

The drivers of Australia's productivity surge*

Gary Banks
Chairman, Productivity Commission

Key points

- Australia's productivity growth surged to a record high in the 1990s – more than double the rate achieved over the 1980s. Australia's productivity surge was also very strong by international standards.
- A new set of service industries – especially Wholesale trade and Finance & insurance – made major contributions to the 1990s productivity acceleration.
- Australia was comparatively quick in adopting information and communications technologies (ICTs) in the 1990s and their use has featured in the productivity accelerations of the new service industry contributors.
- Microeconomic reforms were pivotal in Australia's improved productivity performance, by sharpening incentives for businesses to be more productive and providing them with greater flexibility to adjust to a more competitive environment. Microeconomic reforms encouraged and assisted the uptake of ICTs and the transformation of industries in ways that tap new productivity potential.
- In looking to the future, further productivity gains are possible from continued ICT uptake and business transformation, and Australia is well placed to benefit from e-commerce.
- Policy will continue to play an important role – particularly in relation to labour market flexibility and the development of 'human capital' (in the widest sense).

Introduction

Productivity is not only the key to the performance of firms and industries; it is fundamental to the living standards of the general community. There is now general recognition that Australia experienced a transformation in its productivity record through the 1990s. The causes and industry origins of the productivity surge are perhaps less well known or accepted. A stream of recent Productivity Commission

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research has provided some useful insights, not only reaffirming the role of microeconomic reform, but also revealing the mechanisms by which it has operated.

This paper draws heavily on that research to describe trends in Australia's productivity; the role of different industries in the recent acceleration; how ICT has played a part and the linkages to micro reform. But first, a few points on the concept and measurement of productivity itself.

Measuring productivity

Productivity is, technically, the ratio of output produced to input used. Considered more broadly, productivity measures capture the ability of a nation to harness its physical and human resources to generate output (and income).

Productivity improvement can have connotations of minimising the use of inputs — for example, adopting production processes that eliminate waste or unnecessary costs. But, equally and importantly, it can be thought of as maximising output — using resources in the production of goods and services that add most value.

Productivity is measured in two main ways:

- labour productivity — the ratio of output produced per unit of labour used; and
- multifactor productivity — the ratio of output produced per combined input of labour and capital (buildings, machinery and equipment, etc),

There are pluses and minuses with each of these measures and some care is needed in interpreting them.

Labour productivity can be relatively easy to measure, whether it be at the level of a firm, industry or national economy — requiring only that output and the number of employees or hours of work be quantified. (Measurement of output in some industries, particularly services, is difficult.) Labour productivity reflects how well resources are used in generating output, but there are some dangers in interpreting labour productivity as an indicator of worker efficiency. There are so many factors outside the control of workers — the amount of capital available, changes in technology, management expertise — that affect output and therefore labour productivity.

Multifactor productivity (or MFP) is conceptually a better measure of efficiency of resource use than labour productivity, since it includes the two major elements — labour and capital — on the input side. Improvements in efficiency are a major contributor to improvements in labour productivity and growth in per capita incomes. Indeed, the Commission has calculated that MFP growth accounted for about half the

labour productivity and average income growth from the mid-1960s to the end-1990s (Parham, Barnes, Roberts and Kennett 2000).

In practice, obtaining a reliable measure of capital input for a firm or industry can be problematic. However, the ABS has introduced new methods and refinements in recent years that have improved the measurement of capital input at the aggregate and broad industry levels.

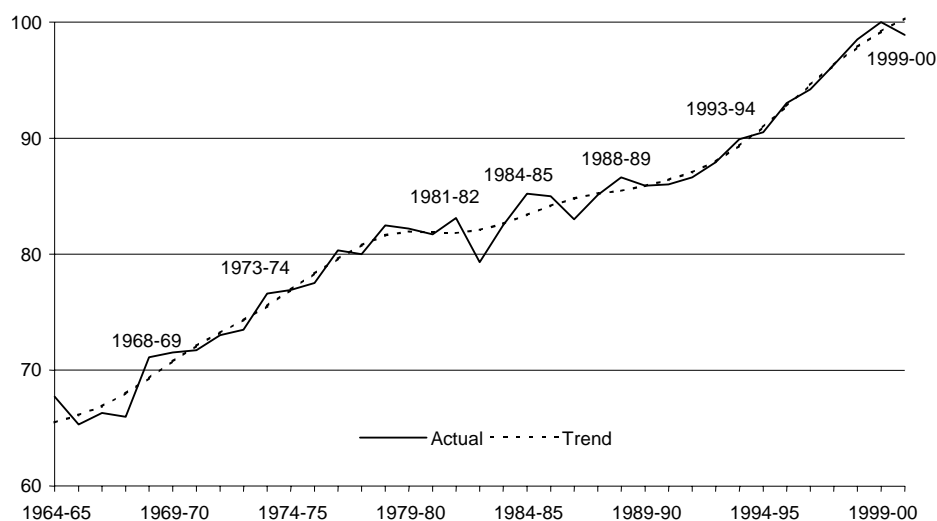
In line with much of the Productivity Commission's work, this paper focuses on multifactor productivity.

Trends in Australia's productivity

Figure 1 illustrates three phases of Australia's productivity performance over the second half of the 20th Century:

- strong productivity growth in the post-war period of reconstruction and expansion, through to the mid-1970s;
- a pronounced deceleration from the late-1970s through to the early 1990s; and
- a renewed surge in productivity growth from the early 1990s.

Figure 1 Australia's multifactor productivity, 1964-65 to 2000-01



Source: ABS 5204.0 and unpublished estimates.

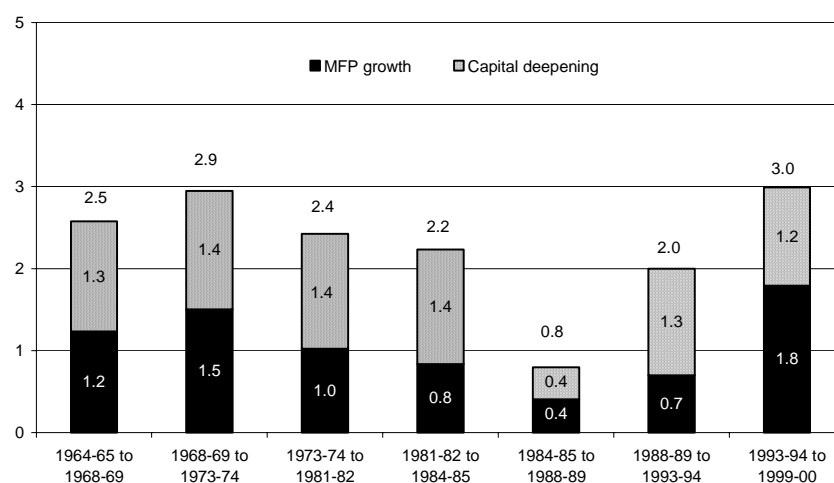
The 1990s surge peaked in 1999-00. There was a downturn in 2000-01, as the economy (output growth) slowed and hours worked declined slightly, but the measured capital input continued to rise at its earlier pace. This downturn in productivity is more likely to be short-lived than indicative of a marked slowing in underlying trend, for reasons that I will come to.

It is apparent from the chart that the 1990s presented the longest period of continuous positive growth in MFP on record. Clearly, there was much more at work than a cyclical uplift out of the early 1990s recession.

The peak years in figure 1 define what is known as ‘productivity cycles’. The 1990s cycle, for example, started in 1993-94 and ended in 1999-00. The ABS calculates the average rates of peak-to-peak growth and publishes them as indicators of underlying rates of productivity growth. Importantly, the use of peak-to-peak productivity cycles ensures that *business* cycles do not have spurious effects on estimates of productivity trends.¹

Figure 2 shows the underlying rates of productivity growth over productivity cycles, as computed by the ABS. The rate of growth in labour productivity is indicated by the height of each column. The rate of multifactor productivity (MFP) growth is indicated by the black portion at the bottom of each column. The lighter shade in the top portion of each column represents the rate of ‘capital deepening’ — indicating increases in the use of capital per unit of labour.

Figure 2 Growth in labour productivity and multifactor productivity over productivity cycles, 1964-65 to 1999-00



Source: ABS 5204.0 and PC estimates.

Two important points are apparent from the chart:

- Firstly, it has been variations in MFP growth — in other words, efficiency — that have almost wholly accounted for variations in labour productivity growth. The

¹ In contrast, Quiggin (2001a) makes productivity comparisons between business cycles. This can obscure important information about productivity growth that occurs independently of the business cycle, as happened in the 1990s. Quiggin (2001b) also claims that the 1990s surge in productivity is partly due to increases in capacity utilisation. But the strong growth in capital in the 1990s was more consistent with an increase in capacity than in its rate of utilisation (Parham, 2001).

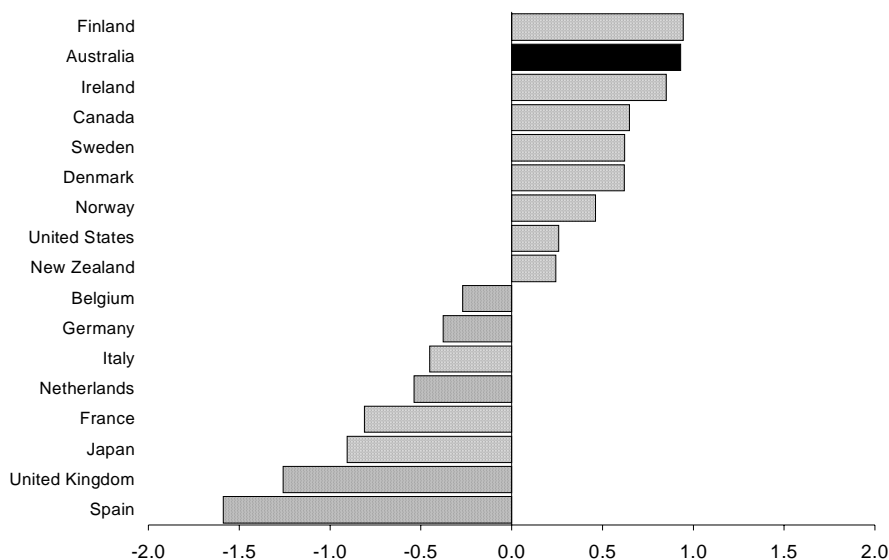
rate of capital deepening has been fairly constant across the cycles (apart from the period of strong employment growth in the late 1980s).

- Secondly, the underlying rates of productivity growth — both for labour and MFP — were at record highs in the 1990s cycle. MFP grew at an annual average rate of 1.8 per cent, just over 1 percentage point (or 2½ times) higher than the previous average from the early 1980s.

Australia’s productivity performance in the 1990s was also strong by *international* standards. Figure 3 shows that Australia was one of only three developed countries to experience a strong productivity acceleration in the 1990s.² Furthermore, unlike the so-called Golden Age of the 1960s, there was no worldwide productivity boom in the 1990s.

The productivity acceleration in the US has received much attention, partly because of the importance of the US economy, but also because it appeared unexpectedly — at a stage in the business cycle when a *slowdown* in productivity growth would normally have occurred. However, according to the Productivity Commission’s investigations, Australia’s productivity surge started earlier than that of the United States and was of much greater magnitude (Parham, Roberts and Sun 2001).

Figure 3 Changes in trend multifactor productivity growth in the 1990s in OECD countries^a



^a Change in average annual rate of Productivity growth from 1980-89 to 1990-99

Source: OECD 2001a

² International productivity comparisons should allow for the fact that productivity can grow relatively fast in countries that are in a process of ‘catching up’ to productivity leader countries. Australia outperformed the predicted rate of productivity growth that allows for catch-up among high-income OECD countries. This contrasts with the two earlier phases, when Australia’s productivity growth was below the ‘catch-up’ benchmark.

The timing, strength and largely localised nature of Australia’s productivity surge suggest that there were some peculiarly Australian explanations — at least in its early stages. A closer examination of the industries responsible for the improved performance provides some insights about those.

Industry contributors to the productivity surge

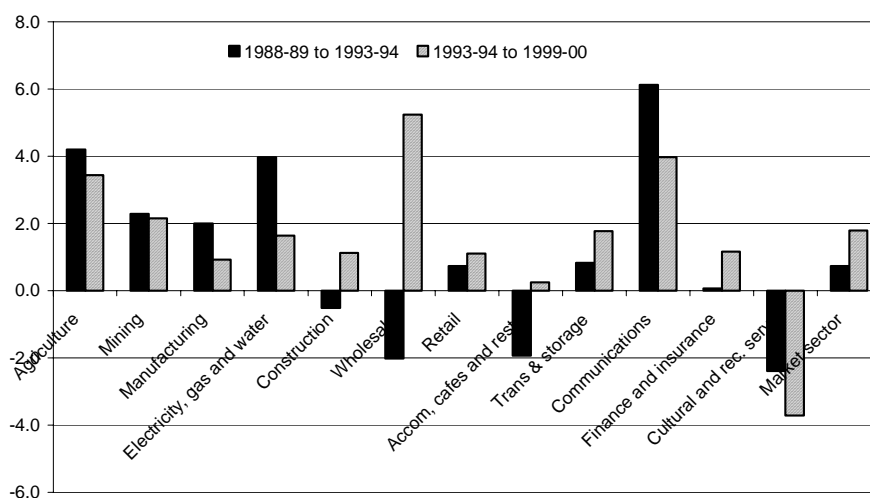
It should be said that industry productivity growth estimates need to be treated with a little more caution than do aggregate measures. Productivity is particularly difficult to measure accurately in some service industries. With that in mind, the industry contributors to the 1990s productivity surge came from unexpected quarters.

Figure 4 shows MFP growth rates in industry sectors over the past two productivity cycles. (Year-to-year estimates from 1974-75 are presented in appendix A.)

In the first cycle (1988-89 to 1993-94) there is evidence of relatively strong productivity growth in the ‘traditional’ contributors to aggregate productivity growth. These are Agriculture and Mining, with their typically strong underlying growth (notwithstanding some cyclical variation) and Manufacturing, which makes a major contribution to aggregate productivity growth — despite somewhat weaker performance — due to the sector’s relatively large size.

These traditional sectors were joined in the 1980s and early 1990s by two other strong performers: Communication services and Electricity, gas & water. Their improved performance should not have been a surprise, given the major efficiencies achieved in these largely government enterprises through the microeconomic reforms in that period.

Figure 4: Industry MFP growth over the last two productivity cycles



Source: PC estimates based on unpublished ABS data.

It is notable that while productivity growth remained relatively strong in these sectors in the 1990s cycle (except for Manufacturing), they all experienced a deceleration compared with the previous cycle. None made a contribution to the productivity surge in the post-1993-94 cycle.

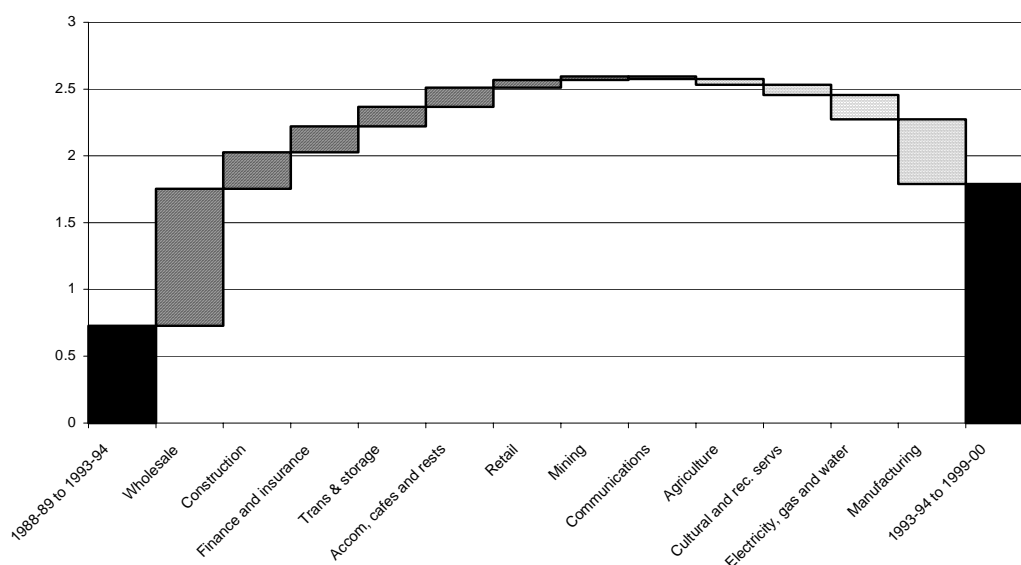
The stand-out performer in the more recent period was Wholesale trade, although other service industries also increased their rate of productivity growth.

Figure 5 depicts the extent to which different industries contributed to the increase in the rate of aggregate productivity growth from the first cycle (represented in the left-most column) to the second (the right-most column). An industry's contribution to the productivity acceleration reflects both its productivity growth rate and its relative size. Those industries on the left side of the 'arch' are positive contributors to the acceleration, whereas those on the right are detractors. The chart shows the 'new' contributors to aggregate productivity growth to have been the following service industries:

- Wholesale trade (overwhelmingly);
- Construction
- Finance & insurance;
- Transport & storage; and
- a few other minor contributors.

The 'traditional' or 1980s contributors made negative contributions in the 1990s, particularly Manufacturing.

Figure 5: Industry contributions to the acceleration in aggregate productivity growth between the last two productivity cycles



Source: Commission estimates based on unpublished ABS data.

ICTs and the new service industry contributors

Part of the success of the new service industry contributors can be explained, at least in an immediate or proximate sense, by their use of information and communication technologies (ICTs).

There has been a lot of interest in ICTs in the context of the US productivity acceleration. A key message that came out of early analyses of the US experience emphasised the productivity gains that arose directly through the *manufacture* of ICTs. More and more powerful microprocessors, computers and communications equipment were produced, with little or no increase in inputs. (See Gordon (2000) as a primary source.)

However, more and more evidence is emerging that the *use* or application of ICTs in the United States has also been important in generating that country's additional productivity growth (see, for example, Brynjolfsson and Hitt 2000, Stiroh 2001 and McGuikin and van Ark 2001). The importance of use (as well as production) was also a central finding in the OECD's recent *Growth Project*, which investigated the reasons for productivity and output differences across countries (OECD 2001a).

The Australian case confirms that *production* of ICTs is not necessary to access so-called 'new economy' productivity gains. Comparative OECD (2001b) data show:

- Australia's use of ICT equipment (hardware and software) to be relatively high among OECD countries:
 - Australia had the third highest investment in ICTs as a proportion of business investment in 1999.
 - Australia was also ranked third on Internet and e-commerce transactions (as measured by secure webservers).
- However, Australia's production of ICTs, in contrast to uptake, is relatively small.
 - Australia ranked only 20th on the proportion of Manufacturing devoted to ICTs.
- On infrastructure indicators (for example, access paths and broadband availability) Australia scores a middle ranking (around 10th-13th).

The new service industry contributors to the productivity surge have links to the use of ICTs. But the links are complex. ICTs are general-purpose or enabling technologies that provide a platform for other innovations. As with other enabling technologies (like electricity) the big productivity gains do not come immediately or directly from the technology's availability, but from it being combined with complementary innovations, including in new products and production processes. These take time. They will generally require additional fixed investments and different work arrangements.

Recent Productivity Commission research (Parham, Roberts and Sun 2001) has highlighted the following points:

- The use of ICTs and their contribution to aggregate productivity growth accelerated in the second half of the 1990s.
- Finance & insurance is a relatively high user of ICTs (on all indicators). So is Wholesale trade, depending on which indicator is used.
- The productivity gains in Finance & insurance appear to have been directly related to ICT use (development of new information-hungry products, for example, financial derivatives for risk-management; and automation of and electronic access to banking services). But looking across all industries there is no clear relationship between the intensity of ICT use and productivity growth.
- In many cases ICT-related productivity gains have been indirect – by facilitating business transformation: in other words, changing what businesses do and how they do it.

The importance of this process of business transformation is well illustrated by earlier Commission analysis of the productivity gains in Wholesale trade (Johnston et al 2000). It emerged that wholesalers were not necessarily becoming much more IT intensive. Rather, they were using these technologies more productively. Bar-coding, scanning and picking technologies, together with inventory management systems, enabled businesses to streamline their operations and move away from storage-based to fast flow-through systems, reducing the need for additional storage (capital) and handling (labour).

A review of studies of IT use in US firms by Brynjolfsson and Hitt (2000) found that gains varied widely at the firm level. Firms needed time to work out what could be done and to undertake complementary investments in organisational change to maximise the gains. This encompassed innovations in product lines, management practices, work arrangements, supplier and customer relationships and so on. Flexibility and adaptation were key ingredients. The authors state:

‘As computers become cheaper and more powerful, the business value of computers is limited less by computational capability and more by the ability of managers to invent new processes, procedures and organisational structures that leverage this capability.

This appears to have been corroborated by a major study of IT use in US firms conducted by McKinsey Global Institute (2001). McKinsey found that only in rare cases did IT directly deliver large productivity improvements. Two examples in the study are on-line retail securities trading and cellular equipment that enables better use of the available spectrum, where the product or service itself was well suited to IT. The study found that, in most cases, IT was only one among many tools that managers used to redesign core business processes, products or services. Competitive pressures were identified as the driving force behind such improved performance.

The microeconomic reform catalyst

This brings us back to microeconomic reform in explaining the ‘surprising’ industry origins of Australia’s productivity surge in the 1990s.

The recent Australian experience has provided some important insights about improving productivity performance:

- Advances in technology are not the only source of productivity growth;
- It is the rate of uptake of technology (not the mere existence of advances) that matters for improving productivity.
- Other facilitating changes within firms are required to get the full productivity potential out of new technologies.

At each step, microeconomic reform has played a significant role. It is worth elaborating briefly.

Advances in technology are not the only source of productivity growth

Economics textbooks often portray technological advance as the only or main source of productivity growth. In the long run, all things being the same, this may be true. But a significant contribution to Australia’s improved productivity performance in the past decade has come from reductions in production inefficiencies — better organisation of production – rather than new technology.

This is clearly illustrated by the improved performance of government business enterprises (GBEs), which dominate the provision of Australia’s economic infrastructure. As noted, these include energy, water and communications, as well as transport services. Microeconomic reforms have driven many of the productivity improvements in these areas by bringing clearer commercial incentives and disciplines to GBEs. The businesses have responded by more clearly defining what they do, adjusting manning levels and improving investment decisions. The Commission’s recent case studies of GBE reform in transport and water services have revealed strong productivity responses (PC 1999).

The gains in productive efficiency have not been limited to GBEs. Reforms impacting on manufacturing have also played a significant role. The Vernon Committee (1965) was an early catalyst for those reforms. It demonstrated that Australia’s productivity potential was not being fully tapped in Manufacturing because a complex, ‘made-to-measure’ tariff structure encouraged industry fragmentation with small scale production oriented toward the confined domestic market. Rationalisation of tariffs was expected to bring gains from specialisation and scale, with production geared more toward export markets.

Recent case studies by the Productivity Commission have illustrated that subsequent efficiency gains were linked to reductions in manufacturing protection. For example, Whitegoods, TCF and PMV were all in a similar, highly-protected position in the late 1970s. But protection was lowered more quickly in Whitegoods through the 1980s and its productivity improved more markedly than in the other two industries (PC 1999).

The importance of technology uptake

I have already noted that Australia moved quickly by international standards in its uptake of ICTs in the 1990s. This rapid diffusion of technology is in marked contrast to the sluggish behaviour of Australian firms in earlier decades.

In most developed countries, the manufacturing sector was an important focus of innovation in the post-war boom period. Yet available technologies were not picked up in Australia. The Jackson Committee of 1975 lamented this failure, in its review of Australia's manufacturing sector:

‘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. ...

Australia's relatively poor 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.’

A senior business leader a few years later noted the implications of government-supported resistance to change (Uhrig 1979, p. 5):

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

The stronger competitive forces in more recent times have strengthened the incentives to adopt technologies that can be used to upgrade productivity and competitiveness and to develop new products and markets (PC 1999, Johnston et.al. 2000). That same pressure has seen a turnover in senior managerial ranks, with greater rewards for productive endeavours relative to rent seeking. In the process, and also reflecting the more general shift to services, Australia has transformed itself from a technological laggard into an advanced user of new technology.

An important Business Council of Australia study in the 1990s (Carnegie and Butlin 1993) noted:

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 need for flexibility and adaptation to get the most out of new technology.

The clear message emerging from studies of firms' use of ICT is that, generally speaking, the large productivity gains do not come from 'bolting-on' ICT to existing modes of production. The gains come from using ICT as part of a process of business transformation. Flexibility and adaptation are key.

Again, the case of Wholesale trade — the stand out performer of the 1990s — illustrates the point. The benefits of transformation to fast flow-through systems in that sector depended importantly on the increased flexibility in labour markets. Industrial relations reforms promoted enterprise flexibility and autonomy, including through the introduction of split shifts and reduced scope for demarcation disputes.

In contrast, the persistent labour market rigidities in much of Europe appear to have reduced the potential for those countries to reap ICT-related productivity gains.

The gains from reform and productivity growth

The study of Australian wholesale trade also illustrates why the benefits of reforms can show up in perhaps unexpected places. The distribution of motor vehicles is one major area of wholesaling. With the increase in international competition (following the reduction in trade barriers), domestic producers looked for savings all along the 'value-chain' — not just in the production of motor vehicles, but also in their distribution and marketing. In other words, increased competitive pressure in downstream markets can have a strong influence upstream. (This was also the story of GBE reform.)

What has also emerged is that the benefits of productivity gains have not been wholly absorbed by businesses, but have generally been passed on to users and consumers. In particular, notwithstanding the major turnaround in the productivity of wholesale trade, gross profit margins declined (Parham, Barnes, Roberts and Kennett 2000). It seems that a more competitive environment not only drives more productivity gains, it also means that the consumer receives more of the benefit from productivity gains through lower prices.

The gains to the community from productivity growth have been substantial at the national level. Growth in real average incomes of Australians accelerated from 1.4 per cent a year in the 1980s to 2.5 per cent a year in the 1990s. MFP growth accounted for over 90 per cent of that acceleration (Parham, Barnes, Roberts and Kennett 2000).

Without it, Australian households would on average have been \$7000 poorer annually by the end of the decade.

The productivity outlook

Notwithstanding the possibility of external economic shocks, there are grounds for optimism about the general productivity outlook for Australia. The underlying rate of productivity growth may not continue at its 1990s rate, when there was considerable scope for us to ‘catch-up’ to other countries after decades of lagging. But it is unlikely to fall back to the rate of the late 1970s and 1980s.

For one thing, the heightened incentives and disciplines for improved performance are not temporary. The reduction of barriers to competition and removal of impediments to innovation can be expected to have lasting effects on the dynamism of our economy. And, to the extent that the economy has become more flexible and adaptable, its capacity to deal with any future external shocks and to continue to benefit from technological advances will have improved.

In this respect, although a lot has been said about the potential productivity gains from computer networks (especially e-commerce through the Internet and specialised networks), their realisation remains largely ahead of us. The use of e-commerce only became widespread in the United States at the end of the 1990s, with Australia a little way behind. But, for reasons just outlined, Australia is now well placed to reap the productivity gains that may flow from e-commerce. We can also take heart from the fact that US analysts are optimistic about the scope for ongoing productivity gains in that economy flowing from ICT use (Greenspan 2002).

While Australia’s aggregate productivity performance has outstripped that of most OECD countries, some industry sectors – notably Manufacturing and Retail trade – have not shown as much strength as in other countries. As demonstrated earlier, productivity growth in these industries stagnated in the 1990s, whereas it accelerated in the United States and other economies (BLS 2002, McKinsey Global Institute 2001).³ On the face of it, there should be scope to reinvigorate productivity growth in these sectors. One possibility is that, in some areas, firms have been insulated from the need or constrained in their ability to undertake the reorganisations that can generate large productivity gains.

What does seem clear, is that government policy will continue to play an important role in Australia’s future productivity performance. Detailed industry research

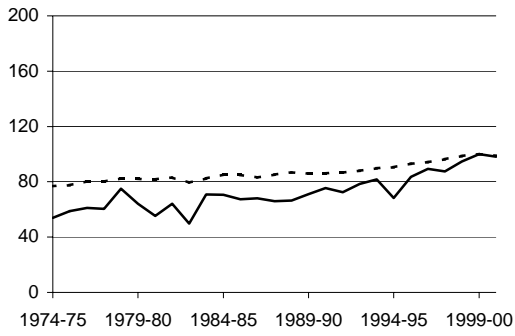
³ The acceleration in productivity growth in US durables manufacturing is partly related to ICTs. The absence of ICT production in Australia would be one reason for Australia falling behind US productivity levels. However, Australia’s Manufacturing productivity has also fallen behind that of many other OECD countries (van Ark and Timmer 2001).

confirms the strong links between microeconomic reform and the 1990s productivity acceleration. Its two-sided influence – generating external competitive pressure and the internal flexibility for firms to respond – has been particularly important to the ‘new economy’ story in the services sector.

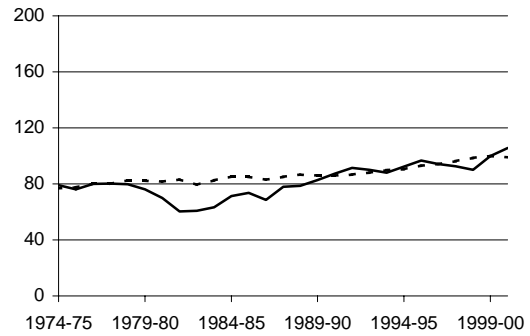
Labour reforms have been the key to this and they will remain of central importance. But the closer that the Australian economy gets to its technological and productive frontier, the more important will innovation be to our continuing progress. Innovation embraces a lot more than technological progress. And while technology can always be imported, its innovative use is largely a domestic issue. Ultimately how well we do it depends on the intellectual qualities and attitudes of the managers and workforces in Australian enterprises. That in turn largely depends on the effectiveness of our education and training systems. Ensuring that those systems work well – and there is growing evidence to the contrary – will be one of the key challenges in sustaining Australia’s productivity performance in the future.

Appendix A: Multifactor productivity by industry sector, 1974-75 to 2000-01

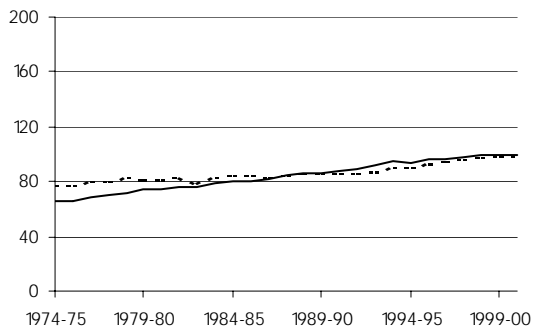
Agriculture



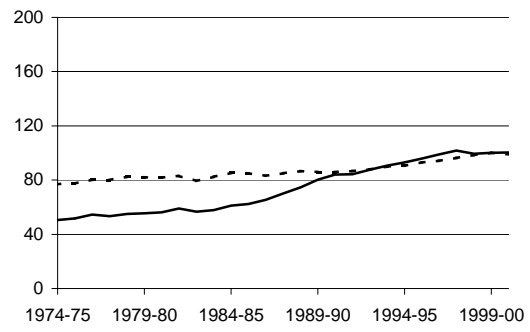
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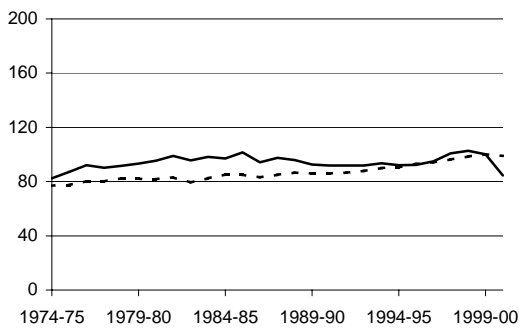
Manufacturing



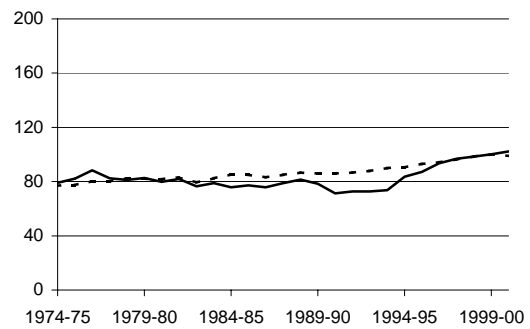
Electricity, gas & water



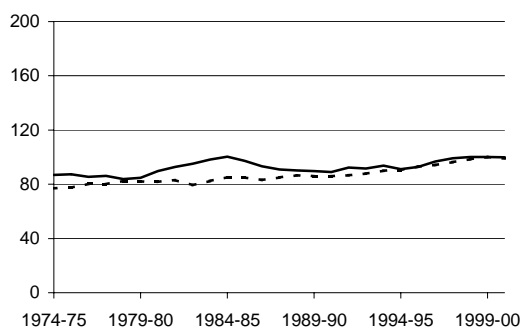
Construction



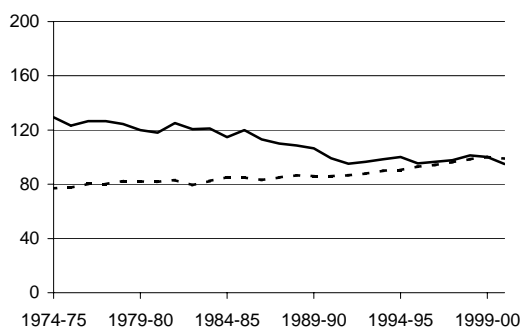
Wholesale trade



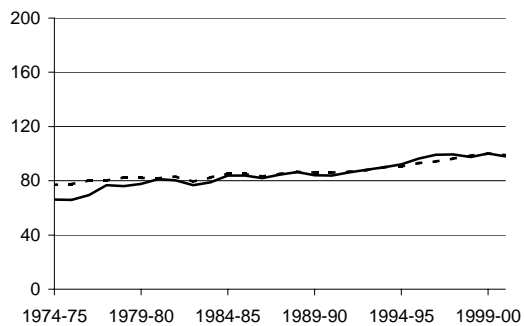
Retail trade



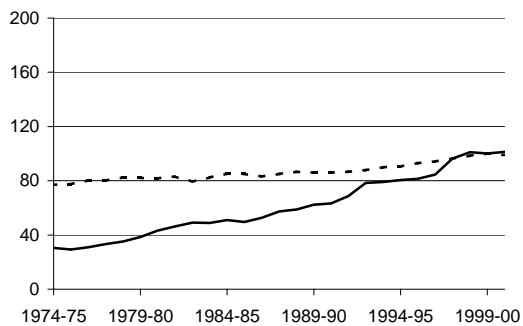
Accommodation, cafes & restaurants



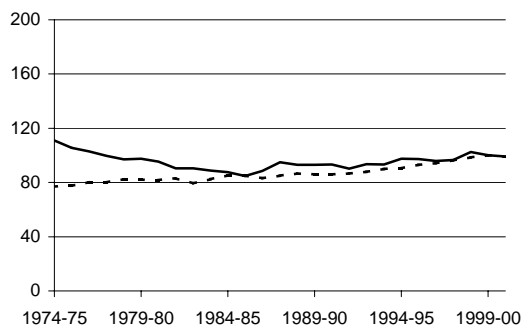
Transport & storage



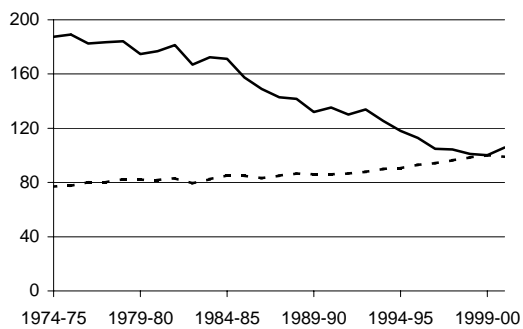
Communications



Finance & insurance



Cultural & recreational services



— Industry - - - - Market sector

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