



Microeconomic Reforms and Australian Productivity: Exploring the Links

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Foreword

The rationale for microeconomic reform is to raise the living standards of the community. Following a broad program of economic reforms, Australia's productivity growth — the major determinant of peoples' incomes over the long term — has surged in the 1990s.

That this represents a break with past trends is becoming clear. But some important questions remain.

How much of the improvement in productivity can be attributed to microeconomic reform? How have the gains been distributed? What have been the adjustment implications?

The Productivity Commission has a broad program of research designed to shed light on such questions, both to assist policy makers and to help promote public awareness of issues that are central to Australia's economic future.

This paper lays a framework for exploring the nature and significance of the links between microeconomic reforms and productivity. In addition to examining general trends, it gets behind the aggregates and into the detail of particular reforms and the responses of individual firms and industries.

The research is not intended to be definitive. But it does add weight to the view that microeconomic reforms are contributing to an enduring transformation of the Australian economy and its productivity performance.

Gary Banks
Chairman
November 1999

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Abbreviations

ABS	Australian Bureau of Statistics
ACR	Accommodation, cafes & restaurants
ANU	Australian National University
ANZSIC	Australian and New Zealand Standard Industrial Classification
ASIC	Australian Standard Industrial Classification
AVETMISS	Australian Vocational Education and Training Management Information Statistical Standard
AWIRS	Australian Workplace Industrial Relations Survey
BERD	business expenditure on research and development
BIE	Bureau of Industry Economics
BLS	Bureau of Labor Statistics
CER	Closer Economic Relations
CRS	Cultural & recreational services
CSOs	Community Service Obligations
DFAT	Department of Foreign Affairs and Trade
DISR	Department of Industry, Science & Resources
DIST	Department of Industry, Science and Technology
EGW	Electricity, gas & water
EPAC	Economic Planning Advisory Commission
FDI	foreign direct investment
GBEs	Government Business Enterprises
GDP	Gross Domestic Product
GFCE	Gross Fixed Capital Expenditure
HRM	human resource management

IAC	Industries Assistance Commission
IC	Industry Commission
ICS	Import Credit Scheme
IIT	Intra-industry trade
IMF	International Monetary Fund
ISDB	International Sectoral Data Base
IT	Information technology
JIT	just-in-time
MER	microeconomic reform
MFP	multifactor productivity
NCVER	National Centre for Vocational and Education Research
NBER	National Bureau of Economic Research
NILS	National Institute of Labour Studies
NRC	National Rail Corporation
NTKs	net tonne kilometres
OAP	Overseas Assembly Provision
OECD	Organisation for Economic Co-operation and Development
PC	Productivity Commission
PMVs	passenger motor vehicles
R&D	research and development
TAFE	Technical and Further Education
TCF	Textiles, clothing & footwear
VET	vocational education and training
WIPO	World Intellectual Property Organisation
WWII	World War II

Key points

- Productivity is the major determinant of long-term growth in average incomes and material living standards of Australians.
- A series of microeconomic reforms was introduced in the 1980s and 1990s to help strengthen growth in living standards. It was expected that reforms would raise Australia's rate of productivity growth, which had slowed in the 1970s and 1980s.
- Australia's productivity performance has improved substantially in the 1990s. Productivity is now growing faster than at any other time in the 33-year period for which measures can be constructed. Growth in average incomes has been restored to rates achieved in the 1960s and early 1970s.
- The Australian economy appears to be operating differently in the 1990s. The surge in productivity growth has reversed two long-term trends: Australia's poor productivity performance, compared with other high-income countries, and a secular decline in capital productivity.
 - Australia's productivity growth in the 1990s has been well ahead of nearly all other high-income countries. This is consistent with a move to catch up on earlier lost ground and move closer to the production standards of other advanced economies.
 - Capital productivity has increased, implying the nation's capital stock is being better utilised.
- An examination of general trends and selected case studies provides evidence that the Australian economy has been undergoing a transformation which is delivering improved productivity performance.
- The transformation is taking place in the following kinds of ways:
 - resources are being more productively allocated;
 - production is becoming more specialised within industries;
 - firms are reorganising and management practices and workplace arrangements are improving;
 - the use of up-to-date technologies and innovation have increased; and
 - workforce skills are increasing.

-
- Microeconomic reforms have a number of links to these changes:
 - direct, specific links to production relationships, for example, through the effects of tariff, tax and industrial relations reforms on resource allocation;
 - opening the economy to overseas trade and investment and enhancing competition from domestic as well as overseas sources; and
 - influencing business expectations and attitudes through changes to the general policy and institutional environment in which they operate.
 - Improved management of the macroeconomic environment has also been a factor in Australia's productivity performance. Other explanations (recovery from recession, increased work intensity, mismeasurement, new technologies) have some plausibility, but they are not sufficient to account for the strength of the productivity surge.
 - Productivity growth is unlikely to continue at its current record rate over the long term. But the prospects for continued strong performance are good, especially if there is ongoing implementation of reform.

Overview

Microeconomic reforms have been introduced over the past decade and a half in the expectation that (amongst other things) they would help to raise Australia's productivity performance. Productivity growth is the major determinant of growth in average income over the long term. It was therefore expected that the introduction of reforms would underpin stronger growth in Australian living standards.

Australia's productivity growth has surged in the 1990s, according to ABS estimates. The rate of productivity growth since 1993-94 has been measured at double its previous average.

Much of the improved productivity performance appears to be coming from a transformation in the production side of the Australian economy since the 1980s. To understand that transformation and the role that microeconomic reform may be playing, it helps to recall the origins of reform.

The origins of reform

It became increasingly apparent from the mid-1960s that longstanding government policies — whatever their successes in the past — were imposing unnecessary costs in terms of holding back growth in living standards.

A series of reports commissioned by governments over the 1960s and 1970s drew attention to structural weaknesses in the Australian economy (box 1). The particular policy approaches that governments had selected to pursue economic development and redistribution objectives, and the way they had been implemented, had contributed (perhaps unintentionally) to these weaknesses.

Box 1 Structural weaknesses in the Australian economy prior to reform

Australians were assured a steady growth in national income for most of this century — up until the mid-1970s. Governments were able to focus much of their policy attention on development and redistribution objectives. Policy strategies included import protection for industries, centralised wage determination and government ownership of large parts of economic infrastructure (energy, transport, water and communication).

From the mid-1960s, some of these policies started to come into question — not about their objectives or whether they enjoyed success, but about some of their (perhaps unintended) consequences. The Vernon Committee report of 1965 was the first of a series of government-commissioned reports during the 1960s and 1970s to draw attention to associated structural problems.

These included:

- the proliferation of small-scale production facilities covering a wide range of products (rather than gains from scale and specialisation);
- the diversion of resources away from the products with the best long-term potential to add value and prospects for growth and exports;
- a predominant focus in manufacturing on the domestic market, leaving a dependence on agricultural and mineral products for export earnings;
- poor investment decisions and excess manning in large areas of economic infrastructure;
- poor work practices, labour relations and management;
- outdated or inappropriate technologies, combined with low innovation and skill development; and
- a production culture that resisted change and showed weak commitment to performance improvement.

These weaknesses meant that Australia's productivity performance and therefore growth in living standards were being held in check. Because of the reliance on agricultural and mineral exports, the economy was vulnerable to adverse price movements in commodities. And the economy did not have the structure, flexibility, or entrepreneurial culture needed to meet the challenges of emerging international competitors, rapid technological change and increasing global integration.

Concerns about structural weaknesses intensified in the 1970s and 1980s, as growth in living standards slowed (figure 1) and prospects for recovery looked grim. Pessimism about the outlook for prices of Australian commodity exports, the emergence of strong competition in manufactures from Asia, current account and exchange rate vulnerability and concern about Australia's slippage in the international league of per capita incomes focused attention on the need for policy reform.

A series of economic reforms has been introduced since the mid-1980s. There have been both macro and micro dimensions. Reforms have encompassed changes in monetary and fiscal policies, capital markets, industry assistance, taxation, government enterprises, regulation, labour markets and industrial relations, competition policy, innovation and training.

Microeconomic reforms were expected to improve productivity by:

- encouraging greater flexibility in the economy so that resources would be attracted to more productive uses;
- improving efficiency and international competitiveness; and
- encouraging a business culture more outward-oriented and more focused on pursuing opportunities to grow and add value.

Australia's productivity performance in the 1990s

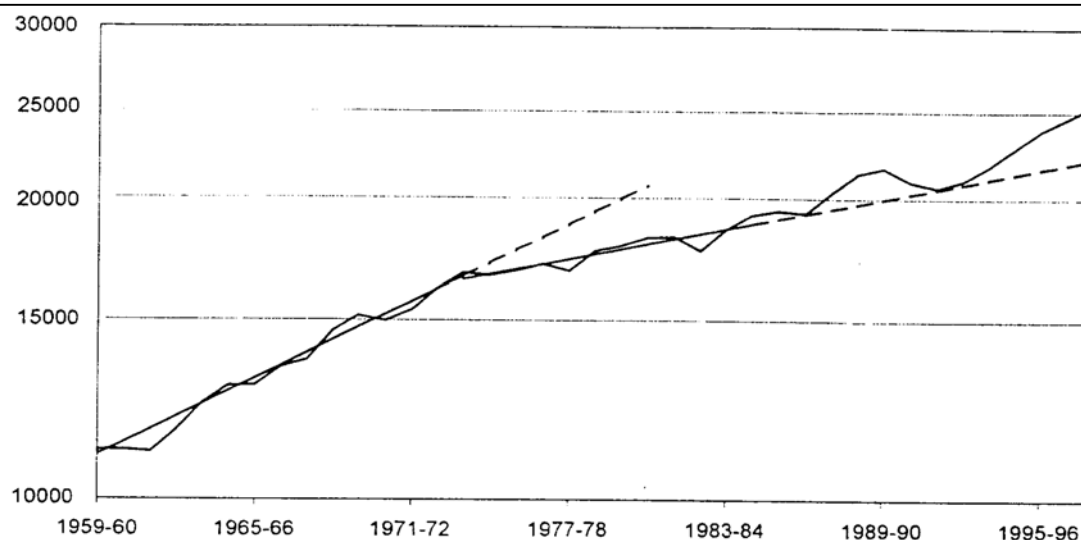
There has been a marked improvement in Australia's rate of productivity growth in the 1990s. In fact, ABS estimates put Australia's productivity growth in this decade at a record peak. Multifactor productivity (MFP) grew at 2.4 per cent a year from 1993-94 to 1997-98, compared with an average of 1.2 per cent a year from 1964-65 to 1993-94. (MFP can be thought of as being combined labour and capital productivity.)

The 1990s productivity surge has more than reversed a decline in productivity growth that started in the late 1970s and continued through the 1980s (figure 2). It has also helped to restore the rate of growth in average living standards in the 1990s (as indicated by growth in average incomes in figure 1).

The 1990s performance also reverses two other very long-term trends:

- Australia's poor performance compared with other high-income countries (box 2); and
- a decline in capital productivity (box 3).

Figure 1 Real gross domestic income per head^a, 1959-60 to 1997-98
1989-90 dollars

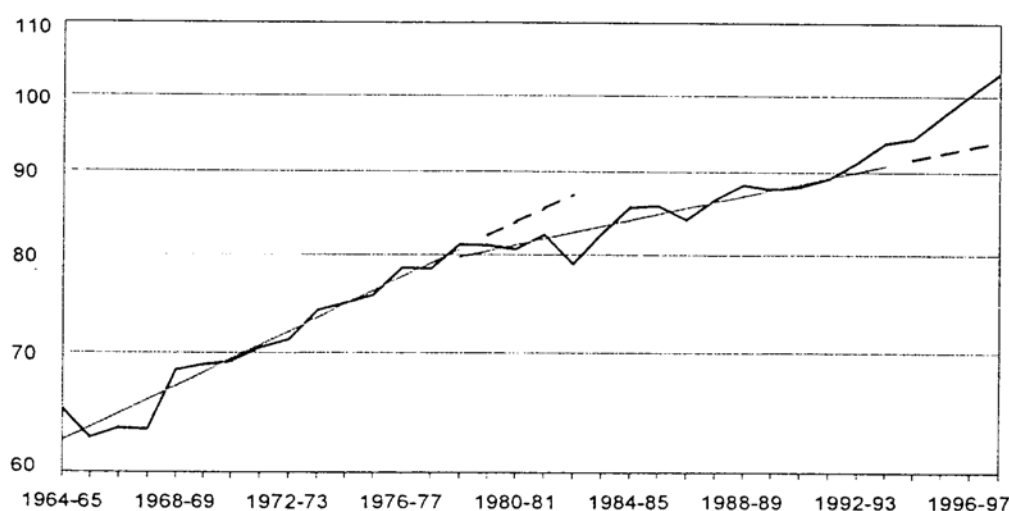


^a The log scales means that the slope of a straight line depicts an average rate of growth. The lines shown are fitted from observations from 1959-60 to 1973-74 to 1984-85 and imply annual average rates of growth of 3.0 and 1.2 per cent respectively.

Data source: Commission estimates based on ABS data.

Figure 1 Multifactor productivity in Australia's market sector^a, 1964-65 to 1997-98

Index 1996-97 = 100, log scale



^a The log scales means that the slope of a straight line depicts an average rate of growth. The lines shown are fitted from observations from 1964-65 to 1978-79 to 1993-94 and imply annual average rates of growth of 1.9 and 0.9 per cent respectively.

Data source: Commission estimates based on ABS data.

Associations between productivity improvement and reform

Does the improvement in Australia's productivity performance in the 1990s match the timing of reforms?

An aggregate view

The timing of the productivity response is at least consistent with a response to the introduction of reforms. While there were some important early steps, reforms grew in coverage and intensity in the late 1980s and into the 1990s. The evidence suggests that productivity growth has been strengthening throughout the 1990s. This could reflect a combination of lags in adjustment to earlier reforms (for example, liberalisation of trade barriers) and response to more recent reforms (for example, the evolution of change in the industrial relations system).

Of course, this broad association is not sufficient, on its own, to establish that microeconomic reforms have been the major factor responsible for the productivity acceleration. The influence of other possible factors must be considered.

Box 2 The 1990s productivity surge and international catch-up

Prior to the 1990s, Australia's productivity record was consistently poor compared with other high-income countries. Over a very long period, Australia made much less progress than other similarly-placed countries in catching up to leading international productivity standards. Its rate of catch-up was slow even in the Golden Age of rapid post-war development. And it was relatively slow in the post-1973 phase when a productivity slowdown hit advanced economies. Australia's ranking in productivity levels among high-income countries slipped from 3 in 1950, to 6 in 1973, to 10 in 1992.

The entrenched nature of this poor rate of productivity catch-up may have had something to do with Australia's isolation. But it is also consistent with the effects of persistent structural weaknesses in the economy, which reduced access to overseas production developments and stifled productivity growth.

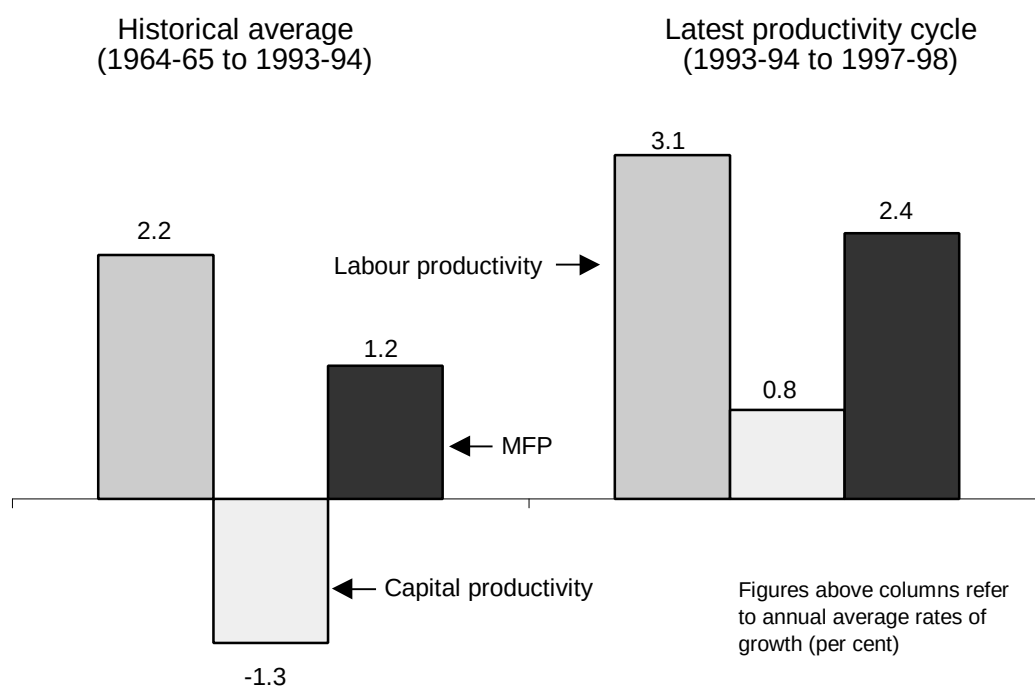
There has been a turnaround in recent years. Australia's rate of productivity growth is well in advance of most other high-income countries in the 1990s.

The turnaround has three related implications:

- There must be 'homegrown' explanation for Australia's productivity surge. There has not been a worldwide productivity boom through the 1990s.
- Something has changed in the way the Australian economy operates, to reverse a long history of relatively poor performance.
- Australia's productivity leap in the 1990s is consistent with a move to catch up on earlier lost ground and move closer to the production standards of other advanced economies.

Box 3 A turnaround in capital productivity growth

A long-term decline in capital productivity since the 1960s has been reversed in the 1990s. Indeed, it is the change in capital productivity, more than labour productivity, which stands out in Australia's 1990s productivity experience.



The turnaround in the capital productivity trend comes largely from improvements in overall efficiency (as indicated by MFP growth). Growth in capital productivity represents the outcome of two opposing influences. On the one hand, there are diminishing returns from capital deepening — adding more capital per unit of labour. Diminishing returns reduce capital productivity. On the other hand, improvements in overall efficiency raise capital productivity.

General productivity or efficiency gains have been sufficiently strong to more than offset the effects of diminishing returns in the 1990s and have been generating much greater value from Australia's capital. The evidence presented in this paper suggests that these gains are coming from such factors as better allocation of investment, greater specialisation, and better management practices and work arrangements.

(The ABS has introduced new estimation procedures which have had most effect on the measurement of capital. Whilst the measures are an improvement, the ABS refers to them as 'experimental' at this stage. Some circumspection on the precision of productivity estimates involving capital measures is therefore in order. But the trends are sufficiently strong to make it unlikely that any ABS revisions will change the general picture.)

An industry sector view

In principle, a more disaggregated industry view provides greater scope to examine associations between productivity improvements and the timing of reforms. It can allow for the fact that different reforms have been introduced to different industries at different times. That said, productivity estimates at more disaggregated levels must be treated with additional caution, from the point of view of accuracy of measurement.

Nevertheless, it appears that relatively strong contributions to aggregate productivity growth have come at various times from Manufacturing, Finance & insurance, Wholesale trade, Electricity, gas & water, Mining, Transport & storage, Agriculture, Construction and Communication services (sectors are listed in descending order of contribution to aggregate productivity growth). Sectoral productivity growth rates are shown in table 1.

Table 1 Growth in multifactor productivity by industry sector
Per cent per year

	1985-86 to 1988-89	1988-89 to 1993-94	1993-94 to 1997-98
Agriculture	-0.1	4.0	-0.8
Mining	2.0	2.0	2.7
Manufacturing	2.4	2.4	0.8
Electricity, gas & water	6.8	5.8	0.6
Construction	-1.6	0.0	2.6
Wholesale trade	2.1	-1.2	7.1
Retail trade	-1.9	1.1	1.1
Accom., cafes & restaurants	-2.7	-1.4	-1.4
Transport & storage	1.1	0.2	2.1
Communication services	3.7	2.4	3.3
Finance & insurance	4.9	1.2	4.3
Cultural & rec. services	-1.2	-1.0	-0.9
Market sector	1.0	1.1	2.4

Source: Commission estimates based on ABS data.

These stronger contributions are broadly consistent with the introduction of industry-specific reforms (for example, tariff reforms in Manufacturing or commercialisation of government business enterprises). But there are some complicating factors. The sectoral productivity trends also reflect:

- The influence of widely-applicable reforms (for example, in capital markets, industrial relations, taxation). The importance of general reforms means that industry productivity movements are not necessarily correlated with industry-specific reforms.

-
- Some productivity effects can be ‘referred’ from other industries. For instance, a more intense focus on cost, quality and timeliness of material inputs in one industry can force suppliers in other industries to improve their performance. In addition, many businesses have responded by contracting out more activities to service industries. These kinds of developments may improve productivity in both the ‘originating’ and the ‘related’ industries.
 - Again, other non-reform influences can be at work.

A diversity in performance within sectors suggests that there are differences in implementation of reform and differences in productivity response that are not evident at the broad level. A prime example is Manufacturing which, overall, has shown relatively steady growth in productivity. But there has been a wide range in productivity performance across industries within the sector. Case studies of three manufacturing industries conducted for this paper also reveal differences in performance across industry segments and firms within industries. Even though they covered ostensibly similar reforms — primarily industry protection reform in manufacturing industries — the case studies revealed marked differences in productivity performance due to differences in the timing and intensity of reform.

A logical implication of these results is that improved productivity performance may be a micro — perhaps even firm-based — story as much as an industry- or sector-based story.

But it also means that some care is needed to take account of the specific timing and nature of reforms, as well as a range of other factors which can affect productivity performance at the micro level.

A case study view

The case studies conducted for this paper suggest that there have been substantial productivity responses to reform in some, but not all, instances.

Five case studies were conducted (box 4). Productivity trends are displayed in box 5. The studies reveal strong productivity improvements in the following cases:

- Whitegoods — labour productivity growth accelerated from 5.3 per cent a year in the 1970s to 8.3 per cent a year in the 1980s;
- NSW rail freight — labour productivity growth accelerated from 7.3 to 13.3 per cent a year over the late 1980s and early 1990s; and has been estimated at 22.2 per cent a year since then (although with resources shifting between organisations as a result of restructuring, the last figure is likely to be something of an overstatement); and

Box 4 The case studies for this paper

Five case studies were undertaken for this paper — two by outside consultants and three by Commission staff. The selection of case studies was intended to provide a range of industries, reforms and responses. But it also reflected the availability of information from earlier industry studies for the manufacturing case studies, and for individual enterprises for the public sector case studies.

Manufacturing sector studies

The manufacturing sector studies covered Whitegoods, Automotive and Textiles, clothing & footwear (TCF). In the 1970s, these were all mature, highly-assisted industries.

The major reforms that these industries have faced have involved reductions in import protection. However, the intensity of reform has differed.

- Quotas were introduced as ‘temporary’ measures for all three sectors in the mid-1970s. They were removed in Whitegoods in 1978, in Automotive in 1988 and in TCF in 1993.
- Tariffs on Whitegoods were reduced significantly between 1978 and 1982 and tariffs on New Zealand imports were reduced between 1978 and 1987. Industry protection in Automotive and TCF was locked in under long-term arrangements and their assistance increased during the 1980s. Various forms of adjustment assistance were applied.
- Tariffs were further reduced on Whitegoods as part of phased, general reductions in tariffs first announced in 1988. Automotive and TCF were granted more gradual reductions and still retain import protection above other industries.

These industries were also able to take advantage of other widely-available reforms affecting R&D, taxation, industrial relations and so on.

Public sector studies

The public sector case studies were of a different character. One, based on NSW rail freight operations, involved reforms to an entire government business enterprise. (This study complements the broader investigation conducted for the Commission’s inquiry on *Progress in Rail Reform*.) The other, contracting out of pipe maintenance activity in Yarra Valley Water, was a single dimension of much broader change.

- Rail reforms commenced in NSW in the late 1980s. Since that time, NSW freight operations have been progressively commercialised, vertically separated from other rail operations and corporatised.
- Yarra Valley Water was formed in 1995 as part of reform of Melbourne Water. Reforms created opportunities for management to implement changes to reduce costs and improve productivity. Contracting of civil maintenance services was one response to the changing business climate. It replaced in-house maintenance services provided by a day-labour force.

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- contracting out of pipe maintenance in Yarra Valley Water led to an improvement in the level of labour productivity of around 60 per cent over 4-5 years.

Detailed examination of a range of possible influences suggests that microeconomic reforms have played the major role in bringing about these productivity improvements. In all cases, there can be reasonable confidence that the improvements in labour productivity reflect substantial improvement in overall efficiency.

In the case of Automotive, there has been a strong improvement in labour productivity. Labour productivity growth has increased from 1.0 per cent a year before 1986-87 to 6.4 per cent a year after 1986-87. However, much of this improvement is coming from increases in capital, rather than an improvement in efficiency. The rate of growth in multifactor productivity (for the broader Transport equipment industry) has increased from 1.7 per cent a year before 1986-87 to 2.1 per cent a year after 1986-87. Whilst that improvement is creditable, it appears that underutilised capacity may have held back a stronger overall productivity response. There has been a sustained increase in investment from 1985-86 (except during the recession); and production suffered in the recession and for a few years thereafter. There are signs of stronger productivity growth, reflecting improved efficiency, in recent years.

The productivity response has been much weaker in Textiles, clothing & footwear (TCF) which shows, at best, weak signs of productivity improvement.

Compared with Whitegoods, the exposure of the Automotive and the TCF industries to reform came much later and less intensely. These industries, and TCF in particular, appear to be still in the earlier stages of transition.

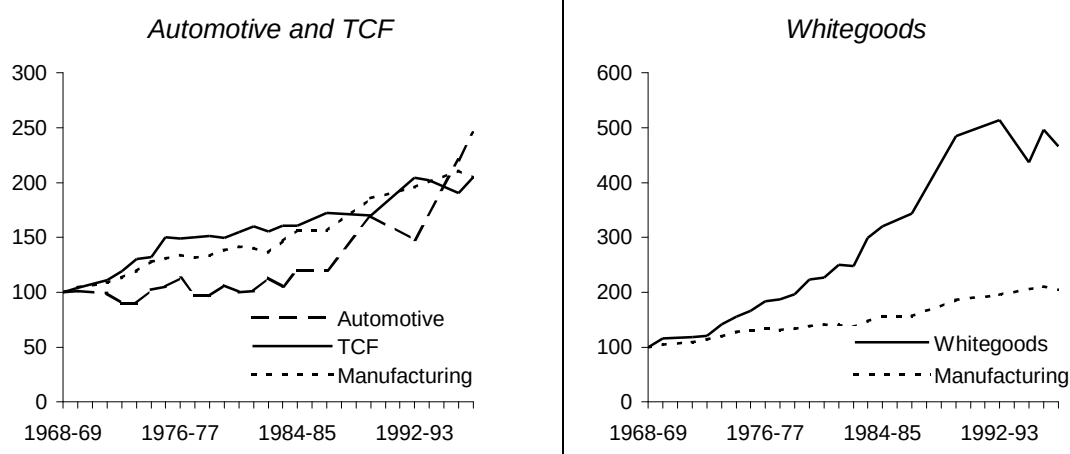
Review of productivity determinants

The paper develops a framework of determinants of productivity as identified in the extensive economics literature on growth. The influence of policy reforms is considered in the context of this framework — specifically, how reforms might affect the identified productivity determinants.

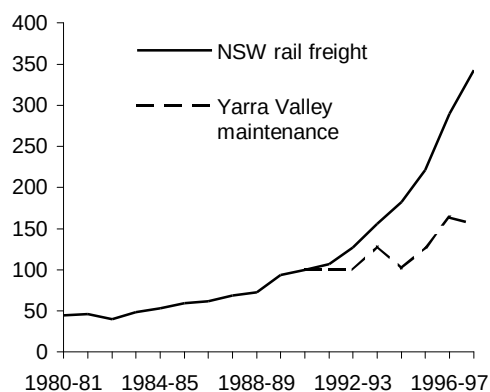
Box 5 Productivity responses in the case studies

Since the late 1980s, microeconomic reforms have made a substantial contribution to the improved productivity performance in Whitegoods, Automotive, NSW rail freight and maintenance of the Yarra Valley Water pipes network. In each case, labour productivity accelerated after relevant reforms. However, the increase in labour productivity has been more subdued in the case of the TCF industries.

Indexes of labour productivity in the manufacturing case studies industries



Indexes of labour productivity in the public sector case studies



The paper then examines evidence on productivity determinants, by way of general trends and the five case studies. The combination of general ('tops-down') and case study ('bottoms-up') perspectives provides a basis for assessing broad trends affecting productivity in the economy as a whole, as well as understanding some of the specific developments and linkages on the 'shop floor'.

The review of productivity determinants suggests that some of the structural problems identified in the 1960s, 1970s and 1980s are now diminishing. A process of 'renewal' or modernisation of Australian production is under way.

Resources are moving more freely to where they can be used more productively. Businesses are taking a more strategic and focused approach to products and markets. There is much greater emphasis on business improvement, which is leading to overhauls of what businesses do and how they do it.

Resources are being more productively allocated

The pace of structural change in the economy has increased since the late 1980s. There has been ongoing growth in inputs in leisure-related service industries, such as Accommodation, cafes & restaurants and Cultural & recreational services in response to consumer demand. But there has also been very strong growth in inputs to business-related services such as Communication services, Finance & insurance and Property & business services. In contrast, there has been weak growth in inputs in ‘traditional’ sectors such as Manufacturing, Agriculture and Electricity, gas & water, suggesting there has been consolidation in these industries around existing input usage.

In Manufacturing and Electricity, gas & water, there have been reductions in employment since the mid-1980s. (Aggregate employment, however, has been growing.) And while investment growth is low in Manufacturing, it is being directed towards modernisation in some segments.

The business-related services are relatively high productivity growth industries (table 1). (Productivity measures for Property & business services are not available.)

Thus, part of the aggregate productivity improvement is coming from:

- high productivity growth in ‘traditional’ sectors, which are consolidating their use of inputs; and
- growth in business-related service sectors which can provide services more productively (through economies of size and specialisation) and have high productivity growth performance and/or potential.

Industry composition effects account for about 0.4 of a percentage point of the 2.4 per cent a year growth in productivity from 1993-94 to 1997-98. This is unusually high, based on previous experience.

There has also been a change in the nature of investment. A greater proportion is being directed toward machinery and equipment, and away from buildings. Expenditure on equipment as a proportion of GDP has increased significantly in the 1990s to reach its highest level for over 30 years. A larger proportion of purchases of equipment has been coming from overseas since the 1980s (a lot of this being

computers and telecommunications equipment). This provides access to technologies developed overseas.

Production is becoming more specialised within industries

There has been rationalisation of products — concentration of production on a smaller range of products — and rationalisation of production facilities through mergers, takeovers and closures.

Case study examples:

- The number of Whitegoods manufacturers has fallen from 18 in 1978 to 3 in recent times. The domestic industry now specialises to a much greater degree, concentrating on larger refrigerators and top-loading washing machines. Plants specialise in single rather than multiple products to gain more from economies of specialisation and scale.
- The Automotive industry, which is sensitive to scale, has rationalised from 5 manufacturers producing 13 models of passenger vehicles at 8 plants in 1985 to 4 manufacturers producing 5 models at 4 plants today. Over the same period, industry production has increased.
- In TCF, production of a number of low-value, standardised products has ceased and many firms have adopted niche market strategies, shifting into more customised, higher-value products with strong brand-name identification. Previous quota assistance had encouraged domestic production of standardised products and importation of specialised products.
- NSW rail freight services and facilities have been rationalised. For example, some low-volume, high-maintenance grain branch lines have been replaced by road haulage. Adoption of better fleet management, better work arrangements and investment in new rolling stock and infrastructure have enabled the rationalisation of yards, maintenance facilities and fuel and crew depots.

Greater specialisation is also evident more generally. One indication is increased intra-industry trade, which refers to the simultaneous increase in imports and exports of goods in an industry. With increases in intra-industry trade, domestic producers leave some products to be supplied by imports and concentrate on other products for supply to both domestic and export markets. An index of intra-industry trade for manufacturing has increased from 66 in 1984-85 to 80 in 1996-97. (An index value of zero indicates one-way trade and a value of 100 indicates an equal level of imports and exports.)

Firms are reorganising and management practices and workplace arrangements are improving

Firms are restructuring not only through mergers and takeovers, but also internally — for example, by redefining core activities, upgrading management practices and redesigning workplace arrangements. Businesses are taking a more strategic approach with a longer-term view, active planning and management of change.

Key features of organisational and management change have included strategic planning to meet competition, streamlining organisational processes to improve efficiency, benchmarking performance against leading global firms and adopting processes and procedures to conform with international quality standards. Advanced management techniques such as total quality control, just-in-time delivery of materials, resource planning and value-added management have been adopted more widely.

The focus on performance has been reinforced with explicit financial incentives linked to business performance increasingly built into management contracts.

Flexibility in work arrangements has improved. As one indicator, enterprise bargaining agreements have grown to cover around half of workplaces (with more than 20 employees) in 1998, from what was a very heavy reliance on the centralised system in the 1980s. Productivity improvements have been an explicit focus of many agreements.

Multiskilling has increased flexibility. And less hierarchical work arrangements in many workplaces mean that those with the best knowledge on the shop floor have greater ability (as well as financial incentive) to suggest and implement productivity-enhancing measures, rather than resist them, as often occurred in the past.

Case study examples:

- In Whitegoods, production methods have been streamlined and new work arrangements put in place. For example, responsibility and decision-making has been devolving to work teams on the shop floor, while the coordination function provided by middle management has been in decline.
- The Automotive industry has adopted the framework of lean production. While lean production is a system designed to expose and address weaknesses in all areas of production, the main innovations in the Australian industry have included work systems employing a multiskilled workforce, better human resource management and better inventory management. And the adoption of

lean production in assembly, with its focus on the timing and quality specification of deliverables, has induced some component suppliers to also adopt lean production techniques.

- Many TCF firms have implemented new management practices, but the trend has not been uniform. The more efficient and world competitive firms have introduced strategies such as benchmarking, quick response production and just-in-time inventory management. However, business improvement activity in TCF has been relatively low.
- There have been fundamental changes in the organisational structure, management practices and work arrangements in NSW rail freight. The former State Rail Authority was restructured from functional units to business units. Decision-making was devolved, the number of layers of management was reduced and accountability for performance was upgraded. Management information systems have been upgraded, excess manning has been reduced, jobs have been redesigned and training has been provided to encourage a more flexible, multiskilled workforce.
- Yarra Valley Water has contracted out pipe maintenance to concentrate on core activities and to promote flexibility and improve performance. With maintenance contracted out, labour engaged in maintenance can be better allocated to the tasks that arise, with less idle time. Contracting out has generated richer information on reliability and maintenance costs, which in turn has provided a sounder basis for decisions about new investment, replacement and maintenance strategies.

The use of up-to-date technologies and innovation have increased

Since the mid-1980s, the adoption of more advanced technologies has accelerated and there has been greater engagement in innovation and production of innovative products. The proportion of those manufacturing businesses with 10 or more employees using advanced technologies increased from 33 per cent in 1988 to 44 per cent in 1997. Expenditure on capital goods from overseas has increased. Business expenditure on R&D has increased strongly since the mid-1980s (at nearly 10 per cent a year).

However, it should be noted that adoption of more advanced technologies has a more muted direct effect on measured productivity growth than many would expect. If technological advances are embodied in capital goods and fully accounted for as quality improvements in the measurement of changes in capital inputs (as ABS procedures seek to do), they will not influence productivity measures. For example, many of the technological advances in telecommunications are embodied in capital

equipment and are reflected in the large expenditures on equipment and infrastructure that have taken place over the past decade. In practice, however, some embodied technological advances are captured in capital inputs and some are not. Those that are not show up in productivity improvements. Furthermore, adoption of new technologies can influence productivity indirectly through associated factors such as organisational and workplace improvements and opportunities to learn by doing.

Case study examples:

- Whitegoods manufacturers now use world-best technology. The production flexibility that computer-aided production provides is now considered to be more important to competitiveness than plant size in this industry.
- Adoption of new technologies in design and production has played a major role in the Automotive industry.
- TCF industries have devoted a greater share of investment to modernising production facilities. Technology in some capital-intensive segments is now comparable to that used by firms elsewhere in the world. However, diffusion of advanced technology is not even throughout the sector.

R&D expenditure has increased in all three industries — strongly so in Whitegoods and Automotive, but R&D expenditure in TCF remains relatively low.

Workforce skills are increasing

The workforce as a whole has become better educated. Rates of retention to final year of secondary school have more than doubled since the early 1980s. The proportion of the workforce holding post-school qualifications, including vocational training, has increased from around 40 per cent in 1982 to over 50 per cent in the 1990s.

The case studies point to increased emphasis on skills and training. This has been in keeping with more technologically-advanced and flexible production systems and the development of flexible and multiskilled workforces.

The links between microeconomic reforms and productivity determinants

The general and case study evidence suggests that microeconomic reforms have been a major influence on many of the developments outlined above. Microeconomic reforms can have pervasive effects on productivity, operating in both direct and indirect ways.

Directs effects on productivity

Most reforms have some direct influence on input/output relationships in production. For example:

- protection policy reforms and taxation reforms alter price and other signals which guide where capital assets, employment, finance and other resources are better used;
- taxation concessions influence the allocation of resources to R&D;
- industrial relations reform has provided a framework to facilitate the redesign of work arrangements within enterprises and allocate labour to where it can be most productively used; and
- reforms can also remove those regulatory barriers that unnecessarily prevent firms from making productivity-enhancing adjustments to products and production processes.

Effects on competition and openness

A large part of the impact of reforms has come indirectly by increasing the exposure of businesses to greater competition and opening the economy to international developments (box 6). Increased competition provides incentives for businesses to improve productivity in order to maintain and improve their financial positions. Competition has been a central catalyst for many widespread and fundamental changes that have brought better performance (box 7).

Box 6 Competition and openness in the Australian economy

Domestic producers have been exposed to greater competitive pressure through liberalisation of barriers to trade in goods and tradable services (the average effective rate of assistance for manufacturing industries declined from 22 per cent in 1984-85 to 6 per cent in 1996-97). Liberalisation of foreign investment has brought competition from the entry of foreign producers into local markets. Domestic competition has also increased through extending and strengthening the operation of competition policy measures, removing some statutory barriers to competition in some markets, as well as greater competition for ownership and control of assets through mergers and takeovers.

The economy has also become more open. Trade intensity (the ratio of imports plus exports to GDP) has increased from 30 per cent in 1984-85 to 47 per cent in 1996-97. Inwards foreign direct investment has increased from an average of around 1 per cent of GDP over the late 1970s and early 1980s to around 2 per cent of GDP from the mid-1980s to the mid-1990s. Outward investment flows have also increased.

Some argue that competition has a negative effect on productivity, by stifling innovation. But the evidence from Australia's experience since the mid-1980s is quite to the contrary. Competition has been a major stimulus to change, including increases in R&D spending (box 7). Openness and competition are important to an economy such as Australia's, which is largely dependent on absorbing technologies from overseas.

Greater openness to overseas trade and investment brings with it greater access to ideas, technologies, expertise and benefits from specialisation and scale. It provides many of the means to achieve more rapid productivity improvements that would otherwise be unobtainable.

Competition was identified as a key driver of change in the case studies.

- In the manufacturing examples, increased exposure to competition came mainly from imports.
- In NSW rail freight, there has been increased competition from other modes of transport in some market segments. Since the mid-1990s, the NSW rail freight market has been opened to competition from other rail freight operators.
- In contracting out of pipe maintenance, the tendering process has provided opportunities for a number of firms to compete.

Box 7 Openness and competition as key drivers of change

Greater openness and competition have been linked to many of the business improvements that have occurred since the 1980s.

The Business Council of Australia conducted a major study of management and enterprise innovation in Australia. It found (Carnegie and Butlin 1993):

Responding to the 'carrots and sticks' of an opening Australian economy has been a recurrent theme for the majority of the enterprises we saw. Indeed our information confirms the view that the decision to open the economy has stimulated a large change in competitive performance. (p. 97).

The internationalisation of the Australian economy and the new performance standards it requires are the predominate drivers of enterprise innovation. They have led to broad improvements in standards, moves to increase value to customers, the search for new products, the ability to turn problems of scale into competitive advantages and the successes of international niche marketing. (pp. 330–31)

The BIE (1993) conducted a survey of 900 firms which identified the need to create a competitive advantage as the foremost influence on R&D expenditure.

Referring to the financial, exchange rate and tariff reforms of the 1980s, one study of organisational change stated:

They created an impetus for organisational change never before experienced in Australia, apart from the mobilisation of industry for each of the two world wars ...

During this period, changing economic and political forces undermined the foundations of custom, practice and precedent that had characterised Australian organisational and institutional life. The pressures on organisations to respond to change were enormous. In many cases organisational survival dictated that transformational rather than incremental changes be undertaken. An economic revolution of epic proportions was in the making, and Australian corporations would never be the same again. (Dunphy and Griffiths 1998, p. 108–10)

Expectations and the policy and institutional environment

Reform can also influence attitudes and expectations in ways that bring fundamental change in businesses' commitment to performance improvement. Businesses form expectations about the ongoing nature and extent of government support they are likely to receive for their production activities. This conditions the extent to which businesses rely on and lobby governments to underwrite their activities or rely on their own devices to achieve their business goals.

The business environment over the decades prior to reform was conditioned by a 'made-to-measure' assistance philosophy which provided assistance to narrowly-defined products and industries. The ready availability of assistance on this basis fostered a reliance on government, resistance to change and a short-term business

outlook. It curtailed the development of a production culture focused on performance.

The implementation of reform brought a jolt to expectations for many. Governments started giving less emphasis to product- and industry-specific assistance in many industries and more emphasis to generally-available measures to support, for example, the development of skills, technology and competitiveness. Many businesses realised they could rely less on tailored government support and they had to take their own measures to secure their future.

The Business Council's study of management and enterprise innovation found (Carnegie and Butlin 1993, p. 80):

Tariff reductions and warnings of tariff reductions to come figure among the most effective triggers for improvement among the enterprises the Study Commission saw.

In the public sector, the conflicting objectives under which government business enterprises operated and the intrusion of political considerations into operations stifled initiative and blurred accountability for performance. With little effective discipline on operating deficits, there was little incentive to improve performance.

Clarification of objectives and accountabilities has changed the environment in which government businesses and their managers operate. Government businesses have been given a clear commercial focus, with clear and strong expectations about performance.

Case study examples:

- The manufacturing case studies illustrate contrasting experiences. The three industries were all highly assisted in the 1970s. But, since then, the Whitegoods industry had greater reductions in assistance over a shorter period (box 4). This brought much quicker adaptation in this industry. Automotive and TCF, although provided with extensive forms of adjustment assistance, were slower to adjust and have been much slower to raise their productivity performance (box 5). Having realised by the mid-1980s that the government policy stance toward support of the Whitegoods industry had changed, the local industry went through a period of relatively rapid adjustment to become internationally competitive.
- In NSW rail freight, the clarification of objectives and accountabilities has established a clear commercial focus. Management could no longer operate under the expectation that the government would continue to fund operating losses. The changes signalled the end to the old way of doing things. To a much greater extent, what is now done and how it is done is based on market demand and commercial principles, or on explicitly identified and funded social need.

The operation has been transformed from a railway run by a bureaucracy to a customer-focused service organisation seeking ways to extend its business and improve its performance.

Reforms have also affected many institutions that impinge on business. The processes for determining workplace arrangements, terms and conditions have undergone significant evolution. Financial and business service institutions have become more sophisticated in the provision of access to finance, insurance against risk and support in business planning and improvement. And corporate governance and supervision arrangements for businesses have also changed significantly.

These changes provide greater focus on performance and, at the same time, provide businesses with greater flexibility to pursue improvements. There is also greater accountability to ensure that performance is delivered and freedoms are not misused.

The strength of the links between reform and productivity

The indirect effects of reform on competition, openness and the policy and institutional environment mean that reforms have exerted an influence on productivity well beyond their specific direct effects.

The importance of ‘signals’ from government suggests a kind of ‘threshold’ effect which heightens the sensitivity of industry responses to policy changes. Even small policy changes can have a profound effect if businesses interpret them as signalling a fundamental change in policy direction. On the other hand, even major policy initiatives may have little effect if it is perceived that the changes are reversible or can be offset by other circumstances or policy measures. As a general example, the ‘announcement effect’ of the well-defined program of phased reductions in tariffs sent a signal to many businesses about the greatly-reduced prospects of gaining further assistance from government. Adjustments in many cases were set in train well in advance of the actual annual reductions that unfolded.

The importance of the indirect effects means that a proportional relationship cannot necessarily be observed between the degree of reform in particular industries, producer responses and productivity outcomes.

There are also complementarities in reforms. Some reforms may be ineffective unless there is a basic incentive provided by competition and good corporate governance arrangements. For example, businesses may be reluctant to take advantage of more flexible industrial relations arrangements unless they have the imperative of competitive pressure.

Complementarities can also be seen in terms of the flexibility businesses have to adjust to a new operating environment. The flexibility to adjust affects the benefits from reforms. For example, if producers were faced with reductions in import protection, but were saddled with ongoing inflexible and inefficient work arrangements and inefficient capital markets, the benefits from reform could be limited. But if labour and capital market and industrial relations reforms are part of the overall ‘package’ of reforms, the benefits from the initial trade reforms could be substantial.

There are gains that come over the long term. Incentives are sharper for producers to improve productivity performance in order to add value. This can mean reducing costs and eliminating waste in the short to medium term. But it can also encourage businesses to add value and increase returns in other ways. In the Australian context, moving from a ‘sheltered’ to a more competitive and self-reliant environment has forced businesses to consider more strategically where their future lies — which products and which markets will enable them to add value. This leads the more entrepreneurial producers to focus on customers and market trends and specialise in products in which they can deliver on differentiated characteristics, quality, service and price. Organisational change, workplace design, innovation, technology and skill development can all then follow. Pursuing new markets, new products and new ways of doing them delivers productivity benefits over the long-term.

As noted above, the focus on performance in some key areas of the economy can be transferred to other areas of the economy. Productivity gains for the economy as a whole can become substantial.

Finally, the greater emphasis on anticipating and managing change also makes the economy more resilient and able to maintain good productivity performance. It was often thought that opening the economy would make it more vulnerable to external shocks. However, businesses are now explicitly managing change and uncertainty. The responses of businesses to the economic crisis in Asia (for example, by switching sales to other markets) suggest that they have greater awareness of markets, have contingency plans in place and have the flexibility to make more rapid adjustment. By maintaining sales and output, productivity performance is also maintained.

Other explanations for the productivity improvement

The evidence points to strong links between reform and productivity. But any assessment of the significance of microeconomic reforms in the 1990s productivity surge also requires consideration of:

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- other possible explanations for the improvement in productivity; and
 - the possibility that some of the productivity improvement might have occurred anyway, without the introduction of microeconomic reforms.

Macroeconomic conditions and management have been a factor

Microeconomic reforms have some immediate payoffs. But they are perhaps best seen as collectively raising the potential for productivity growth over the long term. The extent to which that potential is realised in the short to medium term depends also on macroeconomic conditions — especially demand-side factors, which stimulate output growth. Even though productivity growth has helped to shape macroeconomic outcomes in the 1990s, it is undoubtedly also true that improved management of the macroeconomic environment has helped to maintain demand and therefore the realisation of greater productivity potential over recent years. This is particularly true of the response to the Asian economic crisis.

However, the productivity surge required more than stability in demand in the face of adversity. It required supply-side changes.

Other ‘non-reform’ explanations do not seem to hold up

A number of other explanations for the 1990s productivity acceleration, apart from the effects of economic reforms, have been put forward. While they have some influence, they do not appear sufficiently powerful to explain Australia’s very strong productivity performance.

Effects of the recession. Productivity growth accelerates in the recovery from recession as excess capacity and underutilised labour are soaked up. While strong productivity growth could therefore be expected in the recovery from the early 1990s recession, productivity growth has accelerated faster and for several years longer after the 1990s recession than after previous recessions.

New technologies. It has been suggested that new technologies, particularly in information technology, are bringing productivity improvements through such avenues as network economies, increasing returns and spillover effects. However, the 1990s productivity acceleration is basically an Australian phenomenon in terms of length and strength. There has not been the same experience in other countries (except Ireland and Norway for different reasons and the US productivity acceleration is more recent and less marked). It is difficult to accept that the benefits of new technologies could be sweeping Australia to such prominent effect, without doing the same in other economies. (This kind of ‘frontier’ technological advance is

distinct from greater uptake of existing technologies which, as outlined above, does appear to be a feature of the 1990s.)

Work intensity. The claim has also been made that the measured increase in productivity is a result of people working harder rather than any underlying improvement in efficiency. The greater work intensity is said to stem from reductions in employment, leaving fewer people to undertake the work task. In the productivity context, the issue is not about whether people are working longer (although that can matter for other reasons). Longer hours are reflected in labour inputs. The issue concerns additional work effort during time worked. While there are cases of greater work effort at the micro level (many of which are also consistent with improvements in efficiency), the evidence at the aggregate level does not stack up. More, not fewer, people are working. Moreover, it is claimed that greater work intensity would show up in an improvement in labour productivity, with little impact on efficiency. But, as shown above, the 1990s experience has been characterised by stronger acceleration in multifactor productivity.

Wages and employment. A related claim is that high wages growth has restricted employment growth. Since output growth is said to have remained essentially stable in the absence of true gains in efficiency, this produces an increase in (labour) productivity growth. Again, the exclusive focus on labour productivity is misplaced and the evidence from the 1990s experience on output and multifactor productivity growth does not support the claim.

Measurement error. It has also been suggested that the productivity acceleration stems from measurement error. This is unlikely. The ABS has recently adopted a measurement framework considered to be international ‘best-practice’. (The switch to the improved framework itself made little difference to the estimation of recent trends.) While this still leaves room for measurement error, it would have to be argued that mismeasurement has not been systematic but has changed progressively over the 1990s. A cogent case has not been made.

It is unlikely that such a productivity surge would have happened anyway

Would the productivity-enhancing developments outlined above have occurred anyway, even without reform?

Some may have. But many would not have. The fact that Australia remained insulated from the full extent of world developments for so long in the post-war period suggests that possible productivity improvements may not have been realised without some fundamental changes in the business environment to encourage and allow the more vigorous pursuit of productivity improvements.

There have been advances in technology and disembodied improvements in production techniques which have been taken up in Australia. But past performance, prior to reform, suggests that the uptake would have been much less without the incentives that are much more prominent in today's operating environment.

Some factors such as an improvement in the educational attainment of the workforce may have happened anyway (although there have been some education reforms and the incentives to undertake education and training may have changed). However, even if education levels did increase to the same extent, this alone could not explain the extent of the 1990s productivity improvement. There has not been a surge in education and training of sufficient strength in the 1990s to match the surge in productivity growth.

The productivity growth outlook

Will the high rates of productivity growth seen in recent years endure?

The expansion of Australia's productivity potential through reorganisation and modernisation of production systems and product and market development is likely to bring long-term gains. However, if an adverse movement in macroeconomic conditions did take place (due, for example, to a wider slump in export markets) productivity growth could be set back for a relatively short time.

That aside, part of Australia's productivity surge appears to stem from a process of catching up to the production standards of other countries. As these standards are approached, it is probable that the rate of growth of productivity will slow somewhat from the high rates witnessed in recent years.

However, equally, it is unlikely that the long-term rate of productivity growth would slow as far as the average recorded over the 1970s and 1980s. The search for different ways to add value, the greater focus on development of technology and skills and a greater entrepreneurial culture will bring ongoing productivity improvements.

Finally, government policy will also continue to exert a significant influence. A continuation of reforms is likely to reinforce the prospects for strong productivity growth.

1 Scope of the paper

Productivity matters. Productivity growth is the major determinant of long-term growth in standards of living. Australia's productivity growth in the second half of this century has generally been lacklustre by international standards. But, even so, it has accounted for about two-thirds of the growth in average incomes of Australians (IC 1997a).

Australia's productivity performance has improved significantly in the 1990s (see chapter 3). Whilst this is welcome, the reasons for the improvement are not thoroughly understood.

Interest has centred on microeconomic reform as one possible explanation. A series of microeconomic reforms was introduced during the 1980s and 1990s with the expectation that, amongst other things, they would help to improve Australia's productivity performance. The 1990s productivity surge provides circumstantial evidence of a dividend from reform.

This paper seeks to go beyond the circumstantial evidence to provide a more careful and detailed exploration of the links between microeconomic reform and productivity. In doing so, the paper:

- outlines the nature of reforms and what they were intended to achieve;
- explores the mechanisms through which microeconomic reforms can affect productivity performance; and
- gathers some evidence through case studies and other general indicators on the nature and significance of the links between microeconomic reforms and productivity improvement.

Another motivation for the paper comes from a 1998 conference on microeconomic reform and productivity conducted jointly by the Productivity Commission and Australian National University (PC/ANU 1998). This conference helped to identify several issues of uncertainty and debate in relation to the links between reform and productivity. These turn largely on whether microeconomic reforms are confined to static effects from the reallocation of resources, which are claimed to produce only once-off adjustments in the *level* of productivity, or whether they also lift the *rate of growth* in productivity. This paper also attempts to shed some light on this issue.

The practical significance of the issue is that, if microeconomic reforms were confined to static/level effects, their effects on productivity would tend to fade out at some point, as the full extent of static adjustment is reached. In other words, any influence of reforms on productivity improvement would not be permanent.

This paper is by no means intended as a definitive treatment of microeconomic reforms or of their productivity links. The reforms introduced in Australia have been very broad in compass (chapter 2), covering product and factor markets, competitive reforms, regulation, taxation, institutional arrangements and so on. However, reforms of industry protection policy and government business enterprises are the only ones explored in detail in this paper.

The paper does not attempt a full assessment of the effects of microeconomic reforms. It focuses on the links between reform and productivity and does not consider all benefits and costs. As the next chapter points out, microeconomic reforms can have other potential benefits (for consumers, for the unemployed, for environmental protection and so on) which are not examined in this paper.

The potential costs of microeconomic reforms are also not examined. Reforms bring many changes that can impose adjustment costs, at least in the short term. These can include the costs of finding a new job (retraining, relocation) or a period of unemployment. Adjustment costs may be more intense in locations that are more isolated or have narrower economic bases, because alternatives may be more difficult and costly to find. The costs for certain groups may also be greater — for example, if older age groups find greater difficulty in retraining for jobs in demand.

Reforms have also affected a number of institutions that have helped to determine the distribution of income. A full assessment of reforms would cover their effects on adjustment costs and the distribution of income; and would consider whether these effects have been adequately addressed from a policy point of view.

The potential costs of reforms are not explored in this paper, not because they are unimportant, but because there are limits on the range of issues that can be addressed adequately in one paper. The Commission has been undertaking other work to consider employment and social consequences of productivity, reform and change.

Broad approach

The paper considers the effects of reform on productivity from the productivity perspective. The research strategy was to develop a framework of productivity determinants, and then examine how policy reforms affect the identified productivity determinants.

This latter task was approached via two paths — a general approach and a case study approach. Each has its strengths and weaknesses.

The general approach is used to set out key issues and relationships and to gather evidence at a broad level. But it is difficult to establish the detail and significance of the links between reform and productivity at the general level. Case studies provide more scope in this regard, but they can be limited in the extent to which they illustrate all relevant issues or provide results which can be generalised.

The general approach is set out in the next three chapters. It commences with a review of the nature and objectives of reform (chapter 2) and recent productivity trends (chapter 3). Chapter 4 outlines the framework of factors that are considered in the economics literature to influence productivity, reviews evidence on these factors and considers a number of possible explanations for the 1990s productivity acceleration.

The case studies are summarised in chapters 5 (manufacturing sector) and 6 (public sector). The full text of the case studies is presented in volume 2 of this report. Five case studies were conducted, two by independent contractors and three by Commission staff:

- Whitegoods — Price Wiggins and Associates;
- Textiles, clothing & footwear — Commission staff;
- Automotive — Commission staff;
- pipe network maintenance for Yarra Valley Water — CTC Consultants; and
- NSW rail freight — Commission staff.

The selection of case studies was intended to provide some insight into a range of industries, reforms and responses. One practical issue which also guided the selection was the availability of historical information and data. In the first three areas covering manufacturing, some history is available in the various government reports that have been compiled over the years. In the two areas covering government services, the focus on particular enterprises eased the information task.

Some concluding remarks on level and growth rate effects of reforms are made in chapter 7.

2 Microeconomic reform, productivity and living standards

This chapter outlines the reasons, objectives, nature and expected effects of microeconomic reforms.

The main motivation for introducing microeconomic reforms stemmed from a concern to maintain and improve Australian living standards. It became increasingly apparent from the mid-1960s that longstanding government policies — whatever their successes in the past — were imposing costs in terms of holding back growth in living standards. Concerns about the effects of these policies intensified in the 1970s and 1980s, as growth in living standards slowed and prospects for recovery looked grim. Policy reform was introduced to help rekindle sustainable growth in output and living standards.

2.1 Background to economic reforms in Australia

For most of this century, Australian governments were able to concentrate on broad development and redistribution objectives: population growth; diversification of production; and redistribution of the gains from natural resources. Australia's abundance of natural resources assured a strong stream of national income. And the so-called Golden Age of development after WWII also provided a period of strong growth. With widespread popular support, governments were prepared to pursue development and redistribution goals, even if that came at some cost to average standards of living (Pincus 1995).

Several key policies were called upon in pursuit of these objectives:

- protection policy — shielding local industries from import competition through tariffs, bounties and quota restrictions — which was intended to:
 - redistribute economic activity from land-intensive activities in agriculture and mining toward labour-intensive, urban-based activities in manufacturing;
 - encourage the development and diversification of industries to promote, for example, economies of scale and greater self sufficiency; and

-
- enable wage tribunals to set wages higher than would prevail with more intense import competition (Anderson and Garnaut 1987);
 - centralised industrial relations and wage determination systems which were intended to redistribute income, promote social cohesion and raise wages as an attraction to immigrants;
 - a high rate of immigration which was intended to promote population growth and development; and
 - government ownership and control of economic infrastructure (roads, transport, communications, energy, water) which was intended to promote national and regional development, assist redistribution through provision and subsidisation of some services, and provide employment opportunities as ‘employer-of-last-resort’ to some groups and in some locations.

From the mid-1960s, some of these policies came progressively into question — not so much about their development and redistribution objectives or the benefits they had brought, but about the costs they imposed. A series of reports commissioned by government over the 1960s and 1970s documented the consequences of these policies (appendix A).

The Vernon Committee (1965) report focused attention initially on the way in which protection policy had been implemented. Protection against imports was provided on a piecemeal ‘made-to-measure’ basis. This meant domestic producers were essentially afforded the protection they needed to withstand competition from imports. Because the made-to-measure principle was implemented for narrowly-defined industries and products, it had led to a highly complex structure of industry assistance. (See appendix A for details on implementation of protection policy.)

As outlined in the next section, this in turn had led to a number of problems, including the proliferation of small-scale production operations, covering a wide product range, rather than concentration on products that would add most value and allow gains from scale and specialisation.

The Jackson Committee (1975) review of manufacturing was one of a number of commissioned reports that detailed production inefficiencies. It stated that Australia’s relatively poor productivity performance could be explained by a variety of factors including poor labour relations, outdated or inappropriate technology, lack of scale economies and inadequate management techniques.

While government assistance was generally lower in agriculture than in manufacturing, there were arrangements in some industries, such as marketing and price support schemes, to maintain incomes derived from small-scale farms, many

of which originated in Soldier Settlement schemes. Again, complexity and diversity characterised the assistance landscape in this sector.

In areas of infrastructure, governments did not run their business enterprises on clear commercial principles. Investment and operational decisions also reflected political considerations: there were cross-subsidies and unfunded community service obligations; and the businesses were required to be ‘employers-of-last-resort’. This meant unprofitable and underutilised capacity and poor operational efficiency. Chronic and seemingly unbounded operating losses were not unusual.

Whilst these adverse policy outcomes were perhaps unintended, they nevertheless meant that Australia’s productivity performance and growth in living standards were being held in check. Furthermore, it was recognised that development and redistribution objectives could be pursued by more direct and less costly means. Consequently, the costs of pursuing these objectives were not being minimised.

Some tentative steps toward reform of protection policy were taken in the early 1970s and a 25 per cent across-the-board tariff cut was introduced in 1973. But, as inflation and unemployment took hold in the 1970s, protectionist tendencies re-emerged.

Concerns about structural weaknesses in the economy intensified in the 1980s as slow growth in output and living standards persisted (box 2.1), pessimism about prices for commodity exports took hold and the economy became vulnerable to exchange rate and current account pressures. By the mid-1980s, Australia’s position on the league table of average incomes had slipped (from fifth in 1960 to fifteenth in 1985¹). And East-Asian countries had not only emerged as strong competitors, but their strong growth based on exports cast even further doubt on development strategies based on import replacement.

In short, international competitive pressures and domestic structural pressures were forcing a rethink of policy direction. The prognosis was that, without a change in policy direction, growth in the living standards of Australians would slow even further. A range of macroeconomic and structural policy reforms was required to rekindle sustainable growth.

¹ These rankings, based on IMF (1990, 1997), do not use purchasing power parity exchange rates which would likely make some difference to Australia’s absolute position in 1960 and 1985, but not to the general trend between the two years.

Box 2.1 Growth in average living standards over the century

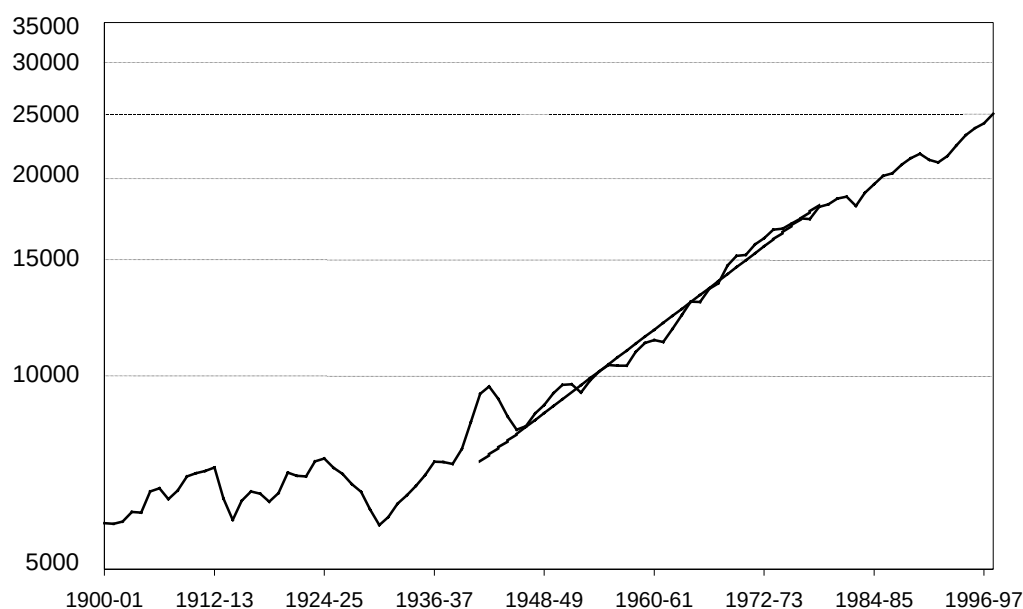
Growth in average incomes is commonly used as an indicator of average living standards. It has some flaws, but nevertheless gives a broad indication of growth in material prosperity.

The two panels show trends in two measures of Australia's growth in average incomes. They are both drawn on a log scale. This means that the slope of a straight line depicts an average rate of growth.

Panel 1 shows the very long-term picture, measured by real GDP per head of population. It shows the relatively rapid growth in the post-war era — the so-called 'Golden Age' of development.

Panel 1 Real GDP per head, 1900-01 to 1997-98

1989-90 dollars



Source: ABS Time Series Statistics database on EconData, plus data supplied by ABS.

(Continued on next page)

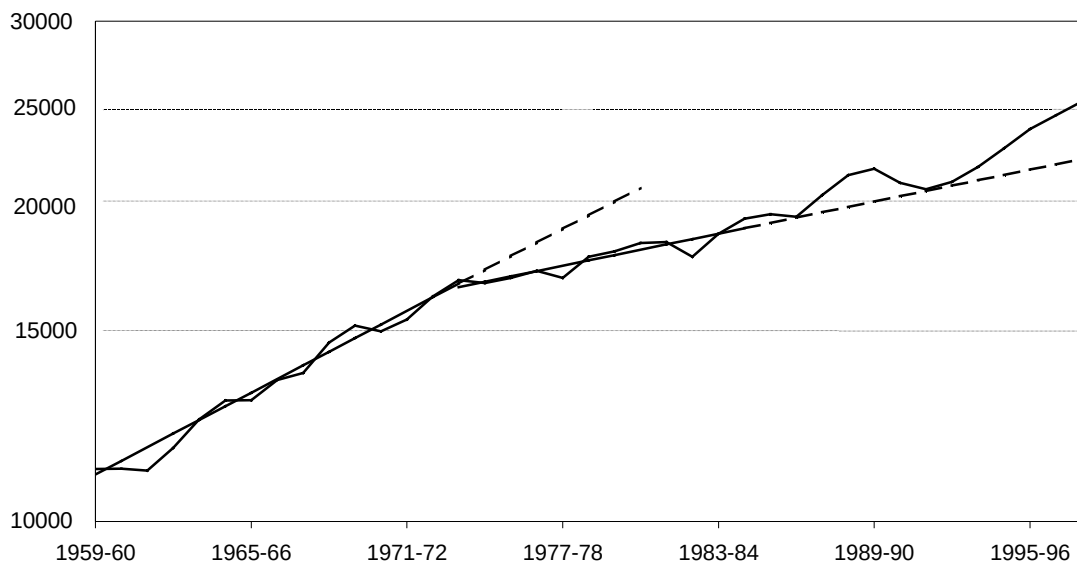
Australian governments were also facing pressures from the actions of governments in other countries. Many countries around the world started major policy reform in the 1980s in response to ongoing stabilisation problems, technological change and global pressures (World Bank 1997; Williamson 1994). While Australia had its own reasons to undertake reform, the changes sweeping other countries added pressures on Australian governments to get their policy houses in order so that Australia could participate more fully in growth in world trade and investment.

Box 2.1 (Continued)

Panel 2 shows a better measure — real domestic income per head — which adjusts GDP for movements in the terms of trade. (It therefore reflects movements in Australians' purchasing power.)

Average incomes by this measure grew at an average rate of 3.0 per cent a year from 1959-60 to 1973-74. The rate of growth then slowed to 1.2 per cent a year until 1984-85. Since then, there have been two periods of reacceleration. In the latter part of the 1980s there was an increase due to strong growth and an expansion of employment. This was reversed in the early 1990s recession. Since then, there has been a further and more extended reacceleration which, it is argued in this paper, is associated with the 1990s productivity surge.

Panel 2 Real gross domestic income per head, 1959-60 to 1997-98
1989-90 dollars



Source: ABS Time Series Statistics database on EconData.

The OECD (1998, p. 11) made the following observation on the international trend.

... OECD governments are taking a critical look at many policy areas. High public debt burdens, an increasing awareness of the limitations on the government's role in the economy, the reduced effectiveness of domestic policies in a rapidly globalising world, and the end of the cold war are among the reasons for a major reorientation of government policy over the past decade.

While the fundamentals of governments' role remain in encouraging the attainment of economic and social goals, governments have shifted, in some areas such as economic infrastructure, from active engagement in production activities towards managing the framework within which others produce and distribute goods and

services. Particularly with technological advances, governments have increasingly recognised that in many areas others now have the skills, financial resources, experience, networks, technical abilities and incentives to produce goods and services better than they can. Furthermore, with growing concerns about constraints on raising revenue and their levels of debt, governments have become a less ready source of funds (for example, to finance large-scale infrastructure projects or even to finance operating losses).

Governments in many countries have also become less intrusive in their intervention in markets in response to greater global integration. They have perceived a need to enhance flexibility in their own economies and minimise avoidable restrictions and imposts on producers in order to attract foreign investment and limit any disadvantages for their own domestic producers who have to operate in competitive and changing world markets.

2.2 Objectives of microeconomic reforms

Microeconomic reforms were intended to correct a number of the problems that had accumulated under previous policies and were holding back the development of Australia's productivity potential and growth in living standards.

Structural problems in the 1970s and 1980s

One of the central economic problems facing Australia was that large parts of the economy had become inefficient, inward-looking and inflexible — unable to respond well to the changes and challenges that were arising from rapid advances in technology, global integration and fiercer overseas competition.

The particular way in which protection policy had been implemented was a major factor shaping the performance of the manufacturing sector. Whilst the made-to-measure approach to protection policy had fostered industry diversification, it had also:

- allowed small-scale production facilities to proliferate across a wide product range (rather than promote gains from specialisation);
- distorted the flow of resources away from industries with the best potential to add value and prospects for growth and exports;
- encouraged the manufacturing sector to focus on import replacement, leaving a continued reliance on agriculture and minerals for export earnings;

Box 2.2 **A businessman's view of the pre-reform environment**

A business leader, John Uhrig, made the following observations about Australian attitudes and approaches to competition and change in the 1979 Stan Kelly Memorial Lecture (Uhrig 1979).

'During a visit to Australia recently, a senior Japanese businessman made the observation that in Japan, companies are accustomed to having to adjust themselves to new circumstances in order to survive. He went on to say that the attitude of Australian manufacturers seemed to be that it was the responsibility of government to change the circumstances instead.' (p. 3)

'... during a very long period in which the absence of rapid change was assured, an evolutionary process has encouraged the development of managers who are best fitted for those circumstances. For this reason, the talents of a great many of our managers are administrative and bureaucratic rather than entrepreneurial.' (p. 5)

'Another aspect of Australian business that forms part of its dilemma and results from its being based on local shortages is the way in which it is geared to the making of profits in the short term. This leaves our companies without business momentum and in no condition to face up to competition from other countries where business momentum tends to be of a much higher order. For a company to build momentum, it must first have a strong sense of long-term purpose and then it must spend.' (p. 6)

- allowed poor management and work practices to develop and become entrenched;
- enabled the continued use of out-dated technologies combined with low innovation and skill development; and
- fostered a production culture that resisted change and showed weak commitment to improving performance. (See appendix A for further details.)

Economic performance was poor in the public sector, where government enterprises provided major services in economic infrastructure — transport, communications, roads, energy and water. Government business enterprises were driven by a mix of commercial, social and political objectives, which led to such problems as excess capacity in highly capital-intensive activities, widespread inefficiencies in operations, continuation of unprofitable services that could be provided by cheaper means, and prices unrelated to costs of provision. (See appendix A for further details.)

There were other policies that affected performance across a wide range of industries. For example, some regulations imposed unnecessary restrictions on firms' ability to adjust production methods. Inconsistent regulation in State and Territory jurisdictions encouraged smaller-scale production for separate regional markets, rather than larger-scale production for national markets. Many regulations prescribed restrictions on competition which, as argued later, acts as a spur to

productivity improvement. Centralised institutional arrangements for negotiating employment terms and conditions encouraged a ‘one-size-fits-all’ approach rather than the development of arrangements at individual workplaces that could be to the benefit of both workers and firms. There were also restrictions in capital markets, distortions arising from taxation regimes, problems relating to corporate supervision and governance and so on. Some of these problems became more evident as the reform process got under way (see section 2.3).

There were also interconnections between policies which affected performance. Protection policy and industrial relations arrangements provide a prime example. The adversarial industrial relations system gave some encouragement to managers to ‘buy industrial peace’ rather than tackle the difficult task of finding productivity improvements through, for example, better work arrangements. They could accede to industrial demands with some confidence that, in the made-to-measure assistance environment, they could seek — and generally be granted — additional assistance to cover adverse movements in costs and competitiveness.

The arrangements also provided little incentive for workers to allow the introduction of productivity-enhancing measures. For example, under a centralised award system, which prescribed relatively uniform terms and conditions, there was less incentive for workers and unions to allow productivity-enhancing technology into a particular workplace. They might get little in the way of additional rewards and might see some jobs disappear.

There was weak commitment to improving performance. In the manufacturing sector, the ready availability of government assistance encouraged producers to seek further assistance as a buffer against the need to lift performance to meet competition. It encouraged resistance to change. And it stifled entrepreneurship and encouraged a narrow and short-term business outlook (box 2.2). In the public sector, the mixture of objectives, diffused accountability for decisions and the lack of discipline on financial performance reduced the incentive for managers to improve productivity performance. Operations were run more as a bureaucracy than as a business with the motives and disciplines to ensure that resources were well utilised.

Economic efficiency

Economists often describe structural problems of the type outlined above as problems in economic efficiency. Economic efficiency is conventionally described in terms of three dimensions:

- allocative efficiency — the extent to which resources are used in ways that contribute most to community wellbeing;

Box 2.3 **Components of economic efficiency**

Economic efficiency is about maximising community wellbeing. Economists commonly say that, economic efficiency requires satisfaction of three components.

Allocative efficiency, in essence, is about ensuring that the community gets the greatest return (very broadly defined) from its scarce and valuable resources. A nation's resources can be used in many different ways. An allocation of more resources to one production activity will produce more output and income from that activity, but reduce output and income produced from other activities where the resources could have been used. The best or 'most efficient' allocation of resources is the one that contributes most to community wellbeing. This often means an allocation of resources that generates the most national income. But it may also mean, for example, that some environmental assets are 'allocated' to conservation in order to meet community values. Prices received for outputs, and costs paid for inputs, are major factors that guide the allocation of resources (although resources that cannot be properly priced or costed in the marketplace often require some form of government intervention to promote the best possible allocation). Improvements in allocative efficiency bring improvements in living standards because resources are used to generate more income and satisfy more needs and desires, but in ways that also reflect community values.

Technical efficiency (sometimes called 'productive efficiency') refers to the extent to which the minimum required inputs of resources are used to produce goods and services, in accordance with economically-feasible technological and management standards. If waste is avoided in this way, improvements in technical efficiency can generate more income and bring improvements in living standards.

Dynamic efficiency refers to the capacity to improve efficiency and generate the most from resources over time. This can mean finding better products and better ways of producing goods and services. Investments in education, research and innovation can be important in this regard. Dynamic efficiency can also refer to the ability to adapt quickly and at low cost to changed economic conditions and thereby maintain output and productivity performance in the face of economic 'shocks'. Improvements in dynamic efficiency bring growth in living standards over time.

- technical efficiency² — the extent to which goods and services are produced with the minimum required inputs; and
- dynamic efficiency — the extent to which resources can be used to produce more output over time and the extent to which production can be altered quickly and at low cost in response to changes in economic circumstances.

These dimensions of economic efficiency are explained more fully in box 2.3.

² Technical efficiency is broadly defined here. In some analyses, the term 'productive efficiency' is used and is defined to encompass technical efficiency plus scale efficiency.

Some examples of the structural problems of the 1970s and 1980s are now grouped into these different dimensions of economic efficiency. As discussed below, this is important in determining the nature and significance of the links between microeconomic reforms and productivity.

Allocative efficiency

- Protection policy had led to production of an excessive range of products, including those to which Australian economic conditions were not well suited (for example, standardised low-value goods).
- Government businesses made some large investments with little prospect of earning satisfactory returns over reasonable time horizons. Many uneconomic services were continued when cheaper options were available.
- The centralised industrial relations system reduced the scope for variation in wages and work arrangements that would have better allocated labour to where it could be utilised most productively.
- Financial capital was rationed. The informal ‘guarantee’ from government assistance was influential in enabling assisted production activities to attract capital. Activities with higher risk, but long-term potential, had greater difficulty in attracting finance.

Technical efficiency

- Protection policy had encouraged small-scale production in manufacturing, often with out-dated technology.
- The ‘employer-of-last-resort’ philosophy meant that employment levels in government enterprises were above minimum requirements.
- Some restrictive work practices meant excess manning and/or avoidable idle time.
- Some regulations were imposing unnecessary costs and restrictions on domestic producers.

Dynamic efficiency

- Rates of adoption of advanced technology and innovation were low.
- Management skills were not strong and a short-term focus worked against business improvement and planning for the future.

Box 2.4 What is microeconomic reform?

The term 'microeconomic reform' is in common usage but can mean different things to different people.

Microeconomic reform involves changes in government policies and institutional arrangements that affect the economic behaviour of particular firms, industries, individuals and households. Reforms can, in principle, be applied to the processes of production, distribution and consumption in all areas of the economy. The ultimate aim of reforms is to improve living standards.

The nature of microeconomic reform depends on the context. As explained in the main text, the context for reform in Australia in the 1980s and 1990s was the realisation that some longstanding government policies and institutional arrangements were imposing some avoidable costs. Without reform, the living standards of Australians would have suffered — and perhaps dramatically so over the long term.

Consequently, a major theme of reform in Australia has been to reduce reliance on these costly approaches; and to find better policies and institutional arrangements to achieve community objectives. Reforms introduced over the 1980s and 1990s have involved winding back a number of government interventions. Greater emphasis has been placed on markets to allocate resources, to provide greater choice to purchasers and to sharpen incentives for firms, individuals and industries to be more productive. This has involved lower import protection, opening up markets to new operators, fewer controls on capital movements, less outside regulation of workplace matters, corporatisation and privatisation of publicly-owned enterprises and so on.

But microeconomic reform does not mean slavish adherence to these methods or to unbridled market forces in general. There is a role for governments to intervene where markets fail and their interventions can improve on market outcomes. For example, some form of regulation is often required to curb any excesses that stem from use of market power and to ensure that appropriate prudential and other standards are met. The merits of privatisation need to be assessed on a case-by-case basis. Government support is required to underpin innovation and the provision of health and education services in the economy. Effective institutions are fundamental to the rule of law and good economic and social outcomes. Depending on the context, reform can be as much about developing and implementing appropriate government intervention as it is about removing it.

- The prospect of government assistance to insulate domestic producers from adverse movements in competition (private sector) and the willingness of governments to underwrite operating losses and unfunded capital expenditure (public sector) weakened incentives to seek out productivity improvements. Businesses did not feel the full consequences of cost increases and failure to introduce productivity improvements.

Microeconomic reform and economic efficiency

Microeconomic reforms were intended to address many of these structural problems and, in doing so, raise Australia's productivity performance.

However, microeconomic reforms are about more than productivity alone. Microeconomic reforms are directed ultimately at improving living standards (box 2.4). They do so by improving economic efficiency. And it is improved economic efficiency that brings productivity and other benefits (box 2.5).

Microeconomic reforms were expected to improve productivity in the following kinds of ways:

- improved allocative efficiency — enhancing flexibility so that investment, employment and other resources would be drawn to more productive activities;
- improved technical efficiency — upgrading technologies, management and work practices towards 'best practice' and gaining more from specialisation and economies of scale; and
- improved dynamic efficiency — upgrading skills and innovation, providing greater incentives to seek out productivity improvements and encouraging greater flexibility to adapt to changing circumstances.

It is the task of chapters that follow to gather evidence on whether expectations about the productivity-enhancing effects of reforms have come to fruition.

However, it should be noted that the nature and significance of the productivity-enhancing effects of reform are contested. Some commentators (for example, Quiggin 1998b) do not consider that microeconomic reforms have major beneficial effects. Effects are seen as largely confined to allocative gains with modest effects on productivity and growth (Quiggin 1998a). Effects on technical or dynamic efficiency tend to be put aside or disputed.

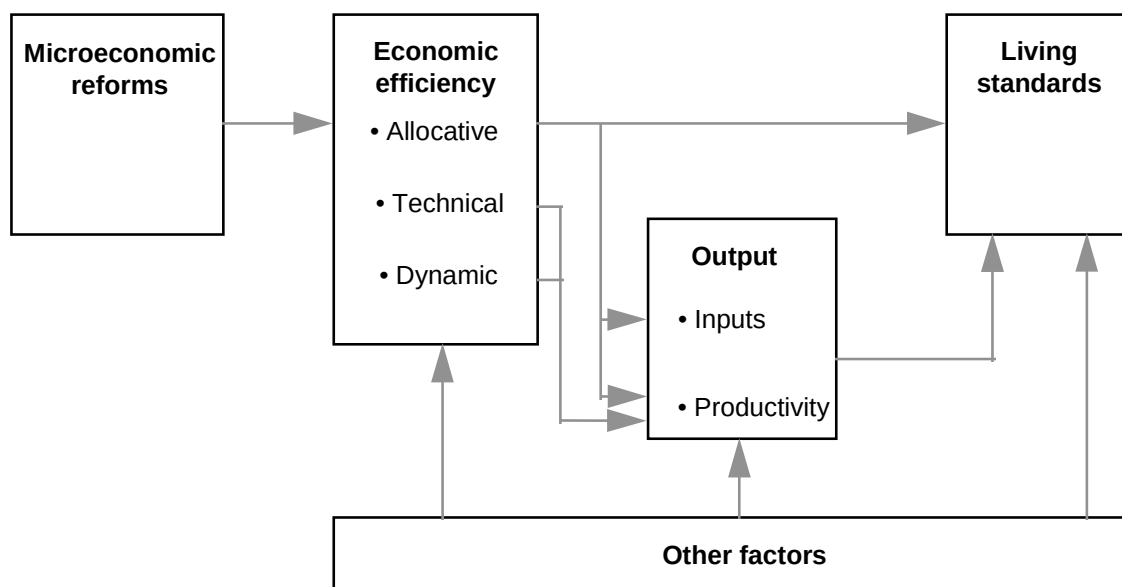
As indicated above, there was a range of allocative, technical and dynamic efficiency problems prior to reform that were linked to a range of longstanding policies. It is true that the productivity gains due to the reallocation effects of reforms of individual policies may be relatively modest. For example, the increase in output from static reallocation associated with tariff reform is typically thought to be significant but reasonably modest in relation to total national output (around 1 or 2 per cent of annual GDP). However, if the full range of reforms are considered and they have been successful in tackling many of the structural problems outlined above — including technical and dynamic inefficiencies — the effects of reform on productivity and growth could be substantial.

Box 2.5 Reforms, productivity and living standards

Microeconomic reforms are not solely about improving productivity. They improve living standards by improving economic efficiency. And it is improved economic efficiency that can bring productivity and other gains.

The concept of living standards covers many facets. Average incomes are often used as a summary indicator of a community's access to goods and services and the distribution of income is often used as an indicator of social equality. More specific elements include quality of health, housing, education, environmental amenity, employment and conditions of work, leisure and lifestyle (IC 1997a, chapter 2).

Economic efficiency is commonly broken down into allocative, technical and dynamic efficiency (box 2.3). Microeconomic reforms can bring gains in all three areas.



Improved allocative efficiency can affect living standards through production effects. It can mean greater employment of people who have a worthwhile contribution to make. It can mean improved productivity as a result of more resources being allocated to production activities that generate more output.

Reforms which improve allocative efficiency can also have 'direct' effects on living standards, for example, through gains to consumers from greater access to their preferred goods and services in response to changes in relative prices. Or, reforms can bring environmental gains by ensuring, for example, that some resources of particular value to the community are conserved.

Technical and dynamic efficiency are more clearly and closely related to productivity improvements. Producing new or existing goods and services with fewer resource inputs is, by definition, a productivity improvement and means that available resources can be used to generate more output and income.

2.3 The implementation of reforms

While the imperative for reform came from a desire to bolster Australian living standards and reposition the economy to deal with globalisation, it took some time for the growing realisation of the need for policy reform to galvanise policymakers into action (see for example, Snape, Gropp and Luttrell (1998)). As outlined in appendix A, there were some steps toward reform of the complex and distorting structure of industry protection, starting in the early 1970s. But there were also mixed signals later in the 1970s when protective quotas were introduced.

It was not until the mid-1980s that substantial policy reform became an active priority. It then became a central policy strategy to turn the inflexible, inefficient and inward-looking production culture around to a more flexible, responsive, efficient and outward-oriented culture. Amongst other things, the emphasis switched from import replacement towards international competitiveness and self-reliance in industry development. (See IC (1998a) for a detailed list of reforms.)

Implementation of reform over time was governed by a number of competing factors:

- there was some prior knowledge of major policies that warranted reform;
- new reform areas and priorities emerged after some reforms were implemented and revealed other structural weaknesses in the economy;
- industry protection in some industries was locked in for periods under long-term arrangements; and
- there were political pressures and social considerations about the pace and directions of reforms.

As a result, reform did not proceed according to a predetermined blueprint or timetable (Garnaut 1994). And, although calls came from a number of quarters for a broad range of reforms to be implemented in close succession or in optimal sequence, reforms in Australia were implemented gradually, sequentially in a number of important respects, and in an order determined in part by opportunity and political judgment.

The completion of reviews of the financial system presented an opportunity for the incoming Commonwealth Government to embark on major reform in 1983. The financial sector reforms had a strong macroeconomic motivation — to bolster the effectiveness of monetary policy instruments. But changes such as floating the currency and abolishing exchange controls were important initial steps in ‘internationalising’ the economy.

There were also active attempts to instil some coherence in industry protection measures from the mid-1980s. One clear signal was that the Government would not grant further increases in assistance on the basis of (un)competitive need. Assistance measures were reviewed and rationalised within broader industry groupings rather than disparate and narrowly-specified industries and products. More emphasis was placed on industries adjusting to change rather than resisting it, improving efficiency and pursuing export opportunities. Such matters as research, innovation and skill formation were approached in more generic rather than industry-specific fashion.

However, further into the 1980s, pressures for more substantial product market reform were building. The property boom was partly attributed to the introduction of financial sector reform without sufficient accompanying reform in other sectors of the economy (Hale 1992). More ready access to finance without improving allocation signals perpetuated a bias in investment away from machinery and equipment towards property (inflation and tax distortions being other factors (Thimann 1998)).

In the late 1980s, tariff reform changed gear. The emphasis shifted from reducing anomalies to reducing general levels of assistance. The Government announced phased across-the-board reductions in tariffs and bounties in Economic Statements in May 1988 and March 1991.

As the tariff wall came down, it exposed other structural weakness in the economy. Manufacturers joined others in calling on governments to broaden the scope of reform so that their inputs could be available on terms that would enhance their ability to compete on domestic and world markets. Inputs of labour and the infrastructure services of government business enterprises (GBEs) were two major cases in point. GBEs comprise a significant part of the Australian economy and have been central in providing vital economic infrastructure services which affect the private sector's ability to develop and compete.

Governments in the different jurisdictions commenced reforms to improve financial performance and efficiency of their GBEs at different times in the latter half of the 1980s. Labour market and industrial relations reforms, to encourage more of a focus on the enterprise and productivity, commenced in gradual fashion in the late 1980s. The enterprise bargaining principle was incorporated into formal industrial relations processes from 1991 (Wooden 1999a).

Garnaut (1994, p. 68) noted that the Government's relationship with the union movement imposed limits on tackling labour market reforms in the 1980s.

Given the severe and deteriorating nature of Australia's long-term economic weaknesses, these limits slowed structural change and the realisation of the employment and other benefits of reform to a damaging extent.

Governments in the various jurisdictions started more intense scrutiny of business regulation in the 1980s to ensure that it did not impose unnecessary costs on producers or isolate them unnecessarily from market disciplines. In the 1990s, co-operation between Commonwealth, State and Territory governments brought about national approaches to regulatory reform (including mutual recognition of regulation and reform of corporate governance and supervision), infrastructure reform and competition policy. Governments also began taking steps to ensure that their own administration of policy programs was more effective and efficient.

Since the mid-1980s, an array of reforms has been introduced to agriculture (deregulation of marketing arrangements and reductions in price support, tariffs and subsidies for some commodities), manufacturing (reductions in tariffs, subsidies and quotas) and services (for example, structural and pricing reforms and deregulation in infrastructure). A number of major reforms had general application across a spectrum of industries. Capital and labour markets have been tackled. And areas of taxation, business regulation, education and training, and innovation have also been at least partially addressed.

While reforms gathered some momentum over time, there was not a seamless program of implementation. The enthusiasm for reform varied among governments, over time and across jurisdictions. Reform in some areas could only be taken so far and had to be revisited when further problems were identified, lessons were learnt, or further pressures emerged. Moreover, not all policy changes introduced could be regarded as true reform in terms of bringing improvement in living standards. For example, some policy changes had more to do with governments managing short-term fiscal constraints (PC 1998, p. 8).

The implementation of microeconomic reforms in Australia cannot be characterised simply. What may have had specific beginnings in the 1960s in misgivings about protection policy has ended up having far-reaching compass. The scope of reform has been very broad. A complex set of quite different instruments has been applied with different intensities at different times by different governments to different industries and sectors of the economy.

An implication is that there can be hazards in considering reform at a general level. Ideally, complete assessment of the nature and significance of the effects of

microeconomic reform would involve some separate consideration of individual areas of reform.

2.4 Key points

- Microeconomic reforms were introduced to improve the prospects for growth in Australian living standards. Growth in living standards slowed in the 1970s. In the 1980s, the persistence of weak economic performance and a gloomy outlook for the future focused attention on the need for policy reform. Microeconomic reforms were intended to raise productivity and help rekindle sustainable growth in output and living standards.
- A number of longstanding policies, motivated by development and redistribution objectives, had been implemented in ways that had the perhaps unintended — but avoidable — consequence of holding back growth in productivity, output and living standards.
- Policies relating to industry protection, government business enterprises and industrial relations (and others) had penalised industries with the best growth prospects, and had fostered inefficiencies, an inward-orientation on the domestic economy, an inflexible industry and production structure and a weak commitment towards improving performance. Structural weaknesses meant the economy was ill-equipped to respond to the challenges of technological advance, global integration and fiercer overseas competition.
- Some of the specific structural problems of the times were the prevalence of small-scale production facilities, outdated technologies and poor management and work practices. Investment and employment were poorly allocated to provide the best opportunities for growth. And the production culture leant toward seeking government assistance to resist change rather than to seek out productivity improvements in order to grow and add value.
- Microeconomic reforms were intended to address a number of these structural weaknesses and thereby improve Australia's productivity performance and lift growth in output and living standards (as well as improve living standards in other ways).
- Some steps in the direction of reform were taken in the 1970s, but they tended to be sporadic. Substantial policy reform became an active priority in the mid-1980s. Momentum gathered in terms of coverage and intensity, especially from the late-1980s and into the 1990s.
- Reforms have not proceeded according to a predetermined blueprint or timetable. The overall approach to reform has been gradual and in a sequence determined in part by opportunity and political judgement; and as reform in one

area revealed the need for reform in another. Implementation of reforms has not been seamless or without problems.

- A wide range of reforms has been introduced by different governments at different times. Microeconomic reforms have covered a broad range of areas including capital markets, industry protection, infrastructure services (government business enterprises), labour markets, business and corporate regulation, competition policy, taxation, training and innovation.
- A complete examination of the links between reform and productivity would ideally involve consideration of the full range of reforms and their collective success in addressing a range of allocative, technical and dynamic efficiency weaknesses in the Australian economy prior to reform.

3 Productivity performance

Australia's productivity performance has improved markedly in the 1990s. This chapter examines the aggregate trends in productivity performance and attempts to identify industries that have improved their performance. It also briefly considers whether productivity improvements at the industry level are associated with the timing of reforms.

3.1 An historical perspective

The Australian Bureau of Statistics (ABS) provides an historical series of estimates of Australia's productivity performance. The ABS recently enhanced its methodology for measuring output, capital inputs and productivity (see the feature article in ABS 5204.0, pp. 8–17).

Trends in aggregate productivity

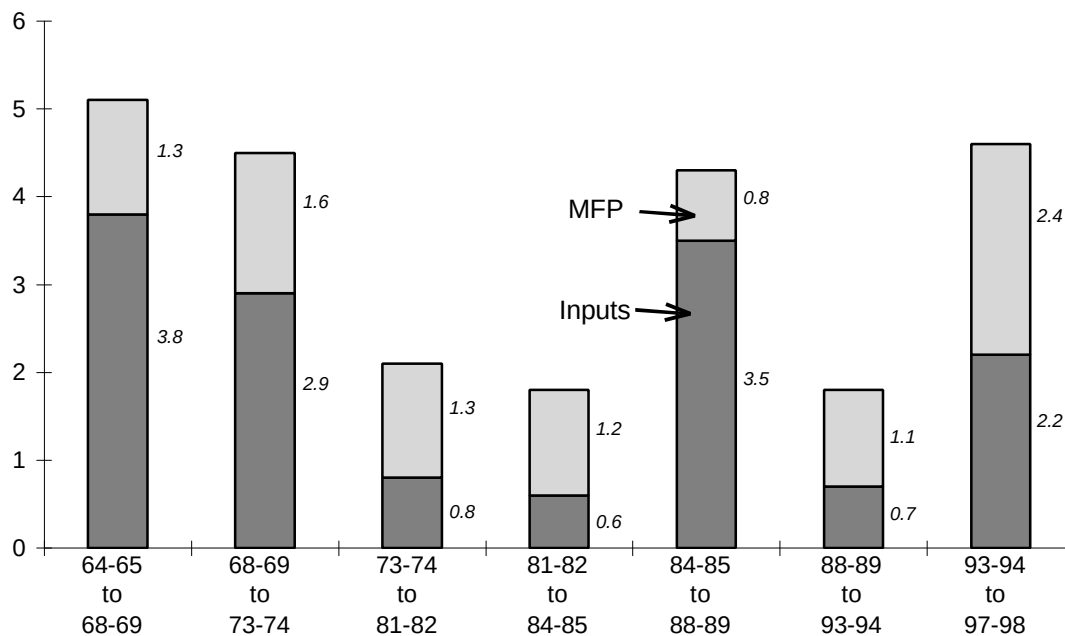
The following examination of aggregate productivity trends relies on estimates of multifactor productivity (MFP), which can be thought of as being combined labour and capital productivity. The ABS estimates cover the market sector of the economy.¹

Productivity cycles

Figure 3.1 provides a broad picture of growth in inputs, productivity and output in the market sector since the mid-1960s. The 33-year period is partitioned into sub-periods that have been identified by the ABS as productivity cycles — from productivity peak to productivity peak.

¹ The market sector defines the extent to which aggregate output can be meaningfully measured for the purposes of productivity calculations. In 1997-98, the market sector accounted for about 61 per cent of GDP. The non-market sector includes areas such as public administration and defence, where outputs are normally measured in terms of expenditures.

Figure 3.1 Annual average rates of growth in inputs, multifactor productivity and output in the market sector, 1964-65 to 1997-98
Per cent per year



Data source: ABS 5204.0.

The figure illustrates a number of points.

- Until the 1990s, input growth was the major factor underlying Australia's output growth.
 - Input growth (and output growth) was high in the 1960s and early 1970s. This reflects the continuation and completion of the immigration and industrialisation phase of development that Australia entered after the second World War.
 - Input growth (and output growth) was again high in the late 1980s. This was associated with strong employment growth (in response to lower real wages) and strong investment, especially in property.
 - Input growth (and output growth) was otherwise low from the mid-1970s through to the 1990s.
- Peak-to-peak productivity growth was reasonably steady from the 1960s to the 1990s.
 - It went as low as 0.8 per cent a year and as a high as 1.6 per cent a year, but mostly varied in the range of 1.1 to 1.3 per cent a year.

-
- The latest productivity cycle, from 1993-94 to 1997-98, shows a different pattern:
 - a return to high output growth;
 - record high productivity growth; and
 - relatively strong input growth, especially compared with the bulk of the mid-1970s to mid-1990s period.

The rate of productivity growth over the latest productivity cycle of 2.4 per cent a year compares with an average of 1.2 per cent a year recorded from 1964-65 to 1993-94. (Average productivity growth over the entire period 1964-65 to 1997-98 was 1.4 per cent a year.)

Higher growth in inputs and higher growth in productivity, as evident in the latest cycle, are not necessarily independent outcomes. Improved productivity can create conditions favourable to additional investment and employment. The relatively strong input growth is also noteworthy for the fact that it came at a time of uncertainty created by the Asian economic crisis.

Trend productivity

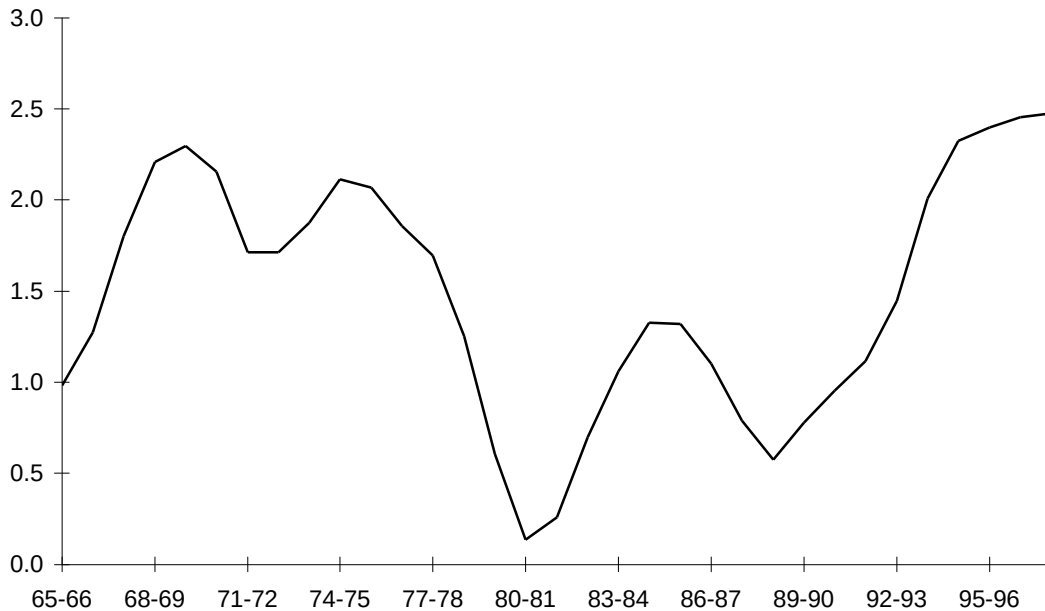
The record high growth in productivity in the 1990s is further illustrated in figure 3.2, which shows the year-to-year growth in the *trend* multifactor productivity index calculated by the ABS. Use of this indicator reduces the short-term volatility in productivity estimates and allows trends to be examined on an annual rather than productivity-cycle basis.

With troughs in the business cycle occurring in 1974-75, 1982-83 and 1990-91, it can be seen that growth in trend productivity has declined in the lead-up to downturns in the business cycle. In the 1990s, however, trend productivity has continued to grow rapidly, with the longest period (9 years) of continuous acceleration on record.

Trend MFP has grown by more than 2 per cent a year since 1993-94. From 1995-96, trend productivity has grown at a record high rate of 2.5 per cent a year.

Figure 3.2 Rate of growth in trend multifactor productivity in the market sector, 1965-66 to 1997-98

Per cent growth over previous year



Source: Commission estimates based on unpublished ABS data.

Input and output influences on recent productivity growth

Table 3.1 gives a broad indication of factors underlying the recent acceleration in productivity growth. The recent productivity cycle from 1993-94 to 1997-98 can be taken as a period largely unaffected by recovery from the early 1990s recession. Over this period:

- the growth in both outputs and inputs has been strong, which suggests that the productivity acceleration has not come from slower input growth;
- the growth in hours worked has been strong by historical standards, which suggests that the record productivity growth has not come at the expense of employment; and
- labour and capital productivity have both grown strongly by historical standards.

Table 3.1 Output and input influences on multifactor productivity growth

Annual average growth rates, per cent per year

	<i>Recent cycle (1993-94 to 1997-98)</i>	<i>History (1964-65 to 1993-94)</i>	<i>After Golden Age (1974-75 to 1993-94)</i>	<i>Long term (1964-65 to 1997-98)</i>
Output	4.6	3.2	2.6	3.3
Inputs	2.2	1.9	1.3	1.9
Labour	1.4	0.9	0.4	1.0
Capital	3.8	4.5	3.8	4.4
Capital-labour ratio	2.4	3.6	3.4	3.4
Labour productivity	3.1	2.2	2.1	2.3
Capital productivity	0.8	-1.3	-1.2	-1.0
Multifactor productivity	2.4	1.2	1.2	1.4

Source: Commission estimates based on ABS 5204.0.

The fact that labour and, especially, capital productivity have grown strongly in this latest productivity cycle, compared with the past, is consistent with a strong improvement in overall efficiency (MFP). All other things equal, an increase in the capital-labour ratio (capital deepening) raises labour productivity (each unit of labour has more capital on average with which to produce output) but reduces capital productivity (each unit of capital has less labour on average with which to produce output). An increase in multifactor productivity, all other things equal, raises both labour and capital productivity.² The historically strong growth in both labour and capital productivity in the latest productivity cycle therefore comes from the strength of the growth in overall efficiency (MFP).

It is particularly noteworthy that the improvement in overall productivity in the latest cycle is sufficiently strong to reverse the historical decline in capital productivity. Improved efficiency has more than offset the diminishing returns associated with capital deepening in the latest cycle.³

This suggests that, rather than having to accumulate more and more capital with diminishing returns in order to promote growth, the capital stock is being used more

² Approximate relationships between growth in labour productivity (lp), growth in capital productivity (c), growth in the capital-labour ratio (k) and growth in MFP (m) can be seen from the following equations:

$$lp = a k + m$$

$$c = (a - 1)k + m$$

where a is the capital share in total factor income.

³ Capital productivity rose in the late 1980s. But this was due to unusually weak growth in capital deepening. MFP growth was also low.

productively to generate output. Possible explanations could include: new investment is being better allocated to more productive uses; more gains from specialisation and scale are being accessed; and production arrangements including organisation, management and work practices are making much more effective use of resources including the capital stock. (Chapter 4 investigates possible explanations.)

Implications for growth and living standards

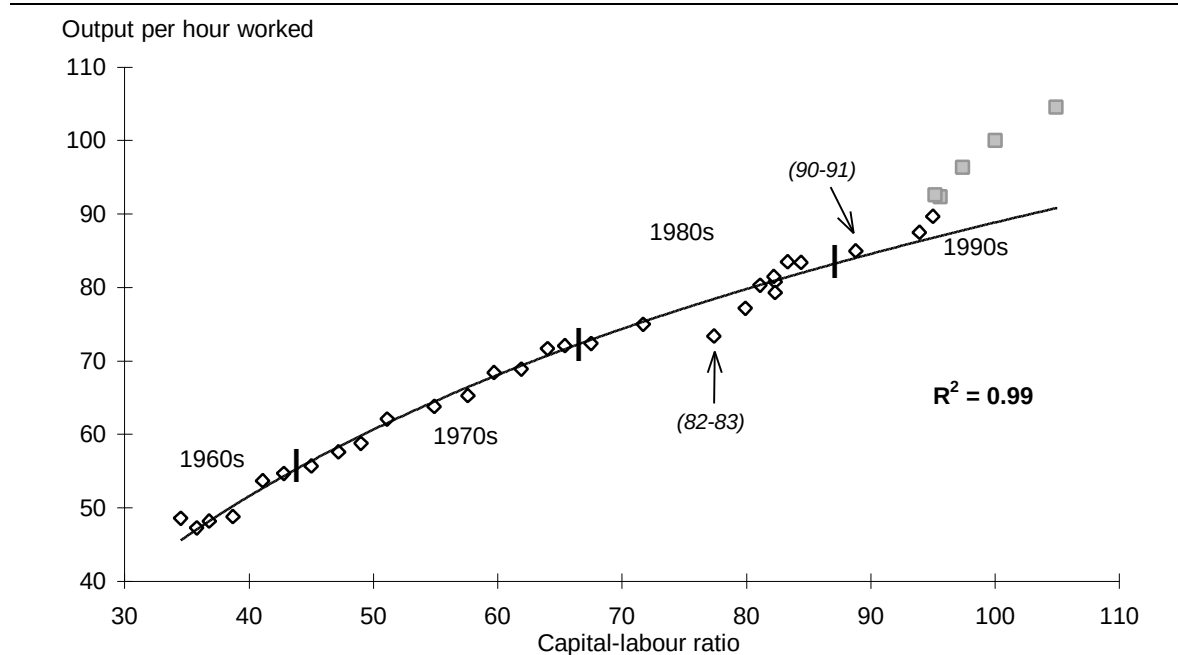
The acceleration in productivity growth in the 1990s has opened up possibilities for faster output growth not seen in Australia since the 1960s. (Faster productivity growth can help bring more favourable macroeconomic outcomes in a number of ways, as box 3.1 sets out.) Figure 3.3 depicts a growth path for the market sector of the Australian economy since the mid-1960s. It shows the increases in output per hour worked that have accompanied increases in capital per hour worked (the capital-labour ratio). (Dividing both output and capital by labour input is a convenient way of capturing the three dimensions of output and inputs of labour and capital in a two-dimensional chart.)

Box 3.1 Higher productivity growth and macroeconomic outcomes

While there are relationships between the micro and the macroeconomic that run in both directions, productivity growth can assist more favourable macroeconomic outcomes in the following ways.

- Faster productivity growth, if accompanied by competitive or other pressure on prices, can help to hold down inflation. (Competition can create a 'virtuous' productivity-inflation cycle as increased productivity helps to hold down inflation; and lower inflation helps to improve productivity by reducing uncertainty, allowing clearer allocation signals to emerge and reducing investment distortions.)
- Faster productivity growth generates additional income which in turn fuels domestic demand.
- Additional output growth induces employment growth. The extent of employment growth is influenced by the distribution of productivity gains between wages, profits and prices. Employment growth is stronger with lower growth in wages and prices, all other things equal.
- Faster productivity growth gives more room for output growth within the constraints of weak savings and associated current account vulnerability. When capital productivity is increasing, as revealed in productivity estimates for recent years, a lower rate of capital accumulation is required to underpin strong output growth. Lower growth in aggregate investment means that an imbalance between investment and domestic savings is not encountered to the same extent. (It does not mean that current account difficulties will not occur. But it does mean they will be less severe than they otherwise would be.)

Figure 3.3 Australia's growth path^a, 1964-65 to 1997-98
Indexes 1996-97 = 100



^a The fitted curve uses data for years up to 1992-93. The curve is of the form $(Y/L) = 40.66 \ln(K/L) - 98.39$. Additional observations from 1993-94 are represented as shaded squares.

Source: Parham (1999).

Growth based on capital accumulation (or, more correctly, capital deepening — increases in capital per unit of labour) shows up as a growth path drawn out over a wide range of values for the capital-labour ratio. Growth based on improved productivity shows up as a steeper slope in the growth path.

Australia's growth path showed a remarkably stable pattern from the 1960s until the early 1990s. The curve fitted from observations for that period shows a very close fit. The 1980s recession is the only period deviating from the path. The general pattern is consistent with the 'growth accounting' view presented in figure 3.1, which suggests that input accumulation has been more important (and variable) than productivity growth in contributing to Australia's output growth.

Compared with other countries, Australia's growth path up to the 1990s was unremarkable in terms of the extent of either capital deepening or productivity growth (Parham 1999).

However, as illustrated in figure 3.3, the economy appears to have taken a new growth path in the 1990s, whereby the surge in productivity growth has brought much more rapid growth in output (per hour worked) than in the past. This is in contrast to most advanced high-income countries which have generally shown a flattening out in their growth paths in the 1990s (Parham 1999).

Box 3.2 **Some implications for living standards**

Growth in aggregate labour productivity is often used as a proxy indicator of growth in average living standards. With plausible assumptions (about relatively minor changes in average hours worked, participation rates and the population/workforce dependency ratio), growth in labour productivity bears a reasonable approximation to growth in average income per head.

On this basis, figure 3.3 shows that the acceleration in productivity growth that underlies the faster growth path in the 1990s has brought forward improvements in average living standards. This is borne out in panel 2 in box 2.1 (p. 9) which shows that the 1990s growth rate in average domestic income has returned to the performance of the pre-1970s 'Golden Age'.

A full assessment of the living standards implications, however, would need to include consideration of the effects of additional productivity growth on the distribution of income, employment and consumption possibilities.

On employment, the general evidence from Australia and overseas is that productivity growth does not bring an inevitable reduction in aggregate employment or increase in unemployment. In fact the evidence is more suggestive of the reverse — that productivity growth brings aggregate employment growth over the long term because it stimulates income and demand (IC 1997a).

There has been very strong productivity growth in the 1990s and, at the same time, the unemployment rate has declined and the employment rate of the working-age population has recovered from a dip in the early 1990s recession. Employment, as a ratio to the size of the working-age population, has recovered over the latest productivity cycle to the same high reached at the end of the 1980s employment expansion (Barnes et al. 1999). Table 3.1 shows that, over the latest cycle of record productivity growth, hours worked grew strongly by historical standards.

Investment can be thought of as a deferral of current consumption and living standards to the future (with the prospect of greater returns then). However, with higher growth in capital productivity, as evidenced in the latest productivity cycle, less growth in investment (capital accumulation) is required to underpin output growth. This means higher current consumption could be sustained without running as readily into constraints imposed by imbalances between savings and investment and associated deficits on the external account. In other words, with higher capital productivity, higher spending to support current living standards could be sustained than would otherwise be the case.

On the distribution of income, specific analysis of the effects of productivity growth on the distribution of income has not been undertaken. However, the following general observations can be made. Harding (1997) found that, while earnings and private income inequality increased between 1982 and 1993-94, it was offset at the lower end by increasing progressivity in income tax and, in particular, government cash transfers. The ABS found the distribution of income to have remained almost unchanged between 1994-95 and 1997-98 (ABS 6523.0).

As a result of the shift to the new growth path:

- output per hour worked in the market sector is 15 per cent higher in 1997-98 than it would have been on the old growth path (determined by extrapolation of the fitted curve); or
- to put it another way, the growth that would have taken about 13 years (from 1991-92) to achieve on the old growth path has been achieved in 6 years. (Parham 1999)

The productivity acceleration has also brought improvements in average living standards (box 3.2).

3.2 An international perspective

Australia's productivity performance was poor by international standards up until the 1990s (IC 1997a). However, few other high-income countries have shared the strength of Australia's productivity acceleration in the 1990s.

Figure 3.4 presents a comparison of Australia's MFP growth with the performance of a grouping of OECD countries. These MFP estimates for Australia are not strictly comparable with the ABS estimates presented elsewhere in this chapter. The OECD-based estimates follow some different data conventions and, most importantly, measure labour input in terms of number of employees, rather than hours of work; and measure capital inputs in terms of capital stock, rather than a flow of capital services. While the OECD-based estimates are useful for international comparisons, the ABS estimates provide a more precise indicator of historical trends for Australia.

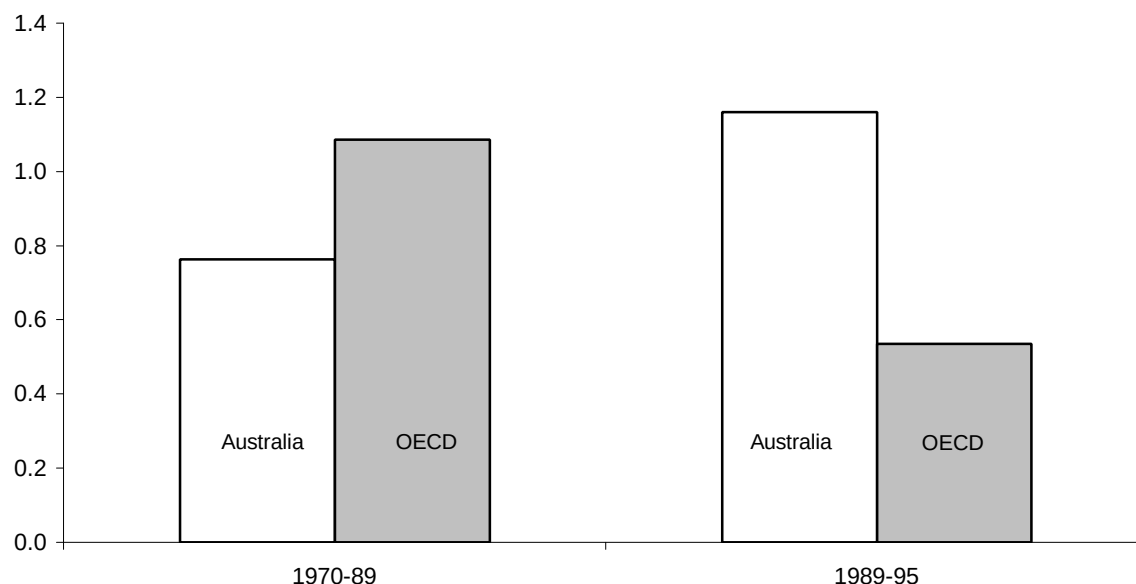
The figure shows that Australia's productivity performance has turned around, from relative sluggish performance over the 1970s and 1980s to above-average performance in the 1990s.

International comparisons should take account of the phenomenon of international 'catch-up' and convergence. According to catch-up and convergence theory (see, for example, Abramovitz 1994):

- there is a tendency for productivity levels among countries to converge (once countries have achieved a certain level of development — referred to as 'conditional convergence'); and

Figure 3.4 Average annual growth in multifactor productivity in Australia and OECD countries^a, 1970 to 1989 and 1989 to 1995^b

Per cent per year



^a OECD average covers: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, United Kingdom, and the United States. ^b OECD growth rate for 1989 to 1995 covers Germany and Sweden to 1994, Canada, Finland, France and Italy to 1996. All other above-mentioned countries are included, except for Denmark, Norway and the United Kingdom, which have been excluded because of insufficient 1990s data.

Source: Commission estimates based on OECD (1999a) ISDB data.

- ‘lagging’ economies have opportunities to achieve relatively rapid productivity growth in catching up to the international productivity leader (commonly taken to be the US over the broad sweep of economic activity and over most of the 20th century).

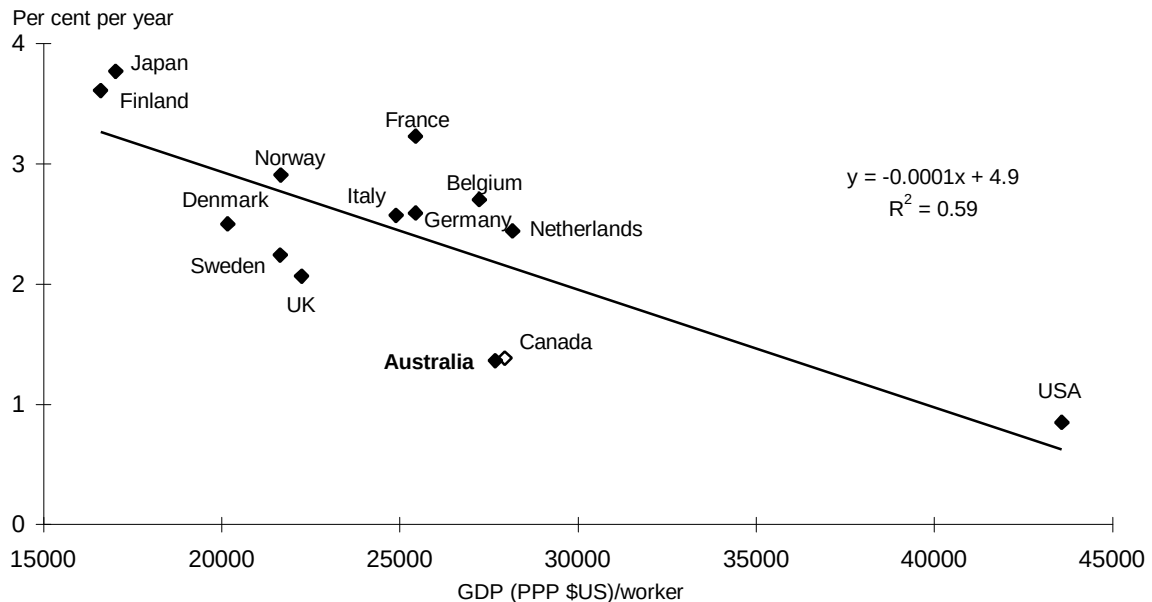
Figure 3.5 shows that the catch-up phenomenon operated among a group of OECD countries over the 1970s and 1980s. There is a negative relationship between the starting level of (labour) productivity in 1970 and the subsequent rate of productivity growth.⁴

It is also evident that Australia’s relatively low rate of productivity growth cannot be attributed solely to its relatively high starting position. Australia’s rate of productivity growth was below the average ‘benchmark’ set by the group of countries and was far below the productivity growth exhibited by European countries that had similar starting positions in 1970.

⁴ This kind of exercise cannot be undertaken for multifactor productivity because a comparative measure of the level of MFP cannot be calculated.

Figure 3.5 Catch-up growth in labour productivity among high-income countries, 1970 to 1989

Productivity levels in 1970, productivity growth 1970-1989



Source: Commission estimates based on OECD data.

Australia's performance was relatively poor in the entire post-war period — even during the 'Golden Age' era. Maddison (1995) shows that Australia had a low rate of catch-up to the labour productivity levels of the US, compared with other high-income countries, over both 1950-1973 and 1973-1992 (results also reported in IC 1997a, p. 66). Australia slipped from a labour productivity ranking of 3 in 1950, to 6 in 1973, to 10 in 1992.

This puts an important perspective on Australia's 1990s performance. It suggests that Australia's relatively poor productivity performance up until the 1990s created a backlog of 'catch-up' opportunities. It also suggests that something has changed in the way the Australian economy operates to make a break with a very long history of underperformance compared with other countries. And, finally, it suggests that Australia's relatively rapid rate of productivity growth in the 1990s (by both historical and international standards) is consistent with a process of catching up to production standards that have evolved in other countries.

3.3 A sectoral perspective

An industry breakdown of productivity trends is of interest in this study, given the focus on the influence of microeconomic reforms. As outlined in chapter 2, reforms

have been introduced in different forms and at different times in different industries. Some industry breakdown could therefore help to explore the associations between productivity performance and reform with greater precision.

Trends in sectoral productivity

The examination of productivity trends at the industry level draws on both labour productivity and MFP estimates. There are two reasons.

First, the ABS only produces labour productivity estimates at the sectoral level. These estimates are fully compatible with the output and labour input measures used in the productivity estimates reported above for the market sector. The ABS does not yet produce MFP estimates for industry sectors (ABS 5204.0, pp. 8–17).

Second, while sectoral MFP estimates have been constructed, they may be less reliable. The Commission has constructed MFP estimates for industry sectors, drawing on ABS data. However, the capital estimates used in these calculations (and therefore the MFP estimates themselves) should be regarded as potentially less reliable at the industry sector level than they are at the aggregate level. (An error of some magnitude in an individual sector may be of only minor significance in the aggregate picture and errors in individual industries could offset each other in the total.⁵)

In principle, labour productivity is not as ideal as MFP as an indicator of efficiency (although, in practice, measurement difficulties also need to be taken into account). Growth in labour productivity can reflect reductions in labour inputs or the additions of new capital (which provide each unit of labour on average with more capital to produce output). But, if a reduction in labour caused production bottlenecks or new capital was not utilised efficiently or intensively enough to pay its way, a labour productivity measure would show an increase, even though overall efficiency declined. An MFP measure — effectively, combined labour and capital productivity — better captures effects on overall efficiency⁶.

Equally, however, labour productivity is by no means meaningless as an efficiency indicator. It does require some care in interpretation. Typically, labour productivity

⁵ In calculating MFP growth at the sectoral level, there is also the issue of whether explicit account should be taken of the higher proportion of materials in total costs (and efficiencies that can be gained, for example, by contracting out). The estimates presented here measure output in value-added terms and take no account of materials efficiency.

⁶ The concept of overall efficiency can be further broadened to include factors such as materials and energy.

moves in the same positive direction as MFP, but grows at a somewhat faster rate. As will be demonstrated below, this reflects the influence of capital deepening — the general rise in the capital-labour ratio — which raises labour productivity but reduces capital productivity, all other things equal.

However, labour productivity should not be interpreted as an indicator of ‘labour efficiency’ alone — at least not without due care. It not only reflects the productivity of work arrangements, but it can also reflect the installation of additional capital, the quality of management and organisational arrangements, the advent of environmental controls on production and many other factors.

Labour productivity and MFP estimates are first presented and the interpretation of trends is then discussed.

Labour productivity estimates

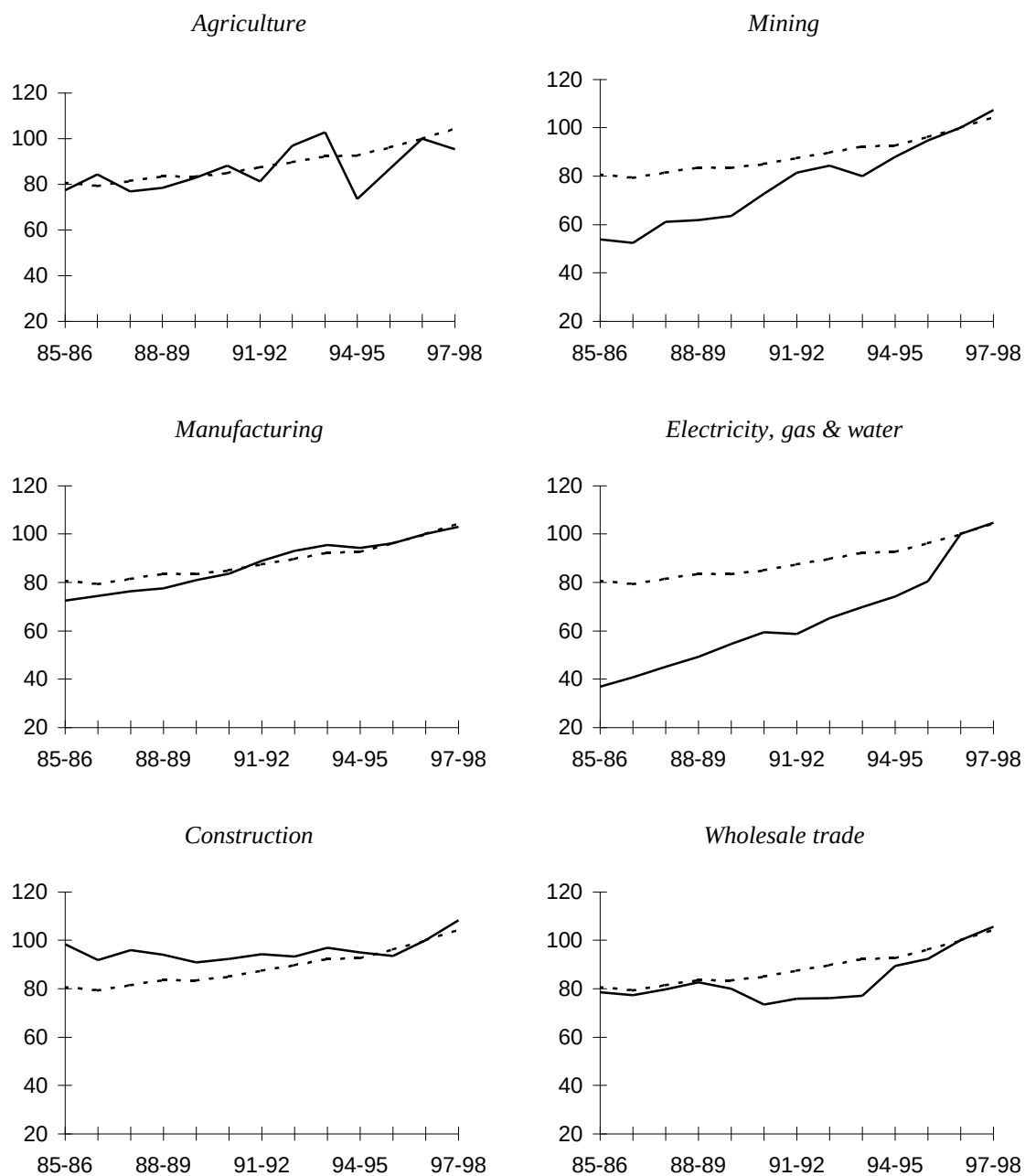
ABS estimates of sectoral labour productivity are displayed in figure 3.6. There is a wide variation in performance across sectors although, to some extent, this can be expected. Some of the differences may reflect variations in innate potential for productivity growth, as well as difficulties in measuring quality improvements, especially in services. Any differences in rates of investment in new capital capacity across industries can also produce differences in labour productivity.

Relatively large increases in labour productivity are evident in:

- Electricity, gas & water;
- Communication services;
- Mining; and
- Finance & insurance.

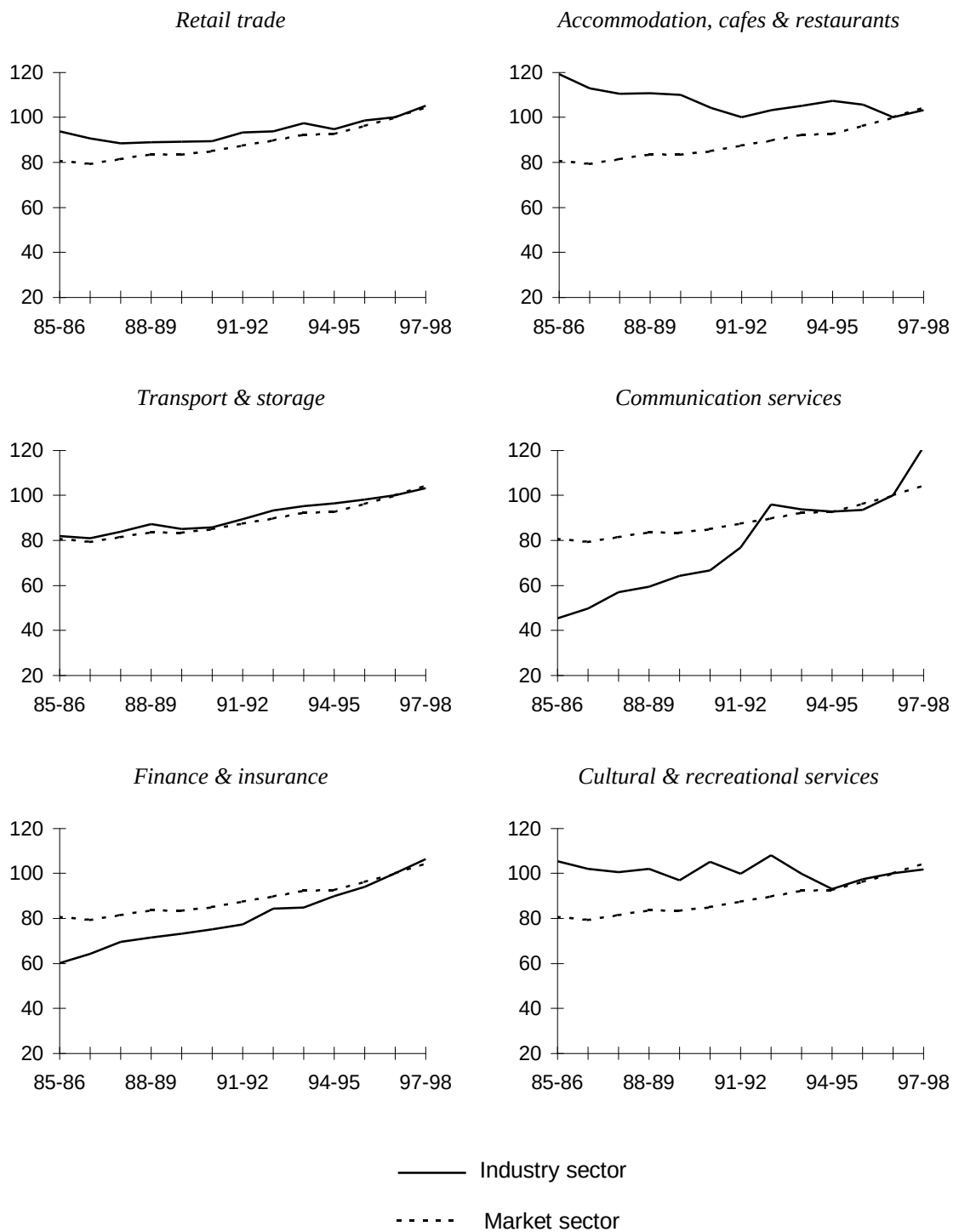
It is also worth noting that the very recent movements are quite even — and universally positive, with the exception of Agriculture. Productivity in Agriculture tends to be volatile, reflecting the vagaries of climate on output, around an overall positive growth trend.

Figure 3.6 Labour productivity by industry sector, 1985-86 to 1997-98
Index 1996-97 = 100



(Continued on next page)

Figure 3.6 (Continued)



Data sources: ABS 5204.0 plus unpublished ABS data.

MFP estimates

Commission estimates of sectoral MFP are presented in figure 3.7. It can be seen that, in broad terms, the MFP trends follow the labour productivity trends presented earlier. However, as foreshadowed, labour productivity growth tends to be higher than MFP growth.

All industries, other than Accommodation, cafes & restaurants (ACR) and Cultural & recreational services (CRS), show at least solid productivity growth. The industries which showed relatively strong growth in labour productivity also show relatively strong MFP growth, albeit with a change in ranking:

- Electricity, gas & water, particularly until 1993-94;
- Finance & insurance;
- Mining; and
- Communication services.

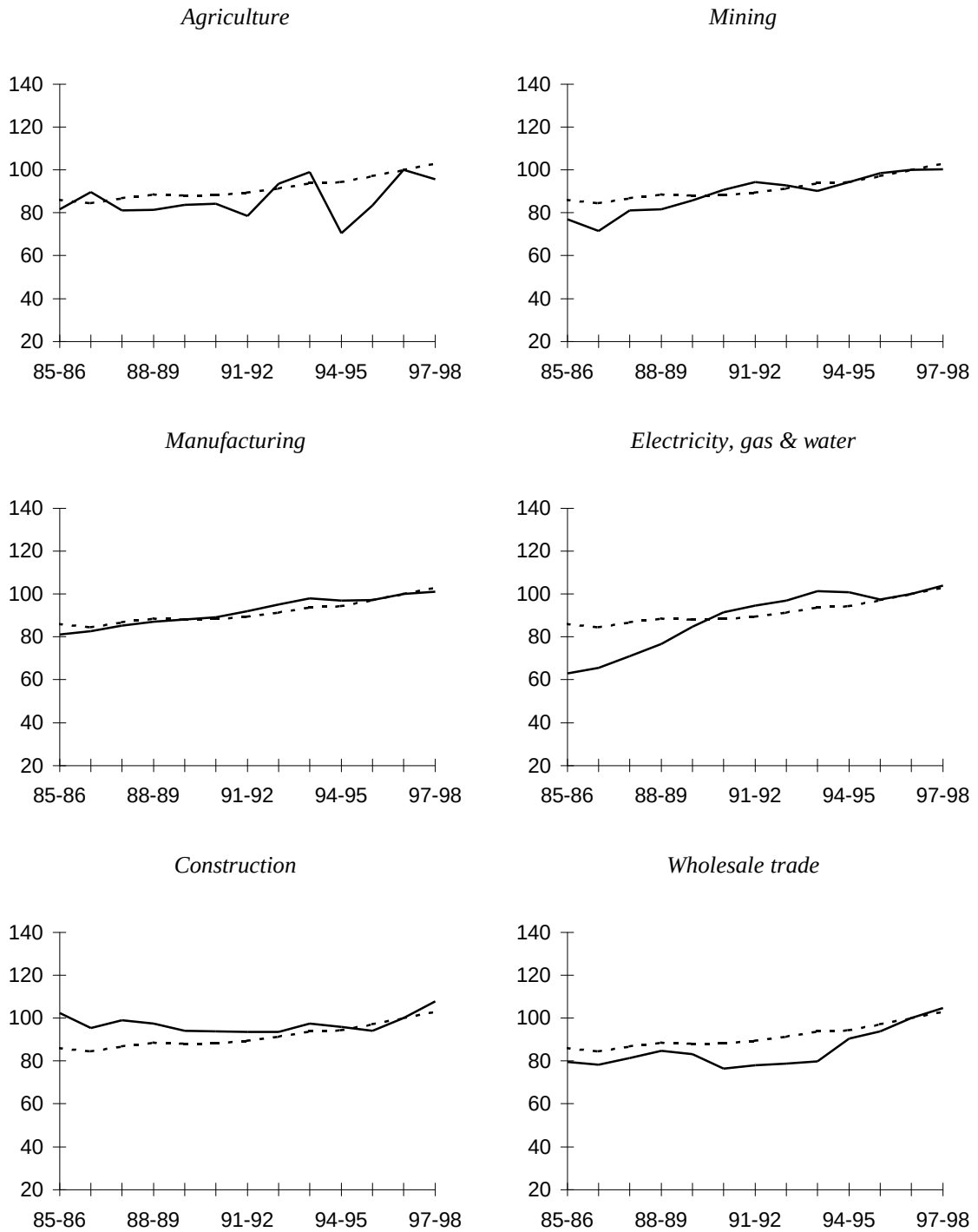
Wholesale trade shows relatively strong MFP growth from 1993-94, after dipping in 1990-91 at the time of the recession.

Manufacturing shows solid, but unspectacular, productivity growth. Its productivity growth has slowed somewhat since 1993-94. However, Gretton and Fisher (1997) show that the steady rate of growth in Manufacturing as a whole masks a diversity in performance within the sector. An update of their results is presented in figure 3.8. Productivity growth has been relatively strong and/or has increased at various times in Food, beverages & tobacco; Textiles, clothing & footwear (TCF); Printing, publishing & recorded media; Petroleum, coal, chemicals & associated products; and Basic metal products. Basic metal products stands out as showing improved productivity performance from the mid-1980s⁷. There has been recent improvement in Transport equipment and Other manufacturing, but deterioration in TCF and Printing, publishing & recorded media. (The MFP trends in TCF and Transport equipment are discussed in detail in chapter 5.)

There has also been variation in productivity performance across segments of Agriculture and Mining (PC 1999, pp. 94–101)

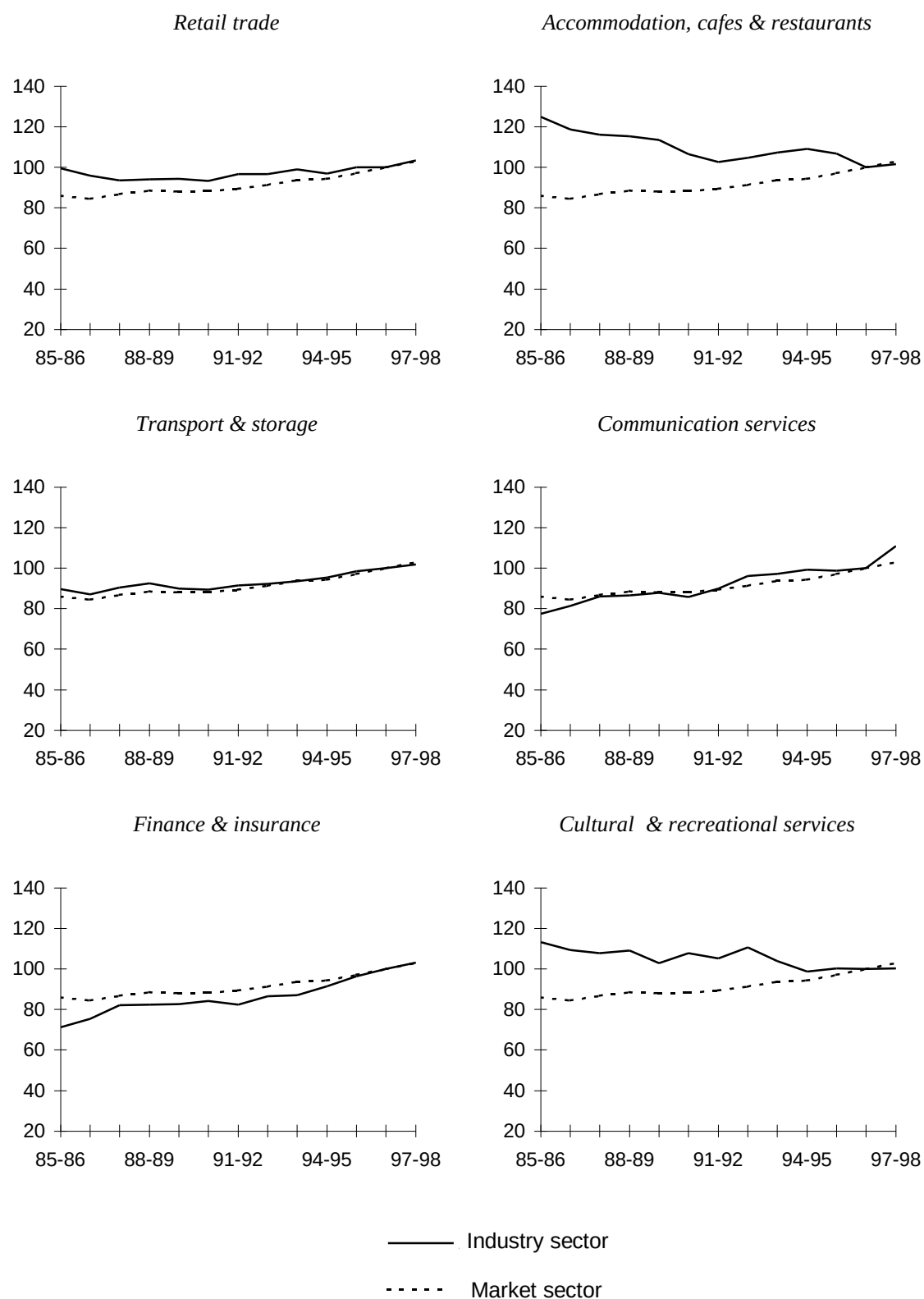
⁷ Developments in the steel and alumina/aluminium industries are likely to provide the major explanation for improvement in productivity performance in Basic metal products. Developments in response to reforms are reported in Demura (1995) and IC (1998b).

Figure 3.7 Multifactor productivity by industry sector, 1985-86 to 1997-98
Index 1996-97 = 100



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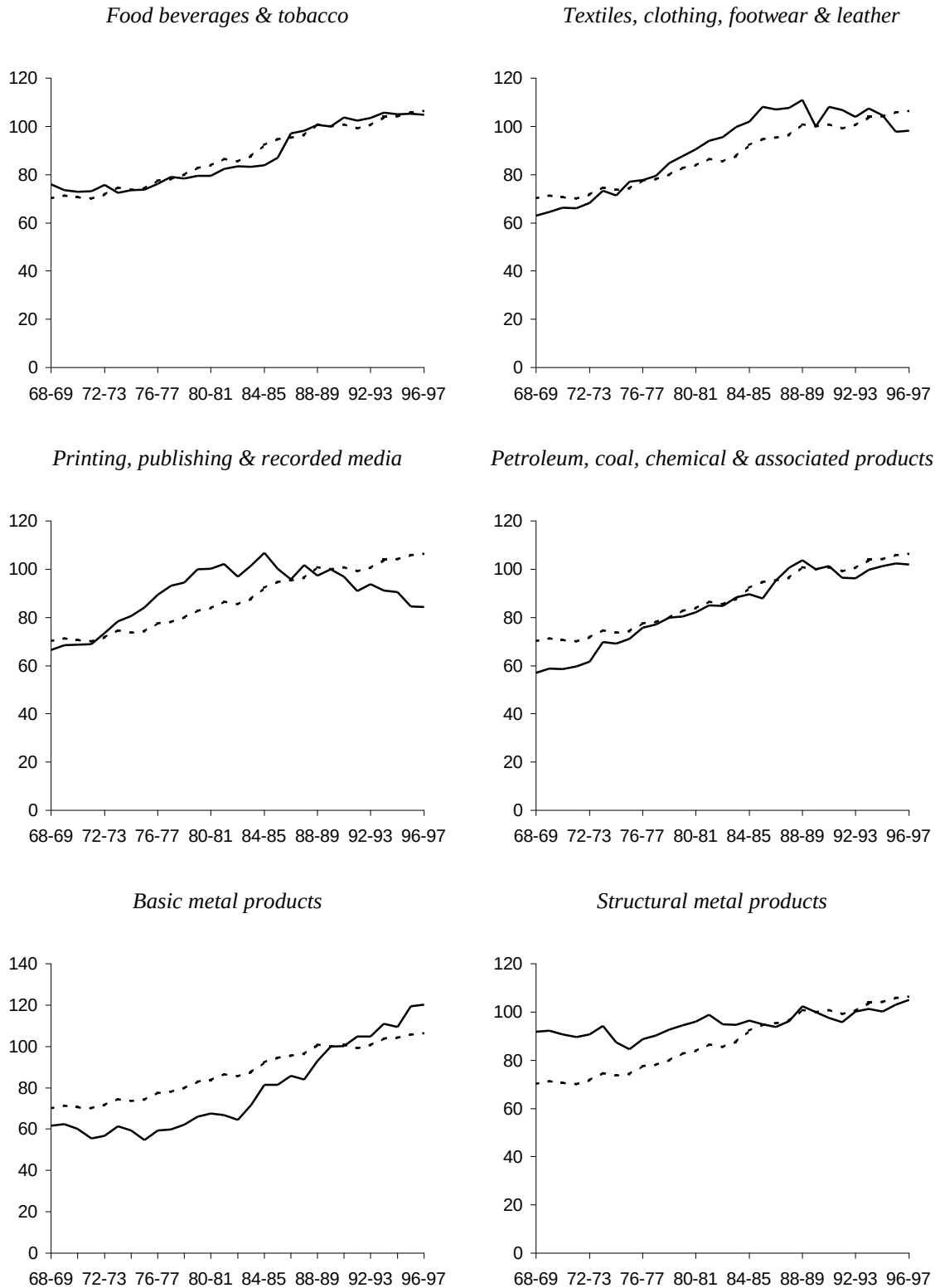
Figure 3.7 (Continued)



Source: Commission estimates based on unpublished ABS data.

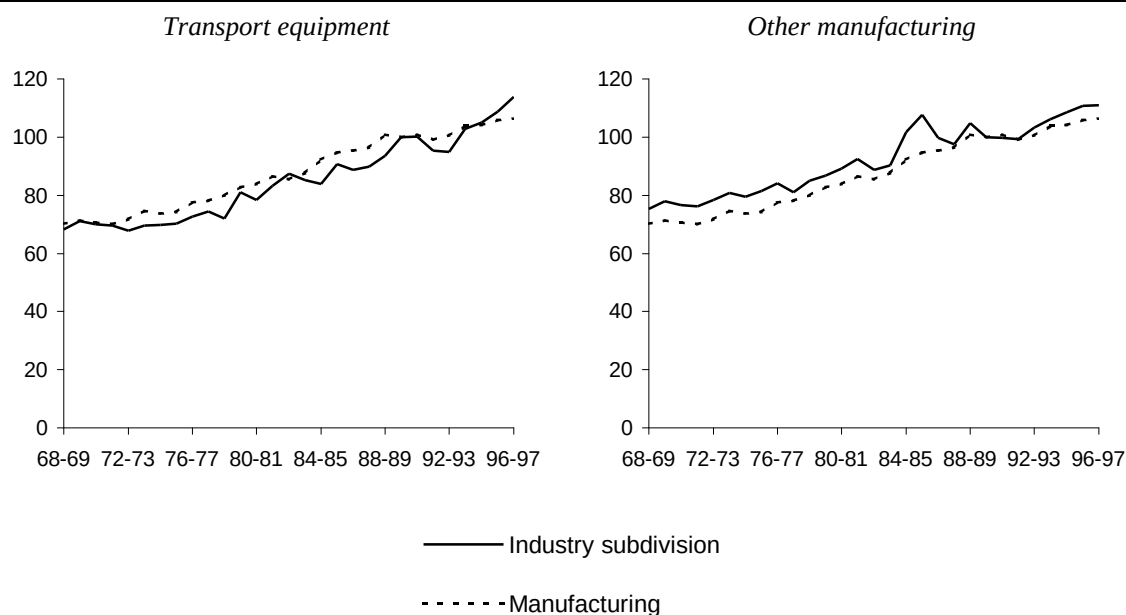
Figure 3.8 Multifactor productivity, by manufacturing industry subdivision, 1968-69 to 1996-97

Index 1989-90 = 100



(Continued on next page)

Figure 3.8 (Continued)



Source: Commission estimates based on ABS data.

Interpretation of labour productivity and MFP trends

The information in table 3.2 helps in the interpretation of labour productivity and MFP results.

The point made above, that labour productivity growth is normally in the same direction as MFP growth, but at a higher rate, is evident. Growth in labour productivity reflects the influence of capital deepening — increases in the capital-labour ratio — as well as improvements in overall efficiency (MFP⁸). Capital deepening raises labour productivity (more capital per unit of labour with which to produce output). The faster the increase in the capital-labour ratio (through capital increases or labour reductions), all other things equal, the greater the divergence between the rate of labour productivity growth and the rate of MFP growth.

Table 3.2 also helps to explain the strong productivity growth in Electricity, gas & water (EGW). Here the capital-labour ratio has grown strongly, principally due to strong contraction in labour input. But strong efficiency gains have more than offset the decline in capital productivity this induces. Capital productivity therefore increases. Strong efficiency gains also raise labour productivity growth.

⁸ See footnote 2.

The story in Communication services is similar to EGW, except that higher capital input — rather than lower labour input — underlies the increase in the capital-labour ratio. The very strong growth in labour productivity in Communication services is attributable to very strong growth in investment. Some of this investment, perhaps in roll-out of new cable and mobile phone infrastructure, is presumably of a long-term nature. It does not appear to have translated as strongly into MFP gains in the short run. MFP growth in Communication services is nevertheless strong.

Mining and Finance & insurance show elements of both — a slight reduction in labour input and a large increase in capital. Strong overall efficiency growth offsets the effect of capital deepening on capital productivity.

Wholesale trade is an industry with relatively high MFP growth, even though labour productivity growth is not particularly high compared with other industries. The relatively slow growth in capital input in this industry means that the growth in the capital-labour ratio is relatively low. This contributes to the relatively low labour productivity growth result. But it also means diminishing returns on the capital side are relatively small; and this contributes to the relatively strong, positive result for capital productivity. MFP growth in this industry sector appears to have come from relatively low input growth — especially capital — combined with about-average growth in output.

Table 3.2 Annual average rates of growth in output, inputs and productivity by industry sector^a, 1988-89 to 1997-98

Per cent per year

	<i>Output</i>	<i>Inputs</i>			<i>Capital labour ratio</i>	<i>Productivity</i>		
		<i>Labour</i>	<i>Capital</i>	<i>Total</i>		<i>Labour</i>	<i>Capital</i>	<i>MFP</i>
Agriculture	2.3	0.1	0.8	0.5	0.7	2.2	1.5	1.8
Mining	5.4	-0.8	4.8	3.0	5.7	6.3	0.6	2.3
Manufacturing	0.9	-2.2	2.0	-0.8	4.3	3.2	-1.1	1.7
Electricity, gas & water	2.5	-5.8	1.1	-0.9	7.4	8.8	1.3	3.4
Construction	2.3	0.7	2.9	1.2	2.2	1.6	-0.6	1.1
Wholesale trade	3.1	0.4	1.6	0.7	1.3	2.8	1.5	2.4
Retail trade	3.0	1.0	4.3	1.9	3.2	1.9	-1.3	1.1
Accomm., cafes & restaurants	2.6	3.4	6.4	4.1	2.9	-0.8	-3.6	-1.4
Trans. & stor.	3.1	1.2	3.2	2.0	2.0	1.9	-0.2	1.1
Communication	9.4	1.1	12.1	6.5	10.9	8.3	-2.3	2.8
Finance & insur.	3.7	-0.8	3.5	1.1	4.3	4.5	0.2	2.5
Cultural & recr. services	3.1	3.2	5.9	4.1	2.6	0.0	-2.6	-0.9
Market sector ^b	3.0	0.5	3.1	1.3	2.6	2.5	-0.1	1.7

^a Growth rates are calculated from end points, that is, levels recorded for 1988-89 and 1997-98. ^b Drawn from published data (ABS 5204.0).

Source: Commission estimates based on unpublished ABS data.

ACR, CRS and, to a lesser extent, Retail trade show relatively low MFP growth. This may reflect innate characteristics of these industries. However, it is possible that output measures in these sectors do not pick up some quality of service and convenience improvements which nevertheless require additional inputs.

Table 3.3 displays the equivalent information for industries within the Manufacturing sector. It shows diversity across industries not only in MFP growth, but also in input and output growth. It should be noted that the different data sources relied on for the calculations for industries within Manufacturing mean that the Manufacturing average reported in table 3.3 does not tally with that presented in table 3.2.

Table 3.3 Annual average rates of growth in output, inputs and productivity by manufacturing industry subdivision^a, 1988-89 to 1997-98

Per cent per year

	<i>Output</i>	<i>Inputs</i>			<i>Capital labour ratio</i>	<i>Productivity</i>		
		<i>Labour</i>	<i>Capital</i>	<i>Total</i>		<i>Labour</i>	<i>Capital</i>	<i>MFP</i>
Food beverages & tobacco	1.7	-0.7	2.9	1.2	3.9	2.4	-1.0	0.5
Textiles, clothing, footwear & leather	-3.7	-4.2	1.0	-2.2	5.1	0.5	-4.5	-1.5
Printing, publishing & recorded media	1.7	1.2	7.2	3.5	5.6	0.5	-4.9	-1.8
Petroleum, coal, chemicals & associated products	1.6	-0.6	3.6	1.8	5.1	2.2	-1.9	-0.2
Basic metal products	2.0	-3.7	0.7	-1.3	4.3	5.8	1.1	3.3
Structural metal products	-0.6	-1.3	-0.3	-0.9	0.3	0.7	-0.3	0.3
Transport equipment	0.8	-3.8	0.6	-1.6	3.9	4.8	0.6	2.5
Other manufacturing	0.3	-1.1	0.5	-0.5	1.3	1.4	-0.2	0.7
Manufacturing	0.8	-1.3	1.8	0.2	3.2	2.1	-0.9	0.7

^a Growth rates are calculated from end points, that is, levels recorded for 1988-89 and 1997-98.

Source: Commission estimates based on ABS data.

Sectoral contributions to market sector MFP growth

Figure 3.9 gives a very rough indication of the contributions of different industry sectors to aggregate market sector productivity growth over time. The contributions take account of the relative size of the industry sectors. Sector productivity growth in each year is weighted by the relative size of the industry in output terms. Some of the year-to-year volatility in sectoral productivity levels has been removed by introducing a moving average.¹⁰ With the various assumptions and adjustments underlying this chart, it should be used only for rough guidance on orders of magnitude and changes in contributions over time. The annual total of the sectoral contributions does not perform very well in tracking the year-to-year movements in the market sector trend series (figure 3.2). Another method for examining relative contributions from sectors is provided below.

The figure shows that the contributions of some sectors vary over time:

- Manufacturing is generally a strong contributor up until 1993-94, after which its contribution falls off.
- Wholesale trade, a net detractor over the recession-affected period 1989-90 to 1991-92, seems to recover later with very strong contributions from 1993-94.
- Electricity, gas & water is a strong contributor in the 1980s, but fades through the 1990s.
- Construction emerges as a strong contributor in the late 1990s.
- Finance & insurance is a strong contributor, which appears to have been hit by the early 1990s recession.
- A similar pattern, but at a lower level, is apparent in Transport & storage.
- Communication services raised its contribution toward the end of the period.

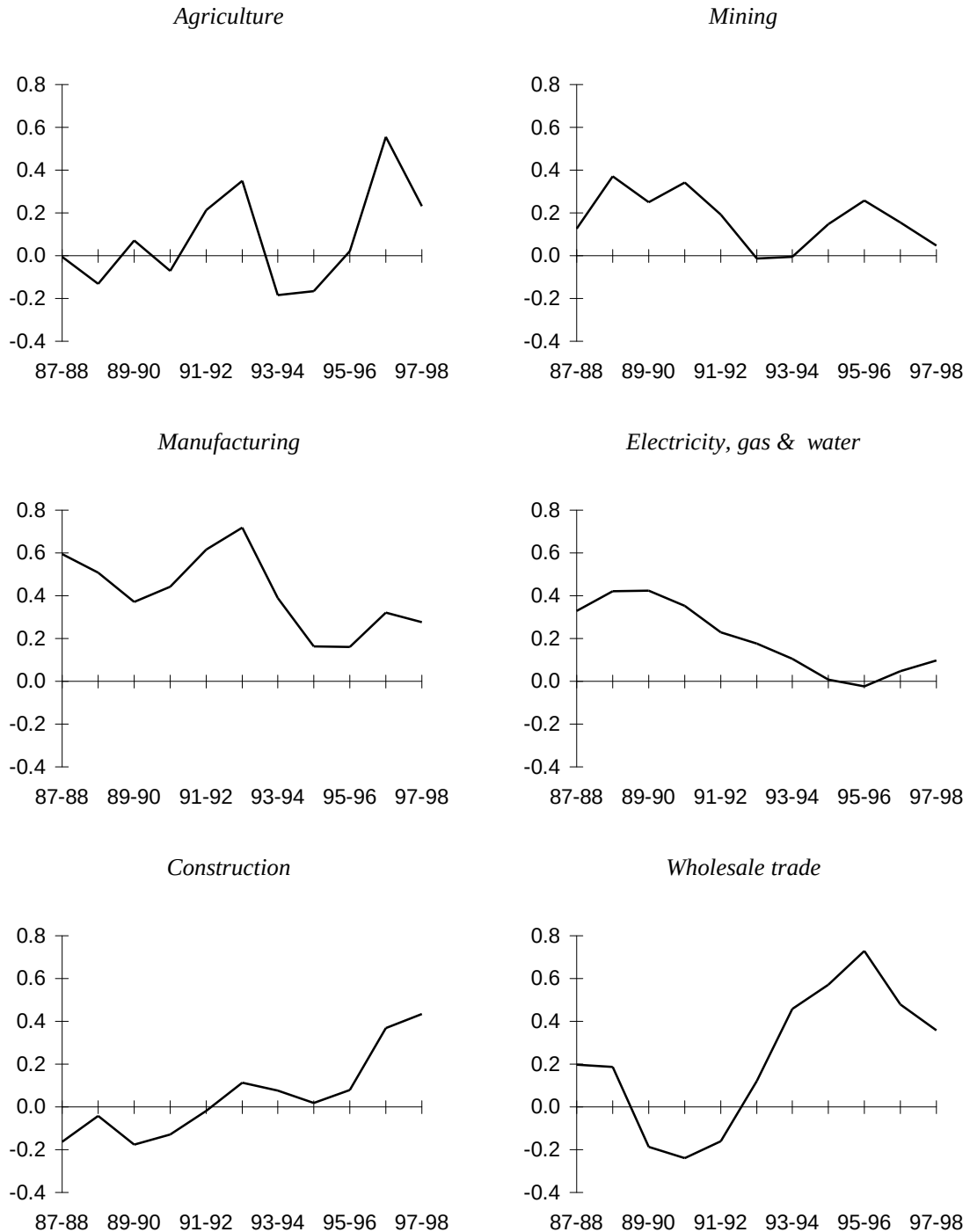
These results illustrate that there is not a simple sectoral story underlying the aggregate trends. Aggregate productivity growth appears to come from different industry sectors at different times. The sectors appear to have their own productivity cycles and trends.

⁹ Yearly production weights among market sector industries are used with weights for period (t+1) applied to growth rates calculated over period t to (t+1).

¹⁰ A 3-year moving average of industry MFP is taken (and the estimate for 1997-98 is calculated by including the MFP value for 1997-98 twice in the moving-average calculation).

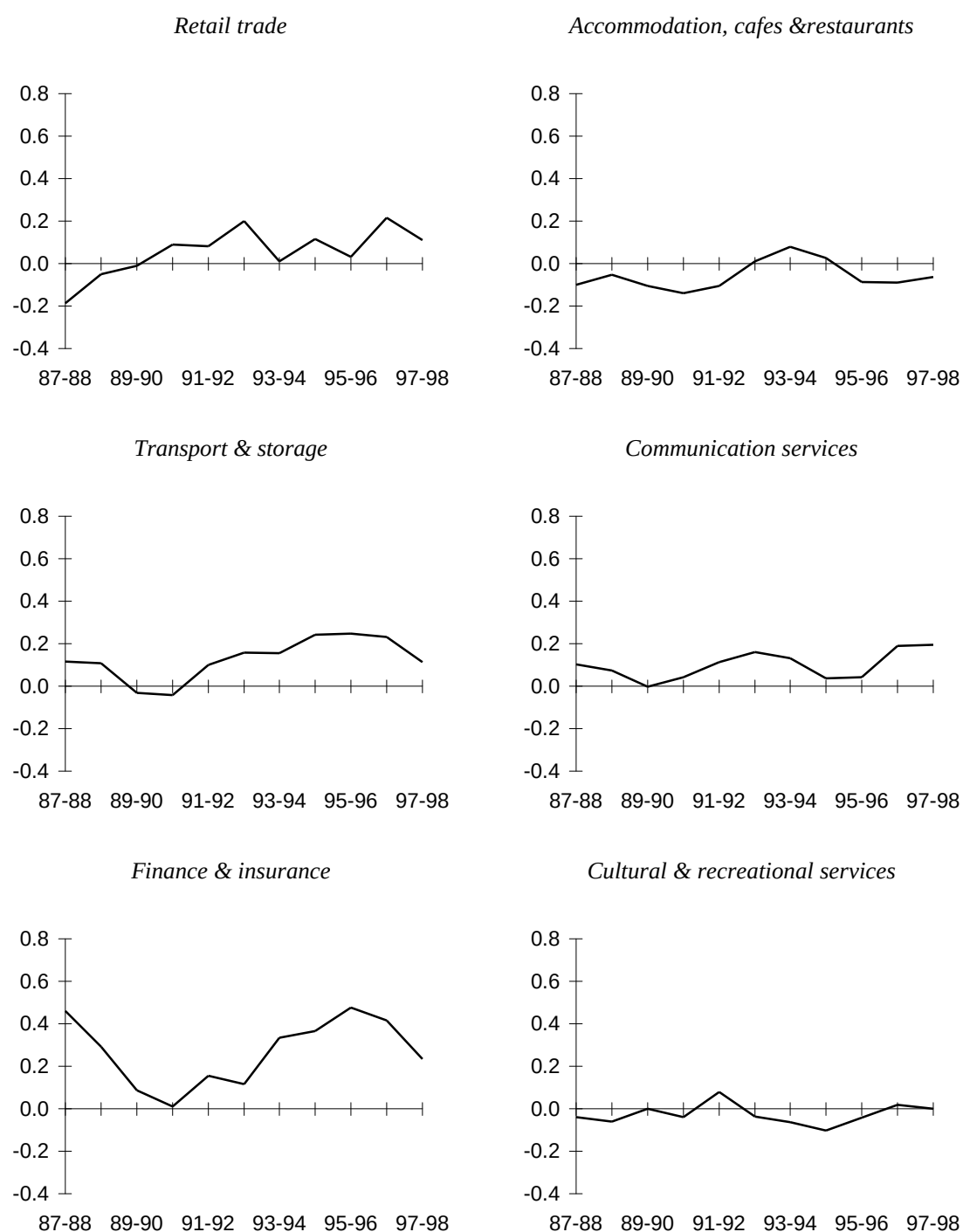
Figure 3.9 Contributions of industry sectors to MFP growth in the market sector, 1987-88 to 1997-98

Per cent



(Continued on next page)

Figure 3.9 (Continued)



Source: Commission estimates.

Table 3.4 Sectoral contributions to market sector multifactor productivity growth^a

Percentage points and (per cent)

	1988-89 to 1993-94		1993-94 to 1997-98		1988-89 to 1997-98	
Agriculture	0.2	(17)	-0.1	(-3)	0.1	(6)
Mining	0.1	(10)	0.2	(10)	0.1	(9)
Manufacturing	0.6	(45)	0.2	(10)	0.4	(26)
Electricity, gas & water	0.3	(21)	0.0	(1)	0.2	(10)
Construction	0.0	(0)	0.2	(12)	0.1	(7)
Wholesale trade	-0.1	(-9)	0.6	(31)	0.2	(14)
Retail trade	0.1	(8)	0.1	(5)	0.1	(6)
Accomm., cafes & restaurants	-0.1	(-4)	-0.1	(-3)	-0.1	(-3)
Trans. & stor.	0.0	(2)	0.2	(11)	0.1	(7)
Communication	0.1	(5)	0.1	(7)	0.1	(5)
Finance & insur.	0.1	(8)	0.4	(21)	0.2	(15)
Cultural & recr. services	0.0	(-2)	0.0	(-1)	0.0	(-2)
Total	1.3	(100)	2.0	(100)	1.6	(100)

^a The sum of contributions does not add to the published growth in market sector productivity due to the use of base-period weights. The differences in the total in this table and in published estimates are due to industry composition effects.

Source: Commission estimates.

A further view on sectoral contributions is provided in table 3.3. This shows the sectoral contributions over the ABS productivity cycles determined at the aggregate level.

Although these calculations do not allow for the cycles of individual sectors, they tend to reinforce the patterns identified above.

Reallocation of resources

In terms of resource allocation, the growth in the total input measure in table 3.2 suggests that inputs have moved out of Manufacturing and EGW and have grown only weakly in Agriculture and Wholesale trade. On the other hand, inputs have grown strongly in Communication services, ACR, CRS and Mining. The growth in inputs in ACR and CRS illustrates that demand-side factors, and not only supply-side factors, are important in determining the allocation of resources¹¹

¹¹ The fact that inputs have grown relatively fast in industries with low productivity levels or growth is not necessarily a concern. As outlined in chapter 2, the broad objective is to improve welfare (which includes consideration of the demand side). The most efficient allocation of resources will be one that includes both high and low productivity industries in satisfying the demands of Australians. Productivity and welfare can be improved through a reallocation of resources if the current allocation is not optimal in meeting these demands.

Since Communication services and Mining are two sectors with relatively strong productivity growth, growth in resources to these sectors would have assisted aggregate productivity growth. Aside from these cases, there have not been dramatic changes in the allocation of resources at this level of aggregation. Although there has been a sizeable reduction in labour input in EGW, this sector does not provide a large proportion of total employment (Barnes et al. 1999). There may nevertheless be more marked allocation effects *within* broad industry sectors.

Other earlier studies presented evidence to suggest that compositional effects at this level of aggregation are relatively unimportant in explaining changes in aggregate productivity (IC 1997a, p. 51; Dixon and MacDonald 1992).

However, table 3.3 does suggest that industry compositional effects may have become more important in recent years. The total contributions in table 3.3 are based on base-period production weights. They differ from market-sector growth rates to the extent that there are changes in industry input and output composition. There is only a minor difference (0.1 of a percentage point) between the totals in the 1988-89 to 1993-94 period. But there is a 0.4 percentage point difference between the totals for 1993-94 to 1997-98. On the input side, there has been a change in industry composition in favour of Mining and Communication services which are relatively high productivity growth sectors. And on the output side, there has been a change in industry composition favouring Mining, Wholesale trade, Communication services and Finance & insurance, all of which are relatively high productivity growth sectors.

Associations between microeconomic reforms and improved productivity

A thorough examination of any links between microeconomic reforms and improved productivity performance requires detailed analysis. It requires consideration of the specific timing of reforms, the counterfactual (what would have happened in the absence of reform) and the contributions of other (non-reform) factors to productivity trends. Much greater industry disaggregation would be necessary in many cases to draw firm links, for example, among the diverse performances within the Manufacturing sector. Furthermore, improved performance in some industries could be due to the introduction of generally-applied reforms (for example, industrial relations reforms) rather than industry-specific reforms.

It is also likely that some reforms have indirect effects. The focus on improved performance and cost in industries facing tougher competitive pressure can transfer

into other industries as producers demand more from suppliers in terms of quality, delivery and price.

However, even with these qualifications, there are signs at the broad industry sector level that productivity improvements could be associated with the introduction of reforms. There have been reforms specifically directed at EGW, Manufacturing, Finance & insurance, Transport & storage, Communication services and Agriculture. And these and other sectors (for example, Mining and Construction) have benefited from generally-applied reforms.

Nevertheless, the diversity in productivity performance at each level of aggregation should be noted. There is diversity within the market sector and diversity within the manufacturing sector. The case studies reported in chapter 5 suggest that further diversity at the firm level within manufacturing industries.

This leads to the possibility that the productivity surge in the 1990s may be a narrow industry or even firm-based phenomenon. Such a suggestion is supported by an ABS 1995 survey which points to a diversity in productivity performance among firms *within* industries (Rogers 1998c).

3.4 Key points

- Australia's multifactor productivity growth in the market sector has accelerated to a record high in the 1990s. It has been running at around 2.4 per cent a year since 1993-94, compared with an historical average of 1.2 per cent a year until that year.
- Productivity growth in the 1990s has replaced the previous heavy reliance on accumulation of inputs (especially capital) to underpin economic growth.
- The productivity acceleration has been under way since the very early 1990s. To some extent, the acceleration reflects recovery from the recession, particularly in the early years. But the productivity acceleration has continued for the longest period and at the highest rates on record — well beyond the period and strength that could be associated with recovery from the recession.
- The productivity surge has not come from slower growth in inputs — especially labour input, which has shown strong growth in aggregate hours by historical standards over recent years.
- The acceleration in productivity growth appears to have put the Australian economy on a new path toward faster sustainable growth in output and average living standards.

-
- Australia's productivity growth was poor by international standards in the post-war period until the 1990s. With a backlog of forgone 'catch-up' opportunities, Australia had the potential to raise its rate of productivity growth by catching up relatively quickly to the production standards in advanced economies overseas. But there had to be a change in the way the economy operates for Australia to break with a long history of relatively poor performance.
 - An examination of industry sectors within the market sector reveals a range of productivity performances. However, there has been more uniform positive growth in the most recent years.
 - The industry sectors which show relatively strong growth in productivity since the mid-1980s are:
 - Electricity, gas & water;
 - Finance & insurance;
 - Mining; and
 - Communication services.
 - Manufacturing shows solid productivity growth and makes a very strong contribution to market sector MFP growth up to 1993-94. Contributions from Wholesale trade, Transport & storage and Construction have picked up since 1993-94. Agricultural productivity growth is volatile around a positive trend.
 - There is not a simple story about the contributions of industry sectors to market sector productivity growth. They vary over time. Industry sectors have their own productivity cycles and trends. And different factors — investment, employment and the effects of the recession — underlie the performance of different sectors.
 - Greater industry disaggregation reveals greater diversity in productivity performance. This is true of the broad industry sectors which comprise the market sector. And, while productivity growth has been solid but unspectacular for Manufacturing as a whole, there is much greater diversity in performance within the sector. For example, Basic metal products stands out as showing very strong productivity growth. Many of the productivity responses may be firm-based as much as, or more than, industry-based.
 - The sectoral productivity trends are broadly consistent with the effects of introduction of reforms. But firmer conclusions require more detailed analysis.



4 What raises productivity?

Does the evidence of a productivity surge in the 1990s mean that the reforms implemented over the past 15 years or so are having success in raising Australia's productivity performance? Or are there other factors at work?

The paper approaches these questions from the productivity perspective. This chapter presents an overview of the factors that are considered in the economics literature to influence productivity over the medium to long term. This provides a framework for considering policy and other influences on productivity. (The framework also underlies the case studies reported in following chapters.)

The chapter then presents evidence on whether there have been changes in these productivity-enhancing factors in Australia since reforms have been introduced. It also considers a range of possible explanations for the 1990s productivity surge.

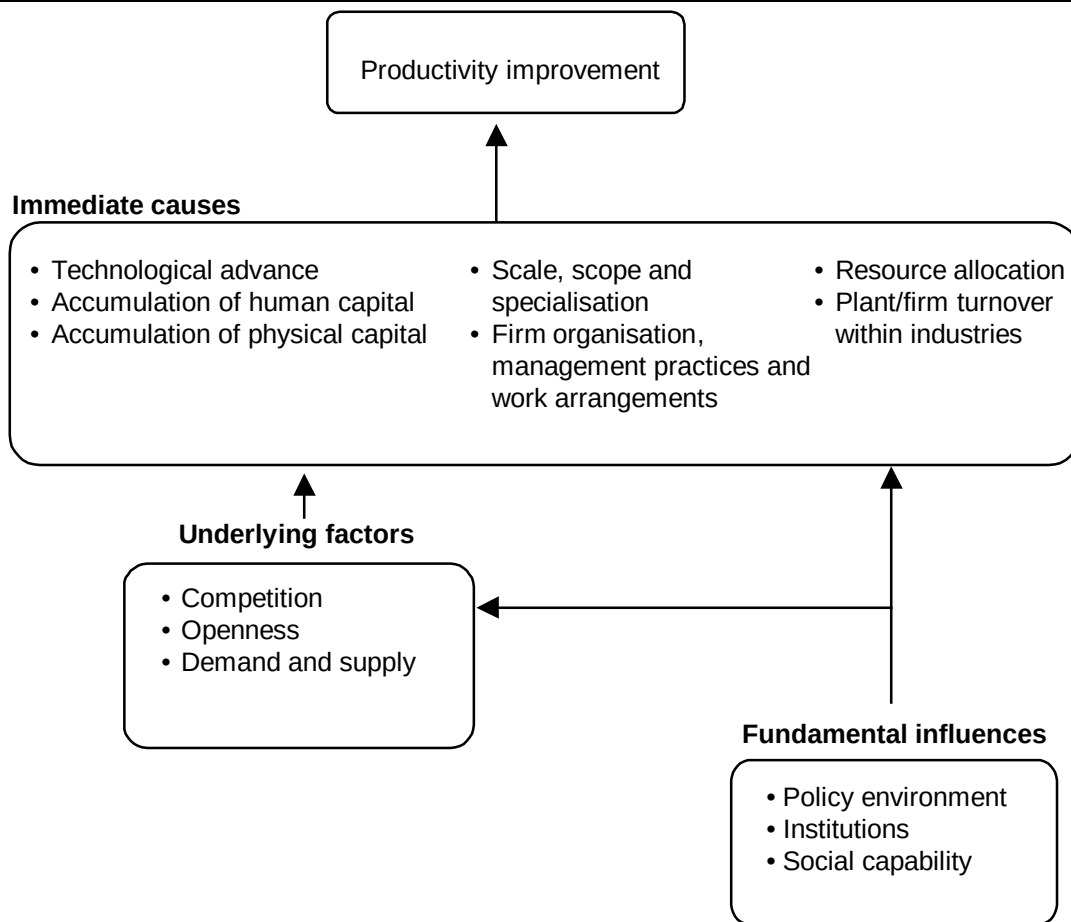
The general evidence presented in this chapter is supplemented by case study evidence presented in following chapters.

4.1 A framework of major factors affecting productivity

Productivity is of immense interest to economists. It is the key to promoting growth in output and prosperity over the long term. And it represents something of a challenge to economists in that precise understanding of what affects productivity and how it can be influenced is somewhat elusive. In that respect, the study of productivity bears some similarities to the study of the health of the human body — there is a lot that is known and can be done, but there is still much in the detail and the complexity that is not fully understood.

Several broad sources of productivity growth can be identified from the economics literature. Technological advance is widely held to be of major importance. Many analysts concentrate exclusively on the complex links between technology and productivity. But there are other broad sources of productivity growth which do not depend on advances in technology. As discussed in chapter 2, there can be policy influences which aim to improve productivity by addressing failures in the operations of markets and problems in the interventions of governments. Some

Figure 4.1 **A framework of major productivity determinants**



analysts, particularly those with an interest in history and in explaining the wide dispersion in the prosperity of nations, emphasise the importance of fundamental social and institutional factors that govern the extent to which firms and individuals engage in productive activity and search for productivity improvements over the long term.

The main productivity determinants identified in the literature are organised into a framework in appendix B. It is reproduced here as figure 4.1. The list of factors in figure 4.1 is by no means exhaustive, but is intended to indicate some of the major influences. They are discussed very briefly below, with some elaboration in the appendix.

A feature of the framework is that it distinguishes between determinants that operate at different levels:

- Immediate causes are determinants that have close and tangible links to input/output relationships in production.

-
- Underlying factors have an indirect effect on productivity by promoting the immediate causes. They help to determine the extent to which the immediate causes change and bring about an improvement in productivity.
 - Fundamental influences are the deep-seated policy, social and institutional determinants which affect productivity in very general and indirect fashion. They operate through underlying factors or immediate causes. They set the general ‘environmental’ conditions which can affect productivity, especially over the long term.

There is an important reason for distinguishing between these groups of factors. Immediate causes may be necessary to bring about substantial productivity improvement, but they may not be sufficient. Changes at the underlying level or, in turn, the fundamental level may ultimately be required. Further explanation and illustration of this point is provided below.

Immediate causes

Technological advance has long been highlighted as a source of productivity growth. It is viewed as one of the major engines of growth. Technological advance brings productivity improvement by bringing into operation better products and better production techniques which enable more value to be added in production. Technological advance encompasses the interrelated aspects of invention of ideas, innovation (bringing ideas to commercial reality) and diffusion (adoption and application of technologies).

In more recent times, the ‘knowledge’ dimension of technological advance has been emphasised in the literature. *Accumulation of human capital, accumulation of physical capital*¹ and research and development are seen as central and interrelated in the development, application and refinement of new knowledge.

Economies of scale and scope and *gains from specialisation* have been important, for example, in bringing about improvements in productivity through techniques of mass production. Specialisation is thought to bring productivity improvements through, for example, learning by doing.

Attention has also turned in recent times to the importance of *firm organisation, management practices* and *work arrangements*. For example, lean production techniques can bring productivity improvements through complete and continuous

¹ Accumulation of physical capital has a direct effect on labour productivity by affecting the capital-labour ratio. Its effect on multifactor productivity is indirect through externalities (see chapter 3 and appendix B).

review of production systems, supply arrangements, inventory management, quality assurance, team-based work and so on. Organisational structure is also increasingly seen as vital to maintaining the flexibility needed to deal with rapid changes and ambiguities in modern market conditions.

As suggested in chapter 2, the *allocation of resources* affects productivity. Removing barriers to better resource allocation can improve productivity.

The normal operations of a ‘dynamic’ economy can also affect average productivity. The productivity levels of plants and firms can vary according to technologies employed, age of equipment, access to inputs and markets and so on. Average productivity in an industry can therefore vary with *plant/firm turnover* — the entry of ‘greenfields’ plants or the exit of ‘unproductive’ plants (and relative growth and decline of incumbent firms and plants).

Again, these immediate causes are overlapping and interrelated. For example, firm organisation can affect the development and application of technology, specialisation and economies of scale.

Underlying factors

Three underlying factors are mentioned — competition, openness and demand and supply conditions. The general feature of underlying factors is that they help to condition the extent to which the immediate causes of productivity growth come into play. In the extreme, a change in firm organisation, a change in management practice, or adoption and development of new technologies might not happen without a clear purpose or incentive such as that provided by competition. Access to overseas technologies and management expertise may not be possible without openness to foreign trade and investment.

Competition

It is often argued that competition provides a basic incentive to improve productivity performance in order to capture market share or even to survive (for example, Porter 1990). Competition can provide incentives to adopt latest technologies and to innovate in order to gain some product or price advantage over competitors. Competition can put some pressure on firms and industries to rationalise, retire less productive operations and to modernise. It can provide incentives for firms to develop new markets which may bring gains from specialisation, economies of scale and the spreading of risks.

There are counterarguments about the effects of competition, a major one being about the influence of competition on innovation. Indeed, some argue strongly that, because of detrimental effects on innovation, microeconomic reforms have limited and perhaps even negative effects on productivity. This view tends to come from the ‘Schumpeterian tradition’ that innovation is related to market power, from which the inference is drawn that greater competition stifles innovation. However, there is little empirical support for this view and it does not appear to have strong relevance to an economy such as Australia’s which is mainly dependent on technologies developed elsewhere (box 4.1). Furthermore, as will be seen later in this chapter, an increase in business innovation has coincided with the increase in competition in the Australian economy.

Competition can affect the rate of plant and firm turnover and force firm reorganisation and changes in management practices and work arrangements.

Empirical evidence, also covered in the appendix, supports the view that competition has a positive effect on productivity performance (appendix B).

Openness

The openness of an economy to trade and investment is considered, both from a theoretical and empirical point of view, to be a potentially major influence on productivity determinants. It is perhaps especially important to countries such as Australia, with a relatively small economy and relatively small population, which must rely heavily on absorbing technologies generated elsewhere (Rogers 1997).

Apart from a competitive element, the following mechanisms can come into play in being open to trade and investment.

- Inward foreign direct investment often brings with it technology (often protected by intellectual property rights), production methods and human expertise.
- Imports of final products, intermediate goods (for use in local production processes) and capital equipment can have technology embodied within them that would not otherwise be available.
- Intra-industry trade leads to specialisation between countries in production of goods and services to which they are better suited and in which they can be more productive.
- Development of foreign markets through trade and outward foreign investment can provide access to ideas and trends and can bring the volumes of sales that can assist with the exploitation of economies of scale.

Box 4.1 **Competition and innovation**

Does increased competition have a positive or negative effect on the rate of innovation?

There has been a longstanding debate going back to the views of Joseph Schumpeter who argued in the 1940s that large firms, operating in concentrated markets, are the main engines of technological advance. The inference drawn from the 'Schumpeterian tradition' is that greater competition reduces R&D effort and the rate of innovation. It would then follow that greater competition may lead to some loss of dynamic gains.

Schumpeterian arguments include claims that large firms provide greater opportunity to spread risks through diversification; they can spread the often large fixed costs of R&D over more output; and they are better placed to capture economies of scale and scope. Market power is considered to be needed to generate the surpluses to fund R&D and to appropriate the benefits from successful innovation.

Against this, King (1998) argued at the PC/ANU conference on microeconomic reform and productivity that, because at least some benefits from innovation would be passed on to purchasers, the monopolist may have too little incentive to innovate to the optimum level. However, he also suggested that there may be circumstances in which competitive firms may undertake too much innovation as they race each other to come first in 'winner-take-all innovation contests'. This presumably involves 'leap-frogging' advances which render previous innovations obsolete too early from a social point of view (which would presumably also induce adjustments in the rate of innovation).

There are a number of in-principle arguments about the basic Schumpeterian position:

- Some (for example, Porter 1990) argue that competition forces firms to innovate in order to survive.
- The focus of the Schumpeterian view tends to be on frontier innovations from 'fundamental' research, whereas different factors may be at work in step-by-step and developmental innovations.
- The position is based on a large and/or closed economy view, whereas smaller and open economies adopt much of their new technology through overseas technology transfer. Innovation in these circumstances tends to be adaptation and development or in niche areas.

There is not much empirical support for the Schumpeterian view (or, for that matter, for the extreme opposite that competition leads to too much innovation). For example, in a review of empirical studies, Symeonidis (1996) found little if any support for the existence of a positive relationship between firm size or concentration, on the one hand, and R&D effort or innovation output, on the other. There are some circumstances in which a relationship could exist. But, generally, industry-specific variations in factors such as opportunities for technological advance were found to be more important explanators.

Box 4.1 (Continued)

Furthermore, effects on innovation are not the only issue relevant to productivity growth. Greater competition can improve productivity by reducing inefficiencies and sharpening the search for further improvements through other means (for example, diffusion of existing technologies or instituting new management and work practices).

Even if competition did result in insufficient innovation, what would be the best way to deal with any underinvestment in R&D and innovation? Allowing restrictions on competition could lead to loss of potential efficiency gains. Improving the definition of property rights through adjustments to patents and copyright systems or encouraging business research through grants, subsidies, tax concessions or government provision could be a less costly way of achieving a desirable increase in innovation. These methods could address any shortfall in innovation while still allowing the other general benefits of competition.

Finally, two elaborations can be added from an Australian perspective. First, there is the broad observation that business R&D expenditure and innovation were low, compared with other countries, in the pre-reform period and have increased in a more competitive environment since the mid-1980s. Second, Australia is a generally small player in the world of innovation. It has a relatively small population from which to draw for the generation of ideas. It has relatively small markets to generate the returns to cover the large fixed costs of research. Firm size tends to be small by international standards. Apart from areas connected with primary production and some niche areas, a large part of Australia's interests in innovation lie in absorbing technologies generated overseas (Rogers 1997). Openness and competition are likely to be very important in the uptake of technologies in economies such as Australia's.

Again, there is empirical evidence to support the view that the openness of an economy is positively related to productivity growth (appendix B).

Demand and supply conditions

Other underlying factors also have a pervasive effect on productivity determinants through what might be termed general demand and supply conditions. The strength and pattern of demand for goods and services, factor endowments, demography and prices can affect the accumulation of human capital, the merits of different production methods and the merits of adopting and developing new technologies. They can affect the opportunities to reap economies of scale, the allocation of resources and the turnover of plants and firms.

Macroeconomic stability also affects productivity performance. The strength of demand affects capacity utilisation in the short run. Productivity growth tends to accelerate as an economy recovers from a cyclical downturn and decelerate as the economy starts to ‘overheat’. Inflation can create uncertainty and distort investment patterns away from longer-term productivity-enhancing options.

Fundamental influences

The vast differences in the prosperity of nations suggest that there are fundamental factors which condition the productive potential of nations and the extent to which that potential is realised over the long term. If the ‘know-how’ to operate efficiently and productively is readily available worldwide, why do the vast differences between countries persist?

Economists point to three interrelated factors. The *policy environment* can affect the emphasis given to economic objectives and the development of productivity-enhancing capabilities (for example, science and education) and the stability of policy settings can affect the risks involved in making long-term investment decisions. *Institutions* are formal and informal ‘rules of the game’ (from corruption to prudential rules and legal enforcement) which determine the costs of coordinating production activities (for example organising labour) and conducting business. They influence the incentives facing firms and individuals to raise productivity. *Social capability* refers broadly to the economic capabilities of a nation and the orientation of its people toward achieving further development. (Again these concepts are explained more fully in appendix B.)

As briefly mentioned in chapter 3, large differences between ‘lesser-developed’ or low-income countries and ‘developed’ or high-income countries in these characteristics present a barrier to the ability of low-income countries to catch up to higher-income countries. Differences in education and skill and in infrastructure (for example, transport, energy and finance) can be determining barriers. ‘Catch-up and convergence’ is considered to be conditional on nations achieving a certain degree of development.

Even within the group of ‘developed’ countries, however, catch-up is not automatic. The European post-war experience provides an illustration. Despite the long-standing and pervasive productivity leadership of the United States, only relatively few countries participated in rapid productivity catch-up in the immediate post-War era. Investment in physical and human capital and incorporation of more advanced technologies were crucial, necessary factors. But they alone were insufficient. Other crucial factors were a policy stance which permitted greater openness to trade and

investment; and social and institutional changes that gave certain European countries the social acceptance and sense of purpose to participate in more rapid catch-up (Crafts and Toniolo 1996).

As further illustration, a social consensus for change has also been considered to underpin Ireland's economic success in the 1990s. As a sense of economic crisis developed in the 1980s, a consensus view emerged that greater self-reliance was required, that restructuring was inevitable and that pay claims and industrial action needed to be moderated. In this environment, more radical policy changes became politically feasible (OECD 1999b).

There were similar elements in Australia over the 1980s and 1990s. Moves to give additional emphasis to economic performance stemmed, at least in part, from a concern that Australia's performance had slipped and the future outlook was grim (chapter 2). This promoted acceptance of the need for policy change.

Microeconomic reforms and productivity determinants

The microeconomic reforms that have been introduced in Australia over the past 15 years or so have been directed at the three levels of productivity determinants outlined above.

- There have been specific reforms to influence determinants at the immediate level — for example, tariff and tax changes to affect relative prices and relative rates of return and thereby influence resource allocation; and taxation and other changes to influence innovation.
- A number of policy reforms have collectively been directed at underlying factors — opening the economy to trade and investment (relaxing trade and investment barriers) and increasing competition (relaxing trade barriers and strengthening domestic competition policy).
- Reforms have also been directed at fundamental influences — changes to institutional arrangements (for example, workplace bargaining, corporate governance, access to finance) and changes in government policy signals to give greater emphasis to longer-term economic performance and industry self-reliance.

4.2 Trends in productivity determinants

Appendix C presents evidence, where available, on a range of indicators related to the productivity determinants outlined above. The factors covered in the appendix are: technological advance (including research and development); accumulation of

physical capital; accumulation of human capital; specialisation; firm organisation, management practices and work arrangements; resource allocation; openness; and competition.

There are two very important caveats in drawing together evidence on trends in productivity determinants:

- There are some major gaps which prevent a comprehensive assessment of the factors which could be contributing to productivity improvement. There is no specific information on economies of scale and scope; and on plant/firm turnover within industries through entry, exit, mergers and takeovers (immediate causes). Quantitative indicators on the underlying and fundamental factors are very difficult to assemble. Even where general indicators are available, gaps remain. For example, there is no comprehensive information on potential improvements in the allocation of investment or in the efficiency of work arrangements. (The case studies which follow in the next two chapters provide information which helps to fill gaps in a number of areas.)
- Among the indicators that are available, no attempt is made to judge their relative significance in affecting productivity performance. Some changes, though very noticeable, could nevertheless have limited overall effect on productivity.

The following material draws on features of the evidence assembled in appendix C. That appendix should be referred to for further detail, sources and explanation.

Diffusion of technologies and innovation

Technological advance is commonly taken to be a major influence on productivity growth. But a distinction needs to be made between embodied and disembodied technological change if the aim is to explain trends in measured productivity. Embodied technological advance changes the quality of capital goods. Statistical agencies attempt to exclude the effects of changes in quality when estimating capital price deflators, which are used to calculate volume measures. If they do so fully, embodied technological advances are reflected in volume measures of expenditure on capital. Technological advance would then affect labour productivity (change in the capital-labour ratio), but it would not directly influence multifactor productivity (MFP). In practice, however, the statistical procedures are not entirely comprehensive and it is highly likely that some embodied advances are included in capital measures and some are not (ABS 5234.0)²

² To illustrate the principles involved, say \$1000 was spent on a machine in one year and \$2200 on an improved machine in another year. Say the statisticians measure machine quality in terms of horsepower; and attribute \$1000 of the increased expenditure to the superior horsepower rating of the new machine and \$200 to pure price level change. In this case, embodied technological change

Consequently, some embodied technological changes are reflected in productivity improvements, and some are not.

There is evidence that the diffusion of new technologies has accelerated since the late 1980s. For example, in the two years to 1995, 47 per cent of all workplaces were affected by the introduction of new office technology and 28 per cent by the introduction of new plant, machinery or equipment. This compares with 34 per cent of all workplaces affected by new technology in the two years prior to 1989-90.

New plant, machinery or equipment was introduced in Manufacturing (around half of workplaces in the two years to 1995) and Mining (about 40 per cent). Major new office technology was introduced in services industries — in over half the workplaces in Electricity, gas & water, Finance & insurance, Property & business services, Government administration and Education.

The use of advanced technologies in manufacturing businesses with at least 10 employees increased from 33 per cent in 1988 to 44 per cent in 1997. Much of the expansion appeared to occur between 1988 and 1991. Smaller firms appeared to account for much of the increase — larger firms already having higher adoption rates.

Australia has a high dependence on technological advances generated and embodied in equipment made overseas. Imports of capital goods have increased from around 30 per cent of total capital goods expenditure in the early 1980s to over 40 per cent in the 1990s. In the 1990s, there was a significant increase in imports of machinery and industrial equipment and steady growth in imports of computer and telecommunications equipment.

Technological innovation has also increased. Nearly 90 per cent of firms responding to a 1998 ABS survey rated improved productivity as an important objective in pursuing innovation. Growth in patent applications accelerated during the 1980s and 1990s.

Research and development

Real R&D expenditure increased at an average rate of 7 per cent a year between 1981-82 and 1996-97. An increasing proportion of this activity is business related.

that increases horsepower would be captured as an increase in capital inputs, which have increased in real terms by \$1000 or 100 per cent. But if the new machine also embodied technology that reduced the amount of waste product (and the statistician took no account of this), this form of embodied technological change would not show up in increased capital inputs and would therefore be reflected in productivity increases.

Business expenditure on R&D grew by nearly 10 per cent a year between 1983-84 and 1996-97. Between 1968-69 and 1983-84, it fell by 3.6 per cent a year.

While R&D expenditure as a proportion of GDP in Australia is lower than in many other industrialised countries, it has increased at a high rate (3.5 per cent a year) since the early 1980s. R&D expenditure as a proportion of GDP has increased from 1.0 per cent in 1981-82 to 1.7 per cent in 1996-97.

Amongst manufacturing firms undertaking R&D, the contribution to sales of ‘totally new’ products and processes increased to 22 per cent in the 1990s (9 per cent 20 years earlier), tripled for ‘significantly improved’ products and processes and almost doubled for ‘marginally improved’ products and processes.

Accumulation of physical capital

Investment in capital is not a direct contributor to productivity growth (unless, as shown in chapter 3, labour productivity is the measure of interest). Investment can influence multifactor productivity indirectly through adoption of new technologies and associated changes in work arrangements and so on. The allocation of investment to different production activities (see ‘Resource allocation’ below) or different asset types can also influence aggregate productivity.

There has been a switch in investment away from non-dwelling construction toward equipment since the late 1980s. Gross fixed capital expenditure on equipment as a percentage of GDP increased significantly during the 1990s and in recent years has been at its highest level for over thirty years. As a proportion of total investment, gross fixed capital expenditure on equipment has increased from 54 per cent in 1989-90 to 63 per cent in 1996-97.

The importance of public infrastructure expenditure has declined over the late 1980s and 1990s and has only been partially offset by increases in private sector infrastructure spending.

Accumulation of human capital

To some extent, education and training can go hand-in-hand with innovation and diffusion of technologies³. Skills are required to use newer technologies (and develop along with their use). Innovation itself depends on specialised skills. Even apart from the technology links, a more educated and trained workforce is generally regarded as more flexible and productive.

³ In some circumstances, technology is considered to have a ‘deskilling’ effect.

The proportion of the employed workforce holding post-school qualifications increased from 44 per cent in 1984 to 50 per cent in 1992. According to a new data series, the proportion has remained stable at around 48 per cent since 1993.

While a declining proportion of the employed workforce, those without post-school qualifications have also been extending their years at school. Those who did not attend the highest level of secondary school declined as a proportion of the workforce from 42 per cent in 1984 to 30 per cent in 1992. In the new data series, the proportion declined from 33 per cent in 1993 to 31 per cent in 1997. This change reflects a very large increase in retention rates to Year 12 since the early 1980s.

Vocational education and training has also expanded. The number of persons enrolled in vocational education programs increased at an annual average rate of 4.6 per cent between 1984 and 1998. Since 1994, it increased by 7.7 per cent per year. The participation of wage and salary earners in training increased from 79 per cent in 1989 to 83 per cent in 1997. The proportion of all workplaces providing formal training programs increasing from 58 per cent in 1990 to 68 per cent in 1995.

Bringing in new business leaders with a capacity to manage change has also been a catalyst for business improvement in the 1990s (Carnegie and Butlin 1993).

Scale, scope and specialisation

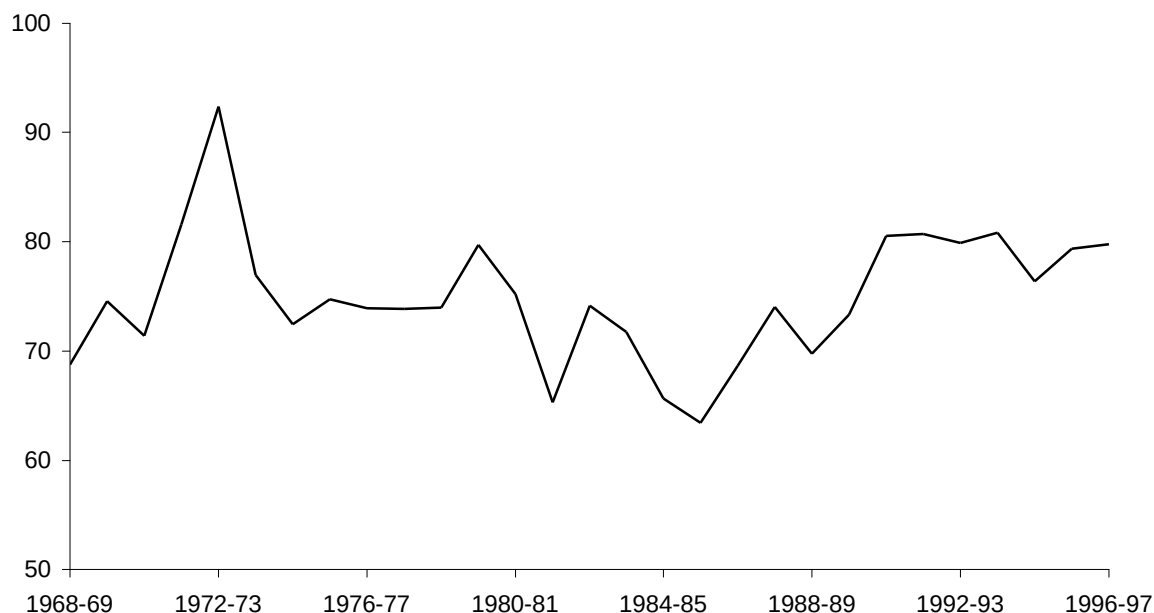
Data on trends in the realisation of economies of scale, scope and specialisation are not readily available.

However, one indicator of specialisation is the intra-industry trade index. Intra-industry trade refers to the simultaneous imports and exports within the same industry classification. With increases in intra-industry trade, the presumption is that domestic producers and importers are specialising more in differentiated products destined for different market segments.

Intra-industry trade has increased within the manufacturing sector since the mid-1980s (figure 4.2). The value of the index has increased from 66 in 1984-85 to 80 in 1996-97. A value of zero indicates one-way trade, whereas a value of 100 indicates balanced export and import trade.

At the sectoral level, increases in intra-industry trade have been most prominent in Textiles, clothing & footwear, Wood & paper products, Non-metallic mineral products and Machinery & equipment industries (appendix C).

Figure 4.2 **Intra-industry trade index for total manufacturing industries, 1968-69 to 1996-97**



Data sources: IC (1995a) and Commission estimates based on ABS data.

Firm organisation, management practices and work arrangements

The late 1980s and 1990s also saw greater diffusion of improved management strategies and techniques to facilitate organisational change and improve competitive advantage. Key features have included mergers, acquisitions and divestments; strategic planning for competition; streamlining organisational processes to improve efficiency; and benchmarking performance against leading global firms. Advanced management techniques such as total quality control, just-in-time, resource planning, and value added management were more widely adopted.

Greater weight has been placed on human resource management and enhancing flexibility through multiskilling and team-based approaches to management and work.

The 1990s has been a period of substantial change in the industrial relations system. Reform of the industrial relations system resulted in an expansion of decentralised arrangements for the determination of the wages and conditions of employment during the 1990s. In 1990, the system of determining wages and conditions was highly centralised and only 20 per cent of employees were covered by formal enterprise agreements. By 1998, over half the non-managerial workforce in

commercial workplaces of more than 20 employees was covered by agreements negotiated at the workplace or enterprise level. About two-thirds of all workplaces are using enterprise-based bargaining approaches to determine wages and conditions.

Workplace agreements have put explicit focus on improving productivity and have provided financial rewards for success in meeting improvement objectives. Similarly, managers are increasingly being engaged under contracts with explicit performance incentives.

Resource allocation

There have been large differences in input growth across industries since the mid-1980s.

- There was strong input growth in:
 - Communication services (5.9 per cent a year from 1985-86 to 1997-98);
 - Accommodation, cafes & restaurants (5.1 per cent a year);
 - Cultural & recreational services (4.3 per cent a year); and
 - Mining (3.1 per cent a year).
- There was weak or negative input growth in:
 - Manufacturing (0.1 per cent a year);
 - Agriculture (0.4 per cent a year); and
 - Electricity, gas & water (-1.4 per cent a year).
- Capital input grew strongly in Communication services (12.0 per cent a year) and Mining (4.8 per cent a year) but was weak in Agriculture (0.9 per cent a year) and Electricity, gas & water (0.7 per cent a year).
- Labour input growth was significant in Accommodation, cafes & restaurants (4.6 per cent per year) and Cultural & recreational services (3.5 per cent a year) but was negative in Electricity, gas & water (-5.7 per cent a year), Manufacturing (-1.0 per cent a year) and Mining (-0.5 per cent a year).

These estimates were derived from data used in the sectoral productivity estimates presented in chapter 3. It was reported there that the reallocation of inputs to Communication services and Mining would have assisted market sector productivity growth. Compositional effects appear to have contributed 0.4 of a percentage point to the total market sector productivity growth (2.4 per cent a year) over 1993-94 to 1997-98.

An indication of resource allocation in the economy as a whole, and for a longer time span, can be gained from an examination of industry shares in employment and investment. There were significant shifts in the industry allocation of employment and (annual) fixed capital expenditure between 1974-75 and 1996-97.

- The Service sector increased its share of total employment from 70.6 to 80.4 per cent while the Manufacturing share declined from 21.6 to 13.5 per cent.
- Most of the increase in the Service sector share came from the Non-market services sector increase in share (from 24.7 to 34.3 per cent) of which the main increase was in Property & business services (from 5 to 10 per cent).
- The only significant increase in employment share in the market sector was in Accommodation, cafes & restaurants (from 2.9 to 4.8 per cent).
- Significant increases in the share of total fixed capital expenditure occurred in Property & business services (from 4 to 11 per cent) and Mining (9.3 to 12.3 per cent).
- The proportion of fixed capital expenditure by Electricity, gas & water declined from 11.1 to 5 per cent while Agriculture's share declined from 11 to 6.2 per cent.

The main changes in the industry composition of output since 1974-75 were a large decline in the share contributed by Manufacturing (from 15.7 to 11.0 per cent) and a large increase in the Service sector's share (from 77.1 to 82.4 per cent) which was largely accounted for by non-market services.

According to indexes of structural change, the pace of change in the industrial composition of the economy appears to have increased since 1988-89 (appendix C).

Openness and competition

Since the mid-1980s, the Australian economy has become more outward-looking and export-oriented. Australia's goods and financial markets have become more closely integrated with world markets.

Trade intensity (ratio of imports plus exports to GDP) increased from 30 per cent in 1984-85 to 47 per cent in 1996-97. Foreign direct investment (FDI) inflows increased from an average of around 1 per cent of GDP between 1971-72 and 1984-85 to 2 per cent between 1985-86 and 1998-99. Over the same period, FDI outflows increased from 0.4 to 1.1 per cent of GDP.

Greater competition has gone hand in hand with greater openness. Imports of goods and tradeable services have increased competition in domestic markets.

Liberalisation of foreign investment has increased competition through entry of foreign firms into domestic markets. Changes to competition policy have also strengthened competitive pressures.

One indicator of competitive pressure for tradeable goods is the effective rate of protection provided by trade barriers. Reductions in effective protection mean more competitive pressure from imports, all other things equal. (Movements in exchange rates also have influence.) Effective protection for manufactured goods declined dramatically from 22 per cent in 1984-85 to 6 per cent in 1996-97 (figure 4.3). Effective rates are projected to decline further to 5 per cent in 2000.

Changes in import penetration may also reflect changes in competitive pressure. Imports have increased their share of the domestic manufacturing sector from nearly 20 per cent in 1971-72 to 35 per cent in 1996-97. The extent of import penetration has varied between industries. It increased most in TCF and Machinery and equipment and, to a lesser extent, in Metal products and Other manufacturing. The shares have changed little in other manufacturing industries.

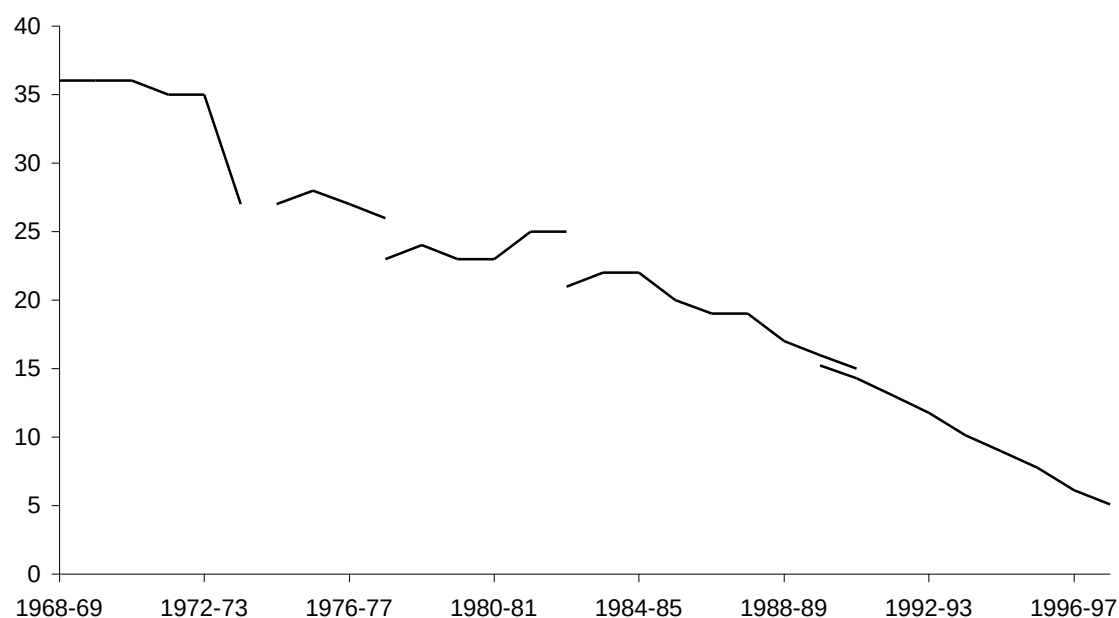
Greater openness and competition appear to have played a significant role in stimulating the diffusion of new technology; innovation and business improvement. A study commission (Carnegie and Butlin 1993) under the auspices of the Business Council of Australia conducted detailed case studies, interviews and surveys of Australian firms and concluded:

Responding to the 'carrots and sticks' of an opening Australian economy has been a recurrent theme for the majority of the enterprises we saw. Indeed our information confirms the view that the decision to open the economy has stimulated a large change in competitive performance. (p. 97)

The internationalisation of the Australian economy and the new performance standards it requires are the predominate drivers of enterprise innovation. They have led to broad improvements in standards, moves to increase value to customers, the search for new products, the ability to turn problems of scale into competitive advantages and the successes of international niche marketing. (pp. 330-31)

Figure 4.3 Effective rates of assistance for total manufacturing, 1968-69 to 2000-01

Per cent



Source: IC (1995a).

The need 'to create a competitive advantage' was also identified as the foremost influence on R&D expenditure in a BIE survey of 900 firms (BIE 1993). The companion reform to provide a tax concession on R&D expenditure has undoubtedly also played a role.

Referring to the financial, exchange rate and tariff reforms of the 1980s, Dunphy and Griffiths (1998, p. 108, 109-10) stated:

They created an impetus for organisational change never before experienced in Australia, apart from the mobilisation of industry for each of the two world wars ...

During this period, changing economic and political forces undermined the foundations of custom, practice and precedent that had characterised Australian organisational and institutional life. The pressures on organisations to respond to change were enormous. In many cases organisational survival dictated that transformational rather than incremental changes be undertaken. An economic revolution of epic proportions was in the making, and Australian corporations would never be the same again.

Policy environment

There have been a number of changes in policies which have signalled a change in the level and form of assistance that governments are willing to provide. In the private sector this has meant less government assistance geared to the needs of

individual firms and industries — as manifest, for example, in made-to-measure import protection. Government support is provided on a more universally-available basis. In the public sector, reforms have explicitly focused businesses on commercial performance.

The change in policy stance for many industries came as what economic historians (Crafts and Toniolo 1996) have described as a ‘shock to entrepreneurial expectations’. Long-standing expectations about ongoing government support for particular industries were confronted. The expected returns from lobbying governments for favoured treatment declined. Businesses came to realise that they would have to rely on their own devices to achieve their business goals.

Changes in expectations about the policy environment brought more rapid adjustment than a reading of the incremental changes in policies and increases in competition might suggest.

The Business Council’s study commission of enterprise innovation (Carnegie and Butlin 1993) captured this kind of change in the operating environment for business in the following way:

The basic market signals changed during the 1980s for domestic producers... Some enterprises began their improvement programs before the first tariff reduction announcements in 1987, and a number of enterprises began to change and improve after the 1987 announcements.

For many companies, the five years from 1984 were a watershed. The scenario of much stronger international competition for the Australian customer base increasingly became certainty for many enterprises. The best enterprises responded. Many learned to focus and apply innovation to satisfy customers in new ways and to build emerging strengths in the enterprise. (p. 78)

Tariff reductions and warnings of tariff reductions to come figure among the most effective triggers for improvement among the enterprises the Study Commission saw. (p. 80)

A picture of change

The general picture that emerges from this review of readily-available evidence is that a process of renewal or modernisation has been under way in the Australian economy since the 1980s. Greater openness and competition are forcing many of the changes.

Some of the main features of organisational change appear to be:

- a much more strategic approach to management with a longer-term view, active planning and change management;

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- rationalisation of production through mergers, acquisitions and divestments;
 - greater product specialisation;
 - use of more advanced management techniques which emphasise improved performance and organisational flexibility;
 - upgrade of technologies in production processes and more active interest in product and process innovation;
 - greater flexibility in production processes through multiskilling, training and skills development and redesign of work arrangements; and
 - greater focus within firms on improving productivity, with explicit financial incentives built into workplace agreements and management contracts.

There are some signs that, in a number of technology and management aspects, foreign and large firms have shown the way. A lot of change in more recent times appears to be coming from small and medium-sized firms upgrading their production arrangements. More resources are being allocated to areas of the economy showing relatively strong growth in output and productivity. Investment has switched away from buildings toward machinery and equipment.

There is some uncertainty about the extent to which technological advance is entering *directly* into productivity measures. But it would appear that upgrading technology, reorganising firms and redesigning management practices and work arrangements are all part of fundamental change that is delivering productivity improvement.

4.3 Possible explanations for the recent acceleration in productivity growth

Many of the above developments are consistent with the productivity-enhancing effects of reforms. However, before drawing any conclusions, it is necessary also to consider other possible explanations for the 1990s productivity surge.

Effects of the recession

The 1990s productivity acceleration was apparent in earlier ABS productivity estimates which extended to 1995-96. However, there was still some uncertainty as to whether the acceleration reflected lingering effects of recovery from the early 1990s recession, even though the acceleration appeared to be strong in comparison with previous recoveries (IC 1997a).

However, with the 1999 release of estimates, it is apparent that productivity growth has continued to accelerate well beyond the period normally associated with cyclical recovery from recession (chapter 3). Indeed, it has continued to accelerate when, on previous experience, a productivity slowdown would be expected as the economy starts to overheat.

Dowrick (1998) has confirmed there has been an increase in Australia's underlying rate of productivity growth (2.1 per cent a year in the 1990s in the non-farm market sector, compared with 0.7 per cent a year in the 1970s and 1980s, on his numbers). His analysis controls for recovery from the early 1990s recession.

The growth path evidence presented in chapter 3 also suggests that the economy has been behaving differently in the 1990s in a way that does not simply reflect the effects of recession. Figure 3.3 suggests that 'underlying' productivity growth may have started to accelerate from the early 1990s.

Worldwide productivity boom

In principle, Australia could be experiencing an improvement in productivity growth common to countries around the world. However, the evidence suggests otherwise.

Dowrick's analysis cited above suggests that Australia's improved productivity performance has not been part of a worldwide productivity boom. This was confirmed in a review of a number of countries by Parham (1999). And the international comparison in chapter 3 showed that Australia's productivity performance has outstripped that of a group of OECD countries in the 1990s.

Marked productivity growth has been a feature of two other high-income countries in the 1990s — Norway and Ireland. According to OECD economic surveys:

- the Norway experience is due to strong export demand lifting output, although continued strong growth is not expected (OECD 1999c); and
- Ireland has shown strong growth in the 1990s, sustained by favourable supply-side factors:
 - inward foreign direct investment;
 - an expanding well-qualified workforce;
 - increased openness and integration with European markets; and
 - a social consensus on pay policy that has left management free to concentrate on improving efficiency (OECD 1997, 1999b).

There has also been much discussion of a productivity acceleration in the United States. However, the evidence of a marked and sustained increase in MFP is more difficult to find. There has been growth of between 1 and 1.5 per cent over recent years, but the average for the 1990s is around 0.5 per cent a year (BLS 1999).

With little evidence of a marked productivity acceleration in other countries (aside from Ireland), a homegrown explanation for the improvement in Australia's productivity performance is needed.

New technologies

A number of commentators, mostly in the US, have put forward the view that developments in information technology are changing the ways in which economies work — creating network economies, increasing returns and spillovers effects which raise productivity growth. There are also strong criticisms of this view and the evidence of a substantial, sustained acceleration in productivity growth is yet to be established in the US (see, for example, Stiroh (1999) for a review of arguments and evidence).

Even so, it is highly unlikely that technological advances of this kind could be having a substantial, measured productivity effect in Australia, but not in other countries.

Work intensity

Greater work intensity has been put forward as an alternative explanation for the improvement in Australian productivity. There is no clear and precise statement of the nature and effects of greater work intensity, but essential features appear to be:

- reductions in employment mean fewer people are having to work harder in order to cover the work task; and
- improved (labour) productivity reflects this greater work intensity rather than any improvement in underlying efficiency.

Quiggin (1998b) links greater work intensity to two trends. First, he says there has been a significant increase in working hours for full-time employees since 1986. (Average full-time hours have increased from 39.7 in 1986-87 to 41.2 in 1997-98 (ABS Labour Statistics database on EconData). Most of the increase has occurred in the 1990s.)

Second, he notes reductions in employment in waterfront industries, railways and other government businesses enterprises and public administration. He says

microeconomic reforms have been highly effective in eliminating inadequate work intensity — essentially what Quiggin refers to as ‘on-the-job’ leisure.

These points raise a number of issues:

- The longer working hours part of this claim is not an issue from *productivity measurement* perspective. Longer working hours are identified in population surveys and are included in the measure of labour input. If fully identified, a longer-hours form of work intensity would not influence estimates of productivity. However, greater work effort per hour worked would be reflected in the productivity measure. (The length of the working week and unpaid overtime may still be issues from other points of view.)
- In a number of areas (for example railways), reductions in some services have accompanied reductions in employment. The same output has not been covered by a smaller workforce in all cases.
- There appears to be a mismatch between the observation that work intensity increased from the mid-1980s and the poor productivity performance in the latter part of the 1980s.
- While there have been employment reductions in certain industries, they have not been universal. In fact, employment has grown along with the productivity surge in the 1990s. As reported in chapter 3, the growth in labour input over the period of record productivity growth (1993-94 to 1997-98) has been high by historical standards. Employment as a ratio to the size of the working-age population has returned in recent years to the high point reached at the end of the 1980s employment expansion (after a dip in the early 1990s recession). And the unemployment rate has declined during the 1990s. (Barnes et al. 1999)
- An increase in work effort would show up most clearly as an increase in labour productivity. Indeed, as noted above, part of the claim is that increased work intensity is not associated with improvements in efficiency. However, while aggregate labour productivity growth has increased in the 1990s, the increase in growth in capital productivity and MFP has been more marked (chapter 3). Furthermore, data in table 3.1 suggest that, in the 1993-94 to 1997-98 productivity cycle, MFP growth has accounted for about 75 per cent of growth in labour productivity and changes in the capital-labour ratio have accounted for only about 25 per cent. It seems that other efficiency-enhancing factors are mainly at work.
- The evidence from chapter 3 suggests that where there have been employment reductions (especially Electricity, gas & water), there have also been marked increases in efficiency (MFP growth).

Overall, while it may be true that work intensity has increased to some extent in some areas, it is very difficult to see how the proposition that working fewer people harder (or even holding back on employment growth) can be the main explanation for the 1990s (labour) productivity improvement.

Wages and employment

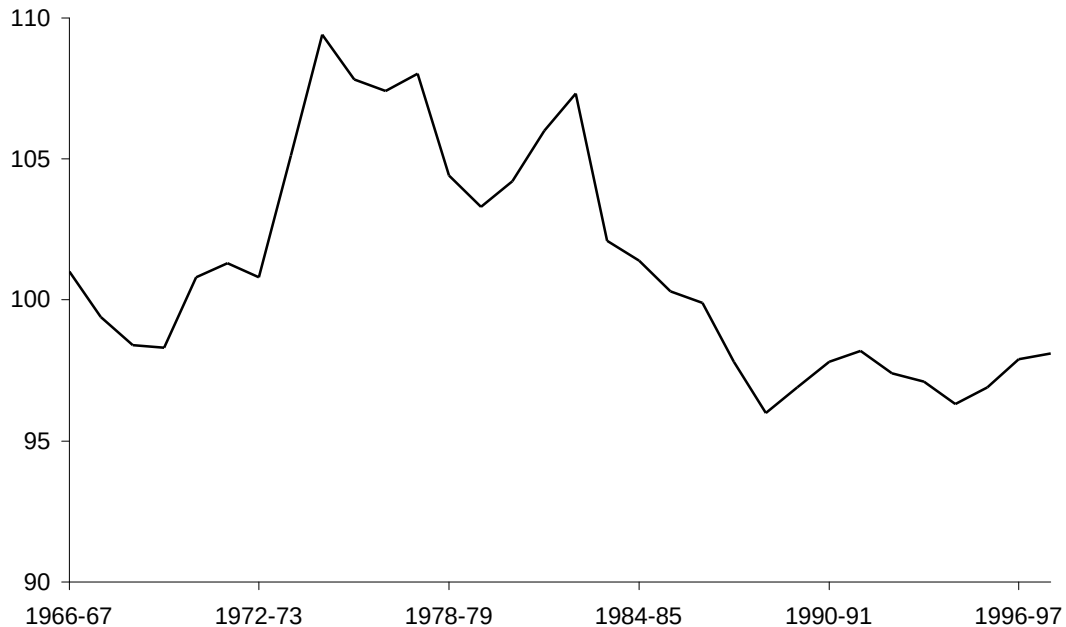
A related suggestion has been that strong (labour) productivity growth reflects the effect of relatively high wages, which restricts employment growth, while output growth remains static in the absence of improvements in efficiency. Gregory (1999), for example, forms this view from a broad-brush comparison between the output, productivity, employment and wage experiences of the US, UK, Australia and NZ over the 1960s to the 1990s.

However, there is more precise information from the 1990s Australian experience which challenges this view. As spelt out above and in chapter 3, in the 1990s: output growth has increased strongly, inputs (including labour input) have grown strongly, employment has grown and unemployment has declined. Unit labour costs have declined since the mid-1980s and remained relatively stable in the 1990s (figure 4.4). This means wage increases have generally been at least matched by productivity increases and therefore have not been at an unsustainable rate which would have put pressure on employment. Moreover, the premiss that efficiency and output growth have been stagnant is not supported by the 1990s Australian evidence.

Again, the focus on labour productivity misses the major change that has occurred in capital productivity and MFP. Like the work intensity argument, this view may have some validity at the margin and in particular cases. But, while it highlights the possibility of tradeoffs between wages and employment in the short run, it does not appear to measure up as a general explanation for productivity trends in the 1990s.

Figure 4.4 **Real unit labour costs in Australia, 1966-67 to 1997-98**

Index 1966-73 = 100



Data sources: Reserve Bank of Australia Australian Economics Statistics database on EconData; Reserve Bank of Australia, *Bulletin*.

Mismeasurement

The change in ABS methodology for measuring productivity has also highlighted measurement as an issue. The ABS has changed its methodology to bring it into line with what is regarded as international best practice. An overview of the changes is presented in ABS (5204.0, pp. 8–17).

It is very unlikely that ABS measurement has contributed in any substantial way to the emergence of the 1990s productivity acceleration. Three distinct points can be made.

- The switch to the new methodology has not made a large difference to the estimation of 1990s trends. The 1990s acceleration was evident in earlier estimates available from the ABS. The new methodology produces slightly higher productivity growth in the 1990s (Parham 1999, p. 6). This reflects a switch to chain-volume output measures, a new methodology for measuring capital inputs, and the inclusion of the high productivity growth Finance & insurance industry.

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- Even though the ABS has labelled the new capital stock estimates as ‘experimental’, the ABS is confident that the new estimates are superior to the old. Revisions to the ‘experimental’ estimates are likely to be relatively minor.
 - The ABS estimates may suffer nevertheless from measurement error. There is a sizable literature on measurement errors that arise in statistical agencies’ methods. However, for measurement error to be an explanation for the 1990s acceleration in productivity, it would have to be argued that an error has arisen (or had greater or lesser effect) in the 1990s than previously. A cogent argument of this type has not been made.

Macroeconomic conditions and management

Productivity growth can be due to a mixture of demand as well as supply factors in the short to medium term. The determinants outlined in section 4.1 can be thought of as developing the productivity potential of an economy from the supply side and over the long term. But the extent to which that potential is realised in the short term depends on the strength of demand. Strong demand supports strong sales and output and therefore strong productivity performance from a given commitment of resources.

Productivity growth in the early part of the 1990s was helped, in this way, by recovery from the recession. Productivity has also undoubtedly been helped by the authorities’ efforts to fight inflation. As mentioned in chapter 2, inflation creates uncertainty and distorts the pattern of investment, which can adversely affect productivity growth. It is also true that productivity improvements can help to reduce inflationary pressures.

On the other hand, the Asian economic crisis which emerged in the latter half of 1990s would have acted against output and productivity growth, all other things equal. Again, sound macroeconomic management in maintaining stability in the domestic economy has undoubtedly been important. And, amongst other things, currency depreciation assisted exporters with flexibility to switch from depressed Asian to more buoyant European and North American markets.

However, sound macroeconomic management should be seen in this context as playing a complementary role. Productivity growth would not have been as strong as a sole result of maintaining demand in the face of adversity. It also required supply-side changes.

Microeconomic reforms

Case study evidence is still to be presented and examined. But what can be said at the general level about the significance of microeconomic reforms?

There are particular problems in attempting to relate microeconomic reforms in a rigorous way to the acceleration in Australia's aggregate productivity growth in the 1990s.

- The lack of a quantitative, time-dependent measure of the incidence of reforms is a major obstacle to conducting a quantitative analysis of reform and productivity links at the aggregate level. There are difficulties in specifying the timing of reform in an aggregate sense. There were starts and stops in the early stages and the scope of reforms broadened substantially over time (chapter 2). Reforms that were in the hands of the State and Territory governments were implemented at different times, in different ways and at different speeds.
- The effects of reforms need to be disentangled from the effects of other factors that might have continued to raise productivity in the absence of reforms.

Dowrick (1998) tried to shed light on the significance of microeconomic reform by studying factors contributing to recent growth in output. Because of the difficulty in characterising and measuring reform at the aggregate level, he was unable to assess the effects of reform directly. However, his analysis did eliminate some other possible explanations for the productivity improvement, such as cyclical recovery, trade expansion or a worldwide productivity boom.

On the other hand, Dowrick cast doubt on the role of microeconomic reform by noting the absence of a systematic international pattern in productivity performance among 'reforming' countries compared with others. He drew particular attention to the below-average performance of New Zealand. However, the counterfactual assessment is important — the NZ economy may have been worse off, particularly in the long run, without reform. And some commentators have hypothesised that macroeconomic conditions and policy settings in NZ (Gregory 1999) and the particular form of labour market reform which emphasised wage rather than productivity adjustments (Edwards 1999) may have played a role in restricting the realisation of productivity gains. The NZ experience does not in itself disprove the possibility of a positive productivity dividend from reform in Australia.

It is difficult — if not impossible — to provide conclusive proof that microeconomic reforms have been having a major positive effect on Australia's productivity performance. However, there are several factors which suggest a significant link.

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- Other factors, while exerting some influence, do not appear sufficiently powerful to explain the strength of the 1990s productivity surge. The need for a homegrown explanation rules out a number of possible contributors such as new technological advances. The strength and duration of the productivity surge has surpassed effects of recovery from recession. Wage and work intensity effects do not appear to be affecting productivity, at least at the aggregate level.
 - The evidence gathered in the previous section on changes that have occurred in productivity-related factors since the mid-1980s is at least consistent with a positive influence from microeconomic reforms. Reforms could have stimulated many of these developments by relatively direct means (resource allocation, innovation policies, institutional arrangements for workplace bargaining, and so on) and indirectly by encouraging greater competition and openness in the economy. The change in business expectations about ongoing government support also appears to have had a powerful influence.

The next two chapters examine more closely how microeconomic reforms may have improved productivity performance in selected case studies.

4.4 Key points

- Three levels of productivity determinants, as identified in the economics literature, can be distinguished:
 - immediate causes have a direct and tangible link to input/output relationships (examples are technological advance; accumulation of human and physical capital; economies of scale, scope and specialisation; firm organisation and management practices and work arrangements; resource allocation; and firm/plant turnover);
 - underlying factors have an indirect effect on productivity through their influence on immediate causes (examples are competition; openness to trade and investment; and demand and supply conditions); and
 - fundamental influences are policy, institutional and social factors which have general and indirect influence, especially over the long term.
- Immediate causes are necessary, but they may not be sufficient to effect major improvements in productivity. Changes in underlying factors and fundamental influences may be required.
- Microeconomic reforms can have links to productivity determinants at all levels.
- Since the 1980s, key developments in productivity-related factors have included:
 - increases in the adoption of advanced technologies;

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- greater business involvement in innovation and formal R&D activity;
 - improvements in human capital in the workforce;
 - organisational change and adoption of improved management techniques;
 - new work arrangements implemented through enterprise bargaining;
 - reallocation of resources and greater specialisation;
 - greater openness and competition in the Australian economy; and
 - changes in the policy environment which have changed expectations about businesses' ability to rely on government support.
- Most of these developments are consistent with influences from microeconomic reforms. There is a clear influence from greater openness and competition and change in the policy environment, which are key drivers of productivity-related change.
 - A range of other possible explanations for the acceleration in Australia's productivity performance — recovery from recession, worldwide productivity boom, new advanced technologies, increased work intensity and related effects and mismeasurement — do not appear to provide major explanation for the 1990s surge in productivity growth.
 - Macroeconomic conditions and sound macroeconomic management have undoubtedly played a complementary role in realising the greater productivity potential that is developing in the Australian economy.

5 Manufacturing sector case studies

This chapter presents the key findings of case studies on the links between microeconomic reforms and productivity improvements in the manufacturing sector. (The following chapter reports the results of public sector studies.) The chapter highlights differences and similarities in reforms and responses across the case study industries.

The detailed case study reports are presented in volume 2. One of the case studies (Whitegoods) was carried out by a consultant and two (Automotive and Textiles, clothing & footwear) were undertaken by Commission staff.

The case studies attempt to take account of the full range of factors that have influenced productivity performance in the industries — industry-specific reforms, generally-applied reforms and other non-reform factors. They aim to provide insight into the mechanisms which link reforms and productivity, as well as the significance of reforms in contributing to productivity improvements.

5.1 An outline of main reforms in the three industries

Chapter 2 gave a brief outline of the industry development strategy which helped to shape the development of manufacturing industries over this century. Providing protection against imports was designed to foster development and diversification in domestic industries. However, the implementation of protection policy through a ‘made-to-measure’ approach (essentially providing domestic industries with whatever protection they needed to withstand competition from imports) led to some deep-seated structural weaknesses. The case study industries were key beneficiaries of protection policy. (The implementation of protection policy and the structural problems it fostered are discussed in appendix A).

The case study industries had some broad similarities in the 1970s and 1980s. They were focused on relatively mature domestic markets. They were among the most highly protected industries. And, in the mid-1970s, when domestic inflation and unemployment emerged, these three industries were provided ‘temporary’ quota protection with the objective of stabilising output and employment.

The industries were widely criticised in the 1970s and 1980s for their inefficiency, lack of innovation, inability to respond to changing consumer demands and conservative, inward-looking attitudes. They were characterised to varying degrees by fragmentation, inefficient scale of operation and outdated technology. Production was directed at supplying a wide range of products to the domestic market rather than specialisation in products in which Australian producers were better placed. Indeed, import quotas (for example on clothing and footwear), encouraged local production in standardised, low value-added goods (which faced the greatest competitive pressure from overseas) and encouraged imports of differentiated, higher value-added products (which would have been better suited to production in Australia given its skill and cost base). Made-to-measure protection led to poor management and work practices and encouraged a dependence on government assistance.

As outlined in appendix A, there was a gradual shift in government industry policy during the 1980s. The key changes involved:

- an end to ‘made-to-measure’ tariff protection;
- setting tariff rates on a broad industry basis rather than product by product;
- greater emphasis on generally available measures such as R&D taxation allowances, accelerated depreciation, investment allowances and export assistance; and
- announcements in May 1988 and March 1991 of phased reductions in border protection to achieve greater uniformity in assistance between industries and enhance the prospects of industries which could meet international competition.

While the liberalisation of trade protection was a major focus of government reform effort, there was also a variety of other reforms relating to regulation, government procurement arrangements, taxation concessions and labour market regulation (see IC 1998a).

Changes in industry-specific protection

While all three industries were involved in the general reforms of protection policy, there were some major differences in the timing and intensity of reforms applied to each of them. The details of protection reform in the case study industries are provided in table 5.1.

- Reform in the Whitegoods industry began much earlier than for the Automotive and Textiles, clothing & footwear (TCF) industries.

-
- Reductions in protection for Whitegoods began in the late 1970s, whereas significant reductions in protection did not come until 1988 for Automotive and until 1989 for TCF.
 - The import quotas, which were introduced as ‘temporary’ measures for all three sectors in the mid-1970s, were removed in Whitegoods in 1978, in Automotive in 1988, but not until 1993 in TCF.
 - Reform in the Whitegoods industry was implemented more quickly than in the Automotive or TCF industries.
 - Whitegoods tariffs were reduced significantly between 1978 and 1982. Tariffs on New Zealand imports were also reduced progressively from 30 per cent in 1978 to zero in 1987. Further reductions were implemented as part of general reductions announced in May 1988 and March 1991. These reductions were completed in 1996. Between 1978 and 1996, tariffs were reduced from 47.5 to 5 per cent and the effective rate of assistance for refrigerators and household appliances declined from about 40 to 6 per cent (figure 5.1).
 - The Automotive and TCF industries received *additional* protection from the mid-1970s to the mid- to late-1980s under long-term industry plans. There were changes to assistance under respective industry plans and they were included in general reductions in industry protection. But the reductions were more gradual and extended over a longer period of time.
 - An industry plan for the Automotive industry was implemented in 1985 and introduced a process of sustained change to the form and level of assistance. The main changes came in 1988, when tariff quotas were abolished and tariff reductions commenced. Tariffs were reduced from 57.5 to 45 per cent immediately, and phased down to 35 per cent by 1992. The local content scheme, which afforded assistance to component makers, was abolished in 1989 and replaced by a tariff arrangement. The effective rate of assistance for the automotive industry declined from 138 per cent in 1984-85 to 28 per cent in 1996-97.¹ The decline was greater for passenger motor vehicles (PMVs) — the effective rate of assistance falling from over 250 per cent in 1984-85 to 29 per cent in 1996-97.
 - Major reforms in the TCF sector were announced in the Button Plan of 1987 and a program of phased reductions in assistance began in 1989. Further tariff

¹ The effective rate of assistance measure for the automotive, clothing and footwear industries declined abruptly in 1985-86 and 1986-87 as a result of the impact of the depreciation of the Australian currency on quota tender premiums. The depreciation itself increased industry competitiveness against imports.

reductions were announced in the 1991 Industry Statement. Quotas were removed in 1993. The effective rate of assistance for the textile industry declined from 75 per cent in 1984-85 to 25 per cent in 1996-97, and that for clothing and footwear declined from over 250 to 52 per cent over the same period. The changes also reduced disparities in assistance within these industries.

- Despite reductions in protection, the Automotive and TCF industries still remain relatively highly assisted.
- The adjustment process was more closely monitored and managed by government in the cases of the Automotive and TCF industries.
 - Despite an increasing market share supplied by imports between 1980 and 1985, the Whitegoods industry was not afforded additional industry-specific assistance or a special plan, as were some other industries. Indeed, the industry was one of few large, highly-assisted industries not made the subject of sectoral plans by governments in the late 1970s and 1980s.
 - The reductions in assistance for the TCF and Automotive industries were closely managed and coupled with measures to assist capital and labour adjustment. Tariff reductions were carefully phased, different forms of export facilitation were adopted in both industries, the Industry Development Strategy provided incentives to promote modernisation and rationalisation in the TCF industries and the Labour Adjustment Package for these industries assisted labour adjustment. Both industries received substantial export assistance.

Table 5.1 Protection reform in the whitegoods, TCF and automotive industries, 1978 to 1997

<i>Year</i>	<i>Whitegoods</i>	<i>TCF</i>	<i>Automotive</i>
1978	Quotas replaced by a 45 per cent tariff (30 per cent for New Zealand) for most whitegoods products, declining to a long-term rate of 30 per cent in 1984 (15 per cent for New Zealand).		
1982	CER agreement with New Zealand of November 1982 provided for a progressive lowering of tariff rates on New Zealand imports over several years and for their removal from 1 July 1987.		
1985			As part of the 1984 Plan, tariff quotas to replace import quotas which are set at around 22 per cent of the PMV market. Penalty duty set at 100 per cent for out-of-quota imports, with the intention to phase the penalty duty rate to 57.5 (current tariff rate) per cent to render the quota redundant.
1986			Restrictions on the duty free entitlement under the local content scheme were introduced to penalise low volume production.
1987		Button TCF industry plan announced to commence in 1989. Included phasing down tariffs, phasing out of quota by 1996, and adjustment packages.	
1988	May Economic Statement announced phasing down of tariff rates to 15 per cent in 1992.	May Economic Statement made modifications to the Plan, including a 5 percentage point reduction in previously announced 1996 tariff levels. Bounty payments to phase down.	Following mid-term review of the 1984 plan, import quotas were abolished in April. Tariff rates reduced to 45 per cent and scheduled to fall 2.5 per cent a year until 1992.

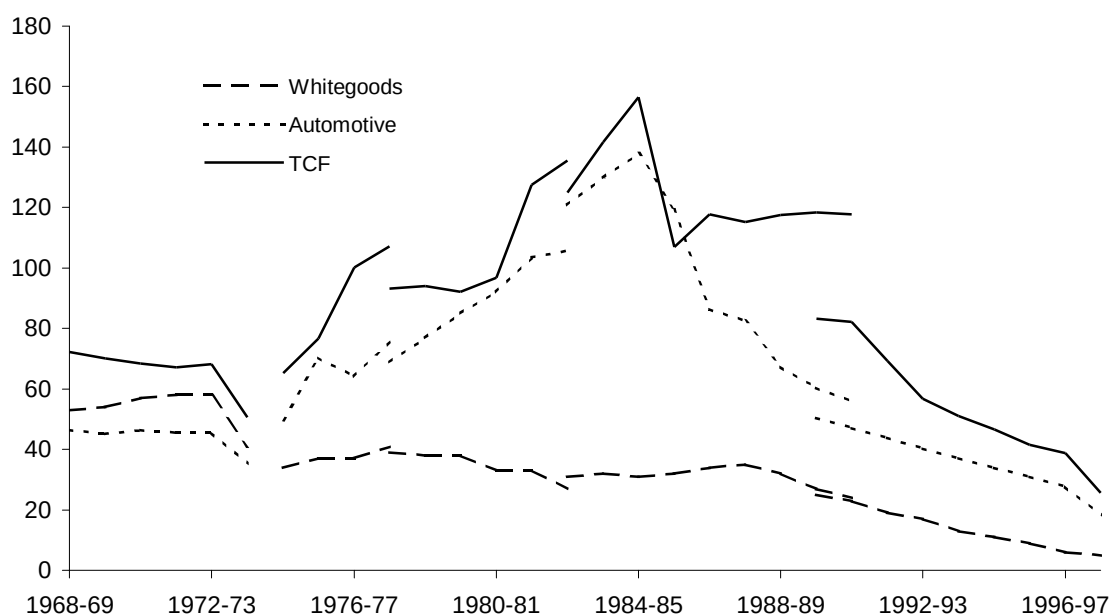
(Continued on next page)

Table 5.1 (Continued)

<i>Year</i>	<i>Whitegoods</i>	<i>TCF</i>	<i>Automotive</i>
1989			Local content scheme abolished in January.
1990		Capitalisation Grant Program announced.	
1991	Industry Statement , government announced program of tariff cuts would continue beyond 1992, resulting in a phasing of general rates to 5 per cent by 1996.	Industry Statement announced tariffs to phase down to a maximum of 25 per cent. Termination of quotas by March 1993. Bounty payments phased out by 1995 and replaced by a 5 per cent tariff. Import Credit Scheme (ICS) introduced.	Scheduled tariff reductions and access to the 15 per cent duty free entitlement set to continue. EFS expanded.
1992		TCF Statement, Overseas Assembly Provisions (OAP) announced, to begin in March 1993.	Tariff rates on replacement components for PMVs to be maintained at 15 per cent from 1992 to 2000.
1995		TCF 2000 Development Package announced, which rolled over existing programs and extended the OAP Program to 2000.	
1997		The Government announced that tariff phasing would continue through to 2000 and would then remain at this level until 2005. TCF tariffs would then be reduced — to 17.5 per cent for clothing and finished textiles, to 10 per cent for cotton sheeting and fabrics, carpet and footwear and to 7.5 per cent for sleeping bags, table linen and footwear parts.	The Government announced that tariff rates will continue phasing to 15 per cent in 2000 and remain at this level until 2005, when they will be reduced to 10 per cent.

Figure 5.1 Effective rates of assistance in the case study industries, 1968-69 to 1997-98

Per cent



Note: The effective rate measure for household appliances includes whitegoods products and a range of household appliances such as electric toasters, fans, jugs, vacuum cleaners and heaters.

Source: IC (1995a).

General policy changes

Over the period of protection policy reform, all three industries had access to a range of government programs generally available to manufacturing industries. During the 1980s, increased assistance was provided to industry through the R&D allowance, export assistance, the introduction of accelerated depreciation allowances for manufacturing plant, new depreciation provisions for industrial buildings and a range of other measures such as the Management Investment Companies Program and the National Industry Extension Service Program. It is estimated that real expenditure on budgetary assistance to manufacturing industry increased by nearly 70 per cent between 1982-83 and 1985-86 (Bell 1993, p. 152).

Government purchasing arrangements also provided additional assistance. In the case of PMVs, local preferences were significant as government car fleets accounted for about 25 per cent of fleet sales.

The changes in manufacturing assistance coincided with broader changes during the 1980s and 1990s. The floating of the Australian dollar in 1983 and its subsequent

substantial depreciation directly benefited the competitive position of many manufacturing industries.

Reform of the industrial relations system resulted in significant changes to the processes and practices for the determination of the terms and conditions of employment. Provision for collective and individual agreements at the enterprise and workplace levels contributed to improved flexibility in the workplace.

There was also a range of reforms in financial markets, infrastructure and GBEs, regulation and other areas.

5.2 Increased competition

Three factors have conditioned the international competitiveness of domestic producers and the extent to which they have been exposed to import competition.

- Overseas developments improved the competitiveness of imports. Through the 1970s and 1980s, new sources of low-cost production emerged in Asia, multinational firms developed global production strategies to reduce costs of supply, and new more-efficient production technologies and management practices were introduced in the industry.
- Trade barriers provided some insulation against improvements in the competitiveness of overseas producers. As just outlined, trade barriers generally declined over the 1980s and 1990s.
- Exchange rate movements also affected competitiveness. Depreciation of the Australian currency in the latter part of the 1980s was favourable to local producers and counteracted at least some of the effects of reductions in protection.

But all three factors only came into play in the 1980s. Under the made-to-measure protection principle, domestic producers were effectively insulated from adverse movements in competitiveness (the first factor). Improvements in overseas competitiveness or reductions in local competitiveness could be counteracted by additional assistance (for example, ‘temporary’ quotas in the mid-1970s).

A key to the made-to-measure principle was the expectation that additional assistance would be made available if needed. A corollary is that, if governments stopped providing additional assistance as needed, domestic producers would become more exposed to movements in relative international competitiveness. It did not actually require reductions in protection for domestic producers to feel greater competition.

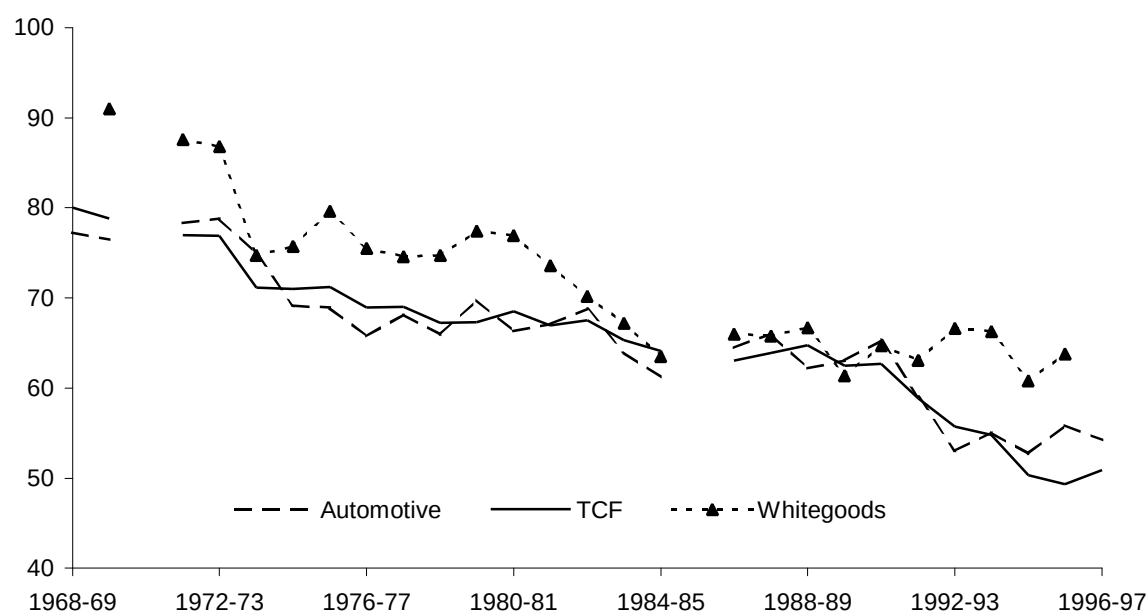
The end of the made-to-measure principle cannot be pinpointed precisely for all industries. But as outlined above, protection in Whitegoods was first reduced in the late 1970s, but not until the late 1980s for Automotive and TCF.

Exchange rate movements (the third factor) really only came into play after the currency was floated in 1983.

Getting a precise sense of the strength of competitive pressure is therefore difficult. One way to get an indication is to examine the reductions in effective assistance (figure 5.1). But, as just outlined, this is only one factor — albeit a very major one.

Another way is to look at import penetration, which increased in all three industries at various times over the 1980s and 1990s (figure 5.2). This gives an indication of the strength of import competition. But it also presents some difficulties in interpretation. If imports and local production are concentrated in different market segments, an increase in import share does not necessarily indicate greater import competition. Market segmentation thus tempers, in a broad sense, the degree of competitive pressure from imports.

Figure 5.2 Domestic market share in the case study industries, 1968-69 to 1996-97
Per cent



Source: Commission estimates based on ABS data.

In each case study industry, the reductions in protection appear to have led to increased import penetration. Although concentrated in particular market segments, the increased imports placed greater competitive pressure on the domestic industries because they were supplying a wide range of products. Under the regime of made-to-measure protection, producers in the case study industries tended to supply a broad range of products rather than specialise.

In the case of Whitegoods, there was a surge in the import share of the domestic market from 25 to more than 35 per cent between 1978-79 and 1984-85 although domestic output increased. The consultant's report indicates that the constant competitive threat posed by imports has remained a significant factor influencing the conduct of the local industry.

Imports of automotive and TCF products increased significantly during the 1990s. The share of local Automotive production declined from 65 per cent in 1990-91 to 54 per cent in 1996-97; although domestic output increased. The domestic market share for passenger motor vehicles fell from 85 per cent in 1987 to 58 per cent in 1997. For TCF, the share of domestic production declined from 63 per cent in 1990-91 to 51 per cent in 1996-97; and domestic output declined as well. It was the fastest increase in import penetration of the domestic market in both industries in the last thirty years.

Increasing import penetration was concentrated at the lower end of the market in each industry. In Whitegoods, the increase in imports was greatest in small refrigerators and front-loading washing machines. For PMVs, the increase in imports was felt primarily in the medium and small end of the market. The small vehicles and micro/light vehicles sector share of the market increased from 27 per cent in 1988 to 37 per cent in 1996 and the import share of this market increased from 25 to more than 85 per cent. Imports in the medium and upper end of the market remained stable at about 20 per cent of the market. Here, the secondary market for fleet vehicles and government purchasing arrangements provides an advantage in competing with the medium to small market segment. In the TCF industries, imports increased strongly in the low-price, mass-produced products. The largest increase in import shares occurred in the most highly labour-intensive industries — clothing, footwear and leather products.

5.3 Industry responses to pressures for change

There was significant restructuring in each of the case study industries. Activities and practices were reorganised between and within firms, and some resources were

released to other industries. The extent of restructuring and adjustment differed between industries.

Management culture

The changes in government policy resulted in greater self-reliance for many firms and managers. Firms could no longer rely on gaining made-to-measure protection from government to maintain profitability in the face of increasing import penetration. The change in attitudes was most noticeable in the Whitegoods industry.

The consultant's study demonstrates that the change in government policy towards the Whitegoods industry provided a major jolt to expectations and modes of operation in the industry. The exclusion of the Whitegoods industry from sectoral or industry plans from the early 1980s was a clear indication that the industry could not expect special treatment and had to find its own way to adjust to the increase in import competition. This was reinforced by the CER Agreement in 1982 to remove tariffs on trans-Tasman trade by 1987 and the 1988 May Statement announcement of large reductions in general tariffs.

By the mid-1980s, expectations about assistance had changed and far-reaching decisions were taken by management to revitalise the industry and aggressively compete for market share. Competition promoted a culture of constantly hunting down inefficiencies and cost savings.

Changes in attitudes in the TCF and Automotive industries were slower coming. Established ways of working with government remained successful for some time. They gained increases in assistance for much of the 1980s and protection was reduced slowly from the late 1980s in conjunction with a range of new assistance and adjustment measures. As a result, major adjustment and industry restructuring by these industries in response to steadily increasing competitive pressures was delayed until the late 1980s and 1990s.

Once reforms took effect, increased imports acted as a spur to change in both industries, although the recession was also a factor in the Automotive industry. The reaction in the TCF industry to the new trading environment was more diverse than in the other industries. Parts of the industry developed a more positive, outward-looking attitude to change and competition. Some firms ceased operating, while others are still to adapt.

In each industry, the change in entrepreneurial attitudes was also manifest in the switch from inward- to outward-looking business strategies. Firms increasingly

looked to develop export markets, although this was supported by specific export assistance in the case of Automotive and TCF². The export share of Whitegoods sales increased from 3 per cent in the late 1970s to 8 per cent in the mid-1990s, although it has since dropped to 7 per cent. Automotive exports as a proportion of turnover increased from about 6 per cent in the late 1980s to almost 16 per cent in 1996-97. TCF exports as a proportion of turnover increased from 4 to 16 per cent between 1988-89 and 1996-97.

Industry changes

A variety of strategies was adopted to increase competitiveness by reducing costs and improving productivity. They included company, plant and product rationalisation, modernisation of manufacturing operations and the introduction of new technology, increased R&D expenditure, better management practices and a greater emphasis on education and training.

Rationalisation and specialisation

Rationalisation was a key response in all industries. Rationalisation and restructuring allowed manufacturers to achieve more economies of size, greater capacity utilisation and increased specialisation — all of which contributed to greater productivity.

This process was most apparent in the structure of the Whitegoods industry which was transformed by mergers and takeovers and the reorganisation of plants. In 1978, there were 16 whitegoods manufacturers in Australia (IAC 1978). Today there are two majors and a small firm in receivership. Many plants have been closed and there is now greater plant specialisation. Single product plants with flexible use of capital and labour are now common.

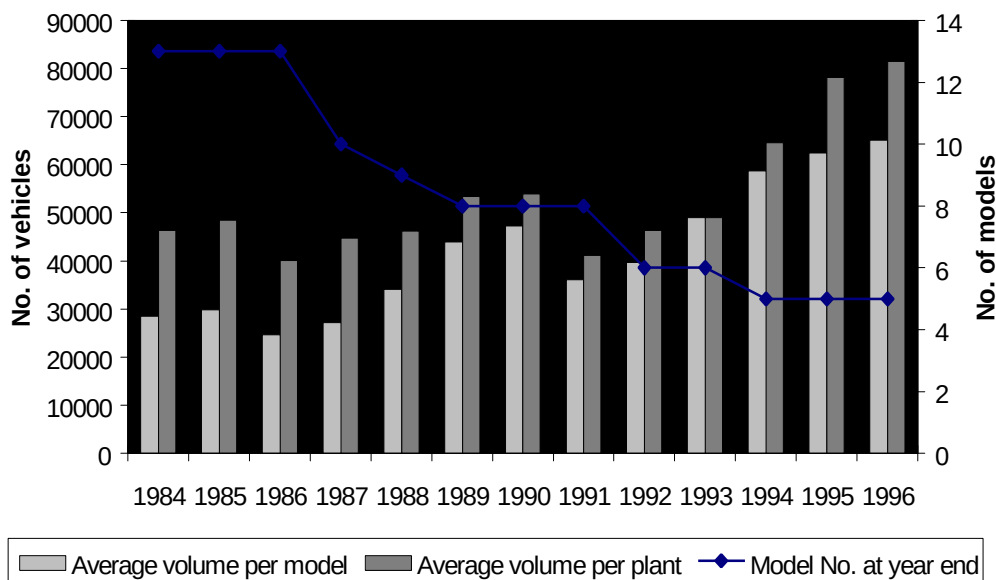
Productivity in the Automotive industry is particularly sensitive to the scale of production. In 1985, 13 PMV models were produced by five manufacturers at eight plants around Australia. Since then, several plants have been closed and models rationalised. There are now four vehicle producers, each operating one plant and producing five models. As a result, significant increases in volumes per plant and per model have been achieved (figure 5.3).

² The whitegoods industry does not have access to the export facilitation arrangements which apply in the automotive and TCF industries.

Considerable rationalisation occurred in the TCF industries in the 1990s to achieve economies of scale and make efficient use of new labour-saving technology. Many firms ceased operation in response to the increased competition. New companies are continuing to emerge.

Rationalisation also involved increasing product specialisation. The Whitegoods industry has specialised in producing the larger refrigerators and top-loading washing machines, leaving the supply of small refrigerators and front-loading washing machines to imports.

Figure 5.3 Number of PMV models, volume per plant and volume per model, 1984 to 1996



Source: IC (1997b).

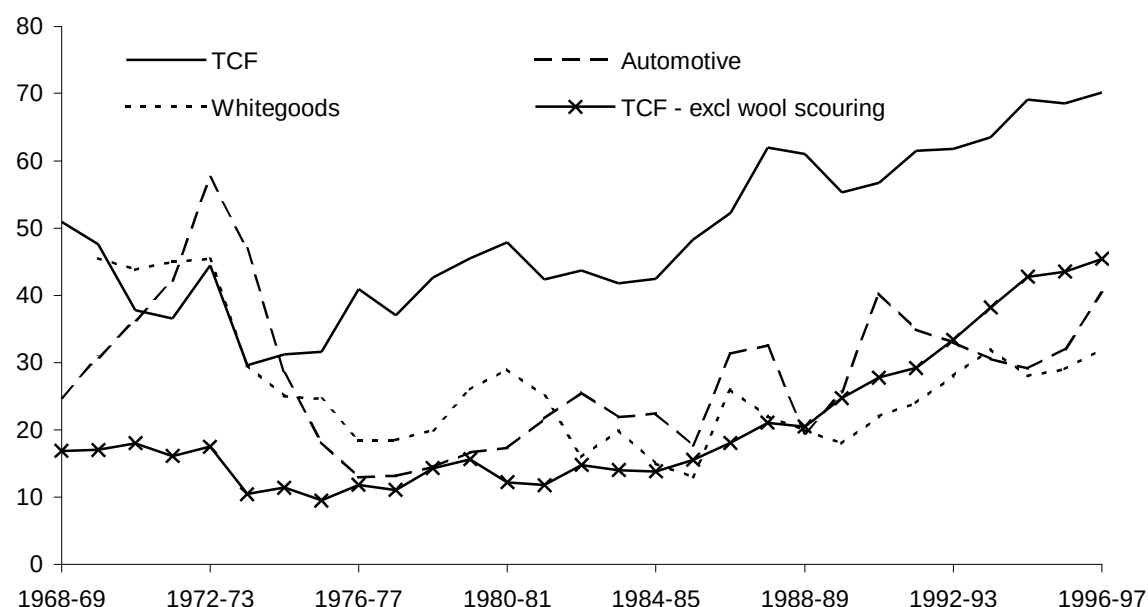
The main response of domestic Automotive producers to the changed assistance arrangements and increased import competition in the small end of the market was to reorientate production towards the upper medium segment of the market. All manufacturers have now withdrawn from small vehicle production. Over the period 1988 to 1996, local production of the Mitsubishi Colt, Ford Laser and Nissan Pulsar ceased. Local production of the Toyota Corolla ceased in 1999. The medium and upper end of the market expanded from about 28 per cent to over 40 per cent of all PMV sales between 1988 and 1996. Domestic producers have maintained about an 80 per cent share of this market sector. However, domestic producers retain some advantage in this market. Seventy-five per cent of new upper medium cars are purchased by fleets, and one-third of these are government purchases. Government

purchasing policies favour purchase of Australian-made vehicles and provide domestic producers with a captive market.

Increased specialisation in product lines occurred also in the TCF industries. Many firms adopted niche marketing strategies and shifted into the production of specialised, higher value products with strong brand name identification.

Increases in intra-industry trade (figure 5.4) for each industry since the mid-1980s provide further evidence of increasing product specialisation³. In the case of the Automotive and TCF industries, this reorientation was assisted by export facilitation schemes.

Figure 5.4 Intra-industry trade index for case study industries, 1968-69 to 1996-97



Source: Case studies (volume 2).

Technology

Adoption of new technology has featured in the response to competition in each industry.

³ The intra-industry trade (IIT) index measures the simultaneous trade of goods produced within the same classification. If a country exports roughly the same amount of goods within a classification as it imports, the IIT index will be high, indicating a high degree of specialisation. However, if there is mainly one way trade, that is, imports with no exports or vice versa, the IIT index will be low, indicating low levels of specialisation.

Box 5.1 Productivity improvement in the Ford Motor Company

Increased competition from imports, stimulated in part by tariff reductions, placed additional cost pressures on Ford.

In response, Ford invested heavily in new technologies and capital equipment in an effort to improve the efficiency of its manufacturing processes. For example, the use of robots in the welding process was introduced in the mid-1980s. Computer-aided design, computer-aided engineering and computer aided manufacturing have been employed. Other technologies and capital equipment in which the company has invested include new stamping presses and an automatic mould line in the casting plant. It also implemented plant and model rationalisation to secure longer model production runs, changes in work practices and made a greater commitment to training and education.

Significant productivity improvement has been achieved in recent years. The company's employment has fallen from about 13 800 in 1990 to about 6500 in 1996, while the number of cars produced has remained at much the same level.

Source: Clarke et al. (1996).

The consultant's study reports that most Whitegoods manufacturing facilities now use world best technology. Technology and plant flexibility are now more important to competitiveness than plant size. Developments in technology and robotics have meant that production processes are less dependent on economies of size. Computer integrated production systems are commonly used to accommodate a wide range of models.

Adoption of new technologies such as robotics in welding processes and computer aided design, engineering and manufacturing has played an important role in improving productivity in the Automotive industry, as well as reducing costs and providing consistently higher quality (box5.1).

Over the decade to 1996-97, greater emphasis was placed on modernising production facilities in the TCF industry. The level of technology employed in the capital-intensive segments of the industry are now comparable with that used by firms elsewhere in the world. Adoption of new technology in the clothing industry increased, including installation of programmable sewing machines, computer aided design and computer numerically controlled cutting systems, electronic data interchange and modern warehousing and distribution systems (box5.2).

Box 5.2 Improving productivity in Yakka Pty. Ltd. — Industrial clothing

Yakka Pty. Ltd. has undergone a number of changes in response to protection reform in the 1980s and 1990s and the resulting increased competitive pressures.

Industrial clothing manufacture has become less labour-intensive. Employment of the company has fallen from over 2000 in 1984-85 to about 1200 in 1994-95. Productivity improvements have been achieved as a result of new technologies, employee productivity-linked incentives and a change in the manufacturing process.

The manufacturing process has gone from a piece-work assembly line process to a just-in-time (JIT) process. The JIT process has been facilitated by technological advances at the distribution stage of the manufacturing process. Yakka now has state-of-the-art warehousing and distribution technology including an electronic system for customer ordering, bar-coding, carousel picking, garment manufacturing systems and a portable data entry system. It now uses computer-aided design, computerised pattern making systems and computer aided cutting machines in the early stages of its manufacturing process to improve productivity.

Source: Clarke et al. (1996).

New technology appears to be concentrated in a relatively small number of firms in the TCF industries. The proportion of businesses with 10 or more employees which had adopted advanced manufacturing technology increased from 20 per cent in 1988 to 36 per cent in 1996-97 (ABS 8116.0). For the industry as a whole, only 18.5 per cent of businesses had acquired at least one advanced manufacturing technique by 1996-97, compared with 24 per cent of businesses for the manufacturing sector. Fewer than one in three TCF manufacturers undertook some form of technological innovation over the period 1991 to 1994. Between 1994 and 1997, the proportion of TCF businesses undertaking technological innovation fell from 28 to 15 per cent, the lowest of all manufacturing industries.

Research and development

Expenditure on R&D has increased in the Whitegoods and Automotive industries. In both industries, R&D expenditure has kept pace with, or exceeded, that of the manufacturing sector as a whole — which more than doubled between 1986-87 and 1996-97 (appendix C).

In the Whitegoods industry, R&D expenditure as a percentage of turnover increased during the 1990s and was higher than that of the manufacturing sector. R&D intensity in the Automotive industry increased during the 1990s, although the major part represents product development and new models. Some multinational firms are using their Australian subsidiaries as a regional base for design and development.

Some independent Australian firms have been successful in selling design and R&D services to the international market.

R&D expenditure in the TCF industries increased in the 1990s, but remains low compared with other manufacturing industries.

Management practices and work arrangements

Management practices and workplace arrangements are an important driver of productivity at the firm level. Significant change took place in these practices as competition created pressures to adjust the organisation of labour.

The consultant's study of the Whitegoods industry reports that decision-making has increasingly devolved from a declining middle management to work teams on the shop floor.

In the Automotive industry, the adoption of lean production techniques has been one element which has contributed to the improved competitiveness of vehicle manufacturers. Lean production is used in some form by each Australian vehicle manufacturer and by a number of their suppliers. Measures of plant management practices show an increase in the use of lean production between 1988 and 1993, while anecdotal evidence suggests further improvement since then. The main innovations have been work systems employing a multi-skilled workforce, better human resource management and better inventory management using just-in-time delivery of component parts.

Increasing competitive pressures strongly influenced changes to increase flexibility in workplace arrangements in the Automotive industry. The changes included the introduction of career paths, multi-skilling, greater employee involvement in production decisions and better industrial relations systems. These changes were helped by reforms in the industrial relations system and the introduction of enterprise bargaining.

Many TCF firms have sought to implement new management practices, but this has not happened across the board and the quality of management appears to differ considerably between firms. The successful, efficient and world competitive firms have introduced strategies such as benchmarking, quick response production, and just-in-time inventory systems. In 1997, less than 10 per cent of TCF firms introduced some form of business improvement activity, compared with the manufacturing average of 18 per cent.

Enterprise agreements are relatively rare in the TCF industries, but appear to be more common in the more capital-intensive segments of the industry.

Education, skills and training

Automotive firms have given greater emphasis to employee skill development. Expenditure on training in the industry is high relative to manufacturing as a whole. Official statistics suggest that training decreased in the industry between 1989 and 1993, although these figures are disputed by the major firms.

The labour force of the TCF industries has less formal education than employees in other sections of the economy and has a relatively high proportion of employees in low-skill occupations. However, the proportion of the workforce which has completed the highest secondary level increased from 10 to 17 per cent between 1984 and 1997, while the proportion with post-school qualifications increased from 19 to 32 per cent.

Capital and labour inputs

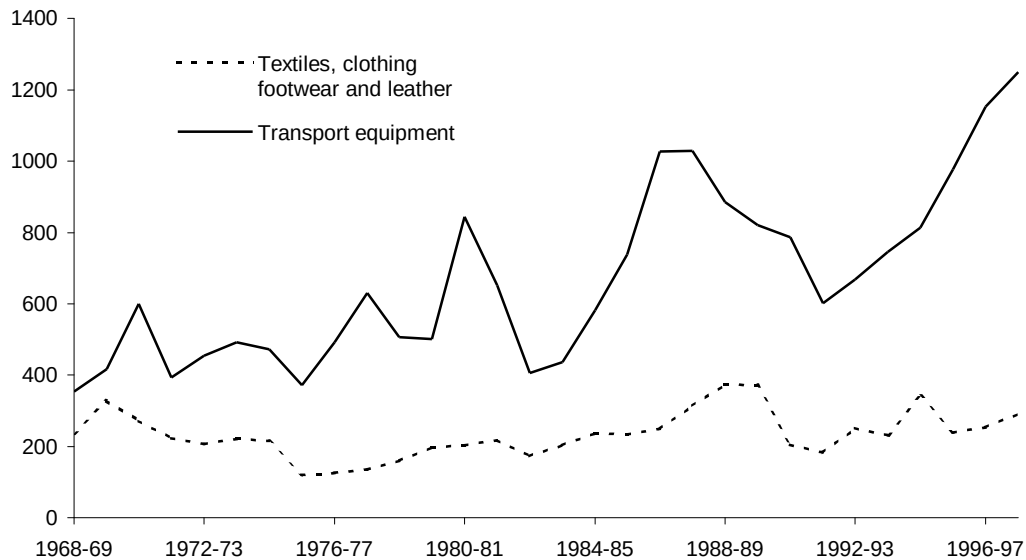
An examination of investment and employment trends gives an indication of broad changes in resource allocation affecting the industries.

Investment

Substantial new investment in plant, equipment and non-dwelling construction contributed to the rationalisation and modernisation of production facilities in each industry. While investment has fluctuated widely, there were periods of historically high levels of investment which coincided with the changes in government industry policy.

A large increase in new capital investment in the Whitegoods industry occurred between 1977 and 1982. High levels of investment occurred in the transport equipment industry (the major part of which is the Automotive industry) between 1985-86 and 1997-98, with the exception of the recession years of the early 1990s (figure 5.5). This was the highest and most sustained period of capital investment in the industry in the previous thirty years. Record levels of investment were achieved in 1996-97 and 1997-98.

Figure 5.5 Private new capital expenditure for the Textiles, clothing, footwear and leather, and Transport equipment industries, 1968-69 to 1997-98
\$1989-90, \$million



Sources: Commission estimates based on ABS 5625.0 and unpublished ABS data.

The rate of new capital investment in the TCF industry fluctuated broadly in line with that of total manufacturing between 1985-86 and 1996-97. There was a substantial increase between 1987-88 and 1989-90 (coinciding with the announcement of the Button Plan) when investment was higher than it had ever been in the previous thirty years. Although investment in the industry remains low by manufacturing standards, it has been higher in the 1990s than in the 1970s and the first half of the 1980s. The textiles industry accounted for most new capital investment in the TCF industries, while investment in the clothing industry remains low.

Employment

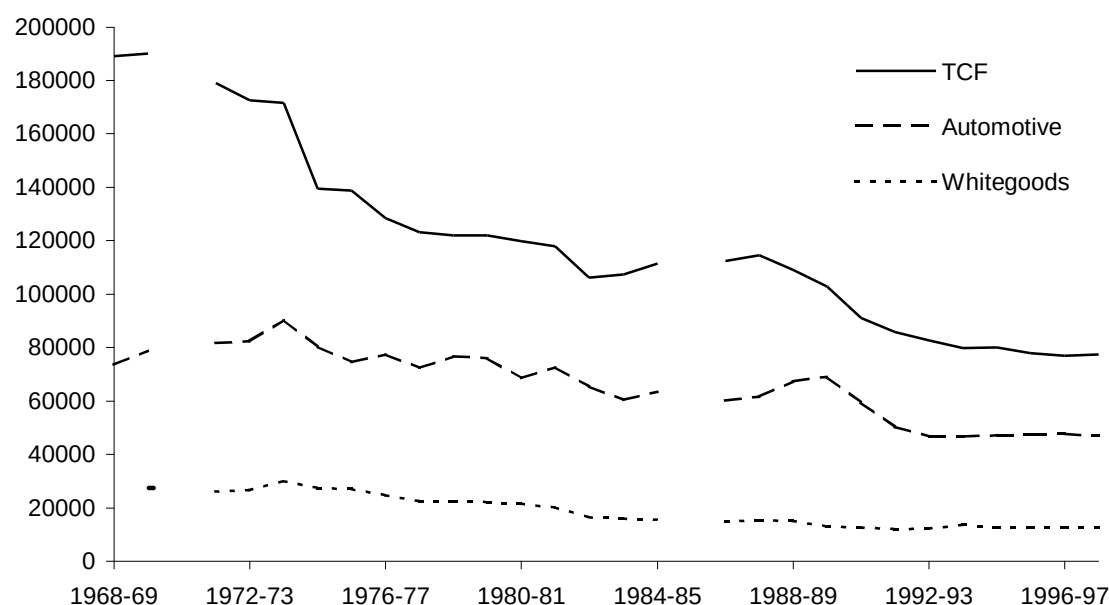
Each industry experienced steady erosion of employment from the mid-1970s under the pressure of increasing competition from overseas suppliers. Once protection was reduced, competitive pressures intensified and employment dropped as firms restructured operations to improve their competitive position (figure 5.6).

Employment in the Whitegoods industry fell by more than 30 per cent between 1978-79 and 1984-85, the period in which the initial tariff reforms were implemented. A further significant reduction in employment occurred in the two

years following the tariff cuts announced in the May Economic Statement of 1988. Since 1989-90, employment in the industry has been stable.

Employment in the Automotive industry declined by 32 per cent between 1989-90 and 1992-93, the largest decline in the previous twenty years. Since then, employment has remained stable. The overall decline between 1989-90 and 1996-97 was about 20 per cent. TCF employment has decreased by about 25 per cent since protection reform began and the reductions continued beyond the recession in the early 1990s. However, the extent of the reduction may be overstated as homeworkers are not included in employment statistics for the industry. The largest measured decline occurred in the clothing industry.

Figure 5.6 Employment in the case study industries, 1968-69 to 1997-98



Data source: ABS 8221.0, various issues.

5.4 Productivity performance

There were noticeable differences in productivity performance in the case study industries following reform. On available indicators:

- productivity has improved markedly in Whitegoods;
- there has been some productivity improvement in Automotive; but
- the signs of productivity improvement in TCF as a whole after reform are weak.

Because of lack of capital data at a disaggregated level, some reliance has to be placed on labour productivity measures. Multifactor productivity (MFP) estimates are available for TCF and for Transport equipment, which includes Automotive plus other industry activities. They are not available for the Whitegoods industry.

Multifactor productivity

MFP in the Transport equipment industry has fluctuated over a considerable period (figure 5.7). This makes it difficult to determine appropriate periods over which to compare growth rates. To overcome this, exponential trend lines were fitted for the periods before and after 1986-87 (see case study 2). This technique reduces the sensitivity of the calculation of productivity growth rates to the end points of comparison periods.

MFP has increased at an average rate of 2.1 per cent a year since 1986-87, compared with 1.7 per cent a year prior to then.

Underutilised capacity has probably been a factor constraining MFP growth since the late 1980s. Historically high levels of investment have been sustained from 1985-86 to 1996-97 (except during the recession) but production suffered in the recession and for a few years thereafter. Production has since recovered to historically high levels and there are signs of stronger productivity growth, reflecting improved efficiency in recent years.

MFP in TCF industries grew relatively rapidly (2.4 per cent a year) between 1981-82 and 1988-89; but declined by -1.5 per cent a year between 1988-89 and 1996-97. It is arguable whether the series should be split at 1985-86, rather than 1988-89. Use of 1985-86 would have raised the growth rate slightly in the first period and reduced the rate of decline in the second.

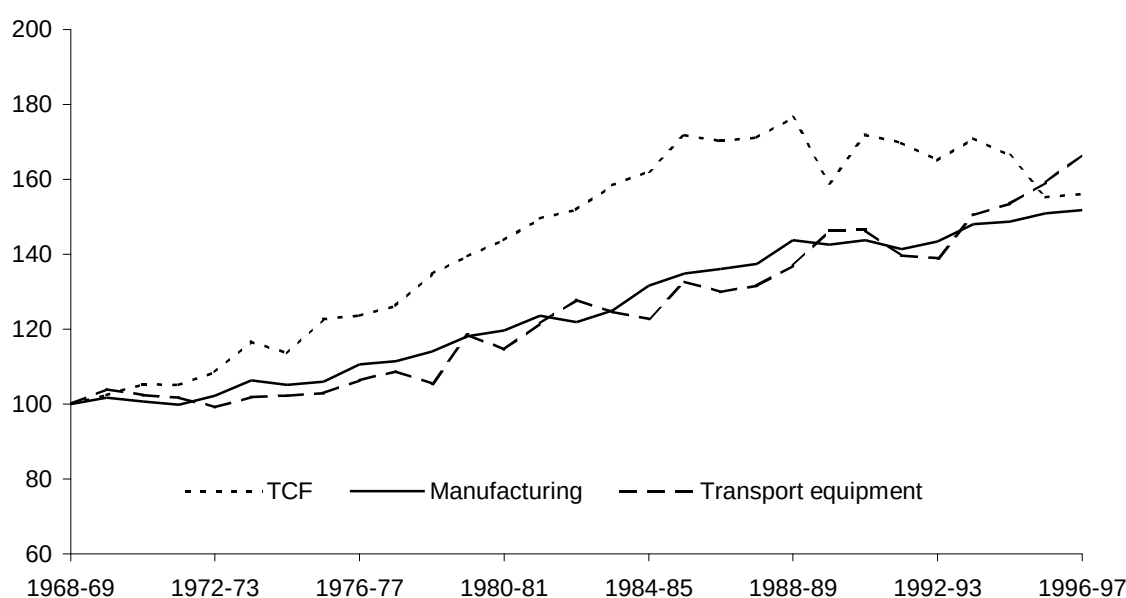
Strong output growth behind protective barriers was the major factor underlying the relatively strong productivity growth in the earlier period. MFP growth in the TCF

industries exceeded the Manufacturing rate from the late 1960s to the mid-1980s. Since then, MFP has declined, while Manufacturing MFP continued to grow.

There appear to be two major factors in the decline in MFP in TCF in the second period. First, output declined significantly (-3.7 per cent a year). Second, there was a small increase in capital capacity as some firms invested in new plant and equipment in the late 1980s. These two factors are likely to mean underutilised capacity and lower productivity performance in the short term.

Figure 5.7 Multifactor productivity in the Transport equipment and TCF industries, 1968-69 to 1994-95

Indexes 1968-69 = 100



Source: Gretton and Fisher (1997).

Labour productivity

The Whitegoods industry achieved relatively high rates of growth in labour productivity (measured as value added per employee) from the late 1970s, with an acceleration in growth from about 1982-83 (figure 5.8). Annual average labour productivity growth was 5.3 per cent between 1975-76 and 1978-79, 5.9 per cent between 1978-79 and 1982-83 and 8.3 per cent between 1982-83 and 1989-90. The level of labour productivity in 1989-90 was nearly triple its mid-1970s value.

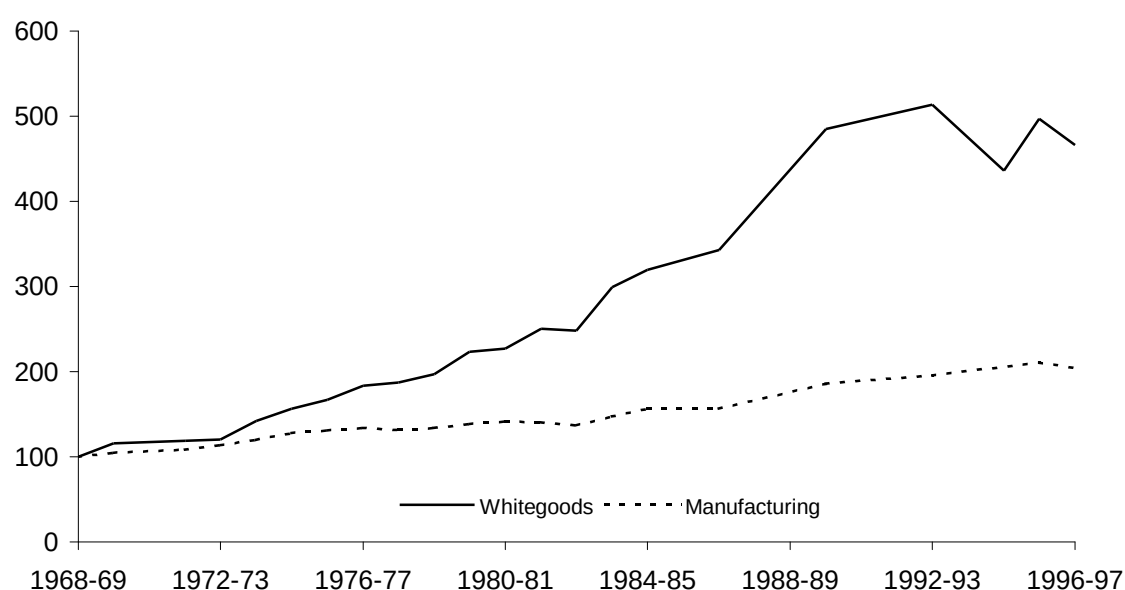
The acceleration in productivity growth came *after* a period of major investment growth and employment reductions (see previous section). This tends to suggest

efficiency gains were largely at work from the mid- to late-1980s, rather than capital deepening.

Labour productivity growth over the entire period was much faster in Whitegoods than in Manufacturing as a whole. However, Whitegoods productivity has levelled out in the 1990s.

There was a strong improvement in labour productivity in Automotive in the late 1980s and 1990s. Growth has increased from 1.0 per cent a year before 1986-87 to 6.4 per cent a year after 1986-87 (calculated from fitted exponential trend). Automotive labour productivity underperformed, compared with Manufacturing through the 1970s and 1980s, but outperformed it after 1986-87 and through the 1990s (figure 5.9).

Figure 5.8 Labour productivity^a in the Whitegoods and Manufacturing industries, 1968-69 to 1996-97^b
Indexes 1968-69 = 100

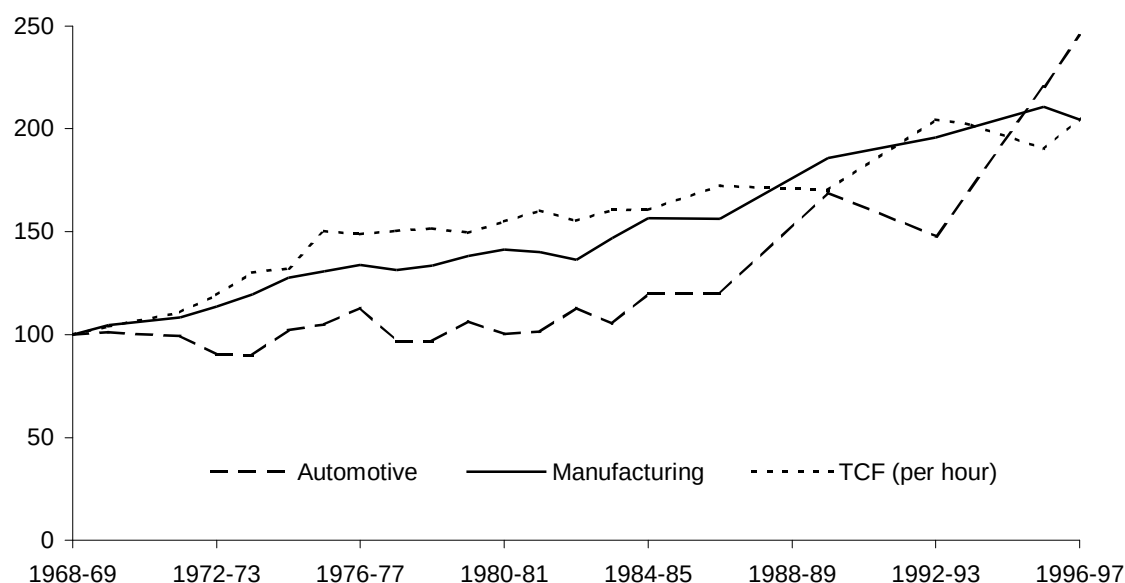


^a Labour productivity is measured as real value added (\$000) per employee. ^b Data was unavailable for a number of years that were interpolated on the chart. The years where interpolations were made are 1985-86, 1987-88, 1988-89, 1990-91, 1991-92 and 1994-95.

Source: Commission estimates based on ABS data.

Figure 5.9 Labour productivity^a in the Automotive, TCF and Manufacturing industries, 1968-69 to 1996-97^b

Indexes 1968-69 = 100



^a Labour productivity is measured as real value added (\$000) per employee. The TCF series is measured as real value added (\$) per hour because of increasing use of part-time employment in these industries. ^b Data was unavailable for a number of years that were interpolated on the chart. The years where interpolations were made are 1985-86, 1988-89, 1990-91 and 1991-92 for all four series; for the automotive industry, 1970-71, 1993-94 and 1994-95; for the TCF industry 1970-71, 1987-88 and 1993-94; and for the manufacturing sector, 1970-71, 1987-88, 1993-94 and 1994-95.

Source: Commission estimates based on ABS data.

A jump in capital deepening associated with increased investment and reductions in employment appears to be a major influence on the initial improvement in labour productivity growth (figure 5.10). Between 1986-87 and 1991-92, the capital/labour ratio for the transport equipment industries increased by 9 per cent a year compared with 4 per cent a year over the previous seven years. The increase between 1986-87 and 1991-92 was driven by both increases in capital and large reductions in employment.

There was a setback in productivity growth in the early 1990s at the time of the recession but high growth has prevailed since then. MFP trends suggest improving efficiency in resource use has been the dominant influence in recent years rather than capital deepening. The capital/labour ratio declined by 1.4 per cent a year between 1991-92 and 1996-97 while labour productivity increased.

Labour productivity growth in the TCF industries was quite modest from the mid-1970s and through the 1980s (figure 5.9). There was a step up in the early 1990s, but no continuation of growth. Labour productivity growth has been much lower

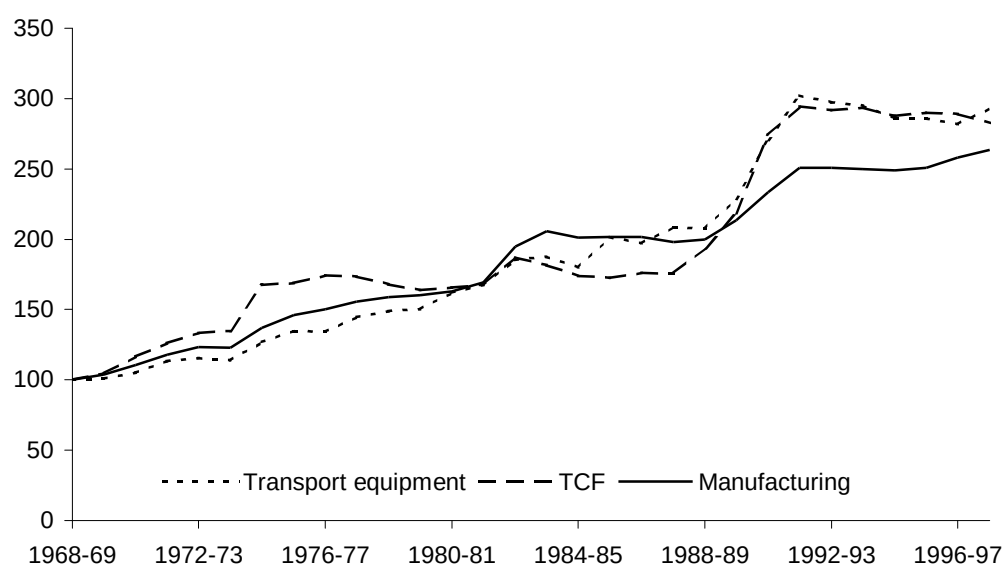
than for the other case study industries⁴. The growth rate in the 1990s of 1.8 per cent a year was only slightly above that of the 1980s (1.6 per cent a year). Overall, the level of labour productivity has increased by about 50 per cent since the mid-1970s.

The slight step up in labour productivity from 1988-89 was associated with capital deepening (figure 5.10). The small improvement was not sustained because output declined.

The poor productivity performance was not uniform across the sector. Labour productivity growth was higher for Textile fibres, yarns and fabrics (2.9 per cent a year) and Knitting mills (11.6 per cent a year) during the 1990s.

Figure 5.10 Net capital stock per employee in the case study industries and the manufacturing sector, 1968-69 to 1997-98

Indexes 1968-69 = 100



Source: Case studies (volume 2).

⁴ Labour productivity in TCF has been measured in terms of value-added per hour worked. The use of hours worked allows for growth in part-time work, which was more prevalent in TCF. The use of numbers of employees for the labour input measure in Automotive and Whitegoods would bias the estimates of labour productivity downward relative to TCF.

5.5 Contribution of microeconomic reforms

There has been a range of reforms and non-reform factors which have affected the case study industries. The major change has been reduction in industry-specific import protection. But the industries have also had access to generally-available measures, especially new industrial relations frameworks for determining work arrangements and employment terms and conditions. Some assistance to industries has been provided in forms to encourage adjustment — for example, exports and modernisation of equipment. And the industries' relationship with government has also changed.

These reform developments have ushered in many changes in the industries — greater product specialisation, rationalisation of firms and plants, modernisation of equipment, new work arrangements, management practices, and so on. And, whilst some of these changes may have occurred anyway, the long-standing resistance to change in the made-to-measure environment suggests that it is likely that very many of them would not have occurred — at least as fast or to the same extent — in the absence of reform.

Contributions to productivity improvement

These industry changes have a very strong productivity response in Whitegoods, signs of a growing response in Automotive but no obvious productivity response, as yet, in TCF.

Whitegoods

The reform process began early for the Whitegoods industry and the productivity response also came early. Productivity increased during the initial period of tariff reform and continued to increase as tariffs were reduced on trans-Tasman trade and further general tariff reductions were made in the late 1980s. The main productivity acceleration came in the mid- to late-1980s, after competitive pressures increased further and it became clear that the industry was to receive no favoured treatment from government. Although a labour productivity indicator was used, the main productivity acceleration does not appear to be strongly associated with capital deepening. It appears to be associated with efficiency gains.

Productivity growth in this industry far exceeded that of Manufacturing as a whole. There is no evidence of other non-reform factors, such as 'exogenous' technological change, that could have stimulated such a strong productivity response in this industry.

Automotive

The timing of responses to reforms is a little more complex in the case of Automotive. While the Button reforms began in 1985, tariff quotas and the depreciation of the Australian dollar seem to provide a buffer against import competition and delayed the need for adjustment in the industry. Adjustment pressures strengthened with the abolition of tariff quotas and the local content scheme and initiation of large reductions in tariff assistance in 1988. The early 1990s recession also hit the local industry's sales.

MFP accelerated in the late 1980s and the 1990s, apart from the slump associated with the recession. Labour productivity accelerated from the late 1980s and during the mid-1990s.

It could be argued that new technologies and management practices would have been introduced in any case by multinational firms — even in the absence of reform. This may be true at least to some extent. However, whilst management frameworks such as lean production may have been adopted, there is still a question as to the vigour with which they would have been pursued. Furthermore, without reforms, the incentives and ability to tackle problems of scale, technology and work arrangements would not have been as strong. Even with explicit adjustment incentives, the government of the day expressed frustration with the pace of change in the industry.

Textiles, clothing & footwear

The TCF industry as a whole has not shown much, if any, productivity response to reform to date. There are at least two possible explanations for the poor productivity response.

First, it could be that adjustment pressures have come relatively late. Gradual and sustained reductions in effective assistance only began in 1991-92 (figure 5.1). Import quotas were not withdrawn until 1993. And a range of budgetary and other assistance measures may have softened the need for fundamental change. The industry is still highly assisted by manufacturing standards.

Second, it could be that adjustments are taking time to implement. There is a sense in the case study that many adjustments are under way, but are not necessarily widespread as yet. For example, MFP growth would be held back in the short run if some existing capital were being run down completely before being scrapped; and new installations were running up to intended capacity. Poor output growth, combined with relatively recent investment suggests capacity utilisation could be an

issue in the short term. In clothing, the shift to the high fashion end with small production runs, may have reduced the opportunity for productivity growth, at least in the short run.

The TCF industries are in the early stages of transition to a position that is likely to deliver higher productivity. Substantial adjustment still has to occur. However, new investment is increasing, rationalisation is continuing, new management and work arrangements are being extended across the industries and education and training of employees is improving.

Main mechanisms of productivity improvement

In each case study industry, the change in government policy brought increased import penetration and greater competition for domestic producers. Imports were generally concentrated in the lower end of the market but they placed considerable competitive pressure on domestic industries which traditionally supplied a wide range of products under made-to-measure protection.

The key response was greater specialisation in goods where firms were better able to meet international competition. Industries increasingly looked to export markets.

Production was reorganised to varying degrees across the study industries to implement these strategies. This involved rationalisation of firms, plant and equipment and reductions in labour. Mergers, takeovers and firm exit resulted in the rationalisation of firms in each industry. Plants were rationalised, in some cases to develop single-product instead of multi-product plants.

Substantial new investment in plant, equipment and non-dwelling construction contributed to the rationalisation and modernisation of production facilities in each industry. New technologies were adopted. Greater weight was given to R&D expenditure and the improvement of labour force skills.

Firms also made significant changes in management and work practices. Workplace arrangements were modernised by many firms, incorporating new ways of managing the production process and inventories, human resource management techniques, multi-skilling of the workforce and better industrial relations.

These mechanisms were implemented widely by firms in the Whitegoods and Automotive industries. The extent of change was less extensive in the TCF industries and is reflected in the relatively poorer productivity performance.

Parts of the TCF industry developed a more positive, outward-looking attitude to change and reduced protection. However, many companies in the industry still have a long way to go to improve productivity performance. There are still many old plants in operation in the industries and many firms are undercapitalised. The training infrastructure has been poor and the workforce is characterised by a low level of skills.

5.6 Key points

- In the 1970s, all three industries were focused on relatively mature domestic markets, and were among the most highly protected industries, with ‘temporary’ quota assistance granted in the mid-1970s.
- Reform was implemented earlier and much quicker in the Whitegoods industry than in Automotive and TCF. For example, the ‘temporary’ quotas were removed in Whitegoods in 1978, in Automotive in 1988, but not until 1993 in TCF. The adjustment process was more closely monitored and managed by government in the cases of Automotive and TCF.
- Over the period of reform, all three industries had access to a range of generally-available government programs and reforms, such as modifications to the industrial relations system.
- Protection policy reform brought improvements in resource allocation and technical efficiency through:
 - greater product specialisation and rationalisation of plants, bringing greater economies of scale;
 - modernisation of equipment and reductions in employment;
 - adoption of new technology;
 - greater R&D effort;
 - improved management practices and work arrangements; and
 - greater emphasis on skill development.
- Protection policy reform brought impetus to these changes through:
 - increased competition from imports; and
 - changes in managerial expectations and attitudes.
- Even though Automotive and TCF have experienced large reductions in assistance and increases in import penetration, their productivity responses have not been, as yet, as marked as the response in Whitegoods. A major factor, in addition to actual changes in competition, appears to be the jolt to

entrepreneurial expectations in the Whitegoods industry when governments gave the signal that the industry would have to become self-reliant, rather than reliant on ongoing government support.

- Labour productivity growth increased in Whitegoods from 5.3 per cent a year between 1975-76 and 1978-79 to 8.3 per cent a year between 1982-83 and 1989-90. There are grounds for confidence that much of this improvement represents improvement in efficiency.
- There has been improvement in labour productivity growth in Automotive since the mid-1980s (increasing from 1.0 per cent a year before 1986-87 to 6.4 per cent a year after 1986-87). However, there is other evidence to suggest that this largely reflects capital deepening, rather than efficiency improvement. Multifactor productivity growth for Transport equipment has increased from 1.7 per cent a year before 1986-87 to 2.1 per cent a year afterwards. There are signs of stronger efficiency improvement in recent years.
- There has only been weak improvement in labour productivity in TCF, and this appears to be due to capital deepening. Multifactor productivity has declined over the 1990s. This productivity response could reflect the later onset of adjustment pressure and relatively low capacity utilisation during the early stages of transition to improved productivity performance.
- Microeconomic reforms have been the major factor affecting long-term productivity performance in the industries. This is clearly so in the case of Whitegoods, is reasonably well established in the case of Automotive, but is yet to be established in the case of TCF.

6 Public sector case studies

This chapter presents the highlights of case studies on how microeconomic reforms have contributed to productivity improvements in the public sector. The detailed case studies and further evidence supporting the statements here are presented in volume 2. CTC Consultants conducted one of the case studies (Yarra Valley Water pipes maintenance) and Commission staff prepared the other (NSW rail freight). As the case studies are of distinctly different character they are treated separately in this chapter.

The operating environment for both rail freight and water services has undergone considerable change over the last decade as a result of government business enterprise (GBE) reforms. The initial phase of GBE reform in these services was directed at increasing the commercial focus of GBE operations. Subsequent phases involved horizontal and vertical separation of GBEs and the introduction of competition. The general background to GBE reform is outlined in appendix A.

6.1 NSW rail freight services

NSW rail freight operations largely involve transporting bulk commodities such as coal and grain to port for export. Rail is also used to haul a wide range of general freight including primary produce, manufactured goods, bulk liquids and import and export containers. The users of rail freight services in NSW include mining companies, the Australian Wheat Board, primary producers, manufacturers, heavy industry and shipping companies.

The State Rail Authority of NSW (StateRail) was the operator of rail freight and other rail services in NSW until 1996. On 1 July 1996, the NSW rail network was restructured and FreightCorp was established as the NSW government's 'above rail' operator of freight services.

Government reforms

In the 1980s, the NSW rail system was beset by serious operational and structural problems. It was chronically over-staffed and hampered by inefficient work practices. It was organised along functional lines rather than business sectors.

Management operated under the expectation that the government would continue to fund operating losses. Day-to-day management decisions were subject to government intervention. Prices did not reflect the costs of providing services. Investment decisions were often subject to political considerations rather than objective project evaluation and State Rail's performance was hampered by worn-out and poorly designed infrastructure.

In common with other Australian rail networks, the commercial operations of the NSW rail system had been long overlaid with various government policy objectives. For many years, State Rail also served as an instrument of industry, regional, employment and social policy. In addition to providing commercially viable services (for example, hauling bulk commodities), State Rail was required by government to meet a range of non-commercial obligations relating to the services it provided, the prices it charged and the inputs it employed. As a result, there were conflicting commercial and non-commercial objectives which left management without a clear corporate mission. There was little incentive to supply non-commercial services at minimum cost and the real cost of provision was largely unknown.

The legacy of these inefficiencies was low productivity, user dissatisfaction and large annual operating losses and mounting debt. Indeed, State Rail required government funding of around \$3 million a day in the late 1980s.

A major reform program for rail services was initiated by the NSW government in the late 1980s and continued in the 1990s. The first phase aimed to improve the commercial focus of State Rail and clarify its relationship with government. The second phase separated freight, passenger, infrastructure and maintenance functions into different organisations. Rail freight services were corporatised and opened to competition from other operators.

The first phase of reform was intended to improve efficiency by putting rail services on a more commercial basis, improving cost recovery, making managers more accountable for the performance of the enterprise and reducing day-to-day government intervention in the firm's operations. Under the *Transport Administration Act 1988*, which came into effect on 16 January 1989, State Rail was required to operate in accordance with sound commercial principles under the direction of an independent board which was responsible for financial operations and formulating business strategies. The Minister of Transport was responsible for transport policy. Rail freight operations were established as a separate business group (Freight Rail) within State Rail.

The transition to a more commercially orientated organisation was assisted by a financial restructuring package to relieve the debt burden State Rail had incurred.

The provision of non-commercial services was to be negotiated between State Rail and the NSW government and formalised through a Community Service Obligation (CSO) contract which came into effect from 1 July 1991. The contract specified the level of service required by the government and the payment to be made to State Rail for the service. The contract was monitored and included performance-based rewards and sanctions.

On 1 July 1996, State Rail was restructured into four independent entities covering freight, passenger, infrastructure and maintenance services. FreightCorp was established as a NSW government-owned statutory corporation operating 'above rail' freight services and responsible for owning and maintaining its own rolling stock and locomotives. The statutory monopoly for rail freight services was removed and other firms are now able to establish competing rail freight operations.

The corporatisation of NSW rail freight services strengthened and extended the move towards 'arms length' operation of NSW rail services. Corporatisation aims to replicate many of the commercial conditions (and incentives) which apply to private firms, but without a change in ownership.

NSW rail freight services were also affected by the commencement of operations of the National Rail Corporation (NRC) in 1993 to operate interstate rail freight services. Public rail authorities gradually transferred interstate rail freight services, employees and assets to the new corporation. State Rail continued to provide selected services to the NRC while the staged transfer of functions, employees and assets took place.

Other sources of change

Apart from government reforms, several other factors have influenced the provision of NSW rail freight services over the last ten years or so. These include competition from road transport, technological change and changes in demand.

Since the early 1970s, road transport has significantly increased its share of the Australia-wide domestic freight task. In contrast, rail's share is largely unchanged and has been maintained mostly through growth in Australia's mineral sector — in particular a growing coal haulage task. (The contribution of coastal shipping has remained relatively static, thereby reducing its share.)

The importance of competition from road transport has varied considerably across market segments. For most of the period covered in the case study, the NSW government-owned operator of rail freight services does not appear to have faced significant competition from road transport in its main business activity — hauling

bulk commodities. Competition from road transport appears to have been a more important influence in the general freight market — where rail has been losing market share to road, not only over short distances but also for interstate movements. While the general freight market is low volume, it is high value and accounted for about 40 per cent of State Rail freight revenue in 1989-90. As a result, competition from road transport in the general freight market can be expected to have exerted pressure for change — particularly from the late 1980s.

While the basic technology underpinning rail freight operations has not changed substantially during the 1980s and 1990s, some technological changes have impacted on the efficiency of rail freight operations. These included: more powerful locomotives and higher capacity wagons; increased axle loads; the replacement of wooden sleepers with concrete sleepers; and advances in computer and communications technology.

Variability in the rail freight task has influenced the performance of NSW rail freight services at different times. Relatively weak growth in the size of the NSW rail freight task in the second half of the 1980s put further pressure on StatRail's poor financial position.

Pressure for change has also come from the users of rail freight services — especially the export coal industry. Rail freight charges account for a significant proportion of the free-on-board price of coal. Since the mid-1980s, the export coal industry has faced growing international competition and has sought to improve productivity and reduce costs. The industry has focused attention on the need to improve the efficiency and pricing of rail freight services.

Responses to change

The commercialisation and corporatisation reforms initiated a fundamental change in rail freight operations. A traditional process-orientated bureaucracy was gradually converted to a business, providing commercial services in competition with other providers and with the goal, of achieving a return on shareholders' investment. In this new environment, a different management culture developed and a wide range of productivity-enhancing measures were adopted over several years. These measures included: rationalisation of services and facilities and reducing overstaffing; reorganisation of StateRail to give it a business focus; improvements in management and work practices; and investment in new rolling stock and other rail infrastructure.

Change in enterprise culture

Commercial and non-commercial objectives were clarified and government was no longer to be seen as an employer of last resort and funder of operating deficits. Managers were given greater freedom to pursue commercial goals and to adjust services to meet the needs of customers. They were required to establish annual corporate plans which incorporated performance goals and evaluation. They were held accountable for improving the commercial performance of the enterprise.

The change signalled the end to the old ways of doing things. The management culture changed from running the railway as a government department to managing a commercial enterprise.

The process of commercialisation put pressure on State Rail to reduce costs, operate more efficiently, develop an organisational culture more conducive to achieving improved productivity; adopt a flatter more accountable management structure; and provide better customer service.

The decision to open the NSW rail network up to competition and moves to create a competitive national rail market increased the pressure for change. FreightCorp is now competing with other operators in interstate and intrastate rail freight markets. As a result, there is pressure to continue to reduce operating costs, provide more flexible and tailored customer service, develop strategic linkages with the private sector, and position the business to take advantage of opportunities emerging in the national rail market.

Rationalisation

An immediate and ongoing response was to reduce overstaffing. Employment (excluding corporate staff) in rail freight declined by nearly 60 per cent from 16 300 in 1988-89 to around 7000 in 1995-96. It has declined further since then, although this was largely due to the transfer of track maintenance staff to the new Rail Services Authority.

The number of locomotives used to haul freight declined from about 670 in 1987-88 to about 300 in 1997-98. The number of wagons has fallen from around 9200 in 1987-88 to 5500 in 1997-98. Part of the reduction in both cases reflects the loss of interstate freight to the NRC and the consequent transfer of some rolling stock.

There has been significant rationalisation of rail freight services and facilities. Some rail services were withdrawn from very low-volume high-maintenance grain branch lines and replaced by road haulage. In addition, the provision of parcels and small

freight services was discontinued because of large ongoing financial losses — despite efforts to restructure it. Rationalisation has included freight yards, wagon maintenance facilities and fuelling and crewing depots.

Both State Rail and FreightCorp have used contracting out to reduce costs and improve efficiency. State Rail contracted out a number of non-core activities such as legal, printing and retail services. Competitive tendering was used for some heavy maintenance and overhaul work. FreightCorp currently contracts out back-shop maintenance services, internal audit services and selected human resource, information technology and legal services.

Enterprise structure

Early in the reform process, StateRail discarded its traditional functional railway structure in favour of an organisation built around three business groups: CityRail, Countrylink, and FreightCorp. The restructuring resulted in smaller, more manageable units, each with a specific mission and objective.

FreightCorp adopted an organisational structure consisting of divisions for business, operations, strategy and support.

Management and work practices

New management practices were adopted to utilise enterprise resources more efficiently. These included strategic planning, new management structures, management information systems and fleet management.

State Rail and FreightCorp adopted more effective strategic planning measures such as corporate plans, performance targets and external review.

To improve management practices, StateRail devolved decision making from head office to the business groups and country regions. The number of layers of management was reduced, and accountability was increased. FreightCorp adopted a performance-based management and remuneration system and a rewards and recognition system was introduced to recognise quality performance by employees.

An early response by State Rail was to redevelop crucial management information systems covering operational performance, human resources, engineering, financial systems and information technology. For example, financial systems were upgraded by the adoption of accrual accounting and the establishment of new asset registers. Computer and communications systems were redesigned and upgraded over several years. FreightCorp implemented a new computer system to cover supply, fleet

maintenance, human resources, payroll and finance functions. It also refined its financial reporting system to better monitor performance in individual market segments.

Better fleet management practices were introduced by State Rail and FreightCorp to increase utilisation and reliability. FreightCorp introduced a real-time train operating system to enhance train planning, programming, monitoring and rolling stock control. It can monitor fleet movements to better utilise rolling stock and provide up-to-date information to customers on train loads, availability and location.

Over the last decade, considerable effort has gone into developing more efficient and flexible work arrangements to reduce operating costs and improve productivity. Key measures included job and work redesign, workplace reforms through enterprise bargaining and employee training. For example, State Rail undertook a job redesign program covering train crewing, yards, terminals, fleet maintenance, train management and administration. A number of improvements were made to work practices during the 1990s. Increased multi-skilling of staff has been achieved. Both State Rail and FreightCorp placed strong emphasis on staff training.

Investment

In the late 1980s, State Rail's performance was impeded by generally worn-out or poorly designed infrastructure. To improve efficiency and reduce operating costs State Rail and FreightCorp have undertaken a range of productivity enhancing investments including: new heavy haul locomotives; higher capacity coal wagons; concrete sleepers and heavier tracks; new wagon maintenance facilities; a new train marshalling yard in Sydney; a new train radio and satellite train tracking system; and fitting coal wagons with automatic equipment identification tags to improve the utilisation of rolling stock.

Other responses

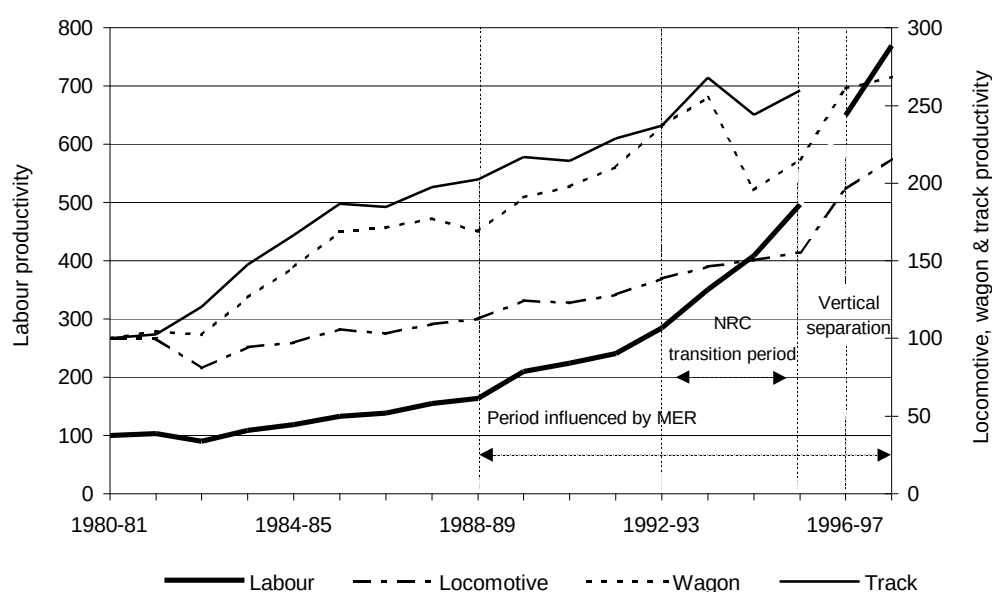
Efforts to reduce costs and improve productivity have been pursued in conjunction with programs to improve the quality of service. Both State Rail and FreightCorp pursued initiatives to develop a customer-focused service culture. These initiatives have included special staff training courses on providing good customer service; surveying major customers to identify performance gaps; opening an integrated customer service centre which operates 24 hours a day, seven days a week; and developing more innovative contractual arrangements (including the use of volume incentives, price structures to encourage efficiencies and reciprocal performance clauses).

Productivity performance

There has been a significant improvement in the productivity performance of NSW rail freight operations since the early 1980s (figure 6.1). While significant productivity growth was achieved prior to the government reforms in 1988-89, it appears to have accelerated since then¹.

Figure 6.1 Labour, locomotive, wagon and track productivity, 1980-81 to 1997-98^a

Indexes 1980-81 = 100



^a See case study report for definitions and data details.

Data sources: State Rail Authority and FreightCorp annual reports.

Between 1980-81 and 1988-89, average annual growth in labour productivity (net tonne kilometres per employee) was 7.3 per cent. It increased to 13.3 per cent between 1988-89 and 1992-93 and appears to have accelerated further between 1992-93 and 1997-98 to 22.2 per cent. This is likely to be an overestimate because infrastructure maintenance and network staff of FreightCorp were transferred to other NSW rail organisations in July 1996. This resulted in an employment reduction of nearly 50 per cent but no change in output. Nevertheless, it seems

¹ Some care needs to be exercised in interpreting changes in NSW rail freight's productivity performance because of breaks in the available data series. The partial indicators are less reliable after 1992-93 because of the phased transfer of services and resources to the NRC and the separation of freight and track operations in July 1996. The details are outlined in the case study report (volume 2).

likely that labour productivity growth was stronger between 1992-93 and 1997-98 than between 1988-89 and 1992-93.

Because of the large reduction in employment after 1992-93, it is desirable to refer also to other partial productivity indicators in an attempt to assess overall productivity performance.

These mostly show high rates of growth (table 6.1) which gives confidence that overall efficiency was improving. Between 1980-81 and 1988-89 average annual growth in locomotive, wagon and track productivity was 2.3 per cent, 8.7 per cent and 10.3 per cent respectively. The rate of locomotive productivity growth doubled to 4.5 per cent a year between 1988-89 and 1992-93, while wagon productivity growth remained steady at 8 per cent a year and track productivity growth declined to 3.8 per cent a year. Between 1992-93 and 1997-98, locomotive productivity growth doubled again to 9.4 per cent a year, while wagon productivity growth declined substantially to 2.3 per cent a year.

Multifactor productivity (MFP) growth was not calculated because of the difficulty in obtaining total capital estimates for the whole period under review. The partial measures are all positive and mostly show high rates of growth (although not to the same extent as labour productivity). Therefore, there can be a high degree of confidence that MFP has also grown strongly and labour productivity can be seen as a reasonable indicator of the trend in overall productivity growth, although it overstates the actual rate of improvement.

Further evidence that the productivity performance of NSW rail freight operations has improved significantly in the period influenced by microeconomic reforms comes from comparisons with world best practice. The available evidence suggests that NSW rail freight has been moving closer to world best practice, notwithstanding the considerable difficulties in comparing the performance of different rail operators. For example, the Bureau of Industry Economics found that between 1991-92 and 1993-94 the amount by which Freight Rail needed to reduce operating costs to match world best practice costs had fallen from 36 per cent to 27 per cent (BIE, 1995, p. 76).

There appears to be a significant difference between the periods before and after microeconomic reform in terms of factors driving productivity growth.

Table 6.1 Average annual growth rates in productivity, output and inputs
Per cent

	<i>Labour prod.</i>	<i>Loco. prod.</i>	<i>Wagon prod.</i>	<i>Track prod.</i>	<i>Output (NTKs)</i>	<i>Labour</i>	<i>Loco.</i>	<i>Wagons</i>	<i>Track</i>
1980-81 to 1988-89	7.3	2.3	8.7	10.3	4.8	-2.3	2.5	-3.6	-5.0
1988-89 to 1992-93	13.3	4.5	8.0	3.8	1.3	-10.8	-2.3	-6.1	-2.4
1992-93 to 1997-98	22.2	9.4	2.3	..	-4.1	-22.2	-11.6	-5.7	..

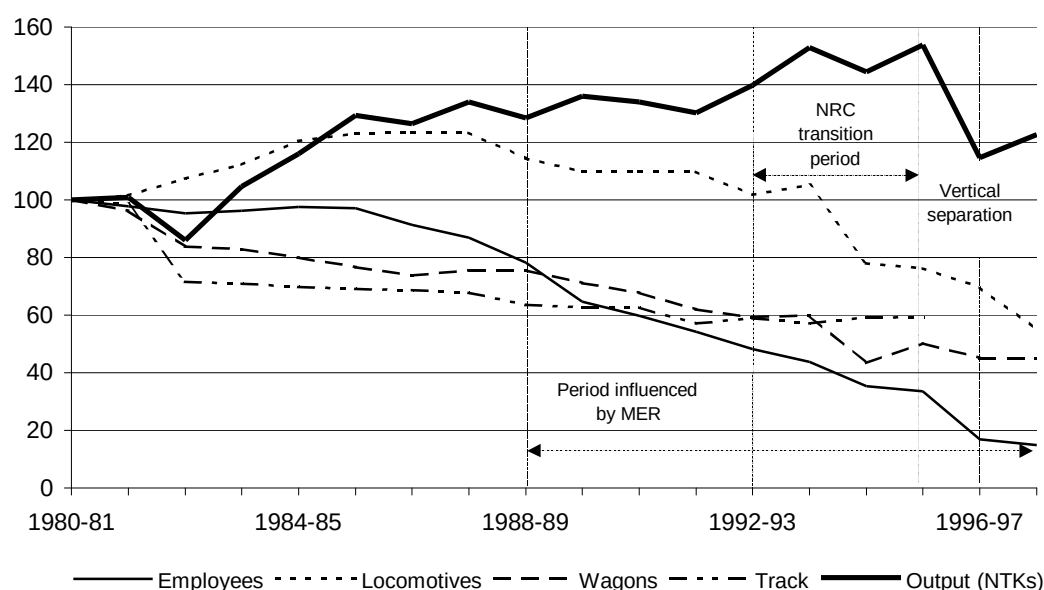
.. Not applicable.

Data sources: State Rail Authority and FreightCorp annual reports.

Prior to microeconomic reform productivity growth appears to have been driven largely by strong output growth, which resulted in greater utilisation of excess capacity. Between 1980-81 and 1988-89, output grew on average by 4.8 per cent a year (figure 6.2) while the average number of employees, wagons and track kilometres contracted each year on average by 2.3, 3.6 and 5 per cent respectively and the locomotive fleet increased by 2.5 per cent a year.

Figure 6.2 NSW rail freight – selected input and output measures, 1980-81 to 1997-98^a

Indexes 1980-81 = 100



^a See case study report for definitions and data details.

Data sources: State Rail Authority and FreightCorp annual reports.

For much of the period influenced by microeconomic reform, productivity growth appears to have been driven largely by structural and operational improvements which reduced resource inputs. Output grew on average by only 1.3 per cent a year between 1988-89 and 1992-93, yet the number of employees contracted by 10.8 per cent a year. Locomotives, wagons and track kilometres contracted on average each year by 2.3, 6.1 and 2.4 per cent respectively. Between 1992-93 and 1995-96, the number of employees, locomotives and wagons used in NSW rail freight operations contracted each year on average by 12.3, 11 and 7.9 per cent respectively. Over the same period, output grew on average by 2.4 per cent a year.

Contribution of microeconomic reforms

The evidence suggests that since the late 1980s microeconomic reform has made a substantial contribution to the improved productivity performance of NSW rail freight operations. Although labour productivity was improving prior to the commercialisation reforms of the late 1980s, the rate of growth accelerated after the changes were implemented and was maintained through the 1990s. Productivity growth prior to the reforms was largely driven by strong output growth, reflecting strong demand. For most of the period since 1988, reductions in resource inputs and associated organisational improvement appear to have been the main source of growth.

The importance of microeconomic reform is that it made a substantial contribution to changing the focus and organisational culture of NSW rail freight operations. These changes appear to have been pivotal in encouraging and enabling management to make wide ranging structural and operational changes during the 1990s to reduce operating costs and improve efficiency.

The main changes which enhanced the productivity performance of NSW rail freight operations included: rationalisation of non-commercial services and facilities; enterprise restructuring; new management practices such as better strategic planning and new management structures and information systems; more flexible work practices; investment in new rolling stock and other rail infrastructure; increased contracting out of specialised services; developing strategic partnerships with other key players; and adoption of new technology.

In the absence of reform, it is difficult to see that other sources of change would have made a significant impact on NSW rail freight's productivity performance. Despite several external studies which identified structural and operational inefficiencies, there is little evidence of management making fundamental changes to address these problems prior to the government initiated reforms.

One consultant's report lamented that there were few, if any, aspects of the operations that had not been reviewed, perhaps several times, in the pre-reform era. The knowledge of what needed to be done existed. But, the incentives and framework to make it happen were absent.

Competition from road transport would have provided some pressure for change. However, the loss of market share to road in the general freight market has been a long-term trend and, up until the late 1980s, the pressure of competition from road transport was not sufficient to encourage management to make substantial structural or operational changes. It was reform of NSW rail freight's operating environment that provided the catalyst for management to begin to respond to competition from road transport.

The most likely scenario is that the productivity performance of NSW rail freight operations would have continued to improve in the absence of microeconomic reform — but at a much slower rate than has been achieved over the last decade. For much of the period, productivity gains would have needed to come primarily from improved efficiency because of slower growth in demand. But improving the efficiency of NSW rail freight operations would have been much harder without the direction and momentum provided by the reforms. StatRail did not have an organisational culture or structure conducive to effectively implement the kind of changes needed to significantly improve the efficiency of rail freight operations.

6.2 Contracting of Yarra Valley Water civil maintenance services

Yarra Valley Water was formed in 1995 as part of the reform of Melbourne Water and its separation into five different business entities. It is the largest of Melbourne's three water retail businesses.

Maintenance of its water and sewerage network is a large annual expense. Civil maintenance relates to the network of pipes and conduits that supply water or transport sewerage. Other maintenance involves mechanical and electrical maintenance.

The specific tasks of civil maintenance are to: repair water mains, pipes and fittings, clear and repair sewers, provide regular non-urgent remedial maintenance; provide scheduled maintenance and inspection of the network; conduct minor augmentation works and attend to water and sewerage pump station alarms. Maintenance work remains highly labour-intensive although some new equipment has been introduced to assist in the diagnosis of the cause of sewer blockages and water mains bursts.

Reform program

The water and sewerage industry was included in the GBE reform program of successive Victorian governments in the early 1990s which was directed at improving the commercial focus of enterprises, reducing costs and improving productivity.

In 1992, the Melbourne and Metropolitan Board of Works and six adjacent water authorities were amalgamated into a new corporatised entity called Melbourne Water. The objective was to increase the commercial focus of delivery of water and waste water services in the metropolitan area and establish the new corporation at arms length from the government.

In 1993, the Victorian Government announced a comprehensive reform program to increase the efficiency of government supplied services. It included further reform of the water and sewerage industry which was implemented through the *Water Industry Act 1994*. A key feature was the disaggregation of Melbourne Water into five separate entities, including three new water and sewerage businesses, which came into effect on 1 January 1995.

The contracting response

The increasing commercial focus in provision of public utility services created an environment for change in Melbourne Water in the early 1990s. It created opportunities for management to implement changes to reduce costs and improve productivity.

Contracting of civil maintenance services was one important response to the changing business climate. Although the initiative to move to contracting out began with industrial problems, it was facilitated by the changing environment in which GBEs were expected to operate and by the specific reforms being developed for the water and sewerage industry. The first contract began in 1993 and a new contract was let in 1996.

Prior to contracting out, maintenance services were provided by a day-labour force. Most of the work performed by maintenance workers relates to unscheduled work associated with unpredictable water mains bursts and sewer blockages. The day-labour arrangements were not well suited to this unpredictable pattern. Melbourne Water had to employ workers during the troughs in the work cycle and there was substantial idle time. There were also inflexibilities in work practices.

Contracting out the maintenance task provided Melbourne Water, and subsequently Yarra Valley Water, with the opportunity to improve efficiency in the task and reduce unproductive labour time. The contracting firm was better able to utilise labour and improve flexibility in work practices. The number of workers employed on maintenance activities on the Yarra Valley network fell by nearly 40 per cent between 1993 and 1998. The number of average hours worked each week increased by 22 per cent and for the first few years of contracting out the increase was greater.

Implementation of contracting out involved the introduction of a new computerised asset management system which enabled works orders and completion notices to be issued electronically between the water authority and the contractor. It facilitated effective management of the separation of the purchaser from the provider.

The introduction of contracting resulted in the development of a schedule of rates detailing a large range of maintenance activities. This has provided more accurate information on costs and productivity of maintenance, a vital component for improving decision-making about replacement and maintenance and for improving efficiency of operations generally.

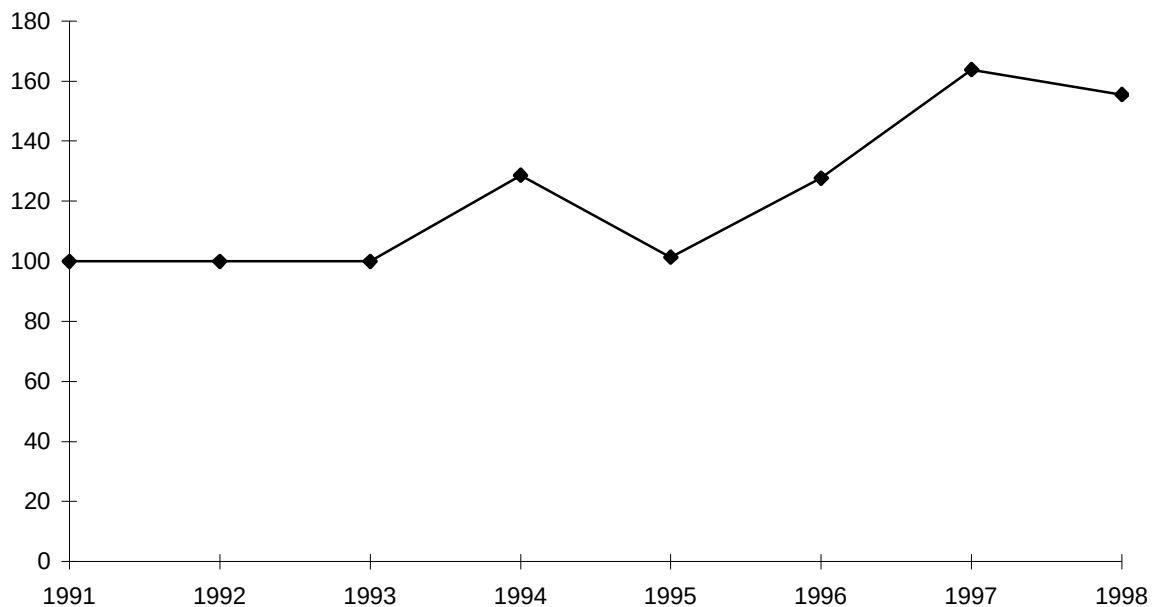
Productivity performance

Productivity levels are measured in terms of maintenance activities per hundred man-hours. It assumes that all maintenance activities require the same effort, which is not the case in practice. For example, a major sewerage blockage requires more effort to fix than a simple leaking valve in the water. However, data which take into account effort to fix between maintenance activities are not available.

The estimates show that labour productivity measured in this way increased from 1994, the first full year of contracting out (figure 6.3). Between 1993 and 1998, average labour productivity growth was 9.2 per cent a year.

Figure 6.3 Index of labour productivity levels in civil maintenance, 1991 to 1998

Index 1991 = 100



Note: Maintenance output levels for 1991 to 1993 are estimated as an average of the three years.

Source: Case study (volume 2).

There is no evidence that the improved productivity has been achieved at the expense of quality of service. The rate at which unscheduled water interruptions have been restored for Yarra Valley Water has increased in recent years and is higher than for the other urban water retailers. The responsiveness of the contractors to sewerage blockages for Yarra Valley Water is better than for the other operators.

Contribution of microeconomic reforms

The improvement in productivity in maintenance services from 1994 can be attributed almost entirely to the change in commercial focus and the decision to contract for these services. Prior to the change in business climate in GBEs, contracting of services was a negligible aspect of Melbourne Water's operations. Contracting made it possible to utilise more efficient work practices and to institute better management and information systems.

There appear to be few, if any, other factors contributing to the improvement in productivity. Some changes have occurred in the use of technology to investigate causes of water and sewerage interruptions but these innovations have not been a source of significant productivity improvement. Maintenance activity remains

highly labour intensive. Other factors, such as seasonal conditions, can affect productivity in the short term but cannot explain the longer-term improvement apparent in figure 6.3. More broadly, contracting out has provided the information on reliability and maintenance costs which contributes to better decisions about new investment, replacement and maintenance strategies.

6.3 Key points

- Labour productivity in NSW rail freight operations grew strongly throughout the 1980s and 1990s, with a major increase in growth from the late 1980s when the reform program was begun. Between 1980-81 and 1988-89, average labour productivity growth was 7.3 per cent per year. Between 1988-89 and 1992-93, it was 13.3 per cent per year and 22.2 per cent between 1992-93 and 1997-98, although the latter rate is likely to be an overestimate.
- Significant improvements in labour productivity were achieved in the maintenance of Yarra Valley's civil maintenance services in the 1990s. Between 1993 and 1998, average labour productivity growth was 9.2 per cent per year.
- Government reforms of GBE enterprises were the primary factor behind change and the improved productivity performance of both NSW rail freight services and Yarra Valley maintenance services. Changes in the operation of State Rail were made possible by legislative reforms introduced in 1989 to give NSW rail operations an explicit commercial focus and clarify the relationship between the enterprise and the government. The separation of rail freight from other rail services and opening up rail freight to other operators in 1996 created further pressures and opportunities for improved performance.
- Contracting out of maintenance services was facilitated by the changing environment facing GBEs in Victoria in the early 1990s and specific reforms in the water and sewerage industry that required enterprises to become more commercially focused.
- The factors contributing to the increase in productivity growth in State Rail included corporate reorganisation to give it a business focus, improved management and work practices, new investment in rolling stock and other rail infrastructure, tackling the problem of overstaffing, rationalisation of some services and facilities, and the development of a customer service focus. Increased productive efficiency achieved by Yarra Valley involved more efficient use of labour and the implementation of new management information systems.
- The stimulus of competition on NSW freight operations was both direct and indirect. Competition from road transport in the general freight market

contributed to pressures on the NSW Government and State Rail to improve efficiency in the operation and pricing of rail freight services. Competition in the world market for export commodities such as coal and wheat carried by State Rail was also a factor. More recent reforms associated with implementation of the National Competition Principles Agreement and the emergence of a national rail freight market have created a competitive environment for the newly corporatised FreightCorp. Competition through competitive tendering provided the direct stimulus to change in Yarra Valley's maintenance services through contracting out of the services.

7 The outlook on productivity growth

If it is accepted that microeconomic reforms are a major part of the explanation for the 1990s surge, what implications does the influence of reform have for the outlook on productivity growth?

Chapter 1 raised the issue of whether microeconomic reforms only have static/allocative effects, which produce once-off adjustments to the *level* of productivity, or whether they also have dynamic effects, which raise the *rate of growth* of productivity. If they have static level effects, the stimulus to productivity growth can be expected to peter out. If they have dynamic growth effects, an enduring improvement in productivity growth can be expected.

Chapter 2 presented some in-principle arguments to suggest that, because of the nature of structural problems facing Australia prior to reform, both types of effect could be possible.

With the benefit of evidence from the review of general trends and case studies, this chapter examines whether the reforms introduced are likely to have productivity level or growth effects.

7.1 The 1990s experience and level and growth effects

The acceleration in productivity growth in the 1990s could obviously mean that new dynamic, growth-enhancing effects are at work.

However, in principle, the higher productivity growth results could be consistent with static effects from reform. There has been a series of reforms introduced over time. Static adjustments to these reforms could be spread out over a number of years. In principle, therefore, a period of higher productivity growth could be the observation of a series of static adjustments to a series of reforms.

The period of higher productivity growth could be quite long, even with static effects. The timing of static reallocation effects depends in part on the length of investment cycles, which can be quite long in some industries (for example, steel making and motor vehicles). The period of higher productivity growth could also be extended as further reforms are introduced.

It could therefore be difficult to distinguish between static and dynamic effects from the mere observation of an increase in productivity growth rate — even over a period as long as 4 to 8 years.

7.2 Level effects from reform

There is evidence from the general trends and case studies of static, level effects. These basically involve adjustments to improve the allocation of resources and technical efficiency of resource use.

There is evidence of reallocation between industries. Resources have been moving out of some previously highly-assisted industries and have been growing in industries such as Mining and Communication services. There is also evidence of reallocation *within* the industries, especially through concentrating domestic production on a narrower product range.

Allocation effects come in both the immediate and long term. For example, short-term impacts of closure of services, reductions in excess labour and contracting-out of services are quite evident in the operation of GBEs. Over the longer-term, reforms can mean better investment decisions with less underutilised capacity. Contracting out of maintenance activities can induce GBEs to plan expansion, replacement and maintenance decisions more systematically. Greater price efficiency can also have long-term allocation effects, not only for the GBEs themselves, but for their business customers.

The evidence gathered also indicates that reforms have provided scope for businesses to improve their operations to bring them closer to ‘best practice’. Some of the specific mechanisms evident have been:

- modernising plant and equipment and introducing more up-to-date technology;
- introducing more efficient organisational structures and more modern management techniques;
- reducing excess manning levels in some activities; and
- introducing more productive work arrangements.

The evidence in this study suggests that inefficiencies in production had arisen and had been tolerated for a long time, because of three main factors:

- the piecemeal, made-to-measure government assistance environment in which manufacturing industries operated;

-
- the conflicting objectives, constraints and political interference that prevented GBEs from operating on clear commercial principles; and
 - regulatory and institutional barriers to improving performance.

The moves to improve resource allocation and technical efficiency toward ‘best practice’ are consistent with the notion of Australian production ‘catching up’ to the production standards of other countries (chapter 3).

7.3 Growth effects from reform

Microeconomic reforms have helped to change the environment in which businesses in both the private and public sectors now operate. This has brought, and will continue to bring, dynamic gains.

Many of the mechanisms that have been brought into greater prominence since the 1980s are likely to bring productivity improvements over time. For example:

- organisational and management changes can bring improvements over time through such avenues as
 - anticipation and management of change;
 - greater flexibility to adapt to emerging trends and sudden changes;
 - focus on continuous improvement in quality, meeting consumer needs and reducing costs and waste; and
 - network alliances and joint-venture arrangements;
- work arrangements, such as team-based approaches, combined with performance-based incentives, build in incentives and capabilities to search for better ways of doing things;
- greater focus on technology, innovation and developing skills pays dividends over time;
- greater exposure to competition provides an ongoing incentive to improve productivity;
- export orientation and openness to involvement with foreigners bring exposure to emerging trends and alternative production methods; and
- the policy and institutional environment puts additional emphasis now on good performance to grow and add value.

7.4 The outlook

The future is difficult to predict with any certainty. There could be unexpected events — such as a further downturn on export markets — which could undermine output and productivity growth over the short term. But this would not necessarily put an end to productivity improvement over the long term.

The evidence in this study suggests that microeconomic reforms have both level and growth effects. To the extent that there are static ‘catch-up’ effects at work, some slowdown in productivity growth from the current rate of around 2.4 per cent a year could reasonably be expected. Nevertheless, it could be some time before ‘catch-up’ effects are exhausted. For example, much of the change that has occurred in enterprise bargaining has occurred in the last few years, and it appears that there is considerable scope for further change (appendix C).

However, because of the growth effects from reform, it is unlikely that productivity growth will slow over the long term to its previous rate of around 1.2 per cent a year. There have been fundamental changes in the way the economy operates which are likely to have permanent effect.

The implications for living standards could be substantial over the long term. There have been some dramatic improvements in productivity and average incomes over recent years. But even what may appear to be a small difference in the long-term annual average rate of productivity growth adds up to a substantial difference over the long term. For example, increasing the annual average rate of productivity growth by half a percentage point would increase income per person by around 13 per cent after 25 years and by around 28 per cent after 50 years (IC 1997a, p. 10).

Finally, to the extent that reforms are responsible for productivity improvement, ongoing implementation of reforms will bolster the prospects for sustained improvement in productivity.

A Background on protection policy and GBE reform

Microeconomic reforms have covered a wide range of policies and areas of the economy (chapter 2). This appendix provides more detailed background on reform of industry protection policy and government business enterprises.

A.1 Reform of protection policy

Over the broad sweep of Australia's economic history, protection against import competition through tariffs, bounties and quotas has been a central element of government policy toward industry and economic development.

Some of the arguments used at various times to protect local manufacturing industries were the need to promote defence industries and self-sufficiency, raise wages and attract immigrants, raise government revenue through tariffs (during times of war), address balance of payments difficulties (under fixed exchange rates), foster infant industries, and offset cost disadvantages of local producers compared with imports (see, for example, IAC 1974). Various forms of assistance to agriculture were justified as an encouragement to export earnings in the face of a balance-of-payments constraint to growth under fixed exchange rates. Marketing, price-support and other stabilisation schemes were introduced in some agricultural industries to maintain returns to farmers, many of whom had started production through small-scale soldier settlement schemes.

However, while arguments for protection were made at a general level, the policy was implemented on a piecemeal, industry-by-industry and product-by-product basis. The amount of protection afforded local industries evolved without real coherence to produce a highly complex structure of tariffs by the mid-1960s. The Vernon Committee (1965, p.390) noted there were some 3400 tariff items and about 10 000 sub-divisions of imports, as well as preferential rates and complicated formulas for some items.

Tariff protection for manufactures was essentially provided according to a 'made-to-measure' principle. This meant that tariffs and subsidies were determined for individual, narrowly-specified products at rates which would account for any

problems encountered by local industry. Typically, tariff rates would be set to offset the cost disability that domestic producers faced in competing with imports.

As a consequence of the piecemeal made-to-measure approach, the main features of the tariff environment in the pre-reform period of the 1960s and 1970s were:

- a highly variable and complex structure of tariffs and subsidies applying to different industries and different products within industries;
- generally high (but variable) assistance to manufacturing with high effective assistance provided through high rates of nominal assistance on outputs and low rates on intermediate inputs; and
- generally lower assistance to agriculture, but wide variations across commodities within the sector.

The policy environment was thought to have contributed to various allocative and technical inefficiencies. In particular, the piecemeal and made-to-measure implementation of protection policy was thought to have:

- encouraged an inward focus on the domestic market as manufacturers sought to replace imports, based on some confidence that government assistance would be provided to do so;
- discouraged output and growth in more efficient industries by raising their input costs directly through tariffs and indirectly through effects on labour costs and access to capital;
- discouraged exports from more efficient industries (in all sectors including manufacturing) for the same reasons;
- encouraged production over a range of products within industries rather than specialisation in products in which Australian producers were better placed; and
- encouraged small-scale production within firms and allowed them to continue to produce with outdated technology, poor innovation and poor management and work practices.

Some of the features of the policy environment and the industry development problems of the 1960s and 1970s are evident in the statements in box A.1. Lloyd (1978) provides a review of the arguments and evidence presented in the literature from this period.

Box A.1 Growing recognition of the structural problems facing Australian industry

By the 1960s, strong criticisms of Australia's tariff regime were being voiced by academics, led by Max Corden. Gradually, the recognition of the need for reform became more widespread outside of academic circles, as reflected in government statements, commissioned reports and independent reviews.

The Vernon Committee (1965) report considered that past experience had vindicated the general case for protection in terms of benefits exceeding costs, but thought the benefits of the measures implemented could have been higher or the costs could have been lower. It was critical of the ad hoc nature of tariff making. It also pointed to

‘... the benefits of specialisation in manufacturing in contrast to the increasing diversification to which many manufacturers have been led by their preoccupation with import replacement. The view that progress in Australian manufacturing is limited to the successive plugging of ‘import gaps’ will, we hope, give way to attitudes more favourable to export development and thus to the rapid increase of productivity in manufacturing. (p. 99)

The Report to the Prime Minister by a Working Group (1974) drew attention to the impact of manufacturing protection on rural and other export industries:

The effect is to attract resources away from the rural and other export industries to the import competing industries; the result is a generally lower level of real income for any given level of population since resources are attracted out of industries able to compete in world terms with little assistance and into industries relying on substantial assistance to enable them to compete. (p. 42)

The Jackson Committee (1975), although making recommendations that aroused some controversy, nevertheless considered Australia's manufacturing to be in a deep-seated malaise.

... Australian Manufacturing was largely created to serve a growing domestic market by deliberate policies of import substitution, immigration, fixed exchange rates and capital inflow ... Now that the domestic market is satiated, and can grow only slowly, most manufacturing is stalled and lacks purpose. It needs exports to grow. But the industry structure created by those earlier deliberate policies is not suited to the challenges of international competition. (p. 1)

Much of the equipment in factories ... is old, inefficient and overdue for replacement; desirable technical innovations have been delayed; and the physical conditions for the workforce leave much to be desired. For ten years the rate of growth in labour productivity of Australian manufacturing has been far below that achieved in Japan, France and Germany and marginally below Britain and Canada. (p. 2)

Australia's relatively poor [productivity] performance can be explained by a variety of factors including poor labour relations, outdated or inappropriate technology, lack of scale economies and inadequate management techniques. (p. 68)

(Continued on next page)

Box A.1 (Continued)

A Government White Paper on Manufacturing (Commonwealth of Australia 1977) signalled an intention toward policy reform.

In the changing environment now being encountered, Australian manufacturing industry needs in the long run to achieve a greater degree of specialisation, with less reliance on government assistance. As a long-term objective the community will be best served by a manufacturing industry with a structure which requires minimum levels of Government support.

... The Government endorses the view ... that it is desirable to give encouragement to “new investment that will be efficient, internationally competitive and export oriented ...” (p. 17)

In its Economic Surveys of the Australian economy, the OECD noted

... the heavy and increasing reliance on primary product exports throughout the seventies has aggravated the recent terms-of-trade losses associated with the international commodity price cycle. There is now widespread agreement that the export base of the country should be broadened and that manufacturing — as well as mining, rural and service industries — should play a key role in correcting the external imbalance. The rapid fall of Australia in the ‘league table’ of per capita income in the OECD has also led to a questioning of development strategies pursued so far. (OECD 1987, p. 50)

Trade restrictions resulted in a broadly based manufacturing sector, primarily aimed at supplying the domestic market. As a result, production units were often of small size and inefficient by international standards. (OECD 1988, p. 49)

In announcing phased reductions in tariffs in 1988, the Treasurer noted

In the past many so-called industry assistance arrangements introduced by successive governments have been anything but assistance. Their legacy is a less flexible economy, too reliant on protection and regulation. The way forward for Australia is not to be closeted and sheltered, but to be open and dynamic, trading aggressively in the world. Only this kind of economy can provide the employment and rising living standards that Australians aspire to. (Keating 1988, p.16)

Rent-seeking, competition and inefficiency

The failure to address these problems was also seen to be one outcome of ‘rent-seeking’ behaviour. The made-to-measure approach created expectations that additional government assistance could be gained to meet any declines in competitiveness. Domestic producers were thereby encouraged to believe they had as much if not more to gain from seeking government assistance than they had from taking the more difficult path of addressing entrenched efficiency problems.

As an example, it was often observed that in many cases managers gave way to demands for wage increases or did not resist or seek to remove inefficient work arrangements because, on the one hand, industrial unrest was likely to be encountered if a stronger stance were taken and, on the other hand, increases in

costs did not have major profit consequences. Additional assistance could generally be sought and found.

The made-to-measure approach may have even curtailed competition between domestic producers in the same industry. If a firm took the approach of containing costs and lowering prices, it could anticipate retaliatory action from other domestic producers. If the domestic industry increased internal competition and reduced costs and prices, it would also destroy arguments for greater assistance against imports based on cost disability.

The proliferation and continued existence of small-scale inefficient production facilities suggests there was some limit on domestic competition. There would be gains from specialisation and economies of scale from mergers and acquisitions. But the fact that these did not take place vigorously suggests that satisfactory returns were already available.

All this suggests that the made-to-measure principle was a source of inefficiency. Operation of the principle allowed inefficiencies to be introduced or to develop (for example, from technological obsolescence) and, once there, the incentives guided producers to pursue paths that would avoid their adverse effects, but allow the inefficiencies to remain.

Elements of reform

A central objective of reform was to bring about greater simplicity and uniformity in the structure of assistance. However, piecemeal reform proved very difficult, as change in protection in one area created other anomalies and complexities. The surer paths to uniformity were to: at least limit further increases in tariffs in already highly-assisted industries and products; review and rationalise assistance to products within broader industry groupings; or reduce tariffs across-the-board to reduce the extent of divergence in assistance rates. Elements of these three approaches to reform were taken at different times (box A.2).

Reform unfolded over the 1970s and, especially, the 1980s (box A.2). Progress was anything but smooth, with various steps forward followed by various steps backward. Attempts in the early 1970s to limit further increases in assistance were undermined by the later introduction of ‘temporary’ non-tariff (quota) measures. Serious attempts to instil some consistency in the structure of industry assistance came in the mid-1980s, when the Government signalled that it was serious about ‘internationalising’ the economy. It put some limits on further increases in assistance and took a broader industry approach to reviewing assistance. It was at

this time that longstanding expectations that governments would provide made-to-measure protection began to be shaken.

Major changes in tariff rates came from the late 1980s with the announcement in 1988 of a four-year program of phased reductions in tariffs. This was followed by a further announcement in 1991 of further phased reductions to 1996 (and to 2000 for motor vehicles and Textiles, clothing & footwear (TCF)).

A strong and consistent signal was required to shake entrenched expectations about the likelihood of ongoing and additional government support. Although there had been tentative signals at various times in the 1970s and early 1980s, they were undermined by subsequent government statements or decisions. A strong change in policy signals appeared to come in the mid-1980s when the Government of the day publicly emphasised international competitiveness and industry self-reliance. Forms of adjustment assistance were made available, but additional import protection was not granted as a rule. Any remaining doubt about the change in policy environment was shaken by the subsequent announcement of phased reductions.

However, incentives for rent-seeking did not entirely disappear. While incentives to lobby for *additional* assistance were dramatically reduced, there was still some opening for some industries to lobby governments for preferred treatment. In particular, Automotive and Textiles, clothing and footwear were two groups insulated to some extent from the otherwise common treatment of industries in the across-the-board approach to tariff reform from the late 1980s (box A.2). This would have given these industries some insulation from the pressures to adjust that would have otherwise been felt.

Domestic producers were exposed to greater potential for competition in two senses under reform. First, the end of the made-to-measure principle from the mid-1980s exposed domestic producers to the potential for open-ended competition. Domestic producers could be faced with the prospect of increased competition if overseas competitors improved their performance or if local costs increased in relative terms, because additional ‘compensating’ government assistance was unlikely to be forthcoming. Thus competitive pressures could increase even though there was no change in Australian protection levels. Second, domestic producers faced increases in price competition (all other things equal) with the introduction of reductions in protection, phased in from the late 1980s.

Box A.2 Milestones and detours along the road to tariff reform

In 1971, the Government announced a program of review of tariffs by the Tariff Board. The Government was careful to point out, however, that this would involve no commitment on its part to implement any recommendations made.

In 1973, tariffs were reduced across the board by 25 per cent. In later public discussions, increases in unemployment were primarily attributed to the tariff cuts, despite the evidence of analytical studies. Further use of the across-the-board method was seen as politically difficult (Lloyd 1978).

There was a return to the piecemeal approach. Non-tariff measures gained favour in response to increasing unemployment. Market sharing through import quotas was introduced as a 'temporary' measure in the mid-1970s, mostly in highly-assisted industries. (In two cases, they were not removed until 1988 (Automotive) and 1993 (TCF)).

In 1982, the Government announced that general reductions in protection were precluded for the time being.

Governments adopted a broader industry-wide approach to reviewing industry assistance from the early 1980s. The Labor Government introduced industry plans in some industries from 1983. While some elements of these plans were questioned in some quarters, they at least attempted to establish greater uniformity in assistance and improve industry efficiency and instil an export focus. The Government increasingly determined industry development measures on a generic basis, for example, generally-available encouragement of R&D.

An agreement for Closer Economic Relations between Australia and New Zealand was introduced in late 1982. It established a progressive move toward free trade in most goods between the two countries at 1 July 1987.

In 1988, the Government announced a four-year program of phased reductions in nominal tariff rates for most imports (excluding Textiles, clothing & footwear and Automotive industries). Tariffs above 15 per cent were to be phased down to 15 per cent and those between 10 per cent and 15 per cent were to be phased down to 10 per cent.

In 1991, the Government announced the continuation of this program of phased tariff reductions. General tariffs were to be phased down to 5 per cent over the four years to July 1996. Tariffs on passenger motor vehicles were to be phased down from 35 per cent in 1992 to 15 per cent in 2000. Tariffs on Textiles, clothing & footwear were to be phased down to a maximum rate of 25 per cent by 2000.

In 1997, the Government announced that tariffs in the Textiles, clothing & footwear industries and the Automotive industries are to be frozen at their year 2000 levels until 2005. The Government also announced packages of non-tariff measures covering these industries.

A.2 Reform of government business enterprises

Historically government business enterprises (GBEs) have provided a wide range of infrastructure and utility services in Australia (including railways; ports; airports; the generation, transmission and distribution of electricity; the storage, purification and supply of water; gas and oil pipelines; and telecommunication and postal services).

Attention turned to the performance of GBEs in the 1980s for three reasons. First, as a large part of the economy (10 per cent of GDP, 9 per cent of the total wage bill and 13 per cent of total investment expenditure in 1992-93), their performance mattered in national terms. Second, since they provide key inputs into industry, their performance affected the quality of service and charges paid by users and therefore the ability of users to compete internationally. Third, governments began looking to GBEs to improve their performance so as to at least limit the drain on government funds (to fund operating losses and major investments), if not to make more of a contribution to government revenue and balance sheets (through dividend and tax-equivalent payments and the proceeds from privatisations). The budget imperative, it must be added, created some potential for governments to make some individual decisions that could be in conflict with the broader national interest (PC 1998a).

Benchmarking comparisons with similar operations overseas reinforced perceptions that performance in Australia could be improved. They pointed to considerable scope for improvement.

GBEs served a number of functions that were often in conflict. The first function was an economic one — to produce services for sale to consumers and commercial users. A second function was to meet social and political objectives as required generally and from time to time by governments. This meant providing subsidised and unprofitable services to some groups; acting as ‘employer of last resort’ in some locations and for some unskilled groups; and implementing some investment decisions that to some extent reflected political priorities rather than strict commercial criteria. In practice, this meant that GBEs were not required to provide a number of services on strict commercial terms. Services were cross-subsidised and/or losses underwritten by government. A third function in some cases was to be an industry regulator (for example, setting and enforcing standards).

There were also commercial constraints. While GBEs were often provided statutory restrictions from competition, they were often also prevented from extending their range of services to enhance their overall performance.

Without passing comment on the merits of the different objectives, their conjunction meant that incentives to perform commercially were dulled,

responsibilities for decisions and performance were diffused and conflicts of interest thrived.

Elements of reform

GBE reform has brought fundamental change. Reorientating these businesses to focus more clearly on commercial objectives has been a major thrust of reform.

Social responsibilities have increasingly been identified explicitly and funded by governments as Community Service Obligations (CSOs), thus allowing GBEs to focus more clearly and exclusively on commercial matters. Performance responsibilities have been clarified. Regulatory functions have been handed over to independent bodies.

Some of the main steps in GBE reform are shown in box A.3. The picture presented in this brief overview, however, does not capture the diversity of approaches adopted by different governments with different degrees of commitment at different times.

The scope and pace of reform varied widely across jurisdictions in the 1980s (box A.4). However, the emphasis tended to be first on administrative reforms — clarifying objectives, expectations and accountability; and imposing accounting standards and dividend requirements. The momentum of reform picked up in the 1990s in terms of depth and jurisdictional coverage. Clarification of responsibilities and separation of GBEs from the day-to-day influence of government became more formal through such avenues as corporatisation. More emphasis was placed on structural reform of vertically-integrated enterprises, enhancing competition in contestable areas and independent regulation in natural monopoly areas. Inter-jurisdictional cooperation was called upon to implement changes designed to bring about efficiency improvements and enhance competition on a national scale.

GBE reforms were designed to bring widespread changes to all aspects of their performance, from a financial and productivity point of view.

Box A.3 **Overview of GBE reforms**

There has been a diversity of approaches among governments to GBE reform. But the key elements have included the following.

Commercialisation reforms

GBEs have been given a much clearer and more exclusive focus on conducting business on commercial terms. This has involved such measures as:

- governments setting clear objectives for GBEs, specifying accounting standards and setting performance targets;
- pricing reforms to ensure that prices charged more accurately reflect costs of providing services (including an adequate rate of return);
- governments explicitly identifying and separately funding Community Service Obligations; and
- providing greater operational autonomy to GBEs through such measures as:
 - appointing a Board of Directors at some distance from government to govern operations;
 - corporatisation of GBEs; or
 - privatisation in some cases.

Competition, regulation and structural reform

Competitive pressures and regulation of GBEs have been enhanced by a number of measures:

- yardstick competition through the publication of performance indicators for similar GBEs in different jurisdictions;
- structural separation of vertically-integrated conglomerates to allow:
 - greater competition in contestable areas;
 - independent regulation of natural monopoly areas; and
 - better definition of responsibilities and accountability in different areas of service;
- removal of statutory protection of GBEs from competition (and similarly allowing GBEs greater freedom to operate in areas of choice on commercial grounds); and
- instituting competitive neutrality conditions on GBEs by, for example, requiring them to meet costs (including tax equivalent payments) that private-sector competitors would need to meet.

Management and performance incentives

In addition to clarifying the objectives that GBEs managers are to pursue and their responsibilities, governments have:

- freed GBEs from normal public service terms and conditions of employment to assist GBEs in attracting managers with greater commercial, private sector and overseas experience; and
- included performance incentives in managers' remuneration packages.

One of the intended benefits of GBE reform was to bring better resource allocation. Better investment decisions were a prime objective. As large capital-intensive operations, the investment decisions of GBEs potentially have major ramifications for resource allocation. A number of areas of GBE operation had been characterised by substantial overcapacity in the past. Excess capacity in electricity generation following the investment boom in the early 1980s was one example.

The greater commercial focus for GBEs under reform laid the foundation for better investment decisions. Governments began to interfere less in investment decisions. With GBEs freer to develop markets and with prices more accurately reflecting costs, investment decisions could be based more firmly on identified need and the prospects of achieving a commercial return. In some cases, pricing reform has constrained demand and forestalled the need for new investment (for example, new dam construction to meet unbridled water demand). And greater commercial focus has turned the attention of GBEs to effective asset maintenance strategies as a complement to asset replacement.

The greater commercial focus has also led GBEs to review their provision of unprofitable services, unless these are underwritten by CSO payments. In other words, resources are increasingly being allocated to services that meet either a commercial demand or an explicit social need.

The clearer commercial focus has focused the attention of GBEs on reducing costs. The possibilities for reducing capital costs, the major element of GBE operations, has been mentioned. Attention also has turned to reducing labour costs by reducing the excess manning levels that built up under the ‘employer-of-last-resort’ philosophy. Some functions and labour were effectively transferred to the private sector following the introduction of competitive tendering and contracting out.

More generally, management ‘slack’ or inefficiency could be reduced by the removal of conflicting objectives, the clarification of responsibilities and accountabilities, the setting of performance targets and the institution of performance-based pay incentives. Greater competitive pressure meant that managers had to ensure genuine improvement in productivity in order to meet performance expectations.

Reform also heralded changes in organisational structures to promote greater customer focus, specialisation, economies of scale and scope, flexibility, and better utilisation of infrastructure.

Box A.4 Some key developments in GBE reform

- 1983 Accounting guidelines for Commonwealth GBEs
 Dividend requirements for Victoria GBEs
 Review of accountability in Queensland GBEs
 Rationalisation of Queensland electricity industry
- 1986 GBE policy and financial reporting in Victoria
- 1987 Policy guidelines for Commonwealth GBEs
 Administrative arrangements spelt out for Queensland GBEs
 Decision to terminate domestic two-airline policy
- 1988 Policy framework for NSW GBEs
 Announcement of increased competition and partial deregulation in
 telecommunications
- 1989 Umbrella legislation on corporatisation in NSW
- 1990 Umbrella legislation on corporatisation in ACT
 Policy guidelines in WA
 Umbrella legislation on financial management in Tasmania
 Special Premiers Conference agrees to a national electricity market
 Port pricing reforms begin in NSW (other States in later years)
- 1991 Commonwealth National Gas Strategy announced. Pricing reforms and
 restructuring commence in States.
 Pricing and institutional reforms in water
- 1992 Policy guidelines on corporatisation in Queensland
 Umbrella legislation on corporatisation in Victoria
 Policy statement in WA
 Government Pricing Tribunal established in NSW
 Barriers between domestic and international air markets removed
- 1993 Administrative guidelines for Commonwealth GBEs
 Electricity reform legislation in Victoria
- 1994 Umbrella legislation on corporatisation in Queensland
 Commonwealth umbrella legislation
 COAG agreement on national monitoring of performance of GBEs
- 1995 Competition Principles Agreement between governments includes provision for
 structural reform of public monopolies, competitive neutrality, prices oversight of
 GBE, access regimes to essential infrastructure and programs of review of anti-
 competitive legislation.
- 1997 Full competition in telecommunications. Sale of spectrum. Part sale of Telstra.

Sources: IC (1994), appendix D and IC (1998a).

B A framework of productivity determinants

The economics literature on the sources of productivity growth is very extensive. And there is a tendency for analysts to go into depth in particular areas rather than provide broad overview of all the major factors.

This appendix attempts:

- to indicate the major determinants of productivity growth as identified in the economics literature; and
- to organise the identified determinants into a framework that shows how they relate to each other.

The appendix does not attempt to provide a comprehensive review of the extensive literature or to do justice to the variety, complexity and thoroughness of research that has been undertaken. All that is required for the current purpose is an appreciation of the major productivity-enhancing factors that emerge from the literature and how they interrelate.

B.1 Background on the literature

Growth theory provides the foundation for studying productivity (boxB.1). Productivity growth is seen as a major engine of (output) growth and is therefore of major interest in understanding the factors that determine growth.

Box B.1 **Methods of analysis of growth and productivity**

Productivity growth is normally considered as part of an analysis of economic (that is, output) growth. Output growth is a function of growth in inputs and growth in the efficiency with which inputs are transformed into outputs. The study of productivity is therefore part of a study of relationships and interrelationships between inputs and output.

Four main approaches are used to analyse growth and productivity.

Theoretical approaches

The diversity in mechanisms and complexity in relationships governing productivity and growth has meant that theoretical analysis has proceeded at two levels.

General theorising on growth has explored different aspects of the puzzle. Individual studies abstract from a number of relationships to focus on what the analyst considers to be important. Collectively, studies have improved understanding of the diversity and complexity of relationships which drive productivity and growth. Theories are usually expressed in words. A prime motivation in this type of work has been to explain what has been observed in individual countries and what underlies differences in productivity and economic growth between countries.

Formal growth theory involves explicit expression of relationships in mathematical form. The factors included in formal models are drawn from a theoretical view of the more important determinants. Assumptions are made and constraints imposed to ensure the models remain internally consistent and stable in their predictions through time. The models may have some difficulty in explaining more than the broad sweep of experience but they are less likely to have logical gaps and flaws.

Nelson (1997) refers to the more general approach as ‘appreciative’ theorising and captured the essential difference between the two approaches as this:

If the hallmark of appreciative theory is storytelling that is close to the empirical details, the hallmark of formal theorising is an abstract structure set up to enable one to explore, find, and check proposed logical connections. (p. 34)

Empirical approaches

Growth accounting is based on an application of the neoclassical model. Growth in output is accounted for in terms of the growth in inputs and the unexplained residual is ascribed to productivity growth. (This also provides the basis for the measurement of productivity growth, for example by the ABS in estimating productivity performance in the Australian economy). Growth accounting thus allows estimation of the size of the contribution of productivity to output growth. Greater precision in the estimation of the amount of productivity growth has been developed by better specifying inputs into production. Some studies have attempted to drive the unexplained residual to zero and, in making this attempt, have taken separate account of some productivity-enhancing factors (for example, human capital improvements).

(Continued on next page)

Box B.1 (Continued)

Econometric evaluation involves a statistical investigation of the strength of relationships suggested in growth theory — explanations of growth, average income or productivity. An evaluation of productivity requires some measure of productivity to be explained, such as a partial or multifactor productivity indicator, or a measure of technology, such as patent applications or acceptances.

There are several approaches in the literature to studying output and productivity growth (box B.1). Perhaps the most prominent stream of work is formal growth theory and associated modelling. It is well known that, within formal growth theory, there is a distinction between the traditional or neoclassical approach and the ‘new growth theory’ approach (box B.2).

However, formal growth theory, be it neoclassical or new, has some limitations when it comes to the identification of possible influences on productivity growth. Certain assumptions are required in formal growth theory work to satisfy conditions for logical consistency and equilibrium (and therefore stability in the predictions of the model). These conditions impose some restrictions on the numbers and types of factors that can be readily incorporated into formal models.

More general theoretical work outside of the formal models is freer from these restrictions and therefore gives rise to the identification of a wider range of factors. Indeed, this more general approach can be thought of as laying a foundation for both formal theoretical work and empirical work.

As an illustration, a number of analysts have pointed out, if not complained, that the factors that have been brought out in ‘new’ growth theory (for example, the importance of R&D and development of human capital) were established independently decades before the advent of new growth theory (Griliches 1998; Nelson 1997). It is not the identification of determinants that is new. It is their incorporation in formal growth models that is new.

Whilst the general theorising establishes greater variety of determinants, formal theory and modelling provides greater rigour and logical checks (box B.1).

Differences can emerge in the literature on the specifics of which broad determinants are the more important or exert more leverage on productivity growth. Partly, this is due to a lack of consensus on some features of the theoretical framework. And, partly, it is due to the inability of the empirics to provide unambiguous support for specific propositions.

Empirical work on the specifics can be confounded by practical limitations that come from deficiencies in data and difficulties in discriminating between alternative explanations for observed phenomena. For example, the ability to assess important factors like investments in human capital through education is severely hampered by the adequacy of data, especially in cross-country comparisons. As Griliches (1998, p. 8) noted:

Knowledge and knowledge generation is indeed the major source of productivity growth in the long run. But our ability to describe and quantify its flows is still quite rudimentary.

Empirical support for some deep-seated social and institutional factors tends to be more limited. This does not necessarily disprove the validity or importance of the connections being made. It reflects the even greater difficulty in mobilising accurate data and providing unambiguous explanations in empirical work. Some major institutional influences (such as governments, unions and education bodies) may be important but difficult or impossible to capture in a meaningful and measureable way.

In taking guidance from the literature, it also needs to be acknowledged that the importance of productivity determinants varies between place and time. In particular, the factors that drive productivity growth in a productivity-leading country such as the United States may not be as relevant in a productivity-following country such as Australia or vice-versa. There is a difference in emphasis (and driving factors) between generating new technologies in the US case and incorporating available overseas technologies in the Australian case (Rogers 1997).

Finally, it should be evident from the discussion which follows, but it should also be stressed, that the determinants do not operate in isolation. They can be highly interdependent or even conditional.

Box B.2 **The analysis of productivity in formal growth theory**

Formal analysis of productivity and growth has proceeded in two major streams, neoclassical growth theory and new growth theory.

Traditional, *neoclassical growth theory* relates inputs of labour and capital to output and treats productivity growth as exogenous (determined by factors outside of production decisions and activities). The model focuses on investment in capital as an 'engine' of growth. It also recognises productivity as an engine of growth and, empirically as the most quantitatively significant explanation of output growth. However, the model does not provide an explanation of what causes productivity growth. Productivity growth is attributed to exogenous technological change, but that technological change just 'happens'. It is not influenced (in the model) by economic incentives and constraints.

Further refinements and applications of the neoclassical model have deepened understanding of the factors affecting growth. The model has provided an indication of the quantitative significance of productivity growth. But beyond the broad and the theoretical, it has provided limited insight into the determinants of productivity growth.

A major departure from the neoclassical approach has come with what is commonly referred to as *new growth theory*. In broad terms, studies within this school of thought provide some explanation as to how productivity growth and technological change come about.

In this approach, productivity growth is endogenous — that is, determined as part of production decisions. Accumulation of knowledge is the key. Knowledge lies in the human capital of people and in the technology embodied in equipment. The accumulation of knowledge is seen as speeding up the rate at which technologies are spread, developed and adapted. Investments in developing the skills of people raises their productivity and raises the knowledge base that assists the development and application of technological change. Investments in capital equipment are seen to create knowledge 'spillovers', as skilled personnel seek to understand and improve on technologies embodied in capital equipment.

The new growth stream of studies thus emphasise investments in capital equipment, education and training and R&D as explanators of productivity growth. But it must also be said that there is not clear agreement on which of these factors is more important or whether different types of these investments are more important than others (IC 1993, appendix B).

B.2 Broad sources of productivity improvement

Technological advance is widely known to be a central factor behind productivity improvement and sustained economic growth over the long term. Technological advance brings new and improved products and new and improved ways to produce

goods and services; and thereby provides opportunities to produce more output from available inputs.

There have been major examples of productivity gains through technological advance. The Industrial Revolution from the 1760s brought the widespread use of machinery into production processes. Improvements in technology, management and organisation from the late 1800s brought economies of scale associated with techniques of mass production. Some believe that the current period of information-based change, though posing something of a ‘paradox’ in view of the slower productivity growth in developed economies from the 1970s, will nevertheless turn out to produce a further period of substantial productivity gain.

Technological advance encompasses the invention of ideas, innovation (bringing ideas into the realm of commercial viability) and diffusion (actual application in production processes). For some countries (at least in some fields), homegrown invention and innovation are the main vehicles for improvements in productivity. In less technologically advanced countries, technology transfer from overseas provides a major source of productivity improvement.

But productivity improvement does not only come about through shifts in the frontiers of technology. Productivity can also be improved within the frontiers of existing knowledge if economies are not operating as efficiently as they could be. There may be failures in the operations of markets and in the interventions of governments which prevent the achievement of possible efficiency improvements. In such circumstances and as outlined in the chapter 2, it may be possible to improve productivity by such avenues as enhancing allocative efficiency, removing barriers to the adoption of more efficient technologies, management practices and work arrangements (improving technical efficiency) and providing incentives to seek out and capabilities to provide productivity improvements over time (improving dynamic efficiency).

Even without market and policy failures, formal and informal institutions which govern the way people and organisations interact in societies can affect productivity performance. For example, North (1989) claims that developments in institutions over the very long term have reduced the costs of transacting in economic life (leading to gains from exchange) to such an extent that they have produced productivity gains to rival those of technological advance. More is said on institutions later in this appendix.

There are other possible sources which depend in part on how productivity is defined and measured. A prime example is the accumulation of human capital through education and training. (In some productivity analyses, it is separately accounted for as part of input growth — see box B.3). Changes in the industry

composition of the economy may also be relevant in explaining observed changes in aggregate productivity.¹ For example, it is sometimes suggested that the growth in lower-productivity services may be a factor reducing growth in aggregate productivity.

B.3 An outline of productivity determinants

Many different factors affecting productivity have been examined in the literature in areas of particular interest to different analysts. Some analysts concentrate on the most immediate and direct connections, for example, between technological advance and productivity growth. Other analysts, particularly those with an interest in history and explaining the wide dispersion in the prosperity of nations, emphasise the importance of fundamental policy and institutional factors which govern the extent to which firms and individuals engage in productive activity and search for productivity improvements.

A very broad framework is used here to organise the major factors that have been analysed in the economics literature. A distinction between ‘immediate’, ‘underlying’ and ‘fundamental’ factors is used to group major factors. Immediate causes are those with a direct and tangible link to input/output relationships. Underlying factors have an indirect effect on productivity through their influence on immediate causes. Fundamental factors are the deep-seated policy and institutional influences which affect productivity generally and indirectly.

To illustrate, technological change may be the immediate factor in bringing about a productivity improvement. But what caused the technological change? The answer may include R&D. What were the factors that prompted a firm to undertake R&D? What to lead to those factors? And so on. Progressively asking these questions leads to underlying and fundamental factors.

¹ Change in industry composition is a more prominent issue if productivity is defined in terms of labour productivity. Labour productivity varies between industries, just as labour intensity varies between industries. As different industries grow and decline, average labour productivity will rise or fall. Of course, changes in industry composition should be consistent with allocative efficiency and should not be engineered solely to improve aggregate productivity performance.

Box B.3 **Productivity, output and quality improvements**

Productivity growth is often thought of and calculated as a residual once growth in inputs is subtracted from growth in output (box B.1). Consequently, what remains in the productivity residual depends in part on how inputs are defined.

In many growth models, productivity is formulated as disembodied technical change. Embodied quality improvements in inputs are captured as augmentation of 'raw' labour input (quantity of employees or hours of work) and of capital input (or different vintages of capital are incorporated to reflect technological improvements).

It is not so straightforward in practice. The approach adopted by the ABS and many others in calculating productivity estimates means:

- improvements in human capital are not measured but are effectively treated as 'disembodied' improvements — not as augmentation of the labour input — and their influence is therefore reflected in the productivity estimates; and
- depending on the accuracy of allowances for quality improvements, some embodied improvements in capital are accounted for in the input measures and some embodied improvements are not.

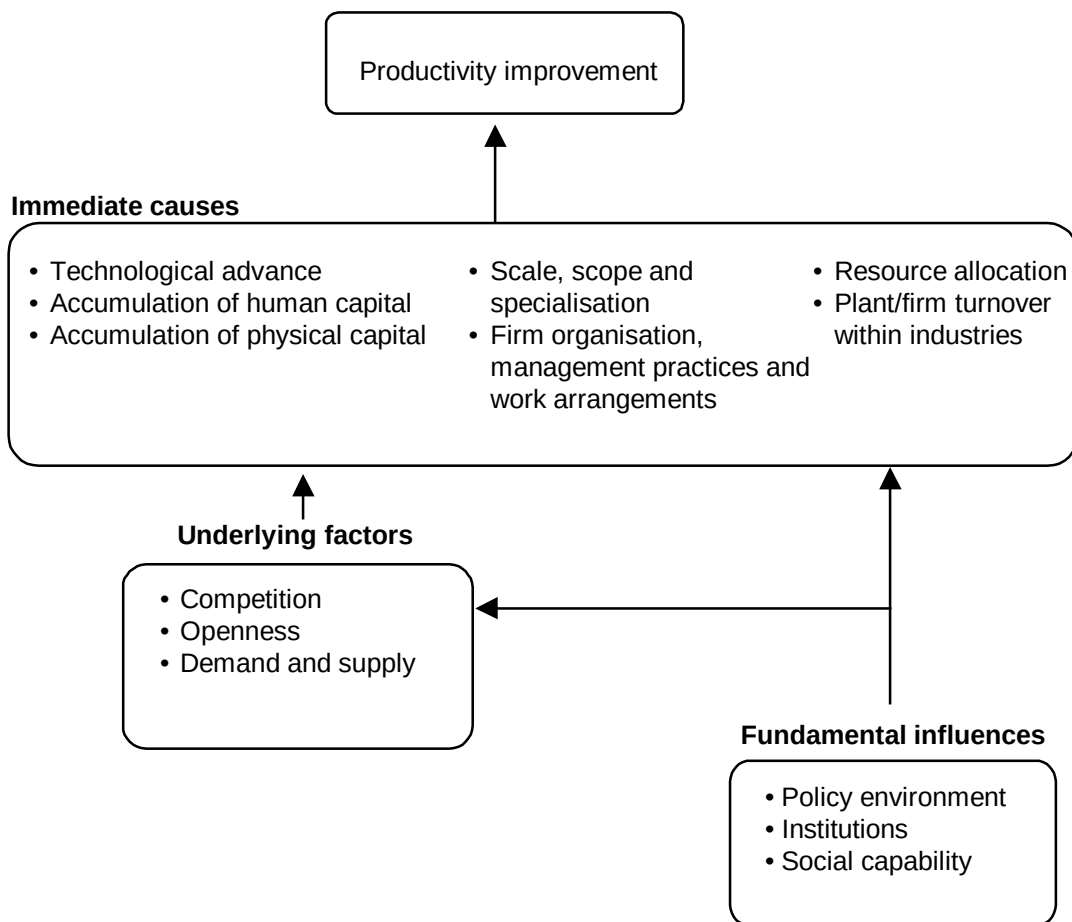
For this reason, not all technological change is reflected in multifactor productivity (MFP) measures (see chapter 4).

It also matters whether labour productivity or multifactor productivity is the concept of productivity being measured. The accumulation of physical capital is more directly relevant to an explanation of labour productivity than MFP. In the labour productivity context, labour is the only input and so the effects of capital accumulation on output are reflected in the productivity residual. In the MFP context, accumulation of capital is included in inputs and are only related to the MFP residual if there are embodied technical changes and spillover effects that are not explicitly accounted for in the measurement of capital inputs.

As will be seen, the distinction between these groupings is important in highlighting the potentially important influences on productivity growth over the long term. Immediate factors may be necessary to bring about substantial productivity improvement, but they may not be sufficient. It may ultimately require changes in the fundamental policy and institutional factors to drive changes in underlying and immediate factors. These kinds of changes may take a number of years to bring about and take full effect.

An overview diagram is included as figure B.1. The discussion which follows mentions the immediate factors briefly, as they are relatively well known, and dwells more on the underlying and fundamental factors.

Figure B.1 **An overview of major productivity determinants**



The diagram also illustrates the main paths by which policy reforms influence productivity. By altering policies and institutions, reforms have influence on productivity through underlying factors and immediate causes. Improvements in economic efficiency do not appear separately in the figure as they operate through determinants such as those listed.

Immediate causes

Immediate causes are the factors which have close and tangible links to productivity and growth. They are the factors which have direct links to input/output relationships in production.

Technology and human capital have been mentioned above. A lot of modern interest within the productivity and growth literature is in exploring the influence of and interrelationships between technology, accumulation of human and physical capital and R&D.

Accumulation of physical capital has direct relevance to labour productivity rather than multifactor productivity. Accumulation of physical capital raises the capital/labour ratio (all other things equal), and this increases labour productivity (see chapter 3). In MFP calculations, accumulation of physical capital is included as an input. Effects on productivity come indirectly through spillovers, for example, in research and development.

Other immediate determinants listed in figure B.1 are:

- economies of scale and scope and gains from specialisation;
- advances in theories and practice of firm organisation, management and work arrangements (for example, lean production techniques which ultimately involve complete and continuous review of production systems, supply arrangements, inventory management, quality assurance, team-based work and so on);
- resource allocation (to reflect the influence of changes in industry structure, as mentioned above); and
- firm/plant turnover.

These factors are well known, although the firm/plant turnover may require some explanation. Different plants or establishments within firms can vary in terms of technologies employed, age of equipment, access to inputs and markets and so on. Firms within an industry can vary widely in terms of the production processes they employ, the markets they serve, the risks they take and so on. Average productivity in an industry can therefore vary depending on the growth and decline of different firms and the entry of ‘greenfields’ plants or the exit of ‘unproductive’ plants. The turnover of firms and plants can rise or fall as demand patterns change or costs of vital inputs change.

There are further interrelationships among the immediate causes. For example, firm organisation is important for the development and application of technology, specialisation and economies of scale.

Underlying factors

Underlying factors have an indirect effect on productivity through their influences on a number of the immediate causes. Three are mentioned here:

- competition
- openness
- demand and supply conditions.

Competition

It is argued that competition, whether it comes from other firms at home or from imports, can provide incentives to implement many factors that promote productivity growth (for example, Porter 1990). It can provide incentives to adopt latest technologies and to innovate in order to gain some product or price advantage over competitors; and to adopt best practice if that is not already in place. Competition can put some pressure on firms and industries to rationalise, retire less productive operations and to modernise. It can provide incentives for firms to develop new markets which may bring gains from specialisation, economies of scale and the spreading of risks.

There are, of course, counterarguments. One stream is that competition is not necessary to achieve good performance as owners of monopolistic firms would be keen to ensure healthy profit making to prevent 'slack' among managers and workers. This has led to considerable analysis of principal-agent issues and the effects of performance-based incentive schemes. The analytical work on this issue tends to favour a positive relationship between competition and performance, for example, as competition in product markets may raise the sensitivity of profits to the actions of managers (Nickell 1996).

The major counterargument, however, concerns the influence of competition on innovation. Indeed, this is one of the major arguments mounted against the view that microeconomic reforms have positive effects on productivity. Some argue from the 'Schumpeterian tradition' that greater competition stifles innovation. However, as discussed in chapter 4, there is little empirical support for this view and it does not appear to have strong relevance to an economy such as Australia's that is mainly dependent on technologies developed elsewhere.

Nickell (1996) surveyed the literature on the relationship between competition and productivity performance. While finding some theoretical arguments and empirical evidence in favour of a positive relationship, his judgment was that the weight of argument and evidence from the literature was not overwhelming. His own empirical work, however, came out in strong support of a positive relationship. He found market power is associated with lower levels of productivity and that competition is associated with higher rates of productivity growth.

Openness

The openness of an economy to trade and investment is considered, both from a theoretical and empirical point of view, to be a potentially major influence on

productivity determinants. Apart from the competitive element, the following mechanisms may come into play.

- Inward direct foreign investment often brings with it technology (often protected by intellectual property rights), production methods and human expertise.
- Imports of final products, intermediate goods (for use in local production processes), and capital equipment can have technology embodied within them that would not otherwise be available.
- Intra-industry trade leads to specialisation between countries in production of goods and services to which they are better suited and more productive.
- Development of foreign markets through trade and outward foreign investment can provide access to ideas and trends and can bring the volume of sales that can assist with the exploitation of economies of scale.

Katz (1998) reported a comparison between open and closed economies. Of 11 open and poor economies in 1970, 8 were not poor in 1989. On the other hand, of 24 closed and poor economies in 1970, 21 were still poor in 1989.

Sachs and Warner (1995) developed a measure of openness for a cross-country study of growth. They found a country's openness to capital flows and technology transfer to be important in explaining international convergence in incomes. In a later study (Sachs and Warner 1997), they provided an illustrative comparison from their results that a closed economy takes 37 years to close the gap between current and steady-state income, whereas an open economy takes 17 years.

Taylor (1996) found openness to be a major factor in explaining growth differences between countries. For example, he found low distortions in the currency system, in imported goods and especially in capital goods explained many of the higher rates of growth in Asia-Pacific economies.

Ergas and Wright (1994) found a positive relationship between trade liberalisation and the performance of Australian firms. The mechanisms they suggested were at work were:

- international exposure encourages greater learning as Australian firms come into contact with and measure themselves against a broader range of rivals, focus on improving quality and customer satisfaction and learn from customers and suppliers;
- the greater pressure to tackle inherited inefficiencies such as constraining industrial relations arrangements; and
- greater selection between firms, as weaker firms are forced to adjust or decline.

Demand and supply conditions

Other underlying factors also have a pervasive effect on productivity determinants through what might be termed demand and supply conditions. The strength and pattern of demand for goods and services, factor endowments, demography and prices can affect the accumulation of human capital, the merits of different production methods and the merits of adopting and developing new technologies. They can affect the opportunities to reap economies of scale and the turnover of plants and firms.

Macroeconomic stability also affects productivity performance in the short run. Productivity growth tends to accelerate as the economy recovers from a cyclical downturn and decelerate as the economy ‘overheats’.

Fundamental influences

Fundamental influences are basic factors which condition the productive potential of a nation and the extent to which it realises that potential over time. Three areas are often mentioned in this context: government policy, institutions and what is referred to as ‘social capability’. They are interrelated and overlap.

Policy direction and policy stability are considered important in creating conditions conducive to productivity growth. Government policies can increase the emphasis they give to economic objectives, as well as assist in developing capabilities in areas which promote productivity growth (for example, education and training; and science and innovation). Policy stability can help create a more certain environment in which to make long-term investment decisions that promote productivity growth. Clear policy direction and stability, combined with good policy-formulation processes, can limit the extent of ‘rent seeking’ (the diversion of energy and talent from promoting productivity to the lobbying of governments in order to gain from favourable policy treatment).

Institutions govern the way in which human and economic interaction takes place. They are sometimes referred to as the ‘rules of the game’ and can be formal (laws, constitutions) or informal (customs, traditions, codes of conduct). From an economic point of view, institutions affect performance by governing interactions between governments, firms and individuals and thereby affecting the costs of obtaining coordination and cooperation in economic activities. They affect, amongst other things, the costs of production and exchange and shape incentives to be productive. Some illustrative examples of institutions are corporations law (including its governance, behavioural and disclosure requirements), wage-

determination systems, science technology and innovation systems and education and training systems.

Social capability is a general concept which refers broadly to the economic capabilities of a nation and the orientation of its people toward achieving further economic development. The concept is not well defined, but is used in historical and comparative studies of nations to cater for factors which, though intangible, seem important in explaining differences in performance. It can cover the technical capabilities of nations to embrace modern production techniques, the ability of communities to cope with change and their cultural values; all of which affect their priorities and degree of common purpose, cooperation and enthusiasm toward economic achievement.

Obtaining empirical verification for these fundamental factors is generally more problematic, given the difficulties in measurement. Nevertheless, in attempting to explain differences in the wealth of nations, studies such as Sachs and Warner (1995) and Hall and Jones (1996, 1999) have pointed to the importance of policy (openness to trade, rule of law), quality of institutions as well as factors such as geography, resource endowments and human capital.

Interrelationships between determinants

The above outline underplays the complexity of relationships among the factors that influence productivity growth. None of the determinants mentioned works in isolation. Some of the interrelationships have been mentioned. But some determinants cannot work in isolation from the joint contribution of others. For example, recent analytical contributions in the literature emphasise the jointness of investments in physical capital, human capital and R&D.

Some factors may even require the complementary influence of other factors in order to take major effect. In other words, to get a substantial productivity outcome, it may not be sufficient to rely on some factors alone.

Underlying factors are potentially important in this regard. A change in firm organisation, a change in management practice, or adoption and development of new technologies might not happen without the incentive of competition. Access to technologies and management expertise may not be possible without openness to trade and investment.

Box B.4 Vocational education and training and productivity

Britain's National Institute of Economic and Social Research found productivity to be much lower in British production plants compared with carefully matched counterparts on the Continent — even in relatively simple operations.

The study attributed much of the explanation to systemic differences in vocational education and training. Qualifications and training levels were generally lower in Britain. There was less emphasis on formal training and more on on-the-job training. The more complex the work, the greater was the gap in skills development.

Deficiencies in skill development meant that British firms had difficulty not only in getting the best out of existing production facilities but also in introducing more effective responses to the increased competition coming from outside the European Union.

For example, lower diagnostic and repair skills among British maintenance teams meant:

- higher rates of machinery breakdown (and greater reluctance to undertake preventative maintenance);
- greater reluctance to automate ancillary devices such as equipment for auto-feeding to, off-loading from and transfer between machines, since more automation meant that there was more to go wrong; and
- greater reluctance to select technically advanced machinery.

The skill gap also meant that, even where advances in machinery were selected, their introduction tended to be postponed until equipment was running smoothly elsewhere. There was less ability to adapt machinery to specific product and process requirements.

Greater technical skills among operators meant lower error rates, greater flexibility to attend to a range of tasks and less time required to accommodate production changes. For example, a style change in clothing manufacture required several weeks to accommodate in Britain (including demonstrations from supervisors), whereas production could return to normal in 2-3 days in Germany (with operators working off technical sketches). The inability on the part of the British to accommodate production changes quickly and easily also militated against the introduction of more advanced, flexible production systems.

The development of technical skills was therefore found to be at the heart of less sophistication in products and processes in Britain (even though age of equipment was slightly younger on average). British firms concentrated on long production runs in the more standardised, but more competitive, products.

The Continental firms responded to a more competitive world by producing a greater range of specialised variants in smaller batches to meet the requirements of individual customers without cost penalty. While they were able to make confident expansion plans, many British firms were beset with declining employment and worries about survival.

Source: Prais (1995).

Fundamental factors may be important in not only creating competitive and open conditions; but also in shaping the ‘drive’ for economic achievement and the ability to succeed. The European post-war experience (described in chapter 4) provides an illustration of the importance and social and institutional changes that gave certain European countries the social acceptance and sense of purpose to participate in more rapid catch-up.

As a further example, institutional differences in the development of vocational skills were found to be at the core of the productivity differences in comparative studies of British and matched firms on the Continent over the 1980s and early 1990s. British and Continental manufacturers adopted quite different strategies in response to increased competition from outside the European Union. Continental firms tended to move into more differentiated products made with more advanced techniques, whereas British firms tended to continue with the production of standardised products. Prais (1995) attributed much of the difference in strategy, as well as general productivity performance, to differences in the technical capabilities of the workforce which, in turn, went back to the nature and quality of the vocational education and training systems in the different countries (box B.4).

C Australian trends in productivity determinants

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This appendix reviews a range of indicators of the determinants of productivity improvement.

The productivity determinants are identified in the framework set out in appendix B. This appendix mostly covers the immediate causes of improved productivity identified in that framework, because many of the underlying factors and fundamental influences are not easily quantified¹. The omission of some of the determinants identified in the framework should not be taken as implying that these factors have not contributed to Australia's improved productivity performance. Rather, it simply reflects a lack of readily available data with which to analyse recent trends.

The review of indicators is not intended to be comprehensive or in-depth. The intention is simply to assemble some readily available data and the results of relevant studies.

C.1 Technological advance

As outlined in appendix B, technological advance is an important immediate determinant of improved productivity. Technological advance brings new and improved products and new and improved ways to produce goods and services; and thereby provides opportunities to produce more output from available inputs.

Australia relies heavily on imported intermediate and capital inputs as a source of new technology. However, there is evidence Australia has been slow in taking up new technologies from overseas.

This section assembles indicators of the diffusion of new technology, technological innovation, industrial property rights, Australia's technological balance of payments and research and development. The indicators suggest that over the 1980s and 1990s there has been increased use of advanced technologies in Australia and greater business involvement in innovation and formal R&D activity.

Diffusion of new technology

While technological advance is a major determinant of productivity growth, the diffusion of new technology can take considerable time and its impact on

¹ This appendix does not cover the following determinants because of a lack of quantitative evidence: plant/firm turnover within industries; demand and supply; institutions; and social capability.

productivity may depend on a critical mass of applications (Landes 1998; David 1990).

The indicators surveyed here confirm the impression of substantial technological change having occurred in the Australian economy over the last decade, especially in the manufacturing sector.² Diffusion is lagging in the small business sector compared with medium and large businesses but it is the latter that contribute the greater part of total turnover.

Spread of new technology

One of the changes surveyed in the Australian Workplace Industrial Relations Survey (AWIRS) is the introduction of major new office technology and major new plant, machinery and equipment; but not including routine replacement.

Although the survey results are not strictly comparable, there does appear to have been an increase in the introduction of new technology between 1989-90 and 1995. In the two years prior to 1989-90, 34 per cent of all workplaces were affected by the introduction of new technology. In the two years prior to 1995, 47 per cent of all workplaces were affected by the introduction of new office technology and 28 per cent by the introduction of new plant, machinery or equipment.

In the two years prior to 1995, 48 per cent of Manufacturing workplaces and 41 per cent of Mining workplaces were affected by the introduction of major new plant, machinery or equipment. Major new office technology was a very significant source of change in the Electricity, gas & water (50 per cent of workplaces), Finance & insurance (57 per cent), Property & business services (58 per cent), Government administration (61 per cent) and Education (69 per cent).

² Data on the diffusion of new technology in Australia is available from the Australian Workplace Industrial Relations Survey (AWIRS) and the ABS. AWIRS is a large scale survey of features of workplaces with a minimum of twenty employees and changes affecting them across all sectors of the economy. Two surveys have been completed, one in 1989-90 (Callus et al. 1991) and the other in 1995 (Morehead et al. 1997). The ABS collects data on the use of computers by all businesses, use of advanced technologies in the manufacturing and mining sectors and technological innovation in the manufacturing and mining sectors. Advanced technologies in manufacturing include computer aided design and/or engineering, standalone numerically controlled/computer numerically controlled machines and programmable logic controllers. Advanced technologies in mining relate to exploration, mining or extraction, mineral and energy processing, engineering and environmental technologies. Technological innovation includes technologically new products and processes and significant technological improvements in products and processes.

Adoption of information technology (IT) is a major feature of technological advance. Over 60 per cent of Australian businesses use computers. Between June 1994 and June 1997 the proportion of businesses using computers increased from 49 to 63 per cent (table C.1).

Much of the expansion in computer use has been due to its expansion in the small business sector, from 46 per cent in June 1994 to 60 per cent in June 1997. However, large businesses are still more likely to have computers than small businesses. Nearly all businesses employing 50 or more persons had computers and 93 per cent of business employing 20–49 persons had computers in June 1997.

Table C.1 Proportion of business using computers, June 1994 and June 1997
Per cent

<i>Employment size group</i>	<i>1994</i>	<i>1997</i>
1–19	46	60
20–49	86	93
50–99	95	99
100 +	99	99
Total	49	63

Source: ABS 8129.0, unpublished data for 1997.

Use of advanced technologies

Manufacturing sector

ABS surveys (ABS 8116.0) indicate that the use of advanced manufacturing technologies increased among Manufacturing establishments between 1988 and 1997. Table C.2 shows that the proportion of Manufacturing businesses³ with a minimum of 10 employees using advanced technologies increased from 33 per cent in 1988 to 44 per cent in 1997. Much of the expansion occurred between 1988 and 1991.

The increased use of advanced technologies was most notable for Manufacturing businesses with less than 50 employees. For example, the proportion of businesses with 10–19 employees using advanced technologies nearly doubled from 17 to 32 per cent.

³ The figures for 1988 and 1991 are not strictly comparable with those for 1997 because the earlier surveys were based on establishments and the later survey was of management units (primarily legal entities).

Table C.2 also indicates a strong relationship between the employment size of an establishment and the acquisition of advanced technology. Over 75 per cent of businesses with 100–199 employees in June 1997 and 84 per cent of businesses with 200 or more employees had acquired at least one advanced manufacturing technology.

Table C.2 Proportion of Manufacturing businesses with advanced manufacturing technology by employment size
Per cent

<i>Number of employees</i>	<i>1988</i>	<i>1991</i>	<i>1996-97</i>	<i>Expected by 1998-99</i>
Less than 10	na	na	17	29
10–19	17	26	32	46
20–49	31	42	53	62
50–99	46	61	53	78
100–199	67	77	76	83
More than 200	82	88	84	90
Total manufacturing (10+ employees)	33	41	44	57

na Not available.

Source: ABS 8116.0.

Within the manufacturing sector, all industries surveyed in 1997 were expecting significant increases in the proportion of businesses procuring advanced technology by June 1999.

In June 1997, Machinery & equipment, Petroleum & chemical products and Non-metallic minerals had the highest proportions of establishments using advanced technologies (table C.3). Food, beverages & tobacco, Textiles, clothing & footwear (TCF), Metal products and Other manufacturing had the lowest proportions of establishments using advanced technologies.

The increase in use of advanced technologies between 1988 and 1997 was most rapid in Wood & paper products & printing & publishing, Textiles, clothing & footwear, and Petroleum & chemical products.

Table C.3 Proportion of businesses with 10 or more employees with advanced manufacturing technology, by industry, 1988, 1991, 1996-97 and expected by 1998-99

Per cent

<i>Industry subdivision</i>	<i>1988</i>	<i>1991</i>	<i>1996-97</i>	<i>Expected by 1998-99</i>
Food, beverage & tobacco	28	32	30	46
Textiles, clothing & footwear	20	30	36	46
Wood & paper products & printing & publishing	22	29	40	53
Petroleum & chemical products	43	44	58	67
Non-metallic minerals	41	47	46	61
Metal products	34	48	38	56
Machinery & equipment	54	61	61	72
Other manufacturing	34	44	38	51
All manufacturing	33	41	44	57

Source: ABS unpublished data.

A large expansion in the proportion of businesses using advanced technology occurred in Metal products between 1988 and 1991 but was largely reversed in the period to June 1997.

Mining sector

Some 48 per cent of Mining businesses had acquired at least one of the advanced mining technologies as of 30 June 1997 (ABS 8121.0). Of the businesses which had undertaken technological innovation between 1994 and 1997, approximately three-quarters had acquired at least one of the advanced technologies.

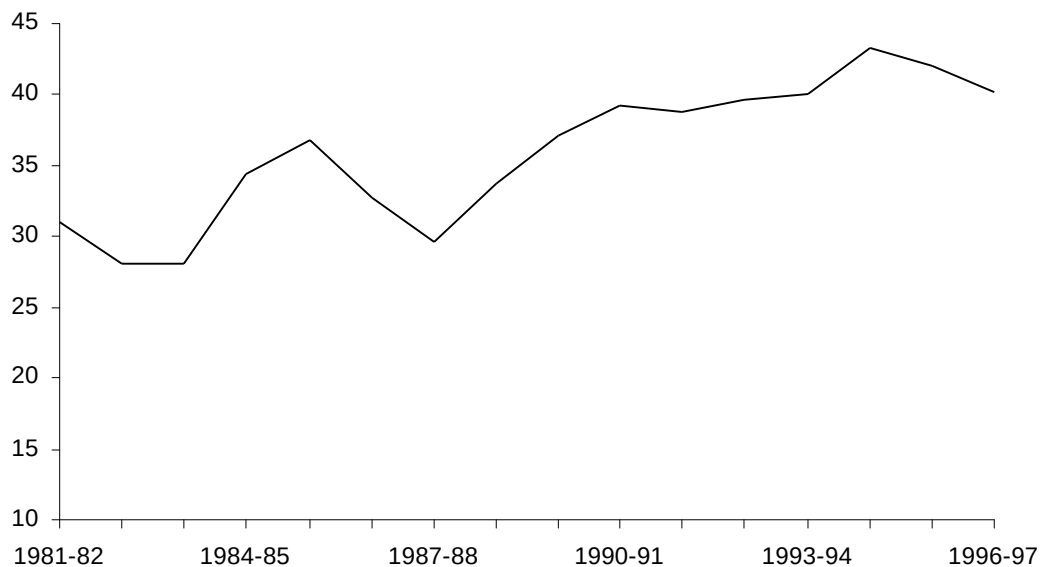
Sources of new technology

New technological knowledge embodied in machines and equipment diffuses among domestic users either by local purchases of Australian-made capital or by local purchases of capital goods produced abroad. The Australian capital goods sector is relatively small and local producers depend heavily upon imported equipment to gain access to new technology.

Sourcing of capital goods from imports has increased. Imports of capital goods as a percentage of total capital goods expenditure has increased from around 30 per cent in the early 1980s to over 40 per cent in the 1990s (figure C.1).

**Figure C.1 Proportion of equipment expenditure sourced from imports
1981-82 to 1996-97**

Per cent



Source: Commission estimates based on ABS Time Series Statistics Plus and National Accounts databases on EconData.

The initial expansion of capital imports in the mid-1980s was largely the result of increased imports of civil aircraft and machinery and industrial equipment. After 1991-92 there was a large decrease in imports of civil aircraft. However, this was offset by significant increases in imports of machinery and industrial equipment and steady growth in imports of ADP and telecoms equipment.

The ratio of payments for overseas technology to GDP has been stagnant since the mid-1980s (Rogers 1997).

Technological innovation

Technological innovation refers to the introduction of new or substantially changed methods of producing goods and services—and often results in qualitative improvements in the goods and services produced (IC 1995c). The published data on technological innovation is confined to the manufacturing and mining sectors.

Improving productivity was frequently identified as one of the most important objectives when undertaking technological innovation. Nearly 90 per cent of firms responding to an ABS survey (ABS 8116.0) rated this as an important objective.

Between 1994 and 1997, the proportion of Manufacturing businesses undertaking technological innovation declined from 32 to 26 per cent (table C.4). Part of the decline may be due to improved coverage of the business register of the ABS, especially in relation to small businesses which are less likely than larger businesses to undertake technological innovation.

A higher proportion of large businesses have undertaken technological innovation than small businesses. Between 30 June 1994 and 30 June 1997, 89 per cent of Manufacturing businesses with employment of 500 or more and 71 per cent of business with 100–499 employees implemented technological innovation compared with 19 per cent of businesses with employment of less than 10 and 43 per cent for businesses with employment of 10 to 49 (ABS 8116.0).

Large decreases in technological innovation occurred in Textiles, clothing, footwear & leather; Printing, publishing & recorded media; Metal products; and Other manufacturing. Small increases were recorded in Food, beverages & tobacco and Wood & paper products.

The overall decline is mainly due to a fall in the proportion of the smallest businesses (less than 10 employees) which undertake technological innovation, from 27 to 19 per cent (ABS 8116.0). For businesses with more than 10 employees, the proportion dropped from 50 to 47 per cent over the period 1994 to 1997.

Table C.4 Proportion of businesses undertaking technological innovation, by manufacturing industry, 1994 and 1997

Per cent

<i>Industry subdivision</i>	<i>1994</i>	<i>1997</i>
Food, beverages & tobacco	33.5	36.3
Textiles, clothing, footwear & leather	28.2	15.4
Wood & paper products	14.3	15.7
Printing, publishing & recorded media	32.3	25.6
Petroleum, coal, chemical & associated products	44.6	42.1
Non-metallic mineral products	35.2	35.5
Metal products	30.9	21.1
Machinery & equipment	40.3	35.3
Other manufacturing	30.5	20.9
Total manufacturing	32.2	26.0

Source: ABS 8116.0, unpublished revision for 1994.

In the mining sector, 42 per cent of businesses had undertaken technological innovation between 1994 and 1997 (ABS 8121.0).

Industrial property rights

Industrial property rights are often used as indicators of innovative activity. Available data include patents, trade marks and industrial designs⁴. However, care needs to be taken in analysing industrial property rights data because it is at best only a partial indicator of innovative activity⁵. The industrial property rights data surveyed in this section provide some qualified support for an increase in innovative activity in Australia during the 1980s and 1990s.

Growth in patent applications accelerated during the 1980s and 1990s (table C.5). By 1997, the number of patent applications was almost three times the number recorded in 1982. Growth in patent applications was largely driven by growth in the number of applications lodged by foreign residents.

⁴ A patent is a property right that enables its owner to prevent others from making or using their invention for a fixed period of time— normally 20 years (IP Australia 1998). Patent data have long been used as an output measure of innovative activity. Applications for patents can serve as a proxy for innovative output, even if many are subsequently rejected, because an application implies a firm considers it has created new knowledge that can be protected (Rogers 1998a). Grants of patents indicate that the innovation represents a new advance on existing knowledge. Trade marks link the owner of a mark with the goods or services provided (IP Australia 1998). Registration of a trade mark gives the owner the exclusive right to use the mark on the goods or services registered. Trade mark owners can renew their marks indefinitely. A registered design provides a property right for the visual appearance of manufactured products. In contrast to a patent, a design right does not cover the functionality of the product. However, to be eligible for registration a design must be applied industrially, as distinct from being purely artistic (IP Australia 1998). Trade mark and design activity data can provide a broader indication of commercial innovation than patents data alone. Trade marks and designs cover different kinds of innovation and tend to relate more directly to market activity than do patents. For this reason they more often reflect successful innovation as distinct from investment in innovation (IP Australia 1998).

⁵ For example, there are some important limitations in using patent data as an indicator of innovative activity. Not all inventors take out patents. The propensity to patent can vary widely from industry to industry— for example in pharmaceuticals patenting is absolutely necessary because of the threat of imitation whereas in computers and electronics patenting is far less valuable because of the short lifetime of the products. The way in which innovation is appropriated differs between sectors and patenting is only one of the methods of appropriation (others are secrecy, lead times, and continual product development). Not all patents have the same commercial value. Many patents protect inventions of low value which never reach the market, or fail there, whilst others cover major technological breakthroughs which lead to market success.

The number of new patents granted has been subject to significant fluctuations, with troughs in the late 1970s and early 1980s and the mid-1990s. In the late 1980s and early 1990s, the number of new patent grants reached levels previously achieved in the mid-1970s. New patents granted to Australian residents average just under 10 per cent of new patents granted in Australia each year.

External patent applications by Australians grew on average by around 17 per cent between 1981 and 1991 (IC 1995c). Growth in external patent applications by Australians between 1981 and 1992 was the highest in the OECD and appears to have been due to an increase in patenting activity by the Australian business sector (DIST 1996).

Patent data can be used to calculate an ‘inventiveness’ coefficient—the number of resident patent applications per 10 000 of the population. In 1996, Australia’s inventiveness coefficient was slightly above 4.6—which was over 24 per cent higher than in 1990 (DISR 1999). In 1996 the inventiveness coefficient for the total OECD was 5.8 which was 6.5 per cent lower than in 1990.

Table C.5 Industrial property rights data ^¾ average annual growth in selected indicators
Per cent

	<i>Patent applications</i>	<i>Patents granted</i>	<i>Trade mark applications</i>	<i>Trade mark registrations granted</i>	<i>Industrial design applications</i>	<i>Industrial design registrations granted</i>
Australian residents						
1972 to 1980	2.7	-6.2	5.4	-3.2	6.5	4.9
1981 to 1990	0.5	10.3	8.7	12.3	3.7	9.9
1991 to 1997	1.6	-2.1	6.3	14.9	0.5	2.4
Foreign residents						
1972 to 1980	-2.9	-6.0	1.3	-3.1	5.0	0.5
1981 to 1990	8.7	8.9	6.5	7.7	4.5	10.1
1991 to 1997	12.9	-6.9	7.1	9.8	5.3	2.5
Total						
1972 to 1980	-1.1	-6.0	3.3	-3.1	6.1	3.6
1981 to 1990	5.9	9.0	7.8	9.7	3.9	9.9
1991 to 1997	10.0	-6.4	6.6	12.1	1.8	2.4

Source: World Intellectual Property Organisation (*Industrial Property Statistics*, various years).

Trade mark application data are supportive of an increase in innovative activity in the late 1980s and early 1990s. Average annual growth in both trade mark applications and registrations granted was stronger during the 1980s and 1990s than the 1970s (table C.5). Trade mark applications peaked in 1996 when they were more than 2.5 times the number recorded in 1982. During the 1980s and 1990s, there was strong growth in the number of trade mark applications lodged by both Australian and foreign residents. Over the period 1973 to 1997, trade mark applications lodged by Australian residents averaged 57 per cent of the applications lodged each year.

In contrast to patent and trade mark applications there has not been strong growth during the 1980s and 1990s in industrial design applications. Moreover the number of applications made is small compared with the number of trade mark or patent applications. Over the period 1972 to 1997, industrial design applications lodged by Australian residents averaged 74 per cent of the applications lodged each year.

Technological balance of payments

The technology balance of payments can be used to assess a country's knowledge output by measuring the flow of technological knowhow and services into and out of that country (DISR 1999). However, the technology balance of payments should not be interpreted as implying that there is some optimal 'level' of payments or that the inflow and outflow of technological knowhow and services need to be in balance.

One of the technology balance of payments statistics produced by the OECD is the coverage ratio — which is the coefficient obtained by dividing technology receipts by technology payments. A coverage ratio shows the extent to which a country covers its own requirements of technological imports by its corresponding exports (DISR 1999).

In 1996, Australia had total technology receipts of \$292 million and total technology payments of \$471 million (DISR 1999).⁶ This represented an overall technology balance of payments deficit of \$179 million. In 1996 Australia's coverage ratio was 0.62. Between 1990 and 1996 Australia's coverage ratio increased by over 72 per cent. This growth rate placed Australia fourth out of 15 OECD countries for which comparable growth rates could be calculated (DISR 1999).

⁶ It should be noted that a weakness of technological balance of payments data is the difficulty in separating technological from nontechnological aspects of trade in services.

Research and development

Research and development is an important input into the generation of new knowledge. However, while expenditure on R&D is an input indicator, it does not say anything about the contribution of R&D to technological advance. The R&D process is essentially a search process and the returns are not easily predictable.

There has been sustained and substantial growth in real expenditure on R&D in Australia over a long period. It increased at an average annual growth rate of 6.8 per cent between 1981-82 and 1996-97. R&D expenditure as a proportion of GDP is low relative to many industrialised countries (IC 1995c). However, since 1981-82, this proportion has grown at an average annual growth rate of 3.5 per cent (to 1996-97), a relatively high rate of growth compared with other OECD countries. It increased from 1.0 per cent of GDP to 1.7 per cent.

Another indicator of a stronger R&D effort in recent years is growth in the number of personnel devoted to R&D. There were nearly 10 R&D personnel (research and associated support personnel) per thousand Australian labour force in 1996 (DISR 1999). This represented a 22.2 per cent increase since 1990. There were 6.6 researchers per thousand Australian labour force in 1996— well above the OECD average of 5.1 (DISR 1999). This represented a 32 per cent increase since 1990.

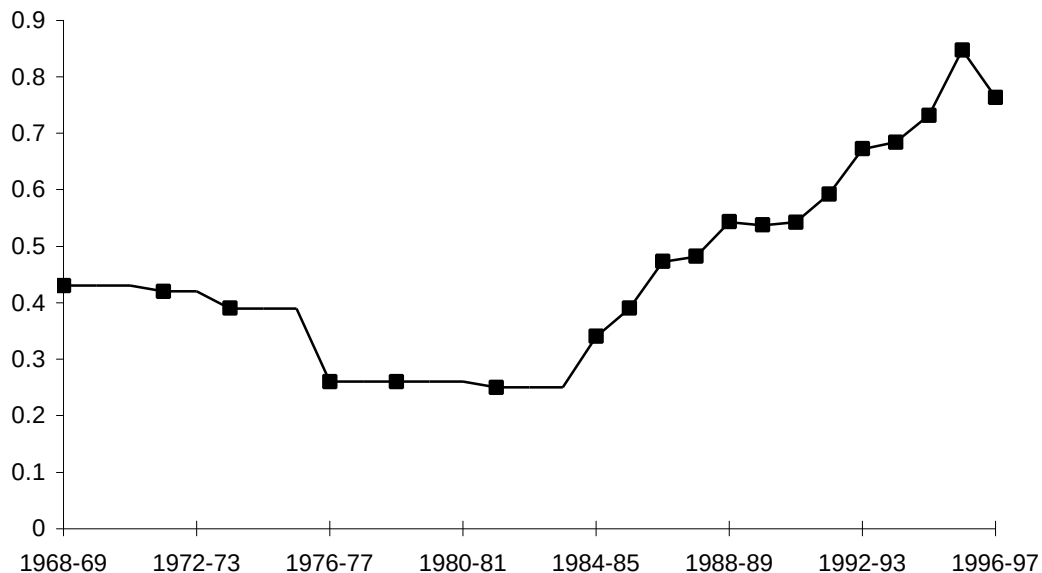
The growth in R&D expenditure largely reflects a shift towards development research and away from basic research. The main reason for this shift has been increasing expenditure on business R&D (figure C.2). Business expenditure on R&D has increased from around 0.4 per cent of GDP in the early 1970s to over 0.7 per cent in the mid 1990s.

Between 1968-69 and 1983-84, business expenditure as a percentage of GDP grew at an average annual rate of -3.6 per cent. Since 1983-84, the annual growth rate has been 9.8 per cent a year. Until the decrease in expenditure in 1996-97, the growth rate had been 11.7 per cent a year. During the 1990s, the annual average growth rate has been 5.9 per cent (9.3 per cent a year until 1995-96).

During the recession, R&D expenditure held up reasonably well and the pickup coming out of the recession was quite strong with increases of 10.0 and 17.4 per cent in 1991-92 and 1992-93 respectively.

Figure C.2 **Business expenditure on research and development as a proportion of GDP, 1968-69 to 1996-97**

Per cent



Sources: IC (1995c) and Commission estimates based on ABS 8112.0.

The manufacturing sector accounted for 59 per cent of business expenditure on research and development (BERD) in 1996-97, up from 55 per cent in 1986-87 (ABS 8104.0). Over that period, the level of R&D expenditure in Manufacturing has more than doubled. A large increase in R&D expenditure was recorded in the mining sector. In 1986-87, it accounted for 4 per cent of BERD and 13 per cent in 1996-97. The contribution to total BERD by other industries declined from 41 per cent to 28 per cent over the same period.

Within the manufacturing sector, the largest contributors to BERD are Electronic & electrical equipment & appliances; Motor vehicles & parts & other transport equipment; Metal products; and Petroleum, coal, chemical & associated products. The main areas of growth in BERD since 1986-87 have been in Wood & paper products; Metal products; and Food, beverages & tobacco.

It has been found that the proportion of Manufacturing firms undertaking R&D is the lowest amongst small firms (Rogers 1998b). However those small firms that do undertake R&D tend to have high R&D intensities (that is, R&D expenditure divided by total sales)—almost 90 per cent of the small firms that do R&D have intensities above 1 per cent (Rogers 1998b).

High R&D intensity imports have increased steadily as a proportion of GDP since the early 1970s to a level broadly comparable with other OECD countries

(DIST 1996). High R&D intensity exports as a proportion of GDP has been much lower than for other OECD countries since 1970 but growth has been much stronger than other OECD countries since 1985 (DIST 1996).

There is evidence that Australian firms undertaking R&D have become markedly more innovative (IC 1995d). In 1971-72, 68 per cent of the output of Manufacturing firms undertaking R&D involved no innovative products or processes. By 1991-92, this proportion had fallen to 38 per cent. In the 1990s, 22 per cent of sales were said to derive from 'totally new' products and processes compared with only 9 per cent twenty years before. Over the same period, the percentage contribution of 'significantly improved' products and processes to sales increased from 7 per cent to 19 per cent and 'marginally improved' products and processes from 13 per cent to 21 per cent (IC 1995c).

C.2 Accumulation of physical capital

Investment in physical capital and economic infrastructure has a direct effect on labour productivity. It can also have an indirect effect on multifactor productivity (MFP) through adoption of new technology and associated changes in work arrangements.

Investment in physical capital

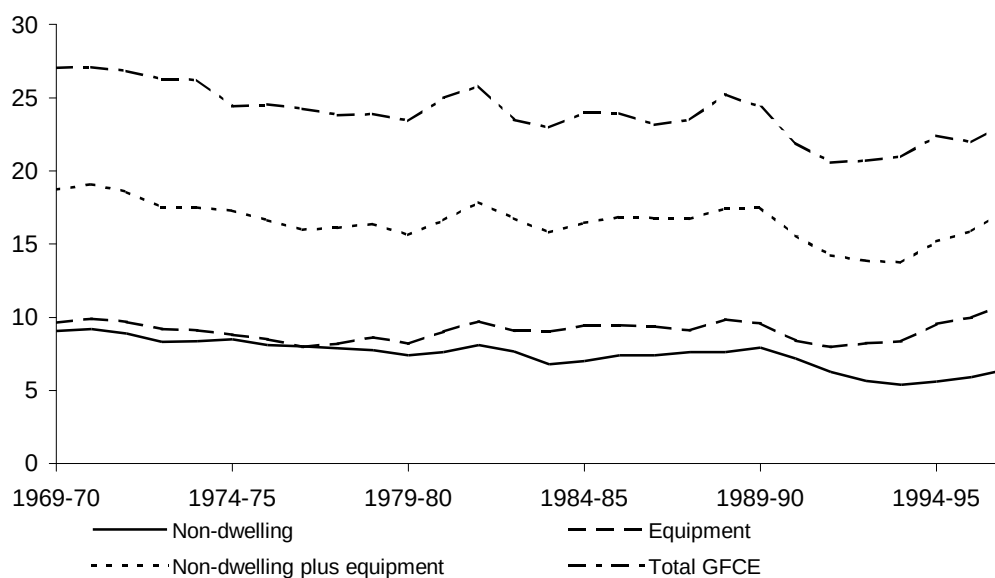
New investment in physical capital is measured here as gross fixed capital expenditure on equipment and non-dwelling construction. It is very much affected by the business cycle. Since the early 1970s, there has been a downward trend in new investment as a proportion of GDP (figureC.3). Since 1994-95, investment in physical capital has recovered to just over 17 per cent of GDP in 1996-97.

This downward trend in new investment since the late 1980s is largely due to changes in expenditure on non-dwelling construction (figureC.3). However, it is to be noted that expenditure on equipment is now at the highest proportion of GDP achieved in the last twenty years.

The recent increase in investment in physical capital is likely to include a significant cyclical component associated with the recovery from the recession— as investment expenditure is closely related to prevailing macroeconomic conditions.

Figure C.3 Gross fixed capital expenditure as a proportion of GDP, 1969-70 to 1996-97

Per cent



Source: Commission estimates based on ABS National Accounts database on EconData.

Investment in economic infrastructure

In Australia economic infrastructure has largely been provided by the public sector. However, there are important exceptions. Some infrastructure has long been provided by the private sector in some States, for example, private sector provision of gas in New South Wales, South Australia, ACT and parts of Queensland. In remote mining communities, economic infrastructure has often been provided by the private sector. In recent times, government sector reforms have involved the transfer of some economic infrastructure facilities to the private sector.

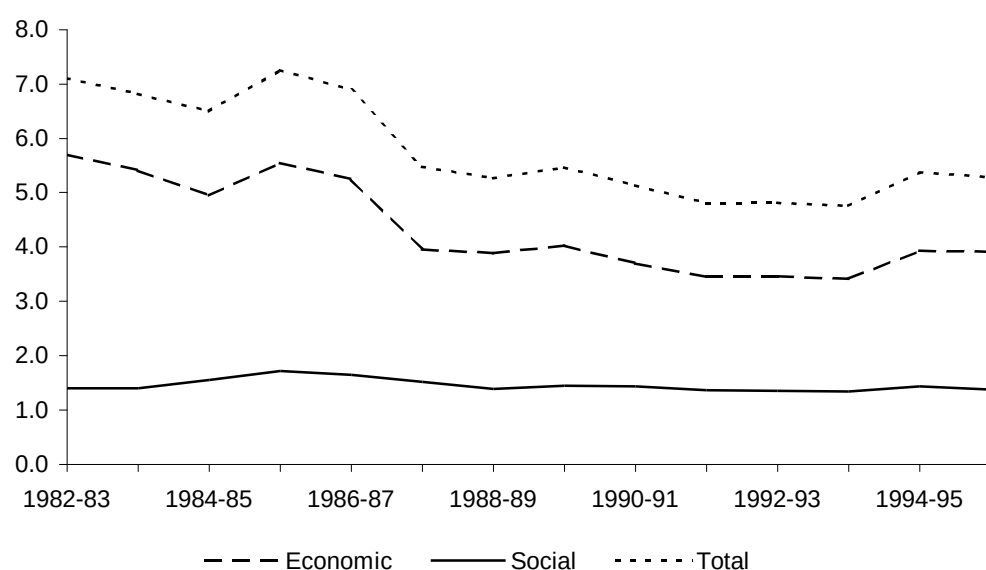
Private provision of infrastructure, however, often involves the public sector. Leaseback arrangements have involved private funding of the capital asset and its management by the public sector. Taxation and other incentives may be offered by governments for the provision of infrastructure. In such instances, although government decisions may play a large part in bringing the infrastructure into existence, they would not be included in statistics on public sector infrastructure investment.

Problems of defining infrastructure and distinguishing private and public provision make it difficult to obtain accurate measures of infrastructure investment.

Gross fixed capital expenditure in a number of infrastructure areas is often used as a broad indicator of infrastructure investment. Total infrastructure investment in Australia (that is, public plus private sector) has declined from around 7 per cent of GDP in the early 1980s to around 5 per cent of GDP in the mid 1990s (figure C.4). This has largely reflected a decline in economic infrastructure investment— as investment in social infrastructure has remained relatively stable over this period.

The decline in infrastructure investment has been due to a decline in public infrastructure investment. Public infrastructure investment has declined from around 6 per cent of GDP in the early 1980s to around 3 per cent of GDP in the mid 1990s. Over the same period private infrastructure investment has increased from around 1 per cent of GDP to 2 per cent of GDP.

Figure C.4 Infrastructure investment^a by broad type of infrastructure, as a proportion of GDP, 1982-83 to 1995-96
Per cent



^a Economic infrastructure investment is defined here as general government gross fixed capital expenditure on transport & communication and other economic services; plus public enterprise gross fixed capital expenditure on water supply, fuel and energy (electricity and other) and transport and communication; plus private sector gross fixed capital expenditure on electricity, gas & water, transport & storage and communication. ^b Social infrastructure investment is defined here as general government gross fixed capital expenditure on education, health & housing & community amenities; plus public enterprise gross fixed capital expenditure on other community amenities; plus private sector gross fixed capital expenditure on education, health, community services and cultural & recreational services.

Source: Commission estimates based on ABS 5204.0.

C.3 Accumulation of human capital

The accumulation of human capital can have a direct and tangible link to improved productivity. Human capital is a source of new knowledge and also embodies existing knowledge which can be transferred to others through the process of learning. Two types of investment in human capital are particularly important: investment in education and investment in training.⁷

In Australia, education is mainly delivered across three main education sectors—schools, vocational education and training (VET), and higher education.

Over the last decade there has been an increase in the proportion of the population completing post-compulsory schooling, the advent of mass higher education and more provision of education and training by the private sector (ABS 4224.0).

In addition, opportunities for further education and training have become more diverse. Traditional providers of education such as schools, TAFE institutions and universities, have introduced more flexible means of delivery that enable students to undertake studies in conjunction with other commitments. For example, external programs and open learning have reduced attendance requirements at tertiary institutions (ABS 4224.0).

Education

The knowledge, skills and attitudes of the workforce can be assessed with the assistance of outcomes-based indicators or, more indirectly, by indicators of inputs into education. Educational attainment indicators are commonly used as a measure of general skills and competencies of the workforce. Very little data are available to capture changes in the quality of education over time.

Labour force education

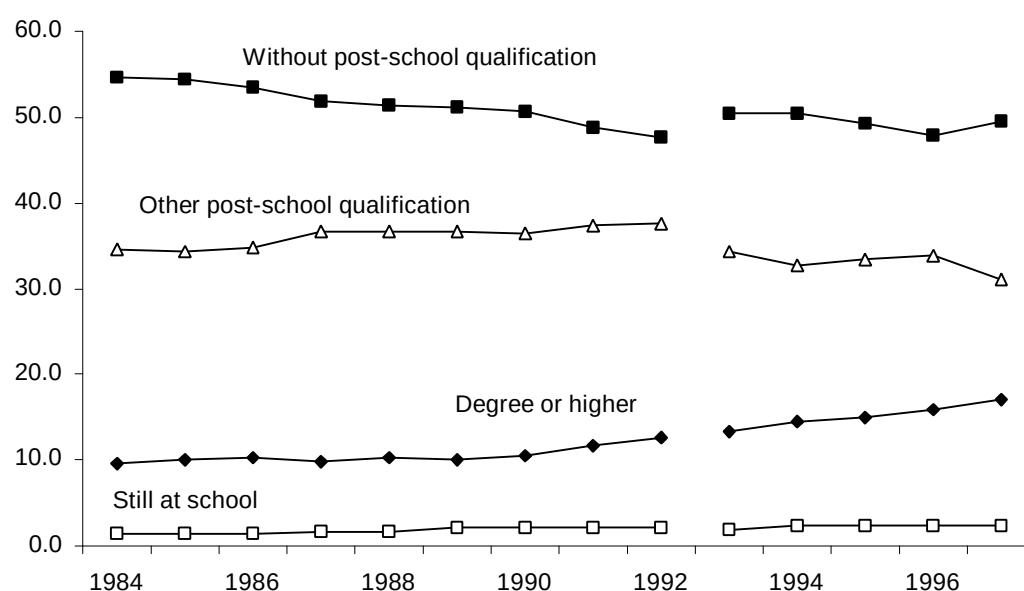
Labour force education levels have increased since 1982. FigureC.5 shows the educational attainment of the employed workforce between 1984 and 1997. The proportion of the employed workforce holding post-school qualifications is

⁷ In recent years the distinction between education and training has become less clear cut. Traditionally education has been used to describe the process of obtaining knowledge, attitudes or socially valued qualities of character and behaviour (ABS 4224.0). Whereas training has been used to describe the development of specific skills to a standard of proficiency for subsequent application in the workplace. Today education extends beyond formal institution-based learning and training beyond the workplace.

considered to be a key measure of educational attainment. This proportion increased from 44 per cent in 1984 to 50 per cent in 1992. A new data series commenced in 1993.⁸ Under this series the proportion of employed persons holding post-school qualifications has been around 48 per cent since 1993.

While a declining proportion of the employed workforce, those without post-school qualifications have also been extending their years at school. Those who did not attend the highest level of secondary school have declined as a proportion of the workforce from 42 per cent in 1984 to 30 per cent in 1992. Under the new data series the proportion declined from 33 per cent in 1993 to 31 per cent in 1997.

Figure C.5 Share of employed workforce^a by educational attainment, 1984 to 1997^b



^a 15-64 year olds. ^b February data from 1984 to 1988 and May data from 1989 to 1997.

Source: Commission estimates based on ABS 6235.0 and 6227.0.

⁸ In the new series people holding qualifications earned as a result of one semester's study were reclassified from the 'with postschool qualifications' group to the 'without postschool qualifications' group (see Barnes et al. 1999 for further details).

The level of educational attainment varies considerably with the occupation and industry in which people are employed. People employed as professionals, para-professionals and tradespersons are more likely to have post-school qualifications than those in other occupations. For managerial occupations, the proportions with and without post-school qualifications are similar. Occupations which are less likely to have post-school qualifications are: Clerks, Salespersons & personal service workers, Plant & machine operators & drivers, and Labourers. Nevertheless, the proportion of people in each of these occupations with post-school qualifications appears to have increased since 1987, significantly in managerial and clerical, and service occupations (ABS 6235.0 and 6227.0).

Relatively large proportions of Plant & machine operators & drivers; Labourers; Managers & administrators; Clerks; and Salespersons & personal service workers have not attended the highest level of secondary school. But the proportions appear to have declined since 1987. In contrast, the proportion of Professionals and Para-professionals who have not attended the highest level of school is very low.

Comparing educational attainment by industry is complicated by the adoption of a new industry classification in 1995⁹. Prior to the reclassification the industries with the highest proportion of employed persons with post-school qualifications were Community services and Electricity, gas & water. The industries with the lowest proportion of employed persons with post-school qualifications were Agriculture, forestry, fishing & hunting, and Wholesale & retail trade. Between 1982 and 1994, the largest increases in the proportion of employed persons with post-school qualifications occurred in Electricity, gas & water, and Finance, property & business services.

Since reclassification the industries with the highest proportion of employed persons with post-school qualifications are Education; Electricity, gas & water; and Health & community services. The industries with the lowest proportion of employed persons with post-school qualifications were Retail trade, and Agriculture, forestry & fishing. The biggest increases in the proportion of employed persons with post-school qualifications were in Government administration & defence, and Finance & insurance services.

⁹ From August 1995, industry data are classified according to the Australian and New Zealand Standard Industrial Classification (ANZSIC). Like the previous Australian Standard Industrial Classification (ASIC), ANZSIC classifies businesses according to their economic activities.

School retention rates and higher education completions

More indirect indicators of the educational attainment of the workforce are provided by data on secondary school retention rates and completions of post-school qualifications. Changes in these measures over time provide a useful indicator of the skills and qualifications of new entrants to the workforce and gradual change in the workforce profile.

A greater proportion of students are remaining at school for longer compared with the early 1980s. Apparent retention rates to Year 12 have more than doubled since the early 1980s, increasing from 35 per cent in 1981 to 77 per cent in 1993, although they have declined since then to 72 per cent in 1997 (table C.6). The increase has been greater for females than males. The proportion of students remaining at school to Year 11 increased from 55 per cent in 1981 to 84 per cent in 1997. The absolute number of students in secondary school increased by about 18 per cent between 1981 and 1997.

The proportion of Year 12 students who transferred to a higher education institution in the year after completing school was 40 per cent in 1985 and 42 per cent in 1997. The transfer rate has been around the 40 per cent level since 1985.

Table C.6 Apparent retention rates of secondary school students to Years 10, 11 and 12, 1981-97

Per cent

	1981	1983	1985	1987	1989	1991	1993	1995	1997
Males									
Year 10	90.3	93.9	93.3	94.6	96.0	98.2	97.5	95.5	96.3
Year 11	51.6	61.7	64.6	68.1	73.0	82.9	84.5	79.5	80.4
Year 12	32.0	37.5	43.5	49.4	55.5	66.1	71.9	66.7	66.2
Females									
Year 10	92.6	94.6	94.3	95.8	98.1	99.4	99.1	97.4	98.2
Year 11	59.0	65.6	68.9	74.0	81.5	89.2	90.5	87.2	88.6
Year 12	37.8	43.9	49.5	57.0	65.2	76.7	81.4	77.9	77.8
All students									
Year 10	91.4	94.3	93.8	95.2	97.1	98.8	98.3	96.4	97.2
Year 11	55.2	63.6	66.7	71.0	77.2	86.0	87.4	83.3	84.4
Year 12	34.8	40.6	46.4	53.1	60.3	71.3	76.6	72.2	71.8

Source: ABS 4221.0.

Participation in higher education increased considerably between 1987 and 1997—with the total number of higher education students increasing from 393 700 to 658 800 (ABS 4224.0). Among the main age group attending university (20–24 year olds) the participation rate rose steadily throughout the 1990s to reach 15.9 per cent in 1996 — approximately twice the level of participation in 1975 and 4 per cent higher than in 1990 (Marginson 1999, p. 167).

Between 1981 and 1996, the number of students completing higher education award courses has more than doubled, increasing from 66 246 to 145 333 (ABS 4224.0; Marginson 1999). Postgraduate completions have increased at a faster rate than undergraduate completions. Over the period, completions at the higher degree level rose by around 490 per cent, compared with 159 per cent for other postgraduate completions and 90 per cent for undergraduate completions.

Vocational education and training

VET programs generally cover the delivery of postcompulsory education and training for the purpose of providing work-related skills. These programs differ from higher education programs in that they are more vocationally orientated (less theoretical and more applied), typically shorter and generally not offered at the degree level or higher.

Unfortunately there is not a consistent data series for participation in VET programs over a long period.¹⁰ However — notwithstanding these problems— the available data shows that the number of persons enrolled in vocational education programs has grown steadily between 1984 and 1998 with average annual growth of 4.6 per cent (figure C.6). Growth has accelerated in recent years with average annual growth of 7.7 per cent between 1994 and 1998.

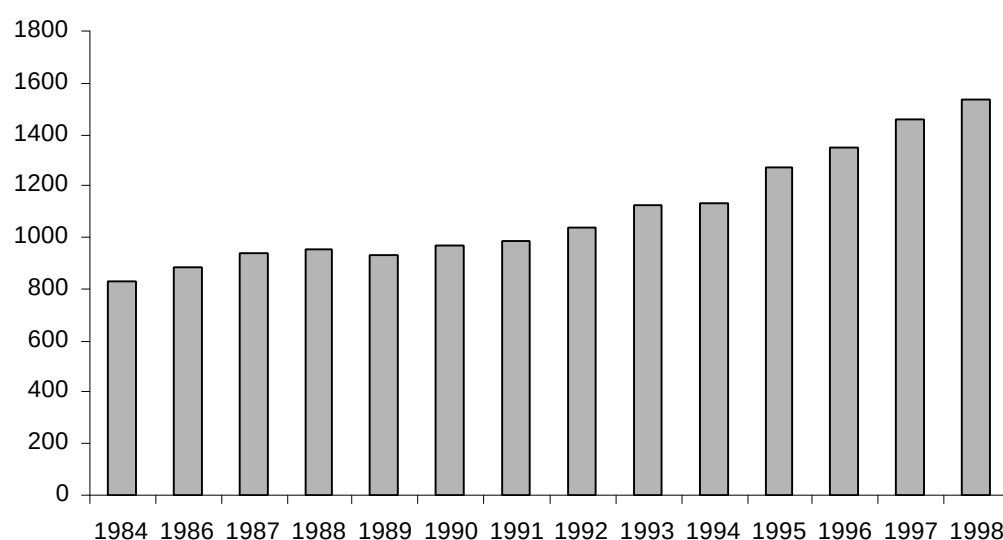
The scope of VET includes persons undertaking contracted training (that is, apprentices and trainees). Average annual growth in the number of apprenticeship commencements and recommencements and the number of apprentices in training was slightly negative between 1984–85 and 1996–97 (contracting on average by 1.6 per cent and 1.1 per cent each year respectively). In contrast there has been very strong growth in traineeship commencements and recommencements and in the

¹⁰ In 1994 there is a break in the data because of the adoption of the Australian Vocational Education and Training Management Information Statistical Standard (AVETMISS) as the data collection standard (ABS 4224.0). AVETMISS was designed to apply to all VET programs (other than those which are higher education or school programs) developed by any organisation. These changes included the adoption of the terms client (to replace student) and module (to replace course) as the fundamental units of measurement. Further breaks in the data series occurred in 1995 with the inclusion of community education providers in the collection, and in 1996 with the inclusion of private providers in the collection.

number of trainees in training (average annual growth of 22.1 per cent and 21.9 per cent respectively).

Since traineeships were first introduced in 1985 their availability and coverage has been expanded. Prior to 1993, traineeships were only available to teenagers (Ball 1999). Furthermore, when traineeships were first offered they were mainly in clerical and retail occupations (NCVER 1999a). Since that time the traineeship system has expanded training opportunities in industry areas such as horticulture, agriculture, manufacturing, utilities and transport and storage (NCVER 1999a). Between 1995 and 1997 there has been a large increase in the number of trade-based traineeships (NCVER 1999a).

Figure C.6 Number of clients in vocational programs, 1984 to 1998^{a,b,c,d}
'000s



^a This chart shows all TAFE students (net) for the years 1984 to 1993. From 1994, data is for VET clients. ^b In 1994 there is a break in the data series because of the adoption of the Australian Vocational Education and Training Management Information Statistical Standard (AVETMISS) as the data collection standard. ^c A break in the data series occurs in 1995 with the inclusion of community education providers in the collection. ^d A break in the data series occurs in 1996 with the inclusion of private providers in the collection.

Data source: ABS 4224.0 and National Centre for Vocational Education Research (<http://www.ncver.edu.au/downloads/stats98b.pdf>, accessed 1 September 1999).

Training experience of wage and salary earners

Table C.7 shows the proportion of people who had been employed over a twelve-month period and who had received some form of training. Notwithstanding the decline in participation rates between 1993 and 1997— participation in training appears to have increased slightly since the late 1980s. Participation in training is most often in the form of on-the-job training. However, between 1993 and 1997 there was a large increase in participation in external training courses. The proportion of wage and salary earners undertaking external training courses in 1993 was 12 per cent compared with 21 per cent in 1997.

AWIRS provides information on participation in formal training programs in the workplace, excluding on-the-job training, attendances at conferences and apprentice training. The proportion of all workplaces providing formal training programs for employees increased from 58 per cent in the 1990 survey to 68 per cent in the 1995 survey (Morehead et al. 1997, p. 112–3).

In 1995, training was more frequently provided in public sector workplaces (78 per cent) compared with private sector workplaces (64 per cent) and in workplaces which were part of a larger organisation (72 per cent) compared with single workplace organisations (51 per cent). Para-professionals (62 per cent) and Professionals (60 per cent) were the most likely to have received training and Labourers & related workers the least likely (30 per cent) (Morehead et. al. 1997, p. 112–3).

All occupations experienced a substantial increase in formal training between the 1990 and 1995 surveys. The percentage of workplaces providing training for Plant & machine operators & drivers more than doubled from 21 per cent to 46 per cent while the percentage of workplaces providing training for managers increased from a relatively low proportion of 25 per cent to 47 per cent (Morehead et. al. 1997, p. 112–3).

In both 1990 and 1995 the industry with the highest proportion of respondents providing formal training programs for employees was Finance & insurance (87 per cent in both years). In 1995 this result was matched by Mining. The industry with the lowest proportion of respondents providing formal training programs was Accommodation, cafes & restaurants (35 per cent in 1990 and 45 per cent in 1995). Of the industries for which reliable data are available, Construction had the largest increase in the proportion of respondents providing formal training programs (29 per cent). All the other industry groups recorded an increase in the proportion of respondents providing formal training programs, except Wholesale trade, Finance & insurance, and government administration which recorded no change.

Table C.7 **Persons who had a wage or salary job in the last 12 months ^¾
proportion receiving training**

Per cent

<i>Employment status</i>	<i>1989</i>	<i>1993</i>	<i>1997</i>
Full-time	80.7	87.2	84.4
Part-time	72.9	81.9	80.2
Permanent	80.5	87.2	84.9
Casual	73.2	81.7	78.4
Total	79.1	85.8	83.2

Source: ABS 4224.0, unpublished data.

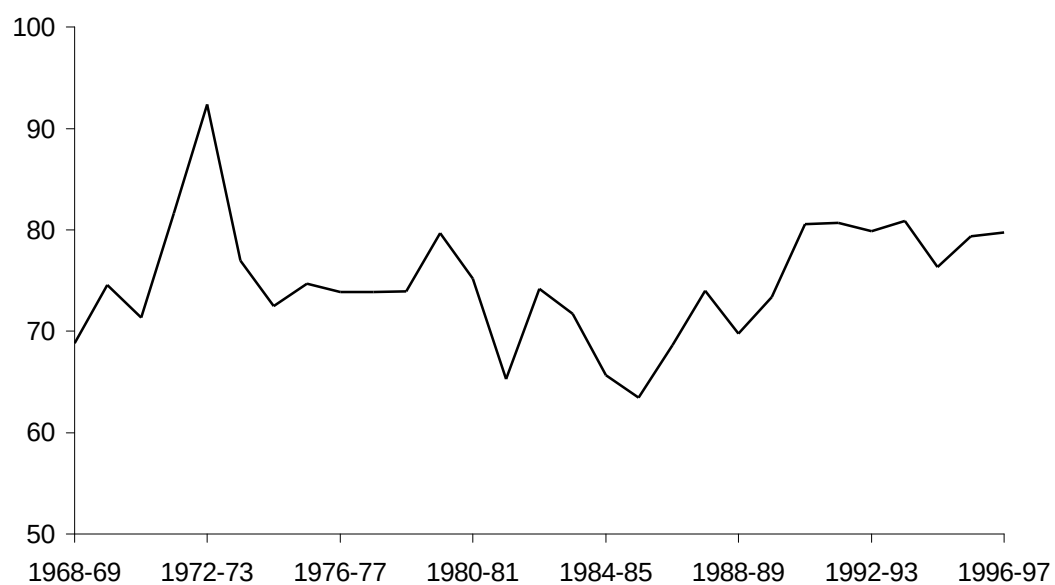
C.4 Scale, scope and specialisation

Data on trends in the achievement of economies of scale and scope and in specialisation are not readily available.

One indicator of specialisation is the intra-industry trade index. Intra-industry trade refers to the simultaneous imports and exports within the same industry classification. With increases in intra-industry trade, the presumption is that domestic producers and importers are specialising in differentiated products destined for different market segments.

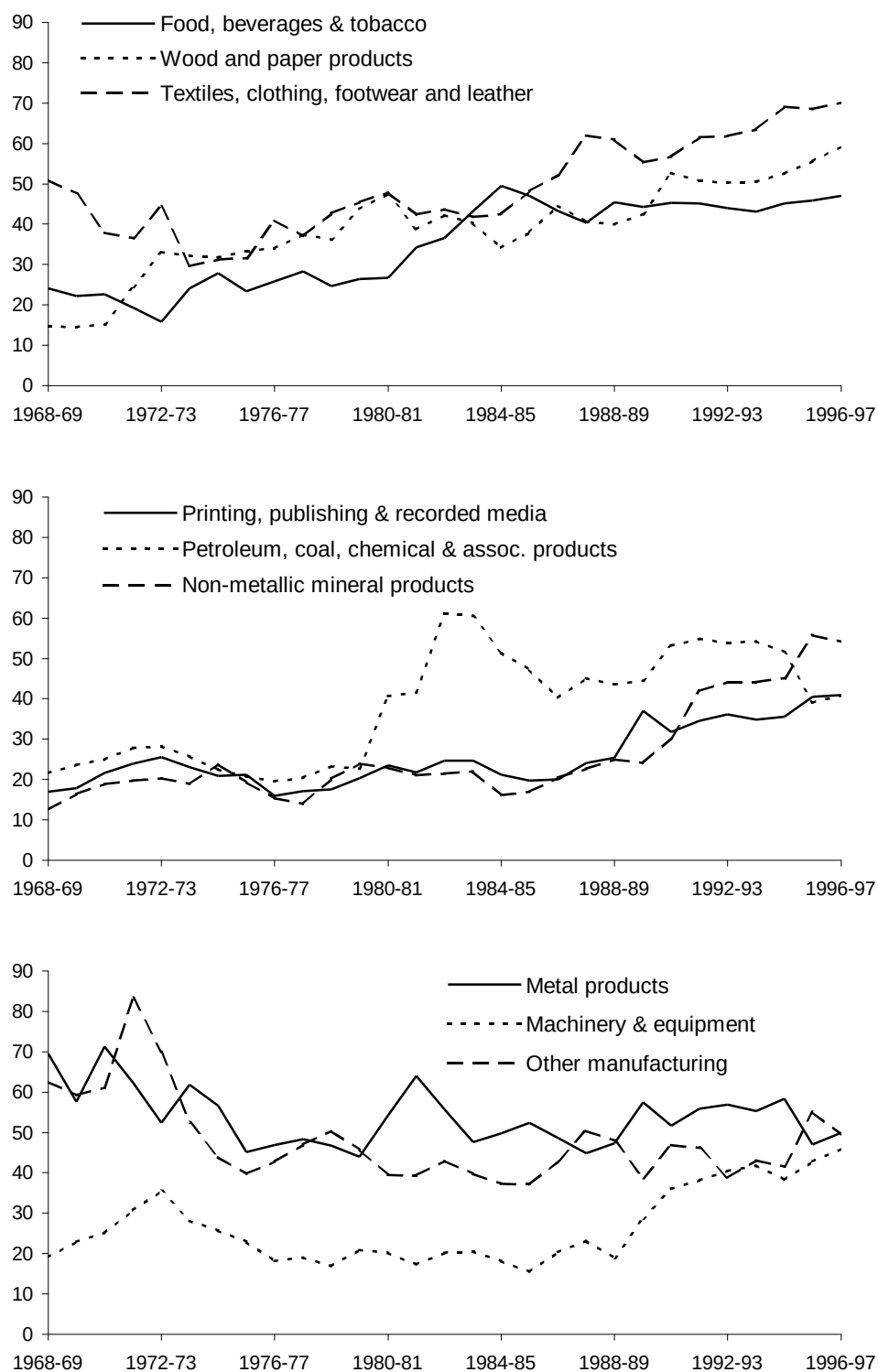
Intra-industry trade has increased within the manufacturing sector (figure C.7). The value of the index has increased from 65.7 in 1984-85 to 79.8 in 1996-97. A value of zero indicates one-way trade, whereas a value of 100 indicates balanced export and import trade. Intra-industry trade has increased significantly in Textiles, clothing, footwear & leather, Wood & paper products, Non-metallic mineral products and Machinery & equipment since the mid-1980s (figure C.8). A decline in intra-industry trade occurred in Petroleum, coal, chemical & associated products.

**Figure C.7 Intra-industry trade index for total manufacturing industries,
1968-69 to 1996-97**



Sources: IC (1995b) and Commission estimates based on ABS data.

Figure C.8 Intra-industry trade index, by ANZSIC manufacturing subdivisions, 1968-69 to 1996-97



Sources: IC (1995b) and Commission estimates based on ABS data.

C.5 Firm organisation, management practices and work arrangements

New techniques of managing equipment and other inputs to maximise productivity are spreading in Australia and approaches to work organisation and quality control have changed radically in recent years.

Organisational change

The early 1980s saw the first wave of Japanese management techniques in Australia (Dawson and Palmer 1995). Total Quality Management techniques were initially diffused via multinational companies, particularly those involved in the automobile and components industries.

Large new projects in the mining boom of 1979–83 had a significant impact on the management of change in business and organisational design in large organisations (Dunphy and Griffiths 1998). The large-scale projects involved massive investment and huge technical requirements which necessitated new management skills. They generated a shift to strategic and human resource management covering organisational design, manpower planning, industrial relations, training, organisation development and community relations. Despite its subsequent collapse, the mining boom had firmly established the need for a strategic approach to corporate change and the vital role of human resource management in the change process.

Many of the techniques of strategic management and strategic human resource management began to be taken up by leading companies in other industries, particularly those that were overseas-owned (Dunphy and Griffiths 1998). Gradually, systematic planned change was becoming incorporated into standard management practice.

However, up until the mid-1980s the majority of small to medium-sized Australian-owned firms were still largely unaffected by the movement for change. In most of these firms, managers continued with traditional ‘Tayloristic’ work environments in an authoritarian manner. Within the public sector also, the traditional large bureaucracies were still largely in place.

Microeconomic reforms implemented in the mid-1980s (financial deregulation, exchange rate deregulation and a commitment to industry restructuring through tariff reductions) dramatically altered the economic environment for both private and public sector organisations.

They created an impetus for organisational change never before experienced in Australia, apart from the mobilisation of industry for each of the two world wars ...

During this period, changing economic and political forces undermined the foundations of custom, practice and precedent that had characterised Australian organisational and institutional life. The pressures on organisations to respond to change were enormous. In many cases organisational survival dictated that transformational rather than incremental changes be undertaken. An economic revolution of epic proportions was in the making, and Australian corporations would never be the same again. (Dunphy and Griffiths 1998, pp. 108, 109–10)

The late 1980s and 1990s saw the widespread diffusion of strategies and techniques devoted to managing organisational change and achieving competitive advantage in the marketplace. It often involved a high level of internal change, including mergers, acquisitions and divestments. Key features are strategic planning for competition, streamlining organisational processes to create efficiencies and benchmarking current performance against that of the leading global firms (Dunphy and Griffiths 1998, pp. 111–7).

Increasing weight was placed on strategic human resource management (HRM) as a means of providing firms with a distinct competitive advantage through the capabilities of its employees. The changes implemented under HRM have been increasingly influencing workplaces in Australia (EPAC 1996). Companies have moved toward more flexible work arrangements with greater resort to team management practices, employee input into decision-making and less hierarchy.

A major contributor to greater flexibility has been multiskilling. It has permitted employees to undertake a wider range of tasks and assume greater responsibility while promoting greater efficiency in the workplace. Industrial relations reforms played a vital role in reducing labour inefficiencies and increasing the flexibility of labour management relations and the variety of possible work conditions (Dunphy and Griffiths 1998, p. 119).

Few studies have been undertaken to gauge the extent of the changes in management and work practices.

A survey conducted by the ABS (8123.0) indicates that the proportion of manufacturing establishments using at least one advanced technique, such as total quality control/management, just-in-time, manufacturing resource planning, computer integrated manufacturing and value added management, increased from 24 per cent in 1988 to 39 per cent in 1991.

The ABS survey indicates that the use of particular advanced management techniques was generally low amongst manufacturing establishments. Total quality control/management was the most commonly used; 24 per cent of establishments

had adopted it in 1991 compared with 15 per cent in 1988. Just-in-time was used by 22 per cent of establishments compared with 15 per cent in 1988.

AWIRS suggests an increasing number of workplaces have been affected by major reorganisations of management structures and work practices. In the two years prior to 1989-90, 37 per cent of workplaces were affected by major reorganisation of management structures and 34 per cent by major restructuring of work practices. In the two years prior to 1995, 51 per cent of work places were affected by reorganisation of management structures and 43 per cent by major change to how non-managerial staff do their work.

The proportion of workplaces affected by both sources of change has increased across all sectors of the economy. The proportion affected also increases with employment size.

In the 1995 survey, 53 per cent of managers said that the main reason for organisational change (involving major new office technology, plant, machinery and equipment, reorganisation of management structures and change in work practices) in the survey period was to improve productivity and efficiency. Other reasons for introducing change were to reduce costs (24 per cent), improve customer service (24 per cent), improve product or service (22 per cent), become more competitive (21 per cent) or make management more efficient (18 per cent).

Industrial relations

During the 1990s there has been significant change in the structures and processes underpinning industrial relations arrangements in Australia. One of the key changes has been the shift to more decentralised bargaining structures to determine wages and conditions in Australian workplaces. Prior to the 1990s the employment conditions of most employees were largely determined by highly prescriptive industry- or sector-based awards. This promoted a high level of uniformity across enterprises. Today wages and conditions are increasingly dependent on enterprise/workplace level agreements (both on a collective and individual basis).

Survey data suggests growth in the use of both collective enterprise and individual agreements.¹¹

¹¹ The two main sources of survey data are the AWIRS and the NELS Workplace Management Survey. The NELS survey was conducted in 1998 and aimed to ascertain the extent to which workplaces have been affected by recent developments in industrial relations (Wooden 1999b). To facilitate comparisons with other survey data, and specifically the 1995 AWIRS, the scope of the survey was restricted to workplaces with 20 or more employees. The scope of the survey was also restricted to commercial businesses (that is, those operating for a profit).

-
- In 1990, only 20 per cent of employees were covered by formal enterprise agreements (Hawke and Drago 1998). By 1998, over half the nonmanagerial workforce in commercial workplaces of more than 20 employees depended on agreements negotiated at the workplace or enterprise level (Wooden 1999a). Around two-thirds of all workplaces are now pursuing industrial relations strategies which place emphasis on either collective enterprise/workplace or individual-level bargaining (Wooden 1999a).
 - The survey data suggest an increase in the coverage of agreements across both workplaces (operating in the commercial sector) and nonmanagerial employees. In 1995 between 42 and 53 per cent of all workplaces had collective agreements in place. By 1998, this had increased to between 50 and 58 per cent (Wooden 1999a). The proportion of non-managerial employees covered by collective agreements increased from between 31 to 36 per cent in 1995 to between 38 and 43 per cent in 1998 (Wooden 1999a).
 - Around 80 per cent of respondents to the 1998 survey who were from workplaces with collective agreements indicated that these agreements were first introduced after 1991 — with almost one-third of this group indicating that the agreements had been introduced for the first time in 1997 or 1998 (Wooden 1999a). About one-third of the sample expected their use of collective agreements to increase.
 - The survey data also suggests growth in the proportion of nonmanagerial employees covered by individual agreements. In 1995 around 12 per cent of non-managerial employees were covered by individual agreements. By 1998 this had increased to around 15 per cent (Wooden 1999a). The majority of respondents to the 1998 survey expected their workplace's use of individual agreements to increase in the next few years.

Growth in the incidence of enterprise agreements does not necessarily indicate the extent to which these agreements have altered employment conditions. For the majority of employees covered by an enterprise agreement, the agreement still has to be read in conjunction with awards and in some cases agreements only touch on a narrow range of work conditions (Hawke and Wooden 1998). Furthermore, in the case of individual agreements many firms tend to negotiate these on a pattern basis, that is, the conditions do not vary considerably across employees (Wooden 1999b).

A feature of Australian industrial relations reform has been the retention of minimum award pay and many minimum award conditions. This has meant that enterprise agreements typically take the form of productivity agreements—whereby productivity enhancing work practice changes are paid for with higher wages (Edwards 1999). The 1995 AWIRS survey revealed that increasing productivity and efficiency was the most common motivating factor behind the

introduction of enterprise agreements, although there was a range of other reasons which also influenced this decision (Drago, Hawke and Wooden 1998).

It has been suggested that one of the consequences of the shift towards enterprise agreements is that it gives managers the opportunity to actively shape wages and conditions. This could be expected to provide greater scope for managers to try and introduce productivity enhancing changes in their workplaces. The 1998 NILS survey suggests a general increase in the significance of management in workplace industrial relations with almost 64 per cent of respondents indicating that their role had increased over the three years prior to the survey (Wooden 1999a). However, workplaces that had introduced collective bargaining was the most likely to report a greater role for management. The survey revealed that 73 per cent of collective bargaining workplaces reported an increased role for management compared with 56 per cent of award dependent workplaces (Wooden 1999a).

It may also be the case that greater employee involvement in the negotiation of wages and conditions may lead to improved productivity. Hawke and Drago (1998) found that in negotiating enterprise agreements those agreements that explicitly sought employee involvement were more likely to produce positive performance outcomes than those which were negotiated in another manner. However, the magnitude of this effect was small.

Hawke and Drago (1998, p. 33) have done some preliminary work on assessing the impact of enterprise agreements on workplace productivity and concluded:

... the evidence suggests that enterprise bargaining during the first half of the 1990s failed to deliver significant productivity and efficiency improvements. It, however, would be premature to conclude that these findings necessarily imply that enterprise bargaining cannot have productivity enhancing effects in the future.

However, it is likely that the full benefits of the move to enterprise bargaining have not yet been realised. Edwards (1999, p. 20) noted in a recent assessment of the Australian economy that:

Enterprise bargaining and workplace reorganisation around new equipment investment have further to go. Enterprise bargains so far cover only one third of the workforce. The bargains themselves usually cover a limited area of working practices. As industrial awards are reduced to core conditions, the scope of bargaining will widen. Trade unions continue to decline in size and influence, suggesting that employer directed changes in work organisation will become easier in the coming years.

A forthcoming Commission staff research paper has found that as the number of issues negotiated at the enterprise level increases, so too does productivity growth (Saleheen and McCalman 2000). It suggests that negotiation over a range of issues provides more scope to arrive at mutually beneficial outcomes.

C.6 Resource allocation

Structural change refers to changes in the overall size and makeup of an economy in terms of the distribution of resources and activity between firms, industries and regions. Resources shift between industries and sectors through the interplay of both demand and supply factors. Because of varying productivity levels across sectors and industries a change in the sectoral/industry mix of the economy may influence measured aggregate productivity growth.

This section looks at evidence of changes in the distribution of inputs (of labour and capital) and output among Australian industries. It also considers a measure of the pace of structural change in output and employment. The evidence confirms that Australia's industry composition and employment structure has changed over the past few decades. However, structural change at the broad sectoral level may not have been a major driver of Australia's productivity performance.

Input growth and allocation between industries

Since the mid-1980s, most industries in the market sector have increased the amount of inputs they use (figures C.9 and C.10). There were significant differences in input growth between industries.

- Several industries experienced strong input growth between 1985-86 and 1997-98. These were: Communication (5.9 per cent a year); Accommodation, cafes & restaurants (5.1 per cent a year); Cultural & recreational services (4.3 per cent a year); and Mining (3.1 per cent a year).
- Construction; Wholesale trade; Accommodation, cafes & restaurants; and Finance & insurance experienced strong input growth between 1985-86 and 1988-89 but the rate of growth declined in the subsequent periods.
- Input growth was low in Manufacturing (0.1 per cent a year) and Agriculture (0.4 per cent a year) between 1985-86 and 1997-98.
- Input usage in Electricity, gas & water declined at average annual rate of -1.4 per cent between 1985-86 and 1997-98.

Labour input growth was generally weaker than capital input growth and, in several industries, it was negative. There were marked differences in the growth of labour and capital inputs between industries (figure C.10).

- Capital input growth largely accounted for input growth in Communication services and Mining: respectively 12.0 and 4.8 per cent a year over the period 1985-86 to 1997-98. Capital input growth was also the main feature of input

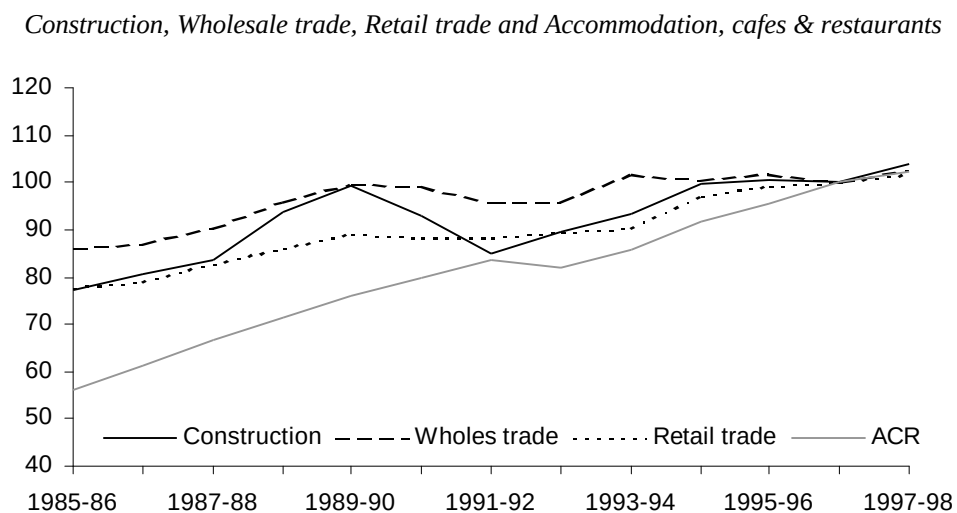
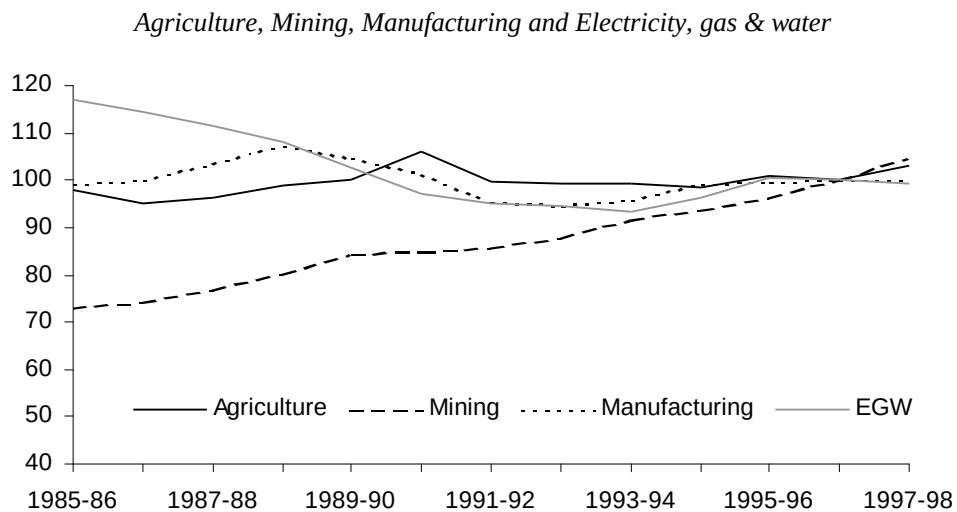
growth in Retail trade; Transport & storage; and Finance & insurance. Capital input growth became more important in Accommodation, cafes & restaurants and Cultural & recreational services between 1993-94 and 1997-98.

- Significant growth in both labour and capital inputs contributed to input growth in Accommodation, cafes & restaurants (4.6 per cent a year for labour and 7.1 per cent for capital) and Cultural & recreational services (3.5 per cent a year for labour and 5.7 per cent for capital) over the period 1985-86 to 1997-98. Lower growth in labour and capital inputs accounted for the decline in input growth in Construction, Wholesale trade and Finance & insurance between 1988-89 and 1997-98.
- The negative growth in inputs in Electricity, gas & water was largely due to employment falling at an average annual rate of 5.7 per cent between 1985-86 and 1997-98. The use of labour by Manufacturing and Mining also contracted over this period, with average annual growth of -1.0 per cent and -0.5 per cent respectively.
- Capital input growth was weak in Agriculture between 1985-86 and 1997-98 (0.9 per cent a year) and in Electricity, gas & water between 1985-86 and 1993-94 (0.7 per cent a year).

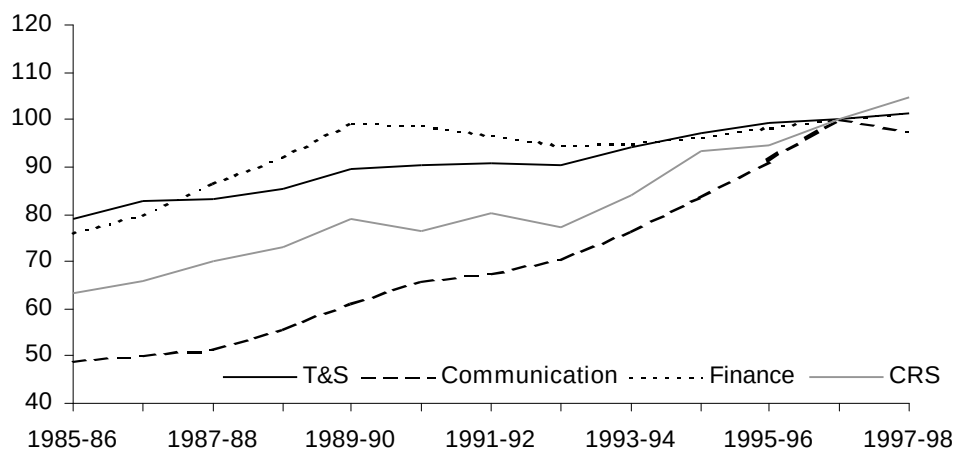
The different input growth rates are reflected in changes in industry composition of employment and fixed capital expenditure although the extent of the impact is influenced by the size of the resource base of industries. For example, small and negative employment growth in Manufacturing led to a large change in its share of total employment while a similar decrease in Mining resulted in a small change in its employment share.

Figure C.9 Total input index, by sector, 1985-86 to 1997-98

Indexes 1996-97 = 100

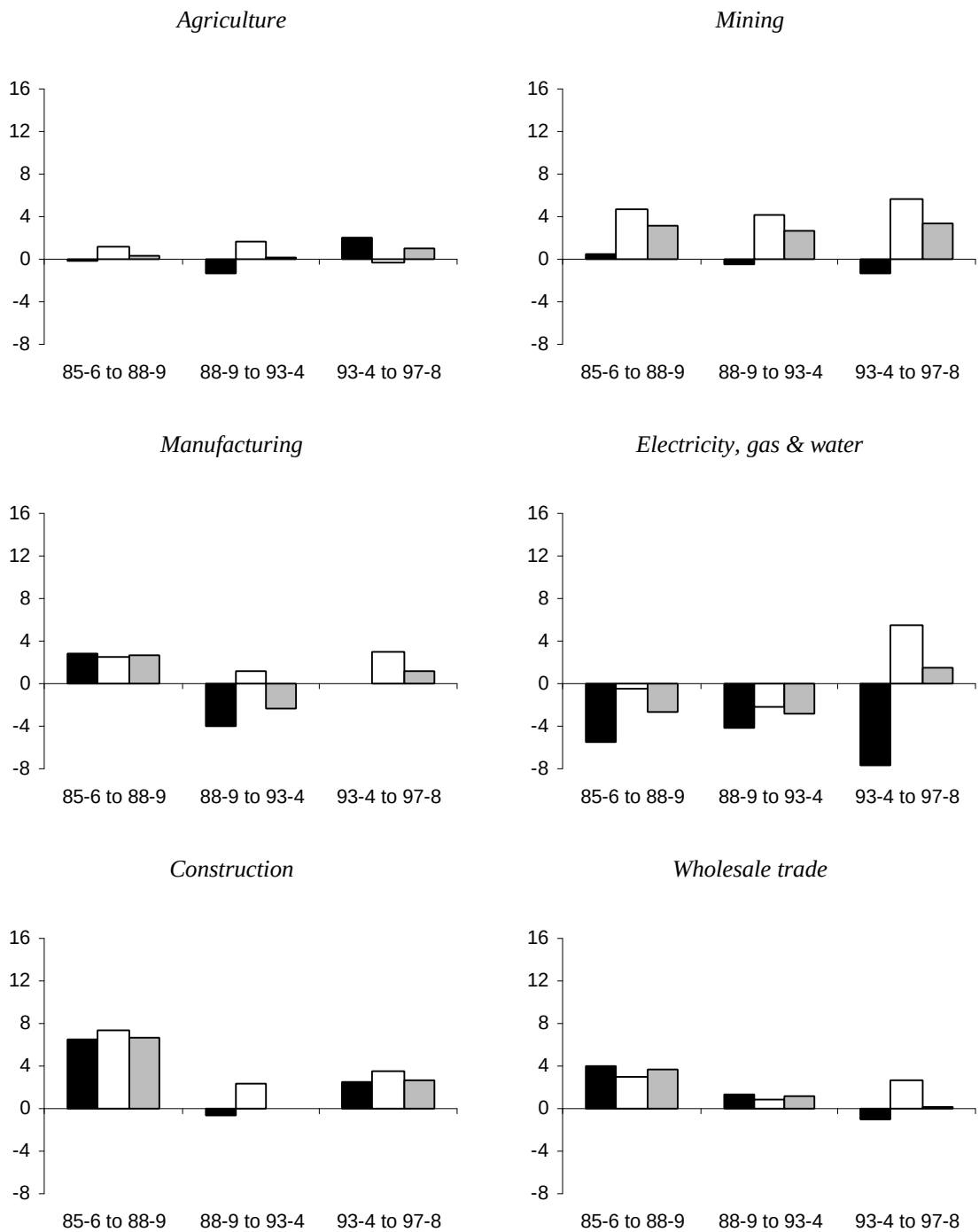


Transport & storage, Communication, Finance & insurance, and Cultural & recreational services



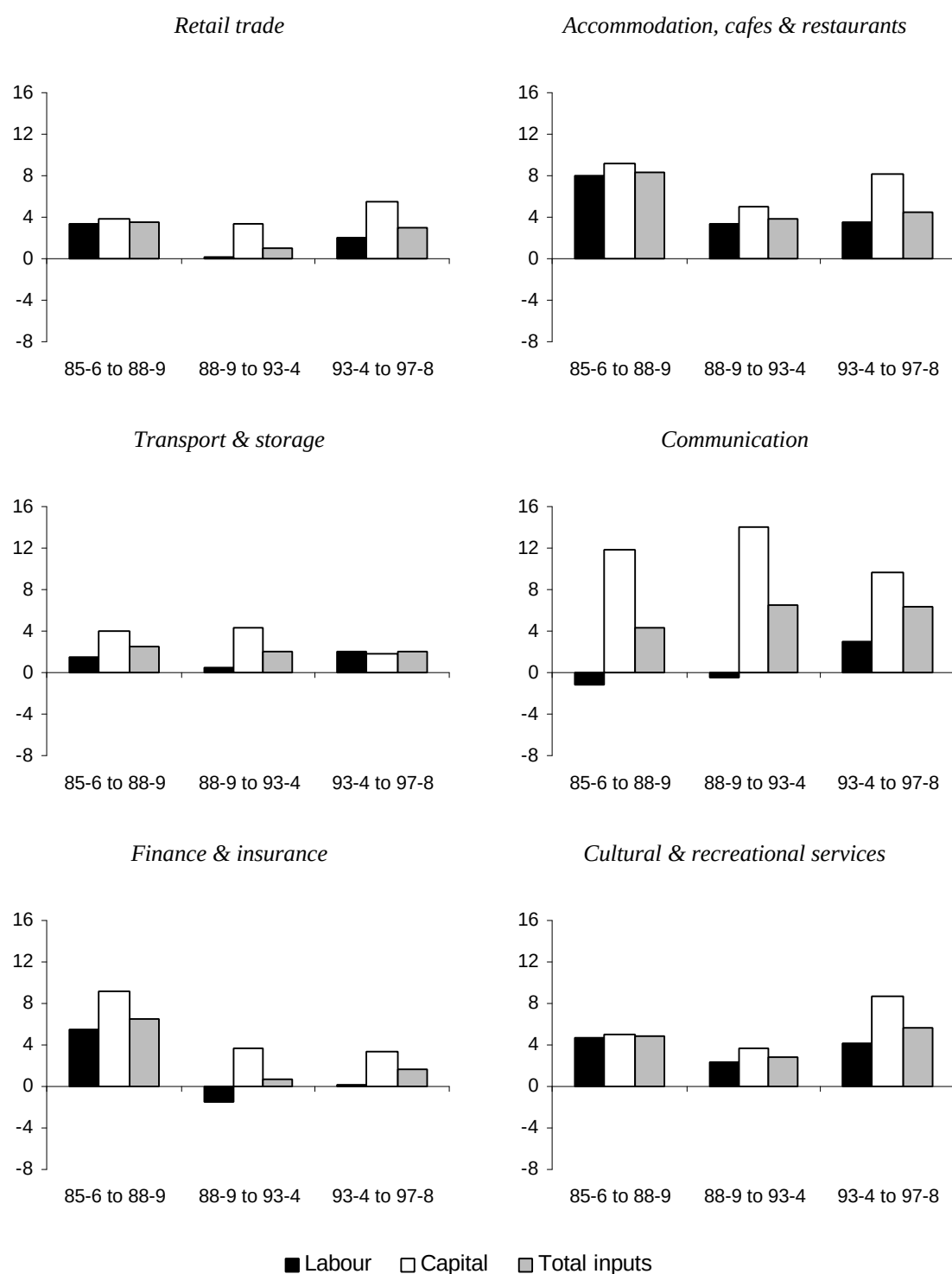
Source: Commission estimates based on ABS data.

Figure C.10 Average annual growth in inputs, by sector, selected periods
Per cent per year



(Continued on next page)

Figure C.10 (Continued)



Source: Commission estimates based on ABS data.

The major shift in industry composition of employment has been the increasing share of the Service sector and the declining share of Manufacturing (table C.8). Between 1974-75 and 1996-97, the Service sector increased its share of total employment from 70.6 to 80.4 per cent while the Manufacturing share declined from 21.6 to 13.5 per cent.

Nearly all the increase in the Service sector share came from the Non-market services sector share which increased from 24.7 to 34.3 per cent¹². Property & business services was the main source of change, its share increasing from 5.0 to 9.9 per cent.

Table C.8 Industry shares of employment, selected years
Per cent

	1974-75	1984-85	1989-90	1996-97
Agriculture	6.4	6.1	5.5	5.0
Mining	1.4	1.4	1.3	1.0
Manufacturing	21.6	16.4	15.4	13.5
Electricity, gas & water	1.8	2.1	1.4	0.8
Construction	8.3	7.4	7.7	7.0
Wholesale trade	6.5	6.2	6.5	5.9
Retail trade	14.0	13.5	14.3	14.8
Accom, cafes & restaur.	2.9	3.4	4.0	4.8
Trans, storage & comm.	7.7	7.2	6.8	6.7
Finance & insurance	3.2	4.1	4.6	3.8
Prop. & business serv.	5.0	6.4	7.7	9.9
Govt admin & defence	5.5	6.0	4.4	4.4
Education	5.1	6.7	6.7	7.0
Health & community serv.	6.1	8.1	8.2	9.2
Cultural & rec. services	1.6	1.8	2.0	2.3
Personal & other serv.	3.0	3.3	3.5	3.8
Total market services	45.9	45.5	47.3	46.1
Total non-market services	24.7	30.5	30.5	34.3
Total services	70.6	76.1	77.8	80.4
Total	100.0	100.0	100.0	100.0

Source: Commission estimates based on ABS data.

¹² The non-market sector is comprised of Property & business services; Government administration & defence; Education; Health & community services; and Personal & other services.

In the market sector, there were small increases in the shares contributed by Retail trade since 1984-85 and by Accommodation, cafes and restaurants and Cultural & recreational services since 1974-75. The large decrease in the Manufacturing share mainly took place in the decade to 1984-85 although significant decreases also occurred in later periods, most notably between 1989-90 and 1996-97. There were also small decreases in the shares of other industries in the market sector spread over several years. The main exceptions were Wholesale trade and Finance & insurance where the large part of the decreases occurred between 1989-90 and 1996-97.

There were significant changes in the allocation of fixed capital expenditure between industries but the pattern differed markedly from that for employment. There was a relatively small increase in the share held in the Services sector from 66.2 per cent in 1974-75 to 69.1 per cent in 1996-97 (table C.9). There was a small decrease in Manufacturing's share of fixed capital expenditure from 13.5 to 12.4 per cent over the same period, most of which occurred after 1989-90.

The most notable feature of the changing allocation of fixed capital expenditure was the increasing share of Property & business services from 4 to 11 per cent over the period 1974-75 to 1996-97. There were large declines in the shares of fixed capital expenditure for Agriculture (11 to 6 per cent) and Electricity, gas & water (11 to 5 per cent) and significantly increased shares for Mining (9.3 to 12.3 per cent) and Cultural & recreational services (1.1 to 3.2 per cent).

The decreased shares for Agriculture and Electricity, gas & water have largely taken place since 1985-86 while the large part of the increased shares for Mining and Cultural & recreational services occurred between 1989-90 and 1996-97.

Table C.9 Industry shares of gross fixed capital expenditure, selected years

Per cent

	1974-75	1984-85	1989-90	1996-97
Agriculture	11.0	10.4	7.0	6.2
Mining	9.3	10.2	9.8	12.3
Manufacturing	13.5	11.2	13.2	12.4
Electricity, gas & water	11.1	11.9	7.7	5.0
Construction	2.4	3.6	4.1	2.7
Wholesale trade	2.7	3.5	2.9	3.4
Retail trade	3.2	4.1	3.8	4.9
Accom, cafes & restaur.	1.7	2.8	3.4	3.5
Transport & comm.	20.4	18.5	18.1	18.6
Finance & insurance	3.0	4.4	7.8	4.6
Prop. & business serv.	3.9	6.5	9.2	10.8
Govt admin. & defence	4.6	3.1	3.5	3.6
Education	7.4	3.6	2.9	3.9
Health & comm. servs.	3.6	3.3	3.4	3.7
Cultural & recreat. serv.	1.1	1.7	1.8	3.2
Personal & other serv.	0.9	1.2	1.3	1.2
Total market services	45.6	50.4	49.6	45.9
Total non-market services	20.6	17.7	20.3	23.2
Total services	66.2	68.2	69.9	69.1
Total	100.0	100.0	100.0	100.0

Source: Commission estimates based on ABS National Accounts database on EconData.

Industry composition of output

The main changes in the industry composition of output have been a large decline in the share of contributed by Manufacturing and a large increase in Service sector's share. The share of Manufacturing declined from 15.7 per cent in 1974-75 to 11.0 per cent in 1996-97 while the Service sector's share increased from 77.1 to 82.4 per cent (table C.10). The increase in the Service sector share was largely accounted for by non-market services.

Other significant changes were increased shares for Transport & communication (5 to 8 per cent); Finance & insurance (5 to 8 per cent) and Property & business services (9 to 11 per cent) and a decline in the share of Wholesale trade (10 to 8 per cent).

Most of the increase in shares for Transport & communication and Finance & insurance occurred between 1989-90 and 1996-97 while the decline in the Wholesale trade share largely occurred in the decade to 1984-85. Most of the

increase in the share of Property & business services was achieved between 1984-85 and 1989-90.

Some of the changes in the industry composition of output appear to be the result of changing efficiency in the use of inputs. For example, Transport & communication increased its share of output despite declining shares in employment and fixed capital expenditure. The share of output of Electricity, gas & water held up despite large declines in employment and capital expenditure shares. On the other hand, the large increases in employment and fixed capital expenditure in Property & business services were not reflected in a similar increase in output share.

Table C.10 Industry shares of gross product, selected years

Per cent

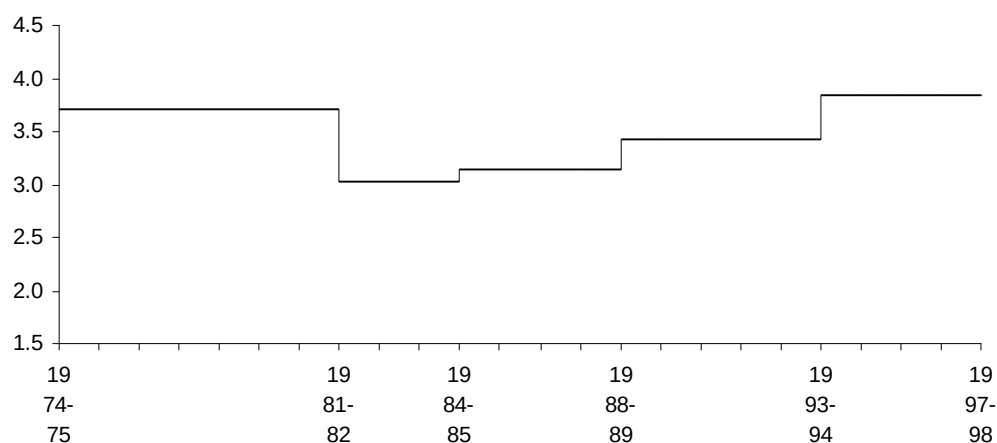
	<i>1974-75</i>	<i>1984-85</i>	<i>1989-90</i>	<i>1996-97</i>
Agriculture	3.9	3.9	3.3	3.1
Mining	3.3	3.3	3.5	3.5
Manufacturing	15.7	13.3	12.4	11.0
Electricity, gas & water	2.3	2.8	2.8	2.6
Construction	6.4	5.9	5.9	5.2
Wholesale trade	10.5	8.9	8.5	8.3
Retail trade	6.8	6.8	6.0	5.7
Accom, cafes & restaur.	1.7	1.5	1.5	1.5
Transport & comm.	5.0	5.9	6.2	7.7
Finance & insurance	5.1	5.5	6.5	7.8
Prop. & business. serv.	9.2	9.7	11.1	11.3
Govt admin & defence	8.5	8.8	9.4	9.4
Education	6.3	6.8	6.4	6.2
Health & community serv.	6.8	7.8	7.7	7.7
Cultural & rec. services	5.2	5.9	5.8	5.9
Personal & other services	3.3	3.3	3.1	3.1
Total market services	43.0	43.2	43.1	44.7
Total non-market services	34.1	36.3	37.7	37.7
Total services	77.1	79.5	80.9	82.4
Total	100.0	100.0	100.0	100.0

Source: Commission estimates based on ABS Time Series Statistics Plus database on EconData.

The rate of structural change

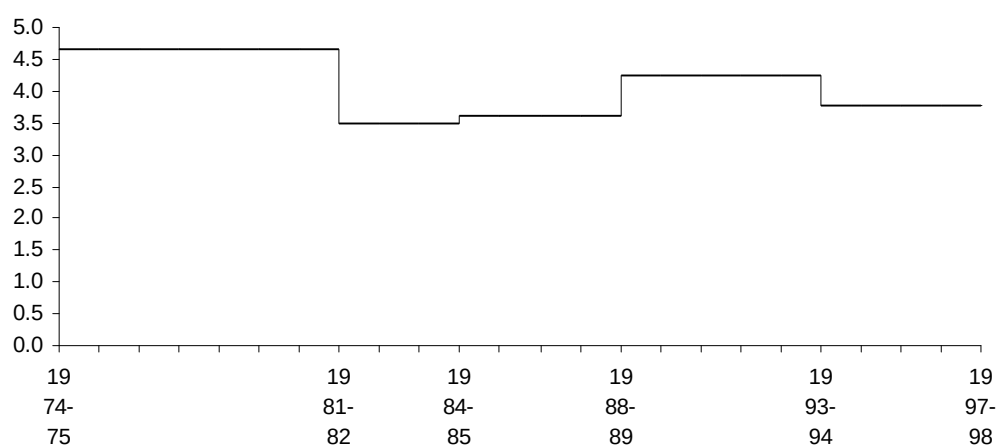
Figures C.11 and C.12 show the pace of structural change in output and employment at the broad sectoral level over the last two decades¹³. Structural change was higher in the 1990s than the 1980s for both output and employment.

Figure C.11 Structural change index, gross product



Source: Commission estimates based on ABS Time Series Statistics Plus database on EconData.

Figure C.12 Structural change index, employment



Source: Commission estimates based on ABS Labour Statistics database on EconData.

¹³ The pace of structural change is measured by an index of industry growth rates. The more growth rates diverge, the higher is the index value.

In terms of output, the pace of structural change since 1994 has been around the same level as that experienced in the 1970s. The rate of structural change in terms of employment remains below the level experienced during the 1970s.

Impact of resource allocation on productivity

The available evidence suggests that changes in the allocation of resources among Australian industries at the broad sectoral level may not have been a major factor in explaining aggregate productivity trends. Dixon and McDonald (1992) carried out a decomposition of changes in labour productivity in Australia from 1971 to 1989-90. They found that changes in the allocation of labour and capital between broad sectoral industries accounted for only a small proportion of the total growth in labour productivity.

Similarly, an analysis of sectoral contributions to productivity average annual growth in Australia from 1974-75 to 1994-95 by the Industry Commission found that compositional effects were not major (IC 1997a).

These results are broadly consistent with international studies. For example, van Ark (1996) shows that the shift from low to high productivity sectors in Europe appears to have a very small effect on the overall growth of labour productivity. Productivity growth within sectors has been the driving force behind growth in post-war Europe and decline in growth since 1973 was mainly accounted for by the productivity decline within each of the sectors of the economy. In this study van Ark adopted a broad sectoral classification. Lansbury and Mayes (1996a,b,c) show that little of the improvement in productivity in the UK in the 1980s was due to a switch from low productivity and low productivity growth sectors to those with a higher level and/or faster growth. If the sectoral distribution of manufacturing industry had been the same in 1990 as it was in 1980, productivity growth would have been almost the same over the decade.

C.7 Openness

The analytical framework provided in appendix B identifies openness as an underlying factor of productivity improvement. By being more open to trade and foreign investment an economy may realise higher productivity growth through increased competitive pressure on import-competing firms; increased opportunities to specialise in the production of goods and services in which the economy has a comparative advantage; increased opportunities to exploit economies of scale; and domestic firms being more export orientated.

Since the mid-1980s, Australia has become more outward looking and export-orientated. Over this period, both Australia's goods and financial markets have become more closely integrated with world markets. Today our links with the rest of the world are arguably stronger and more pervasive than at any time over the past century (Lowe 1994).

Trade intensity

One indicator of the openness of an economy is the ratio of gross trade (imports plus exports) to GDP. This provides a measure of trade intensity (figure 13). The ratio of Australia's gross trade to GDP was around 22 per cent in 1959-60 and did not reach 30 per cent until 1984-85. Since the mid-1980s, the pace at which Australia has become integrated into the world economy has increased. The ratio of gross trade to GDP increased to just under 40 per cent in 1993-94 and was 47 per cent in 1996-97.

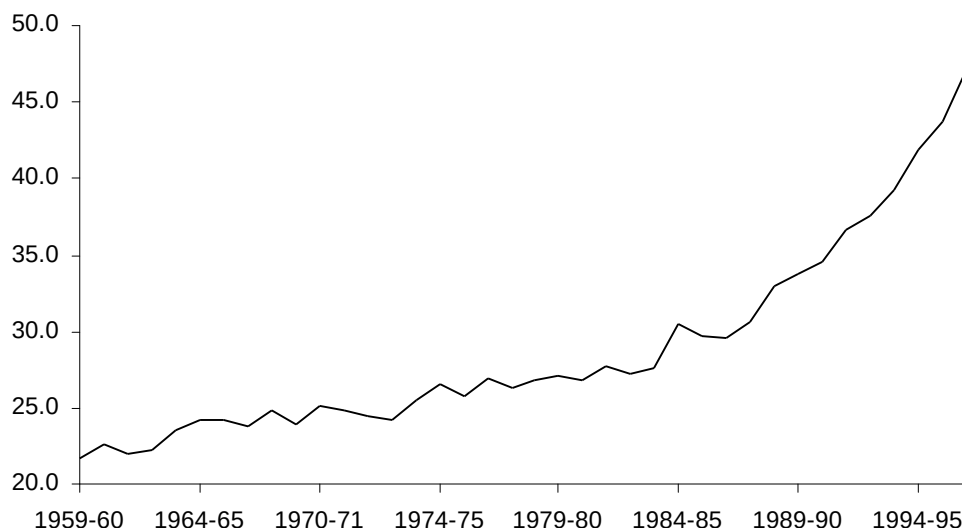
Some other indicators of the increasing openness of the Australian economy to international trade include:

- Australia's exports of goods and services grew in real terms at an average annual rate of 7.9 per cent between 1987-88 and 1996-97. This was much stronger than growth between 1977-78 and 1986-87, which was 4.7 per cent. Imports of goods and services grew in real terms at an average annual rate of 7.2 per cent between 1987-88 and 1996-97. This was also much stronger than the growth between 1977-78 and 1986-87, which was 4.3 per cent (ABS National Accounts and Time Series Statistic Plus databases on EconData).
- Between 1987-88 and 1996-97, exports of manufactured goods grew in real terms at an average annual rate of 9.6 per cent— compared with growth of only 3.3 per cent between 1977-78 and 1986-87. The export intensity of Australia's manufacturing sector increased from 17 per cent in 1986-87 to 25 per cent in 1996-97.¹⁴
- Imports of manufactured goods grew in real terms at an average annual rate of 7.8 per cent between 1987-88 and 1996-97 — compared with growth of 4.4 per cent between 1977-78 and 1986-87. The import penetration of the Australian domestic market for manufactured goods (share of imports in total sales to the domestic market) increased from 28 per cent in 1986-87 to 34 per cent in 1996-97.

¹⁴ Exports as a percentage of sales.

Figure C.13 Trade intensity^a: exports plus imports as a proportion of GDP, 1959-60 to 1996-97

Per cent



^a Trade intensity is exports plus imports relative to GDP (all in constant prices).

Source: Commission estimates based on ABS Time Series Statistics Plus and National Accounts databases on EconData.

- Australia's services exports grew in real terms at an average annual growth rate of 10.4 per cent between 1987-88 and 1996-97 — compared with a growth rate of 6.5 per cent between 1977-78 and 1986-87. Australia's services imports increased more slowly with real average annual growth of 6.1 per cent between 1987-88 and 1996-97.

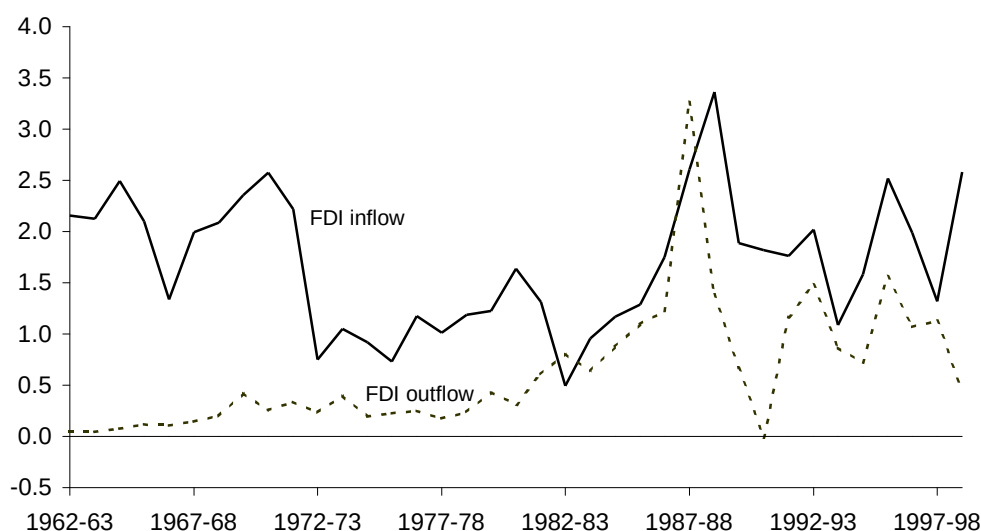
Foreign investment

The increasing openness of the economy has not been restricted to trade flows. Increasing levels of both inward and outward foreign investment have also been a distinctive feature of the increasing international integration of the Australian economy.

Foreign direct investment (FDI) flowing into and out of Australia increased markedly in the second half of the 1980s (Howe 1994). FDI inflows slowed considerably in the early 1990s while FDI outflows fell rapidly between 1988 and 1990-91. Both FDI inflows and outflows have subsequently recovered—although not to the peaks recorded in the late 1980s (figure C.14).

Figure C.14 **Foreign direct investment flows^a as a proportion of GDP, 1962-63 to 1998-99**

Per cent



^a Direct investment refers to financial investments by a non-resident that allows the non-resident significant direct influence over policy decisions of the enterprise. Until 30 June 1985, the ABS used a minimum ownership level of 25 per cent of the ordinary shares of voting stock (or equivalent equity interest) for investment to be classified as direct. Since 1985 the minimum ownership level has been 10 per cent, in line with international practice (Howe 1994).

Sources: Commission estimates based on ABS Time Series Statistics Plus database on EconData, ABS 5363.0 and 5303.0.

FDI inflows increased from an average of around 1 per cent of GDP between 1971-72 to 1984-85 to an average of 2 per cent of GDP between 1985-86 to 1998-99. Over the same period, FDI outflows increased from 0.4 per cent to 1.1 per cent of GDP on average.

The high level of FDI inflows in the second half of the 1980s was not out of line with that in the 1960s or the early 1970s (Howe 1994). However, it is significant that Australia has continued to attract substantial FDI despite reduced incentives for simple import substitution because of the winding back of Australia's trade barriers.

Reflecting the strong growth in FDI inflows in the second half of the 1980s, the value of Australia's FDI stock more than trebled over the past decade, from \$41.1 billion in 1985-86 to \$157.8 billion in 1997-98 (ABS 5363.0).

Over time there has been a shift in the sectoral allocation of FDI inflows away from manufacturing, mining and agriculture towards the service. Manufacturing's share of Australia's FDI stock fell from 35 per cent in 1976-81 to 27 per cent in 1982-92 (Ergas and Wright 1994).

The services sector accounts for the largest proportion of Australia's FDI stock. In both 1985-86 and 1995-96 services accounted for 55 per cent of Australia's total inward FDI stock (Hardin and Holmes 1997). Finance & insurance account for the largest share — over one-third of services sector FDI stock and 20 per cent of total inward FDI stock.

The lift in FDI outflows over the second half of the 1980s— to a high of around 3 per cent of GDP in 1987-88 — was a significant change from historical experience (Howe 1994).

The services sector accounted for just under half of total outward FDI stock in 1995-96 (Hardin and Holmes 1997). Finance & insurance accounted for nearly 80 per cent of services sector outward FDI stock and 40 per cent of total FDI stock.

As at 30 June 1997 the United States and the United Kingdom were Australia's largest sources of FDI stock (DFAT 1999). The Netherlands, Germany, France and Switzerland were other important European sources of FDI. Japan remains Australia's largest regional source of FDI, followed by New Zealand, Singapore and Hong Kong (DFAT 1999).

With the increasing internationalisation of the Australian economy there has been a shift in the focus of Australia's outward FDI. While the pattern of FDI outflows continue to reflect Australia's traditional trade and economic links— the United Kingdom, the United States and New Zealand— investment in the Asian region has increased (DFAT 1999).

Ergas and Wright used US Department of Commerce data on FDI inflows into the United States to examine the extent and pattern of the increase in Australian FDI. They found that Australian firms accounted for barely 0.5 per cent of annual inflows of FDI into the United States in 1980 (and even less before then), their share quadrupled to between 2 and 2.5 per cent for 1985, 1986, 1987 and 1988 and then seemed to stabilise at around 1.5 per cent in 1990 and 1991 (Ergas and Wright 1994).

C.8 Competition

Competition is seen as having an important effect on productivity performance. However, there is little readily available information on the general level of competition in the economy.

One way of shedding some light on trends in competition is to consider the tradables sector of the economy where imports of goods and services and the entry

of foreign firms into the domestic market serve as a sources of competition. Here, several factors influence the extent of competition for domestic producers.

- Overseas developments affect the level of competition from imports. Through the 1970s and 1980s, new sources of low-cost production emerged in Asia, multinational firms developed global production strategies to reduce costs of supply, and new more-efficient production technologies and management practices were introduced in the industry.
- Trade barriers reduce the impact of increasing competition from overseas producers.
- Regulatory barriers to foreign investment reduce the scope for takeovers, mergers and the participation of foreign investors.
- Exchange rate movements may reduce or enhance competition from abroad by their impact on the relative costs of imports and exports and on the costs of acquiring assets at home or abroad.

Getting a precise sense of the strength of competitive pressure is therefore difficult.

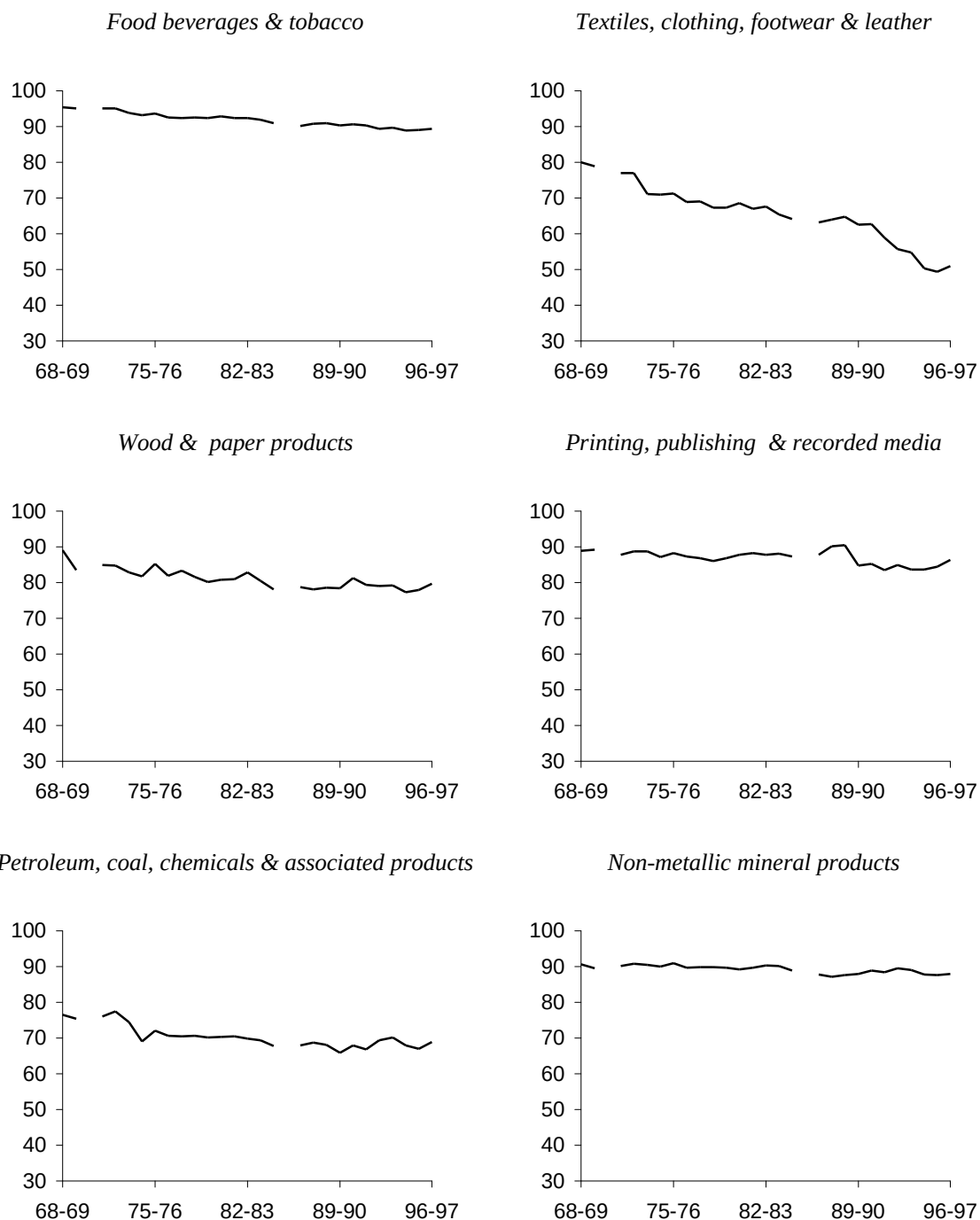
One indicator of the level of competition facing domestic producers is import penetration. However, changes in the extent of import penetration must be interpreted with caution. If imports and local production are concentrated in different market segments, an increase in import share does not necessarily indicate greater import competition. Market segmentation thus tempers, in a broad sense, the degree of competitive pressure from imports.

In the manufacturing sector, import penetration increased significantly over the past 25 years but its extent varied between industries (figure C.15).

- Domestic market share for Manufacturing declined from 82 per cent in 1971-72 to 65 per cent in 1996-97.
- Import penetration increased most for TCF and Machinery and equipment. Domestic market share for TCF declined from nearly 80 per cent in the early 1970s to about 50 per cent in 1996-97 and from 70 to under 40 per cent for Machinery and equipment.
- Import shares of the domestic market also increased significantly for Metal products and Other manufacturing. The domestic share for Metal products fell from 92 per cent in 1971-72 to 81 per cent in 1996-97 and most of the decrease occurred from the mid-1980s. The share for Other manufacturing fell from 83 to 70 per cent with most of the decrease occurring in the early 1970s.

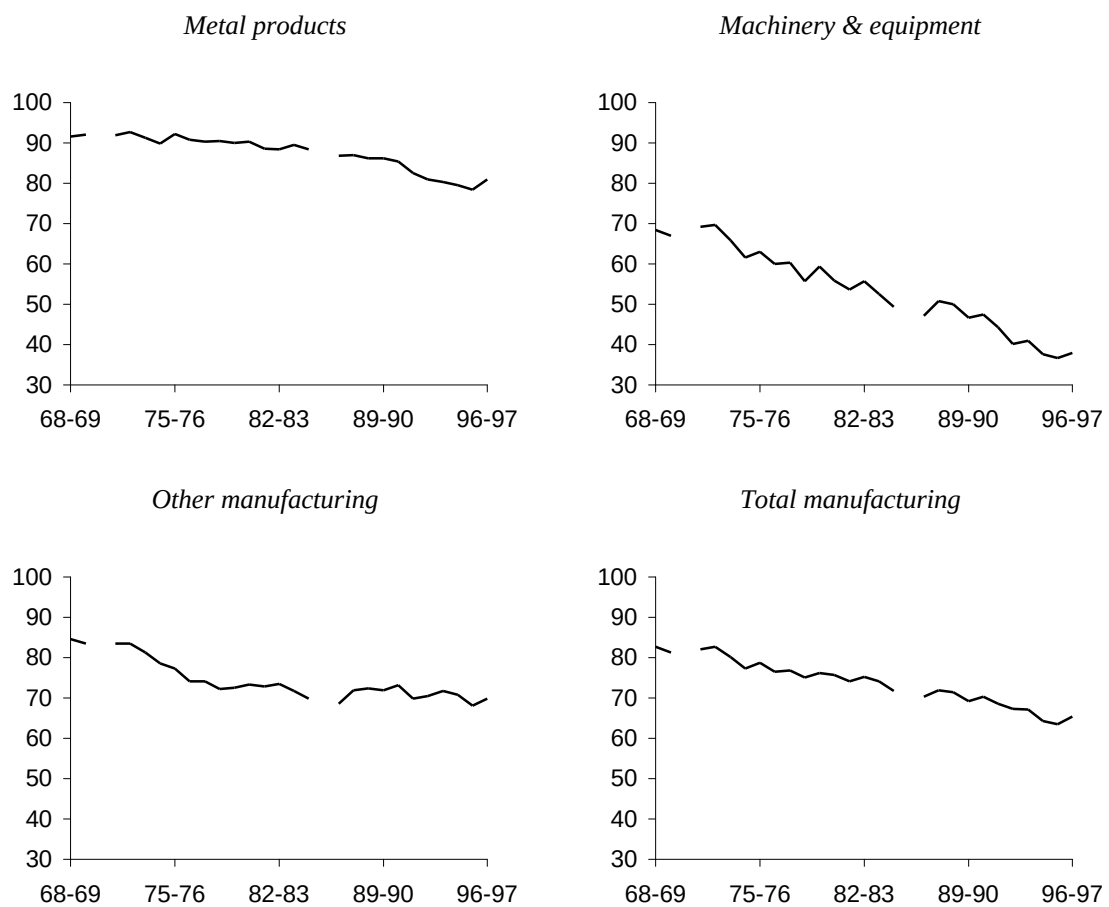
Figure C.15 Domestic market share, by manufacturing subdivision, 1968-69 to 1996-97

Per cent per year



(Continued on next page)

Figure C.15 (Continued)



Source: Commission estimates based on ABS data.

- Domestic market share has remained relatively stable in all other manufacturing industries since the early 1970s.

Another indicator of the competitive pressure on the tradable goods sector is the effective rate of assistance. Less effective assistance generally indicates more competitive pressure from imports, other things equal.

Assistance for all manufacturing industries has declined since the 1970s (IC 1995a). TCF and Machinery and equipment were the most highly assisted industries and have experienced large declines in protection. Metal products and Other manufacturing were accorded substantial assistance which has also been reduced.

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