SUBMISSION 20

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From the Chairman's Office

1 September 2009

Mr Stephen Boyd
Committee Secretary
Standing Committee on Economics
PO Box 6021
House of Representatives
Parliament House
CANBERRA ACT 2600
AUSTRALIA

Dear Mr Boyd

Submission — Raising the Level of Productivity Growth in the Australian Economy

Please find enclosed the Productivity Commission's submission to this inquiry. For some 20 years now, productivity issues and policy settings have been an important part of the work of the Productivity Commission and its predecessors, the Industry Commission and the Industries Assistance Commission.

Our focus has primarily been on the measurement and interpretation of productivity, its trends and developments in the market sector of the economy, and the policy challenges we face in returning Australia to strong productivity and economic growth.

If you have any queries regarding the submission, please do not hesitate to contact Donald Brunker on 02 6240 3342.

Yours sincerely

Gary Banks AO
Chairman

Australian Government
Productivity Commission

Submission to the House of Representatives Standing Committee on Economics

Productivity Commission Submission

Inquiry into Raising the Level of Productivity Growth in the Australian Economy

September 2009

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Abbreviations

ABS	Australian Bureau of Statistics
BERD	business expenditure on research and development
COAG	Council of Australian Governments
CSIRO	Commonwealth Scientific and Research Organization
EGW	Electricity, gas & water
EU	European Union
GDP	gross domestic product
GERD	gross expenditure on research and development
IC	Industry Commission
ICT	information and communication technology
IT	information technology
MFP	multifactor productivity
NRA	National Reform Agenda
OECD	Organisation for Economic Co-operation and Development
PC	Productivity Commission
R&D	research and development

Explanations

Billion	The convention used for a billion is a thousand million (10^9).

OVERVIEW

Key points

- Australia's rate of productivity growth will be a major determinant of future income growth, and of how well the country recovers from the global financial crisis and meets longer term challenges such as population ageing and climate change.
- The determinants of productivity growth operate at two broad levels:
  - immediate causes which, at the individual firm level, include innovation, the adoption or adaptation of technological and organisational advances and the achievement of economies of scale and scope
  - underlying drivers such as competition policy and an open economy, and more fundamental institutional arrangements.
- Over the last four decades, Australia's market sector multifactor productivity (MFP) growth has averaged 1.1 per cent per year. This places us in about the middle of the OECD rankings over the long term.
- Concerns about declining productivity growth and per capita income growth in the early 1980s gave impetus to the significant economic reforms which were implemented from the mid-1980s.
  - Subsequently, during the 1993-94 to 1998-99 productivity cycle, average annual MFP growth surged to 2.3 per cent. Australia's productivity performance rose to 2rd in the OECD at this time.
- The fact that MFP growth has declined since 1998-99 is not unexpected, but the extent of the decline is, especially since 2003-04.
- Commission analysis suggests that 70 per cent of the recent rapid decline since the cycle ending in 2003-04 is accounted for by specific developments in 3 sectors:
  - Mining, with declining resource quality and large capital investment that has not yet translated into output; Electricity, gas & water, with capital investment and reduced rainfall; and Agriculture, with the drought.
- Though important in the long run, factors which are unlikely to have played an immediate and direct role in the recent decline are expenditure on infrastructure, education and training, or R&D.
- To raise the rate of productivity growth, a broad based reform program is required which:
  - removes impediments to the efficient allocation of resources across the economy
  - heightens the incentives for firms to perform, while helping to enhance their organisational flexibility and capability.
- The National Reform Agenda provides an appropriate framework. While recognising the constrained fiscal environment in the short term, policy settings should be based on a commitment to an open and competitive economy, ongoing regulatory reform and efficient investment in human and physical capital.

Overview

Productivity is a measure of how efficiently an economy is operating. Growth in productivity is an important determinant of long-term economic growth and hence income growth. As such, Australia's future productivity performance will affect its rate of recovery from the current global financial crisis as well as its future prosperity and capacity to address the longer-term challenges of population ageing and climate change.

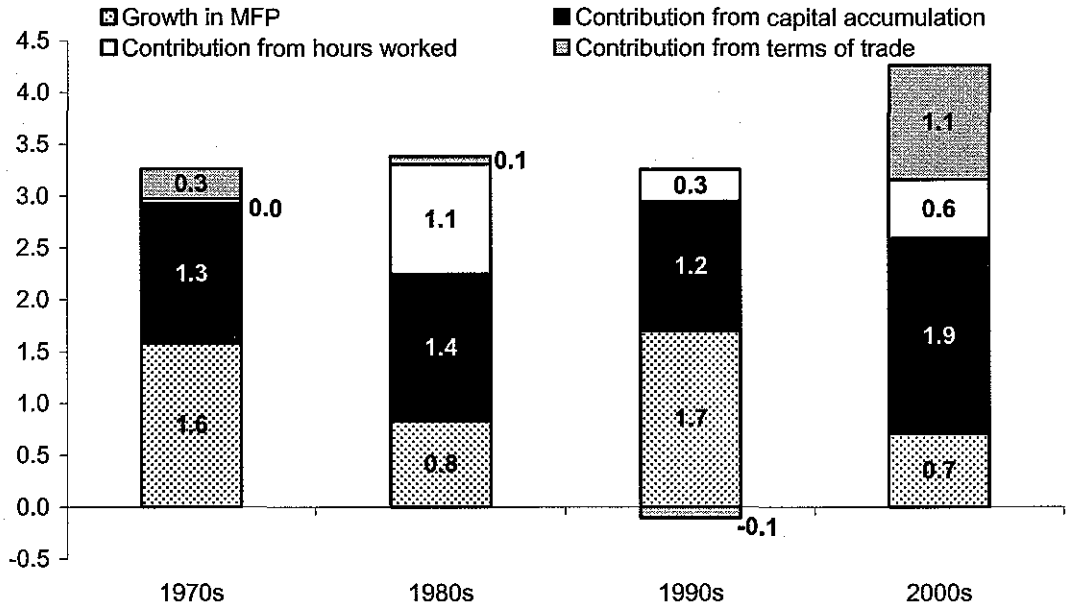
There are two main measures of productivity. The most commonly referred to is labour productivity, which is calculated for the whole economy as real GDP per hour worked. It is a catch-all concept which enables additional output to be compared with the actual hours worked by the labour force. However it is not, despite its title, a good indicator of labour efficiency. A finding of growing labour productivity is typically due in part to an increase in output resulting directly from additional capital investment and complementary factors, as well as improvements in the way labour is used. It is widely recognised that productivity growth defined in this way accounts for most of the growth in real income over the long term.

Multifactor productivity (MFP) measures the amount of output (real value added) obtained from a combined unit of capital and labour. It enables economic growth to be clearly analysed in terms of the contributions from each of its constituents: growth in labour, in capital and in productivity. It is the primary measure referred to in this submission. Being the more comprehensive indicator of productive efficiency, it contributes policy relevant insights into the various determinants of growth.

Taking into account the growth in labour and capital, and changes in the terms of trade, MFP growth has been responsible for over one-third of total real income growth over the last four decades (figure 1).

Figure 1 **Contributions to income growth — the importance of MFP**

Percentage points



Australia's productivity performance

Over the last four decades, annual multifactor productivity growth in the 'market sector' of Australia's economy has averaged 1.1 per cent. This places Australia just below the middle of OECD rankings over the period.

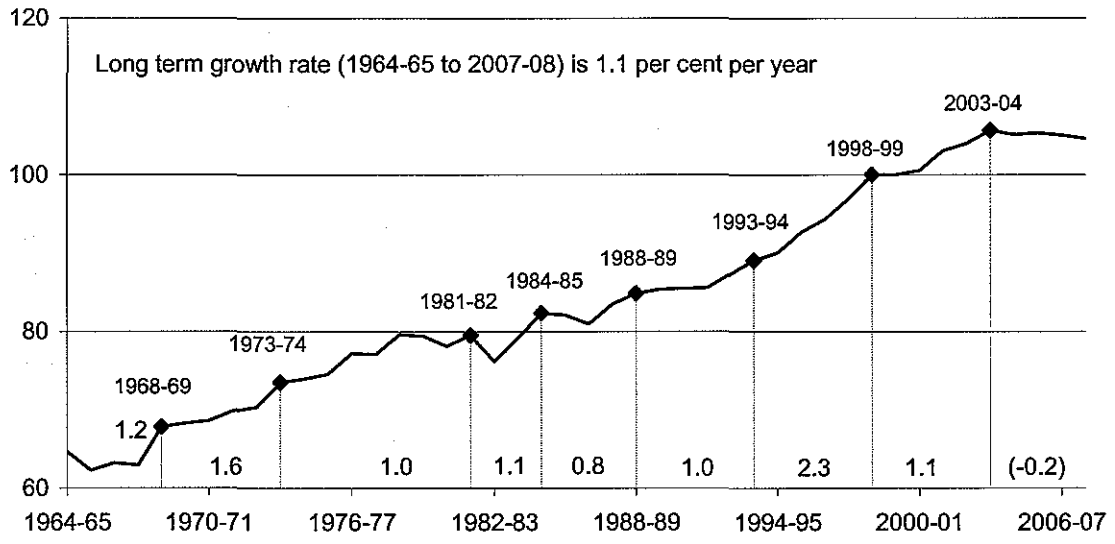
As figure 2 demonstrates, Australia's rate of MFP growth has been quite varied over time. Of particular note, from a policy perspective, is the poor performance of the early 1980s. This outcome, together with a relative decline in per capita income compared with the OECD average, added impetus to the rising pressure for significant economic reform. The first waves of reform commenced in the mid-1980s and culminated in the adoption of the National Competition Policy in the mid-1990s.

The productivity surge of the 1990s

Subsequently, Australia's annual MFP growth rate rose more rapidly, and during the 1993-94 to 1998-99 productivity cycle averaged an extraordinary 2.3 per cent. This is substantially above the rates in any of the other productivity cycles and more than twice the long-term average rate of 1.1 per cent. Australia's international ranking rose from 12th to 2nd amongst key OECD countries.

Figure 2 **Market sector MFP index and average growth rates within productivity cycles, 1964-65 to 2007-08**

Index 1999-2000 = 100



The 1990s productivity surge could not be attributed to international trends, normal recovery from domestic recession, improved labour force skills, or greater work intensity. There was rapid uptake of new technologies (including ICTs) in this period but their contribution to MFP growth was small. More fundamental and far reaching in influencing productivity were the microeconomic reforms of the late 1980s and 1990s.

Productivity reversal in the 2000s

Average annual MFP growth in the first cycle this century, to 2003-04, returned to the long-term average of 1.1 per cent, but in the current partially completed cycle since then it has averaged -0.2 per cent. Given the longer term importance of productivity to living standards, this very significant fall in the rate of productivity growth has understandably been of concern. The equally significant rise in national income that occurred at the same time, until the financial crisis, has added to the complexity.

Closer analysis, however, suggests that special developments in three sectors can explain much of the recent decline in productivity growth.

- Mining has been experiencing a depletion of in-situ mineral resource deposits (particularly in relation to coal mining and oil and gas extraction) and, with the export boom, lags between capital expenditures and corresponding increases in mining output. Both of these have suppressed productivity growth in the sector.

- Productivity in the Electricity, gas & water sector has suffered from large increases in capital and labour inputs, together with significantly reduced output growth. Reduced rainfall has necessitated the introduction of demand management initiatives to reduce urban water consumption, while requiring new capital investments for recycling and desalination. Major conservation initiatives are also underway in relation to rural water.
- Agricultural productivity suffered from an extended drought, with output falling more quickly than adjustments could be made to labour and capital inputs.

The Commission has calculated that if the influence of these three sectors is removed from MFP estimates, average annual MFP growth from 1998-99 to 2003-04 is 1.3 per cent (compared with 1.1 per cent for the full market sector) and since 2003-04 it is around 0.7 per cent (compared with -0.2 per cent for the full market sector). Thus, 70 per cent of the recent rapid decline in productivity growth since the cycle ending in 2003-04 is accounted for by specific developments in these sectors.

Other possible causes of the productivity slowdown

Capacity constraints within the economy generally over the past few years, following a very long period of uninterrupted economic growth, have meant that it has become much harder to raise productivity. Rising national income associated with the commodity price boom has led to higher prices and profits. As a result, in recent years it may have been more profitable for businesses to focus on meeting expanding demand than on seeking more cost-effective means of production. In addition, as unemployment rates fell towards 30 year lows, businesses may have been forced to employ individuals offering lesser productivity potential (at least in the short term). It is difficult, however, to assess the quantitative impact of these effects on recent productivity outcomes.

In terms of education and training, available measures of the change in labour quality suggest that it had only a very small *direct* influence on the unusually high productivity growth of the 1990s, and even less on the recent productivity slump. The outcome from quality education and training should, however, be seen in a longer-term context, and, by its very nature, is unlikely to show up as a factor in short-term fluctuations in productivity.

Real R&D expenditure in Australia has been growing quite strongly since the mid-1970s, but growth has been particularly strong in the 2000s. The main driver of this is business expenditure on R&D. After adjusting for Australia's differences in industry composition (which affects R&D intensity) business R&D intensity is now

3rd amongst 20 key OECD countries. On the basis of this evidence it cannot be concluded that there has been a lack of business R&D expenditure or that this has been a determining factor in the productivity slowdown.

Although there is some empirical evidence that investment in physical capital, including public infrastructure, was subdued during the 1990s and early 2000s, the picture since the mid-2000s has been in marked contrast, with substantial increases in new investment spending. Rather than a slow-down in investment being the cause of lower productivity growth, the analysis suggests that it is the large-scale investment in mining and in new economic infrastructure in recent years that has been temporarily depressing productivity growth.

Policy settings to improve productivity growth

The challenge in the Committee's Terms of Reference to identify policies to increase the level of productivity (and if possible, its sustainable rate of growth) is that many factors influence productivity growth, which often interact in complex ways.

Productivity growth is a means to an end, not an end in itself. Moreover, measures of productivity imperfectly capture the underlying concept (for reasons including the imperfect valuation of quality improvements). Productivity growth in an industry can ebb for a time, for reasons not reflecting its potential to expand profitably, as the mining sector currently demonstrates. Serious policy errors can arise if we lose sight of the ultimate objective of raising living standards.

The key lessons from the unprecedented productivity growth of the 1993-94 to 1998-99 productivity cycle were that broad, enabling economic reforms, together with the pervasive, competitively-driven deployment of breakthroughs in information and communication technologies, provided unprecedented opportunities to change production processes and redesign workplaces to raise productivity, with heightened competitive pressures to do so.

Contrasting that era with today's new challenges after Australian governments' fiscal responses to the global financial crisis, suggests several broad policy tasks to maintain and strengthen the framework conditions for future productivity growth:

- managing the steady withdrawal of fiscal and monetary stimulus to maintain an inflation and interest rate environment conducive to the private sector's need to finance investment
  - notably, governments' initiatives to boost productivity growth will need to be attentive to fiscal and resource costs; initiatives with low fiscal cost, such as

regulatory reforms, would seem particularly attractive in an era of fiscal consolidation

- combating reintroduction of policies that would reduce competition in product markets (through protectionism or government procurement preferences), or capital markets (through new regulations going beyond necessary prudential supervisory improvements), or that would re-introduce rigidities in labour markets
- recapturing some of the infrastructure sectors' higher productivity growth of the 1990s, by ensuring that infrastructure investments with the highest social returns are selected, and that the much larger stock of existing infrastructure is well regulated and efficiently priced
  - large investments in infrastructure networks such as electricity and broadband are likely to further reduce measured productivity growth in the infrastructure sectors for a period, before any increase in productivity in both those sectors and user industries as the new capacity is put to use.

As the special factors reducing productivity in Mining, Electricity, gas & water and Agriculture wash through production processes, and new investments begin to add to output, some recovery in productivity growth is to be expected.

But that likely natural recovery provides no grounds for complacency: although the terms of trade remain historically high, the peak levels seen over the last few years cannot be relied on to continue to drive rising living standards. Greater dependence will have to be placed on productivity to generate future income growth.

The unprecedented fiscal expansion in response to the global financial crisis, and associated debt, only add to the existing long-term imperatives for increased productivity growth arising from demographic ageing and greenhouse gas abatement and other costs. Productivity growth can in effect help service the debt now accumulating from fiscal deficits, as well as offset the effects on future income of withdrawal of governments' stimuli from consumer spending.

Effective policies today for productivity growth tomorrow

Ultimately, raising overall productivity depends on the performance of individual firms, and the competitive pressures that result in better performing firms and industries prevailing over the others — 'creative destruction'.

How well productivity performs at the firm level can be influenced by policies directed at three areas:

- *incentives* — the external pressures and disciplines on organisations to perform well
- *flexibility* — the ability to make changes to respond effectively to market pressures
- *capabilities* — the human and knowledge capital, as well as infrastructure and institutions, that are needed to make necessary changes.

Australia's first two waves of reform (first lowering border protection, and then behind-the-border reforms of infrastructure and labour markets) can be seen as mainly focussed on incentives and flexibility. These reduced inefficiencies and assisted productivity catch-up in the 1990s. While there is more to be achieved by policy reforms in both these areas (by means noted below), there is relatively more to be done in building capabilities in the human capital area. This changing emphasis is reflected in the evolution and broadening of reform measures from the National Competition Policy to the current 'third wave' National Reform Agenda.

Incentives: competition is the key

Market competition is crucial in encouraging cost reductions and product and process improvements, including through higher rates of innovation and diffusion. Notwithstanding the first and second waves of reforms, not all opportunities for allocative and technical efficiency improvements have yet been exhausted, and need to remain on the National Reform Agenda.

- Competitive reforms in areas such as coastal shipping and aviation, as significant transport inputs, offer potential to stimulate innovation and productivity more widely.
- Implementation of scheduled tariff reductions for the automotive industry and textile, clothing and footwear industries is expected to deliver further net benefits, although increased subsidies are unlikely to yield commensurate gains.
- Improved competition in pervasive small business areas such as pharmacies, taxis and newsagencies would also stimulate innovation and lower costs in those services, to the benefit of consumers across the country.

Subsidies to support production or investment can also dull competition. While there can be a case for subsidies where market signals and incentives are inadequate, they need to be well targeted to ensure that the public benefit exceeds the cost, and that public funding does not simply crowd out private sources. Little of the nearly $17.5 billion of gross annual Commonwealth assistance to industry is regularly reviewed to assess whether the community gets value for its money. With

the further substantial industry assistance forthcoming as part of Australia's greenhouse policy response, it will also be crucial that this is rigorously assessed to ensure that it does not unduly detract from productivity growth.

For the bulk of innovation activity, competition provides sufficient incentive for private enterprises, without the need for taxpayer support. However there is clearly a role for assistance to encourage firms to undertake greater R&D where the results of that R&D are widely shared. While the Commission has found little evidence to support fears of underinvestment in research with direct commercial applications, there are potential benefits from public support for more basic or strategic research, where the returns can be difficult for an organisation to adequately appropriate. But, again, careful design and evaluation are needed to ensure that support measures actually give rise to additional R&D activity, such that the benefits to society exceed the costs.

Flexibility: enabling organisations to be responsive

Productivity improvements often entail changes in the way organisations arrange their production processes. Increasingly, firms tailor products to different customer needs, often providing a joint package of goods and services. They need to be able to react quickly to changes in customer requirements.

Flexibility to alter work arrangements plays an essential role. Reforms to industrial relations arrangements since the late 1980s have enabled firms to be more innovative than was previously possible (a recent illustration of which has been the preservation of jobs by shortening of hours worked during the current slowdown). This flexibility has been reflected in greater take-up rates of new technologies. It is important to preserve the ability of organisations to engage effectively with employees to change work arrangements in response to commercial imperatives. Flexibility in employment arrangements can yield significant benefits for employees as well as their employers.

Excessive regulation can also reduce an organisation's adaptability or responsiveness, and burden it with unnecessary costs. Compulsory, expansive standards, complex requirements, or marked differences across jurisdictions can all limit, or raise the cost of, organisational changes needed for successful innovation. Twenty seven regulatory 'hotspots' have rightly been identified by Council of Australian Governments as needing reform under the National Reform Agenda. It is important now that reform proceeds quickly. The Regulation Taskforce estimated that unnecessary compliance costs could amount to some $8 billion nationally. The

costs are likely to be significantly greater if they included the effect that such red tape can have in limiting innovation and productivity growth.

Capabilities: improving the 'support platforms' for productivity growth

Productivity growth will increasingly need to occur through people working 'smarter' rather than harder. Organisations need people who can develop new and better ways of doing things, including through adopting and adapting existing knowledge and technologies.

COAG's National Reform Agenda has placed central importance on building Australia's human capital as a key reform stream. The Commission has estimated that improvements in workforce productivity arising from specifically targeted reform areas in health and education could add 3 per cent to annual GDP (PC 2006). Initiatives related to education and training, in particular, are estimated to raise aggregate labour productivity by up to 1.2 per cent and the average level of schooling by up to 0.25 years by 2030.

The importance of education

Addressing educational disadvantage is a priority, as is raising productivity in the provision of education services and, above all, in improving the quality of teaching at all levels.

Ensuring quality teaching has arguably been the most neglected area of education policy. Teachers' pay has fallen significantly relative to non-teachers' pay, contributing to the shortage of qualified teachers of 'hard' subjects (maths, science and IT), which are the keys to further skill development. There is a need to upgrade existing teachers' qualifications, and constrain administrative 'creep'. And it is important to find ways by which good teachers (and matching resources) can be directed to schools in disadvantaged areas.

Australia's universities, and public research bodies such as CSIRO, are important in the 'national innovation system' both as generators of new knowledge and as stores of knowledge. The Commission's report on *Public Support for Science and Innovation* (PC 2007a) found that there was some risk of funding falling short for basic research and a related concern that the pursuit of commercialisation of university research should not be taken further.

Efficient infrastructure

The timely provision of efficient economic infrastructure also plays a key role in supporting Australia's productivity performance. Transport and communications provide particularly important platforms for innovation and many of the intangible investments such as databases, information systems, organisational capital, and delivery systems, support an organisation's on-going innovation activity.

Good regulation is central to Australia reaping the potential benefits from private investment in infrastructure. Competition regulation has a key role. Third party access regimes for 'essential facilities' have been modified in recent years to reduce their potentially inhibiting effects on investment. But further legislative amendments are needed following a Federal Court decision in 2007 that has raised questions about the sustainability of the light handed approach for airports, posing risks for investment in infrastructure more generally.

Environmental and social regulation can also affect infrastructure investment and usage. In particular, Australia's actions to reduce greenhouse gas emissions will have significant implications for investments in energy and transport that need to be taken into consideration.

Where public provision of infrastructure is necessary, such as for much of the road network, it is important that projects are subject to far more rigorous cost-benefit assessment than has typically occurred in the past, if investments are to yield the highest payoff to Australia's productivity and living standards.

Government services

Governments must also promote productivity improvements in their own services. The legal and judicial framework for markets, governance systems for Government Trading Enterprises, and accountability frameworks for the delivery of public services provide important platforms that enable, as well as affect the incentives for, innovation and productivity growth in the public and private sectors.

With the fiscal pressures we now face coinciding with the need for greater attention to human capital development and provision of care in an ageing society, there is an imperative for the range of human services to be delivered more efficiently as well as more effectively. Services in the areas of education, health, childcare and aged care are all important to Australia's futures productivity and the wellbeing of the community generally.

1 What is productivity and why is it important?

1.1 What is productivity and productivity growth?

Productivity is essentially a measure of how much output we get from a unit of input, and thus the 'efficiency' of production.

As there are many ways of measuring inputs (and outputs), there are also many different measures of productivity. The most common are *labour productivity*, which is the quantity of value added[1] per hour worked, and *multifactor productivity* (MFP) which is the quantity of value added obtained from a 'unit bundle' of both labour and capital.

Labour productivity is the most commonly used measure for a number of reasons. First, it is easier to measure as it avoids the need to estimate capital inputs and avoids the need to aggregate capital estimates and hours worked. Second, a rough measure of labour productivity for the entire economy can easily be obtained by dividing GDP by official estimates of total hours worked in the economy (there are no official estimates of capital inputs for the whole economy). Finally, it allows for a comparison of levels of labour productivity (value added per hour worked) between different parts of the economy or between different economies.

It is widely recognised that productivity growth defined in this way accounts for most of the growth in real income over the long term — hence Krugman's famous observation "productivity isn't everything, but in the long run it is almost everything" (Krugman 1990, p. 9).

However, MFP is a better indicator of productive efficiency, as MFP growth measures the growth in value added over and above that explained by growth in *both* primary factor inputs: capital and labour, whereas labour productivity growth

[1] Value added is defined as the value of output less the value of all inputs other than capital and labour. The quantity of value added refers to (deflated) nominal valued added (that is, value added with the effect of price changes removed).

abstracts from the growth in capital (box 1.1). Positive MFP growth contributes to sustained growth in per capita income as it increases the outputs of goods and services produced from a given amount of capital and labour. (Unless otherwise specified, unqualified use of the term 'productivity' in this submission refers to MFP).

While estimates of output and hours worked are published for the whole economy, productivity is only well-measured in that part of the economy the ABS calls the 'market sector' — this is all the economy except health, education, defence, government administration, property and business services, and personal and other services. Only in the market sector industries is output growth well enough measured in relation to growth in capital and labour inputs to make useful estimates of MFP growth.

Box 1.1 Labour productivity versus multifactor productivity

Labour productivity is a measure of the amount of output produced per hour worked, and is generally computed as value added divided by hours worked. However, as value added reflects the return to both labour and capital, it is more appropriate to consider the ratio of value added to 'a unit bundle' of both capital and labour — this is multifactor productivity (MFP).

It is straightforward to show (though a little algebra is required) that labour productivity growth is equal to the sum of MFP growth and a term proportionate to the growth in the ratio of capital to labour — this term is known as capital deepening. So labour productivity growth can arise through an increase in MFP or through an increase in the ratio of capital to hours worked — i.e. more capital per unit of labour input.

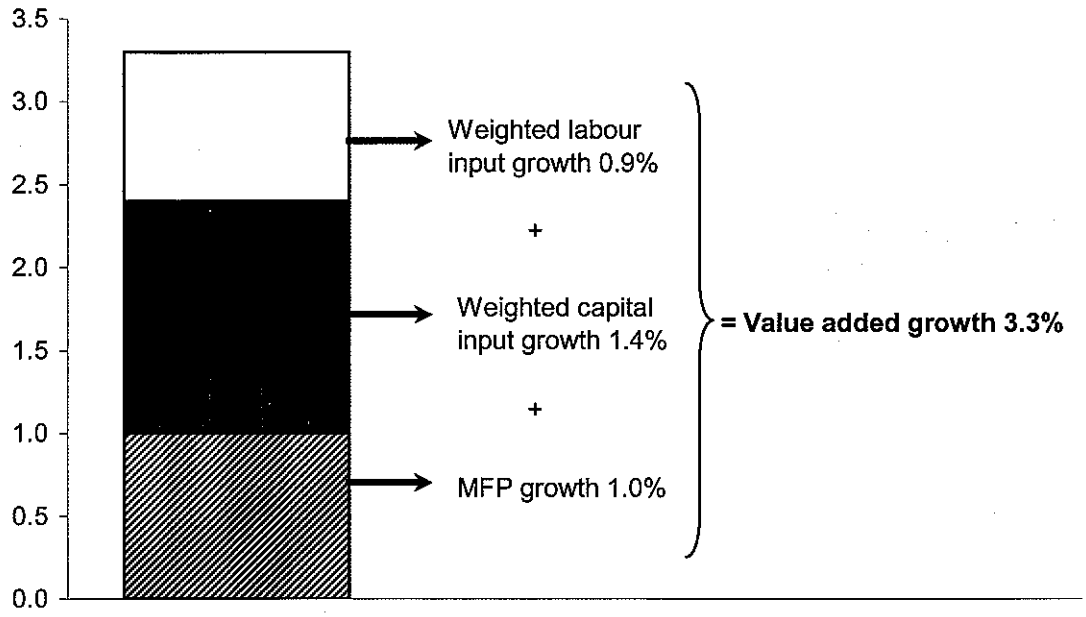
To the extent that growth in labour productivity arises from an increase in capital deepening rather than MFP, it is the additional capital (per unit of labour) that is the source of the additional output (per hour worked). As capital is a scarce resource, this capital deepening comes at a cost which must be offset against the value of the additional output. In a hypothetical case where capital deepening is positive and MFP growth is zero, labour productivity growth will also be positive (equal to the growth in capital deepening). However, the additional (relative) capital cost fully offsets the increase in value added so that in net terms the community is no better off even though there has been labour productivity growth.

It is this lack of explicit accounting in labour productivity for the additional (relative) resource cost of capital that can lead to labour productivity being a misleading indicator of changes in the productive efficiency of the economy. In contrast, MFP accounts fully for both capital and labour resource costs.

There is a variety of methodological techniques used to measure productivity growth in different circumstances. However in the official 'growth accounting' approach, MFP growth is calculated as the difference between observed output

growth and growth in an index of capital and labour inputs. In other words, it is that part of the observed growth in value added that is not directly attributable to increased inputs of capital and labour. Value added growth is then equal to the sum of MFP growth and a weighted average of the growth rates of capital and labour inputs (figure 1.1).

Figure 1.1 **The components of value added growth**
hypothetical example



It is readily understood how increasing capital and/or labour inputs will increase output, but where does MFP growth come from? In the original conception it was seen as reflecting the rate at which technological advance supplemented productive capacity. New technologies and other innovations enable more output to be produced from the same quantity of inputs (or equivalently the same output from less input).

However, when measured as the difference between growth in value added and an average of capital and labour input growth, estimates of MFP can also reflect the impact of changes in the business operating environment, economies of scale, and the entry and exit of businesses. These drivers of productivity are discussed below in section 1.3.

But productivity estimates can also reflect measurement issues which can distort the picture. Variation in capacity utilisation, capital/output lags, unmeasured changes in the quality of inputs and outputs, as well as random measurement error can all play a role — and some have been particularly important in recent years.

- There can be several years between initiating certain large new capital investments and the physical capital actually becoming operational. Investment expenditures during this period are typically accounted for as capital input growth even though there is no (or comparatively little) associated output produced. This leads to reduced productivity initially and then increased productivity as production from the new capital comes 'on line'.
- Moreover, once a highly indivisible (lumpy) investment, for example a new gas pipeline, comes on line, it will typically have excess capacity for an extended period of time. However, the full amount of the capital is usually accounted for in the productivity measurement as soon as the investment has been made. This tends to result in lower measured productivity early in the asset's lifetime, with productivity rising as capacity gradually becomes more fully utilised.
- An unmeasured increase in the quality of an output will result in measured productivity being lower than it is in reality. Similarly, an unmeasured increase in the quality of an input will result in higher measured productivity. Measures of quality change can be made for some inputs and outputs, including certain electronic and IT equipment, but others are very difficult to identify and measure. Also, outputs in many service industries (for example, insurance and banking) are inherently difficult to define and measure, making the measurement and interpretation of productivity in these industries difficult.

1.2 Why is productivity growth important?

The ultimate objective of all public policy is to improve the wellbeing of the community. The concept of wellbeing has numerous dimensions, both material and non-material. However, income growth and its distribution are central to the ability of families to provide for current and future consumption, and for government to fund social services and support creative endeavours. Income growth also creates improved opportunities for employment, with associated benefits of improved social outcomes. Productivity growth contributes to growth in per capita income as it increases the outputs of goods and services produced per unit of physical input. These and other interdependencies are sketched in figure 1.2.

Figure 1.2 **How productivity growth contributes to wellbeing**

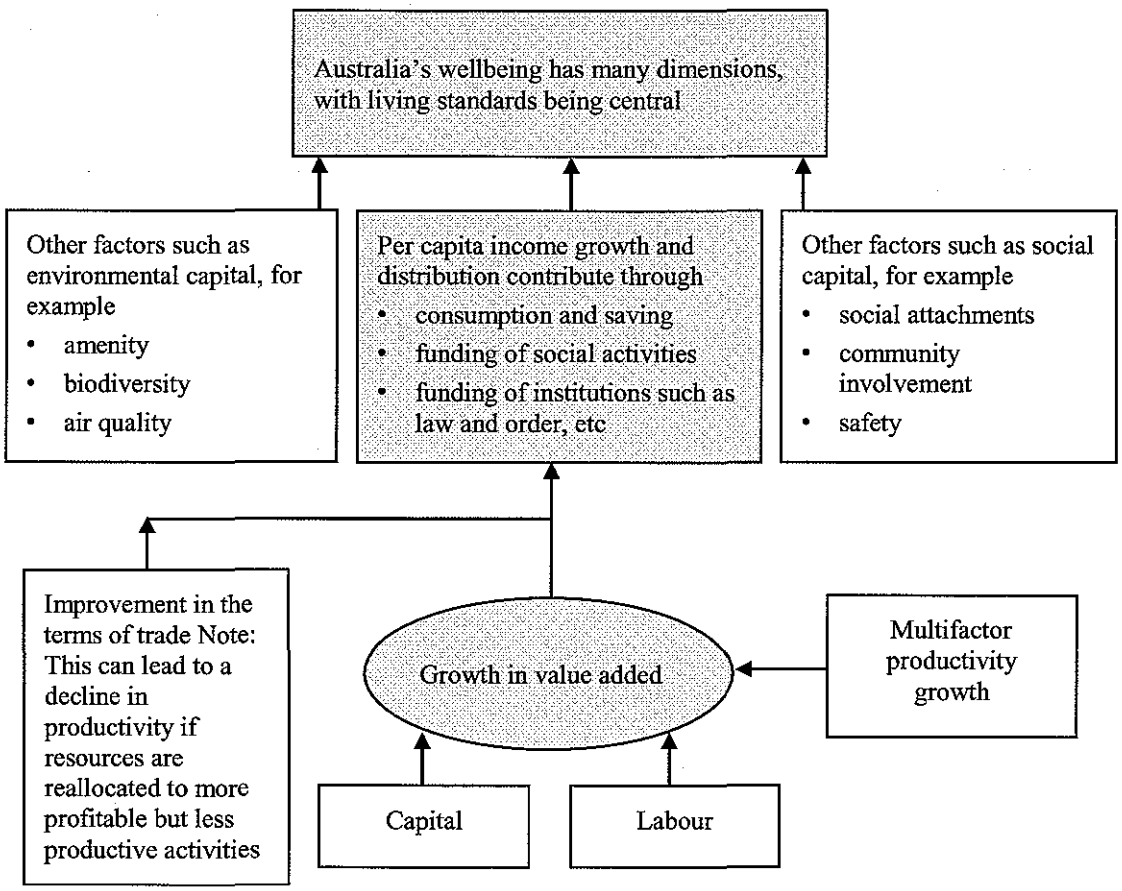
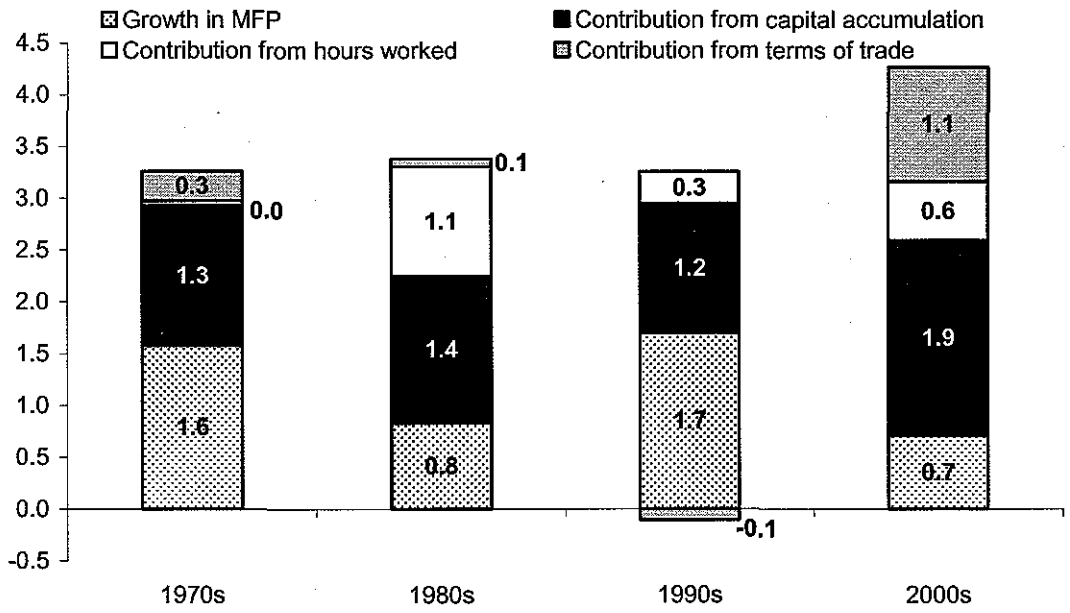


Figure 1.3 shows the contribution to Australia's real income growth over the past four decades, from changes in capital inputs, labour inputs, MFP and the terms of trade. Changes in the terms of trade — the prices of Australian exports relative to imports — have had only a small effect over the longer term, though in the most recent decade sustained increases in commodity prices have made a large contribution to income growth.

It is clear from figure 1.3 that over the longer term MFP growth has been a major contributor to growth in income in Australia. Over the past four decades it has contributed more than one-third of total growth in real gross domestic income.

Figure 1.3 **Contributors to growth in real gross domestic income**

Percentage points — average annual rates



Data source: ABS (*Australian System of National Accounts, 2007-08*, Cat. no. 5204.0) and Commission estimates.

Productivity growth is not costless. Achieving sustained higher levels of productivity (and therefore income) requires effort and investment in one form or another, although the costs of accessing some key sources of additional productivity can be low relative to their benefits.

A major and important difference between economic growth arising from the use of additional physical capital or additional labour and that arising from productivity growth relates to the enduring characteristics of many aspects of the latter. An additional piece of capital or an additional hour of labour temporarily generate additional output but are transient in a very real way — the additional capital is subject to physical decay and the extra hour worked is soon gone. In contrast, the discovery and application of a new useful technology, or a better organisational structure contains elements of knowledge which, even if the technology or organisational structure eventually becomes obsolete, typically endure within new technologies and organisational structures which have been built on the old. Short of being entirely forgotten for some reason, knowledge and knowhow do not simply fade away.

Similar considerations apply in the case of policy initiatives that create competitive incentives for firms to perform better, or that enhance the flexibility of businesses to

respond to economic opportunities and technologies, or reduce regulatory compliance costs.

1.3 The drivers of productivity

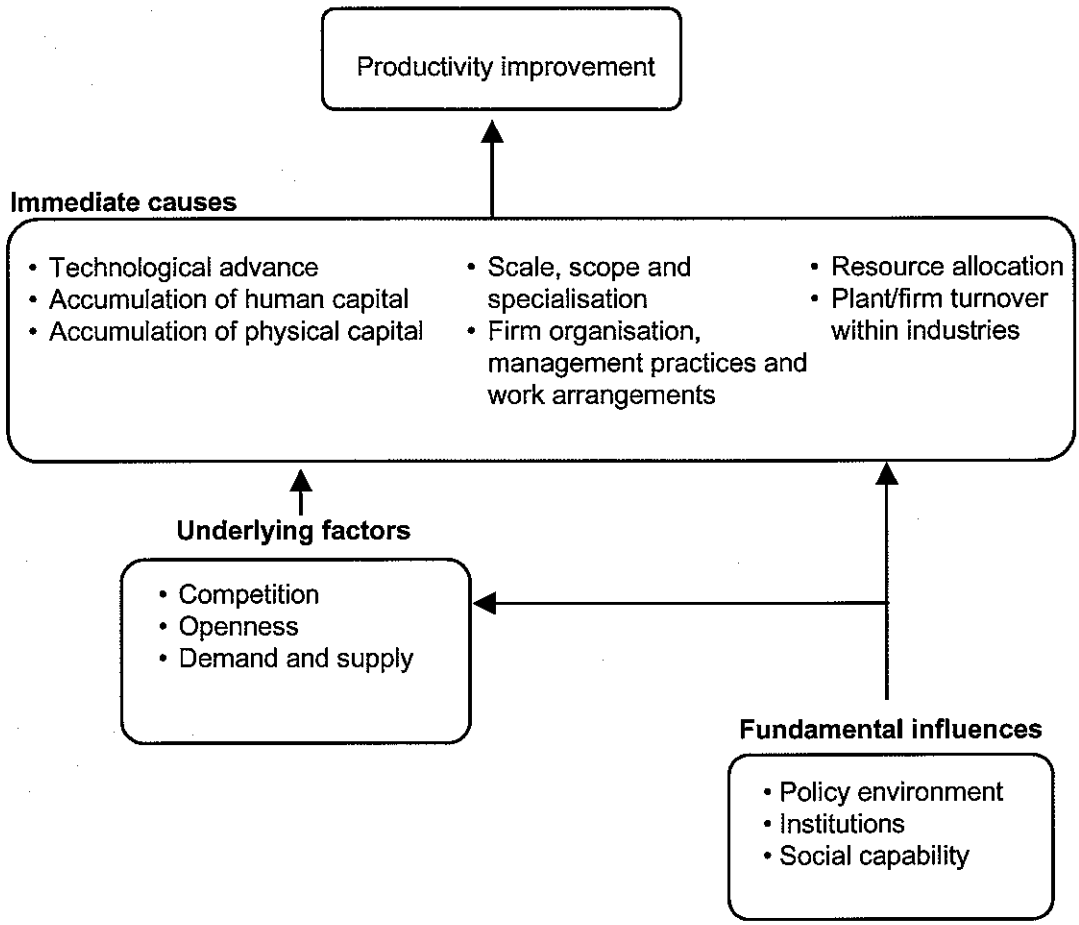
Productivity is thus a major contributor to growth in output and prosperity over the longer term. However, understanding precisely what has affected productivity in practice and how it can be influenced is not straightforward.

Figure 1.4 provides a framework for thinking about the main productivity determinants and, potentially, the role of public policy.

- *Immediate causes* have close and tangible links to input/output relationships in production. They may be necessary to bring about substantial productivity improvement, but they may be difficult to activate without changes at the other levels.
- *Underlying factors* can 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.

There are also *fundamental influences* which involve more deep-seated policy, social and institutional factors which affect productivity in very general and indirect fashion. They set the general 'environmental' conditions which can affect productivity, especially over the long term.

Figure 1.4 **A framework of major productivity determinants**



Source: PC (1999, vol. 1, p. 54).

'Immediate causes' of productivity change

Technological advance brings productivity improvement by producing better products and bringing into operation better production techniques which enable more value to be added in production. In more recent times, the 'knowledge' dimension of technological advance has been emphasised. *Accumulation of human capital, accumulation of physical capital* 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.

Firm organisation, management practices and *work arrangements* also affect productivity. For example, lean production techniques can bring productivity improvements through complete and continuous 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.

Better *resource allocation* improves productivity through resources being allocated to production activities that generate more output. The normal *plant/firm turnover* in a 'dynamic' economy can also affect average productivity — productivity levels of plants/firms vary so average productivity in an industry can vary with the entry of 'greenfields' plants or the exit of 'unproductive' plants.

Underlying factors and more fundamental influences

The general feature of the underlying factors — *competition*, *openness* of the economy to trade and investment and *demand and supply conditions* — is that they help to condition the extent to which the immediate causes of productivity growth come into play. A change in firm organisation, a change in management practice, or the 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. Inaccurate price signals and other distortions to demand and supply outcomes can impede the accumulation of human capital and obscure the merits of different production methods and new technologies.

However, more fundamental factors condition productive potential and its long-term realisation. The *policy environment* can affect the emphasis given to economic objectives and the development of productivity-enhancing capabilities, and the stability of policy settings can affect the risks involved in making long-term investment decisions. Formal and informal institutional 'rules of the game' influence the costs of coordinating production activities and conducting business. They influence the incentives facing firms and individuals to raise productivity. *Social capability* refers broadly to the orientation of people toward change of the kind required to achieve further development.

Increasing productivity levels versus growth rates

The benefits derived from investment of effort in relation to the determinants of productivity growth set out in figure 1.4 can permanently lift the *level* of

productivity. Some of them may even lift the *rate of growth* in productivity in an enduring way. For example, Aghion and Howitt (2009) report on theoretical developments and empirical results that show that the removal of barriers to entry and the introduction of pro-employer changes in labour market regulations can permanently increase the incentive to innovate. Elevated rates of innovation should permanently increase the rate of productivity growth, as ongoing additional innovations continually reduce production input requirements relative to output, either through better products or through more efficient production of the same products.

The gains in income from a sustained higher *level* of productivity are enduring and result in a higher level of income than would otherwise be the case, by a constant amount over time. In contrast, the gains in income from a sustained higher *rate of growth* in productivity diverge from what would otherwise be the case by a uniformly increasing margin over time. For example, a permanent increase in the *level* of productivity of 0.5 per cent will result in income being forever 0.5 per cent above what it would otherwise be, but a permanent increase in the productivity *growth rate* of 0.5 per cent will result after 20 years in income being 10.5 per cent higher than otherwise. The desirability of permanently higher rates of growth in productivity is clear, but it is generally more difficult to achieve than a permanently higher level of productivity as it requires an ongoing commitment of resources/effort yielding a net payoff, whereas a permanent increase in the level can often be achieved through a one-off effort such as a reorganisation of the production process to make use of a new technology.

2 Explaining Australia's productivity performance over time

2.1 Long-term trends in productivity

Over the 43 year period from 1964-65 to 2007-08 (the duration of Australia's official productivity time series) annual multifactor productivity (MFP) growth in the Australian market sector has averaged 1.1 per cent per year.

International comparisons

Based on available OECD estimates, Australia's MFP growth over the long term is slightly below the median of the 19 OECD countries for which comparable data exist and ranks 12th overall[1] (figure 2.1). A large proportion of the countries considered exhibit average annual MFP growth within a very small band around the median rate.

Whereas figure 2.1 provides a guide to how Australia's multifactor productivity has been growing relative to others, it is also of policy relevance to establish how this country compares in terms of productivity *levels*. However, meaningful comparisons of levels can only be made for labour productivity (output per hour worked) — for which differences in industry structure and labour utilisation rates can make it very hard to draw robust conclusions about relative performance.

- Inter-country differences in labour productivity can reflect more or less capital intensive industries being more dominant in some countries than others. A good

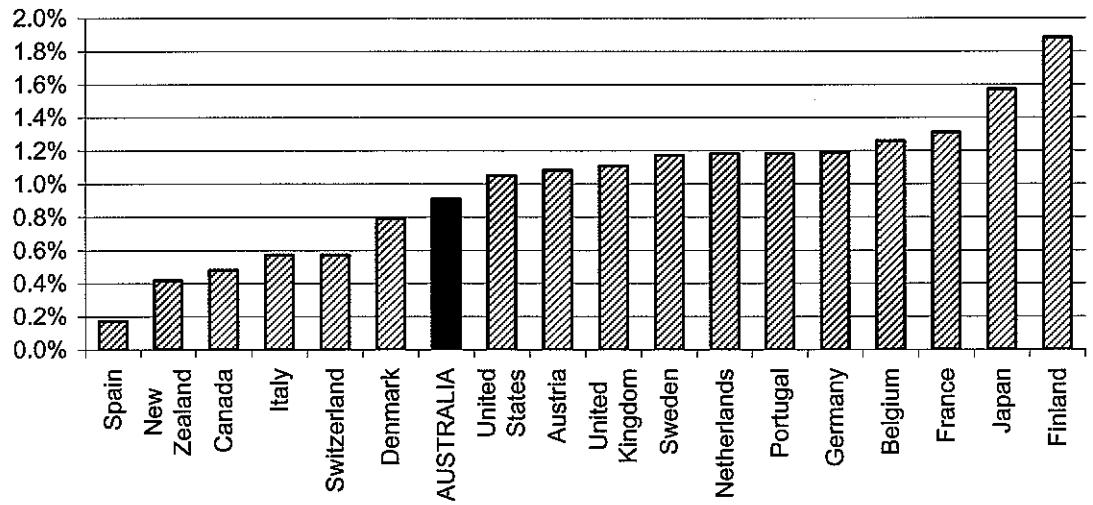
[1] Comparison of Australia's long-term average annual MFP growth with OECD countries for which MFP estimates are available can only be made over a variety of time periods due to variations in data availability. OECD estimates for Australia differ somewhat from the official ABS estimates due to adjustments necessary for cross country methodological uniformity. Data for Ireland are available but have been excluded to aid with scaling. Ireland's MFP growth has been significantly above other OECD countries. While the precise sources of that growth are unclear, it was associated with a low starting point, newly acquired access to the European Common Market, rigorous deregulation, policies to foster foreign direct investment, and direct EU subsidies.

example of this is the rise in the importance of oil extraction (a highly capital intensive industry) in Norway and the Netherlands.

- Significant changes in labour utilisation (hours worked per head of population) in some but not other countries can also affect relative labour productivity — France is an example of a country where labour utilisation dropped dramatically during the 1970s.

These comparability issues mean that cross time comparisons are best made with the labour productivity 'frontier' country alone. The United States is widely regarded as representing the frontier.

Figure 2.1 **MFP growth in selected[a] OECD countries, 1985-2007[b]**
Average annual growth rate



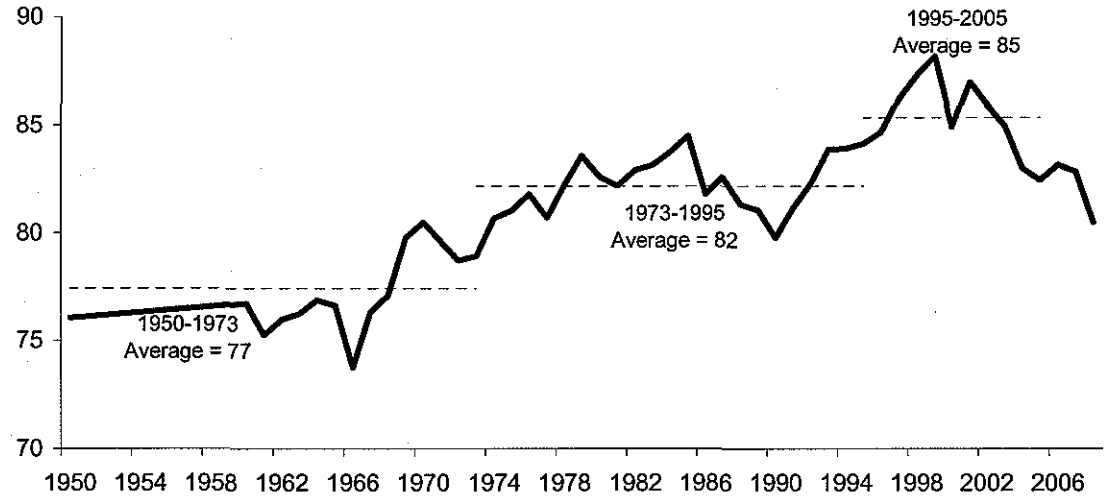
[a] Selected countries are those for which data are available. [b] Or closest available years. To 2006 for Italy, Japan and Sweden, to 2005 for Denmark, Finland, Netherlands and the United Kingdom, to 2004 for Belgium, 1989-2006 for New Zealand, 1990-2006 for Spain, 1991-2007 for Germany, 1991-2006 for Switzerland, 1995-2005 for Austria, 1995 to 2005 for Portugal.

Data source: OECD.Stat (database).

Figure 2.2 plots Australia's labour productivity relative to that of the United States over the 58 years to 2008. Australia's labour productivity rose from around 77 per cent of US levels in the 1950s and 1960s to an average of around 85 per cent in the 1995 to 2005 period, though the pace of this 'catch-up' has not been even, and relativities have recently widened again given Australia's poorer recent productivity growth record.

Figure 2.2 **Australia chasing the productivity frontier**

Australian labour productivity, per cent of US level 1950 to 2008



Data source: Updated from Dolman, Parham and Zheng (2007), Commission calculations based on The Conference Board Total Economy Database.

Australia's long-term catch-up to the United States has therefore been quite slow overall and a significant gap remains, even abstracting from Australia's performance over the past few years. In part, Australia's relative performance is constrained by differences in industry presence and composition and in access to gains from specialisation and scale, with fundamental historical and geographic factors, including Australia's remoteness from markets, also playing a key role (Dolman, Parham and Zheng 2007).

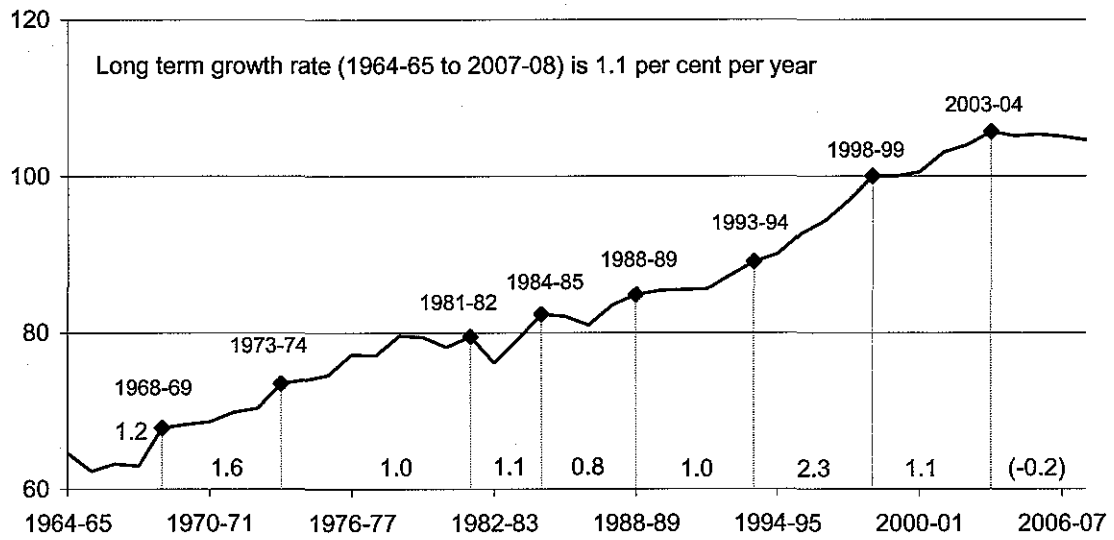
Nevertheless, there does appear to be scope for Australia to further close the gap. Various estimates made by Dolman, Parham and Zheng suggest that there is the potential to close the gap to around 10 percentage points over the next two decades or so.

A closer look at domestic trends

As a result of the many factors that influence the components of measured productivity growth, rates of MFP growth in the Australian market sector vary considerably over time. For example, productivity tends to slow during dips in the business cycle, and can sometimes slow during early stages of rapid investment growth and then accelerate as output from that investment 'catches up'. To avoid comparisons of productivity (or productivity growth rates) across inappropriate points of time the ABS identifies productivity cycles — periods over which average growth in MFP can be most appropriately compared. These cycles frequently (though not always) coincide with the period between successive peaks in MFP.

Figure 2.3 provides a time series of the level of (an index of) MFP for the Australian market sector between 1964-65 and 2007-08, together with the ABS defined productivity cycles and the average annual rates of MFP growth within each cycle. The final period from 2003-04 to 2007-08 does not represent a full productivity cycle. However, the average annual growth rate of MFP in this period is included for completeness.

Figure 2.3 **MFP growth across productivity cycles, 1964-65 to 2007-08**
Index 1999-2000 = 100



Data source: ABS (*Australian System of National Accounts, 2007-08*, Cat. no. 5204.0) and Commission estimates.

Average productivity growth rates have varied considerably across the seven completed cycles since 1968-69. However, the standouts are the very high average growth rate recorded in the 1993-94 to 1998-99 cycle, and the subsequent decline, particularly the very low (negative) growth recorded thus far in the current incomplete cycle that began in 2003-04.

2.2 The productivity 'surge' of the 1990s

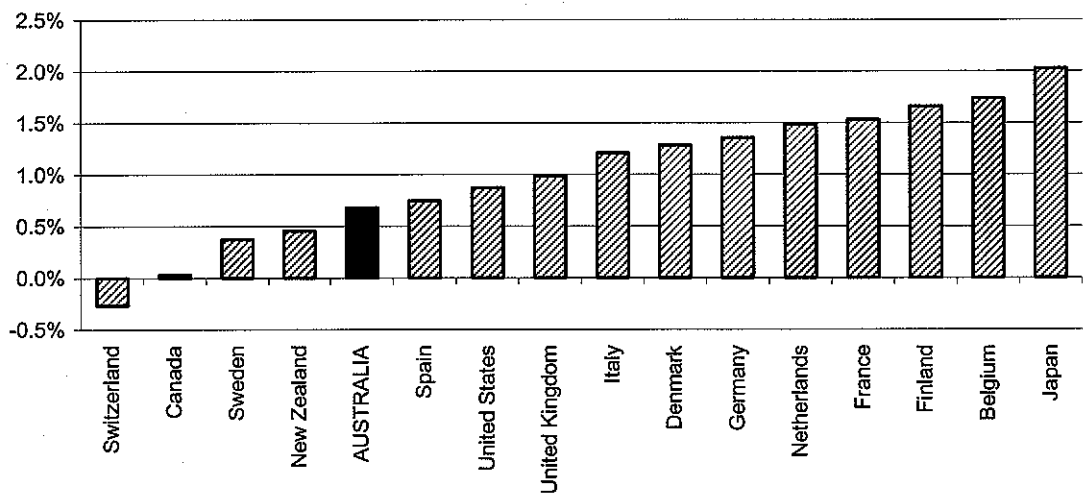
Australia's average annual MFP growth rate during the 1993-94 to 1998-99 productivity cycle, at 2.3 per cent, was substantially above the rates recorded in any of the other productivity cycles and more than twice the long-term average. Real value added growth consequently averaged a strong 4.5 per cent during the period.

The sharp rise in Australia's productivity growth during this period was also reflected in a significantly improved performance relative to other OECD countries.

Australia's average annual MFP growth rate rose from 12th among 16 OECD countries in the 1985 to 1994 period to 2nd among a slightly expanded group of 18 countries between 1994 and 1999 (figures 2.4 and 2.5).

Figure 2.4 **MFP growth in selected[a] OECD countries, 1985-1994[b]**

Average annual growth rate

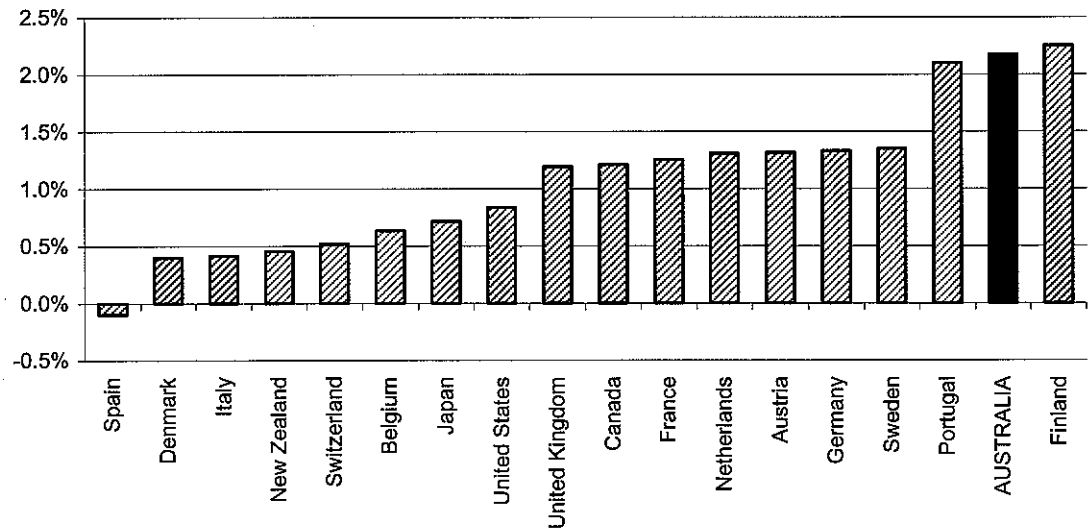


[a] Selected countries are those for which data are available except Ireland, which has been excluded to aid scaling. Ireland had the highest MFP growth by a substantial margin. [b] Or closest available years. To 2006 for Italy, Japan and Sweden, to 2005 for Denmark, Finland, Netherlands and the United Kingdom, to 2004 for Belgium, 1989-2006 for New Zealand, 1990-2006 for Spain, 1991-2007 for Germany, 1991-2006 for Switzerland.

Data source: OECD.Stat (database).

Figure 2.5 **MFP growth in selected[a] OECD countries, 1994-1999[b]**

Average annual growth rate



[a] Selected countries are those for which data are available. [b] From 1995-1999 for Portugal and Austria.

Data source: OECD.Stat (database).

This dramatic improvement was also associated with a period of relatively rapid catch up towards the United States in terms of labour productivity *levels* (noted previously in figure 2.2).

The improvement was broadly based, encompassing a variety of industries (table 2.1). Of particular note were the productivity improvements in Wholesale and Retail trade, Construction, Transport & storage, and Accommodation, cafes & restaurants.

Table 2.1 **Growth in MFP by industry, 1988-89 to 1998-99**
Per cent per year

	1988-89 to 1993-94	*1993-94 to 1998-99*
Agriculture, forestry & fishing	3.9	3.7
Mining	2.4	0.5
Manufacturing	0.3	0.9
Electricity, gas & water	3.7	2.0
Construction	-0.4	2.7
Wholesale trade	-2.3	5.8
Retail trade	1.2	1.9
Accommodation, cafes & restaurants	-1.6	2.1
Transport & storage	1.4	2.2
Communication services	5.9	4.7
Finance & insurance	3.0	3.0
Cultural & recreational services	-0.9	-1.4
Market sector	**1.0**	**2.3**

Source: Commission estimates based on ABS (*Experimental Estimates of Industry Multifactor Productivity, 2007-08*, Cat. no. 5260.0.55.002).

The reasons for this productivity surge and, in particular, the link to the program of microeconomic reforms that preceded and coincided with it were debated at the time. However, analysis by the Productivity Commission ruled out most other factors as being significant contributors. For example:

- Unlike the experience in the 1950s and 1960s, Australia could not be said to have been carried along by an international productivity boom. Indeed, as is evident in figure 2.5, Australia's MFP growth performance was at the front of OECD countries during this period.
- The surge in productivity also could not be dismissed as the normal result of recovery from the early 1990s recession. The improved performance was longer and stronger than in previous recoveries. Besides, focusing on average growth rates across the productivity cycle abstracts from cyclical influences.

- Higher skill levels in the workforce also did not have a significant direct impact on productivity growth in this period. Analysis by Barnes and Kennard (2002) of ABS estimates of MFP adjusted for labour quality shows that there was in fact a decline in the contribution of labour quality improvement between the 1988-89 to 1993-94 cycle and the period of the surge.
- It cannot be concluded that Australia's acceleration in productivity growth arose from any special technological leap forward. While some other countries, including the United States, derived some productivity benefit from rapid advances in the *production* of information and communication technologies (ICTs) in the 1990s, Australia produced little in the way of ICTs and so did not access that source of productivity gain. As far as the use of ICTs is concerned the Commission (Parham, Roberts and Sun 2001) found that while the adoption of information technology in Australia had contributed to labour productivity growth through increasing the amount of capital available to labour, it appeared to have very little role to play in the increase in market sector MFP growth over the period.

The removal of these possible explanations as likely causes of the surge in productivity leaves the reforms of the latter part of the 1980s and the 1990s as the prime candidate. This should not have been surprising, as the reforms were predicated on the need to remove policy-related sources of inefficiency that were seen as holding back relative living standards.

One of the central economic problems that had faced Australia up to the mid-1980s was that large parts of the economy were inefficient, inward looking and inflexible. In particular, protection policy had allowed small scale production to proliferate, distorted the flow of economic resources away from industries with the best potential to add value and prospects for growth, encouraged manufacturing to focus on import replacement, and fostered a culture that allowed poor management and work practices to develop and become entrenched. This meant Australia was not well placed to respond to the changes and challenges arising from rapid technological change, global integration and fiercer competition from abroad.

The reforms of the 1980s and 1990s encompassed changes in monetary and fiscal policies, capital markets, industry assistance, taxation, government enterprises, regulation, labour markets and industrial relations, and innovation and training. These changes were linked with greater economic flexibility, improved efficiency and international competitiveness, and a more outward looking, opportunity focused business culture (PC 1999, OECD 2000, Salgado 2000).

- Resources were more productively allocated — high productivity growth occurred in 'traditional' sectors (such as manufacturing and utilities), which were consolidating their use of inputs.
- Production became more specialised within industries — rationalisation of manufacturing industries led to a greater emphasis on the production of single, specific (and often higher-value) products.
- Firms re-organised in conjunction with improvements in management practices and workplace arrangements — key changes included better organisational processes, benchmarking and adoption of international standards. Management techniques such as total quality control, 'just-in-time' delivery, resource planning and value-added management were also adopted more widely.
- The use of up-to-date technologies increased — the number of businesses using advanced technologies increased from 33 per cent in 1988 to 44 per cent in 1997. Expenditure on capital goods from overseas increased and business expenditure on R&D increased strongly.
- Workforce skills increased — rates of retention to final year of secondary school increased significantly with the proportion of the workforce holding post-school qualifications (including vocational training) increasing from around 40 per cent in 1982 to over 50 per cent by the end of the 1990s.

Links were also identified between tariff, tax and industrial relations reforms and:

- the allocation of resources to more productive uses — reform provided more accurate price and other signals that indicated where resources could be better used
- the opening of the economy to overseas trade and investment — greater openness enabled wider access to ideas, technologies, expertise and benefits from specialisation and scale that may have otherwise been unobtainable
- the enhancement of competition from domestic as well as overseas sources — reform increased the exposure of businesses to greater competition, which in turn provided incentives for businesses to improve productivity
- changes in business expectations and attitudes through changes to the general policy and institutional environment in which they operate — less emphasis on product- and industry-specific assistance in many industries led to businesses being unable to rely on government support. This provided incentives for firms to take their own measures to secure their future. Taxation concessions also influenced the allocation of resources to R&D.

The links between the reforms and these changes in the factors underlying productivity, together with the relatively small direct effects of labour quality change and ICT use on MFP growth, strongly suggest a significant role for economic reform in the 1990s acceleration in MFP growth in Australia (see also Dowrick 2000 and 2001). By way of example, box 2.1 elaborates on the forces that drove improved productivity performance in the wholesale and retail trade industry sectors.

Box 2.1 Wholesale and retail trade productivity

The wholesale and retail sectors make a major contribution to the overall performance of the Australian economy. In the 1990s both sectors underwent considerable change that led to improved productivity performance.

Average annual MFP growth in the wholesale sector was negative through the 1988-89 to 1993-94 productivity cycle but then accelerated to 5.8 per cent through the 1993-94 to 1998-99 cycle. It was the most significant contributor to Australia's remarkably high aggregate MFP growth during this cycle. Developments within the sector consistent with this productivity acceleration include:

- the widespread adoption of productivity-enhancing technologies (for example, barcoding, paperless pick systems and automatic re-ordering processes) which moved the sector from a storage-based system to a fast flow distribution network
- greater competition, providing a catalyst for rationalisation (through mergers, acquisitions and firm exits) and outsourcing of non-core functions.

The productivity performance of the *retail sector* also improved and made an important contribution to Australia's productivity growth. Key developments included:

- intensified competition, leading to rationalisation in tandem with the widespread adoption of labour saving technologies
- changes in legislation governing trading hours and reforms to industrial relations legislation which increased the focus on enterprise-based work conditions.

Source: Johnston et al. (2000).

2.3 The productivity reversal this century

Average annual MFP growth in the 1998-99 to 2003-04 cycle returned to the long-term average of 1.1 per cent, but in the part cycle since then it has averaged -0.2 per cent.

Productivity growth fell broadly and quite substantially in the 1998-99 to 2003-04 cycle compared with the previous cycle (tables 2.1 and 2.2). Average MFP growth

fell by more than one percentage point in seven of the twelve industry sectors making up the market sector, as the scope for further gains from the economic reform program of the 1980s and 1990s appears to have been largely exhausted. Manufacturing and Cultural & recreational services were the only industries to record significant increases in average productivity growth compared with the earlier cycle. Average rates of MFP growth in Electricity, gas & water, along with Communication services fell by more than 4 percentage points, though Communication services recovered quite strongly in the following years.

Table 2.2 **Growth in MFP by industry, 1998-99 to 2007-08**
Per cent per year

	1998-99 to 2003-04	*2003-04 to 2007-08*
Agriculture, forestry & fishing	3.4	-1.4
Mining	-0.7	-4.8
Manufacturing	1.8	-0.8
Electricity, gas & water	-2.3	-4.2
Construction	1.0	1.0
Wholesale trade	1.8	0.3
Retail trade	1.3	0.6
Accommodation, cafes & restaurants	0.7	-0.2
Transport & storage	2.4	0.8
Communication services	0.1	3.0
Finance & insurance	0.7	2.2
Cultural & recreational services	1.4	0.2
Market sector	**1.1**	**-0.2**

Source: Commission estimates based on ABS (*Experimental Estimates of Industry Multifactor Productivity, 2007-08*, Cat. no. 5260.0.55.002).

While some other economies with similarities to Australia (for example Canada) also experienced a strong downturn in productivity at this time, Australia's performance relative to the OECD average declined substantially from its heights experienced through the second half of the 1990s. Indeed, Australia's average annual MFP growth fell from 2nd highest among 18 key OECD countries in the second half of the 1990s to 14th among those 18 countries in the 1999 to 2007 period (figures 2.5 and 2.6).

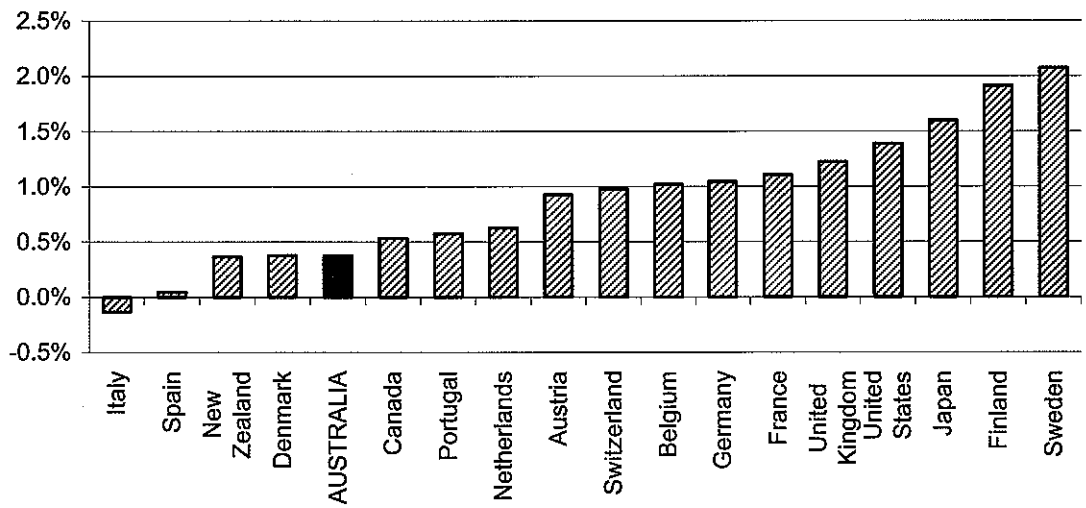
Since 2003-04, productivity growth has fallen further in nine of the twelve market sector industries with Agriculture, Mining, Manufacturing and Electricity, gas & water falling by around another 2 percentage points or more (while these are significant, it should be noted that it is usual for productivity growth to be lower in the early years of a cycle).

Average annual MFP growth in Mining has fallen from -0.7 per cent in the last complete cycle to -4.8 per cent in the part cycle since 2003-04, and Agriculture has fallen from 3.4 per cent to -1.4 per cent. In 2007-08 these two industry sectors alone accounted for 17.5 per cent of total market sector value added. In addition, Manufacturing MFP growth has fallen from 1.8 per cent to -0.8 per cent per year and Electricity, gas & water has fallen from -2.3 per cent to -4.2 per cent. The four industries together account for almost 40 per cent of total market sector value added.

However, special circumstances largely explain the poor MFP performance of three of these four sectors.

Figure 2.6 **MFP growth in selected OECD countries, 1999-2007**[a]

Average annual growth rate



[a] Or closest available years. To 2006 for Italy, Japan and Sweden, to 2005 for Denmark, Finland, Netherlands and the United Kingdom, to 2004 for Belgium, 1989-2006 for New Zealand, 1990-2006 for Spain, 1991-2007 for Germany, 1991-2006 for Switzerland, 1995-2005 for Austria, 1995 to 2005 for Portugal.

Data source: OECD.Stat (database).

The mining boom: good for incomes, bad for productivity?

First, and probably most influential among the various explanations for the productivity decline in this sector is the resources boom. This has been a boom in mineral prices rather than in aggregate mining output, although official statistics do show quite solid average annual growth of 3.7 per cent in value added in the mining sector in the period since 2003-04. However, the rapid increase in the price of many minerals over this period has driven the non-rural component of the commodity

price index up more than 70 per cent, generating an increase of more than 150 per cent in profits in the sector.

In an effort to gear up production to take advantage of profit opportunities arising from the rapid growth in mineral demand, mainly from China, the mining industry expanded both capital and labour inputs at an extraordinary rate. Growth in hours worked has averaged around 10 per cent per year and growth in capital services around 8 per cent per year since 2003-04, both far exceeding average annual value added growth of 3.7 per cent. The question is why has value added growth been slower than aggregate input growth (resulting in negative MFP growth)?

While productivity in mining has fallen, profits have soared. Indeed it is to some significant extent the rapid response by the sector to the rise in profit opportunities that has been instrumental in depressing MFP growth. Higher MFP would have resulted had efforts to gear up for future expansion in output not been so vigorously pursued, but that would have been at the cost of anticipated future profits.

The reasons for this are identified in the Commission's Staff Working Paper *Productivity in the Mining Industry: Measurement and Interpretation* (Topp et al. 2008). That study estimated an average lag between investment in new capital and the corresponding increase in value added of around 3 years in the mining sector. As discussed earlier, the effect of such lags on measured MFP growth is to depress the measure when growth in capital inputs is increasing, and increase the measure when capital input growth eases back. The study found that around one-third of the decline in mining sector MFP between 2000-01 and 2006-07 was attributable to this effect. All other things equal, this should be 'paid back' in years to come as the associated capital comes fully into production, but recent global financial and economic developments may delay that effect.

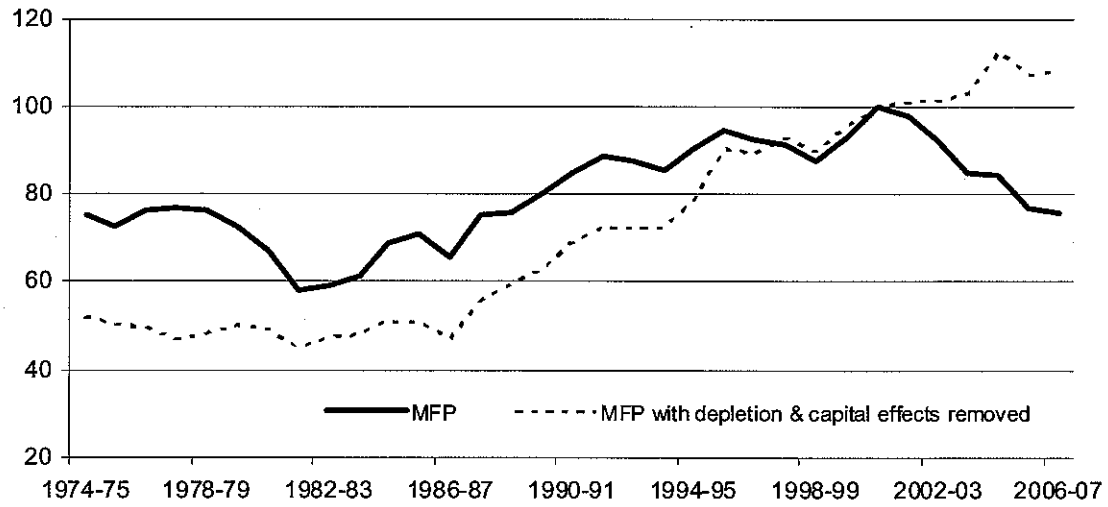
However, the mining sector has also exhibited comparatively poor MFP growth over the longer term which cannot be explained by the lag associated with recent increases in the rate of growth of capital inputs. The same study identified a long-term systematic decline in the quality of in-situ resource deposits which results in some instances in an increase in extraction costs and in some instances a decrease in output quality. Both of these effects put downward pressure on MFP growth in the mining industry. Since 2000-01, resource depletion was estimated to have had an even more significant effect on measured MFP growth than the capital lag effect. Once the capital lag effects and the resource quality depletion effects were removed, MFP growth returned to positive trend growth (figure 2.7).

While the capital lag effects can be expected eventually to raise measured MFP growth, the current global economic situation may delay this rebound longer than

might otherwise have been the case. However, overlaying this temporary rebound and beyond, the resource quality depletion effect is likely to continue to be an ongoing detractor from the productivity enhancing effects of technology and other efforts to improve the business management and operations environment, with an uncertain longer-term net outcome.

Figure 2.7 **Mining MFP (level) with and without depletion and capital lag effects**

Index 2000-01 = 100



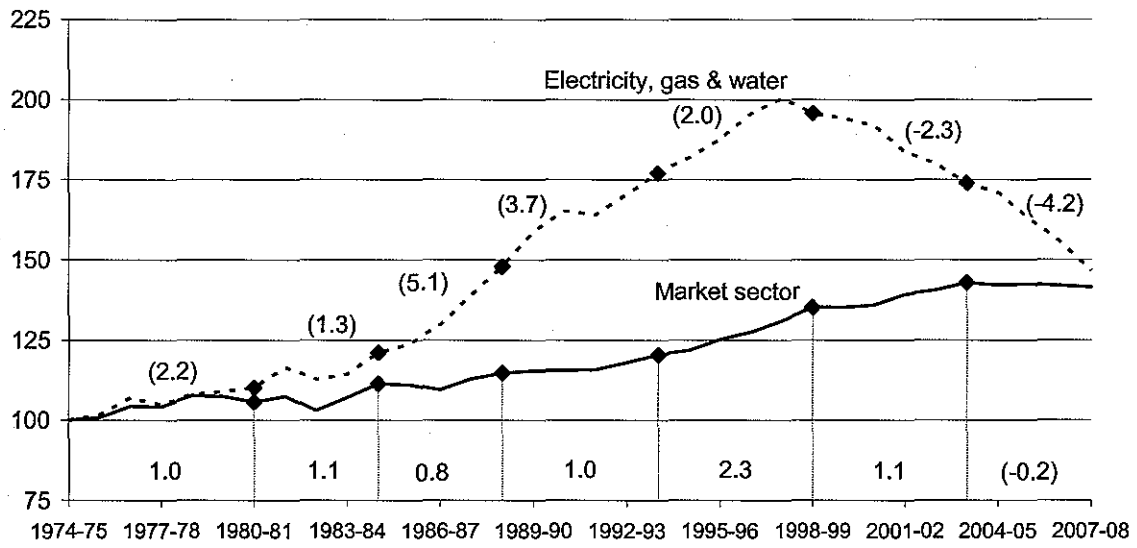
Source: Topp et al. (2008, p. xxii).

Electricity, gas & water experienced significant capital expansion

Another sector exhibiting strong declines in MFP since 1998-99 is Electricity, gas & water. It is instructive to analyse developments in this industry sector over the longer term as it was one of the industries to have exhibited the largest productivity gains from the economic reforms in the 1980s and 1990s, but has since gradually declined to have the lowest MFP growth next to Mining in the most recent period (figure 2.8).

Figure 2.8 **MFP across productivity cycles — Electricity, gas & water and total market sector**

Index 1974-75 = 100



Data source: ABS (*Australian System of National Accounts, 2007-08*, Cat. no. 5204.0); ABS (*Experimental Estimates of Industry Multifactor Productivity, 2007-08*, Cat. no. 5260.0.55.002) and Commission estimates.

Even prior to the commencement of structural reform and the implementation of competition policy this industry sector exhibited stronger than average MFP growth. However, through the mid-1980s and early 1990s its MFP growth rate accelerated significantly and it was one of the stronger MFP growth industries through that period.

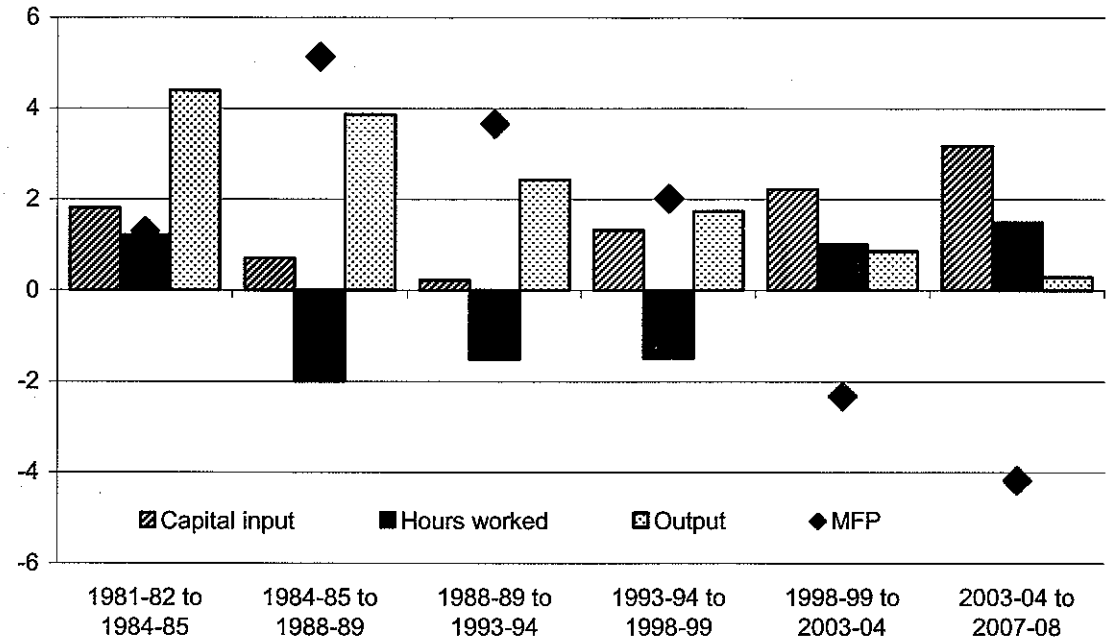
In each of the three cycles covering the period from 1984-85 to 1998-99 average annual growth in labour input into this industry was negative, and in the first two of these cycles capital input growth was very small. These developments reflected structural reforms in the industry which, among other goals, addressed the prior build up of excess capital capacity and an inefficiently large work force. Output still grew strongly without the need for commensurate increases in capital input as excess capacity was gradually unwound (figure 2.9).

In the last of these three cycles labour input continued to decline, but with previous excess capital becoming fully employed capital input growth grew quite strongly again and output growth slowed somewhat.

Since 1998-99, average annual rates of growth in capital inputs and hours worked have both been very high (this industry sector is very capital intensive so the weighted capital input growth rates in figure 2.9 are substantially higher than the corresponding weighted growth in hours worked).

Figure 2.9 **Value added and capital and labour input components of MFP growth in Electricity, gas & water, by productivity cycle**

Average annual growth rate



Data source: Commission estimates based on ABS (*Experimental Estimates of Industry Multifactor Productivity, 2007-08*, Cat. no. 5260.0.55.002).

The combined effects of Australia's growing population, increasing demand for energy consumption, and (recently) less reliable rainfall are giving rise to significant increases in the demand for capital (and labour) inputs in this sector with gross fixed capital formation (chain volume measure) in 2007-08 twice that in 2003-04 and four times that in 1995-96.

While consumption of energy continues to increase, very low rainfall has exerted significant downward pressure on water consumption. In response to this reduction in supply, major initiatives in conservation and demand management have been embarked upon in relation to urban water (National Water Commission 2009) and a $10 billion plan put in place for rural water buyback and water conservation infrastructure.

It therefore appears likely that, in the near term at least, there will be ongoing strong growth in capital services in this sector. As some of these capital projects (for example, new desalination plants and water recycling capital) take time to construct and make operational there is likely to be an associated 'drag' on measured productivity growth. Although the sluggish value added growth resulting from intense downward pressure on urban water consumption may be somewhat

alleviated once the developing capital stocks relating to desalination and recycling of water come on stream, the reliance of this new source of water on significant new capital will keep productivity lower than would otherwise have been the case. In addition, the reduced rainfall and ongoing constraints on growth in rural water consumption will also keep downward pressure on productivity as additional conservation measures will be necessary.

Agricultural productivity reduced by drought

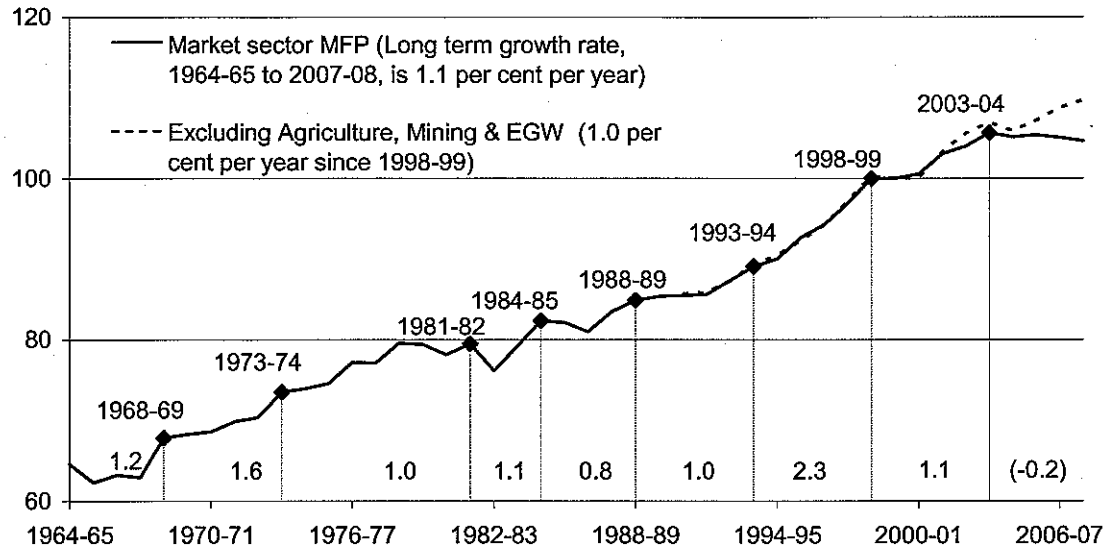
In the most recent period average annual MFP growth in Agriculture, forestry & fishing has been -1.4 per cent, following strong average annual MFP growth of between 3 and 4 per cent across each of the preceding three complete productivity cycles. The decline in Agricultural MFP reduces average annual MFP growth as a whole by 0.06 of a percentage point (the relatively small impact is a result of Agriculture's small share of total market sector value added). This outcome is a direct consequence of the severe drought induced fall in the sector's value added of some 18 per cent in 2006-07, with MFP growth of -19.4 per cent in that year.

The three sectors collectively had a big impact on MFP growth

Once the influence of these three sectors is removed, average annual MFP growth over the period from 1998-99 to 2003-04 returned to a more typical 1.3 per cent (compared with 1.1 per cent for the full market sector). Since 2003-04 it has averaged around 0.7 per cent (compared with -0.2 per cent for the full market sector) (figure 2.10). While average annual MFP growth of 0.7 per cent is still considerably below the long-term average of 1.1 per cent, productivity growth is generally lower in the early years of a cycle, and the average when the cycle is complete may therefore prove to be greater. Commission estimates indicate that these three sectors accounted for 70 per cent of the recent decline in MFP growth relative to the 1998-99 to 2003-04 cycle.

Figure 2.10 **Market sector MFP and the impact of poorer performing sectors, 1964-65 to 2007-08**

Index 1999-2000 = 100



Data source: ABS (*Australian System of National Accounts, 2007-08*, Cat. no. 5204.0); ABS (*Experimental Estimates of Industry Multifactor Productivity, 2007-08*, Cat. no. 5260.0.55.002) and Commission estimates.

Additional possible causes of the productivity slowdown

There are other factors that have received some attention in the context of their possible effects on Australia's recent productivity performance, including: capacity constraint effects; the rate of investment in physical capital in general and in infrastructure in particular; and the adequacy of expenditure on R&D.

Capacity constraint effects were widespread

The rapid increase in incomes associated with the commodity price boom has also given rise to increased aggregate demand in Australia, pushing up prices and profits. It may be that these developments have resulted in better profit opportunities from businesses focusing more on meeting expanded demand than on seeking more cost effective means of production.

In addition, as the unemployment rate approached 30 year lows it seems likely that to increase output businesses were forced to employ individuals with lower ability and less relevant qualifications, leading to slower rates of productivity growth. Although Dolman (2009) concludes that this productivity effect of unusually low rates of unemployment is not likely to have been large, taken together with the

possibility of better profit opportunities from output expansion rather than cost reduction, the two together may have contributed in a more significant way to slower productivity growth.

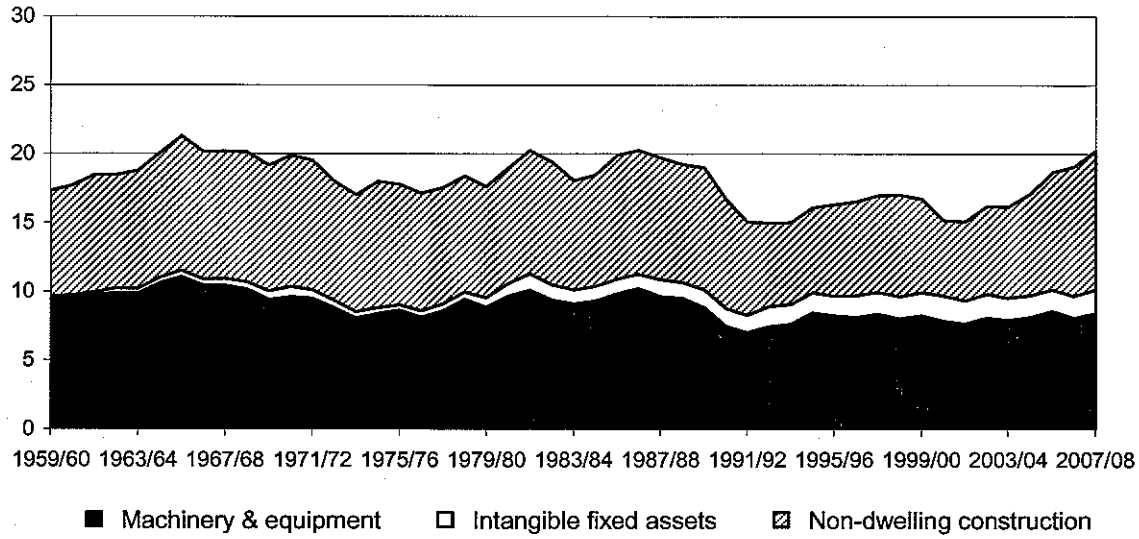
Was investment adequate?

Investment plays a very significant role in economic growth. It is necessary to replace worn out and obsolete capital as well as to add to the stock of capital to lift the output of the economy. Increasing the capital stock is important for most countries, both to cope with the demands of an increasing population, and because the long-run accumulation of capital per worker is usually associated with faster economic growth and improved living standards. Increasing the capital stock through investment can raise labour productivity but does not of itself raise MFP. This is because the associated increase in output is offset by the increase in capital. However, investment does play the role of a 'vector' for the diffusion of new technologies embedded in capital, and the diffusion of such technologies, along with necessary complementary organisational and management innovations, is vital to aggregate productivity growth in the economy.

During the 1960s, 1970s and 1980s the rate of investment in physical capital was fairly steady, averaging around 18 per cent of GDP (figure 2.11) though with a growing share of investment in 'intangible' assets such as computer software. In the early 1990s however, the rate of investment in physical capital dropped to around 16 per cent of GDP and stayed thereabouts until the early 2000s, from which time it gradually climbed again to around 20 per cent in 2007-08 — similar to peak rates in the 1980s. It is also apparent that much of the decline in the 1990s was attributable to a fall in the rate of investment in non-dwelling construction, and that it is this component that has been responsible for the rebound also.

Figure 2.11 **Gross fixed capital formation as a share of GDP, by type of capital[a]**

Per cent



[a] Gross fixed capital formation in Machinery & equipment, Non-dwelling construction, and Intangible fixed assets as defined in the ABS System of National Accounts.

Data source: Commission estimates using data from ABS National Accounts (2007-08) on dXtime (database).

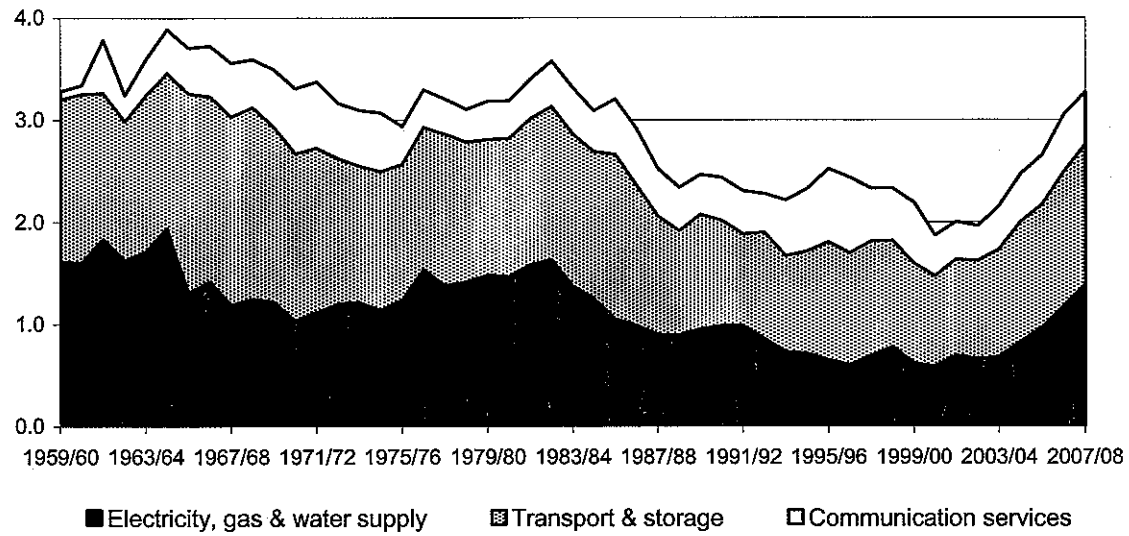
Investment in 'public' infrastructure capital — non-dwelling construction in Electricity, gas & water, Transport & storage, and Communication services — forms a key component (around 30 per cent) of total investment in non-dwelling construction. ABS national accounts data show that the rate of investment in 'public' infrastructure fell significantly over most of the 1980s and early 1990s (figure 2.12) and that this fall accounts for a significant part of the decline in the overall rate of investment in physical capital over that period. Since around 2003-04, however, the rate of investment in these industries has rebounded back to the sorts of levels being achieved through the 1970s and early 1980s.

It should be emphasised that the potential impact of investment on productivity and economic growth depends on the quality of investments and on the efficiency with which the capital is used. The excess capacity inherent in much of the public infrastructure capital in the 1970s and 1980s, together with inappropriate allocations of plant and equipment arising from selective protection and industry policies, would have detracted from productivity at the time. The introduction of microeconomic reforms, particularly competition policy and the disciplines it imposed through appropriate required rates of return and competitively neutral pricing, is likely to have significantly improved the quality and efficiency of use of capital in the period when investment was declining.

Moreover, as discussed earlier, rapid rises in the rate of investment in physical capital (especially in case of very large capital projects such as in the mining and 'public' infrastructure arenas) can have a temporary negative impact on productivity growth. Such effects are likely to be present in the recent slowdown in productivity growth, but data limitations make the extent of these difficult to assess.

Figure 2.12 Capital investment in 'public' infrastructure as a share of GDP, by industry[a]

Per cent



[a] Capital investment is defined as gross fixed capital formation in non-dwelling construction capital. Capital investment and gross domestic product (GDP) are measured in nominal terms, and reflect investment by both the government sector and the private sector.

Data source: Commission estimates using data from ABS National Accounts (2007-08) on dXtime (database).

In addition, there are many factors that can result in investment levels that are not socially optimal. For instance, in the presence of negative externalities (for example pollution) unregulated private investment is likely to be too high, while in the presence of positive externalities (for example those associated with certain infrastructure) private investment is likely to be too low. Specific investment decisions can also be influenced by regulations and taxation. For example, regulatory arrangements may unduly raise the costs or reduce the revenue from investments in particular areas.

The diversity of issues associated with different investments means that a meaningful assessment of the appropriateness of the level of investment can, in general, only be made on a case-by-case basis, taking into consideration all factors affecting decision making and the social costs and benefits from that investment (see box 2.2). It is therefore not possible to assess from aggregate investment data alone whether investment is adequate or not.

Box 2.2 When is investment in physical capital 'adequate'?

Ideally, investment in new physical capital should continue to the point where the benefit to the community from the last dollar invested just equals the cost of the capital. From the broad community perspective it is the social benefits and costs that matter in determining an adequate or efficient level of investment, not just the benefits and costs faced by the investor.

In certain cases private benefits and costs associated with new investments will be much the same as public or social benefits and costs, and in these cases 'leaving it to the market' will tend to generate an appropriate level of investment. This is not to say that poor investment decisions will never be made, nor that there should be a constant or predictable level of investment each year. Investment responds to business cycles, technology changes, changes in consumer tastes, even the weather. The important point is that in those parts of the economy where markets operate well, the nature and amount of this private investment will generally be appropriate.

However, private benefits and costs do not always equate to social benefits and costs — key examples include activities generating significant forms of pollution, industries exhibiting natural monopoly characteristics, and activities with widespread community benefits but from which it is difficult for the investor to capture a commensurate return. This can lead to production and investment decisions that are not socially optimal. In such circumstances regulation may have a role to play in securing a socially superior outcome.

Largely because of their natural monopoly characteristics and widespread community benefits, the majority of economic or 'network' infrastructure assets in Australia — our roads, bridges, railways, ports and airports, electricity generation and distribution networks, and telecommunication networks — have traditionally been owned and operated by governments. In recent decades some government owned infrastructure assets have been privatised or corporatized, while in other cases private sector businesses have independently entered infrastructure industries to directly provide goods and services (for example in telecommunications). An assessment of the 'adequacy' of investment in public infrastructure therefore requires consideration of government investment in these industries, private sector investment, and the regulatory environment that influences investment decisions. Getting investment in these sorts of assets 'right' requires rigorous and transparent cost-benefit analysis.

Whatever the type of capital, achieving the appropriate level and mix of investment can be significantly undermined by industry policies and regulatory arrangements that distort prices, raise costs or reduce competition. Ultimately, industry policies and regulatory environments that promote competitive market outcomes and minimise the cost and intrusiveness of regulations in achieving their objectives are a precondition for achieving an adequate level of investment.

Source: Banks (2008), PC (2008a).

Was R&D deficient?

R&D activity — the precursor of technological innovation — is important to productivity growth. The pursuit of more efficient production processes and improved goods and services plays a significant role in improving productivity. However, establishing the quantitative links between R&D activities and their associated gains is difficult (especially in the case of public R&D) because many of the gains are spread through technological diffusion or 'spillover' benefits. This makes it hard to calculate both the productivity benefits and the financial return to R&D. However, available estimates suggest that R&D has not been a major driver of MFP growth in Australia (box 2.3).

Box 2.3 R&D and productivity

There are widespread and important economic, social and environmental benefits generated by Australia's public funding support of science and innovation.

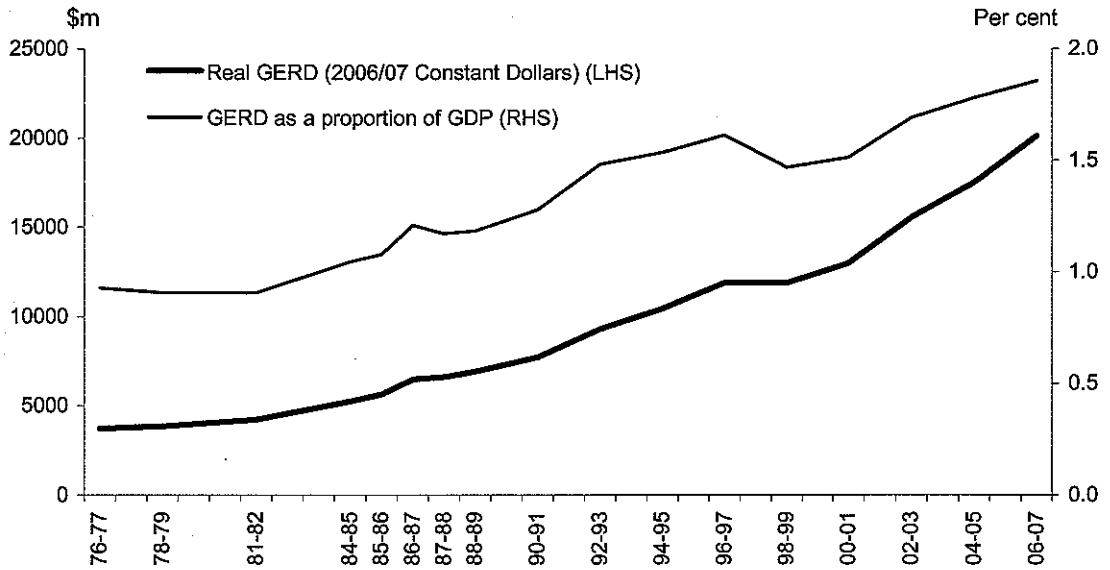
R&D activity (as part of the broader concept of innovation) is clearly important to productivity growth. However, establishing the quantitative links between R&D activities and their associated gains is difficult (especially in the case of publicly funded R&D) because many of the gains are spread through technological diffusion or 'spillovers'. This makes it hard to calculate both the productivity benefits and financial return to R&D.

Nevertheless, research by the Commission (PC 2007a) suggest that R&D's contribution to Australia's cumulative MFP over the past two decades has been between 2.5 and 7.5 per cent (so that the remaining 97.5 to 92.5 per cent of MFP can be attributed to other factors).

The Commission judges that the social benefits of publicly funded R&D are likely to be higher in universities and public sector research agencies due to their orientation towards public good research and the associated development of high quality human capital. Business programs are likely to make smaller social contributions as they tend to 'crowd out' some otherwise privately funded R&D.

Real gross expenditure on R&D in Australia has been growing quite strongly over the period 1976-77 to 2006-07, but growth has been particularly strong in the more recent period from 2000-01 to 2006-07 (figure 2.13). It has also been growing as a proportion of GDP.

Figure 2.13 **Real gross expenditure on R&D and R&D intensity[a], 1976-77 to 2006-07**



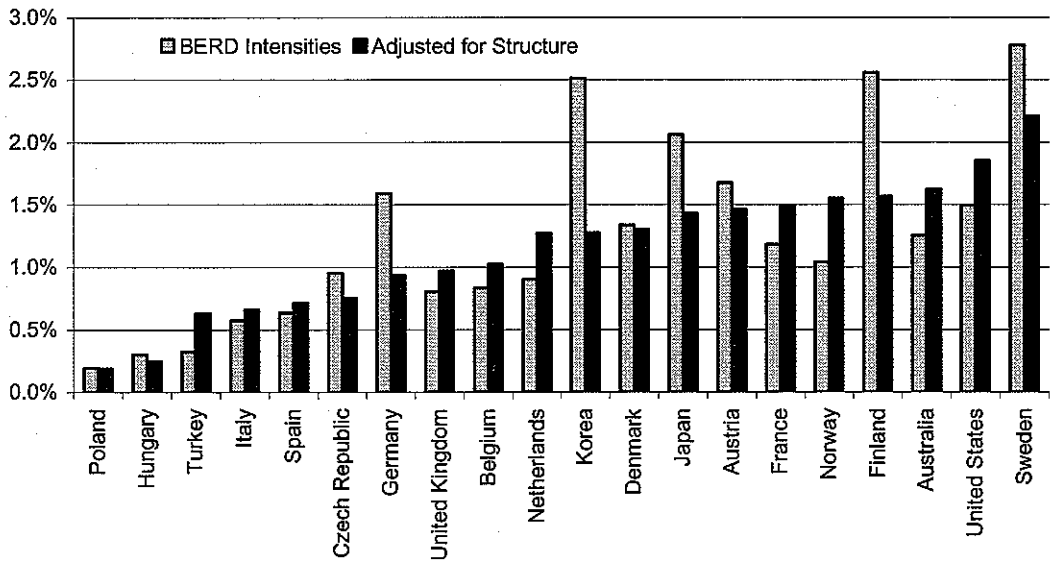
[a] Gross expenditure on R&D as a proportion of GDP.

Data source: Commission estimates based on ABS (*Research and Experimental Development, all Sector Summary, Australia*, Cat. no. 8112.0, various issues); ABS (*Australian System of National Accounts, 2007-08*, Cat. no. 5204.0).

Compared with other OECD countries Australia's business expenditure on R&D (BERD) as a proportion of GDP has historically been quite low, but has been rising over time. That said, differences in the composition of industries across countries often make such straightforward comparisons invalid. An alternative and more valid comparison is obtained by applying a common industry composition across all countries. The Commission has conducted such an analysis with the results shown in figure 2.14 (PC 2007a). When a common industry structure is applied Australia's ranking rises from 9th to 3rd among 20 key OECD countries.

Figure 2.14 **BERD intensities across OECD countries adjusted for variations in industry structure**[a]

BERD as a share of value added, 2006



[a] All countries are assumed to have the same industry structure. Estimates are calculated on the basis of R&D intensity per industry with the weights of each industry corresponding to their share of total business sector value added on average across the OECD countries listed.

Data source: Update of PC (2007a, p. 575) using OECD.Stat (database).

While on this basis there is no evidence of an underspend on business R&D, Commission analysis has identified some risk of a funding shortfall for basic research (which typically displays more positive external benefits than commercially oriented research) and a related concern that there was too great an emphasis on the commercialisation of university research (PC 2007a).

3 Policies for improving productivity performance

3.1 Productivity growth: an important way to promote living standards

For Australians to enjoy higher living standards requires both higher productivity and sustained high allocative efficiency, as noted in chapter 1:

- higher productivity (that is, productive efficiency), to permit greater outputs of the mix of goods and services demanded at any point in time, for each unit of labour and capital deployed, and also
- high allocative efficiency, to best allocate resources toward satisfying community demands as consumer tastes change, new policy priorities emerge (such as environmental objectives) and worker preferences change (including because of an ageing population).

The challenge in the Committee's Terms of Reference to identify policies to increase the level of productivity (and if possible, its sustainable rate of growth) is that many factors influence productivity growth, which often interact in complex ways. Unfortunately, policies that aim to increase productive efficiency (for example, by increasing the supply of some important inputs such as infrastructure), can impair allocative efficiency. Higher measured productivity today, can come at a cost of reduced ability to meet tomorrow's demands, and thus hinder rather than help rising living standards. To take a hypothetical example: if governments were now to assist industries with high measured productivity and tax those with declining productivity, they would deter resources from flowing to the mining sector notwithstanding that sector's continuing world class performance, high contribution to rising living standards, and great potential.

In short, productivity growth is a means to an end, not an end in itself. Moreover, measures of productivity imperfectly capture the underlying concept (for reasons including the imperfect valuation of quality improvements). Productivity growth in an industry can ebb for a time, for reasons not reflecting its potential to expand

profitably, as the mining sector currently demonstrates. Serious policy errors can arise if we lose sight of the ultimate objective of raising living standards.

The complex policy task of increasing underlying productivity growth without detracting from other contributors to rising living standards can be informed by a good understanding of why productivity growth has ebbed and flowed over recent decades.

3.2 Policy lessons from the 1990s productivity surge

During Australia's 1993-94 to 1998-99 productivity cycle, annual multifactor productivity (MFP) growth was substantially above the rates in any cycles before or since, and more than twice the long-term average rate of productivity growth.

The key lessons from this unprecedented productivity growth were that broad, enabling economic reforms, together with the pervasive, competitively-driven deployment of breakthroughs in information and communication technologies, provided unprecedented opportunities to change production processes and redesign workplaces to raise productivity, with heightened competitive pressures to do so.

- Macro policy reforms set fiscal and monetary policies in a stable medium-term framework, lowered inflation, and reduced financing costs.
- Microeconomic reforms had intensified domestic competition, lowered trade barriers to foreign competition, increased labour market flexibility, and increased the efficiency with which economic infrastructure was regulated, operated and priced.

Contrasting that era with today's new challenges after Australian governments' fiscal responses to the global financial crisis, suggests several broad policy tasks to maintain and strengthen the framework conditions for future productivity growth:

- managing the steady withdrawal of fiscal and monetary stimulus to maintain an inflation and interest rate environment conducive to the private sector's need to finance investment
  - notably, governments' initiatives to boost productivity growth will need to be attentive to fiscal and resource costs; initiatives with low fiscal cost, such as regulatory reforms, would seem particularly attractive in an era of fiscal consolidation
- combating reintroduction of policies that would reduce competition in product markets (through protectionism or government procurement preferences), or capital markets (through new regulations going beyond necessary prudential

supervisory improvements), or that would re-introduce rigidities in labour markets

- recapturing some of the infrastructure sectors' higher productivity growth of the 1990s, by ensuring the infrastructure investments with the highest social returns are selected, and that the much larger stock of infrastructure is well regulated and efficiently priced
  - large investments in infrastructure networks such as electricity and broadband are likely to further reduce measured productivity growth in the infrastructure sectors for a period, before any increase in productivity in both those sectors and user industries as the new capacity is put to use.

3.3 Policy lessons from the 2000s productivity reversal

The unusual conjunction of policy reforms and technological opportunities in the 1990s suggests it would have been hard to maintain that decade's uniquely high MFP growth rate. The period of easy initial 'catch-up' from sclerotic past practices of the 1970s to better international work practices is behind us. The stimulus of intensified competition and the gains of flexible markets remain, but further productivity improvement is now in the more difficult terrain of improving human capital and innovation. Moreover, even with success at these current challenges, there are plausible reasons in market size and geography why Australia may never lead, or even completely catch up to, the ever-improving international productivity frontier.

Even so, the decline in MFP growth has been unexpectedly sharp in the incomplete current productivity cycle, especially since 2003-04. Understanding with hindsight why the slowdown occurred is important to properly understanding what can be done to accelerate growth, and which adjustments might be expected to run their course.

It is also worth guarding against unduly pessimistic conclusions based on an incomplete productivity cycle. By definition, an incomplete cycle will manifest lower 'average-to-date' productivity growth than will ultimately be recorded for the whole cycle.

The terms of trade paradox

The 2000s slump in productivity growth coincided with, and was partly caused by, the terms of trade boom: key mining industries rightly took profit opportunities arising from high export prices by investing more labour in existing mines to lift

output quickly, and investing capital in expanded and new mines that will only lift output over time. Mining sector productivity growth has consequently turned negative for a period: more labour and capital inputs, but less than proportionate increases so far in output.

This adjustment neatly underscores that businesses need to pursue opportunities to maximise profits, not target productivity as an end in itself. The national corollary of that is apparent in strong Australian real per capita income growth in 2000s up to the onset of the global financial crisis, notwithstanding the sharp productivity growth slowdown (see figure 1.3).

As well as the terms-of-trade boom temporarily reversing productivity growth in the mining sector and the wider pressures of a 'full-capacity' economy, there were special circumstances in this and other sectors compounding the productivity growth slowdown in the 2000s:

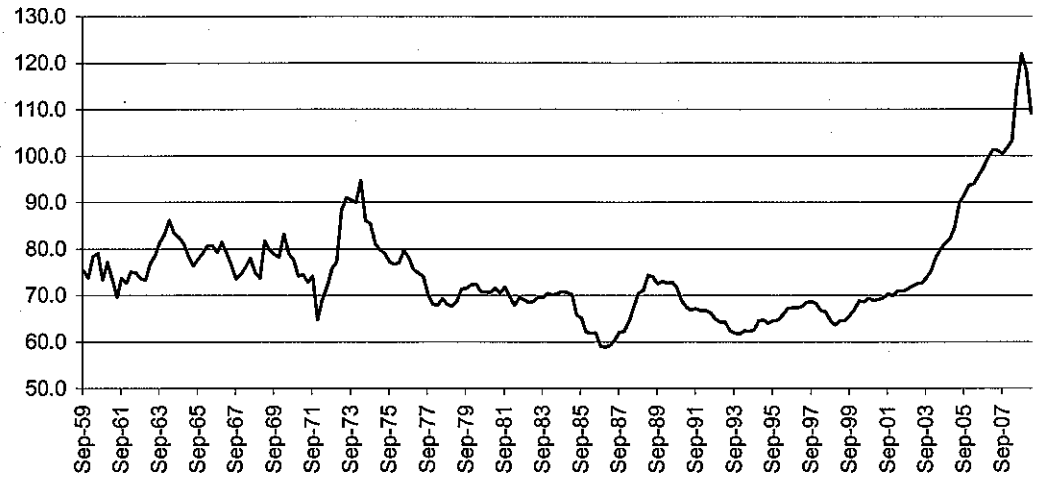
- exhaustion of quality reserves in some existing mines and oil and gas fields
- drought effects on agricultural and utilities productivity
- a wave of investments in utilities after the uptake of excess capacity from earlier investments and the productivity reforms of the 1990s. (It is worth noting that to the extent that Australian governments are now embarking on a program of heavy infrastructure investments, measured productivity in that sector is likely to slow further before it recovers as the new capacity is put into productive use.)

These elements contributed about 70 per cent of the productivity growth slowdown since 2003-04, relative to the 1998-99 to 2003-04 productivity cycle.

As these effects wash through production processes and new investments begin to add to output, some recovery in productivity growth is to be expected.

But that likely natural recovery gives no ground for complacency. Although the terms of trade remain historically high (figure 3.1), the peak levels seen over the last few years cannot be relied on to continue to drive rising living standards. Greater dependence will have to be placed on productivity to generate future income growth.

Figure 3.1 **Terms of trade**
Index 2006-07 = 100



Data source: ABS (*Australian System of National Accounts: National Income, Expenditure and Product 2009*, Cat. no. 5206.0)

The unprecedented fiscal expansion in response to the global financial crisis, and associated debt, only add to the existing long-term imperatives for increased productivity growth of demographic ageing and greenhouse gas abatement and other costs (PC 2005). Productivity growth can in effect help service the debt now accumulating from fiscal deficits, as well as offset the effects on future income of withdrawal of governments' stimuli from consumer spending.

3.4 Effective policies today for productivity growth tomorrow

Past experience has demonstrated that policy can be influential in raising productivity growth. That said, and as illustrated in figure 1.4, policy initiatives need to be broadly based, and to address underlying factors such as competition and openness that drive change for the better.

Ultimately, raising overall productivity depends on the performance of individual firms, and the competitive pressures that result in better performing firms and industries prevailing over the others — 'creative destruction' (box 3.1).

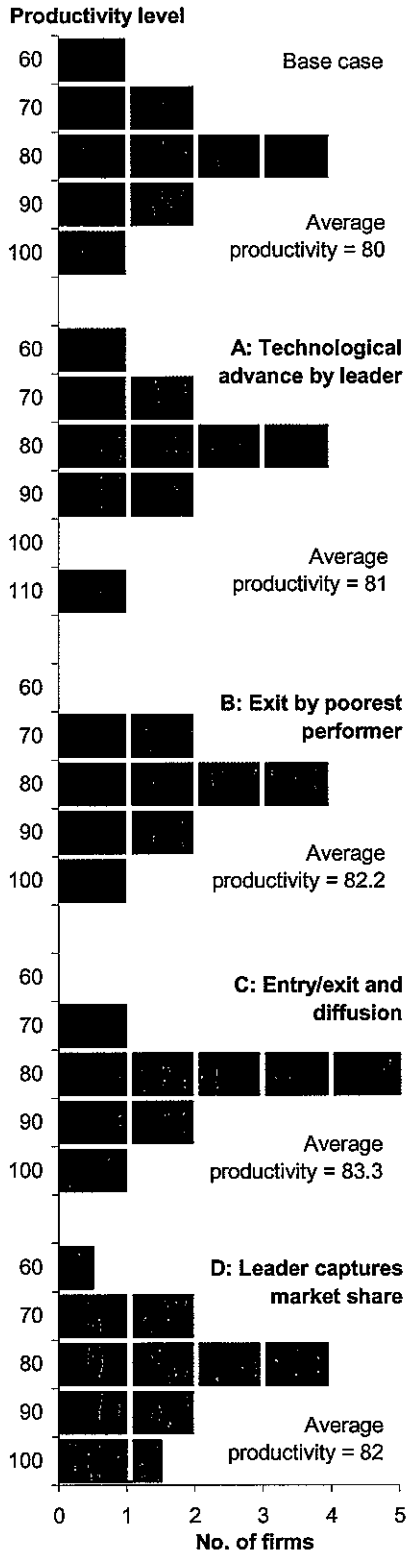
Box 3.1 Multiple mechanisms for industry productivity growth: a hypothetical

Let's assume that there are 10 organisations in an industry. Their productivity levels vary from 60 to 100, as shown in the base case diagram at the top. For ease, the organisations are assumed to be the same size. The initial base case industry average productivity level is 80.

Average industry productivity can increase through a number of mechanisms:

- a productivity improvement (for example, technological advance) by the leading organisation (case A);
- a productivity improvement (for example, the diffusion of an existing technology) among follower organisations, which enables them to catch up at least partially to the leader (case C);
- the exit of the least-productive organisations (cases B and C);
- the entry of new organisations with above-average productivity levels (case C); and
- leading organisations (more productive) capture market share from less-productive organisations (case D).

What this stylised 'hypothetical' illustrates is that organisation-level dynamics can have very important influences on an industry's overall productivity and, by implication, that of the wider economy. Productivity improvements in an economy can be more about raising the performance of productivity laggards, or their exit, as about developing and implementing 'cutting-edge' technologies.



How well productivity performs at the firm level can be influenced by policies directed at three areas:

- *incentives* — the external pressures and disciplines on organisations to perform well
- *flexibility* — the ability to make changes to respond effectively to market pressures
- *capabilities* — the human and knowledge capital, as well as infrastructure and institutions, that are needed to make necessary changes.

All three influence the motivation and ability of organisations to innovate or adopt improvements in processes and products. Only a small part of this need involve new technologies; indeed, it is more about the continual learning and experimenting at the organisation level and responding to client needs.

The three policy dimensions of incentives, flexibility and capabilities are strongly interactive. All three need to be attended to in a policy framework that promotes a focus on productivity and innovation by organisations, and diffusion of best practices among them. Australia's own history of decades of relatively weak innovation and productivity growth coinciding with a relatively highly-educated workforce illustrates this interdependence among the three policy dimensions.

Australia's first two waves of reform (first lowering border protection, and then behind-the-border reforms of infrastructure and labour markets) can be seen as mainly focused on incentives and flexibility (Banks 2008). This reduced inefficiencies and assisted productivity catch-up in the 1990s. While there is more to be achieved by policy reforms in both these areas (by means noted below), in the current third wave of reforms, there is relatively more to be done in building capabilities in the human capital area. This changing emphasis is reflected in the evolution and broadening of reform measures from the National Competition Policy to the current National Reform Agenda

Incentives: competition is the key

There is a substantial body of international evidence demonstrating the crucial role of market competition in encouraging cost reductions and product and process improvements, including through higher rates of innovation and diffusion (OECD 2007). As discussed earlier, the first wave of market-opening reforms of the 1980s and 1990s removed many entrenched inefficiencies from the economy and provided ongoing incentives for productivity improvement. Nevertheless, not all

opportunities for allocative and technical efficiency improvements have yet been exhausted, and need to remain on the National Reform Agenda.

- Competitive reforms in areas such as coastal shipping and aviation, as significant transport inputs, offer potential to stimulate innovation and productivity more widely.
- Implementation of scheduled tariff reductions for the automotive industry and textile, clothing and footwear industries is expected to deliver further net benefits, although increased subsidies are unlikely to yield commensurate gains.
- Improved competition in pervasive small business areas such as pharmacies, taxis and newsagencies would also stimulate innovation and lower costs in those services, to the benefit of consumers across the country.

Barriers to international trade and domestic contestability are not the only forms of assistance that can dull competitive impulses for innovation and productivity improvements. Subsidies to support production or investment can have a similar effect, providing firms with a protective buffer against more competitive rivals. While there can be a case for subsidies where market signals and incentives are inadequate, they need to be well targeted to ensure that the public benefit exceeds the cost, and that public funding does not simply crowd out private sources. Little of the nearly $17.5 billion of gross annual Commonwealth assistance to industry is regularly reviewed to assess whether the community gets value for its money (PC 2009b). With the further substantial industry assistance forthcoming as part of Australia's greenhouse policy response, it will also be crucial that this is rigorously assessed to ensure that it does not unduly detract from productivity growth.

Much of the innovation on which productivity improvements at the firm and economy-wide levels depend, does not involve technologies developed by innovating organisations. Indeed, according to survey data, only 30 per cent of what the ABS defines as 'major innovating firms' actually perform R&D (PC 2007a). For the bulk of innovation activity, therefore, competition provides sufficient incentive for private enterprises, without the need for taxpayer support.

However there is clearly a role for assistance to encourage firms to undertake greater R&D where the results of that R&D are widely shared. While the Commission has found little evidence to support fears of underinvestment in research with direct commercial applications, there are potential benefits from public support for more basic or strategic research, where the returns can be difficult for an organisation to adequately appropriate. But, again, careful design and evaluation are needed to ensure that support measures actually give rise to additional R&D activity, such that the benefits to society exceed the costs (PC 2007a). It seems unlikely that the extension of tax concessions will induce

sufficient additional R&D to warrant the revenue forgone, and the costs of raising it elsewhere.

Flexibility: enabling organisations to be responsive

Productivity improvements often entail changes in the way organisations arrange their production processes. Increasingly, firms tailor products to different customer needs, often providing a joint package of goods and services. They need to be able to react quickly to changes in customer requirements.

Flexibility to alter work arrangements plays an essential role. Reforms to industrial relations arrangements since the late 1980s have enabled firms to be more innovative than was previously possible (a recent illustration of which has been the preservation of jobs by shortening of hours worked during the current slowdown). This flexibility has been reflected in greater take-up rates of new technologies (Parham et al. 2001). For example, as shown in box 2.1, the breakdown in the demarcation of work responsibilities in the wholesale and retail industries with the move from industry to enterprise-based bargaining, enabled adoption of new scanning and database technologies that drove rapid productivity growth from the mid-1980s (Johnston et al. 2000).

While industrial relations regulation addresses a legitimate concern for workers' basic rights based on community norms, it is important to preserve the ability of organisations to engage effectively with employees to change work arrangements in response to commercial imperatives. As the economy changes, different firms and industries will come under divergent pressures in a way not amenable to enforcement of common employment conditions, as the recent debate about the special circumstances of the hospitality sector illustrates. Flexibility in employment arrangements can yield significant benefits for employees as well as their employers. This is demonstrated, for example, by research into the growth in part-time employment for women and older workers since the early 1990s (Abhayaratna et al. 2008).

There is a range of other regulations that can reduce an organisation's adaptability or responsiveness, and burden it with unnecessary costs. The Commission has recently released indicators of the quantity and quality of business regulation and has been benchmarking compliance costs of registration across jurisdictions (PC 2008b; 2008c), as well as conducting annual reviews of the Commonwealth's regulatory burdens on various business sectors (PC 2007d; 2008d; 2009a).

Compulsory standards, complex requirements, or marked differences across jurisdictions can all limit, or raise the cost of, organisational changes needed for

successful innovation. For example, innovation in occupational health and safety practices based on workers assuming responsibility for risks they are best placed to manage, is prevented by regulation in some jurisdictions. This and another 26 regulatory 'hotspots' have rightly been identified by the Council of Australian Governments (COAG) as needing reform under the National Reform Agenda (NRA) (box 3.2). It is important now that reform proceeds quickly. The Regulation Taskforce estimated that unnecessary compliance costs could amount to some $8 billion nationally (PC 2006). The costs are likely to be significantly greater if they included the effect that such red tape can have in limiting innovation.

Box 3.2 The national regulatory 'hotspots'

COAG has identified 27 regulatory areas requiring national reform.

- National harmonisation of occupational health and safety laws is seen as a priority; with commitment to harmonisation reflected in a commitment to develop model legislation by September 2009.
- Early action in 2008 on a further 12 areas, covering environmental assessment and approvals bilaterals, payroll tax administration, trade licences, the Health Workforce Intergovernmental Agreement, national trade measurement, rail safety regulation reform, the consumer policy framework, product safety, trustee companies, mortgage credit and advice, margin lending, and non-deposit taking institutions.
- Significant progress to be made in accelerating the five remaining COAG hotspots — development assistance, building regulation, chemicals and plastics regulatory reform, Australian Business Number and business names registration, and Personal Property Securities reform.
- Nine new areas to be added to COAG's regulation work program, covering standard business reporting, food regulation, a national mine safety framework, electronic conveyancing, upstream petroleum (oil and gas), maritime safety, wine labelling, directors' liabilities, and financial service delivery.

Source: COAG (2008a (Attachment B) and 2008b).

Capabilities: improving the 'support platforms' for productivity growth

Productivity growth will increasingly occur through people working 'smarter' rather than harder. Organisations need people who can develop new and better ways of doing things, including through adopting and adapting existing knowledge and technologies. Managerial skills are a critical input into innovations in organisational practice, while creative talent enables the development of new products as well as engaging client interest.

COAG's National Reform Agenda has placed central importance on building Australia's human capital as a key reform stream. The Commission has estimated that improvements in workforce productivity arising from specifically targeted reform areas in health and education could add 3 per cent to annual GDP (PC 2006). Initiatives related to education and training, in particular, are estimated to raise aggregate labour productivity by up to 1.2 per cent and the average level of schooling by up to 0.25 years by 2030. Of the three types of specifically-targeted initiatives, initiatives to improve transitions from school and adult learning had similar effects on labour productivity, but reflecting the lags between intervention and labour market outcomes, early childhood development and literacy and numeracy initiatives do not impact as strongly on productivity over the study timeframe.

However, the Commission's initial estimates of the gross benefits of the NRA human capital reform stream are only broadly indicative. Apart from excluding the potentially large program costs that may be called for, they are exploratory in the methodologies used. Indeed, the Commission found that, in contrast to the better-researched competition-related reform areas, policies directed at enhancing the capabilities and work incentives of Australians often lack a strong conceptual and evidence base. While the potential for substantial benefits from reform is there, the extent to which these can be realised will depend on having a mix of specific measures that can be shown to yield benefits exceeding their costs (PC 2006).

Primary and secondary education

Addressing educational disadvantage is a priority, as is raising productivity in the provision of education services and, above all, in improving the quality of teaching at all levels (COAG 2008a,b). But ensuring quality teaching has arguably been the most neglected area of education policy (Banks 2008). Teachers' pay has fallen significantly relative to non-teachers' pay. This helps to explain the shortage of qualified teachers of 'hard' subjects (maths, science and IT), which are the keys to further skill development. Unlike other professions, there appears to be no relationship between the aptitude of teachers and their pay. These problems are compounded within government schools in some jurisdictions by restrictions on the ability of principals to appoint the best person for a particular vacancy.

There are many other challenges to ensuring quality teaching. The need to upgrade existing teachers' qualifications is one. Constraining administrative 'creep', which steals the valuable time of teachers, is another. And it is important to find ways by which good teachers (and matching resources) can be directed to schools in disadvantaged areas. Progress is being made in some of these areas in individual

jurisdictions. COAG is ideally placed to initiate an assessment of what approaches to Australia's education workforce would best meet future needs.

Research and innovation

Australia's universities, and public research bodies such as CSIRO, are important in the 'national innovation system' both as generators of new knowledge and as stores of knowledge. Their social value depends on the quality of basic and strategic research that they perform which would not otherwise be undertaken.

The Commission's report on *Public Support for Science and Innovation* (PC 2007a) found that there was some risk of funding falling short for basic research and a related concern that the pursuit of commercialisation of university research should not be taken further. The Cutler Report argued that publicly-funded knowledge should be made freely available (Cutler 2008). Cutler sees the development of networks and linkages which facilitate dissemination of research findings for more commercial uses as an objective of "market facing" innovation programs. However, experience has shown that it can be challenging to develop effective programs that can yield a net benefit over time to the community. For example, the Cooperative Research Centres, a major, long-standing policy initiative in this area, appear to have strayed from their original mission (PC 2007a).

Infrastructure

The timely provision of efficient economic infrastructure also plays a key role in supporting Australia's productivity performance. Transport and communications provide particularly important platforms for innovation and many of the intangible investments such as databases, information systems, organisational capital, and delivery systems, support an organisation's on-going innovation activity.

Currently, the most important policy initiative in this area is the national broadband network. In planning the network, the use of a thorough cost-benefit analysis would aid the implementation study during its detailed work, including its application to a pilot project in Tasmania. Commission research also shows the importance of the appropriate structure of private financing, pricing and access regulation and community service obligations in enhancing the prospects of the successful delivery of this project (PC 2009c).

More broadly, good regulation is central to Australia reaping the potential benefits from private investment in infrastructure. Competition regulation has a key role. Third party access regimes for 'essential facilities' have been modified in recent

years to reduce their potentially inhibiting effects on investment. But further legislative amendments are needed following a Federal Court decision in 2007 that has raised questions about the sustainability of the light handed approach for airports, posing risks for investment in infrastructure more generally (PC 2007b).

Environmental and social regulation can also affect infrastructure investment and usage. In particular, Australia's actions to reduce greenhouse gas emissions will have significant implications for investments in energy and transport that need to be taken into consideration.

Where public provision of infrastructure is necessary, such as for much of the road network, it is important that projects are subject to far more rigorous cost-benefit assessment than has typically occurred in the past, if investments are to yield the highest payoff to Australia's productivity and living standards (PC 2007c). The Commission has identified a number of key themes and issues that are central to achieving adequate and efficient investment in 'public' infrastructure (PC 2008a) (box 3.3).

Box 3.3 Infrastructure investment and the regulatory environment

Principles for achieving adequate and efficient investment in 'public' infrastructure:

- clear objectives (of regulation) focused on enhancing efficiency
- improved governance and institutional arrangements shaping the activities of Government Trading Enterprises
- further unwinding of underpricing and non-cost reflective pricing of certain publicly provided infrastructure services
- more rigorous cost-benefit analysis to underpin public funding of infrastructure
- 'investment friendly' regulation of privately provided infrastructure
- resolution of some outstanding structural (vertical and horizontal integration) issues
- recognise and address the challenges in getting public-private infrastructure partnerships 'right', particularly in regard to risk allocation and ensuring sufficient competition amongst potential project proponents
- take account of the impacts of policies in other parts of the economy on efficient infrastructure investment, especially policies pertaining to greenhouse gas abatement.

Government services

In relation to capabilities, governments provide the regulatory and institutional framework for economic activity. They must also promote productivity improvements in their own services. The legal and judicial framework for markets, governance systems for Government Trading Enterprises, and accountability frameworks for the delivery of public services provide important platforms that enable, as well as affect the incentives for, innovation and productivity growth in the public and private sectors.

With the fiscal pressures we now face coinciding with the need for greater attention to human capital development and provision of care in an ageing society, there is an imperative for the range of human services to be delivered more efficiently as well as more effectively. Services in the areas of education, health, childcare and aged care are all important to Australia's futures productivity and the wellbeing of the community generally.

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