If 30 per cent or more of employees at a plant or department decide that they wish to unionise, the union may petition for an election.[17] The Taft-Hartley Act provides that the NLRB would then supervise a secret ballot of those employees that it decided were eligible to vote (Freeman 1988). If more than 50 per cent of the employees vote for the union, it is certified by the NLRB and can then enter into collective bargaining arrangements with the employer. The employer is obligated to bargain with the collective bargaining representative of the workforce, though not to come to an agreement. To resolve impasses, workers can strike while employers can lock out striking employees and hire replacement workers. Decertification of a union can occur by similar processes to those for certification. Thus, there can be union and non-union plants and departments within the same enterprise.

Only workers vote in a representation election, but management plays an active role in many campaigns, generally trying to convince workers to reject unions. Many managements employ labour-management consulting experts (known as 'union busters') to convince workers to vote against the union (Freeman 1988). Such consultants can emphasise positive labour relations by having the non-union employer provide a union-like environment that includes factors such as higher wages and better fringe benefits. They may instead conduct an active, legal campaign that includes much communication with workers regarding management's views of what unionisation will mean for the workforce, gerrymandering of the unit of representation, and delay of the election itself. Finally, they can conduct an illegal election campaign.

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17 In practice, unions petition for an election only if two-thirds of employees are willing to request an election (Freeman 1988).

Although employers are forbidden under the Taft-Hartley Act to discriminate against workers for union activity, whereas unions are forbidden from engaging in unfair tactics such as secondary boycotts, the number of charges of 'unfair' management practices filed by unions under the law has increased rapidly since 1960 (Freeman 1988, Farber 1990).

The 'right to work' States are an important feature of the industrial relations scene in the U.S. Located primarily outside the traditional industrial regions to the north, 'right to work' States have enacted legislation which specifies that an individual need not join a union. This provision applies even in firms which have traditionally been unionised and in firms where a majority of employees have voted under Federal legislation to be represented by a union. The power of the States to legislate in this area derives from the Taft-Hartley Act, which makes invalid, in any State proscribing them, collective bargaining agreements that require union membership as a condition of employment (Reder 1988).

In such circumstances, there is an economic incentive for employees not to join a union in a 'right to work' State, because they can enjoy any benefits the union brings at no cost (the free rider problem).[18] However, Farber's (1984) analysis of survey data in the U.S. suggests that the lower extent of unionisation in 'right to work' States is largely a reflection of tastes against union representation, rather than a real effect of the 'right to work' laws through the free rider mechanism.

The process of wage determination

Wage determination in the U.S. varies according to whether the workplace is unionised or non-unionised. Wages in the unionised sector are determined by a system of collective bargaining.[19] A typical collective agreement runs for three years and contains a no-strike provision for the term of the contract. Accordingly, the agreement usually incorporates grievance procedures which could ultimately involve binding arbitration by agreed private sector agencies (Edwards and Podgursky 1986). U.S. companies are increasingly turning to a Japanese-type system of profit sharing and performance-based bonuses for workers. This change introduces a cyclical element to employers' labour costs and provides a direct incentive for workers to increase their productivity (Business International Corporation 1988 p. 25).

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18 There is no free ride according to Cregan and Johnston (1990). If wage rises accrue to everyone regardless of union status, members pay in the conventional way, whereas non-members pay by a resistance to pressures from union members at the workplace.

19 Collective bargaining generally involves a broader range of issues than simply wages. Other issues usually included are holiday pay, health insurance, pensions, seniority rules, and rules governing layoff and the allocation of overtime.

Although still highly decentralised by Australian and N.Z. standards, for many years a system of 'pattern bargaining' has existed whereby key settlements in certain companies influenced all other collective bargaining outcomes via traditional relativities. In more recent years, however, this pattern has tended to diminish in favour of more decentralised outcomes.

As outlined earlier, most work places in the U.S. are not unionised. Wage determination in the non-unionised sector reflects basic supply and demand factors in the labour and product markets. This does not mean that wage outcomes in the two sectors are independent of each other, because labour in the U.S. is traditionally highly mobile. Thus, if employers in the non-unionised sector wished to attract or retain workers in reasonably tight labour markets, they would have to offer wages and conditions that bore an appropriate relationship to those in the unionised sector. Indeed, it has been suggested that some employers in the non-unionised sector offer wages and conditions of employment at least equal to the unionised sector as a means of persuading their employees not to opt for unionisation (Farber 1990).

Nevertheless, there seem to be some substantial differences between wages for employees of manufacturers located in States where employees are generally unionised and those located in the 'right to work' States. For example, wages for production workers in Michigan, a predominantly unionised State, are around twice those for workers with comparable skills and experience in non-unionised Nevada, although skilled workers are remunerated similarly in both States.

3.3 Industrial relations at the plant level

The relationship between management and employees has considerable potential to affect productivity and therefore unit costs of production. It is not possible to determine exactly the impact of management-employee relations on these measures. Nevertheless, there is considerable qualitative evidence that the productivity performances of the plants assessed in this study are affected significantly by the differing industrial relations patterns described in this section and in Chapter 4.

3.3.1 The U.S. plant

The main feature of the industrial relations system at the U.S. plant is the presence of collective bargaining. A formal Agreement between management and the union is drawn up at intervals of three to five years. The Agreement is binding upon both parties during that period. During the duration of the Agreement, the right to strike exists over standards (e.g. work rates such as outputs per unit time) and rates of pay for new jobs, but only after all grievance procedures have been exhausted and the International Union has sanctioned the stoppage. If the parties have not reached an agreement on the terms of the new document by the expiration date of the

Agreement, the Union may strike. If this occurs, management may hire replacement workers to the extent permitted by Federal law.

The most recent Agreement commenced operation on 12 March 1990 and is to remain in force until 25 August 1995. Under this Agreement, a $US1000 annual bonus introduced in 1986 is maintained, and hourly rates of pay for production workers are increased by $US0.25 per hour in March 1990, August 1992 and August 1994. Employees covered by skilled trades classifications receive an additional $US0.25 per hour increase on the same dates. It would seem that the latter increase is intended to redress slightly a compression of wage rates that occurred during the 1980s (Chapter 4).

The U.S. plant is a 'union shop'. That is, a new employee must join the union upon taking up employment.[20] Almost all shop floor employees belonged to a single union, the United Automobile, Aerospace and Agricultural Implement Workers' Union of America (UAW) (Figure 3.1). The only other union on site, the Teamsters' Union, covered a small number of drivers employed by the company. Demarcation problems between the two unions appeared to be rare, possibly because the jurisdiction of the UAW is set out in detail in its Agreement with the company.

Compared to Australian unions, the on-site branch of the UAW (Local 1002 or simply the 'Local') is relatively autonomous. The Local has its own building and day-to-day union matters are virtually the exclusive preserve of union officials elected by the plant's union members. Even negotiation of the collective Agreement is undertaken largely by Local 1002 officials. The main role of the head office of the UAW in Michigan is to provide legal and other back-up as required.

On the management side, industrial relations at the U.S. plant are directed by an industrial relations manager, who is aided by the plant's personnel manager. Both these staff have university degrees in Labour and Industrial Relations.

Grievances and workers' complaints at the U.S. plant are settled by a formal grievance procedure laid down in detail in Article Eight of the Agreement. If an employee grievance is not satisfactorily redressed by the foreman or union steward, the grievance is written up in a standard format. The relevant foreman is obliged to reply in writing to the grievance within two working days. Should this reply not be acceptable to the employee, the grievance is taken up at one of the regular meetings between the plant's union committee and management. Finally, if the grievance is still not resolved, it is submitted to an independent Arbitrator selected by the parties. The parties may select the Arbitrator from a panel provided by the Federal

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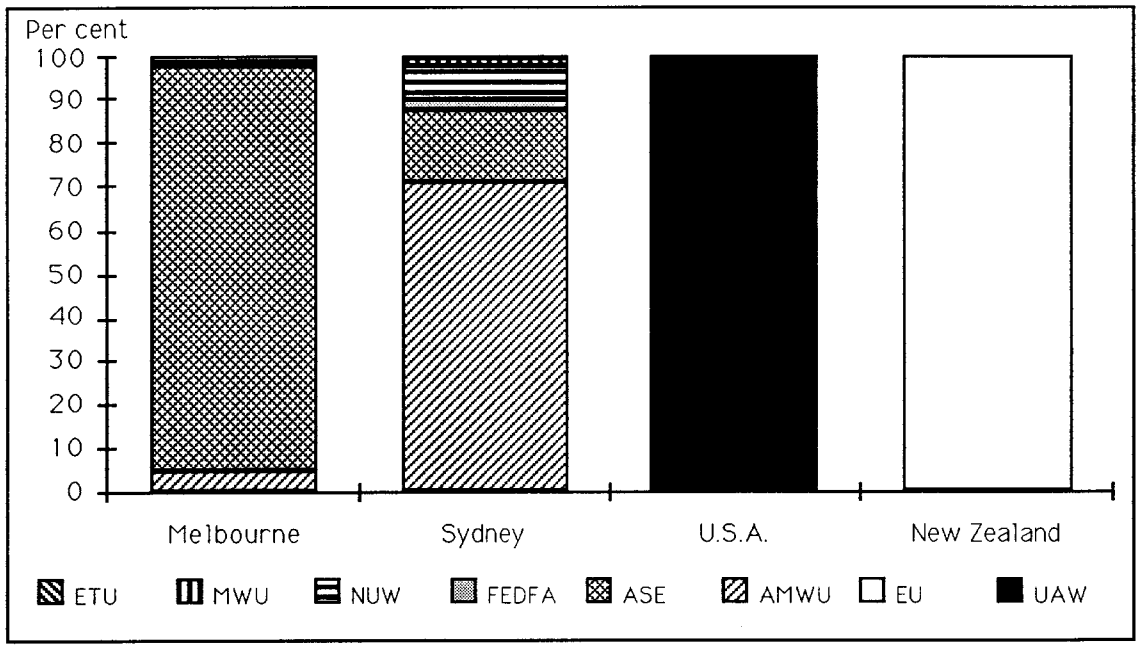
20 In the State of Michigan, the general position is that employees must pay union fees even if they choose not to join a union. However, many collective bargaining agreements specify that employees must join the union after being hired.

Figure 3.1 Union coverage in water heater manufacturing



Source : BIE calculations based on data provided by the plants.

Note : ETU is the Electrical Trades Union, MWU is the Miscellaneous Workers' Union, NUW is the National Union of Workers, FEDFA is the Federated Engine Drivers' and Firemen's Association, ASE is the Australasian Society of Engineers, AMWU is the Amalgamated Metal Workers' Union, EU is the N.Z. Engineers' Union, and UAW is the United Automobile, Aerospace and Agricultural Implement Workers' Union of America.

Mediation and Conciliation Service. The Arbitrator's decision is final and binding upon both the union and the company.

Although the number of grievances lodged by workers has declined over recent years, both management and the union at the U.S. plant expressed some dissatisfaction to the BIE inspection team with the time taken to settle grievances and with the large number of grievances outstanding. As a result of this dissatisfaction, the union's local committee and the plant's management agreed to an additional meeting before the arbitration step. A UAW International Representative, who assists the local committee in these matters, also attended and a large backlog of outstanding grievances was settled. Nevertheless, the number of grievances remains an on-going problem at the U.S. plant. The grievances can involve considerable

opportunity costs, in terms of workers and management being diverted from their usual tasks, with an associated adverse impact on productivity.

However, the U.S. plant is an example of a company where changes in attitudes on the part of management and workers have been instrumental in improving company profitability and employees' satisfaction with work. Before 1978, absenteeism was rife, worker morale was low, and productivity, market share and profitability were poor. In 1978 the company commissioned a consultant to investigate the problems. The consultant's survey of employees resulted in the identification of specific grievances and eventually led to the setting up of a committee of workers, union representatives and management which formulated a plan to improve communication between the employer and employees.

Substantial changes followed: a new air-conditioned cafeteria was built, the parking lot was paved, a bi-monthly company newsletter was introduced, and the practice of laying off employees during downturns in demand was discontinued. More fundamentally, the industrial relations climate at the plant changed following the report. Management adopted more of an 'open door' approach to contact with the union, and set up a formal arrangement to meet union officials periodically.

The attitude changes have not been confined to management. There is a recognition by workers and their union representatives that employment and the possibility of real wage increases are intimately connected with productivity growth and the company's profitability. There is also an awareness that the environment in which the plant operates has become even more competitive, due to water heater production in 'right to work' States and in Mexico (Section 2.2.2). This strategic view held by employees and their union officials is perhaps the single most important factor that differentiates the state of industrial relations at the the U.S. plant from that at the Sydney plant.

Some of the direct effects of the industrial relations changes from 1978 to 1985 at the U.S. plant include:

- a 40 per cent increase in productivity;
- a decline in absenteeism from 7 to about 2 per cent; and
- a 67 per cent decrease in the number of grievances.

The benefits of these improvements have been shared between shareholders, workers and consumers. Company profitability has improved and, as indicated above, workers received wage increases in the latest negotiated agreement.

3.3.2 The Melbourne plant

Labour relations in Australia are characterised by two main features (Section 3.2.2). First, unions are organised along occupational rather than enterprise lines. Secondly, there is a high degree of centralisation in the determination of wages and conditions. The Melbourne plant is no exception to this characterisation, and so employees and union delegates tend to see themselves as part of a larger national organisation. This situation is in sharp contrast to the more autonomous union structure at the U.S. plant, and also differs somewhat from the position at the Sydney plant.

Nevertheless, at least one union at the Melbourne plant at times has displayed considerable independence of action. On several occasions when stop-work meetings have been called by the union's central organisation, on-site members have met and voted to remain at work. The formal arrangement is for union stewards to attend the meeting (on full pay) and to report back subsequently to their members. Should the union meeting decide, however, that strike action is appropriate, all on-site members have to comply whether or not this is the view of members at the water heater plant.

The union with the greatest number of members at the Melbourne plant is the Australasian Society of Engineers (ASE) (Figure 3.1). The other unions involved are the AMWU and the National Union of Workers (NUW). Inter-union relations exhibited a tension between co-operation on the one hand and rivalry on the other. This tension appeared to be most notable between the ASE and the AMWU, which compete for coverage of maintenance and production workers.

The number of unions with members at the Melbourne plant is likely to reduce in the next few years. Many stewards advised the BIE inspection team that they favoured a reduction in the number of unions, and there was an expectation that the ASE and NUW would cover all employees on the site if ACTU proposals for the restructuring of union coverage were implemented. However, this notion was opposed by the stewards of some of the unions with relatively few members at Vulcan's Melbourne complex, on the basis that such changes would substantially reduce the influence of their members.

Co-operation between unions at the Melbourne plant occurred mainly via informal contacts between shop stewards. This was also the initial mechanism by which any demarcation problems tended to be settled. More formally, all stewards met each month to discuss relevant issues before meeting with management. Most issues discussed at the meeting originated off site. In discussions with the BIE inspection team, stewards stated that most on-site matters, whether between unions or between unions and management, were settled amicably.

Industrial relations issues at the Melbourne plant are handled by the Manufacturing Manager (a senior executive position) with the assistance of the Personnel Manager. The Manufacturing Manager, in particular, seemed to enjoy the respect of employees and union stewards. He was described as 'firm but fair' by employees, consistent

with the company's 'open door' policy for shop stewards. Management at the plant accepts that unions have a legitimate role. In this context, it is relevant to note that some shop stewards have an informal role as counsellors and mentors for their members. This role benefits management too via the promotion of a more satisfied and productive workforce.

As at the U.S. plant, management at the Melbourne plant has a policy of avoiding layoffs when there is a slackening in demand. This is achieved by moving employees to another product area (for example, to the areas in which heaters or dishwashers are manufactured) and by increasing stocks of finished goods.

In recent years, important changes have flowed from an ergonomic consultant's report commissioned by the management of the Melbourne plant. The most important change from an industrial relations and productivity perspective has been the introduction of rotation within each work group or cell. The change was motivated largely by a desire to reduce the accident rate, and it has been successful in this regard. It has also significantly reduced the boredom that can be associated with repetitive work and appears to have increased the job satisfaction of workers. Despite initial opposition, production employees now appear to welcome the chance to move to different tasks, and do so without prompting from supervisors.

Grievance or complaints procedures at the Melbourne plant are much more informal than at the U.S. plant. Depending on the individual workers' inclinations, a grievance is initially taken up with either the worker's leading hand or the relevant shop steward. Comments by production workers indicated that most approach their leading hand as a first step. If not satisfied with the leading hand's response, the grievance can then be pursued with more senior personnel, up to the level of Manufacturing Manager. The shop steward normally draws a grievance brought to her (or him) to the attention of either the leading hand or foreman.

A distinctive feature of the Melbourne plant's workforce is the substantial number of workers who are of South-East Asian origin. Relations between this group and other workers appeared to be free from friction. The lack of friction seems to reflect a recognition of the skills shown by many of the South-East Asian employees, of their commitment to the task, and management's practice of having South-East Asian employees work side by side with employees of European descent. Amongst other advantages, this practice assists in overcoming any difficulties that the South-East Asian workers might have with the English language. In addition, the company has organised tuition in English during work hours for those workers who are considered likely to benefit (Section 4.4.2).

3.3.3 The N.Z plant

Industrial relations at the N.Z. plant, located in Auckland, closely resembled those at the Melbourne plant. Wages and conditions were largely determined by an award

registered with the N.Z. Arbitration Commission. This award was negotiated by the Engineers' Union and the Auckland Employers' Association, which is a division of the N.Z. Employers' Federation. The N.Z. company was just one of many employers which were party to the award, and in practice it paid wages that were considerably above the levels stipulated in the award.[21]

The Engineers' Union covered non-managerial employees at the plant, and all such employees were required to join the union. An unusual feature of the N.Z. plant was the system of 'hourly foremen', who were non-managerial employees. They worked on the shopfloor, were members of the union, attended union meetings, and conveyed the decisions of those meetings to management.

Of the plants considered in this study, the N.Z. plant had the best record in terms of industrial disputes. Over its life of twenty years, the plant has had just one dispute, which was a wildcat strike called by boilermakers some years ago. Thus, it was not surprising to find that the Engineers' Union was considered by management and workers to be moderate and progressive. Many workers expressed the view that they would join the union even if this were voluntary, partly because of the assistance that they received from stewards at the plant in dealing with management. Some members, however, considered that the monopoly power of the union had led to its hierarchy outside the plant giving them poor service, with little advice or feedback.

As at the Melbourne plant, industrial relations at the N.Z. plant were relatively harmonious. Demarcation disputes did not occur because of the site's coverage by a single union. Moreover, there was considerable labour flexibility, in contrast to the situation at the Sydney plant (Section 3.3.4). For example, during a period of low demand for LPG gas cylinders, management was able to move workers at the N.Z. complex from water heater to drum manufacture.

A feature of the N.Z. plant was the high proportion of Polynesian employees. Management noted that many of these employees were not used to working in an industrial environment and that their safety consciousness was not always high.

3.3.4 The Sydney plant

Although the Sydney plant had essentially the same award structure as the Melbourne plant, the industrial relations outcome has been very different. Management-union relationships at the Sydney plant were characterised by much greater mistrust, suspicion and antagonism than those at the other plants. Moreover, negative work practices were endemic at the plant during 1989-90.

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21 The over award wages paid at the N.Z. plant could be changed by the firm at any time, as collective agreements were not permitted under the 1987 Labour Relations Act (Section 3.2.3).

Such practices are detailed in Chapters 4 and 5. However, the following examples illustrate the attitudes that prevailed in late 1990 at the time of the visit to the Sydney plant by the BIE inspection team.

- The 'us and them' attitude at the plant was shown by the worker-imposed restriction that managerial employees and visitors to the plant not enter the toilets provided near production areas and used by those workers, or industrial action would follow.

- The degree of suspicion which characterised management-employee relations was shown by a union steward who described as 'bribery' the provision by management (in an effort to promote better relations) of free tickets for workers to attend rugby league and soccer games. The tickets were available as part of a minor sponsorship and management took the option to involve employees at all levels, rather than just executives.

There are five major unions on site at the Sydney plant. The number of unions is considerably larger than the Australia-wide average of one for all manufacturing plants, and two for unionised manufacturing plants. It is, however, one fewer than with the average number of unions for workplaces employing more than 500 persons (on an all-industries basis) (Callus *et al.* 1991 p. 246).

The major unions with coverage at the Sydney plant are the AMWU and the ASE, which cover maintenance and production employees, the ETU, NUW and the FEDFA (Figure 3.1). The AMWU is the largest union in terms of numbers, followed by the ASE. Relations between the unions exhibited a tension between the need to co-operate on the one hand, and rivalry on the other. Rivalry between the ASE and the AMWU stemmed from their coverage of the same occupations, and the transfer to the ASE of some AMWU members following a period of industrial disruption associated with the latter union during 1989-90.

On the management side, industrial relations at the plant are handled by an Industrial Relations Manager, who advises and reports to the Operations Manager. The company considers that it has an 'open door' policy to shop stewards.

A significant aspect of the industrial relations climate at the Sydney plant is the range and number of on-site agreements. In many cases, their origins date back several decades when a range of different plants was located on the site. For example, in 1973 there were eight separate and distinct business units on the site, reporting through a hierarchy to three separate General Managers. There were also multiple unions on the site. At that stage, the site was the largest within Rheem and the company's profit performance was dependent on continued functioning of the total site. Management were also very conscious of their perceived responsibility to provide good service to customers, because of the company's relatively high market shares in many products. Thus, management was willing to make concessions on

wages and conditions in an attempt to gain industrial peace, and to prevent disruptions in one business unit spreading to another.

In essence, this behaviour reflected the high cost of plant stoppages in the short term, the relatively small effect on unit costs of each concession, and the perceived ability to recoup any increased unit costs due to concessions via higher prices. The lack of competition from imports and the deterrence to entry provided by large fixed costs seem to have been associated with this pricing behaviour.

Many of the plant's work practices during the 1989-90 period to which our data apply, and much of its labour inflexibility, seem to stem from these on-site agreements. Indeed, one manager at the plant estimated that a 20 per cent increase in productivity could result from reducing the number of unions and demarcations, from eliminating restrictive practices, and from increased flexibility for management to improve productivity via better organisation of work.

The negotiation of the on-site agreements illustrates another facet of industrial relations at the Sydney plant. Stewards of the major unions at the plant (the AMWU and the ASE) appeared to have a relatively high degree of autonomy - these on-site stewards generally undertook negotiations with management.[22] Moreover, the stewards were prepared to disregard the wishes of their State offices if they considered that the circumstances warranted such action. An apparent exception was the NUW, whose on-site representatives gave the impression that they were not prepared to participate in this study without the approval of their State office. Such approval did not seem to eventuate, despite discussions with a senior ACTU officer.

3.4 Concluding comments

The industrial relations systems of Australia and N.Z. have been similar for much of the twentieth century, with wages and conditions established and disputes settled via a centralised, semi-judicial framework. This framework has been questioned recently, and there have been moves on both sides of the Tasman towards a less centralised industrial relations system with a greater enterprise focus. These changes have been more extensive in N.Z. than in Australia. N.Z. has moved to a system of enterprise agreements that involves civil law employment contracts, with a greater role for management and employees. Widened scope in Australia for enterprise productivity bargaining was introduced within the existing wage-fixing process in October 1991.

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22 Sloan and Wooden (1990) consider that the highly centralised nature of bargaining in Australia means that shopfloor union representatives have little power and influence within the union, even though the main contact for employees with their union is at the shopfloor.

A largely decentralised industrial relations system has evolved in the U.S., with the government and judiciary playing a relatively minor role. Collective bargaining is the means by which disputes are resolved and wages and working conditions are set in unionised plants. However, the majority of the U.S. workforce and most enterprises are not unionised. In these enterprises, wages and conditions are determined by the state of local labour markets, and the attitudes of firms towards investment in human capital.

Industrial relations at the water heater plants reflected their particular national contexts. Thus, the U.S. plant was characterised by collective bargaining whereas the Australian and N.Z. plants were linked via industry awards to centralised quasi-judicial frameworks.

The industrial relations outcomes at the Australian and N.Z. plants varied considerably during 1989-90, despite their similar industrial relations frameworks. In particular, the relatively harmonious employee-management relations at the N.Z. and Melbourne plants, and the relative absence of negative work practices, bore a closer resemblance to the U.S. plant than to the Sydney plant. Industrial relations at the latter plant were notable for their degree of employee antagonism to the plant's management, the strength of the shop stewards on site, and the extent of restrictive work practices at the plant.

These differences at the plants emphasise the importance of competition in the marketplace, or potential competition (for example, from Australian imports) in the case of the N.Z. plant. Such competition would constrain the extent to which firms and unions could enter work practice/remuneration arrangements similar to those prevailing at the Sydney plant during 1989-90, at the expense of consumers. As demonstrated by the differing outcomes at the Melbourne and Sydney plants, and the improved outcomes at the U.S. plant during the 1980s, relationships between employers and employees and attitudes to work and its organisation are critical to the process of achieving better performance in the workplace.

Chapter 4

Work practices, training and education

4.1 Introduction

The objective of this chapter is to examine more closely some of the industrial relations and labour force differences at the water heater plants. To this end, the plants are assessed in terms of a range of work practices, training and education indicators. These indicators have been identified as important influences on productivity, following visits to the water heater plants, discussions with plant employees, unions and management, and an analysis of data provided by each plant.

4.2 Work practices

Several aspects of work practices at the plants are examined in this section. They include qualitative labour flexibility, such as constraints on the allocation by management of employees to different tasks and the extent of job rotation, and quantitative labour flexibility, such as the employment of temporary workers and the use of overtime. Maintenance issues and the extent of industrial disputation at the plants are discussed also.

4.2.1 Labour flexibility

Constraints on the allocation by management of employees to different tasks are likely to lower productivity and result in higher unit costs. Each of the water heater plants considered here had such constraints, although not necessarily to the same degree. Examples of constraints on the allocation of labour included restrictions on the duties foremen could undertake, and on the re-allocation of under-utilised labour from one section of a plant to another. Union demarcations, fixed ratios of employees, and union restrictions on the types of work permitted to be done by particular grades of employees (such as foremen and other management personnel) were factors underlying constraints at most of the plants.

Constraints on labour flexibility at the U.S. plant included its seniority-based promotion system, restrictions on the production tasks that foremen and

maintenance personnel might undertake, and an apparent restriction on management tailoring the remuneration of some non-managerial employees to conditions in the labour market (Section 4.3.1). The latter restriction could result in the loss of skilled and productive employees to higher paying firms, in cases where the Agreement between the company and union set a pay rate which was below that prevailing outside the firm.

Promotion at the U.S. plant was governed by seniority rather than merit. There are advantages and disadvantages associated with promotion on the basis of seniority compared to promotion on merit. The use of a seniority criterion helps to eliminate managerial discrimination and favouritism, and the perception that promotions have been gained via favouritism (Macdonald 1989). This approach can reduce rivalrous behaviour between employees, with benefits to the firm in terms of higher morale and productivity, and can facilitate the transfer of training from more senior to less experienced employees, as the former need not fear that they could be creating a rival for promotion.

However, promotion on the basis of seniority could lessen the overall incentive to perform, as individuals' efforts would not be a factor in selection for promotion, and this approach could lead to the advancement of senior employees who were less qualified and able than their more junior colleagues. Indeed, there is a range of evidence that increased experience does not necessarily mean increased performance, and can be associated with reduced performance (Medoff and Abraham 1980, 1981; Abraham and Medoff 1985, Mills 1985). Macdonald (1989) points out that by curbing competition between employees for promotion, seniority provisions can support union bargaining power. Such provisions can also perpetuate inequalities of opportunity associated with gender, ethnic origin and socio-economic background.

Under the terms of the Agreement at the U.S. plant between the company and union, foremen and maintenance workers were not to work on the production line and production workers and foremen were not to undertake maintenance tasks. These restrictions were generally adhered to. However, there was a wide range of minor maintenance tasks that production workers undertook as part of their duties: they changed wire feed gears and the tops of auto-welders, put ends on air hoses, pushed reset buttons and performed some lubrication.

The U.S. plant at one time had 'lead men'. These workers were broadly equivalent to the leading hand positions in the Australian and N.Z. plants. They were able to undertake production work and some supervisory and co-ordination functions. The 'lead men' positions were eliminated due to a perceived inconsistency between their non-managerial status and roles as both work supervisors and plant operators.

Overall, labour flexibility at the Melbourne plant seemed equal to if not ahead of that at the U.S. plant. Although flexibility was circumscribed by restrictions on the maintenance work that production employees and foremen might perform, the plant

manager had successfully approached maintenance employees to have some tasks transferred from them to production workers. For example, maintenance workers agreed to the setting up of a new dome welder by production workers. These approaches had not always been successful, however. Management in the plant's paint shop sought to have production workers remove the indexes (hooks used on the paint line) and replace them after cleaning. However, this transfer of responsibility was opposed by the plant's fitters, who would have lost a relatively easy job usually performed on Saturday overtime.

Some maintenance was performed by production workers, such as changing the tips on spot welders. However, informal attempts by production workers to undertake minor maintenance, such as fixing air guns, were not always successful. In the case of air guns, some parts were lost, to the chagrin of the fitters called to rectify the 'maintenance' undertaken by production workers. Nevertheless, several personnel commented that productivity could be improved substantially by the transfer of tasks from maintenance to the production area, with appropriate production workers receiving the necessary training. This issue is discussed further in the context of award restructuring (Section 4.3.3).

In general, there was considerable flexibility at the Melbourne plant to move production workers between the water heater plant and plants producing other goods on the site. There were few restrictions also on moving workers between sections on the water heater production line, although some workers had refused to rotate jobs in this way. As was the case at the other plants except for N.Z., management was not in a position to tailor individual pay scales to individual work performance.

All the constraints found at the U.S. and Melbourne plants applied at the Sydney plant, and were more strictly adhered to. This adherence reflected implicit or explicit threats of industrial action if there were non-compliance. In addition, there were constraints on moving production workers to the water heater plant from other production areas, because of on-site agreements (Section 3.3.4).

Absent workers at the Sydney plant could be replaced in the short term with more or less skilled employees, depending on the circumstances. The standard practice was for an absent first class operator to be replaced with a second class operator, who would receive additional training from the leading hand and would be remunerated at the appropriate higher level. If the line were missing a process worker, that worker could be temporarily replaced by a higher level first or second class operator.

Area seniority (one's seniority within a particular production area) was used at the Sydney and U.S. plants as the basis for promotion. This method was not favoured by some workers, because it created a disincentive to learning additional skills by moving to different areas of production. In general, however, workers were reluctant to change the area seniority system.

A high degree of labour flexibility prevailed at the N.Z. plant. Workers could be switched from one line to another to meet production schedules, and foremen could work on the production line when necessary. A demarcation between production and maintenance work existed, and was generally adhered to. The high degree of labour flexibility at the N.Z. plant partly offset the cost penalties associated with its small production scale (Chapter 5).

4.2.2 Job rotation

Job rotation was not practised on an official basis at the U.S. plant, except for a 'labour bank' to cover absenteeism and similar contingencies. Nevertheless, some employees traded jobs informally, a practice which seemed to meet with tacit approval from the company. The UAW Local appeared to raise no objections to this practice. The trading of jobs was limited to employees within the same skill classification who worked in the same area of production.

In contrast, rotation of tasks on the assembly line was the norm at the Vulcan plant in Melbourne. A similar situation prevailed at the N.Z. plant, where most workers in both the cylinder and assembly sections rotated their tasks daily so that they undertook a variety of work.

Except for the press shop and some heavy jobs in cylinder manufacture, rotation of workers between different tasks was not common practice at the Sydney plant. New employees were rotated over a two-week trial period between around five different tasks, but one task per employee was the norm once an employee became permanent.

Some Sydney workers interviewed by the BIE inspection team were in favour of job rotation, but the majority of employees either were unwilling or lacked sufficient confidence to undergo the extra training that would be required for them to rotate between different positions. Leading hands favoured job rotation for quality reasons, but acknowledged that this would require a changed attitude on the part of production workers.

4.2.3 Temporary employees

There were very few temporary workers at the Australian plants. This outcome could reflect the view that unions should ensure that employees have a right to a permanent job. Further, the provision of on-the-job training to temporaries is quite costly to the firm, given award provisions as to their wages and that some time can be expected to elapse before the quality and quantity of their work effort, even with training, would match that of permanent employees. As a result, fluctuations in demand were usually met by employing permanent employees on overtime rather than hiring temporary workers. Some temporary employees (usually students on

vacation who had relatives in the company) were recruited at the U.S. plant during early summer to provide coverage during the holiday period.

4.2.4 Overtime

Overtime was used at each plant to achieve additional output, or to meet shortfalls in normal production schedules that arose as a result of capacity constraints, machine breakdowns or absenteeism. Most plants asked for volunteers to work overtime, but a roster system was often used when frequent amounts of overtime were being worked. This was particularly the case at the U.S. plant, where compulsory overtime was posted if too few employees volunteered. One or two full Saturday shifts were worked per month at the U.S. plant during 1989, with some two hourly overtime periods being scheduled on weekdays. If too many workers volunteered, the available overtime was allocated on a seniority basis, following procedures laid down in the Agreement. As in Australia, overtime was paid at penalty rates.

At the N.Z. plant, a three-hour overtime period was being worked three times a week during 1989-90. The level of overtime has decreased since then due to a slowdown in sales.

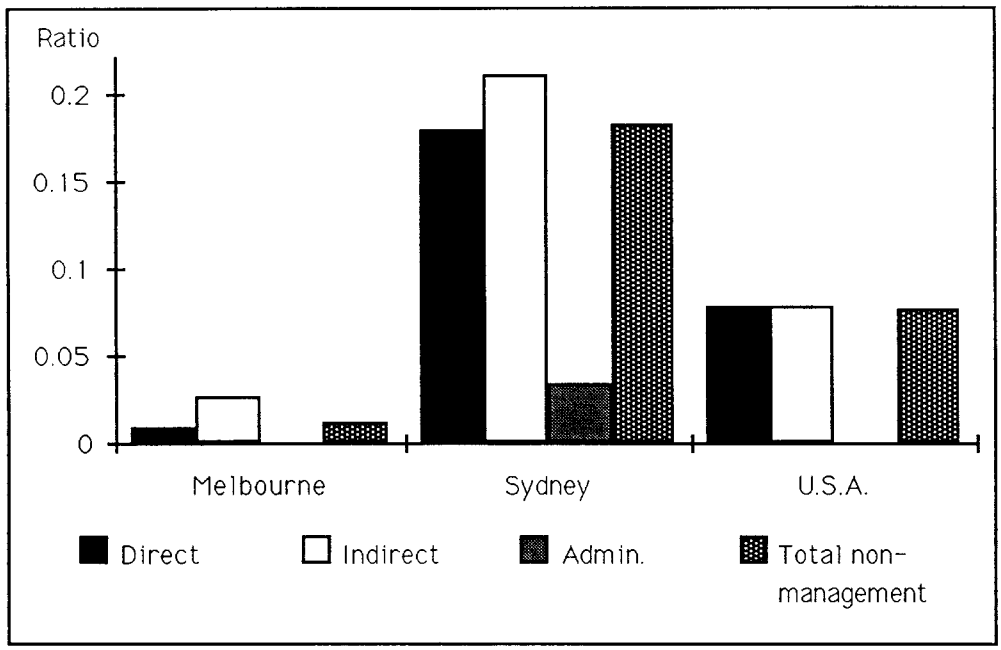
Overtime on weekends in the Australian plants was restricted to Saturday mornings, as the penalty rates during the remainder of the weekend were considered to be prohibitive. The little overtime that was worked at the Melbourne plant during 1989-90 was determined in some areas of production by whether there had been any breakdowns, and in other areas by inherent capacity limitations. An example of the latter was the tank fabrication area, where equipment was run on some Saturday mornings if output on a three-shift basis during the normal five-day week was insufficient to meet demand.

As Figure 4.1 shows, overtime at the Sydney plant as a proportion of total hours worked far exceeded the proportions at the other plants. Three nights of overtime per week (at four hours per night) were the norm during 1989-90, but the level of overtime has reduced significantly since then as demand dropped with the slowdown in the Australian economy.

4.2.5 Maintenance

Major maintenance at all plants was carried out by specialist maintenance employees. However, minor maintenance (such as lubrication or machine adjustments) was sometimes undertaken by the machine operators. The degree to which this practice was adopted and the extent to which it was tacitly sanctioned by maintenance employees or management varied from plant to plant. For example, demarcations between maintenance and production workers were generally

Figure 4.1 Ratio of overtime to total hours worked per year in water heater manufacturing, by labour category



Source : BIE calculations based on data provided by the plants.

Note : Data were unavailable for the N.Z. plant. The data for the U.S. plant pertain to the calendar year 1989. Those for the other plants pertain to the financial year 1989-90.

observed at the Sydney plant, whereas a more flexible approach to the performance of maintenance was adopted at the N.Z. plant. There was often a reluctance amongst some production workers at the plants towards undertaking minor maintenance. These workers viewed themselves as having fixed roles, and considered that the performance of additional tasks should be rewarded with higher pay.

The maintenance section at the U.S. plant operated on either two or three shifts per day, depending on the particular area. Maintenance employees were also required to work the two seven-day plant shutdowns, when non-managerial employees took their annual leave. A computer program was used to generate a weekly list of items for preventative maintenance, which was usually performed during the third shift. The use of outside maintenance contractors was not common at the U.S. plant due to clauses in the collective Agreement that favour the plant's maintenance employees.

Comments by many employees at the U.S. plant indicated that there were problems in the maintenance section. One interviewee suggested that these problems were of sufficient magnitude to be reducing the efficiency of the plant. Specific issues raised included demarcations between electricians and mechanics, and between production and maintenance employees, and complaints that: preventative maintenance schedules were not always followed; there were inadequate inventories of spare parts; undue delays were experienced in having preventative maintenance carried out; and that many maintenance workers were unwilling to work normal Saturday overtime. Moreover, it was suggested that relations between maintenance and production employees had deteriorated, with the latter feeling that maintenance personnel were not doing their job, while maintenance personnel felt that they were not receiving the opportunity to do their job and that the maintenance section was undermanned.

However, the major problem with the maintenance area at the U.S. plant relates to the skills and training of its employees. Information supplied by the plant indicates that the remuneration of the plant's tradesmen was well below that offered elsewhere in the State of Michigan. As a consequence, the company had difficulty in attracting skilled and experienced tradesmen and relied to a large extent on 'upgraders'. Upgraders are generally former production workers who have received substantial on-the-job training.

Several observers suggested that the skills of the upgraders were overly job specific. It was made clear that upgraders tended to lack the general training that would enable them to deal with problems outside their immediate experience, although the recent inclusion of some formal training in the upgrading program could ameliorate this situation. It was also suggested that many upgraders were not interested in undertaking additional formal training, such as that offered by technical institutions. Maintenance personnel, in turn, commented that their immediate supervisors (who tended to have a background in production rather than maintenance) did not know their job adequately, did not share work-related information, did not follow up their suggestions and did not encourage further training.

Most preventative maintenance at the Australian plants was carried out on Saturdays, with occasional overtime on a Sunday. The Maintenance Manager at the Melbourne plant was seeking to instil a preventative maintenance philosophy based on the condition of equipment, rather than the time between servicing. Pre-loading (i.e. deliberately increasing output on a machine scheduled for overhaul) was practised in order to minimise the disruption to production from maintenance work. Any significant restructuring of the plant's layout to improve performance and material handling was performed by maintenance staff, mainly during the Christmas holiday break.

Production workers and storemen at the Melbourne plant may unofficially undertake small maintenance jobs, such as lubrication, without arousing undue demarcation sensitivities. However, one source of friction was the demarcation

between electricians and fitters, with electricians adopting the view that fitters did not possess the requisite skills to carry out even incidental electrical tasks safely.

A relatively high proportion of maintenance tasks at the Melbourne plant were performed by contract employees. Management stated that there were three principal reasons for this policy. The first related to load sharing. The company has found that it is more economical to employ only the number of maintenance employees required to cover some two-thirds of peak maintenance requirements, with contract labour being employed to cover peak demands. The second reason was that contractors were believed to be better tradesmen in some instances, given the difficulties under the Metal Trades Award in rewarding only better performing employees at the plant. Thirdly, contractors seemed more willing to undertake emergency breakdown repairs at weekends or late at night.

There were relatively few critical comments from either production or maintenance employees regarding maintenance at the Melbourne plant. However, one observer noted that there tended to be relatively little analysis of the underlying causes of breakdowns. Hence, there was a tendency to patch-up rather than, as the observer put it, 'fix past the fix'. There was also some criticism of the stores system and of the existing centralised maintenance system. Under the latter system, no tradesmen were specifically designated to water heater production in 1989-90. Since then, some maintenance employees have been devolved to the various plants at Vulcan's Melbourne complex.

There was no time-based preventative maintenance program at the N.Z. plant, on the basis that a part-time fitter lubricated the machinery and advised management if there were problems such as worn bearings. The time of the other fitters was equally divided between maintenance and fabrication of plant and equipment. Some friction has occurred between fitters and electricians in the past at the N.Z. plant, but the plant's current contract electrician and its employed fitters worked together relatively harmoniously. It was noted that the presence of only one electrician on site had caused delays in some cases, and that on occasions there had been a shortage of fitters to cover breakdowns.

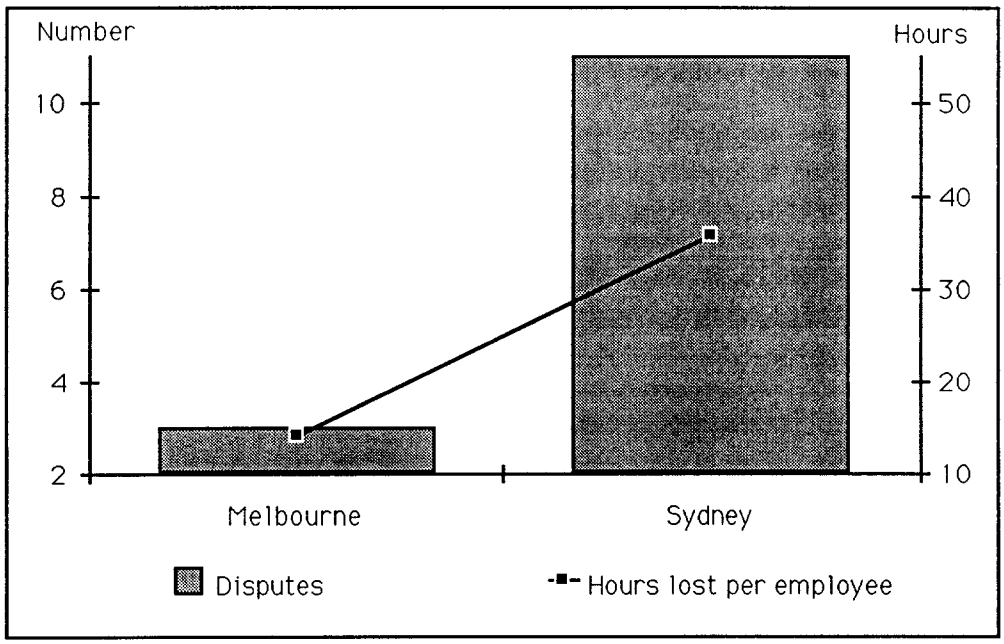
Preventative maintenance at the Sydney plant was carried out by fitters and electricians using a job card check system, according to a schedule drawn up by the Production Manager. A number of both management and maintenance employees suggested, however, that little or no preventative maintenance was being performed in practice. It was stated that fitters were largely responsible for preventative maintenance, but that they did not perform their tasks in ordinary time because they preferred to perform breakdown maintenance on overtime. A range of employees advised the BIE inspection team that demarcation problems and attitudes of 'not my job' and 'not my machine' were prevalent amongst maintenance personnel. It was argued that one result of the unsatisfactory level of **preventative** maintenance was an extremely high level of **breakdown** maintenance and lost production time (Section 5.5.1).

The view that preventative maintenance at the Sydney plant was far from satisfactory was by no means unanimous, however. Some personnel stated that maintenance at the plant had improved in recent times and, as a result, there had been a 50 per cent reduction in the size of work in progress. Nevertheless, one manager argued strongly that it was important to have the less complex preventative maintenance carried out by production workers. He considered that not only would this result in cost savings, but it also would engender a feeling of 'ownership' of the machine by its operators and would encourage a greater sense of responsibility for their work area.

4.2.6 Industrial disputes

Figure 4.2 shows the number of disputes and total hours lost per employee through industrial disputes at the Sydney and Melbourne plants during 1989-90. It should be noted that:

Figure 4.2 Number of industrial disputes and hours lost per employee



Source : BIE calculations based on data provided by the plants.

Note : There were no industrial disputes during 1989-90 at the U.S. or N.Z. plants.

- there were no disputes at either the U.S. or the N.Z. plant during the survey period; and that

- information provided indicates that the pattern of industrial disputes during 1989-90 was typical of the average pattern over the last few years.

The relatively high number of hours lost per employee at the Sydney plant was due entirely to the greater number of disputes occurring during the year, which outweighed the shorter average duration of each dispute. Of the eleven disputes at the Sydney plant during the year, ten were minor (lasting less than one day), eight were settled by negotiation with management, and two required external processes for settlement.

Almost all industrial disputes at the Sydney plant were linked to on-site matters. Several workers commented on the trivial nature of many of these disputes. For example, it was claimed that in one instance workers on the afternoon shift stopped work on a hot day because the day shift workers had received favourable treatment in the form of cool drinks. Another example cited was a series of strikes that were aimed at having telephones installed near the production line. The genesis of this strike was the failure of a telephone message to reach a particular individual on one occasion, where the practice had been for telephone messages received at the front office to be delivered to the person concerned. Given the industrial relations climate at the Sydney plant (Section 3.3.4), the relatively high stoppage frequency seems to reflect union power and its exercise at the plant.

This outcome is consistent with the recent analysis by Drago and Wooden (1990) based on a survey of over 300 workplaces operated by companies that are members of the Business Council of Australia (BCA). In that sample, stoppages were more likely to occur where the firm has monopoly power, the workplace is large, there are a large number of unions, and where the union exercises a relatively strong influence on management.[1] Such factors loomed larger during 1989-90 at the Sydney plant than at the Melbourne plant.

There has only ever been one strike at the N.Z. plant. This lack of industrial disputation could reflect the presence of a single union on site, a union which was described by the plant's management as being 'moderate'. Some time ago, the plant's storemen were represented by the N.Z. Storemen and Packers' union. Because of demarcation and other conflicts with this union, the plant's management had trained and relocated production workers to the stores area. These staff receive the Storemen and Packers' award rates of pay, but have not sought to join that union.

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1 Other significant factors included the availability to non-managerial employees of profit-sharing schemes, domination by blue collar occupations, the prevalence of piece rates, and the co-existence of State and Federal award coverage (Drago and Wooden 1990). The first pair of factors applied to both Australian plants, whereas the second pair applied to neither plant.

4.3 Remuneration and conditions

Several aspects of remuneration and conditions at the plants are examined below. They include arrangements for incentive and over award pay, the availability of profit sharing, and the top to bottom range of pay scales. Progress on award restructuring is discussed also.

4.3.1 Labour remuneration

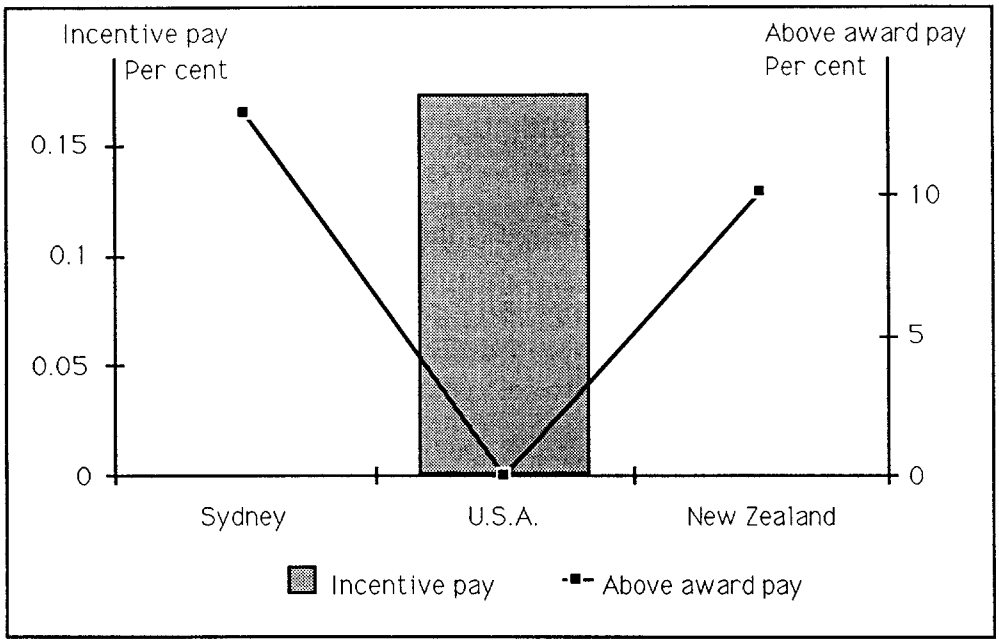
At the U.S. plant, the new collective Agreement adopted in 1990 maintained a $US1000 annual bonus introduced in 1986, and increased hourly rates of pay for production workers by $US0.25 per hour in March 1990, August 1992 and August 1994. Employees covered by skilled trades classifications receive an additional $US0.25 per hour increase on the same dates. The 1990 increase was the first pay increase for the plant's employees since 1986. Put another way, employees at the U.S. plant accepted considerable reductions in their real wages between 1986 and 1990, as the company sought to re-establish its financial viability.

Incentive payments were not generally made at the U.S. plant, and were looked upon by some employees as discouraging co-operation at the workplace. Others (particularly production workers) were in favour of an incentive scheme. Incentive pay at the plant was limited to a performance-related bonus for supervisors and superintendents. To receive the bonus, a supervisor had to attain 80 per cent of a performance standard. The standard was based on the number of employees and the level of output produced. Each additional percentage point over the 80 per cent threshold resulted in an additional bonus. The actual performance level on introduction of the bonus was only 60 per cent, but had reached 83 per cent by late 1990.

Operators at the Australian plants were paid according to their skill level, rather than the tasks performed at the time. Minimum pay rates were set by the Metal Trades Award, which was binding on the company. In addition, there was an over award pay component at both Australian plants, although data were unavailable for the Melbourne plant (Figure 4.3).

Enterprise agreements covered aspects of wages and conditions at both Australian plants. At the Melbourne plant, these related to on-site conditions and included special provisions pertaining to work breaks during the summer months, when high temperatures are aggravated by the heat generated by the furnace. These agreements were much more extensive at the Sydney plant (Section 3.3.4). They included redundancy agreements, which have led to the emergence of a proportion of the workforce who wish to be made redundant for the short term gain of a redundancy payment.

Figure 4.3 Ratios of incentive and above award pay to total pay



Source : BIE calculations based on data provided by the plants.

Note : Data were unavailable for the Melbourne plant. Data on the overall level of incentive pay were unavailable for the N.Z. plant. The above award pay ratio for the N.Z. plant was derived as the simple average of the ratios for each classification. The data for the U.S. plant pertain to the calendar year 1989.

A share ownership scheme operated at the Australian plants. Employees who have been with the company twelve months or longer may take up shares in SABH Ltd using an interest free loan provided for this purpose by the company. Other fringe benefits at the Australian plants included discounts on Rheem and Vulcan products, such as water heaters, electric radiators and dishwashers.

A range of managerial and production employees at the Melbourne plant considered that there would be an advantage in having an incentive scheme for quality work, but that such an incentive scheme would have to be formulated so as not to disrupt team harmony. It was noted that incentive-based payments could lead to a decline in quality and a run-down of capital, if short time horizons were adopted under such schemes. Some employees considered that an attendance bonus would be useful. Attendance bonuses were employed by the U.K. Kodak plant considered in the first microproductivity study (BIE 1990a p. 33).

Management at the Sydney plant advised that labour productivity improved by some 170 per cent over the five years to 1986, following substantial investment and the introduction of better work practices. However, the introduction of the two-tier wage process adopted by the Industrial Relations Commission (IRC) in 1987 had the paradoxical effect of aborting the process of workplace reform. The process reintroduced an attitude that reforms to work practices should be accompanied by increased wages, and it re-established previous restrictive work practices.

During 1989-90, Rheem attempted to introduce an incentive payment for a period of five months, based on achievement of volume, to be accumulated on a weekly basis. The payment would apply to all employees, including forklift drivers, maintenance workers, storemen and other indirect production workers. The package offered could have resulted in a $300 bonus payment at Christmas if output were maintained at the level necessary to meet market demand. The package was opposed by AMWU production workers, who held out for a pay rise irrespective of performance. As a result the scheme was dropped, although it was supported by non-AMWU workers. Despite this outcome, most production workers interviewed by the BIE inspection team favoured on-site negotiation over wages and conditions.

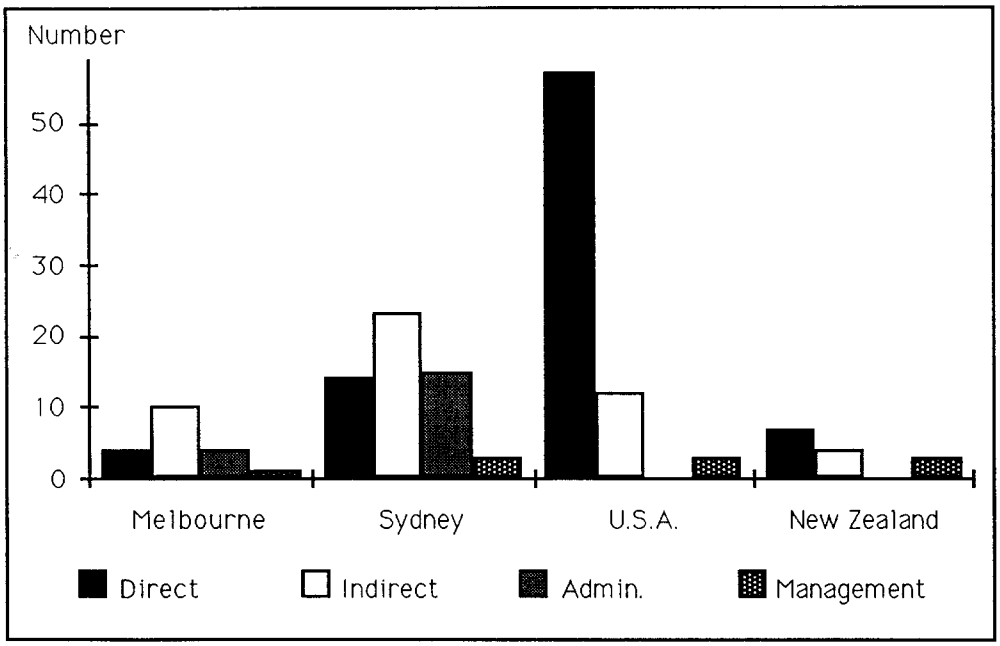
Base wage rates for employees at the N.Z. plant during 1990 were $NZ7.27 per hour for production workers and up to $NZ8.23 per hour for welders. Employees were paid the base wage rate plus an increment of $NZ0.03 per hour for each six months of service. In addition to their wages, workers at the N.Z. plant received a performance bonus based on a formal appraisal of individual output, safety record, time keeping, absenteeism, communication skills and level of enthusiasm. The performance bonus could be up to $NZ1.13 per hour, but most employees received only about $NZ0.30 per hour. The scheme was considered to provide an incentive for workers, but it appears that delays in implementation have reduced the impact of any incentive.

A further problem was the length of time between assessments. These were intended to be conducted half-yearly, but it appears that the actual period between assessments was much greater. Indeed, some employees indicated that the period between assessments could be as long as six years. Management indicated that the most recent assessment had taken about eighteen months, because of the complexity of the assessment procedure.

At the Australian plants, production workers received an over award wage rate (Figure 4.3) plus allowances for dirty work, hot areas and similar circumstances. A 15 per cent allowance for working on the afternoon shift was also paid. Pay levels at the N.Z. plant too were considerably above the award rate. This rate functioned as a minimum wage, which during 1990 seemed to be below the market rate in large cities such as Auckland where the plant is located.

The number of job classifications for each category of labour at the different plants is shown in Figure 4.4. The numbers vary considerably between the plants, with a tendency towards more classifications in the larger plants. The very high number of classifications for production workers at the U.S. plant relative to the other plants reflects the traditional job boundaries built into the U.S. Agreement.

Figure 4.4 Number of job classifications, by labour category

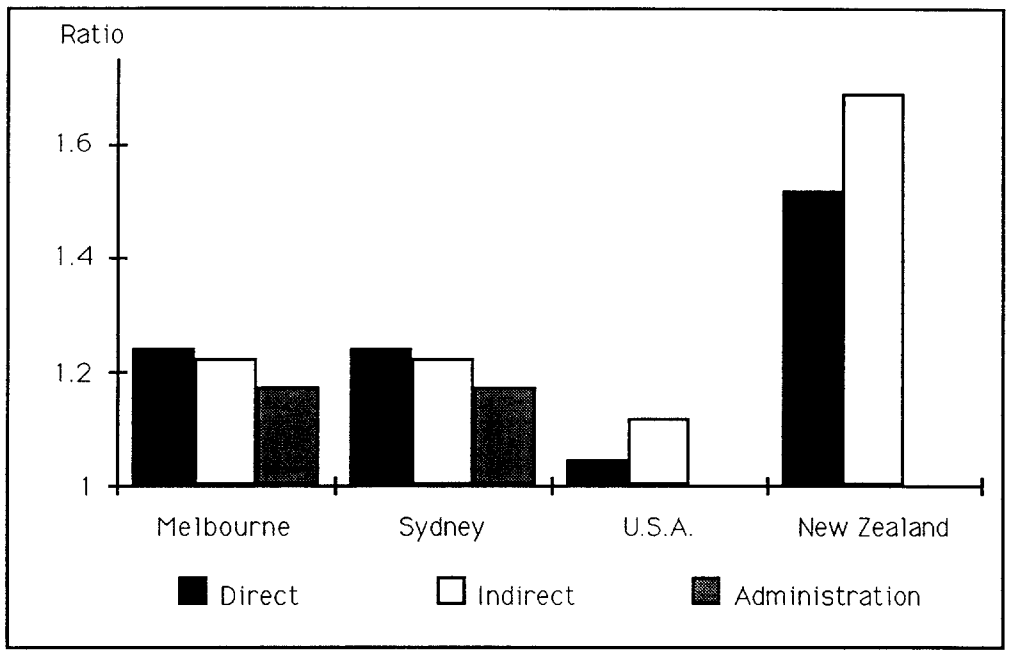


Source : BIE calculations based on data provided by the plants.

Note : Data were unavailable for administration workers at the U.S. plant. The data for the U.S. plant pertain to the calendar year 1989. There were no administration workers in the water heater component of Rheem's N.Z. complex.

The spread of pay scales for non-managerial employees at the plants is shown in Figure 4.5. Pay scales were most compressed at the U.S. plant, and least compressed at the N.Z. plant. The outcome for the U.S. plant developed during the early 1970s, a period of relatively high inflation, when lower paid workers received relatively greater pay rises because of the flat rate quarterly cost-of-living adjustment built into the Agreement at that time. The $US1000 per year lump sum bonus paid currently at the start of each year (in lieu of the previous cost-of-living adjustment) has had the

Figure 4.5 Ratios of pay rates at the top classification to those at the bottom for non-managerial employees, by labour category



Source : BIE calculations based on data provided by the plants.

Note : Data were unavailable for administration workers at the U.S. plant. The data for the U.S. plant pertain to the calendar year 1989. There were no administration workers in the water heater component of Rheem's N.Z. complex.

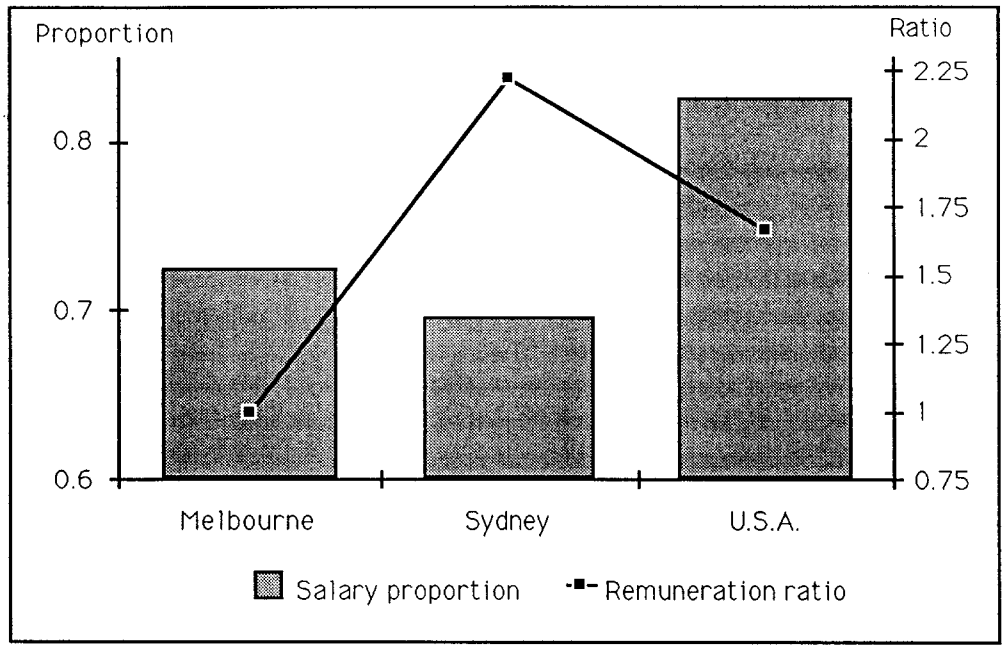
effect of perpetuating a compression of wage rates at the U.S. plant. The broad range of pay scales at the N.Z. plant reflects a labour market in which pay rates for particular skill categories can be increased at the firm level to attract labour, without flow-ons to other skill levels.

Compression of pay scales can have adverse effects on the labour market. This phenomenon encourages labour turnover and it may reduce the incentive for employers to provide training, because there is no or little reduction in employees' wages during the training period. Blandy (1987) suggests that there has been a compression of earnings in Australia due to our centralised wage fixing system, compared to what would have occurred in a more decentralised system. The outcomes in Figure 4.5 for the Australian plants relative to that in N.Z. are consistent with such analysis, but the data for the U.S. plant show that the converse outcome can occur in particular circumstances.

4.3.2 Managerial remuneration

Figure 4.6 shows salaries as a proportion of total managerial remuneration and the spread of managerial remuneration for the plants. Fringe benefits and other non-salary costs were relatively more important in the Australian managers' remuneration packages. At both the Sydney and Melbourne plants, salaries accounted for approximately 70 per cent of total managerial remuneration, compared with over 80 per cent at the U.S. plant.

Figure 4.6 Salaries as a proportion of total managerial remuneration, and the ratio of the highest to the lowest managerial remuneration



Source : BIE calculations based on data provided by the plants.

Note : Data were unavailable for the N.Z. plant. The data for the U.S. plant pertain to the calendar year 1989.

Managerial remuneration was less compressed at the Sydney plant than at the larger U.S. plant. The low spread of managerial remuneration at the Melbourne plant is due to the low number of managerial levels at that relatively small plant.

Managerial pay at the plants during 1989-90 depended on conditions in the relevant labour market. In future, the Hay system will be used to determine managerial remuneration within the SABH group of companies. The Hay system involves an appraisal of each position according to the 'know how' and 'problem solving' required, and the impact of the position on 'end results'.

4.3.3 Award restructuring

Award restructuring evolved out of a recognition that Australian productivity growth was being hampered by rigidities such as those described in Section 4.2. In particular, it represents an attempt to overcome problems associated with demarcations between employees with narrowly defined skills, a lack of definite career paths for unskilled and semi-skilled workers, and a lack of opportunities and an inadequate system of rewards for individuals undertaking further training.

Under the agreement covering award restructuring negotiated by the Metal Trades Industry Association (MTIA) and the Metal Trades Federation of Unions (MTFU), a new award is being introduced which *inter alia* provides for fourteen levels and two sub-levels of wage groupings for all employees in the Metal Trades Industry. These levels range from Engineering (Production) Employee Level I through to Professional Engineer Level IV. The range of remuneration in the new award is to be considerably greater than that under the existing structure. A further element in the MTIA/MTFU agreement is the establishment of enterprise-based consultative mechanisms and procedures which permit the employer to direct employees to perform any work within their skill capability and training, provided this does not lead to de-skilling or compromise safety. Coupled with this reform is the establishment of both on-the-job and external training schemes, and provision for enterprise level agreements.

Approaches to the issues raised by the award restructuring process differed from plant to plant. Although not subject to multiple unions and awards, the U.S. plant had demarcations and rigidities similar to those at the Australian water heater plants. Consolidation of many job levels into a smaller number of levels was proposed by the U.S. management some six years ago. That proposal did not proceed, because of complications arising from negotiations with the union and because the plant's management considered that such rationalisation would not yield substantial efficiency gains. However, the company does have a policy of training each worker for at least two jobs.

At the Melbourne plant, a course on award restructuring was conducted with representatives from both management and unions. Fortuitously, changes proposed by the unions were very similar to the changes proposed by management. The plant's management advised the BIE inspection team that considerable progress had been made in establishing career paths and in the broadbanding of awards. The

Workplace Resource Centre, a tripartite body established by the Commonwealth Government to assist with award restructuring, had helped in this regard.

Some production workers at the Melbourne plant were opposed to formal restructuring. They argued that there was adequate scope for individuals to become multiskilled through informal processes, and that any additional skills gained through restructuring were not likely to be rewarded. The attitude of these workers was reminiscent of the reported comments of an English worker who participated in a job enrichment plan (Herman 1982, quoted in Thompson 1990):

> you move from one dirty, boring, monotonous job to another dirty, boring monotonous job. And then to another dirty, boring, monotonous job. And somehow you're supposed to come out of it feeling all 'enriched'. But I never feel enriched - I just feel knackered.

Even those employees opposed to award restructuring appeared to accept it as inevitable. Overall, the process of restructuring at the Melbourne plant seemed to have proceeded relatively smoothly, but slowly, in 1989-90.

A consultative union-management committee was formed in October 1989 at the Sydney plant and a pilot program was established as a precursor to plant-wide restructuring. The pilot scheme involved the relocation of machinery to improve workflow, a reduction in manning levels, training of relief staff, and retraining operators to undertake lubrication and die-setting tasks. As an incentive to co-operate in this program, workers were offered an extra $21 per week. However, the then AMWU withdrew from the pilot scheme on the grounds that its members had not received restructuring training. There were suggestions that the real reason for the AMWU stewards' actions was a dispute with the then ASE, which had at that time begun to recruit production workers. The pilot scheme was reactivated subsequently, and was approved by the IRC in March 1991. The $21 per week increase was paid and backdated several months for this group of employees.

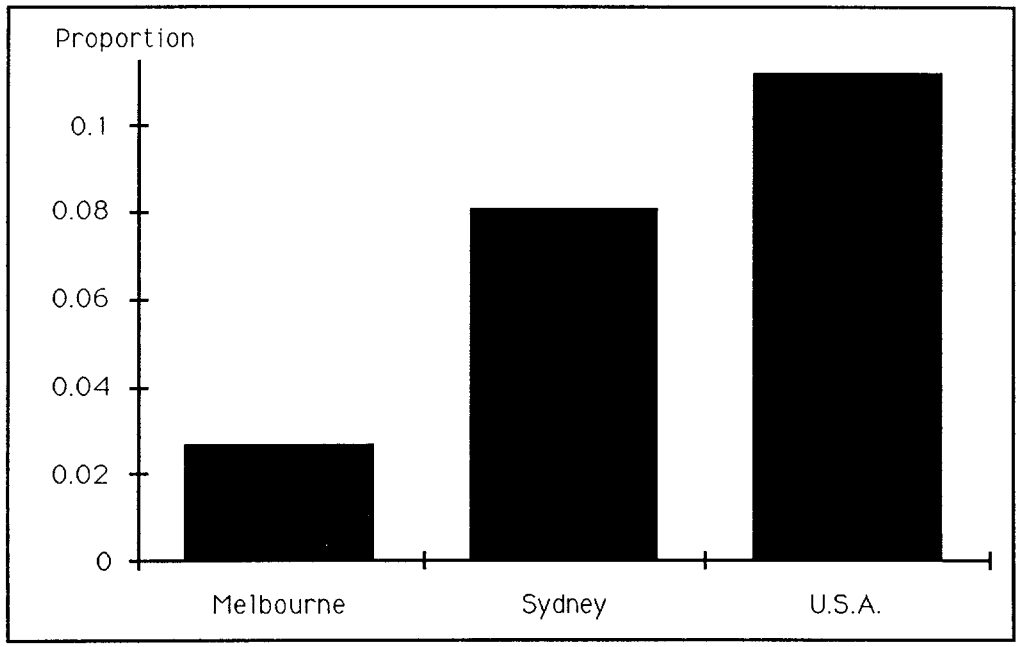
4.4 Labour turnover, training and education

There can be competitive advantages to a company in retaining skilled employees. In general, plants with a higher labour turnover are obliged to incur higher training expenditure than those with more stable workforces. Because training is essential for the operation of the equipment, it can be in the interest of the company to encourage experienced operators to remain with it by providing them with appropriate remuneration.

4.4.1 Labour turnover

Total labour turnover and labour turnover by category at each of the plants are shown in Figures 4.7 and 4.8 respectively. These variables are defined as the ratio of the average of recruitment and departures to average employment levels, and are an indication of relative workforce stabilities. Although overall labour turnover at the Sydney plant was significantly above that at the Melbourne plant, it was somewhat below that at the U.S. plant.

Figure 4.7 Total labour turnover as a proportion of average employment

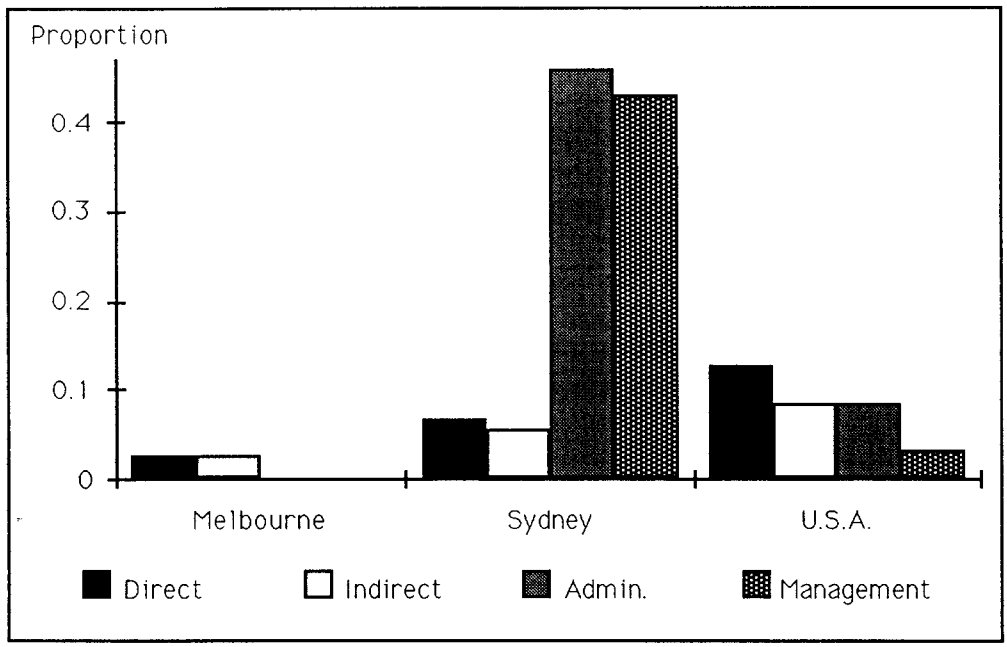


Source : BIE calculations based on data provided by the plants.

Note : The data supplied by the plants were corrected to ensure that they added to the correct total. The data for the Melbourne plant exclude intra-Vulcan transfers. The data for the U.S. plant pertain to the calendar year 1989. Data were unavailable for the N.Z. plant.

Management considered that labour turnover during 1989 at the U.S. plant was typical of that in recent years. In their view, the plant's labour turnover reflected retirement of employees or their move to other areas, rather than a move to other employment in the neighbourhood of the plant. They attributed this outcome to the

Figure 4.8 Labour turnover as a proportion of average employment, by category



Source : BIE calculations based on data provided by the plants.

Note : The data supplied by the plants were corrected to ensure that they added to the correct total. The data for the Melbourne plant exclude intra-Vulcan transfers. The data for the U.S. plant pertain to the calendar year 1989. Data were unavailable for the N.Z. plant.

relatively high wages offered at the plant for direct production workers compared to those offered by other local employers. The current rate of turnover was contrasted with that prevailing a decade or so ago. Then, poor employee morale, income uncertainty due to layoffs, difficult work conditions, poor promotion prospects and poor procedures for the selection of supervisors resulted in much higher labour turnover.

Labour turnover at the Melbourne plant was viewed with concern by management. According to exit interviews conducted at the plant, a significant reason for labour turnover was the competitive wage rates offered by other firms in the Bayswater area near the plant. When economic conditions were relatively buoyant, the plant's production workers were willing to change their employment for relatively small increments in remuneration, and the company was inhibited from offering increased wages to retain valued employees by the requirements of the Accord, the IRC, and

the difficulty in preventing wage increases for a particular skill category and union coverage from flowing on to other skill categories.

A somewhat different perspective on labour turnover was given by current production workers. They commented that in the past some employees sought dismissal in the warmer months so that they could enjoy summer's pleasures on unemployment benefits. Other reasons for labour turnover included the high temperatures inside the plant during summer, the low temperatures inside the plant during winter, and relatively low wages. However, the employees did indicate that working conditions were regarded as better than at other plants in the area, that employees were well treated, and that the factory generally operated without substantial tension between employees, unions and management.

The workforces at the Sydney and U.S. plants, in contrast, saw their positions as more of a long term prospect, although turnover at these plants was higher than at Melbourne. During 1989-90, turnover at the Sydney plant consisted mainly of departures, as the number of production workers was decreased over the year. In contrast, both departures and recruitment were of a similar magnitude at the U.S. plant during 1989. Departures at that plant generally reflected career moves to other areas of the U.S., as well as some retirements from the labour force.

With the exception of the Sydney plant, the turnover rates at each plant were similar by category (Figure 4.8). The apparently high labour turnovers for the managerial and administration categories at the Sydney plant are in part a statistical artefact, because the average numbers of employees in these categories were quite small.

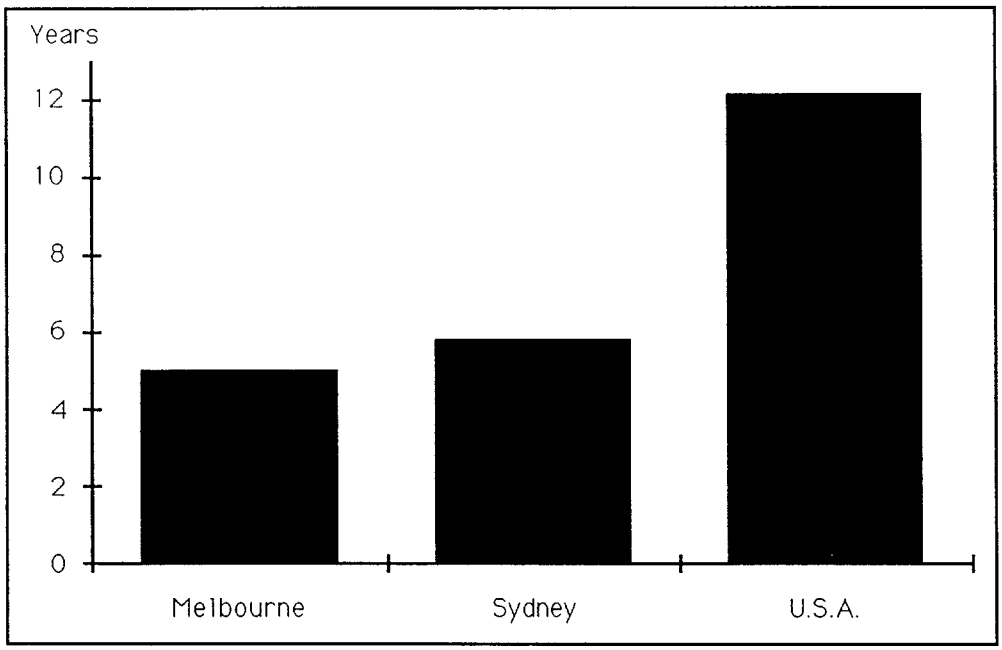
However, senior management at the Sydney plant has had a policy in recent years of recruiting new managerial personnel. This policy is a major reason for the relatively low average number of years of experience in water heater production for Sydney's management (six years) relative to the average experience (twelve years) of their U.S. counterparts (Figure 4.9). Management at the Melbourne plant, recruited from outside the plant, had a similar length of experience to the average for the Sydney plant.

4.4.2 Training

The level of training provided per employee is influenced by factors such as turnover of the workforce, the installation of new machinery, and the existing skill levels and composition of the workforce.

New employees at all plants spent time at an orientation course. Although the length of the course varied from plant to plant, the topics covered in the courses were similar. They included the operations of the company, an outline of the different functions of the plant, and the safety program. After attending these courses, recruits

Figure 4.9 Management, average number of years' experience



Source : BIE calculations based on data provided by the plants.

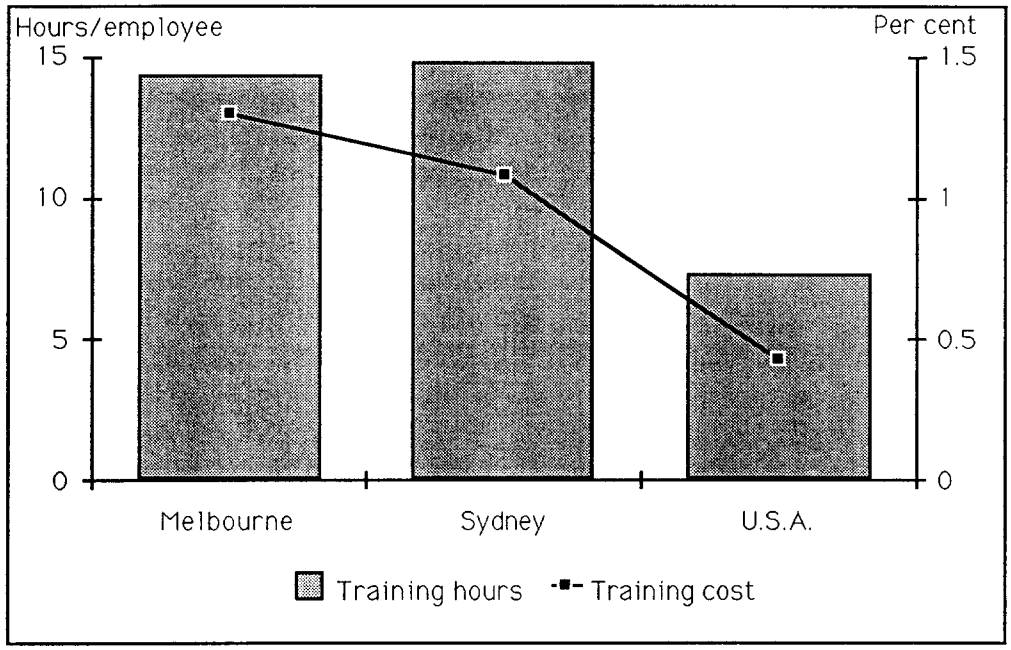
Note : The data for the U.S. plant pertain to the calendar year 1989. Data were unavailable for the N.Z. plant.

were passed to the shift foreman for allocation to the production line, where they received on-the-job training.

At the U.S. plant, new employees received instruction on possible work hazards, as required by U.S. 'right to know' legislation, and advice on the use of safety shields and appropriate footwear. They were advised also on the contents of the collective Agreement with the UAW. Following orientation training, new employees were trained by a skilled production worker. A supervisor from the relevant area kept weekly records of the recruits' progress, and instructed recruits as required. New employees were on forty-five days' probation.

The relatively low priority accorded to formal training at the U.S. plant is clear from the training data presented in Figure 4.10. Most workers at the U.S. plant gained their skills through on-the-job training, on which details were not recorded during 1989. The lack of formal training at this plant reflected management's view that most

Figure 4.10 Training hours per employee and training costs as a proportion of the total wage bill



Source : BIE calculations based on data provided by the plants.

Note : The cost data include the labour cost to the firm of employees' time while at training. On-the-job training data were unavailable for the Melbourne and U.S. plants. The data for the Sydney plant include the information available for on-the-job training. These data represent only a small proportion of the total on-the-job training undertaken at the plant during 1989-90. The data for the U.S. plant pertain to the calendar year 1989. Data were unavailable for the N.Z. plant.

tasks for direct and indirect workers were semi-skilled, and could be learned in 'under four hours'.

There was no formal apprentice program at the U.S. plant. As discussed in Section 4.2.5, the roles of tradesmen at this plant were in general performed by upgraders, former production workers who received substantial on-the-job training. A similar training method was employed for stick welders. They undertook a four-hour course on Saturdays for between four and six weeks, with a written and practical test at the end of the course. Such welders were difficult for the company to recruit, probably because the position received only a small margin ($US0.41 per hour) over the rate for assembly workers.

At the Melbourne plant, training in English language skills was provided by a Government-funded teacher to selected employees at two-hour classes conducted twice a week. The main purpose of this course was to ensure that employees' language skills were sufficient for them to be conscious of the need for safety and quality, and to understand the instructions of their supervisors. Structured courses on quality control and safety were provided for a range of Melbourne employees during 1989-90. In that year, some foremen and leading hands at the plant undertook a TAFE course on supervision. A formal training program for direct and indirect production workers was being prepared at Vulcan's Melbourne complex in 1990 for implementation under the award restructuring process (Section 4.3.3).

On-the-job training at the N.Z. plant was performed typically by leading hands. The plant's employees were encouraged to undertake Polytechnic courses in areas such as welding and die-setting, for which they were reimbursed if successful. The BIE inspection team gained the impression that communication at the plant was circumscribed by language difficulties amongst the predominantly Samoan production workers. To overcome these difficulties, a range of employees suggested that workers who undertook English language courses should be reimbursed by either the Government or the firm.

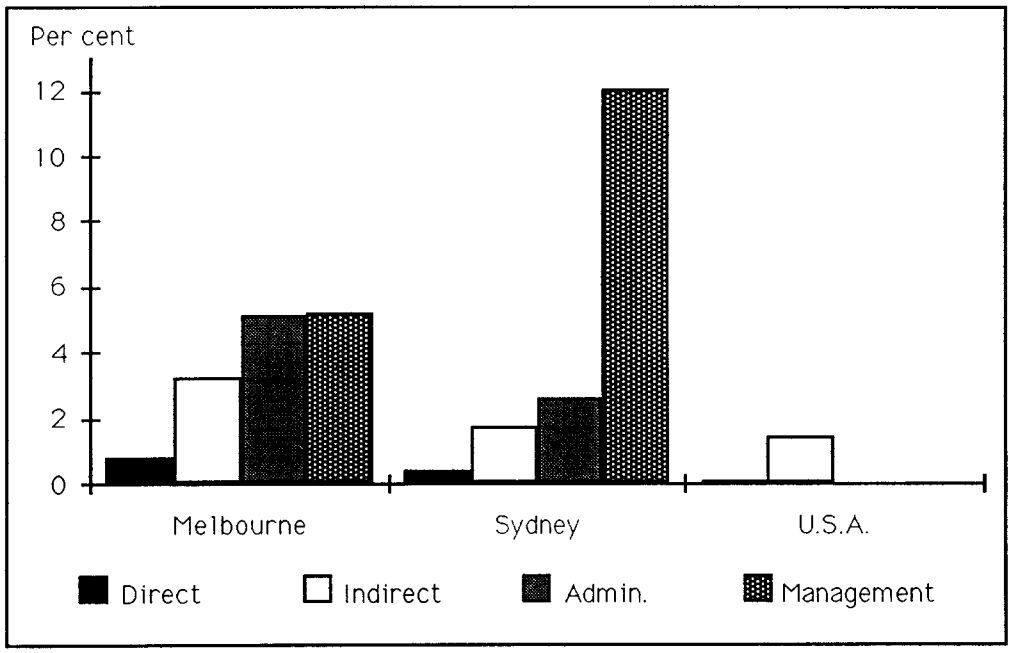
Most training of direct production workers at the Sydney plant, as at the N.Z. plant, was conducted on the job by foremen and leading hands. Formal, external training undertaken by production workers in areas such as welding was supported by the company through reimbursement of fees, but time off for educational or training purposes was generally available only to trainee engineers and apprentices. Nevertheless, several fitters were undertaking a TAFE course in pneumatics and hydraulics at the time the BIE inspection team visited the plant.

Although management indicated that the main skills deficiencies of direct production workers were in areas such as arithmetic and literacy, there were no programs at the plant to rectify these deficiencies. However, it should be borne in mind that the applicability of such skills is general rather than limited to a specific firm, and so the benefits from training in these areas are likely to be weighted towards the worker rather than the firm. In such cases, Government or worker funding of remedial training would seem more appropriate than employer funding (Borland 1990).

Training costs as a proportion of the wage bill and training hours per employee for each category of labour are shown in Figures 4.11 and 4.12 respectively. The two main features are the low level of formal training provided to all employee categories at the U.S. plant, and the relatively high proportion of resources devoted to the training of managers at the Sydney plant during 1989-90.

The former outcome is discussed above. The latter outcome is due to the introduction by the Sydney plant of a quality control system known as the Quality

Figure 4.11 Training costs as a proportion of the wage bill, by labour category



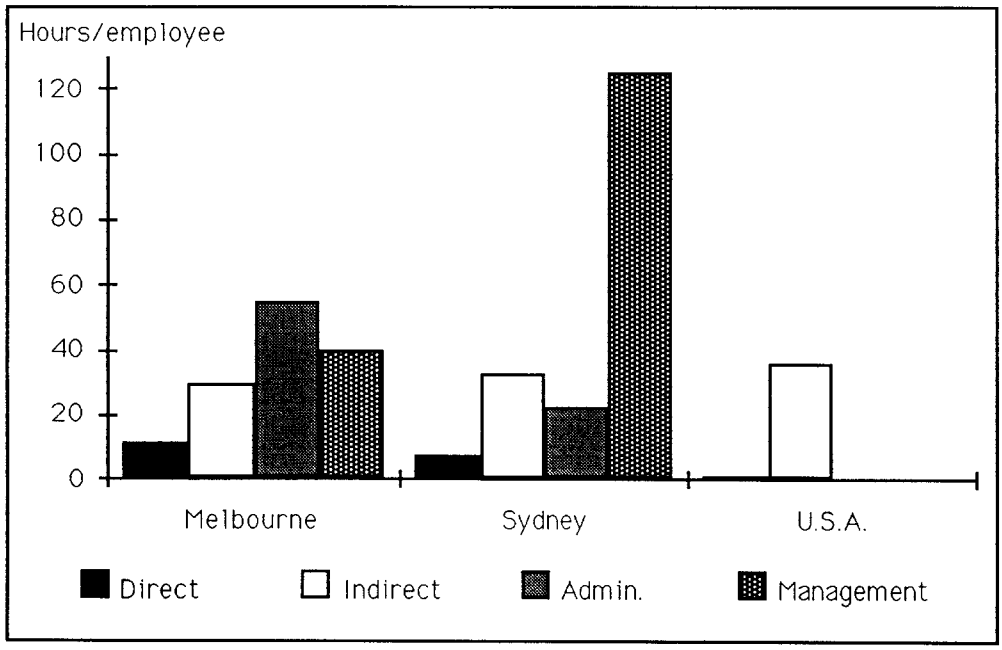
Source : BIE calculations based on data provided by the plants.

Note : The cost data include the labour cost to the firm of employees' time while at training. On-the-job training data were unavailable for the Melbourne and U.S. plants. The data for the Sydney plant include the information available for on-the-job training. These data represent only a small proportion of the total on-the-job training undertaken at the plant during 1989-90. The data for the U.S. plant pertain to the calendar year 1989. Data were unavailable for the N.Z. plant.

Improvement Process (QIP) (Section 2.4). QIP involves considerable training for management in its early stages. The relatively small level of training provided to direct production workers at the Sydney plant, compared to the outcome for that category at the Melbourne plant, was due mainly to the refusal by some employees to attend training courses. Management's view was that this behaviour reflected the industrial relations culture at the plant during 1989-90 (Section 3.3.4).

The adequacy of Australia's training effort has been questioned in recent years. In 1988, the Federal Minister for Employment, Education and Training released a discussion paper which claimed that there was an urgent need for Australian industry to lift its contribution to training and skill formation (Department of Employment Education and Training 1988).

Figure 4.12 Training hours per employee, by labour category



Source : BIE calculations based on data provided by the plants.

Note : On-the-job training data were unavailable for the Melbourne and U.S. plants. The data for the Sydney plant include the information available for on-the-job training. These data represent only a small proportion of the total on-the-job training undertaken at the plant during 1989-90. The data for the U.S. plant pertain to the calendar year 1989. Data were unavailable for the N.Z. plant.

Although some data relating to expenditure on education and training show that Australia lags behind the major industrial nations, interpretation of this type of data has its shortcomings. These include the partial nature of the Australian data, the inadequacies of the procedures used to estimate it, the different bases on which the individual country data were collected, and the presence of significant inter-country differences in industry structure, the nature of training systems, the role of immigration, the industrial environment and the rate of structural change. Careful analysis of the available data suggests that there is only equivocal support for the notion that expenditure by the private sector in Australia on training has been lagging that in other major countries (BIE 1990b).

In September 1989, the Federal Government announced that it would introduce a Training Guarantee Scheme requiring all companies with a payroll exceeding $0.2 million to spend a sum equal to 1 per cent of it on an approved training scheme

during 1990-91, with the proportion rising to 1.5 per cent in 1991-92. Firms have the option of undertaking their own training, or contributing to approved training funds at the State level.

Arguments for and against this kind of intervention, which is relatively common abroad, are summarised in the BCA (1988), Chapman and Stemp (1989), and the Department of Employment, Education and Training (1988). Borland (1990) emphasises that the source of underinvestment in training is most significant for determining the appropriate policy response. For example, where it is the nature of Australia's labour market institutions (such as the job classification structure, minimum wage provisions and craft unions) that are the source of underinvestment, it is institutional reform which is required to raise training. Borland points out that the nature of training has important consequences for who should pay for the training. In particular, it is inappropriate for firms to pay for general training, if they cannot recoup the requisite benefits.

The level of training at the Australian plants considered in this study compares favourably with that at the U.S. plant. Nevertheless, training (especially formal training) was not given a high priority at any of the plants. Although training at the Australian plants during 1989-90 was directed towards areas of perceived importance such as safety and quality, there appeared to be no systematic analysis of skills inadequacies, or of how training might be used to ameliorate such inadequacies.

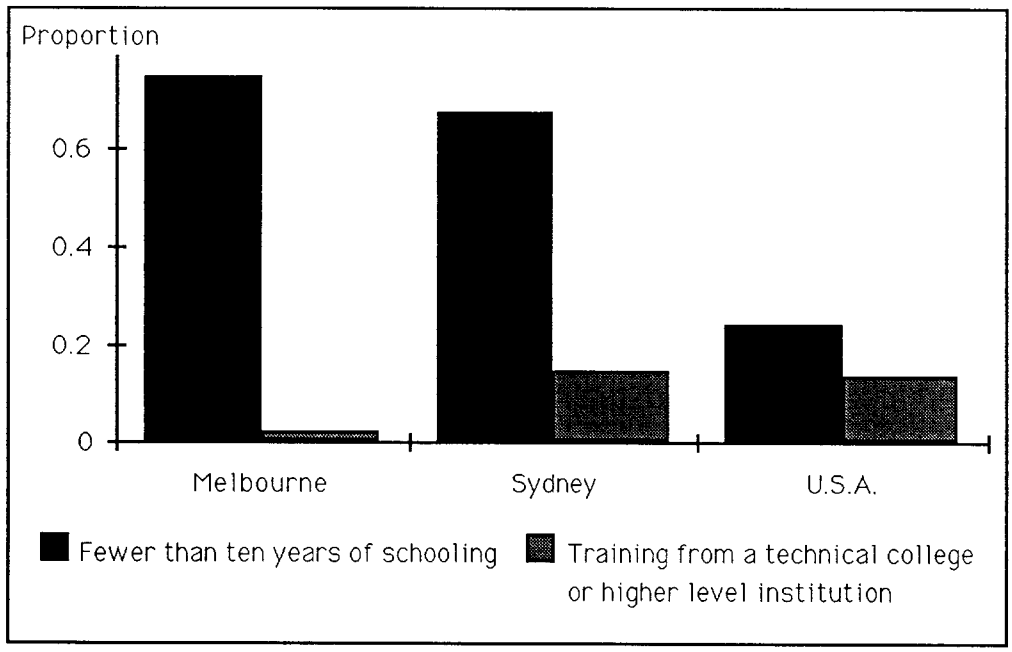
This situation could change in subsequent years with reform of union structures and work practices, with progress on award restructuring, and with the introduction of the SABH human resources program. The objective of the latter program is to identify 'gaps' between standards and their achievement, and to correct them with appropriate training. A further objective of the human resources program is to identify and train employees considered to have potential for further promotion.

4.4.3 Education

The available data on the schooling and formal training of employees by labour category are summarised in Figures 4.13 to 4.15. The first of these figures indicates that the level of educational attainment of the U.S. employees was generally higher than that of their Australian counterparts. The proportion of employees with fewer than ten years of schooling at the U.S. plant was much lower than the proportions at the Australian plants, while a higher proportion of employees at the U.S. plant had obtained training from a technical college or higher level institution than the proportion at the Melbourne plant.

The data by labour category presented in Figures 4.14 and 4.15 indicate that:

Figure 4.13 Proportion of employees with a given educational attainment



Source : BIE calculations based on data provided by the plants.

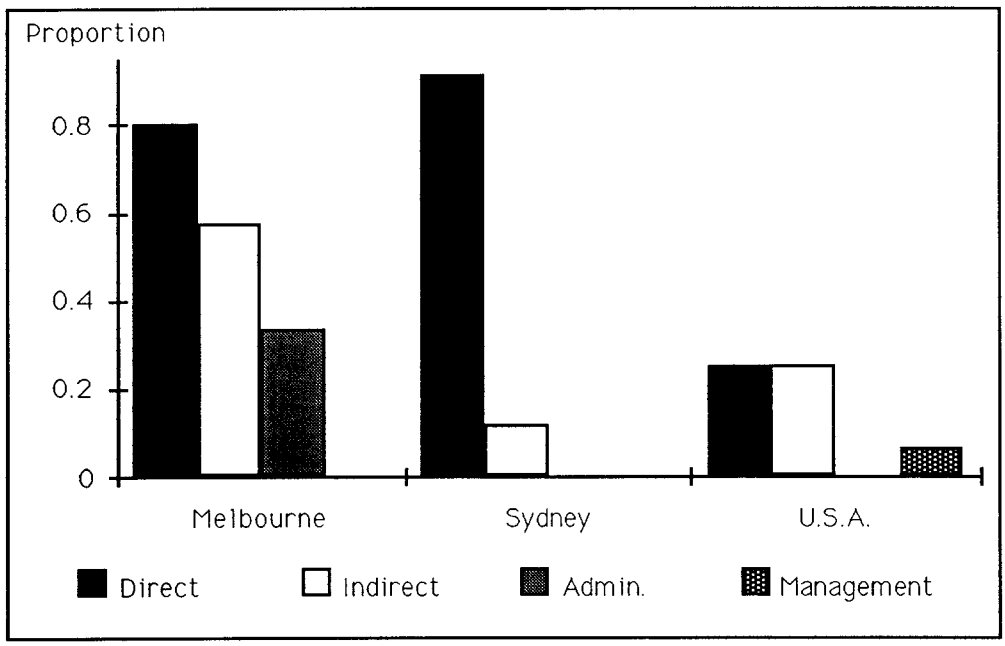
Note : The data for the U.S. plant pertain to the calendar year 1989. Data were unavailable for the N.Z. plant.

- direct production workers at the U.S. plant were better educated on average than their Australian counterparts[2]; and that
- the difference in educational qualifications between the U.S. plant's management and its other employees was less marked than at the Australian plants.

On the first point, management at the Sydney plant considered that the levels of literacy and numeracy among production workers were unsatisfactory, although

2 It was not possible to obtain separate data for the educational qualifications of direct and indirect production workers at the U.S. plant, and so the data shown in Figures 4.14 and 4.15 are for the composite production worker category. The conclusion stated in the text follows because production workers were the dominant component of this category (Figure 5.6).

Figure 4.14 Proportion of employees with fewer than ten years of schooling, by labour category



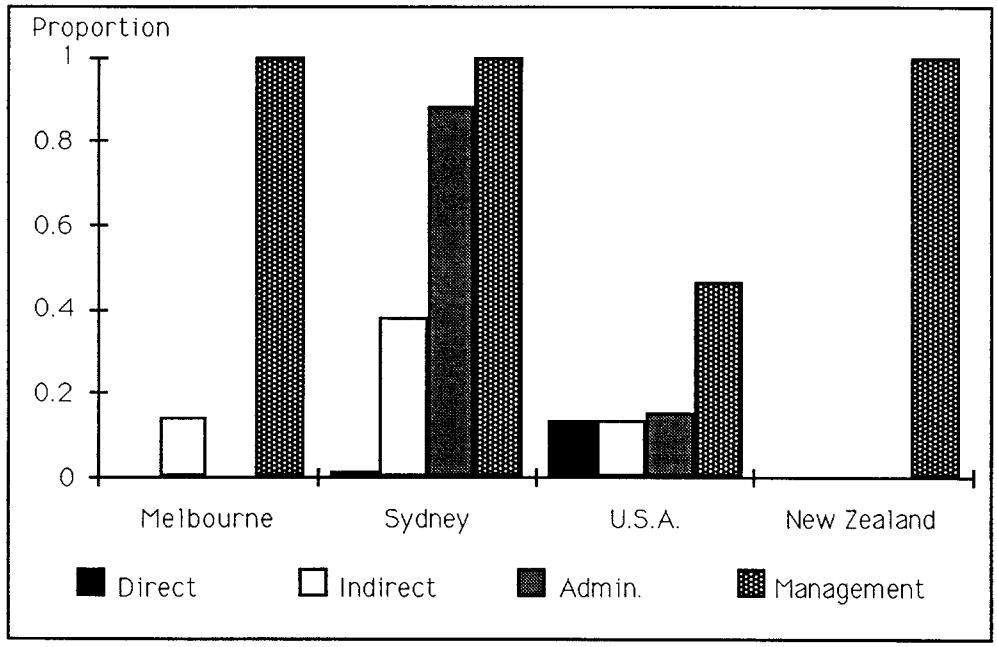
Source : BIE calculations based on data provided by the plants.

Note : The data for the U.S. plant pertain to the calendar year 1989. Separate data for the educational qualifications of direct and indirect production workers at the U.S. plant were unavailable. The data shown for this plant are for the composite production worker category. Data were unavailable for the N.Z. plant.

most employees were proficient in spoken English. The data presented in Figure 4.14 are consistent with this suggestion, because 92 per cent of direct production workers at the Sydney plant had fewer than ten years' schooling. The corresponding proportion was only slightly lower at the Melbourne plant.

The second point reflects the relative lack of further education amongst management at the U.S. plant. For example, only 47 per cent of U.S. management had training from a technical college or higher institution, whereas the corresponding proportion for the Australian and N.Z. plants was 100 per cent. The outcome at the U.S. plant follows from the policy there of promotion from the shop floor. For example, the Production Manager commenced employment at the plant on the production line. It should be noted, however, that the generally higher educational qualifications of production workers at the U.S. plant, relative to those at the other plants, implies a larger 'pool' of suitably qualified candidates for promotion.

Figure 4.15 Proportion of employees with training from a technical college or higher level institution, by labour category



Source : BIE calculations based on data provided by the plants.

Note : The data for the U.S. plant pertain to the calendar year 1989. Separate data for the educational qualifications of direct and indirect production workers at the U.S. plant were unavailable. The data shown for this plant are for the composite production worker category. Data were unavailable for non-managerial employees at the N.Z. plant.

4.5 Concluding comments

The U.S. plant encapsulated much of what might be considered desirable in an industrial relations framework. The UAW Local and the plant's management had an implicit understanding, the parameters of which included a recognition by the union that the welfare of its members was intimately connected to the financial viability of the company. On the management side, this implicit understanding involved *inter alia* the eschewal of retrenchments, an acceptance of the legitimate role of the UAW Local, and a willingness to remunerate direct production workers at rates near the top for the local labour market.

This is not to say that labour relations at the U.S. plant have been without conflict, given the number of grievances raised by workers at the plant (Section 3.3.1).

However, the conflict has occurred within bounds accepted by both sides, and through channels set in place through the collective Agreement. In short, industrial relations differences between workers, their union and management have been resolved in ways that were not inimical to the plant's competitiveness.

On the negative side, the U.S. plant had constraints on labour flexibility, problems in its maintenance area and a poor formal training record. On balance however, the plant's record over the 1980s and its current performance suggests that it is well placed to meet the competitive challenges from producers located in the lower labour cost areas of Mexico and the U.S. 'right to work' States.

Despite their different national frameworks, industrial relations outcomes at the Melbourne and N.Z. plants had more in common with those at the U.S. plant than with the pattern observed at the Sydney plant. Both the Melbourne and N.Z. plants had a similar degree of labour flexibility, and a relatively harmonious industrial relations environment, exemplified by their low level of industrial disputes. The Melbourne plant also compared favourably with the U.S. plant in terms of its emphasis on training, multiskilling and job rotation.

Management at the Melbourne plant has shown a high degree of innovation. They have been willing to try new production procedures and have sought to identify areas of weakness, such as bottle-necks in production due to old equipment and problems due to a lack of familiarity by some workers with the English language. This dynamic attitude at the Melbourne plant is to some extent a spin-off from the acquisition of the U.S. plant by SABH. The U.S. plant's productivity and cost performances (as measured by SABH) have become the benchmark that both Australian plants are striving to attain.

Industrial relations at the Sydney plant during 1989-90 were characterised by conflict, and negative work practices at the plant were rife. As a consequence, the plant ranked poorly in terms of labour flexibility, manning, job rotation and industrial disputes. Employees of the Sydney plant did not recognise to the extent of employees at the U.S. and Melbourne plants that their welfare was linked to the competitive success of their employer. This outcome would seem to reflect employees' perception of the strong competitive position of the Sydney plant in the Australian market, and the comparative ease with which these employees could obtain alternative local employment during 1989-90. Indeed, management at the Sydney plant considered that the introduction of redundancy agreements had resulted in the emergence of a proportion of the workforce who wished to be made redundant, for the short-term gain of a redundancy payment.

Nevertheless, the Sydney plant was not an unmitigated industrial relations disaster. Formal training levels were relatively high, and the plant's management displayed the same endeavour to improve productivity as management at the Melbourne and N.Z. plants. Moreover, management has sought to improve industrial relations

outcomes, and at least some union stewards and plant employees have recognised that all parties could benefit from improvements in this regard.

However, a long history of acquiescence in union demands, and management's failure on occasions to support foremen and middle managers in disputes with union stewards, appears to have engendered a belief that virtually any union demand would meet with success. The industrial relations problems at this plant during 1989-90 were of such a magnitude that the plant's viability could be in question should a more competitive environment emerge in the industry, unless relations between employees and management were changed dramatically for the better.[3]

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3 In similar vein, Caves (1980) concluded that divisive labour-management relations were a trait that marked afflicted U.K. manufacturing industries 'for slow extinction'.

Chapter 5

Relative performance of the Australian producers

5.1 Introduction

There is no single measure which adequately captures all of the variables influencing competitiveness. The overall outcome depends on price and non-price factors, where the latter category includes issues such as quality, deliverability and customer servicing. The analysis in this chapter focuses mainly on price factors, although there is a discussion of issues associated with the quality of outputs and inputs.

The main determinants of international price competitiveness are the costs of production at the various water heater plants and the relevant exchange rates which convert those production costs into a common currency unit. Production costs can be partitioned into labour, capital and material costs, which depend in turn on input costs per unit of time and the relevant partial productivity measures (such as labour and capital productivity).

As pointed out in Chapter 1, an objective of this study was to examine the productivity of manufacturing plants engaged in producing a relatively homogeneous output. In practice, however, there are various elements of product differentiation (for example, whether the unit is a gas or electric model, the degree of energy efficiency, and the capacity of the unit) that need to be allowed for in a comparison of water heater plants' costs and productivity. The requisite calculations involve expressing each plant's output in terms of a particular water heater model produced at that plant; with a plant's model selected on the basis of its comparability to the standard model chosen at the other plants.

This chapter compares the relative productivity and unit cost performance of the Melbourne (Victoria), Sydney (New South Wales), N.Z. and U.S. water heater plants. Factors examined include those affecting outputs, labour, material and capital inputs, plant maintenance and setting up, and productivity and cost measures.

5.2 Output

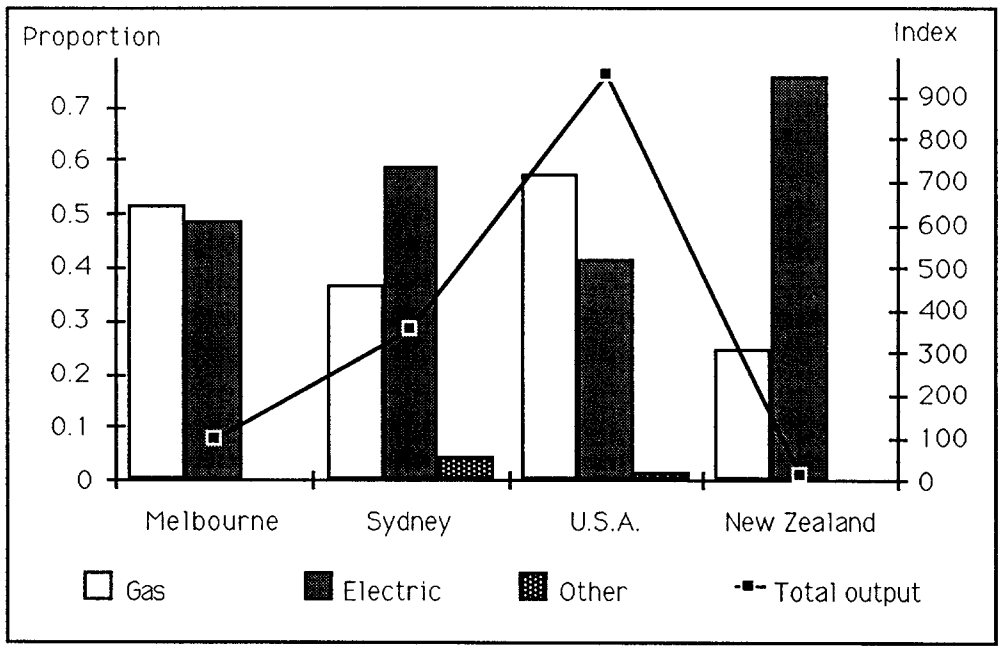
Water heater output levels are affected by a number of factors, including product mix and waste. Product mix has an effect through time lost in setting up machinery

for the production of different capacities of the inner tanks that contain the hot water. Waste was a small percentage of output at all plants and was a minor factor in explaining differences in production costs.

5.2.1 Output level

The output of the U.S. plant was some two and a half times that of the largest Australian plant (Rheem, Sydney). The Sydney plant in turn produced over three times as much as the Melbourne plant (Figure 5.1). The output of the N.Z. plant was around 12 per cent of the level produced by the Melbourne plant. This low level reflects the small size of the N.Z. market, and the importance in that market of low pressure water heaters. The latter segment of the market is insignificant in Australia and the U.S.

Figure 5.1 Level and composition of output



Source : BIE calculations based on data provided by the plants.

Note : The level of output is expressed in terms of the 125 litre electric standard water heater. Additional information on this methodology for the calculation of weighted output levels is presented in the note to Figure 5.18. The N.Z. data are unweighted. The data for the U.S. plant pertain to the calendar year 1989. Those for the other plants pertain to 1989-90.

It should be noted that there are some significant variations between the shares of the market held by the plants in the different countries. The Sydney and Melbourne plants between them supplied some 75 per cent of the Australian market, whereas the N.Z. plant supplied around 90 per cent of the mains pressure units in that market. In contrast, the U.S. plant supplied just 12 per cent of the U.S. market.

The various plant managements attempt to maintain an even rate of production through the year. They have found that the costs associated with the recruitment and training of new staff, both direct costs and those incurred via adverse effects on product quality, exceed the production and inventory costs associated with holding a greater buffer stock. However, the Australian water heater plants close down for several weeks in summer so that employees can take annual leave. As a result, production is generally increased in the months leading up to the shut down, so that demand can be met during the subsequent period.

An important question is how typical was the level of output produced by the plants in the survey year. Should output levels be particularly atypical by plant, the productivity and unit cost measures derived from the survey data might advantage some plants at the expense of others.

In general, output levels were above normal. The Sydney and Melbourne plants were meeting strong demand in Australia, due to substantial growth in the new housing market. Similar factors were evident in the U.S. market. However, the N.Z. plant was operating in an economy that had grown only slowly since the mid-1980s (Harris, Lee and Simmons 1991). On balance, the available evidence suggests that of the plants considered here, only that located in N.Z. was disadvantaged to a significant degree by the level of demand in the survey year.

5.2.2 Output mix

The composition of output between gas, electric and other models is shown in Figure 5.1. Output by the Melbourne plant was evenly balanced between electric and gas units. However, many of its electric units are produced under contract for the Sydney plant and sold under that plant's 'Rheem' brand name. This process of production sharing began in 1989, when industrial action disrupted activity at the Sydney plant. Competition from Rheem, then a separate company, had driven Vulcan from the electric market in the early 1980s.

As a consequence, most units produced and sold by the Melbourne plant were powered by gas. This outcome also reflects the characteristics of its major markets in Victoria and Western Australia. Around 98 per cent of new homes in Victoria are connected to gas mains. In Western Australia, there is a favourable market for the high efficiency gas units produced by Vulcan, reflecting the comparatively high cost of energy to domestic consumers in that State.

The output mix of the Sydney plant is broadly typical of demand in New South Wales. A small number of its electric (160 to 315 litre capacities) and gas (standard efficiency) models were produced under contract for the Melbourne plant and sold under the Melbourne plant's 'Vulcan' brand name. The sale, as Vulcan product, of items produced by Rheem enabled Vulcan to supply its customers with a broader range of products. The producers considered that this process results in additional competition between the marketing areas of the two companies, an outcome viewed favourably by the energy authorities in New South Wales and Victoria. The Sydney plant also produced some 'other' units. These models are mainly gas and electric units for heavy duty use in establishments such as motels and hotels, but also include a small number of solar-powered units.

Electric units are even more dominant in the N.Z. market than in Australia, reflecting the limited availability of gas, particular in the South Island. In contrast, gas units have the highest share of production by the U.S. plant. The price and availability of gas in the U.S. market are significant factors contributing to this outcome. The 'other' units produced by the U.S. plant were mainly tanks sold to several other manufacturers, plus a small proportion of solar-powered units.

The degree of product differentiation was considerably greater at the U.S. plant than in Australia. Bradford-White produced some 300 gas models and almost as many electric models during 1989. By comparison, the Sydney plant produced only ten electric and ten gas models and the Melbourne plant manufactured just three gas and two electric models during 1989-90. In part, the U.S. plant produced a large number of models because it was in the process of introducing new, better insulated models which are required by Federal energy standards. As models based on previous Federal regulations are discontinued, the degree of product differentiation at the U.S. plant will diminish. Other factors associated with the large number of U.S. models include differentiation between models produced for retail sale and the wholesale trade, and production of a range of models for the mobile home market.

Other things equal, the greater the number of models produced by a plant the more likely it is that there will be some efficiency penalties, and therefore increased unit costs, due to shorter production runs. This is especially so in water heater production if a change of model also involves a change in tank size, or more specifically, tank diameter or length.

The small, Melbourne and N.Z. plants produced the fewest number of tank sizes (Table 5.1). The two electric sizes produced by the Melbourne plant during 1989-90 had the advantage that they involved only a single tank diameter, which reduced the costs involved in time lost due to model changes. The larger Sydney and U.S. plants were involved in the production of a greater number of tank sizes, although these numbers increased by less than the increase in total output relative to that of the Melbourne plant (Figure 5.1).

Table 5.1 Number of sizes produced

Location	Name	Number of sizes produced	
		Gas	Electric
Melbourne	Vulcan	3	2
Sydney	Rheem	5	8
U.S.A.	Bradford-White	5	13
N.Z.	Rheem	2	3

Source : BIE calculations based on data provided by the plants.

Note : The data for the U.S. plant pertain to the calendar year 1989. The squat and standard height electric models produced by the U.S. plant are counted as separate capacities in Table 5.1, because they involve tanks of different diameters and lengths. The number of gas sizes produced by the Sydney plant includes two heavy duty models. Although the inner cylinder size is common, the gas water heaters produced by the Sydney plant for location inside or outside the home have outer jackets that are significantly different in their design and construction. This factor adds to the degree of product differentiation at the Sydney plant.

Thus, it might seem that the larger plants on average were advantaged by longer production runs of particular sizes. In fact, all plants are moving to shorter production runs so that their responsiveness to customers is improved and inventory costs are restrained. The impact of the number of sizes produced on productivity and costs would not seem, therefore, to advantage or disadvantage any particular plant to a large degree.

The electric and gas models produced by the plants are partitioned by model capacity in Figures 5.2 and 5.3 respectively. Electric output by the Melbourne plant during 1989-90 was limited to the 80 and 125 litre capacities. Since then, this plant has broadened production to include the 160 litre model, of which a substantial number are produced under contract for the Sydney plant.

The mix of electric models produced by the Sydney plant was weighted towards both large (250 to 400 litre) and small (51 litre) models, whereas that produced by the U.S. plant was predominantly in the intermediate sizes (80 to 160 litres). The 28 per cent (by number) share of production at the Sydney plant contributed by the small,

Chapter 5

Relative performance of the Australian producers

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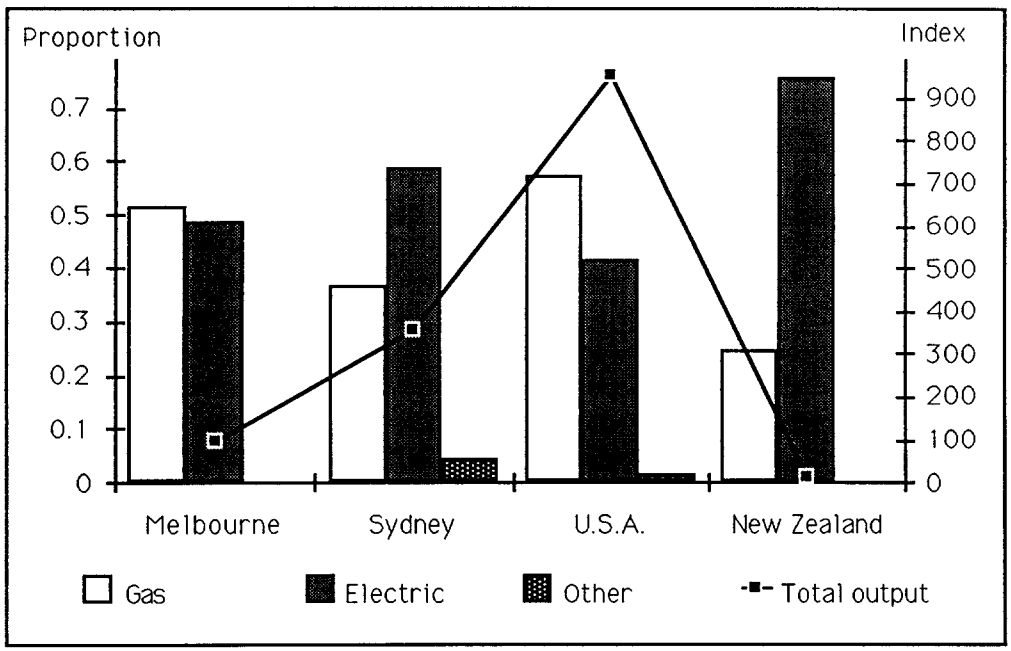

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The composition of output between gas, electric and other models is shown in Figure 5.1. Output by the Melbourne plant was evenly balanced between electric and gas units. However, many of its electric units are produced under contract for the Sydney plant and sold under that plant's 'Rheem' brand name. This process of production sharing began in 1989, when industrial action disrupted activity at the Sydney plant. Competition from Rheem, then a separate company, had driven Vulcan from the electric market in the early 1980s.

As a consequence, most units produced and sold by the Melbourne plant were powered by gas. This outcome also reflects the characteristics of its major markets in Victoria and Western Australia. Around 98 per cent of new homes in Victoria are connected to gas mains. In Western Australia, there is a favourable market for the high efficiency gas units produced by Vulcan, reflecting the comparatively high cost of energy to domestic consumers in that State.

The output mix of the Sydney plant is broadly typical of demand in New South Wales. A small number of its electric (160 to 315 litre capacities) and gas (standard efficiency) models were produced under contract for the Melbourne plant and sold under the Melbourne plant's 'Vulcan' brand name. The sale, as Vulcan product, of items produced by Rheem enabled Vulcan to supply its customers with a broader range of products. The producers considered that this process results in additional competition between the marketing areas of the two companies, an outcome viewed favourably by the energy authorities in New South Wales and Victoria. The Sydney plant also produced some 'other' units. These models are mainly gas and electric units for heavy duty use in establishments such as motels and hotels, but also include a small number of solar-powered units.

Electric units are even more dominant in the N.Z. market than in Australia, reflecting the limited availability of gas, particular in the South Island. In contrast, gas units have the highest share of production by the U.S. plant. The price and availability of gas in the U.S. market are significant factors contributing to this outcome. The 'other' units produced by the U.S. plant were mainly tanks sold to several other manufacturers, plus a small proportion of solar-powered units.

The degree of product differentiation was considerably greater at the U.S. plant than in Australia. Bradford-White produced some 300 gas models and almost as many electric models during 1989. By comparison, the Sydney plant produced only ten electric and ten gas models and the Melbourne plant manufactured just three gas and two electric models during 1989-90. In part, the U.S. plant produced a large number of models because it was in the process of introducing new, better insulated models which are required by Federal energy standards. As models based on previous Federal regulations are discontinued, the degree of product differentiation at the U.S. plant will diminish. Other factors associated with the large number of U.S. models include differentiation between models produced for retail sale and the wholesale trade, and production of a range of models for the mobile home market.

Other things equal, the greater the number of models produced by a plant the more likely it is that there will be some efficiency penalties, and therefore increased unit costs, due to shorter production runs. This is especially so in water heater production if a change of model also involves a change in tank size, or more specifically, tank diameter or length.

The small, Melbourne and N.Z. plants produced the fewest number of tank sizes (Table 5.1). The two electric sizes produced by the Melbourne plant during 1989-90 had the advantage that they involved only a single tank diameter, which reduced the costs involved in time lost due to model changes. The larger Sydney and U.S. plants were involved in the production of a greater number of tank sizes, although these numbers increased by less than the increase in total output relative to that of the Melbourne plant (Figure 5.1).

Table 5.1 Number of sizes produced

Location	Name	Number of sizes produced	
		Gas	Electric
Melbourne	Vulcan	3	2
Sydney	Rheem	5	8
U.S.A.	Bradford-White	5	13
N.Z.	Rheem	2	3

Source : BIE calculations based on data provided by the plants.

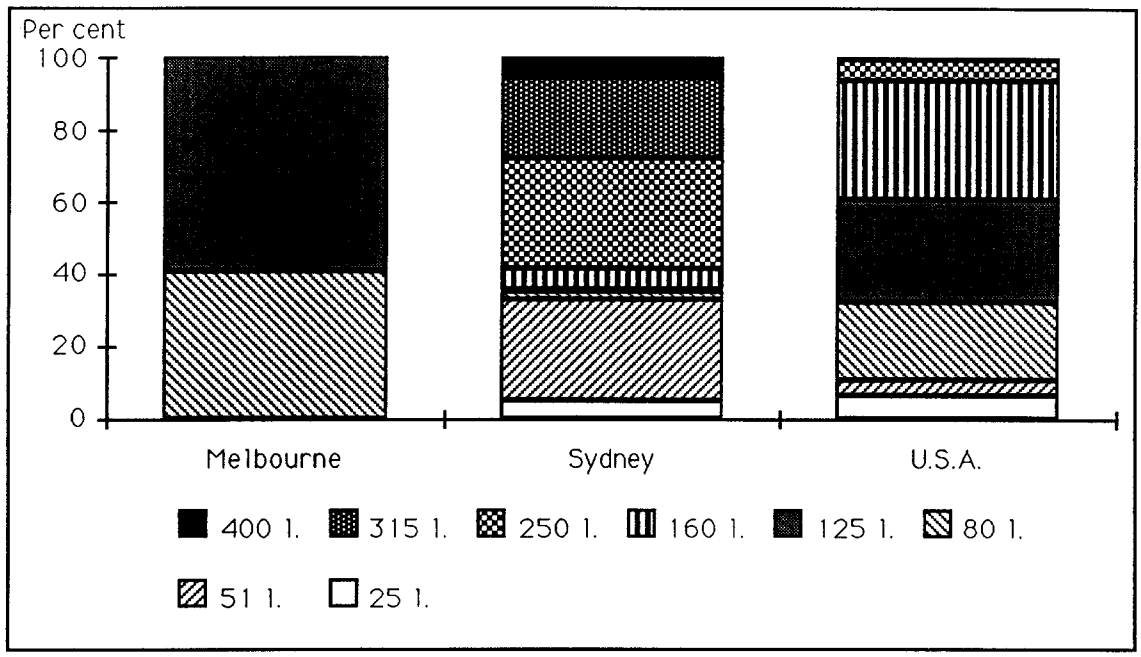
Note : The data for the U.S. plant pertain to the calendar year 1989. The squat and standard height electric models produced by the U.S. plant are counted as separate capacities in Table 5.1, because they involve tanks of different diameters and lengths. The number of gas sizes produced by the Sydney plant includes two heavy duty models. Although the inner cylinder size is common, the gas water heaters produced by the Sydney plant for location inside or outside the home have outer jackets that are significantly different in their design and construction. This factor adds to the degree of product differentiation at the Sydney plant.

Thus, it might seem that the larger plants on average were advantaged by longer production runs of particular sizes. In fact, all plants are moving to shorter production runs so that their responsiveness to customers is improved and inventory costs are restrained. The impact of the number of sizes produced on productivity and costs would not seem, therefore, to advantage or disadvantage any particular plant to a large degree.

The electric and gas models produced by the plants are partitioned by model capacity in Figures 5.2 and 5.3 respectively. Electric output by the Melbourne plant during 1989-90 was limited to the 80 and 125 litre capacities. Since then, this plant has broadened production to include the 160 litre model, of which a substantial number are produced under contract for the Sydney plant.

The mix of electric models produced by the Sydney plant was weighted towards both large (250 to 400 litre) and small (51 litre) models, whereas that produced by the U.S. plant was predominantly in the intermediate sizes (80 to 160 litres). The 28 per cent (by number) share of production at the Sydney plant contributed by the small,

Figure 5.2 Electric output classified by capacity



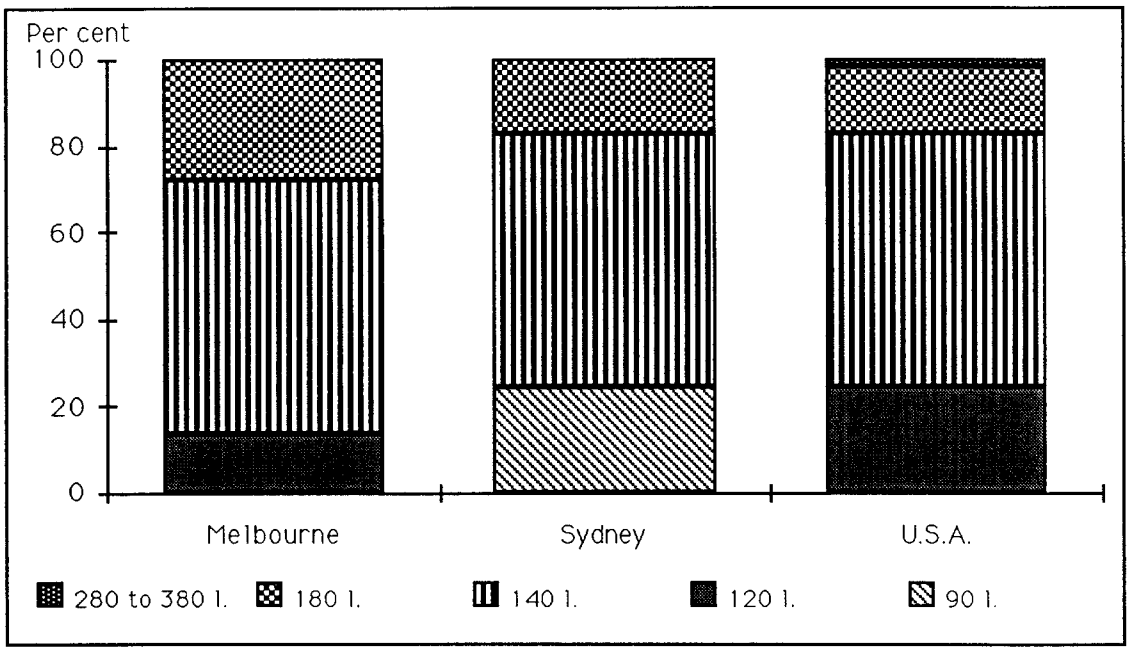
Source : BIE calculations based on data provided by the plants.

Note : The data are by number, not value. Data were unavailable for the N.Z. plant. Data for the U.S. 6, 12, 20, 30, 40, 50, 65 and 80 to 120 gallon models are shown here in the 25, 51, 80, 80, 125, 160, 250 and 250 litre categories respectively. A U.S. gallon is 3.785 litres. The U.S. models are sized on the basis of capacity, whereas the amount of hot water that can be delivered (90 per cent of capacity) is used in Australia. This factor is taken into account in the allocation of U.S. models to capacity classes. The data for the U.S. plant pertain to the calendar year 1989.

51 litre model reflects substantial demand for 'under the sink' units that are used primarily in home units and caravans.

The outcome for the 250 to 400 litre classes produced by the Sydney plant is due partly to demand from households with multiple bathrooms, and partly to the rules in Australia that govern the provision of electricity for water heaters at off-peak prices. The basic off-peak rules require electric models to have a capacity of 250 litres or more. The 'new age half price' rules for twin heating element models require a capacity that depends on the number of bedrooms/studies in a residence. For example, a three bedroom/one study residence is typically required to install a 400 litre twin element electric model under the latter provisions. Electricity used to

Figure 5.3 Gas output classified by capacity



Source : BIE calculations based on data provided by the plants.

Note : The data are by number, not value. Data were unavailable for the N.Z. plant. Data for the U.S. 30, 40, 50 and 75 to 100 gallon models are shown here in the 120, 140, 180 and 280 to 380 litre categories respectively. A U.S. gallon is 3.785 litres. The data for the U.S. plant pertain to the calendar year 1989.

power such a water heater is supplied by the electricity authority at half the standard domestic price. Such pricing provisions are not common in the U.S. market.

The distributions by capacity of the gas models produced by the Melbourne, U.S. and Sydney plants in 1989-90 are quite similar (Figure 5.3). The main difference is the production by Sydney of a 90 litre model instead of the 120 litre models supplied by the Melbourne and U.S. plants.

It should be noted that there are other aspects of product diversity in addition to those of power source and capacity. For example, the Sydney plant manufactured both standard (some of which were produced under contract for the Melbourne plant) and high efficiency gas units, whereas the Melbourne plant manufactured only a high efficiency gas model, of different design to the Sydney units. Additional

product diversity reflects regional requirements. Relevant aspects include special pressure and temperature relief valves that are not clogged by the 'hard' water in South Australia.

The standard gas units produced by the Sydney plant were divided into those for location either inside or outside the home, whereas the Melbourne gas units were for location outside only. The inside product is largely for the replacement market, as new homes are designed generally with the water heater located outside the residence, thereby eliminating the requirement for a water heater gas flue inside the house. The gas models produced in the U.S. are largely for the inside market. This reflects the harsher weather and customary location in basements of water heaters and heating furnaces, in much of the market served by the U.S. plant.

5.2.3 Quality

Quality problems with final output during 1989-90 were at a similar, low level at each of the plants, as shown by the data on the ratio of warranty cost to production cost (Figure 5.4). This outcome is consistent with the focus on quality at each of the plants[1], and the broad similarities between their quality control procedures (Section 2.4).

The second variable depicted in Figure 5.4 is the ratio of waste cost to the cost of production. This indicator is somewhat higher for the larger (U.S. and Sydney) than for the smaller (Melbourne and N.Z.) plants. One factor here is that the larger plants manufacture a higher proportion of their inputs. It is to be expected therefore that their waste proportions overall would be higher than those of the Melbourne and N.Z. plants, which contract out operations such as the cutting to size of the steel used to fabricate the inner water tank (Section 2.3). However, the level of waste at the Sydney plant was increased by the low quality of the hot rolled steel with which it was supplied during 1989-90 (Section 5.4.1).

5.2.4 Sales

The export propensity of the plants is shown in Figure 5.5. The data for the Australian plants are consistent with the impression gained from industry data (Section 2.2) that the water heater industry in Australia currently has low international tradability.

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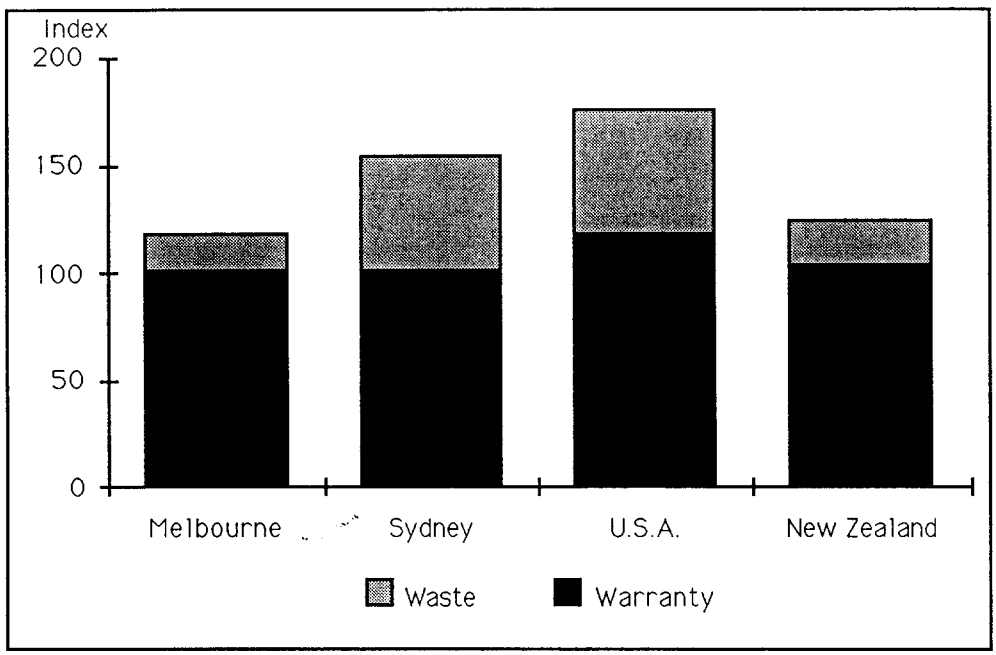
1 Since the study, the Sydney plant has been successful in achieving accreditation as a 'Quality Endorsed Company' to Australian Standard 3901, Quality systems for design/development, production, installation and servicing. The plant's comprehensive quality program has resulted in reductions in re-work and a reduction in warranty costs of some 25 per cent. The Melbourne plant is seeking similar accreditation.

Figure 5.4 Ratios of warranty and waste cost to the cost of production



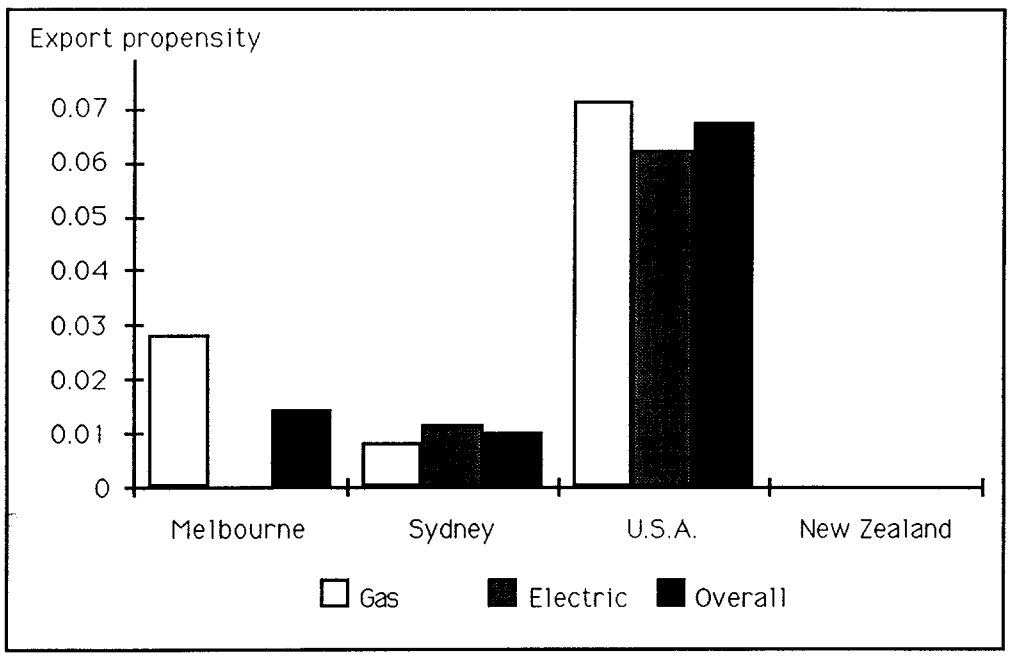
Source : BIE calculations based on data provided by the plants.

Note : The data are indexed relative to the warranty ratio of the Melbourne plant. The denominator of the ratios is the value of output, at standard cost. The data for the U.S. plant pertain to the calendar year 1989. The data were compiled by the Sydney plant according to the method of calculation used by the U.S. plant.

Most of the exports by the Melbourne and Sydney plants were to N.Z. The gas models exported by the Melbourne plant are distributed in N.Z. by an associated company, and are sold in competition with those produced by the N.Z. (Rheem) plant. The high efficiency gas models and the large, 315 litre electric model exported to N.Z. by the Sydney plant supplement the range produced by its small, sister plant in Auckland.

The N.Z. plant did not export domestic water heaters during 1989-90. Its former markets in nearby islands and South East Asia are now supplied from Sydney, which also exports to the Middle East. The export propensity of the U.S. plant in 1989 was considerably higher than those of the other plants. Canada, the Far East and Europe were important export markets for the U.S. plant, with Canada and the Far East being the major markets for gas and electric models respectively.

Figure 5.5 Export propensities



Source : BIE calculations based on data provided by the plants.

Note : The export propensities are calculated as the ratio of the number of units exported in 1989-90 to the number of units sold that were produced by the plant. The data for the U.S. plant pertain to the calendar year 1989.

The managements of all plants are keen to improve their export propensities and profits, through improvements to product quality, cost and marketing. Such improvements can also improve their positions in their home markets, particularly in the U.S. where competition between the five major firms is intense.

Imports traditionally have comprised an insignificant proportion of the Australian or N.Z. markets, due mainly to significant transport costs for water heaters and, to a lesser extent, to product performance regulations that operate to a degree as a non-tariff barrier to trade. The management of the Australian and N.Z. plants consider that the importance of imports is likely to increase in the future. Significant influences in this regard include the existence of excess production capacity in the U.S., the acquisition of U.S. production facilities by the Australian parent company, SABH Ltd, and reform of shipping and waterfront inefficiencies in N.Z. and Australia.

Until recently, waterfront activity in Australia was stifled by restrictive and inefficient work practices which reduced productivity.[2] Despite reform in this area, other impediments to trade remain. Trans-Tasman shipping routes continue to be reserved for Australian and N.Z. carriers by an agreement between Australian (the Waterside Workers' Federation and the Seamen's Union) and N.Z. (the Waterside Workers' Union and the Seafarers' Union) trade unions. Following calls by the N.Z. Government for a review of trans-Tasman shipping, the unions announced in June 1991 that they would continue to fight proposals to open the Tasman Sea to international shipping (Knight-Ridder 1991). Other international liner shipping is predominantly controlled by cartels of shipping operators, which have considerable influence in the control of prices and route schedules and which have been exempted from certain provisions of the Australian Trade Practices Act (BIE 1990d).

5.3 Labour input

It is to be expected that the quantity and quality of labour employed in the production process would have an important impact on the productivity and average costs of production at each plant. The quantity of labour can be measured directly, and forms the basis of this section. The qualitative aspects of the labour force are arguably at least as important as the quantitative aspects, although their influence is more difficult to capture. Chapters 3 and 4, especially the discussion of industrial relations at the plant level, provide qualitative background to the discussion presented below.

5.3.1 Labour mix

For the purpose of exposition, labour has been divided into four categories: direct, indirect, administration and management. As the name suggests, direct production labour consists of employees who fabricate and assemble water heaters. This category includes welders, machine operators and those employees engaged in fitting components. Indirect labour consists of foremen, maintenance workers, quality control and stores; whereas administration employees consist mainly of secretarial, purchasing and production planning personnel.

To ensure comparability between the water heater plants, management and administrative personnel at Melbourne and Sydney have been limited to those whose duties relate only to water heater manufacture. In some instances this entailed dividing labour between water heaters and other aspects of production. Additional details on the procedures adopted are listed in the note to Figure 5.6.

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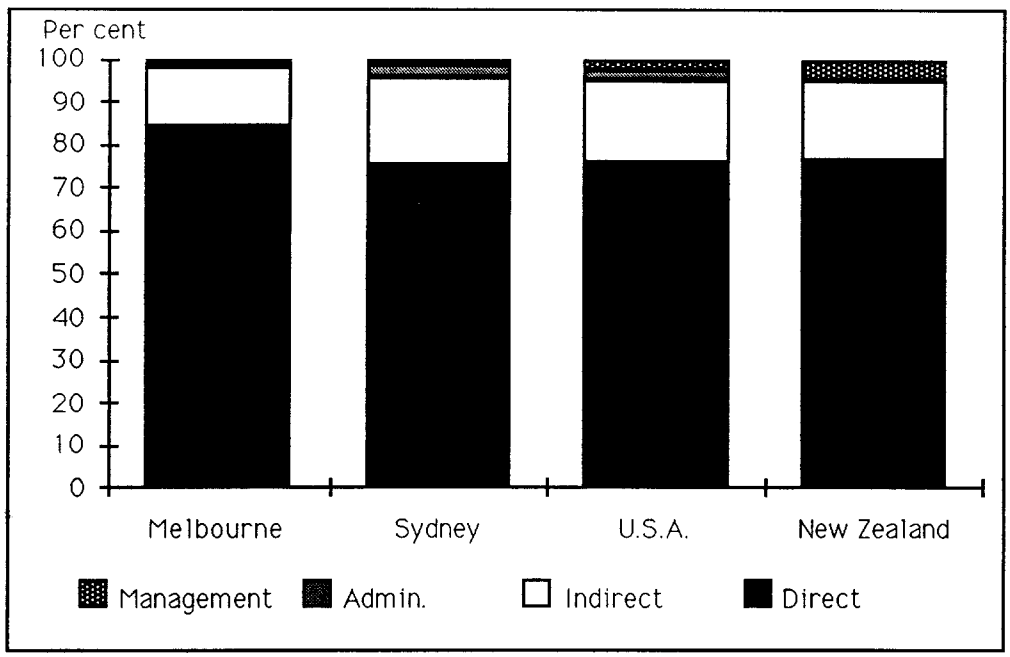
2 After two years of negotiations, the last of the waterfront agreements between employers and unions was reached in October 1991. The agreements establish new work practices and manning levels, and end the national labour pooling arrangements (Gray 1991).

Figure 5.6 Average total employment, by employee category



Source : BIE calculations based on data provided by the plants.

Note : For comparability between countries, the data are adjusted as follows. The Melbourne data are based on an average of the number of employees each month, weighted by the number of work days in each month. The administration category for Melbourne includes 0.1 secretaries, 0.2 production planners and one purchasing officer. The Sydney and U.S. data are based on simple averages of the number of employees at the end of each quarter. This procedure was adopted because of the stability of employee numbers at these plants relative to the Melbourne plant. The data for the N.Z. plant are based on employee numbers in June 1990.

The direct category for the U.S. includes labour bank employees. The indirect category includes employees who report to the quality assurance manager. It excludes those who report to the director of engineering; the manager of electronic data systems; the distribution, traffic and industrial relations managers and the financial controller. The managerial category excludes the corresponding managers, the Vice President of engineering and the General Manager.

The number of hours worked by temporary and part-time employees are converted to full-time equivalent employees by dividing by the product of eight hours per day and 219 days per year (for the Sydney plant) and 240 days per year (for the U.S. plant). The data for the U.S. plant pertain to the calendar year 1989.

It is evident from Figure 5.6 that the Melbourne plant had the highest proportion of direct labour (84 per cent compared to around 75 per cent in the other plants) and the lowest proportion of indirect labour (14 per cent compared to around 20 per cent in the other plants).

This difference between Melbourne and the other plants partly reflects the organisation of functions at Vulcan's Melbourne complex. For example, responsibility for quality control in water heater manufacture there has largely been devolved to production workers (Section 2.4). In contrast, a substantial proportion of workers in the indirect category at the Sydney and U.S. plants perform much of the quality control function. An additional factor is the relatively high proportion of direct production workers involved in the manufacture of parts for, and assembly of, the inner 'skirt' associated with the Vulcan high efficiency gas water heaters.[3] The latter aspect could change in future with the planned development of a less complex gas model with similar efficiency.

The labour force composition by sex varies substantially between the plants (Figure 5.7). At around 23 per cent, the proportion of females in non-managerial staff at the Melbourne plant is similar to the average figure (26 per cent) for Australian manufacturing as a whole (Callus *et al.* 1991 p. 29). The proportion of females at the U.S. plant (around 15 per cent) was appreciably below that at the Melbourne plant, but well above the very low levels found at the Sydney (about 3 per cent) and N.Z. (nil) plants.

A variety of reasons were given for the outcomes in Sydney and N.Z. In Sydney, these included the preconceived attitude of workers that females undertaking such work were the exception rather than the norm, which has led females employed there to resign and few females to apply. An associated factor until the mid-1980s was the rules imposed by employees, which meant that the career path of females was limited to levels below First Class Welder or First Class Sheet Metal Worker. The 'boisterous' nature of male employees was considered to be associated with the lack of female applicants for positions at the N.Z. plant.

A different culture was evident amongst employees at the U.S. and Melbourne plants. The long-standing policy there is for male and female applicants and employees to receive equal opportunities. Nevertheless, the majority of females at the U.S. plant were employed in final assembly, where they undertook work that was less demanding physically in a cleaner, quieter environment for only $US0.40 per hour less pay. However, the lack of female applicants for vacant foremen positions, and the fact that just one female has become a welder, one of the highest

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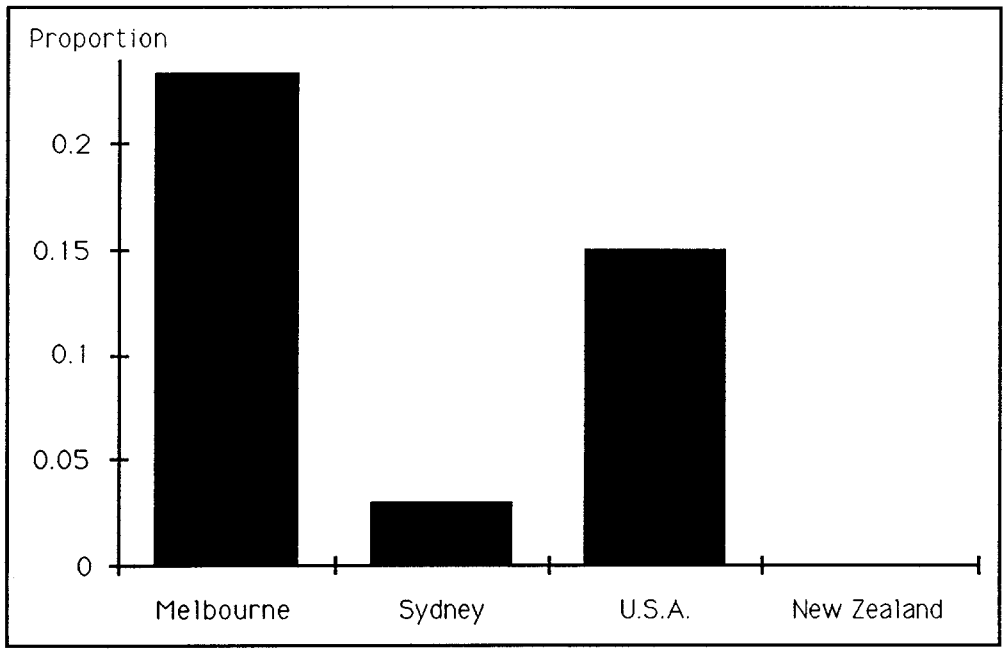
3 The 'skirt' is a complex metal assembly surrounding the inner water tank that provides a lengthy path through which exhaust gases pass before being vented into the atmosphere. The design results in additional energy transfer to the water tank and increases thermal efficiency.

Figure 5.7 Proportion of females in permanent non-managerial staff



Source : BIE calculations based on data provided by the plants.

Note : The data for the U.S. plant pertain to the calendar year 1989.

paid levels in direct production[4], seems to suggest that preconceived notions of male roles still exist at the plant.

Part of the explanation for the relatively high proportion of female employees at the Melbourne plant may be improved job opportunities for females in the local labour market, due to a substantial period of tightness in that market. Other factors that could have influenced the outcome include the dominant position of the ASE union relative to the AMWU in that plant (Figure 3.1) and the positive role played by the ASE's female shop stewards in Vulcan's Melbourne complex.

Managers and workers at the Melbourne plant considered that its female workers were as productive as the males, although the females were generally employed in

4 Employees at the Australian and N.Z. plants expressed considerable surprise on being shown a photograph of this employee undertaking her work (see the cover of this report). Until then, many seemed to consider that such tasks were undertaken only by males, by definition.

assembly tasks. State regulations that limit the weight females may lift at work restricted their employment in the tank fabrication area during 1990. The range of opportunities at the Melbourne plant open to females has broadened since then, as further mechanisation of the tank fabrication process eliminated the lifting previously required in this area.

5.3.2 Labour hours

Labour hours in each of the countries are determined by local employment laws and industrial relations institutions (Chapter 3). These conditions are reflected in the number of working days, number of shifts and length of the working week (Figure 5.8). Another influence on labour hours is the corporate culture of each plant which is, to some degree, conditioned by institutional factors.

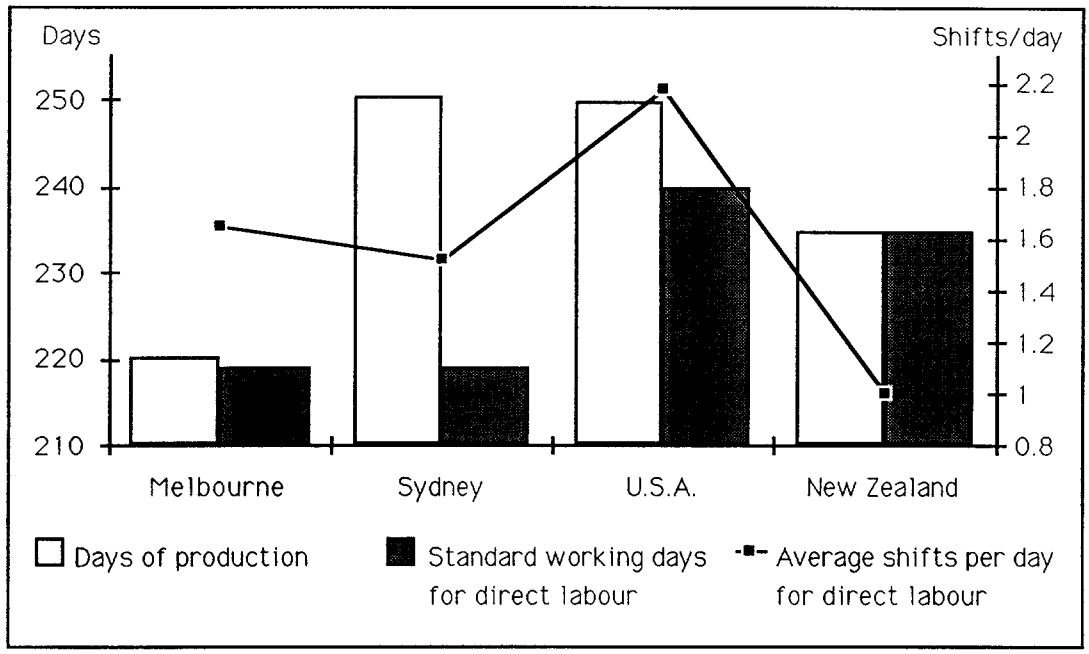
Employees of the Australian plants had the lowest number of standard working days, followed by those of the N.Z. and U.S. plants. The number of standard working days is the number of days production employees worked during 1989-90, excluding weekends (104 days), public holidays, annual leave and rostered days off (RDOs). The RDOs arise in the Australian plants because the award shift length of 7.6 hours (corresponding to a working week of thirty-eight hours) is less than the standard shift length actually worked (eight hours per day). The relatively low number of standard working days in the Australian plants is due to the eleven RDOs and the annual leave provisions under the Federal Metal Industry Award (twenty days, versus fifteen in N.Z. and ten in the U.S.).

The number of plant operating days was well above the number of standard working days for the Sydney plant, and to a lesser extent for the U.S. plant. The differences are due to substantial periods of overtime worked at these plants during the year (Figure 5.9).

All plants operated on a standard, five-day working week during 1989-90. The N.Z. plant operated mainly on a single-shift basis, except for the furnace area which worked for only two days per week and the steel pressing area which operated for one week per month. The Melbourne and Sydney plants used single and double shifts in different areas of production, which gave weighted averages of 1.7 and 1.5 shifts per day respectively (Figure 5.8). The capital stock at the U.S. plant was employed more intensively than those of the other plants. It operated for a similar number of days to the Sydney plant, but ran on a mixture of two, 2.5 (half manning on the third shift), and three shifts per day, which gave a weighted average figure of about 2.2 shifts per day.

The usage of overtime at the water heater plants is shown in Figure 5.9. There was a small level of overtime in total hours at the Melbourne plant, due to the relatively high reliability of the plant (Figure 5.15) and general ability to meet orders via

Figure 5.8 Working periods at the plants



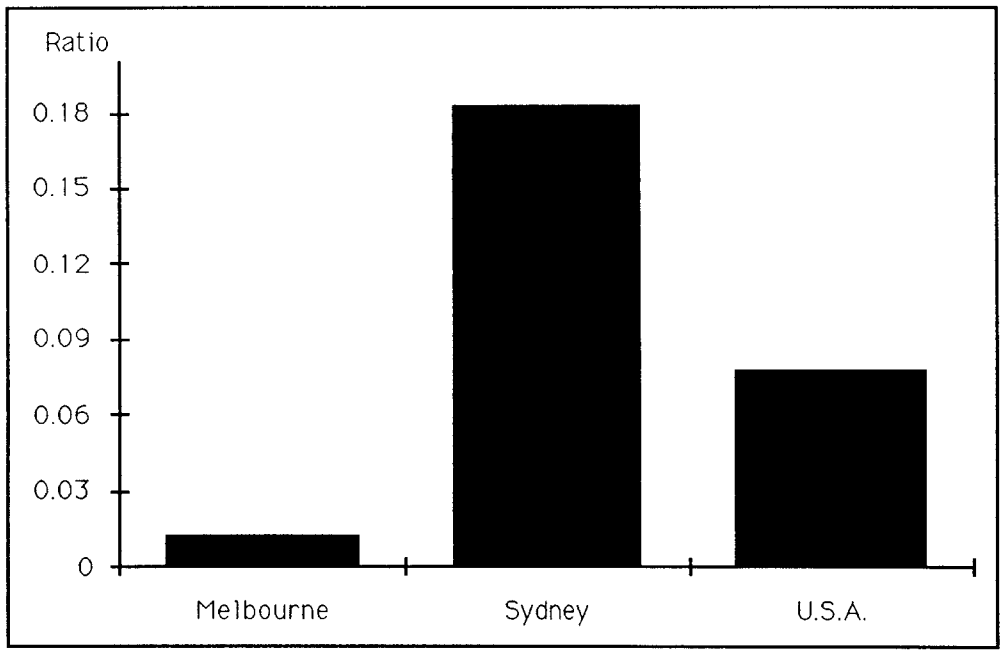
Source : BIE calculations based on data provided by the plants.

Note : The data for the U.S. plant pertain to the calendar year 1989. Those for the other plants pertain to 1989-90. The number of days of production is calculated as the sum of the number of standard days of production and an imputed number of days that takes overtime into account. The latter term is derived as the ratio of the total number of overtime hours worked by direct production workers to the product of the standard shift length, the average number of shifts worked per day, and the average number of direct production workers during the year. Indirect production workers are included in these terms for the U.S. plant, due to limitations in the data. The average number of shifts per day for direct production workers is calculated as the sum of the number of shifts intended to be worked in the various production areas, weighted by the number of employees working in those areas. The impact of factors such as downtime is excluded from these data.

production during standard work periods. Overtime was used much more extensively at the U.S. plant, so as to meet demand for its product.

Overtime by non-managerial employees contributed about 18 per cent of total paid hours at the Sydney plant, more than twice the level at the U.S. plant. This outcome reflected the combined effects of restrictive work practices, such as poor compliance with the hours of work specified in the award and sickness/absenteeism

Figure 5.9 Ratio of overtime hours to paid hours, non-managerial employees



Source : BIE calculations based on data provided by the plants.

Note : The data for the U.S. plant pertain to the calendar year 1989. Data were unavailable for the N.Z. plant.

(Figures 5.10 and 5.11), and a comparatively high level of machine breakdowns at that plant (Figure 5.15).

The stipulations for working overtime are similar in the U.S., Australian and N.Z. plants. In Australia, penalty rates of 150 per cent of the normal rate apply during the first three hours if the overtime is worked between Monday and Saturday inclusive. The rate increases to 200 per cent after three hours. The 200 per cent rate applies also on Sundays and public holidays. Workers in N.Z. receive penalty rates of 150 per cent for the first three hours and 200 per cent thereafter. Hours worked after noon on Saturday are paid at the 200 per cent rate. At the U.S. plant, the penalty rate is 150 per cent for the first two hours during the normal working week and 200 per cent thereafter. However, the 150 per cent rate applies for eight hours on Saturday. The penalty rate for Sundays and public holidays is 200 per cent.

The paid hours by employment categories as a proportion of total paid hours for 1989-90 are shown in Table 5.2. The number of shifts worked, overtime and the

employment level were taken into account in deriving these data. The hours data reflect the number of staff in each category (Figure 5.6) with small adjustments due to the differing contributions by overtime to total hours for each employee category.

Table 5.2 Total paid hours and their components, by employee category

	Employee category				
Plant	Direct	Indirect	Admin.	Management	Total (Index)
Melbourne	0.84	0.14	0.01	0.01	100
Sydney	0.76	0.21	0.02	0.01	409
U.S.	0.75	0.20	0.02	0.03	495
N.Z.	0.76	0.19	0.00	0.05	33

Source : BIE calculations based on data provided by the plants.

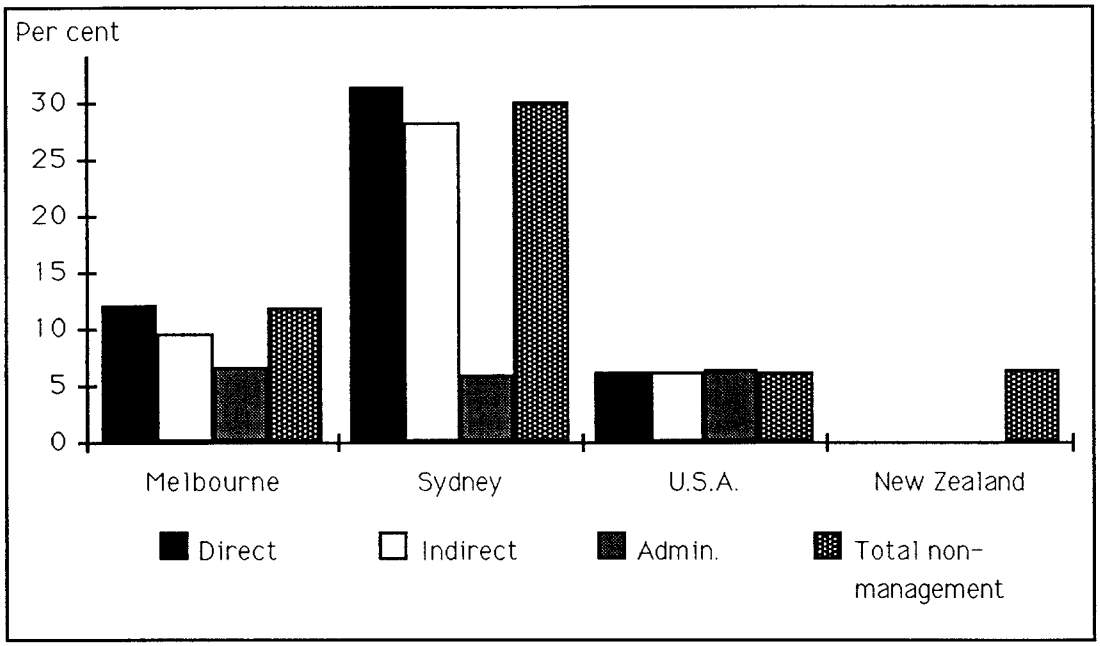
Note : The data for total (standard plus overtime) paid hours are indexed relative to those for the Melbourne plant. The number of standard hours worked at the plants are derived from data on the number of standard working days by multiplying by the product of the average number of employees and the award shift length. This procedure was used due to inconsistencies in the raw data supplied by the plants. The data for the U.S. plant pertain to the calendar year 1989.

5.3.3 Unproductive hours

The level of unproductive hours relative to paid hours is an important indicator of how effectively management is able to utilise the labour potentially available for production. It is also significant in relation to potential productivity improvements, to greater competitiveness and reduced prices to consumers, and to possible trade-offs between labour and management over remuneration and work practices.

The overall level of unproductive hours as a proportion of paid hours for each category of non-managerial employees is shown in Figure 5.10. The U.S. and N.Z. plants had the lowest proportions of unproductive hours overall, at about 6 per cent. However, the data for the N.Z. plant are less precise than, and omit some

Figure 5.10 Ratio of unproductive hours to paid hours, by employee category



Source : BIE calculations based on data provided by the plants.

Note : The data for the Melbourne plant are derived as follows. All employees are assumed to receive two, paid ten-minute refreshment breaks per work day. Time lost due to industrial action is that shown in Figure 4.2. The time spent by administration staff at meetings and the level of paid meal breaks for all employees are set to zero, to ensure consistency with the other plants. Wash periods at each plant are excluded from the analysis.

All employees at the Sydney plant are assumed to receive two, paid refreshment breaks per work day, of fifteen and seven minutes' duration. Time lost due to industrial action in Sydney is that shown in Figure 4.2. Consistent with information provided by workers at the plant, direct and indirect production workers are assumed to take additional time off as follows: five, ten and thirteen minutes per day at morning tea, lunch and afternoon tea respectively; they start work ten minutes late and finish work ten minutes early; and they take two, thirty-minute 'toilet' breaks per day.

Separate data for the direct and indirect categories of production worker are unavailable for the U.S. plant. U.S. employees receive one, paid ten-minute refreshment break per work day. This break is taken near the midpoint of the initial (five-hour) work period, in accord with the Agreement between the firm and the local branch of the union.

Data for injuries and meetings are unavailable for the N.Z. plant. A sickness/absenteeism rate for this plant is calculated on the basis that employees are absent for five work days per year. All employees in N.Z. are assumed to receive two, paid ten-minute refreshment breaks per work day.

components included in, those for the other plants. The proportions of unproductive hours at the Australian plants were much higher - at around 12 per cent for the Melbourne plant and almost 30 per cent for the Sydney plant. These high levels reflect the substantial contributions to unproductive hours by the larger employee categories (the direct and indirect production workers). The proportions of unproductive hours for administrative employees at the Australian plants were similar to that for this category of employees at the U.S. plant (about 6 per cent).

Details on the components of unproductive hours for direct production workers are presented in Figure 5.11. The components and their totals vary considerably among the plants reviewed. The main cause of the very high proportion of unproductive hours at the Sydney plant is the component labelled 'other'. This term picks up what is described by managers at the plant as 'poor timekeeping'. It includes time lost due to employees who routinely start work late, take extended refreshment and meal breaks, 'require' two lengthy 'toilet' breaks per day and stop work early.

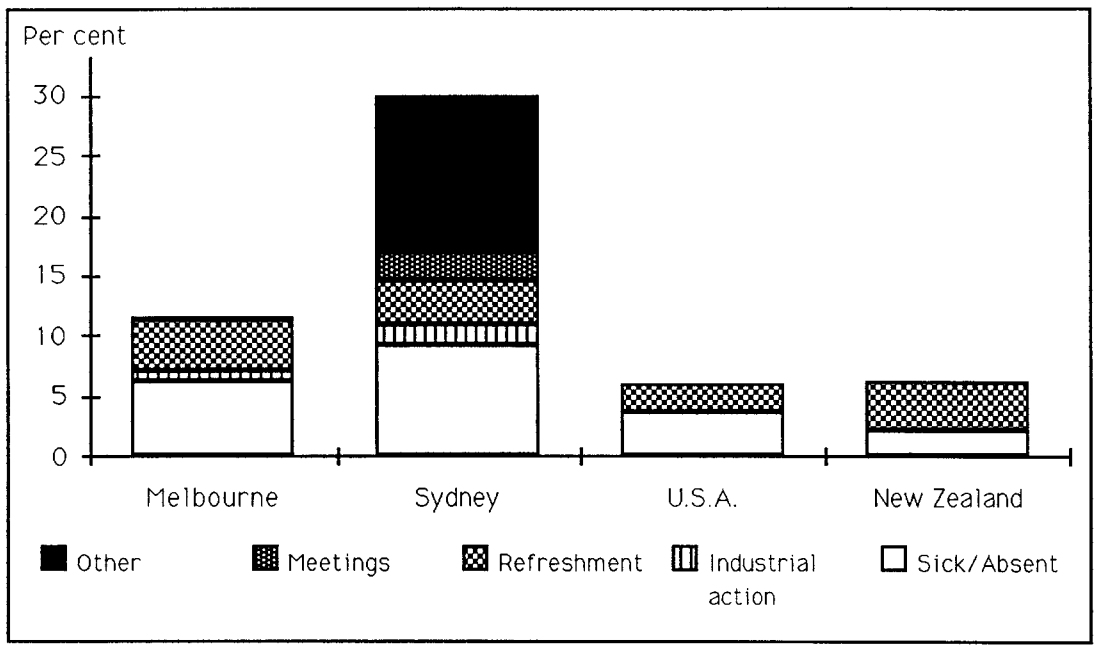
Such practices are, of course, at variance with the awards that specify conditions of employment for the Metal Trades Federation of Unions in Australia. This poor timekeeping arose apparently in past periods of strong demand for the firm's product, and was acquiesced in at the time by management keen to retain the firm's reputation as a reliable supplier. The practice continued until the end of 1990, due to the threat of union industrial action combined with the absence of strong competition from imports in the local product market.

Although sickness/absenteeism rates are a large proportion of total unproductive hours at each of the plants, there is considerable variation in the magnitudes of this component. It increases from about 2 per cent in N.Z. (based on imprecise data) to 4 per cent in the U.S., 6 per cent in Melbourne and more than 9 per cent in Sydney.

There are a multitude of factors that affect absenteeism rates. They have been modelled recently in an economic framework that stresses the cost to individuals (the opportunity cost) of their absence from work (Kenyon and Dawkins 1989). That is, absence from employment in Australia was modelled in terms of the individuals' hourly wages, standard hours of work, the penalties imposed for absenteeism, non-labour income and overtime hours. The authors also examined whether absenteeism was related to the industrial relations environment at a given workplace, which the analysis presented in Section 3.3.4 and Chapter 4 suggests is a significant factor for the Sydney plant.

An important result in the context of our study is the conclusion by Kenyon and Dawkins (1989) that a deteriorating industrial relations environment, and the associated decrease in job satisfaction, increases absenteeism. Moreover, the pattern appears to be that periods characterised by high levels of strike activity were likely to be preceded by periods with increased absenteeism. Other significant influences on absenteeism were hourly earnings, penalties and overtime (negatively related) and standard hours and paid sick leave (positively related).

Figure 5.11 Ratio of unproductive hours to paid hours for direct production workers, by component



Source : BIE calculations based on data provided by the plants.

Note : The data for the U.S. plant pertain to the calendar year 1989. The sickness/absenteeism data include a small contribution from injuries. Additional information on the data shown in this figure is presented in the note to Figure 5.10.

Such results shed some light on the sickness/absenteeism data presented in Figure 5.11. One might expect the absenteeism rate and the level of strike activity (Figure 4.2) to be higher at the Sydney plant than at the Melbourne plant on the basis of the former plant's less positive industrial relations environment (Section 3.3).[5] The effect of the industrial relations environment at the Sydney plant seems to dominate the expected negative effect on absenteeism of overtime (Figure 5.9), and the stereotype of higher absenteeism amongst females due to family commitments and a

5 Kenyon and Dawkins (1989) analysed quarterly data, and found that increased absenteeism preceded increased strike activity by one quarter. As our analysis covers a period of one year, it is plausible to expect annual absenteeism rates to be associated with strike activity in the same year.

lack of child care facilities.[6] Although females are a much higher proportion of the labour force at the Melbourne plant (Figure 5.7), the absenteeism rate is much lower in Melbourne than Sydney.

Management at both plants monitor absenteeism and counsel staff with high levels, with possible disciplinary action at a later time if performance does not improve. However, the better industrial relations environment at the Melbourne plant suggests that the counselling and disciplinary process is likely to be taken more seriously by employees there than by those at the Sydney plant.

Comparing the Melbourne and U.S. plants, one might expect the absenteeism rate to be lower at the U.S. plant due to the latter plant's higher level of overtime (Figure 5.9), higher wages for direct production workers (Figure 5.22), and limited availability of paid sick leave. These factors seem to dominate the expected positive effect on absenteeism of longer standard hours at the U.S. plant. The relatively good performance by the U.S. plant in this area also reflects industrial relations changes initiated since its first Management Consultancy report of 1978 (Section 3.3.1). Before the introduction of these changes, absenteeism had been running at a similar rate to that at the Melbourne plant during 1989-90.

Senior Rheem and SABH management have contrasted the 'supply' of paid sick leave/absenteeism in Australia under the Federal Metal Industry Award with that prevailing at the U.S. plant. In Australia, there is a sick leave entitlement to five paid days in the first year, and eight days in subsequent years, with unused days accumulating indefinitely.

Under the Agreement between the U.S. Bradford-White Corporation and the local branch of the UAW, employees who have completed their probationary period, become ill, and furnish acceptable evidence of such illness, automatically receive sick leave for the duration of the illness. The period of sick leave is limited to thirty days per illness, but can be extended by mutual agreement between the company and union. An insured weekly benefit of $US165 is available for up to twenty-six weeks with medical verification for non-work related accident or illness disabilities. However, employees who are absent from work for two days or less do not receive sick leave, and must give proper notice to the company on the first full day of such absence.

Discussions with employees and managers at the plants suggest that the number of days sick leave taken by many employees in Australia is influenced by the provision

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6 For example, a survey of managers in forty large Australian companies found that the prevailing view was that women would absent themselves to care for sick children and the men would go to the races (Bagwell 1991). The Business Council of Australia (1989a) and Australian Manufacturing Council (1990) recommend changes to structural workplace barriers and human resource and training practices so as to achieve improved employment opportunities for women in manufacturing.

that short periods of sick leave are paid, even without evidence of illness. The quantitative importance of such absenteeism can be considered by comparing in Figure 5.11 the percentages of hours lost due to strikes (0.8 and 1.7 per cent at the Melbourne and Sydney plants respectively) with that lost due to sickness/ absenteeism (6 and 9 per cent respectively). It would seem that the focus on strikes in much commentary on Australia is misplaced, and that the current sick leave provisions in Australia can result in substantial abuse that is a more significant impediment to productivity and competitiveness than is strike action.

The impact of injuries on productive hours is quite small at each of the plants (0.8, 1.6 and 0.3 per cent at the Melbourne, Sydney and U.S. plants respectively). This outcome is consistent with the high priority placed on the health and safety of workers by management at each plant.[7] For example, managers and employees at the Australian plants are involved in regular plant inspections with the aim of reducing the chance of injury in the plants. The causes of any injuries (such as language difficulties, cuts due to sharp metal edges) are analysed, and expenditure is incurred on training and equipment to remedy the situation.

These practices and the formalisation of a rehabilitation policy contributed to a 50 per cent drop in lost time injuries at the Sydney plant between 1988-89 and 1989-90, with a further 25 per cent (on an annual basis) drop to the end of 1990. The rehabilitation policy included an education policy for production workers on lifting and on eye, hand and foot protection; ergonomic surveys and purchase of remedial tooling, components and chairs; and tighter criteria for allowable compensation claims to reduce malingering.

The BIE inspection team did not gain the impression that the differences between the performances of the plants in terms of time lost due to injuries were due to major differences in their inherent safety or work practices. For example, much machinery at the U.S. plant had less guarding than is the case at the Australian plants, but the injury rate was lower at the former plant. More significant factors seem to include the industrial relations environments at the plants and financial incentives to stay away from work if slight injuries are incurred (Reed 1990). The former seems to contribute to the different outcomes at the Australian plants, whereas the latter could influence the outcomes in Australia relative to the U.S.

Johnson and Ondrich (1990) estimated the effects of disability benefits in the U.S. on the probability of returning to work and on the expected duration of work absences. They found that disincentives to return to work existed, even when disability benefits were not conditional on the recipient remaining out of work. Durations of work absences were influenced by the type and severity of injury, level of benefits

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7 The range of plants in Vulcan's Melbourne complex compete in terms of their safety records. At the time of the visit by the BIE inspection team, the water heater plant had the best record of the Vulcan plants, despite the heavy work involved in tank fabrication.

(positively), the physical demands of the jobs for which the worker is qualified (positively), available wages (negatively), and the sex of the worker (shorter absences for men).

5.4 Material inputs

As discussed in Chapter 2, the production of water heaters is a manufacturing process that is intensive in its use of materials. The most significant of the material inputs is steel.

5.4.1 Steel

BHP supplies the Sydney plant with the hot rolled steel from which the inner water tanks are fabricated. The quality of the steel supplied during 1989-90 was considered to be low by managers and the workers who used it in production because of its wavy edges, oil coating and variable specification. The steel needed trimming to remove wavy edges, which required the company to purchase heavy equipment at an additional cost of more than $1m, and resulted in higher costs due to waste material (Figure 5.4). Such problems were not seen directly by the Melbourne plant, because it employed a subcontractor to cut to size the hot rolled steel with which it was supplied.

The U.S. plant has an advantage relative to the Australian plants because managers there can purchase high quality, clean, de-oiled steel that has close tolerances and is trimmed to size. The better quality of the steel meant that the U.S. company could purchase equipment for its trim line at lower cost than that required by the Sydney plant, and the level of waste material was reduced.

Water heater production in the U.S. benefits from a high degree of competition in input markets. For example, there are around six domestic steel producers from which the U.S. company can choose. Moreover, imported steel is readily available. Thus, when Bradford-White was dissatisfied with the quality of the U.S. steel in the past, it was able to source its supplies from abroad until such time as the quality of the domestic product improved. In contrast, there is only one domestic steel producer in Australia. Tariff protection, anti-dumping actions and potential disruptions to supply from industrial activity at ports have not made steel imports a viable alternative for the Australian water heater producers.

Japan supplied quality pre-cut steel to the N.Z. plant. BHP was not used as a supplier due to the price, the quality of its product and the perceived unreliability of supply. The local producer, N.Z. Steel, was not used because it was unable to supply steel in the the 2 mm thickness used for the shell of the inner water tank.

Recent initiatives by BHP Steel are addressing these issues. A change in steel grade to one with a tighter range of chemical properties and a processing change to offer improved flatness have improved steel quality. Monitoring by BHP Steel of international prices confirms that prices in the U.S. are amongst the cheapest in the world, but suggests that Australian prices are broadly comparable with those in N.Z., Korea and Japan.

5.4.2 Other materials

Following the acquisition of the U.S. plant by SABH Ltd, the parent company of the Australian plants, greater information was available to the purchasing areas of the Sydney, Melbourne and N.Z. plants on the potential price and quality of material inputs and the timeliness of deliveries that could be achieved abroad. The plants have been working with local suppliers to improve performance in all these areas.

For example, the Sydney plant has moved from dual to single sources of supply and long term contracts in many cases, with associated benefits to the single supplier. The benefits to the water heater plant are the requirement that suppliers' performances improve towards the goal of 100 per cent acceptable quality, that prices reflect movements in world prices and the suppliers' productivity, and that there be smaller and more frequent deliveries of parts so that inventories can be reduced. Almost all suppliers have improved their performance in these areas. The perceived exception is BHP's performance in, for example, the supply of Colorbond from which the outer jackets of water heaters are fabricated.

The N.Z. plant could readily purchase a range of imported inputs at world qualities. The U.S. plant also had no significant problems with materials, reflecting the greater degree of competition there between suppliers. Consequently, the purchasing section at the U.S. plant was able to take the position that any quality problems with purchased inputs (such as pilot lamps, thermocouples, elements and anodes) were remedied by the supplier, or it lost the business.

5.5 Capital inputs

In addition to materials and labour, the third major input to water heater production is the capital stock. It consists of three main categories: the plant and equipment employed in tank fabrication and assembly, buildings and structures, and inventories.

5.5.1 Plant and equipment

Value, age and operation

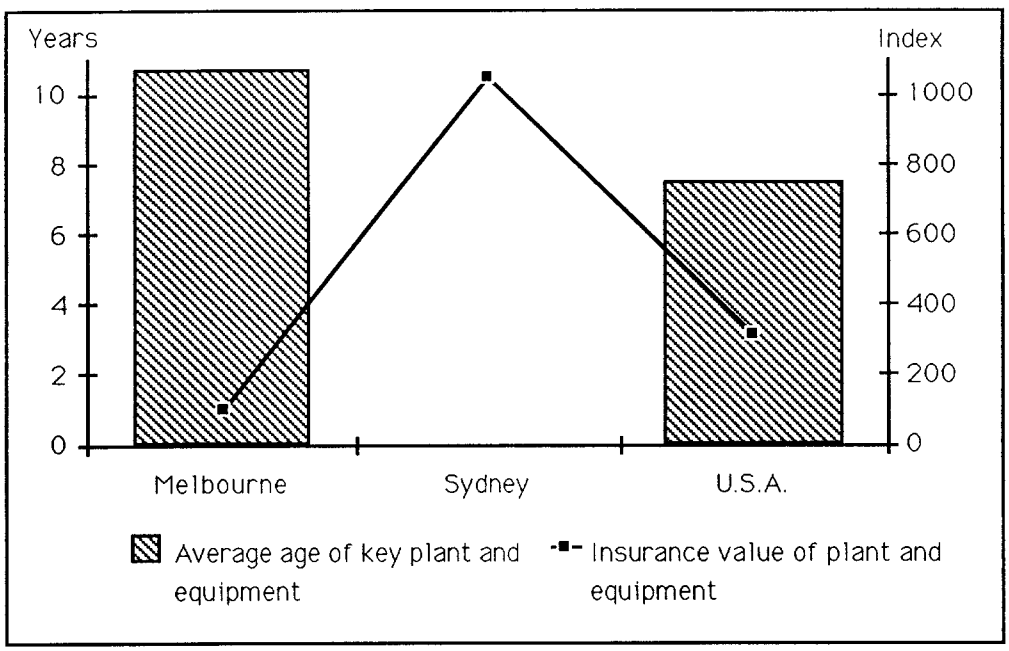
The plant and equipment operated by the Sydney plant had by far the highest insurance value, followed by the larger U.S. and smaller Melbourne plants (Figure 5.12). There are a range of reasons for this outcome. First, the management of the Sydney plant has invested in additional plant and equipment in an attempt to alleviate the adverse effects of restrictive work practices on the rate of production. Thus, the plant is more mechanised and modern than those in the U.S. and Melbourne.

Secondly, as production increased in line with demand during the 1980s, it was decided to produce water heaters on the site in two separate plants, which would specialise in electric and gas models respectively. This approach had the advantage that the costs of production for gas and electric models could be more readily distinguished. However, the two-plant approach did not seem to work well in practice, as labour productivity at the time decreased by 12 per cent despite the additional investment in welding equipment and a furnace. The U.S. plant, which was not owned by SABH at that time, adopted a different approach. It simplified and improved work methods and invested in additional machinery for what was essentially a single plant.

Finally, machinery at the U.S. plant has less guarding than is the case at the Australian plants, and it is therefore less expensive. In Australia, it is argued that machines should be guarded against most, if not all, equipment malfunctions and operator error or carelessness. However, operators working in such an environment tend either to ignore or not notice problems because of the assumption that the machinery will operate in a foolproof fashion. In such cases, they could suffer accidents. The rationale at the U.S. plant is to train operators in all aspects of their machinery, so that they both respect and understand the potential for accidents. The levels of injuries at the plants (0.8, 1.6 and 0.3 per cent of productive hours at the Melbourne, Sydney and U.S. plants respectively) suggest that the less guarded machinery at the U.S. plant could be safer in practice than the more expensive, guarded machinery employed by the Australian plants.

The Melbourne plant had a range of slower and less complex equipment than that employed by the larger U.S. and Sydney plants. This reflects the relatively small scale of its output (Figure 5.1) and continued uncertainty regarding its role as a manufacturer of some electric water heater models for the Sydney plant. The product sharing arrangement began in August 1988 for an initial period of six months, but has continued at relatively high levels for more than three years.

Figure 5.12 Average age and value of plant and equipment



Source : BIE calculations based on data provided by the plants.

Note : The insurance data are indexed relative to the Melbourne plant. The insurance data on plant and equipment either commissioned or disposed of during the year is scaled by the proportion of time for which it was available for use. The data for the U.S. plant are converted to Australian currency using an exchange rate of $US0.769 per $A, the simple average of the quarterly exchange rates for 1989-90. Data were unavailable for the N.Z. plant. Appropriate data on the age of key plant and equipment were unavailable for the Sydney plant.

The average age of key plant and equipment (weighted by their insurance values) at the Melbourne plant was around ten years, some two years above that for the U.S. plant. This weighting gives a more accurate picture of the vintage of capital equipment, because insurance values reflect improvements in old machines as a result of refits and refurbishments. However, the measured difference is probably not significant in this case, given the difference between the proportions (70 and 11 per cent respectively) of the plant and equipment for which ages were available.

Indeed, subsequent investment by the Melbourne plant, such as a robot to undertake dome welding and an Azdorf tank roller and longitudinal welder, would have lowered the average vintage of its plant and equipment by a substantial amount. Data on the age of key plant and equipment at the Sydney plant were unavailable.

However, the BIE inspection team gained the impression that the average vintage of Sydney's plant and equipment was unlikely to be much below that of the Melbourne plant.

Capital utilisation

Capital utilisation is a measure of the extent to which the plant and equipment of a factory is fully employed. As an indicator of capacity utilisation, the total times for which different areas of the plants were operating or on standby have been aggregated to give overall normal operating time and standby time respectively for the year (Figure 5.13). These times are based on the total time in a year potentially available for operation, that is twenty-four hours a day for 365 days.

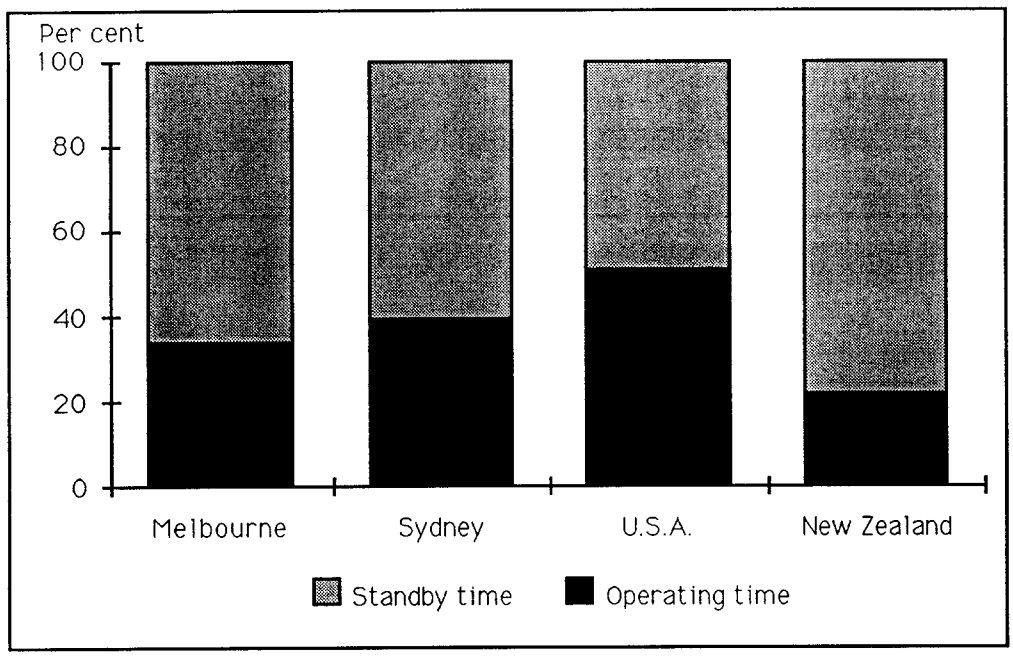
Normal operating time denotes time when the operating department chooses to run the system. It includes uptime (when the system is performing as intended), stoptime (when the system is not productive due to some form of operator intervention), and downtime (time when the system is inoperable due to some form of maintenance). Standby time is when the operating department chooses not to run the system but it is capable of producing (such as during holidays, weekends and rostered days off).

The available data (Figure 5.13) suggest that capacity utilisation was highest at the U.S. plant (50 per cent) followed by the plants in Sydney (39 per cent), Melbourne (33 per cent), and N.Z. (21 per cent). Capacity utilisation at the U.S. plant was enhanced by having the highest number of standard working days for direct production workers, and the highest average number (2.2) of eight-hour shifts per day (Figure 5.8).

The higher level of capacity utilisation at the Sydney plant relative to that in Melbourne is due to the substantial level of overtime worked at considerable cost in the former plant during 1989-90 (Figure 5.9). In normal operation, its operating time would be similar to that in Melbourne, some 17 percentage points below the level achieved by the U.S. plant. The lower capacity utilisation at the Australian plants reflects both the relatively low number of standard working days, due to the shorter working week and longer annual leave in Australia, and the impact of penalty rates for multi-shift work, which seem to encourage firms to invest in additional production capacity rather than to operate on a three-shift basis.

In this context, it is relevant to note that Bradford-White's new plant in Nevada is considering scheduling operations for four days per week (beginning on Tuesdays) with two ten-hour shifts per day. Such arrangements have the advantages that employees do not miss work due to the public holidays that occur on Mondays, start-up time of the plant and enamelling furnace is reduced by operating for twenty hours per day, preventative maintenance can be performed on Mondays and in the four-hour period between work days, and employees can undertake their personal

Figure 5.13 Operating and standby time



Source : BIE calculations based on data provided by the plants.

Note : The data for operating time include actual overtime worked during 1989-90 (1989 for the U.S. plant). They are calculated as the product of the number of days of production, the average number of shifts per day and the length of a standard shift, divided by the product of 365 (days) and twenty-four (hours per day). Additional information on the data is presented in the note to Figure 5.8.

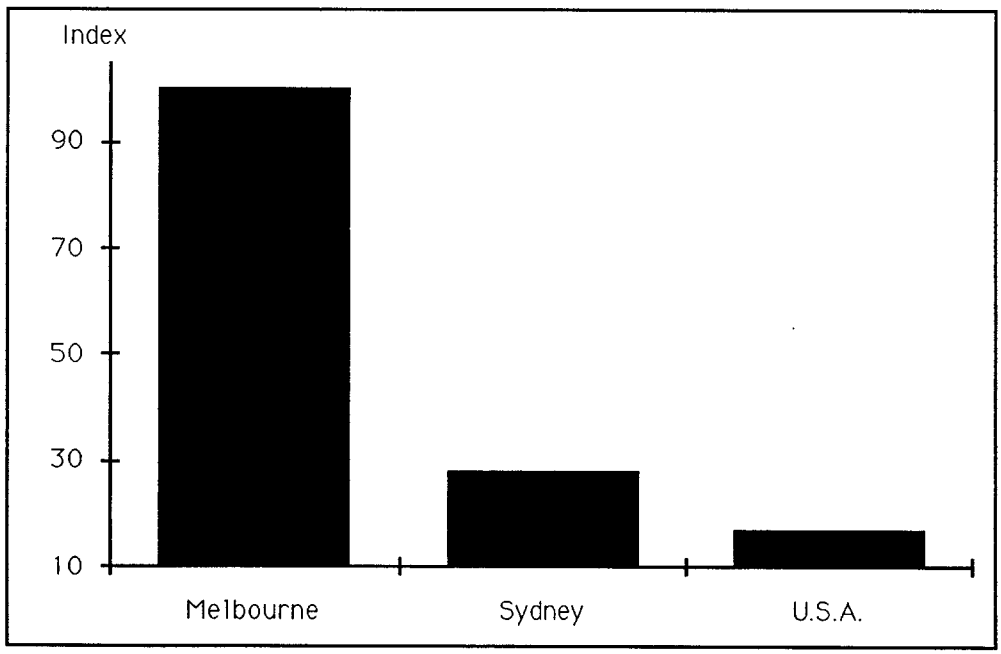
business on Mondays. Such arrangements would enable the operating time of the Nevada plant to be around 45 per cent, similar to that achieved at the existing U.S. plant located in Middleville, Michigan.

Plant maintenance and setting up

An important aspect of the operational flexibility of the plants is their setting up performance. This is the time taken to set up the machinery to produce water heaters of different types. The better the setting up performance, the more quickly the company can respond to market demand for different water heaters, and the smaller is the required inventory of finished product (Carlsson 1989).

The setting up performance of the plants is considered here in terms of the ratio of set up time to output (Figure 5.14). The performance of the large U.S. plant led that of the Sydney plant by a substantial margin. In turn, the Sydney plant was well ahead of the performance achieved by the small Melbourne plant. These outcomes reflect the characteristics of the equipment in use at the plants, work practices adopted by and the skills of their labour forces, the responsiveness demanded by their customers, and the cost of setting up relative to the cost of inventories.

Figure 5.14 Ratio of setting up time to output



Source : BIE calculations based on data provided by the plants.

Note : The data are indexed relative to the Melbourne plant. They are calculated as the sum of total, weekly setting up times in the various areas of production, and converted to an annual basis using plant operating times (Figure 5.13). The denominator of the data is the level of output, expressed in terms of the 125 litre electric standard water heater. Additional information on the methodology for the calculation of weighted output levels is presented in the note to Figure 5.18. The data for the U.S. plant pertain to the calendar year 1989. Data were unavailable for the N.Z. plant.

The relatively poor setting up performance of the Melbourne plant seems to be caused by the limitations of its coil cut up and blanking area. This machinery is recognised by management as a limitation and it is targetted for replacement by a

new, high speed, automatic cut to length line. Such investment would be expected to improve the setting up performance of the Melbourne plant to a substantial degree.

Management at the Sydney plant has worked hard to improve the plant's setting up performance. Process engineers are now responsible to the Production Manager for a particular area of production, and work with production employees to improve setting up times. For example, the setting up time for a machine that produces cylinder domes has been reduced in recent years by around 60 per cent, due to better machine layout and additional training for its operators. As an additional benefit, such efforts have improved the output rate by 100 per cent relative to that achieved five years ago. Nevertheless, the setting up performance of the Sydney plant still lags that achieved abroad, particularly when the less automated nature of much equipment at the U.S. plant is taken into account.

The time and expenditure on maintenance relative to the output produced by the plants are shown in Figure 5.15. The time-based data should be regarded as indicative, because information on hours worked by contract maintenance personnel was not available for all plants. Nevertheless, both maintenance variables indicate that the performance of the Melbourne and U.S. plants was a great deal better than that of the Sydney plant.

The poor maintenance performance of the Sydney plant during 1989-90 is due largely to plant breakdowns, particularly in tank fabrication. Underlying factors in this regard include an apparent lack of commitment by maintenance personnel to preventative maintenance and to their 'customers', which are the production areas, and to slow progress on award restructuring and overcoming demarcation issues between fitters, electricians and production workers. Such problems, and a lack of general training for maintenance workers, were evident at the U.S. plant also. These issues are addressed in detail in Section 4.2.5.

The overall maintenance and setting up performance of the plants is summarised in Figure 5.15. These data suggest that the performance of the Melbourne and U.S. plants was a great deal better than the Sydney plant. This outcome is due to the large influence of maintenance hours, as discussed above.

5.5.2 Buildings and structures

The buildings and structures employed by the Sydney operation had the highest insurance value, followed by those of the Melbourne and U.S. plants (Figure 5.16). The areas of the U.S. and Sydney plants were around three and two-and-a-half times respectively that of the Melbourne plant. The low insurance value per unit of area of the U.S. operation's buildings seems to be due to its location in a small town in the Michigan countryside.

Figure 5.15 Ratios of maintenance and setting up effort to output

Source : BIE calculations based on data provided by the plants.

Note : The data are indexed relative to the Melbourne plant. The maintenance and setting up hours data are indexed relative to the maintenance performance of the Melbourne plant. The data for the U.S. plant pertain to the calendar year 1989. Data were unavailable for the N.Z. plant.

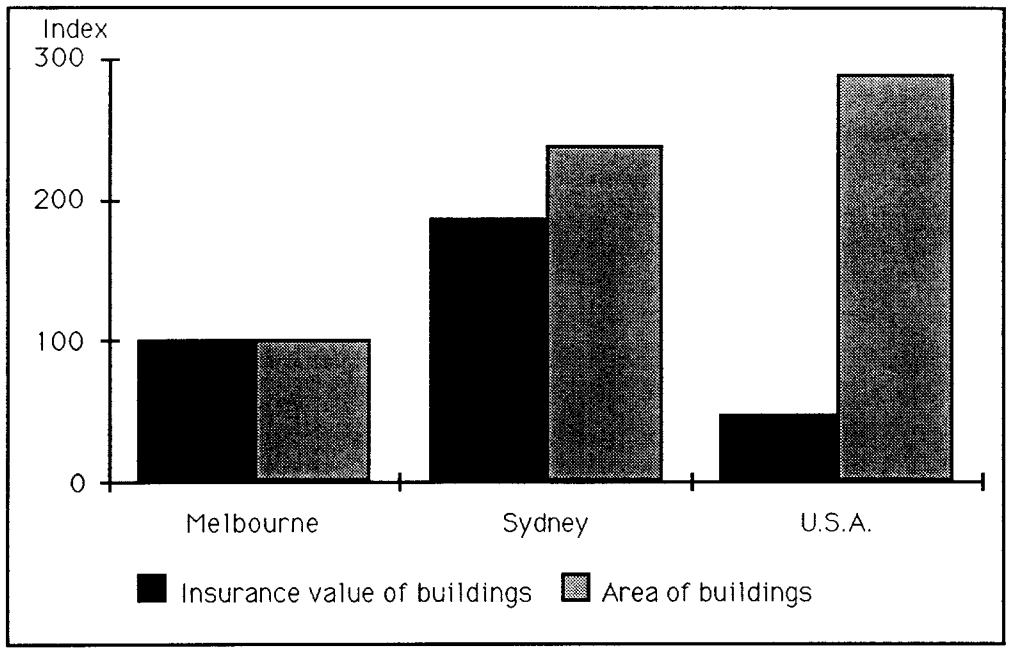
Water heater manufacture in each building is on a single level, which reduces handling costs and the likelihood of product damage while it is being moved to storage or shipping.

5.5.3 Inventories

The level of inventories held in the water heater plants (Figure 5.17) reflects, *inter alia*, the extent of seasonal variation in demand, product mix and its effect on setting up time, and the cost of holding inventories. The latter factor is, in turn, affected by rates of corporate taxation and inflation (Section 5.7.3).

The Melbourne plant had the lowest reported number of days of work in progress and materials inventories, followed by the U.S. and Sydney plants. The good

Figure 5.16 Value and area of buildings and structures



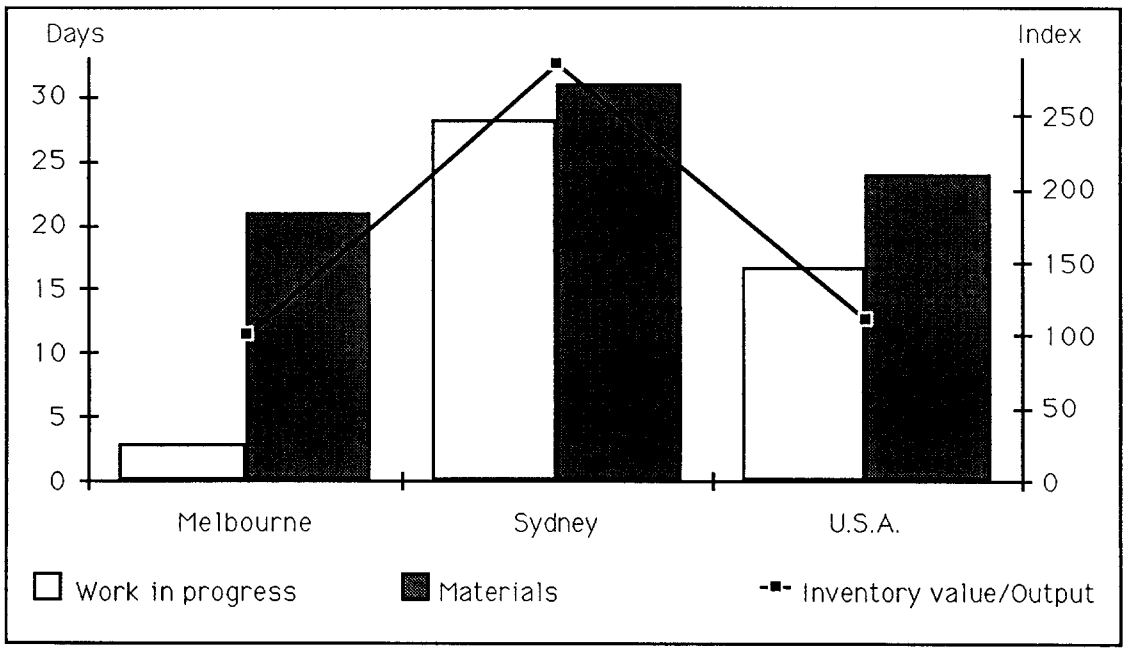
Source : BIE calculations based on data provided by the plants.

Note : The data are indexed relative to the Melbourne plant. The data for the U.S. plant are converted to Australian currency using an exchange rate of $US0.769 per $A, the simple average of the quarterly exchange rates for 1989-90. For comparability between countries, the data for the U.S. plant include only the shipping docks component of its large despatch area. Data were unavailable for the N.Z. plant.

performance of the Melbourne plant in terms of work in progress reflects interaction between a relatively small range of tank sizes (Table 5.1) and frequent production runs of different models. However, the data on materials for Melbourne are likely to be biased downwards relative to the Sydney and U.S. plants. This is due to the many inputs that were fabricated for the Melbourne water heater plant during 1989-90 by other parts of Vulcan's Melbourne complex, and for which all stocks might not be included in the data.

An additional factor to be taken into account is the operating time of the plants (Figure 5.13). One might expect that the plants with higher operating time, such as those in the U.S. and Sydney, would have more days of work in progress and materials. This is indeed the case, and shows the performance of the U.S. and Sydney plants to be better than they might appear from Figure 5.17 at first glance.

Figure 5.17 Number of days of inventory, and ratio of inventory value to output



Source : BIE calculations based on data provided by the plants.

Note : The number of days of inventory is calculated as the product of 365 and the ratio of the sum of the average inventory for each quarter to annual materials consumption. The data for the U.S. plant pertain to the calendar year 1989. Data were unavailable for the N.Z. plant.

Once the level of output produced during the year is taken into account, the overall conclusion is that the Melbourne and U.S. plants perform considerably better in terms of inventories than the Sydney plant (Figure 5.17). This outcome seems to reflect both a poor productivity performance by the Sydney plant, which decreases its output relative to the inputs employed (Section 5.6), and inventory levels that are high relative to those of the U.S. plant. Sydney managers attributed the latter outcome at least partly to the need to allow for the effects of industrial disputation.

All plants are trying to reduce their levels of inventories, so as to lower inventory holding and storage costs. The U.S. plant now makes its large stock orders around five weeks in advance of requirement, for supply over a period of about eight weeks with weekly delivery to the plant. During 1989-90, many inputs were delivered to the Sydney plant on a two-to-four week cycle. Most suppliers considered that they would benefit from such an approach, via easier organisation and control of smaller deliveries. The exception was BHP, which continued to supply when it had product

available, rather than when requested. Almost 80 per cent of deliveries from BHP were late by more than three weeks, which meant that the water heater plant had to carry larger inventories to ensure continuity of production. A similar problem was evident at the Melbourne plant.

The management of the Sydney plant is moving to smaller runs of parts that they produce. For example, the press shop has moved from monthly to fortnightly runs for most parts, with weekly runs in some cases. This approach has the benefit that any faults result in less scrap and re-work. It is consistent also with the current aim to produce every gas and electric model once a week, which should enable stocks of work in progress and final product to be reduced. At the end of 1989-90, around 75 per cent of models were being produced on a weekly basis. By the time of the visit by the BIE inspection team, this performance had increased to 92 per cent. A subsequent goal is to produce every model twice a week. Such changes put even more pressure on the plant to improve its setting up performance, such as by workers in a production area taking responsibility for the completion of their stage in the production process (Briggs 1988).

5.6 Productivity

The fundamental concept underlying all productivity measures is the quantity of output produced per unit of input. Two inputs are considered here: labour and capital (in terms of plant and equipment, and buildings and structures).

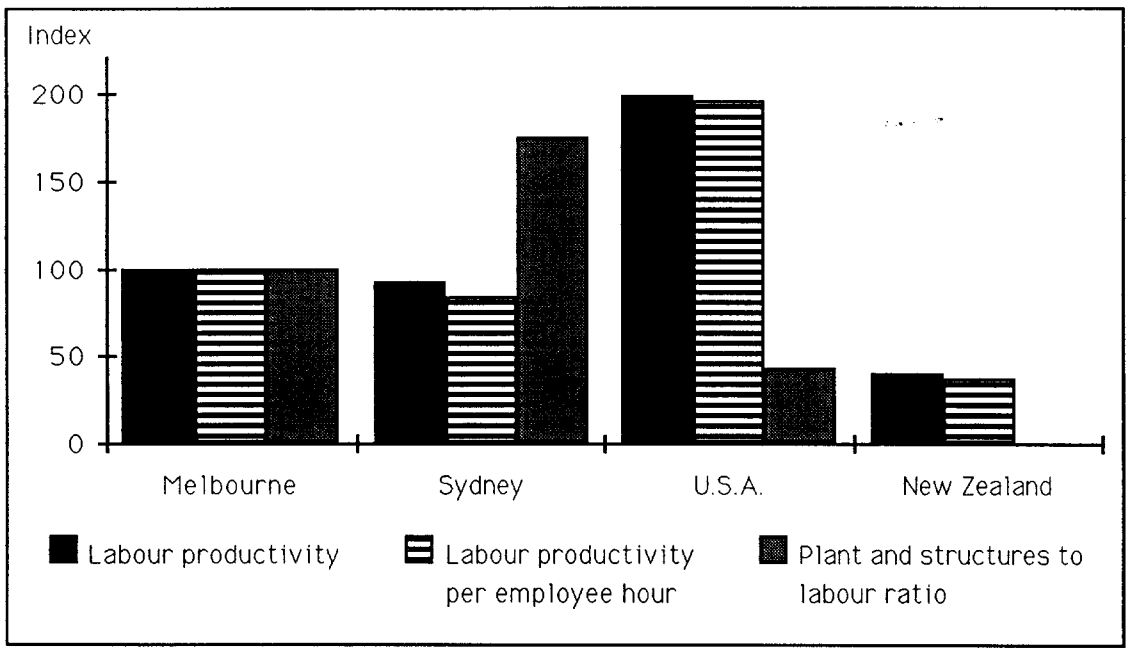
5.6.1 Labour productivity

Two measures of labour productivity were derived as performance indicators. The first measure relates output to the employment level, whereas the second allows for the number of hours employees worked in the survey year. The U.S. plant is well ahead of the Australian and N.Z. plants according to both measures (Figure 5.18).

We now consider some possible reasons for these outcomes (Harris 1986 p. 74). First, economic theory suggests that a plant with a higher capital intensity (the ratio of plant and structures to labour) would tend to have higher labour productivity, other things being equal. However, the Australian plants had the highest and second-highest capital intensities but lower labour productivity than the U.S. plant (Figure 5.18). It would seem therefore that other things might not be equal.

Secondly, a plant with a higher level of output would tend to have higher labour productivity if there were scale economies in production, other things being equal. As expected on this basis, the U.S. plant had higher levels of output and labour productivity than the Sydney plant which, in turn, had higher levels of output and

Figure 5.18 Labour productivity



Source : BIE calculations based on data provided by the plants.

Note : The data are indexed relative to the Melbourne plant. Total employment in water heater production is expressed in terms of direct labour equivalents. That is, the labour variable takes account of the difference in relative annual total cost and productivity between direct production workers and the other categories of labour (Griliches and Ringstad 1971, BIE 1988a). It is calculated as the sum of the number of direct production workers, and the number of employees in the other categories converted into direct production worker equivalents. The conversion involves dividing the annual cost of each other labour category by the annual standard cost of direct production workers. The latter variable is derived as the product of the average cost per direct production worker (the ratio of the total cost for direct labour to the average number of direct labour) and the ratio of the total number of hours worked by direct labour to the sum of total standard and overtime hours, where overtime hours are weighted to reflect the overtime cost premium. The data for total labour hours are derived as the ratio of total labour cost to the average cost per hour for direct labour. Total plant and structures is expressed in terms of plant equivalents. That is, the variable takes account of the difference between the costs of capital (Figure 5.25) gross of depreciation and productivity between plant and structures. The numerator of the productivity data is the level of output, expressed in terms of the 125 litre electric standard water heater. It is derived as the ratio of total production valued at standard cost, divided by the standard cost of production of the appropriate electric model. For the U.S. plant, model MIRE40S5DS9 is employed as the relevant unit. The data for the U.S. plant pertain to the calendar year 1989. They are converted to Australian currency using the simple average of the quarterly exchange rates for 1989-90. N.Z. labour productivity data are derived as the ratio of unweighted output during 1989-90 to unweighted total employment in June 1990.

labour productivity than the N.Z. plant. However, the small Melbourne plant had a higher labour productivity than the larger Sydney plant.

Thirdly, a plant with better technology, work or management practices would tend to have higher labour productivity, other things being equal. The BIE inspection team gained the impression that the degree of mechanisation at the U.S. plant was higher than that at the Melbourne plant, which in turn had a higher degree of mechanisation than the N.Z. plant. However, the Melbourne plant had higher labour productivity than the more mechanised Sydney plant.

The Sydney plant seems, on this basis, to be the main outlier relative to economic theory, with the Melbourne plant under-performing only relative to its capital intensity. The remaining explanatory factor is work and management practices. These practices are discussed in detail in Chapter 4. In summary, work practices in terms of labour inflexibility, overmanning, limited job rotation and industrial disputes were particularly adverse at the Sydney plant relative to the other plants during 1989-90. Industrial relations at the Sydney plant were characterised by suspicion and conflict, and the performance of the plant seemed to suffer accordingly. The data on unproductive hours presented in Figure 5.11 show part of the adverse effect of such practices on productivity. That portion alone amounts to a 25 per cent handicap relative to the U.S. plant.

The Melbourne plant was affected much less by such factors. Nevertheless, its performance too was adversely affected by restrictive union demarcations and a higher rate of absenteeism than at the U.S. plant.

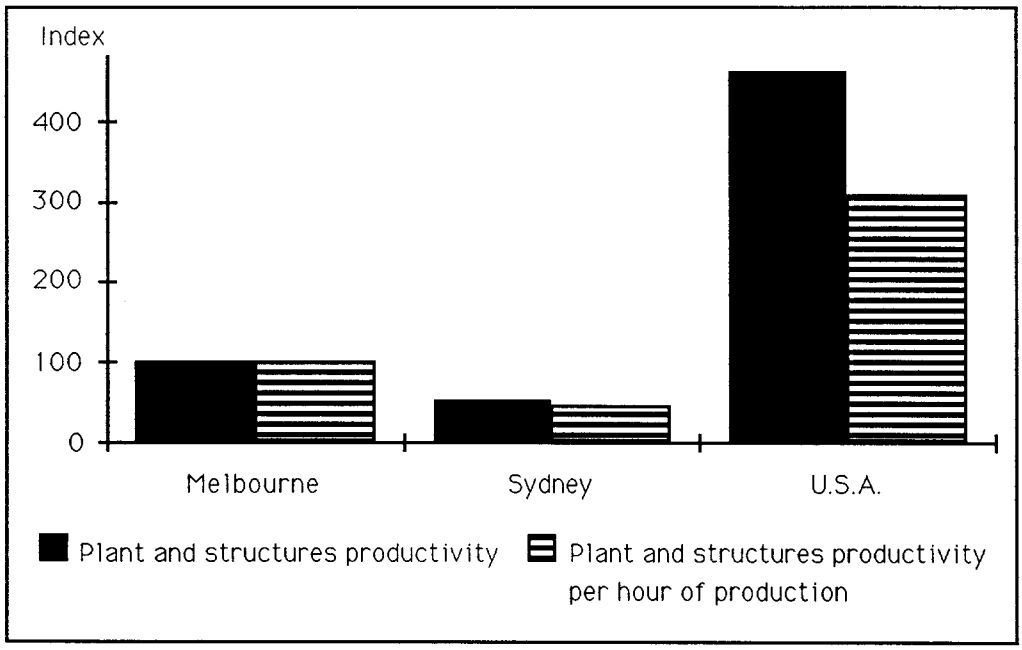
5.6.2 Capital productivity

Two measures of plant and structures productivity were derived (Figure 5.19). The first relates output to the value of plant and structures employed in the process, whereas the second allows for the number of hours of production for the survey year.

The U.S. plant is well ahead of the Melbourne plant according to both measures, although the difference is less pronounced after adjustment for hours of use (Figure 5.19). The performance of the Sydney plant trails that of the smaller Melbourne plant by a substantial margin, and the difference is increased by the adjustment for hours of use. The influence of the hours of use factor reflects the capacity utilisation of the plants (Figure 5.13).

The possible reasons for these outcomes include the same set of factors as those discussed in Section 5.6.1: capital intensity; output level; and technology, work and management practices. First, economic theory suggests that a plant with a higher capital intensity (the ratio of plant and structures to labour, shown in Figure 5.18)

Figure 5.19 Capital (plant and structures) productivity



Source : BIE calculations based on data provided by the plants.

Note : The data are indexed relative to the Melbourne plant. The numerator of the productivity data is the level of output, expressed in terms of the 125 litre electric standard water heater. The number of hours of production is derived as the product of the number of days of operation during 1989-90 (Figure 5.8) and the number of hours of operation per day (the number of shifts per day times eight). The data for the U.S. plant pertain to the calendar year 1989 and are converted to Australian currency using an exchange rate of $US0.769 per $A, the simple average of the quarterly exchange rates for 1989-90. Data were unavailable for the N.Z. plant.

would tend to have lower capital productivity, other things being equal. The data are consistent with this hypothesis.

An additional influence is the reduced 'safety' guarding of machinery at the U.S. plant. This factor would tend to increase its measured capital productivity both directly, through the reduced cost of plant and equipment for similar rates of operation, and indirectly by reducing cycle times, easing adjustments and facilitating setting up through reduced complexity of operations (Figure 5.14).

Secondly, a plant with a higher level of output would tend to have higher capital productivity if there were scale economies in production, other things being equal. As expected on this basis, the U.S. plant had higher levels of output and capital

productivity than the Sydney plant. However, the small Melbourne plant had higher capital productivity than the larger Sydney plant.

Thirdly, a plant with better technology, work or management practices would tend to have higher capital productivity, other things being equal. As discussed at Section 5.6.1, the degree of mechanisation at the U.S. plant seemed higher than that at the Melbourne plant. However, the Melbourne plant had higher capital productivity than the more mechanised Sydney plant.

The Sydney plant seems, on this basis, to be the main outlier relative to economic theory, as it was in its labour productivity performance. The remaining explanatory factor is work and management practices. A significant factor in this regard is the actual rate of plant operation relative to the design rate. At the Melbourne plant, the design rate was considerably less than that of the larger plants in Sydney and the U.S., but the actual rate of operation in most areas was very close to the design rate. An exception was the coil cut up and blanking area, where the actual rate of operation was less than half the design rate. The machinery that acted as a 'bottle-neck' during 1989-90 is targetted for replacement by a new, high speed, automatic cut to length line.

The actual rate of operation at the Sydney plant varied from 50 to 80 per cent of the design rate in tank fabrication, whereas 80 per cent of the design rate was achieved typically in assembly. The 'bottle-necks' in this case were both mechanical (breakdowns, see Figure 5.15) and human (the poor work practices discussed in Chapter 4 and partly summarised in Figure 5.11). In contrast, there appeared to be no significant differences between the design and actual rates of operation at the U.S. plant.

An additional, significant influence on productivity is the plant layout adopted by management. As outlined in Chapter 2, the U.S. plant ran much of its machinery within a particular stage of production in parallel rather than serially. The parallel layout seems to have greater efficiency in practice for large plants, because total production is not halted if a machine fails, less complex conveyors are required, maintenance is less critical, and the reduced complexity increases the uptime of the area.

The U.S. plant had simple, very effective conveyors. For example, projection welders were located on a kicker, with races on either side. A simple, hand adjustable jack allowed the operator to change the height for tank cylinders of different heights. In contrast, the Sydney plant had a complex conveyor during 1989-90 which required many adjustments, and setting up for tank cylinders of different heights took a leading hand around forty minutes to complete.

Since the acquisition of the U.S. plant by SABH Ltd, the parent company of the Australian plants, the management of the Sydney plant has recognised the efficiency gains that would be possible with a changed layout. During the 1990-91 Christmas

plant shutdown, production at the Sydney complex was consolidated in a single plant with a parallel layout. The changes have yielded substantial efficiency gains.

In summary, the capital productivity performance of the Sydney plant during 1989-90 suffered due to its poor practices in areas such as plant layout, excess capital stock, unproductive work time, labour inflexibility, restrictive union demarcations, overmanning, limited job rotation and industrial disputes.

5.7 Costs

5.7.1 Unit costs

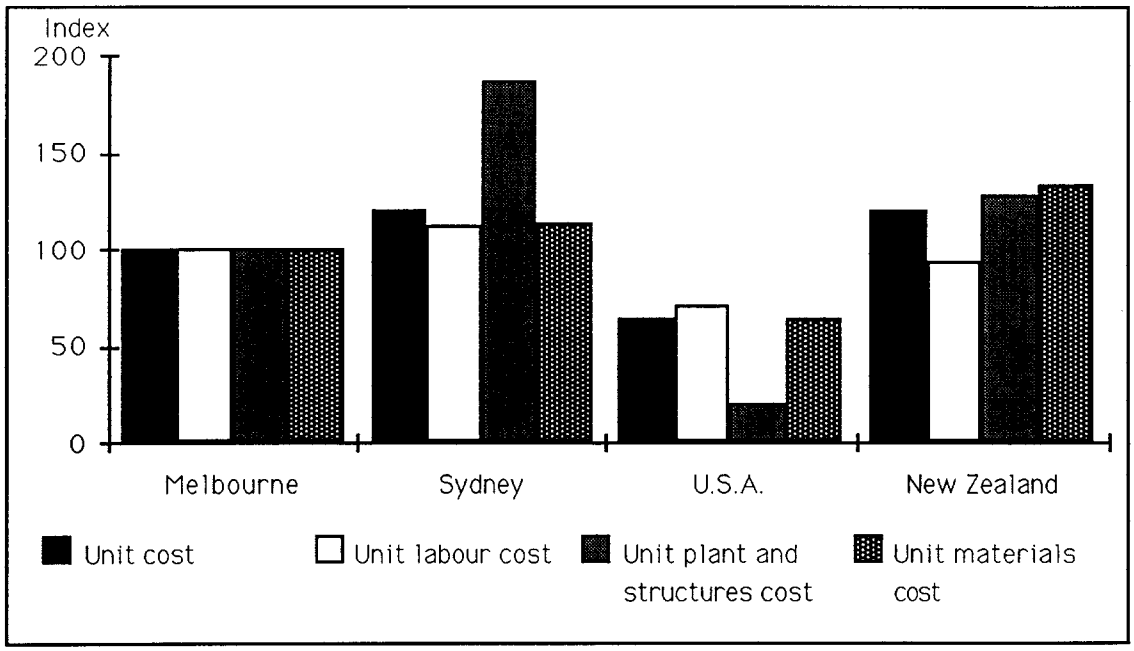
Unit costs are calculated in this study as the ratio of total costs to the weighted level of output. They are assessed in terms of the cost per unit of input and the partial input productivities discussed above, as these are the components of input costs per unit of output. Unit costs by category are shown in Figures 5.20 and 5.21. For clarity, the former figure shows the more significant unit costs, in the sense that their contributions to the total costs of production are larger, whereas smaller unit cost components are shown in the latter figure.

Consistent with the good performance of the U.S. plant in terms of both labour and capital productivities, its unit costs of production were lower than those of the other plants. The components of unit costs (labour, plant and structures, and materials) were generally higher for the Sydney plant than elsewhere, as expected given its relatively poor productivity performance. The exceptions were that unit materials costs of the Sydney plant were slightly lower than those of the very small N.Z. plant (Figure 5.20).

Of the non-U.S. plants, the Melbourne plant generally had the lowest components of unit costs, with the possible exception of its unit labour costs relative to the N.Z. plant. However, the data for the latter plant were calculated on a different basis to those for the other plants, as explained in the note to Figure 5.20.

The inventories costs per unit of output (Figure 5.21) for the Australian plants are consistent with their stock levels (Figure 5.17), with the Melbourne plant showing a much better performance during 1989-90 than the Sydney plant. The corresponding cost variable for the U.S. plant is lower than would be expected on the basis of its stock level. This reflects the fact that the cost of capital for inventories is much lower in the U.S. than in Australia, due to the taxation in Australia (but not the U.S.) of increases in inventory values that occur with inflation (Section 5.7.3). Maintenance costs per unit of output are much higher for Sydney than for the other plants, as expected given the high rate of breakdowns at the former plant during 1989-90 (Figure 5.15).

Figure 5.20 Unit cost indices for total, labour, capital and materials



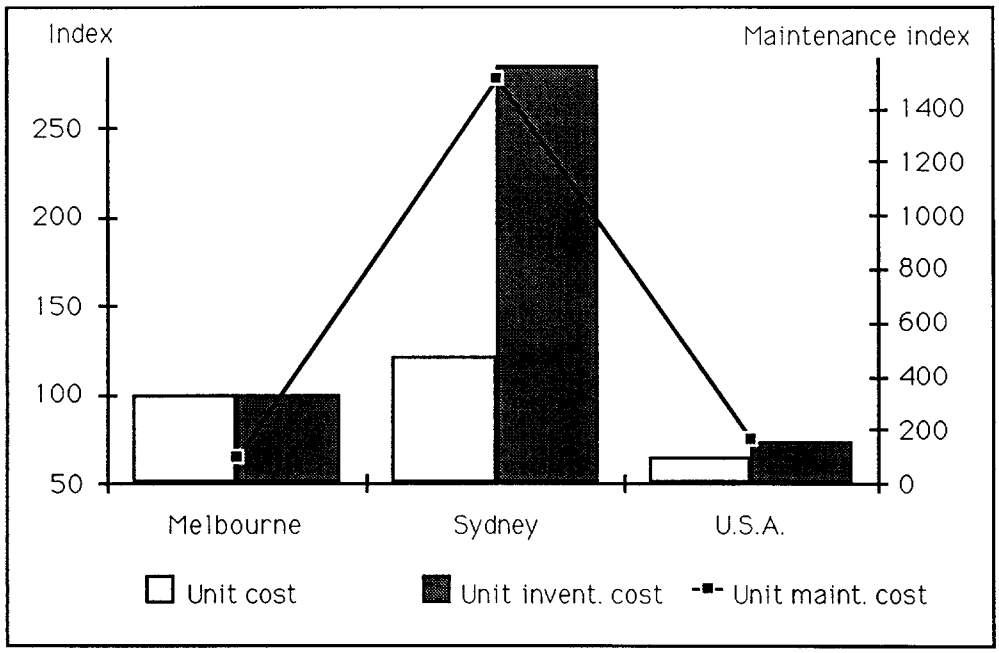
Source : BIE calculations based on data provided by the plants.

Note : The data are indexed relative to the Melbourne plant. The plant and structures cost is derived as the sum of the products of each category of capital and its cost of capital (Figure 5.25) gross of depreciation. The labour cost data per unit of output reflect the distribution of labour by category (Figure 5.6) and relative labour costs (e.g. management is considerably more expensive on average than direct labour, see Figure 5.22). The denominator of the cost data is the level of output, expressed in terms of the 125 litre electric standard water heater. The data for the N.Z. plant are derived from a comparison of production costs of the 135 and 180 litre electric and 150 litre gas models in Sydney and N.Z., prepared by the N.Z. plant in November 1990. The data for the U.S. plant pertain to the calendar year 1989 and are converted to Australian currency using an exchange rate of $US0.769 per $A, the simple average of the quarterly exchange rates for 1989-90.

5.7.2 Hourly labour costs

Underlying the major cost components shown in Figure 5.20 are the costs per unit for labour, capital and materials. The hourly costs for the four categories of labour are shown in Figure 5.22.

Figure 5.21 Unit cost indices for total, inventories and maintenance



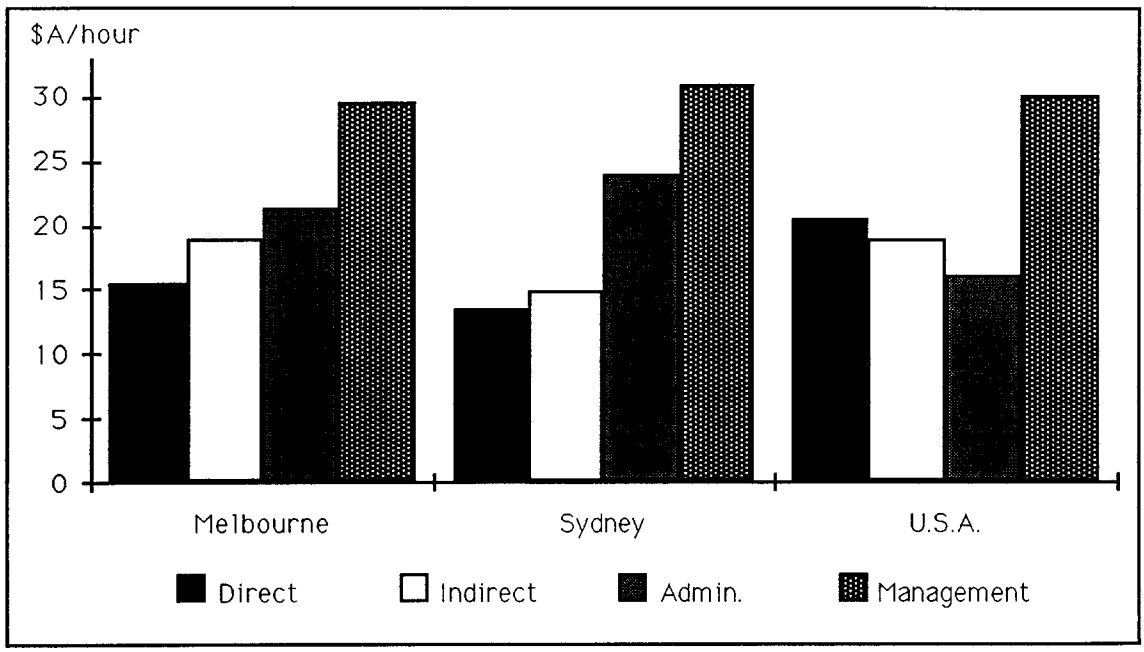
Source : BIE calculations based on data provided by the plants.

Note : The data are indexed relative to the Melbourne plant. The inventories cost is derived as the product of the the cost of capital for inventories (Figure 5.25) and the average annual value of work in progress and materials. The denominator of the cost data is the level of output, expressed in terms of the 125 litre electric standard water heater. Data for inventories and maintenance costs were unavailable for the N.Z. plant. The data for the U.S. plant pertain to the calendar year 1989 and are converted to Australian currency using an exchange rate of $US0.769 per $A, the simple average of the quarterly exchange rates for 1989-90.

The average cost of management labour per hour was similar at the three plants. The average hourly costs for the other labour categories were quite similar at the two Australian plants, with variations reflecting different proportions of employees in the various classifications. However, there were substantial differences between the average hourly costs for non-managerial labour at the Australian and U.S. plants.

For example, direct production workers at the U.S. plant cost on average around $A5 per hour more than their counterparts at the Melbourne plant ($A20 versus $A15) whereas indirect production workers cost on average $A19 per hour at both plants. The different relativity between the average costs of direct and indirect production workers in the two countries seems to reflect the combined effect of a higher

Figure 5.22 Hourly labour cost, by employee category



Source : BIE calculations based on data provided by the plants.

Note : The hourly labour costs are derived as the ratio of the annual standard costs to the award hours worked per year, excluding annual leave. The derivation of annual standard costs is explained in the note to Figure 5.18. Such data were unavailable for the N.Z. plant. The costs for the Australian plants reflect average costs during 1989-90, whereas those for the U.S. plant are average costs during 1989 converted to Australian currency using an exchange rate of $US0.769 per $A, the simple average of the quarterly exchange rates for 1989-90.

proportion of indirect employees in lower classifications at the U.S. plant, and the substantial compression of pay rates there since the 1970s. The latter phenomenon is due to the provision of cost of living adjustments on a flat rather than percentage basis (Section 4.3.1).

It should be borne in mind when considering these data that they are derived on the basis of award hours of work per year. Thus, actual wages at the U.S. plant over the course of a year were increased relative to those at the Australian plants because employees in the U.S. worked two hours more per week and had up to ten days less annual leave (known as vacation in the U.S.) per year. Employees of the Australian plants received twenty days annual leave per year, versus ten days at the U.S. plant after at least one year of continuous service. There was no long service leave as such

at the U.S. plant.[8] However, employees with seniority of between ten and twenty years were allowed a third week of paid vacation, whereas those with seniority of at least twenty years were allowed two extra weeks of paid vacation.

Similarly, there was no holiday leave loading (17.5 per cent in Australia) as such at the U.S. plant. However, employees with seniority of between five and ten years received a 12.5 per cent loading on their vacation pay. Those with seniority of between ten and fifteen, between fifteen and twenty, and more than twenty years received loadings of 50, 75 and 125 per cent respectively. Such payments are included in the data from which the hourly labour costs are derived.

The overall components of labour cost at the plants are shown in Figure 5.23. Wages at the Australian plants contributed around 88 per cent of total labour costs, considerably above the 80 per cent recorded at the U.S. plant. However, employees of the Australian plant paid for medical insurance from their wages, whereas the U.S. company paid the medical insurance costs of its workers. This component comprised around 10 per cent of labour costs at the U.S. plant.[9] Taking this custom into account, total wages and medical insurance comprised around 90 per cent of labour costs at the U.S. plant, similar to the proportion (88 per cent) at the Australian plants.

The non-wage components of labour cost are shown on an expanded scale in Figure 5.24. There are significant differences between the Australian and U.S. plants in the relative importance of the labour cost components. First, payroll tax comprised between 5 and 6 per cent of labour costs at the Australian plants, well above the analogous State tax in the U.S.[10]

Payroll tax has significant disadvantages. It is a source of efficiency losses by distorting the allocation of resources from their optimal use (BIE 1985). The reliance of State Governments in Australia on payroll tax seems to reflect Constitutional inhibitions on their use of comprehensive sales taxes. Such inhibitions are not present in the U.S. or many other countries.

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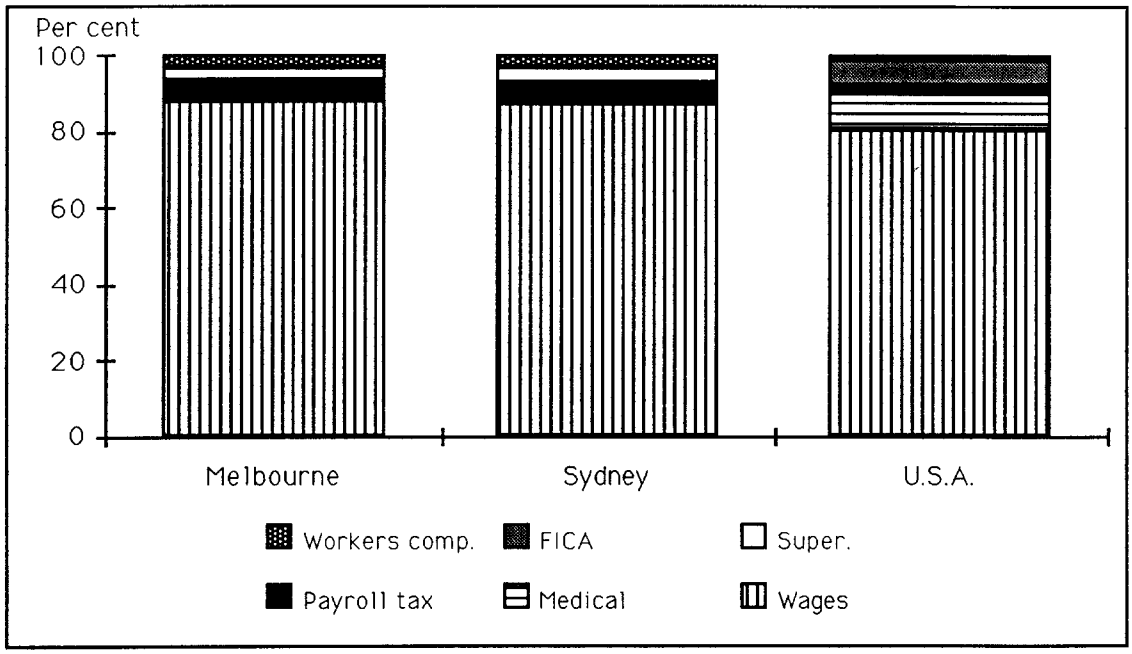
8 Many employees in Australia become eligible for long service leave of three calendar months duration after the completion of ten years continuous full-time service.

9 The practice of large employers in the U.S. paying their employees' medical insurance seems to date from World War II. At the time, the War Labour Board had ruled against payment of any wage rises, so the unions obtained a rise through the strategy of proposing that employers pay health insurance premia instead (Peers 1991).

10 Payroll tax was introduced by the Federal Government of Australia in 1941 to provide funds for the payment of child endowment. Since 1971, the tax has been collected by State Governments for their own use.

Figure 5.23 Components of labour cost



Source : BIE calculations based on data provided by the plants.

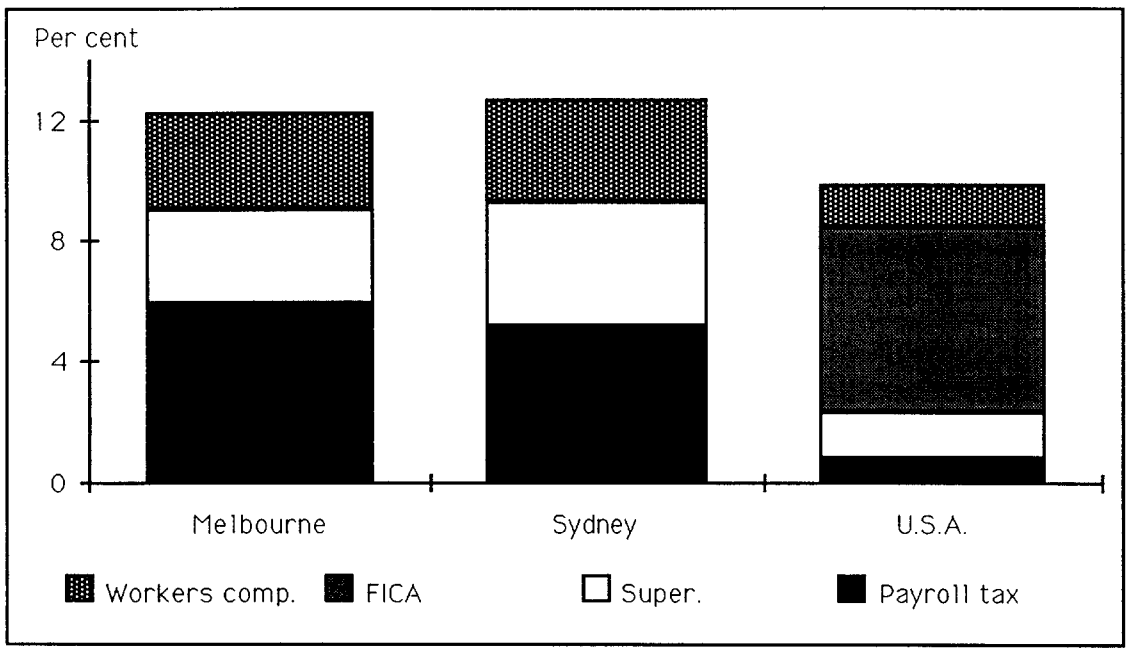
Note : The wages components for the plants include holiday loadings and payments for long service leave. FICA in the U.S. is a Social Security tax.

Secondly, the superannuation and FICA (social security tax) category contributed almost 8 per cent of labour costs in the U.S., around twice the percentages at the Australian plants. There were two levels of superannuation at the Australian plants. The first is company-based and has been available to all employees for many years. The second is the 3 per cent component mandated under the Federal awards that apply to non-managerial employees.

The two elements in this general category at the U.S. plant were superannuation, which is a company-funded pension plan, and FICA, which is a Social Security tax paid to the Federal Government. Expected benefits under the U.S. Social Security tax depend on a variety of factors, including one's marital status, age, sex, age-earnings profile, length of career, number of children and other income sources in retirement.

For many individuals there is only a weak relationship between benefits and contributions (Boskin and Puffert 1987). Unlike award-based superannuation in

Figure 5.24 Non-wage components of labour cost



Source : BIE calculations based on data provided by the plants.

Australia, the company-funded pension plan at the U.S. plant was negotiated between the company and its employees, represented by the local branch of their union. The plan therefore reflects the trade-off employees overall have selected between current income, saving through the pension plan, and other saving such as through purchase of the family home.

Thirdly, expenditure on workers compensation premia in Australia was more than twice the proportion of labour costs incurred by the U.S. plant. A likely factor in this regard is the greater impact of injuries on productive hours at the Australian plants (0.8 and 1.6 per cent during 1989-90 for the Melbourne and Sydney plants respectively) relative to the U.S. (0.3 per cent during 1989). However, the much higher rate of injuries at the Sydney plant relative to that in Melbourne was not shown in the levels of workers compensation premia.

This discrepancy seems to reflect the lack of a close relationship in Australia between compensation expenditure per workplace by the relevant Government agencies and the level of insurance premia. That is, there is cross-subsidisation between workplaces within a particular industry, and between industries. This approach, known in Australia as 'community rating', has been adopted by State Governments

in South Australia, Victoria and New South Wales to overcome perceived inadequacies in risk-based premiums and to improve the competitiveness of trade-exposed industries. The Industries Assistance Commission (1989 p. 26) concluded that:

> These rationales are of dubious merit. Such cross-subsidisation results in inefficiencies by encouraging resources from low-risk to high-risk activities, and reduces overall incentives for accident prevention. Moreover, where inadequacies in risk-based premiums are found to exist, they should be treated directly by modifying premium structures rather than de-emphasising risk-assessment in determining an appropriate price for insurance.

In contrast to the environment faced by the Sydney and Melbourne plants considered in this study, workers compensation premia for the U.S. plant were determined on a commercial, actuarial basis and depended on the performance of that workplace. Such arrangements provide a financial incentive for the firm to undertake cost effective expenditure that reduces injuries.[11]

In summary, labour costs per hour at the Australian plants tend to be below those of the U.S. plant once the high proportion of direct labour in total employment (Figure 5.6) is taken into account. This outcome has been assisted by a considerable period of wage restraint in Australia. The problem of high unit labour costs at the Sydney plant (Figure 5.20) relative to those in the U.S. and Melbourne (to a lesser extent) is therefore mainly one of low labour productivity per paid hour (Figure 5.18). However, the levels of payroll taxes disadvantage both Australian plants relative to that in the U.S. In addition, workers compensation premia in some States of Australia do not seem to relate closely to the injury performances of individual workplaces.

Since the completion of this study, the Australian Government announced in the 1991 Budget that a superannuation guarantee levy would be introduced. From 1 July 1992, employers with an annual payroll of under $50 000 will have to pay 3 per cent of wages in superannuation, whereas other employers will have to pay 5 per cent. Employers will receive credit for superannuation contributions that they already make. The proportion of wages paid in superannuation by all employers will be scaled up to 9 per cent by 2000.

The overall objective of the policy seems to be to move Australia away from an unfunded, means-tested age pension to a compulsory national retirement savings plan backed by a safety net pension. This policy could ultimately result in support for the elderly coming mainly from their own savings, rather than from taxes on subsequent working generations. The difference between the Australian plan and

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11 See Reed (1990) for a discussion of this issue for workplaces in N.S.W. and the U.S.

those that are common in other OECD countries is that Australia's scheme is expected to be fully funded in advance (that is, each generation would pay for itself), and it is to be administered by and invested in the private sector (Knox 1991).

These changes to superannuation policy raise a range of issues. They include: the effects on labour costs, employment and business investment; the net effect of the policy on total saving, given that the additional saving via superannuation could be offset by decreased saving in forms such as bank deposits, government securities and shares; whether the current, tax concessions for private superannuation saving are appropriate, particularly for high income groups, given the negative effect of such concessions on government saving; the possibility of additional competition in the form of superannuation saving, such as via individual plans using tax-favoured superannuation savings accounts administered by the banks; the relationship between the levy and the current 3 per cent award superannuation; and how the defined benefit funds to which many employers contribute will be dealt with (Berg 1991, Dodd 1991b, Dodd and Doman 1991, Dunstan 1991, Knox 1991, Stutchbury 1991a, Walsh 1991). Finally, because population aging affects future labour, financial and housing markets, it is important to examine the incentive effects of government regulations, taxes and subsidies in these areas.[12]

5.7.3 Capital costs

An important factor in the magnitude of the costs associated with plant, structures and inventories is the cost of capital (Figure 5.25). This can be defined as the pre-tax real rate of return on an investment required to achieve a given rate of return after company tax. The pre- and post-tax returns differ according to the company tax rate, the relative rates of allowed and economic depreciation, the taxation arrangements for inventories, inflation, and the effect of inflation on these variables. The methodology and parameters employed are outlined in Appendix 1.

The costs of capital for plant and structures during 1989-90 were quite similar for each of the plants. These outcomes occurred despite relatively generous depreciation

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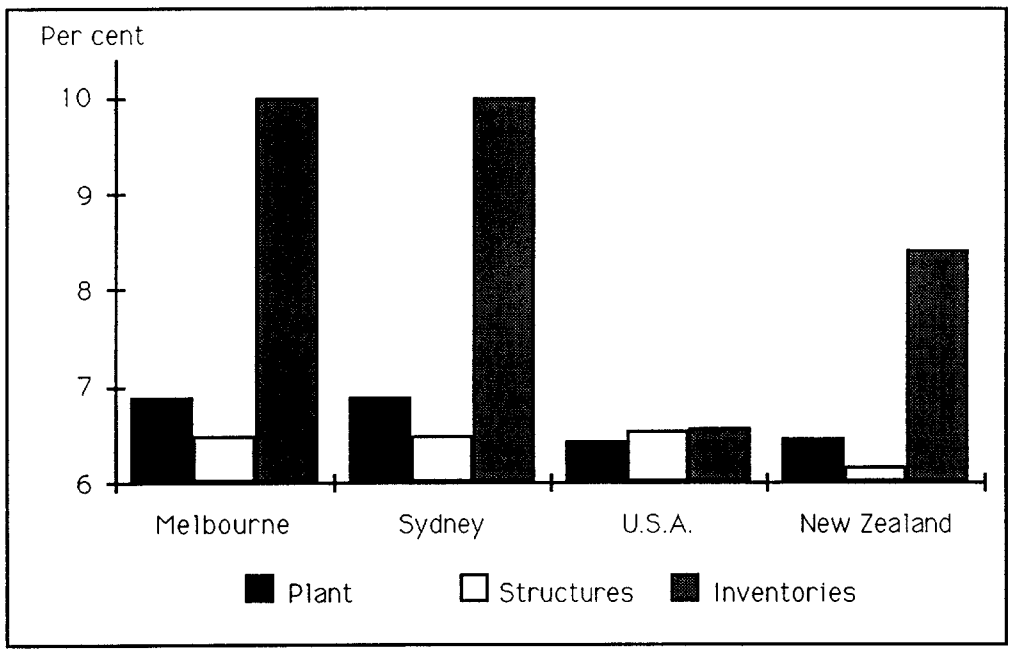
12 For example, the availability of an age pension to females at age sixty, subject to residency, income and assets tests, five years below the age limit for males, is likely to have effects on the labour market by encouraging early retirement for females, and to affect adversely the balance between the number of workers and pensioners. A service pension is available to veterans, with the rate determined by income and assets tests, five years before the age pension, at fifty-five for women and sixty for men. Borsch-Supan (1991) suggests that the incentive effect of age pensions towards early retirement can be decreased by structuring pensions to decrease at an actuarially fair rate as the retirement age decreases. He considers that relevant reforms in other areas include death, gift and wealth taxes, the removal of incentives that favour investment in owner-occupied homes, and the removal of disincentives to family care for the aged and inter-generational living arrangements.

Figure 5.25 Costs of capital for plant, structures and inventories



Source : BIE calculations based on data provided by the plants.

Note : The cost of capital data exclude the impact of dividend withholding tax in the country that hosts the investment and personal tax on unfranked dividends paid by the parent company to Australian resident individuals from foreign source income. Such taxes are irrelevant to an investment funded from retained earnings because they must ultimately be paid whether or not the retained earnings are invested. The cost of capital data shown here are net of depreciation, so that estimates for assets with different lifetimes (such as plant and structures) can be analysed on a comparable basis. The gross of depreciation data are used in the calculation of capital and total costs.

provisions in the U.S., and despite statutory rates of corporate tax in the U.S. (34 per cent) and N.Z. (33 per cent) which were low relative to that prevailing in Australia (39 per cent). The Australian results reflect the offsetting effect of a real discount rate that was lower than in the U.S., due to a higher Australian rate of inflation in 1989-90.[13] The influence of the lower real discount rate on the N.Z. data was offset by

13 The effect is equivalent to the impact of inflation (π) on the real after-tax return derived from interest paid on deposits in financial institutions. From equation 3 in Appendix 1, the retained earnings discount rate in real terms is $\rho - \pi = (r + \pi)(1 - m) - \pi = r(1 - m) - \pi m$ which declines with the rate of inflation for positive, marginal rates of personal tax.

depreciation provisions that were the least generous of the countries considered here.

The cost of capital for inventories in the U.S. was relatively low, due to the availability of last in/first out valuation provisions for tax purposes. These provisions alleviated the taxation of higher inventory values that were due solely to inflation. The inflation component was taxed in Australia and N.Z. due to the lack of a stock valuation adjustment and positive rates of inflation in these countries. The outcome is that the cost of capital for inventories in Australia and N.Z. was high relative to other assets, and the holding of stocks was discouraged in these countries relative to investment in plant and structures. [14]

These results draw attention to possible distortions in the allocation of resources in Australia and N.Z. arising from the very different costs of capital applicable to inventories and, for example, plant. Such distortions are not a new phenomenon.[15] However, it should be borne in mind that the data presented here are for new investment funded from retained earnings with zero debt. They do not necessarily reflect the costs of capital for Australian manufacturing plants in general. The assumption of zero debt is adopted because there is no necessary link for multinationals, such as SABH Ltd, between the location of productive investment and where funds are borrowed. Borrowing, to some extent at least, may be undertaken in countries which offer the most favourable conditions in a combination of tax rate, nominal interest rate and other factors (BIE 1988b Chapter 5).

5.7.4 Material costs

The extent by which the prices of selected material inputs were higher in Australia than in the U.S. is shown in Figure 5.26. The margin varies from around 5 per cent for gas thermostats, to 38 per cent for cylinder parts and 98 per cent for pilot

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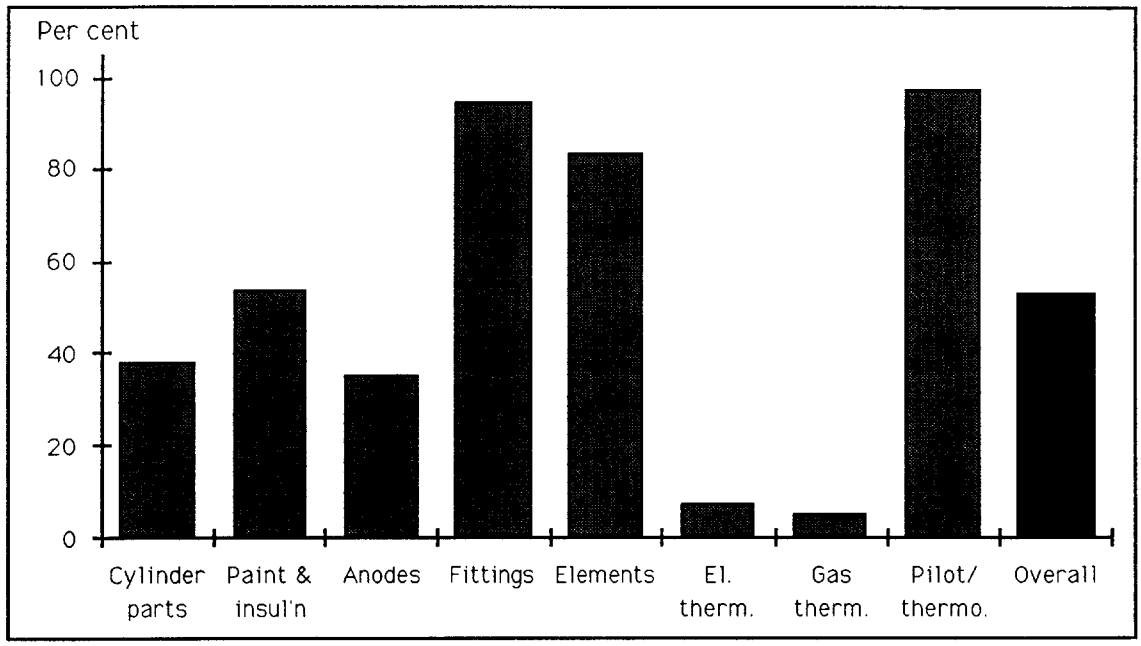
14 By September 1991, the annual rate of inflation in Australia had declined to 3.3 per cent. At this rate, the costs of capital for plant and structures were estimated to have increased to 8.3 and 8.7 per cent, with that for inventories remaining unchanged at the assumed real rate of interest of 10 per cent. The overall outcome has been for the decline in the rate of inflation to increase the real discount rate (see Footnote 13) and the retained earnings costs of capital for plant and structures, and to increase the uniformity of the costs of capital for plant, structures and inventories (the standard deviation of the costs of capital, a measure of distortion, declines from 1.6 to 0.8 per cent). Last in/first out valuation of inventories for tax purposes in Australia would have resulted in a cost of capital for that asset of 5.1 per cent in 1989-90, increasing to 7.9 per cent at an inflation rate of 3.3 per cent. The standard deviation of the costs of capital in this case would have declined from 0.7 to 0.3 per cent with the decrease in the rate of inflation.

15 See BIE (1988b Chapter 4) for a detailed analysis.

Figure 5.26 Materials price disadvantages faced by the Australian plants vis-a-vis the U.S. plant



Source : BIE calculations based on data provided by the Sydney plant.

Note : The data by category presented here are derived from the ratio of the simple averages of prices within each category for the Sydney and U.S. plants. The overall figure is based on a weighted average of the price margins by category, with weights derived from materials used by the Sydney plant during 1989-90. U.S. prices are converted to Australian currency using an exchange rate of $US0.769 per $A, the simple average of the quarterly exchange rates for 1989-90.

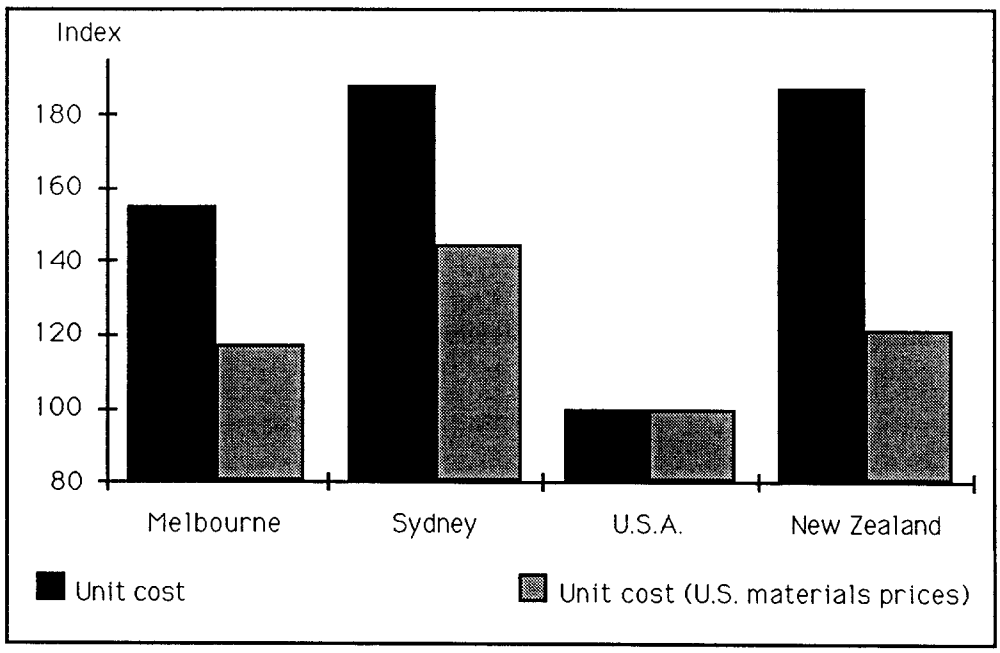
lights/thermocouples. The overall price disadvantage faced by Australian plants on their material inputs was about 53 per cent.

Since the acquisition of the U.S. plant by SABH Ltd, the parent company of the Australian plants, management have become more aware of the extent to which the prices they face in Australia differ from world prices. Detailed price comparisons between Australia and the U.S. have been used to persuade some suppliers to lower their prices, and to keep subsequent price increases below the rate of inflation. The prospect of competition from imports has been most effective in those industries with a small number of possible suppliers. It was less successful in the case of steel products supplied by BHP during 1989-90, and seems to have had little effect on transport costs, which contributed to higher prices in Australia. Changes instituted

by BHP since 1989-90 have resulted in some reduction in prices, to levels broadly comparable with those in N.Z., Korea and Japan but above those in the very competitive U.S. market (Section 5.4.1).

Materials costs are the largest component of total cost, and are a significant factor in the poor overall cost performance of the non-U.S. plants during 1989-90. Figure 5.27 gives an insight into the extent to which the unit cost advantage of the U.S. plant is due to lower materials prices. It shows the actual unit cost outcomes, and the hypothetical outcomes if all plants could purchase material inputs at the prices prevailing in the U.S. The outcome in the latter case is that the U.S. plant would continue to have a better cost performance than the other plants, although the margin would be reduced substantially.

Figure 5.27 Actual unit cost, and hypothetical unit cost with U.S. materials prices

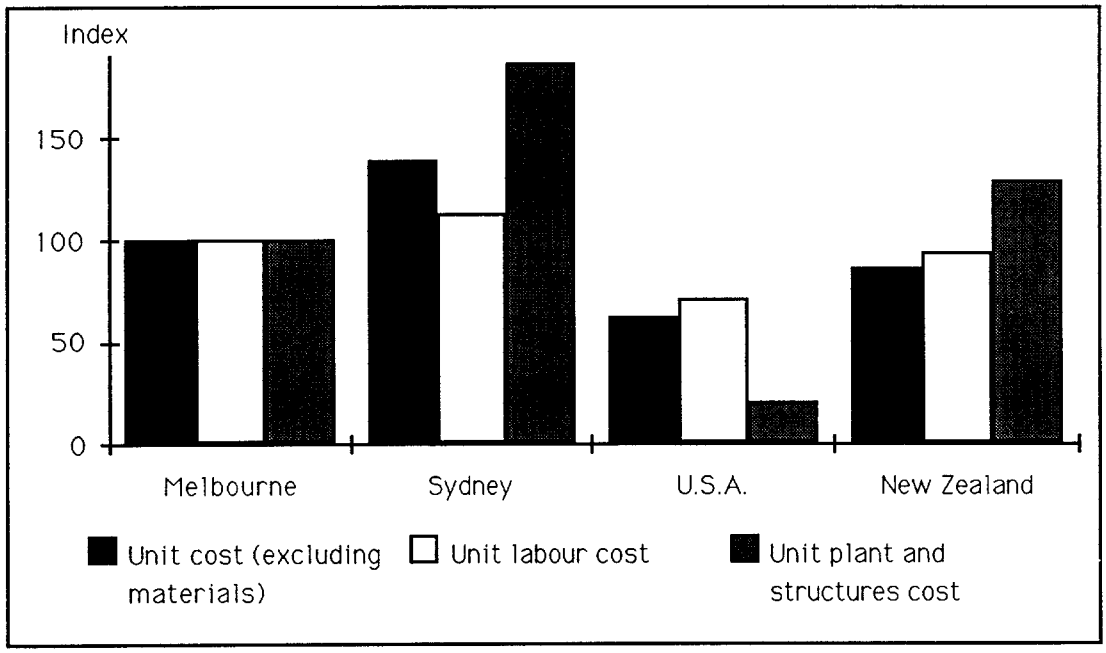


Source : BIE calculations based on data provided by the Sydney plant.

Note : Adjusted materials costs are derived by scaling the original cost data for materials (Figure 5.20) by the overall price disadvantage faced by Australian plants on their material inputs (Figure 5.26). The price disadvantage faced by the N.Z. plant on its materials purchases relative to the U.S. plant is derived by combining the Australia-U.S. and N.Z.-Australia price disadvantages. The latter term is derived from a comparison of materials costs of the 135 and 180 litre electric and 150 litre gas models in Sydney and N.Z., prepared by the N.Z. plant in November 1990.

The contributions by labour and capital costs to inter-plant differences in unit cost are shown more clearly by excluding materials costs from total cost (Figure 5.28). The performance of the U.S. plant remains well in front of those of the other plants, due largely to its superior labour and capital productivity performance (Figures 5.18 and 5.19). It is followed by the N.Z. and Melbourne plants, although the data for the former plant should be regarded only as indicative because of the different basis of calculation (see the note to Figure 5.20). The low ranking of the Sydney plant is consistent with its relatively poor labour and capital productivity performance (Figures 5.18 and 5.19).

Figure 5.28 Unit cost indices for labour, capital and total excluding materials



Source: BIE calculations based on data provided by the plants.

5.8 Concluding comments

The main finding regarding the performance of the plants is that the unit costs of the Australian plants were higher than those of the U.S. plant, by 88 and 55 per cent in the case of the Sydney and Melbourne plants respectively. The main factors responsible for these differences were high material costs in Australia and relatively low labour and capital productivities at the Australian plants.

The productivity and cost performances of the Australian plants during 1989-90 were adversely affected by:

- lack of effective competition in input markets and the unavailability of imports at world prices due to tariff protection, anti-dumping actions and low productivity on and reliability of supply through the waterfront; and by

- high absenteeism.

In addition, the performance of the Sydney plant was reduced by:

- poor work practices in terms of labour inflexibility, overmanning, limited job rotation, industrial disputes and poor timekeeping; and by

- past management decisions in areas such as plant layout and excessive capital stock.

Changes in these areas would lift the performance of the Australian plants.

Chapter 6

Summary and conclusions

This study examines at a micro level the productivity of two Australian manufacturing plants relative to two plants located abroad, in the U.S. and N.Z. All plants are owned by South Australian Brewing Holdings Limited (SABH). The main findings are that the productivity and unit cost performance of the Australian plants lagged those of the U.S. plant, and that there were significant productivity and unit cost differences between the two Australian plants. The latter differences are primarily attributed to the differing employer-employee relations found at the Sydney and Melbourne plants.

The analysis has identified a range of areas in which performance could be substantially improved in line with better practices in Australia and abroad. These areas cover input pricing, work and management practices, and management-labour relations.

6.1 Product and market characteristics

The production process for the manufacture of water heaters is described in Chapter 2. In summary, the production of water heaters involves the fabrication of an inner water tank to which many small parts and fittings are attached as it moves along a production line. Finally, an outer metal jacket is fabricated and fitted, and insulation material is inserted between the inner tank and outer jacket.

The level of output produced during 1989-90 varied considerably between the water heater plants. The U.S. plant had by far the largest output, over twice that of the Sydney plant and around nine times that of the Melbourne plant. The output of the N.Z plant was around one-eighth of the Melbourne plant. The outputs of the plants in the relevant 'snapshot' year were above normal, with the exception of the N.Z. plant which operated in an economy characterised by slow growth since the mid-1980s.

All plants aimed to produce a quality product and all were actively taking steps to improve product quality. For example, SABH Ltd has introduced a new quality control system at the plants, involving extensive training for employees and management in quality issues.

The export propensity (that is, export sales as a proportion of total sales) of each plant was relatively low. It was zero for the N.Z. plant, about 1 per cent for the Australian plants, rising to 7 per cent for the U.S. plant.

Imports have traditionally had a negligible share of the Australian market. This has been due mainly to significant sea transport costs for water heaters, and to a lesser extent to product performance regulations that operate to a degree as non-tariff barriers to trade. However, imports could increase in future because of the existence of excess production capacity in the U.S., the acquisition of U.S. production facilities by SABH Ltd, and possibly lower transport costs due to shipping and waterfront reforms.

Although it is likely that the performance of the U.S. plant was advantaged by its larger scale, the size of the Australian market is such that a plant of U.S. scale located here would need to have a high export propensity for its output to be absorbed.[1] Given the difference between the performances of the Sydney and U.S. plants, such markets could only be gained profitably by an Australian plant if there were large improvements in performance in the areas discussed above, and in areas such as the waterfront that affect exports. In this context, the term 'waterfront' includes the stevedores, shipping companies, port authorities, harbour towage operators, freight forwarders, customs agents, container depot operators, ships' agents, the Australian Customs Service and freight operators (Davis 1991d).

6.2 Industrial relations systems

There are substantial differences between the industrial relations systems of the countries under review (Chapter 3). The industrial relations systems of Australia and N.Z. have been similar for much of the twentieth century, with wages and conditions established and disputes settled via a centralised, semi-judicial framework. This framework has been questioned recently, and there have been moves on both sides of the Tasman towards a less centralised industrial relations system with a greater enterprise focus. These changes have been more extensive in N.Z. than in Australia.

A largely decentralised industrial relations system has evolved in the U.S., with the government and judiciary playing a relatively minor role. Collective bargaining is the means by which disputes are resolved and wages and working conditions are set in unionised plants. Thus, the U.S. plant was characterised by collective bargaining,

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1 It might seem that the performance of the U.S. plant benefited also from its capacity utilisation rate of 50 per cent, versus rates of 39 and 33 per cent for the Sydney and Melbourne plants respectively. However, the low share of capital costs in the total means that the overall advantage from higher rates of capacity utilisation would be small. It would be even smaller, if the additional wear and tear on machinery from higher levels of use were taken into account.

whereas the Australian and N.Z. plants were linked via industry awards to centralised quasi-judicial frameworks.

The industrial relations outcomes at the Australian and N.Z. plants varied considerably during 1989-90, despite their similar industrial relations frameworks. In particular, the relatively harmonious employee-management relations at the N.Z. and Melbourne plants, and the relative absence of negative work practices, bore a closer resemblance to the U.S. plant than to the Sydney plant. Industrial relations at the latter plant were notable for their degree of employee antagonism to the plant's management, the strength of the shop stewards on site, and the extent of restrictive work practices at the plant.

6.3 Productivity and costs

The operations of the water heater plants and their performance according to a range of measures are examined in Chapter 5. The performance of the plants is summarised in Table 6.1. The top row in this table presents information on the relative performance of the plants in terms of the overall performance measure, the unit cost of production. The performance of the plants in terms of a range of quantitative measures that affect the unit cost of production is shown elsewhere in the table.

The U.S. plant was the best performer, having the lowest unit costs overall and for each input. The small N.Z. plant generally lagged the performances of the other plants. The main factors underlying the U.S. plant's lower unit costs were its superior productivity and the lower materials prices available to it (Chapter 5).

The performance of the Australian plants fell between those of the U.S. and N.Z. plants, generally somewhat nearer to the N.Z. end of the spectrum. This outcome was due to the higher materials prices that they faced and their lower productivity. The relatively poor productivity performance of the Australian plants reflected their levels of unproductive hours (Chapter 5), and poor work and management practices, particularly in the case of the Sydney plant (Chapters 3 and 4).

Differences between the two Australian plants in many ways provide more insights than comparisons between them and the U.S. plant. In terms of both productivity and unit cost measures, the Melbourne plant ranked ahead of the Sydney plant. This was despite the Melbourne plant's smaller output and less mechanised capital stock. From the evidence presented in Chapters 3 and 4, the differing industrial relations environments at the two plants are the main reason for the relatively poor performance by the Sydney plant during 1989-90.

The main quantitative evidence to support this conclusion was the relatively high proportion of unproductive hours (that is, hours which employees are supposed to

Table 6.1 Performance of the plants

Variable	Melbourne	Sydney	U.S.	N.Z.
Unit cost	Medium	High	Low	High
Unit materials cost	Medium	Medium	Low	Medium
Unit labour cost	Medium	Medium	Low	Medium
Unit capital cost	Low	High	Very Low	Medium
Unit inventories cost	Low	High	Low	N.A.
Unit maintenance cost	Low	Very High	Low	N.A.
Hourly labour and maintenance cost	Medium	Medium	Medium	N.A.
Material prices	High	High	Medium	High
Cost of capital - plant and structures	Medium	Medium	Medium	Medium
Cost of capital - inventories	Very High	Very High	Medium	High
Labour productivity	Medium	Medium	High	Low
Capital productivity	Medium	Low	High	N.A.
Inventories productivity	Medium	Low	Medium	N.A.
Unproductive hours	Medium	High	Low	Low

work but do not) at the Sydney plant. Much of the 30 per cent of paid hours that were unproductive at that plant reflected work practices not sanctioned by the relevant award, such as overly long meal and refreshment breaks, lengthy toilet breaks, starting work late and finishing work early. These practices were a legacy of past management acquiescence and poor management-labour relations. A related

factor was the relatively high number of hours per employee lost at the Sydney plant due to sickness/absenteeism.

It is evident that considerable potential productivity gains could be achieved at the Sydney plant from reform of work practices. Other areas that could be improved include the degrees of labour inflexibility, overmanning and limited job rotation. The performance of the U.S. plant too could improve with changes in these areas (Section 4.2).

There was considerable scope also at the Sydney plant for rationalisation of production. Since this study was undertaken, management at the plant has shut one of its production areas, improved the layout and reliability of the other production area, and reduced the level of overmanning and unproductive standard hours.

Other major areas where potential gains could be made include improved access of the Australian plants to materials at world prices and quality, perhaps in response to increased competition in input markets (Section 6.4). In addition, greater competition from imports in the water heater market would be expected to yield welfare gains for consumers. Such competition would constrain the extent to which firms and unions could enter work practice/remuneration arrangements similar to those prevailing at the Sydney plant during 1989-90.

6.4 Materials

The differing quality and cost of material inputs for the water heater plants is a major theme of this study. The production of water heaters is a materials intensive process. Much (but not all) of the unit cost advantages enjoyed by the U.S. plant reflected its access to less costly and higher quality material inputs. The margin of advantage enjoyed by the U.S. plant ranged from 5 per cent for gas thermostats, to 38 per cent for cylinder parts and 98 per cent for pilot lights and thermocouples.

Since the acquisition of the U.S. plant by SABH Ltd, management have become more aware of the extent to which material prices in Australia differ from world prices. Detailed price comparisons between Australia and the U.S. have been used to persuade some suppliers to lower their prices, and to keep subsequent price increases below the rate of inflation.

Steel, the major material input for water heaters, provides a useful example of how the U.S. plant was relatively advantaged in this area. Whereas it enjoyed access to high quality, clean de-oiled steel closely aligned with its requirements, the Sydney plant's management noted that its steel supplies during 1989-90 were of variable thickness, tended to have wavy edges and were sometimes oil coated. To alleviate these problems, the plant had to invest in equipment at an additional cost of more than $1m.

Recent initiatives by BHP Steel are addressing these issues. A change in steel grade to one with a tighter range of chemical properties and a processing change to offer improved flatness have improved steel quality. Monitoring by BHP Steel of international prices confirms that prices in the U.S. are amongst the cheapest in the world, but suggests that Australian prices now are broadly comparable with those in N.Z., Korea and Japan.

Reduced protection against imports in product markets accompanied by supporting microeconomic reforms in input markets can lead to increased competition, and pressure to improve workplace efficiency and to lower prices. A secondary measure would be for assessments of anti-dumping applications to give greater weight to the impact of such actions on downstream users and consumers of final products. In addition, regulation in support of competitive outcomes may need strengthening in some oligopolistic industries. The aim of such regulation would be to discourage anti-competitive behaviour by increasing the likelihood that it would be detected, and by increasing the penalties that apply to such behaviour.

Further, consideration could be given to promotion of competitive outcomes by changing the merger test under the Trade Practices Act from one of market dominance to the weaker 'substantial lessening in competition' criterion. Underlying this proposal by the Trade Practices Commission is the view that domestic competition is more beneficial for Australia's economic welfare, through outcomes such as lower prices and more efficient work and management practices, than potential gains from industry mergers and rationalisation.

The empirical evidence for countries such as the U.S. [for example, Ravenscraft and Scherer (1986)], U.K. [for example, Cowling *et al.* (1980), Cosh *et al.* (1980)] and Australia (BIE 1990c) provides little support for the view that mergers are necessary or sufficient for efficiency gains. Cowling (1987) concludes that restricting mergers would serve generally to protect relatively small, efficient firms from the predatory intentions of other, normally larger, firms and that the consequences of this could be greater efficiency in general. Moreover, Geroski (1990) provides fairly strong evidence that increases in competitive rivalry would actually stimulate innovative behaviour. Porter (1990 p. 663) considers that a strong antitrust policy, especially in the area of horizontal mergers, alliances, and collusive behaviour is essential to the rate of upgrading in an economy. He recommends that mergers, acquisitions, and alliances involving industry leaders be disallowed. The merits of these and other approaches to promoting competition warrant closer examination.

6.5 Labour flexibility and training

The degree of labour flexibility in its different forms at the plants is summarised in Table 6.2.

Table 6.2 Labour flexibility at the plants

Qualitative flexibility	**Melbourne**	**Sydney**	**U.S.**	**N.Z.**
Bargaining arrangements	Union by union, centralised wage fixing	Union by union, but autonomy sought at the plant level	Enterprise basis	Centralised, but moving to enterprise basis
Multiskilling	Low	Low	Low	Low
Demarcations - horizontal (between trades)	Moderate	Strong	Moderate	Moderate
Number of unions	Three	Five	One	One
Quantitative flexibility				
Overtime arrangements	Available in each plant at a substantial cost premium			

Improved labour flexibility is an aim of management at the Australian water heater plants, and there is considerable scope for such improvement (Chapter 4). For example, the productivity performance of all plants could be improved by the removal of demarcation barriers between production workers, fitters, electricians, storemen and forklift drivers. Such barriers mean that production workers may not remove hooks used on a paint line and replace them after cleaning, may not load final product into trucks, and may not be trained to drive a forklift, to undertake maintenance, nor to work in a stores area. Job rotation even within production is limited at the Sydney plant. Award restructuring and reform of union structures in Australia might eventually lead to reformed work practices and extended career paths in such areas.

Formal training at the Australian plants was more extensive than at either the N.Z. or the U.S. plants (Chapter 4). There was no support therefore for the notion that the Australian plants' training efforts were low by international standards. However, on-the-job training at each plant during 1989-90 appeared to be more significant than

formal training. This situation could change in subsequent years with reform of union structures and work practices, with progress on award restructuring, and with the introduction of the SABH human resources program. The objective of the latter program is to identify 'gaps' between standards and their achievement, and to correct them with appropriate training.

There were marked differences between the educational profiles of employees at the Australian and U.S. plants. Production workers at the U.S. plant had higher levels of education than their Australian counterparts, with the majority of Australian employees not having completed ten years of schooling. In contrast, managerial personnel at the Australian plants had higher qualifications than their U.S. counterparts.

Consistent with the educational attainments of their workforces, there were some problems with basic literacy and numeracy at the Australian plants. These problems seemed to reflect the non-English speaking backgrounds of many workers at the plants. Similar problems arose at the N.Z. plant. As the applicability of literacy and numeracy skills is general rather than limited to a specific firm, the benefits from training in these areas are likely to be weighted towards the worker rather than the firm. In such cases, government or worker funding of remedial training would seem more appropriate than employer funding.

6.6 Remuneration

A key influence on remuneration at the U.S. plant has been the willingness of employees to accept real wage reductions in the 1980s while the plant re-established its financial viability (Chapter 4). The return to profitability of the plant resulted in an increase in wages during 1990. This ability of the U.S. plant to reach an enterprise agreement with its employees has had advantages for both the firm and its employees. The firm gained by not having an increase in its labour costs during periods of low or negative profitability, while employees preserved their source of employment in an area with relatively few alternatives for semi-skilled workers.

The remuneration flexibility at the U.S. plant was not apparent at the Australian water heater plants, where remuneration during 1989-90 was established uniformly regardless of conditions in local labour markets.

There was a greater degree of remuneration flexibility at the N.Z. plant than at first would be apparent. This was because award wages were below the market level in Auckland, where the plant is located. Thus, the N.Z. plant offered remuneration above the award rate, depending on the relative availability of potential employees in areas such as production and maintenance. Recent changes to N.Z. labour law could further increase the flexibility of wages and conditions at the plant.

Many occupations at the Australian plants, such as production workers and fitters, were characterised during 1989-90 by a low ceiling on wages and responsibility, reflecting slow progress on award restructuring. These factors tend to encourage higher voluntary turnover and industrial disputes. The firms were unable to increase the remuneration of particular skill categories to retain workers, because of the knowledge that such a change would bring demands from the other unions for similar wage increases.

Wage flexibility at the enterprise level can encourage skill formation. Firms that wish to undertake a lot of training need to be able to offer lower start/higher finish career pay profiles (as in Japan and Germany) than firms that do little training (Blandy 1989). The reason is that the wage profile in training-oriented firms needs to ensure that the costs and benefits are shared sufficiently between employees and employers, so that their joint investments are protected from piracy by other firms.

6.7 Enterprise bargaining

As observed in Section 6.2, the study has identified significant differences between the industrial relations systems of Australia, N.Z. and the U.S. The influence of industrial relations systems in Australia and N.Z. on opportunities for enterprise bargaining and productivity outcomes has emerged as a key issue in microeconomic reform in recent years. Reforms directed at the development of a less centralised system with greater emphasis on enterprise bargaining have been instituted in N.Z. and are in progress in Australia (Chapter 3, Harris 1991).

Such reform reflects the view that the system in Australia has left little scope for flexible outcomes because negotiations have occurred within an environment which limited the scope for enterprise bargaining. A number of factors have been identified as contributing to this including: craft-based union structures which result in a multiplicity of unions at the enterprise level, increase disputes and prevent the realisation of the full benefits from multiskilling; and institutional and attitudinal constraints which support work practices that limit workplace flexibility and substantially reduce productivity.[2]

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2 Similarly, the U.K.'s system of industrial relations, from which the Australian system was drawn, has been argued to impair industrial productivity in a number of ways (Davies and Caves 1987 p. 4). The U.K. system both reflects and reinforces the preference of workers for a secure job and restrictive work practices, at the expense of higher wages. The preference for restrictive practices in turn makes adequate quality control more costly and delays the introduction of technological change. The lack of a binding legal framework deprives managements of contractual assurance about the short-run continuity of their labour supply and therefore about the levels of output they can achieve.

Of course, enterprise bargaining is not a panacea for poorly performing firms. Although the U.S. plant has an enterprise agreement, the Melbourne plant achieved a similar degree of labour flexibility within Australia's centralised system. This achievement was due to the relatively harmonious relations at the plant, the plant's small size, and the recognition by employees that their welfare was linked to the success of the employer in meeting competition from other plants (Chapters 3 and 4).

However, as discussed in Harris (1991), enterprise bargaining does provide a greater opportunity for direct bargaining between a firm and its employees over work practices, wages and conditions. There are potential gains for the parties to the bargain, and for consumers through lower prices. Whether the distribution of the gains is appropriate for overall welfare depends on the extent of competition in product markets and the level of union power.

Before November 1991, Section 115 of the Industrial Relations Act provided some flexibility for companies in Australia to enter into specific agreements with their workers on wages and conditions. These agreements could vary from outcomes prevailing under the wages system, subject to the IRC being satisfied that the agreement was justified on its merits, related to circumstances which were of a special and isolated nature, and was not a device to circumvent the general wage fixation principles and thus threaten the orderly operation of the industrial relations system. Such provisions and their interpretation by the IRC acted to restrict the use of Section 115 Agreements by employers and unions.

During the first half of 1991, the Sydney plant commenced negotiations with site delegates on a Section 115 enterprise agreement. During this period, some beneficial changes were achieved and organisers of all unions were kept informed. By June 1991, consensus had virtually been achieved and a submission was being prepared for the IRC. However, the emergence of an industrial campaign in support of the Accord following the April National Wage Case decision caused a difference between the various unions on site. It became necessary to involve State and Federal Officials of the unions to enable negotiations to re-commence. This experience emphasises the difficulties of satisfying a multiplicity of interested parties in a multitude of unions at the enterprise level.

Reflecting, in part, similar experiences elsewhere and concerns about the limitations of provisions in the IR Act, including the Section 115 framework, a number of reform proposals have been canvassed in recent years. The main proposals are discussed in Harris (1991). They include a system that would operate within the existing centralised system; a CPI-linked general wage rise on top of rises derived from enterprise bargaining; the addition of fixed-term enterprise agreements to the existing award system; and a system of voluntary agreements between employers and employees, without the mandatory intervention of trade unions or industrial tribunals.

In late October 1991, the IRC announced its decision in the 1991 National Wage Case. Despite what it considered to be a diversity of opinions, and a failure of the submissions to the proceedings to confront practical problems, the IRC devised an enterprise bargaining principle. From 1 November 1991, it would be prepared to ratify enterprise bargaining agreements made between parties under Sections 112 (consent awards) and 115 (certified agreements), subject to certain requirements being met (Chapter 3).

As observed by the OECD (1990, p 62) there are a range of problems associated with the Australian tradition of craft-based trade unions which limit the scope for realising gains from enterprise bargaining arrangements.

- Such a union structure is associated with rigid work demarcations that discourage multiskilling and moves to more flexible and efficient work practices.

- Craft or occupation-based unions have opposed changes in individual firms, even when they have been supported by and offered potential benefits to their members, on the grounds that the changes might set bad precedents for members working in other firms.

- Firms can be reluctant to negotiate changes in one award in a multi-award, multi-union plant because of fear that such changes would bring demands from the other unions for similar changes. The time and effort required to negotiate change in multi-union firms may also act to discourage management from seeking change.

Most of these problems would be alleviated by a move to industry unions, as proposed by the ACTU and Federal Government (Chapter 3). However, only branches of unions with substantial autonomy at the firm level or enterprise unions, with their workplace focus, would seem to deal with the second issue. The OECD (1990 p. 79) considers that unionist aspirations are likely to be best served by relatively few large unions with solid support services, as suggested by the ACTU, combined with substantial decentralisation of negotiating responsibility on local working conditions to affiliates at the firm level.

In Australia, Section 118 of the Industrial Relations Act provides a means by which union coverage at workplaces can be rationalised. This Section enables a company/ companies or a union to seek a ruling from the IRC that workers should be represented by a single union. However, this process can be delayed by unions that retaliate against loss of coverage by appealing to the High Court, and the outcome might not reflect the wishes of employees in the company or industry.

In many OECD countries, there is a move to 'enterprise-focussed' unionism, whether or not there are enterprise unions. Borland *et al.* (1990) note that firms will tend to favour enterprise-based unionism because this reduces union power. The step from

industry to enterprise unions in Australia is opposed by the ACTU on the basis that it would reduce the effective representation of workers' interest, and would be counter to the policy of promoting fewer, larger and more effective unions.

Wages and related employment conditions which affect work practices and the organisation of work are key issues for negotiation at the enterprise level. The possible dangers from decentralisation of wage fixing are emphasised by experiences in the 1960s and early 1970s, and again in 1981-82, which showed that the generalising effect of flow-ons produces an excessive overall wage movement. Some interest groups suggest that these experiences indicate that the IRC needs to impose an upper limit on possible wage increases, given the existence of factors such as union power, legal delays in response to industrial action, the multi-enterprise structure of unions and awards, and lack of competition in some product markets.

To a significant degree, it is the forces of competition in product markets that ensure firms do not grant wage rises which are inconsistent with productivity and conditions in their labour market. However, as the MTIA (1991) emphasises, enterprise bargaining creates considerable risks for firms and employment outcomes in circumstances where unions are strong and firms operate in a competitive market. Indeed, the management of the Sydney plant suggests that the historical experience there is such that the IRC has a vital role to play in enterprise bargaining, in order to ensure that enterprise agreements are not the result of industrial pressure for unreasonable conditions, and that agreements are complied with. Such considerations suggest an important role for government in facilitating the move towards enterprise-based industrial relations and in removing barriers to competition in the economy (Section 6.4).

During the 1980s, profit sharing and employee share ownership schemes have been encouraged by governments in countries such as the U.K. and U.S. via tax concessions. Underlying this approach are the notions that a profit-sharing economy would have more flexibility in labour costs and working time, would stimulate higher productivity, and would encourage a greater willingness to invest in new techniques and know-how (Weitzman 1983, 1985). A different rationale for profit sharing is that it eliminates the inefficiency that arises when union-firm bargaining is constrained by the assumption that it is the firm which determines the employment level. On this basis, there could be a role for government in supporting the introduction of profit-sharing schemes (Anderson and Devereux 1989, Ireland 1989, Johnson 1990).

A range of issues other than wages could be addressed in firm-union negotiations at the enterprise level. These include compressed work weeks, and changes to working time provisions such as sick and annual leave, work on public holidays and weekends, and changed arrangements for overtime and shift work.

Such changes could allow individual workers greater freedom of choice about working patterns, and allow more scope for demand and supply effects in local

labour markets in a similar fashion to that planned for the new Nevada plant of the U.S. company considered in this study (Dawkins *et al.* 1986, Kostiuk 1990). Also, they could better reflect the circumstances facing individual firms, allowing seasonal demand to be met with lower inventory costs and higher levels of capital utilisation to be achieved. To date, little progress has been made in these areas in Australia, despite the insistence of the IRC in the 1989 National Wage Case that attention be given to such inflexibilities as abuse of sick pay, restrictions on overtime and inflexible working hours.

At the instigation of management at the Sydney plant, there have been significant reforms in work practices, such as unproductive work time, during 1991. Additional reforms have been delayed by the complexity and time required to negotiate an enterprise agreement with the five unions on site. Finally, in November 1991, agreement was reached between the parties for wage rises of $15 per week for workers at the plant, based on changes in work organisation and the achievement of a productivity target. A further wage rise of $18 per week will be paid when the plant reaches its next productivity target, which further closes the gap between the Sydney and U.S. plants. The agreement is for a one-year fixed term, and excludes any other wage rises awarded by industrial tribunals during that period. The IRC has ratified the agreement as a consent award under the new enterprise bargaining principle.[3]

6.8 Final remarks

The Australian plants currently compete with each other and with another producer in the Australian market. The extent of competition that they face from imports is likely to increase in the future, due to excess production capacity in the U.S., and some reform of shipping and waterfront inefficiencies in Australia. Given the substantial gap between the productivity and cost performances of the Australian and U.S. plants, the future viability of the Australian plants could be in question without significant improvements in performance.

Best manufacturing practice, as identified by the MIT Commission on Industrial Productivity (1989) involves six crucial patterns to be a successful manufacturer. These are:

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3 The aim of the award is to develop a company with a management and workforce that is flexible, committed and highly skilled; a company built on participation, team-work, trust, devolved responsibilities and a shared vision of the future based on innovation and excellence. These issues will be addressed through the adoption of a process which aims for cultural and attitudinal change across all levels as a result of the need to be productivity conscious, and the application of this consciousness to the identification of major barriers to performance and job satisfaction inherent in current methods and systems.

- simultaneous improvement in quality, cost and delivery;
- staying close to the customer;
- closer relations with suppliers;
- using technology for strategic advantage;
- flatter and less compartmentalised organisations; and
- innovative human resource policies.

SABH Ltd is adopting policies and practices in all these areas to improve its manufacturing performance. It is strong in some areas such as close relations with customers and suppliers, quality, and the use of technology. Some aspects of performance, such as the price and quality of purchased inputs and the high cost of capital for inventories, are largely outside the control of the Australian plants. Government reform in these areas could improve the plants' competitiveness and benefit the consumers of their products.

This study points to the last two areas, which include work and management practices, where additional, substantial gains can be made. To date, the pace of union and award rationalisation at the two Australian plants has been glacial, for which responsibility lies with the parties concerned and the legislative/regulatory framework in which they are constrained to work. Reforms to the framework would support more decentralised union structures, facilitate enterprise unionism where favoured by employees, encourage multiskilling across current demarcations for all workers at the plants, and improve the framework for the prevention and settlement of disputes.

However, it is also apparent that legislative/regulatory reform alone is unlikely to be successful in promoting better outcomes. As demonstrated by the differing performance of the Melbourne and Sydney plants, and the Australian and U.S. plants, relationships between employers and employees, and attitudes to work and the organisation of work and production processes, are also critical to the process of achieving advances in productivity and cost performance.

More generally, these lessons may be applicable to a range of manufacturing plants in Australia, with the associated implications for their competitiveness and our future living standards.

- The BCA has put forward a proposal involving a two-stream system whereby employers and employees could elect to remain within the existing award system, or could negotiate fixed-term enterprise agreements as an alternative to award coverage.

- The CAI has proposed that individual employers and unions negotiate fixed-term agreements which would have the force of law, with no strikes or lockouts during the life of the agreement and provision for voluntary unionism.

- The Federal Opposition has also proposed a system of voluntary agreements between employers and employees as an alternative to the current system, but without the mandatory intervention of trade unions or industrial tribunals.

- The approach supported by the ACTU for dealing with inflexibilities under the current system involves three main elements. First, there is provision for a general wage rise without productivity offsets, linked to movements in the CPI. Secondly, there is provision for further increases to reflect award restructuring and market-related adjustments. The final element envisages adjustments linked to productivity-related improvements at the enterprise or industry level.

- Reflecting concerns with union power and the absence of practical mechanisms to ensure that changes in wages are tied to productivity gains in particular industries/enterprises, the MTIA favours an approach which works within the existing centralised system.

Appendix 1

Cost of capital

A1.1 Introduction

The cost of capital used in Chapter 5 is based on King and Fullerton (1984). The version employed here looks strictly at the return to the firm in the host country on retained earnings invested in that firm. That is, it excludes the impact of dividend withholding tax in the country that hosts the investment and personal tax on unfranked dividends paid by the parent company to Australian resident individuals from foreign source income. Such taxes are irrelevant to an investment funded from retained earnings because they must ultimately be paid whether or not the retained earnings are invested.

A1.2 Methodology and data

Consider an investment project with an initial cost of one unit. Define the cost of capital (p) as the gross marginal rate of return (MRR):

$$p = MRR \tag{1}$$

The present value of cash flows to the company arising from the investment after company tax is:

$$V = \int_0^\infty (1 - \tau)\, MRR \exp[-(\rho + \delta - \pi)u]du$$

$$= \frac{(1 - \tau)\, MRR}{\rho + \delta - \pi} \tag{2}$$

where τ is the statutory rate of corporate tax, δ is economic depreciation and π is the rate of inflation. Economic depreciation is assumed for convenience to be exponential. It should be distinguished from depreciation for taxation purposes, which can be non-exponential.

ρ is a retained earnings discount rate (Scott 1987 p. 261):

$$\rho = (r + \pi)(1 - m) \tag{3}$$

where r is a standard real return and m is the weighted marginal rate of personal tax on interest income. In this study, a real return of 10 per cent is assumed for r, in line with previous research (BIE 1988b) and discussions with managers of the companies considered in this study. The term m is assumed to be 39 per cent, based on Jones and Revesz (1987 p. 16) and the changed taxation arrangements in Australia for superannuation funds since that analysis.

Let the cost of the company's investment project be unity, the initial outlay for the asset. After allowing for the discounted present value of any tax allowances or grants given for the asset (A) the true cost of the project (C) is therefore:

$$C = 1 - A \tag{4}$$

The value of A comprises three elements; the value of standard depreciation allowances, the value of any immediate write-off and the value of any grants and allowances:

$$A = f_1 z + f_2 \tau + f_3 g \tag{5}$$

where f_1 is the proportion of the asset entitled to standard depreciation allowances, f_2 is the proportion qualifying for expensing (e.g. an investment allowance or a tax credit divided by the company tax rate), f_3 is the proportion qualifying for grants, g is the rate of grant and z is the present value of tax depreciation. The term z is given by either:

$$z_1 = \int_0^\infty \tau a \exp[-(a + \rho)u]\, du$$

$$= \frac{a\tau}{a + \rho} \tag{6}$$

or:

$$z_2 = \int_0^L \frac{\tau \exp[-\rho u]\, du}{L}$$

$$= \frac{\tau(1 - \exp[-\rho L])}{\rho L} \qquad (7)$$

where z_1 shows the present value of declining balance depreciation at rate a, and z_2 shows the value of prime cost depreciation over a lifetime L.

For the marginal investment to be attractive, the MRR earned is that which equates V with C at the prevailing discount rate. Setting V from (2) equal to C from (4) and using (1) to eliminate MRR, an expression for p, the cost of capital to the company, is derived:

$$p = \frac{(1 - A)(\rho + \delta - \pi)}{1 - \tau} \qquad (8)$$

p describes the pre-tax real rate of return on an investment that is required to yield a given rate of return after company tax.

In the case of inventories for which a proportion ν is subject to historical cost accounting, a unit marginal investment incurs tax of $\nu\tau\pi$ per year. In this case, (2) and (8) become respectively:

$$V = \frac{(1 - \tau)\,MRR - \nu\tau\pi}{\rho - \pi} \qquad (9)$$

$$p = \frac{[\rho - \pi(1 - \nu\tau)]}{1 - \tau} \qquad (10)$$

as A and δ are zero.

The depreciation data used to derive the costs of capital for the different countries are summarised in Tables A1.1 to A1.3. The taxation variables, rates of inflation and derived costs of capital are presented in Table A1.4.

Table A1.1 Summary of depreciation variables by asset, Australia, 1989-90

	Variable			
	Economic depreciation rate	Statutory depreciation rate		
Asset	Declining balance (per cent)	Declining balance (per cent)	Straight line (years)	Investment allowance (per cent)
Plant	10.0[a]	12.0[b]	12.5[1]	n.a.
Buildings	3.75[b]	n.a.	40.0[b]	n.a.
Inventories[c]	Inventories valuations may be based on the lowest of the cost, market value or replacement value.			

Sources : (a) Derived from the statutory rate of depreciation, on the basis that the statutory rate is calculated as the economic rate of depreciation plus a loading of 20 per cent (Treasury 1988 p. 9).
(b) Data supplied to the BIE by Rheem Australia Limited.
(c) CCH (1990).

Notes : (1) A choice is permitted between straight line or declining balance calculations. In the Australian tax schedules, the declining balance rate is set at 1.5 times the straight line rate.
n.a. Not applicable.

Table A1.2 Summary of depreciation variables by asset, New Zealand, 1989-90

	Variable			
	Economic depreciation rate	Statutory depreciation rate		
Asset	Declining balance (per cent)	Declining balance (per cent)	Straight line (years)	Investment allowance (per cent)
Plant	10.0[a]	10.0[b]	n.a.	n.a.
Buildings	3.75[a]	n.a.	100.0[b]	n.a.
Inventories[c]	Inventories may be valued at cost, market or replacement value. The first in/first out (FIFO) method is acceptable. Use of an average or standard cost method is also acceptable, provided a fair approximation of actual cost results.			

Sources : (a) Derived from the Australian data.
(b) Data supplied to the BIE by Rheem New Zealand Limited.
(c) CCH (1990).

Note : n.a. Not applicable.

Table A1.3 Summary of depreciation variables by asset, U.S.A., 1989-90

	Variable			
	Economic depreciation rate	Statutory depreciation rate		
Asset	Declining balance (per cent)	Declining balance (per cent)	Straight line (years)	Investment allowance (per cent)
Plant	10.0[a]	18.75[b]	8.0	n.a.
Buildings	3.75[a]	n.a.	20.0[b]	n.a.
Inventories[c]	Inventory is generally valued at cost or market value, whichever is lower. If a specific identification of items sold and on hand cannot be made, FIFO, last in/first out (LIFO), or the average cost method must be used. The U.S. plant considered here uses the LIFO method.			

Sources : (a) Derived from the Australian data.
(b) Data supplied to the BIE by Bradford-White Corporation.
(c) CCH (1990).

Note : n.a. Not applicable.

Table A1.4 Summary of taxation and other variables by country, investment in the production of water heaters by a subsidiary company, 1989-90

Variable					
	Net cost of capital (per cent) at the corporate level[a], [1]				
	Asset			Other variables	
Country	Plant	Buildings	Inventories[2]	Corporate[b] tax rate (per cent)	Inflation[c] rate, CPI (per cent)
Australia	6.88	6.48	10.00	39.00	7.68
New Zealand	6.46	6.18	8.42	33.00	7.67
U.S.A.	6.43	6.55	6.57	34.00[3]	4.52

Sources : (a) BIE calculations as outlined in this appendix.
(b) CCH (1990).
(c) International Financial Statistics (I.P. Sharp) for 1989.2 to 1990.2.

Notes : (1) Calculated assuming a pre-tax real rate of interest of 10 per cent.
(2) The use of FIFO or average historical costing means that the inflationary gain on inventories is taxed as current profits when inventories are turned over. Only the U.S.A. allows LIFO, which avoids this distortion.
(3) The Michigan single business tax of 2.35 per cent of the tax base is excluded because capital acquired during the year is deductible (Michigan Department of Commerce 1989).

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