New South Wales
TREASURY

PRODUCTIVITY TRENDS
Implications for the NSW Economy and Budget

Office of Financial Management

Research & Information Paper

PREFACE

This report reviews recent productivity trends in the economy, their interpretation, and their implications for the Budget.

It is one of several recent Treasury publications dealing with productivity, microeconomic reform and financial management in New South Wales.

The views expressed in this paper are those of the author and do not necessarily reflect the views of NSW Treasury or the NSW Government.

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Written by John Diller.

CONTENTS

ABBREVIATIONS

ABS	Australian Bureau of Statistics
ALP	Australian Labor Party
BEA	Bureau of Economic Analysis (US Department of Commerce)
BLS	Bureau of Labor Statistics (US Department of Labor)
COAG	Council of Australian Governments
FRBNY	Federal Reserve Bank of New York
GCI	Government Charges Index
GDP	Gross domestic product
GFS	Government Finance Statistics
GSP	Gross state product
GSP/Hr	Gross state product per hour worked
ICT	Information and communications technology
IGR	Intergenerational Report (Commonwealth 2002-03 Budget Paper 5)
IMF	International Monetary Fund
MFP	Multifactor productivity
NAFTA	North American Free Trade Area
NCP	National Competition Policy
NSW	New South Wales
OECD	Organisation for Economic Cooperation and Development
PBS	Property and business services
PC	Productivity Commission
RBA	Reserve Bank of Australia
TFP	Total factor productivity
US	United States
WTO	World Trade Organisation

EXECUTIVE SUMMARY

Productivity growth is shorthand for the mechanism through which business investment (capital deepening) and improvements in government policy, business management and technology (multifactor productivity gains) together are translated into higher output per hour worked in the economy and improving living standards in the community at large.

Expectations for trend productivity performance play an important role in determining fiscal performance targets for the medium term. From a national perspective, those expectations also are important in assessing the size of the output gap within the business cycle, and the appropriate stance of monetary and fiscal policy.

Correct interpretation of productivity trends requires careful attention to issues of data and analysis, including the definition of capital, the depreciation rate, quality adjustments for both capital and labour, and choice of time periods. Revisions to past data and definitions can lead to significant changes in reported productivity trends.

Australian and overseas research suggests that productivity growth increased very strongly in the 1990s. Multifactor productivity growth in Australia's market sector accelerated from an average 0.6% per annum in the 1980s to 1.3% in the 1990s, including an average 1.8% in the five years ending 1999-2000. This was one of the strongest improvements of any OECD country.

The available data for New South Wales suggests that aggregate productivity growth was on a par with the national average. Gains during the 1990s were particularly strong in utilities, communications, mining and wholesale trade.

Studies by the Productivity Commission, the International Monetary Fund, the Reserve Bank and others have attributed Australia's strong performance primarily to structural reform over the past two decades, and partly to the diffusion of information and communications technology. A third (but related) factor is increased globalisation of markets for goods, capital and technology. Skeptics, particularly John Quiggin in Australia and Robert Gordan in the United States, claim that these results have been exaggerated by failure to eliminate cyclical effects, by underestimation of labour inputs, and by selective choice of sectors included in analysis. While debate is still continuing, the argument supporting the productivity acceleration thesis remains fairly persuasive.

Is productivity growth in the next decade likely to be closer to the experience of the 1990s, or to revert to the lower path of the 1980s? Prospects for all of the three main drivers of the recent acceleration remain supportive. The ongoing microeconomic reform program under COAG, in which NSW actively participates, is an important element in that outlook.

From a fiscal strategy standpoint, higher productivity growth in the general economy would boost revenue collections, providing scope to accelerate the reduction of net financial liabilities, reduce taxes and/or increase spending on priority programs. This would be conditional on strengthened linkages between wage costs and productivity growth in the general government sector. Simulations using a Treasury budget model indicate that a 0.5 percentage point improvement in productivity could improve the annual budget result by about one billion dollars by 2020, achieving the target of zero net debt some four years earlier than in the absence of such improvement.

INTRODUCTION

NSW Treasury's interests in productivity include its relationship to the sustainability of wage outcomes in the NSW public sector; the performance of government entities, and the pricing of their outputs; and prospects for the broader economy and their implications for sustainable trends in public sector financial aggregates. There is also a welfare concern as

> ..labour productivity growth is generally accepted as the most important contributor to rising material living standards during the twentieth century[1].

The focus of this review is at the macro level, particularly the relationship to medium term economic parameters in the Budget.

The need for a review arises from Australian and overseas research suggesting that aggregate productivity growth may have accelerated during the 1990s. How robust is the evidence, and to what factors can it be attributed? Was the experience of the 1990s a limited episode or is it likely to be sustained across the current decade?

1. DEFINING AND MEASURING PRODUCTIVITY

1.1 Defining productivity

Productivity compares under varying circumstances (between usages, places or points in time) the volume of output obtainable with given inputs. At the macro level the focus is on rates of GDP growth achieved over selected periods, in relation to the growth of capital and labour inputs during the same period.

The term "productivity" commonly is used as shorthand for labour productivity (output per worker, or per hour), but that simplification can be misleading.

In the classical model, labour productivity growth is assumed to decline steadily in the long run. This is because labour productivity is assumed to depend on growth in capital stock per worker (which will face declining marginal returns) and a fixed rate of technological progress. More recent models relax the assumption of the homogeneous "worker" (by substituting a hybrid concept of effort plus human capital), and also assume that the rate of technological progress can change as a result of exogenous events, endogenous processes and policy.

Multifactor productivity (MFP) techniques allow statisticians to attribute gains in gross labour productivity (GDP per hour worked) to component factors, including capital deepening (increased capital inputs per hour worked) and multifactor productivity (the excess of growth in output over total weighted inputs). Total factor productivity (TFP) studies include land (natural resources) as an additional factor[2].

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[1] Paul Dalziel, "Strategic Economic Management: a Third Way for Government Policy in New Zealand," *New Zealand Strategic Management*, 2001.

[2] Australian (ABS) studies make this distinction between MFP and TFP. United States studies typically do not (refer Steindel & Stiroh, *Productivity: what is it, and why do we care about it?* FRBNY Staff Research Paper 122, April 2001, p 4 - 5).

More detailed MFP decomposition methods (referred to as "growth accounting") attribute total output growth to changes in labour quantity, labour quality, categories of capital input (typically computer technology and other); and distinguish MFP gains in production from gains in use, and other sources. Decomposition by industry provides further insights on sources of productivity growth. Armed with these techniques, economists in the US and other countries including Australia have analysed the productivity issue in increasing detail over the last few years.

1.2 Measurement issues

Measurement issues loom large in productivity studies, and limit their comparability. Among the more important data issues are the definition of capital, the depreciation rate on fixed capital, quality adjustments for both capital and labour, and choice of time periods.

Research tends to focus on the market sector rather than aggregate output, due to measurement and valuation problems in government. Some studies limit their scope to the non-farm market sector, due to climate related volatility in agriculture.

In most studies prior to the 1990s the capital stock was taken as a proxy for the capital input to the production process, with stock estimated from investment in a perpetual inventory model. From 1998-99 the ABS adopted a "capital services" approach, which adjusts stocks for their age efficiency and rental price. The assumptions underlying the depreciation rate (or age efficiency profile) for assets can substantially affect the capital service estimates; and this is reflected in successive revisions which have been made to the estimates.

Recent studies seek to distinguish the role of information and communication technology (ICT) from other capital inputs. Correctly valuing ICT capital in the productive process poses particularly difficult problems, with a rapidly expanding range of products, steeply declining prices, exponentially rising capacity, and compressed economic life. Most studies use a set of "hedonic" indexes maintained by the United States Bureau of Economic Analysis (BEA) to quality-adjust ICT capital. The effect of quality adjustment is to raise the volume of capital services. If quality adjustment is incomplete, this imparts an upward bias to the residual MFP estimate.

Some recent studies attempt to break out labour quality as a separate input to the production process. In the United States, the BEA calculates wage differentials for various skill levels, which become proxies for labour quality[3]. In Australia, the ABS has begun experimental quality adjustment using an econometric weighting of factors contributing to wage differentials – primarily educational attainment and length of workforce experience[4]. But even gross labour input may be revised, as the ABS did in April 2001. Reconsideration of the data can and does lead to substantial changes in the assessment of productivity performance.

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[3] US Council of Economic Advisers, *Economic Report of the President 2001*, 107th Congress 1st Session, HD 107-2 (hereafter CEA 2001), Chapt 1 Page 29, describes US-BLS skill adjustment methodology. It remains an open question, however, whether labour markets are efficient enough for wages to provide a reliable expression of skill differentials.

[4] ABS, "Further developments in the Analysis of Productivity Growth in Australia," in ABS, *Australian National Accounts*, September 2001. It also describes current ABS work on assessing the contributions from ICT and from intermediate inputs to productivity growth.

Due to the lagged response of employment to changes in output, short run productivity performance is highly correlated with the business cycle. Cyclical effects must be netted out to avoid false readings of trend growth in productivity. The Productivity Commission (PC) cites five different techniques, all of which yield broadly similar results for Australian performance in the 1990s[5]. The most common method is to measure average productivity growth between similar phases in consecutive business cycles. All cyclical adjustment techniques, however, are limited by incomplete information about the current cycle. International comparisons (such as the OECD Growth Project[6]) must also deal with differences in cycles among countries.

2. RELEVANCE TO TREASURY

Productivity growth, together with growth in labour supply, is used to fix Treasury's medium term parameter for economic growth net of business cycle fluctuations (i.e., potential output). A change in expected productivity growth would directly alter expected growth in potential output and by implication the expected growth rate for State revenues and the trend in State net liabilities. Small differences in productivity can make a large cumulative difference to the level of economic output and to the financial position of the State within the timeframe of the *Debt Elimination Act*[7].

From a national perspective, a higher productivity parameter also has the effect of increasing the size of the negative output gap during a cyclical downturn (inviting a stronger monetary/fiscal policy response) and reducing the positive gap during upswings (encouraging a more benign prognosis for inflation). Other things being equal, national policy-makers (Commonwealth Treasury and RBA) can, and arguably should, let the economy run faster if they are convinced that the trend growth rate of productivity has increased.

A higher productivity parameter also implies higher average returns on capital and higher real interest rates[8]. As noted by the RBA,

> The increased rate of productivity growth enjoyed in the United States and Australia over the 1990s is likely to have put upward pressure on the neutral rate in both countries. A sustained increase in the rate of productivity growth raises the rate of return to investment. The consequent rise in investment requires a rise in the neutral rate to bring savings and investment back into balance[9].

By implication, if the productivity parameter is revised, then the benchmark rates of return on assets and projects as well as projected State government interest expense, should also be revised.

[5] Dean Parham, *Role of Productivity in Australia's Growth*, presentation to PC/ISR Seminar, 21 June 2001.

[6] OECD, *The New Economy: Beyond the Hype*, final report on OECD Growth Project, 2001 (hereafter: OECD 2001)

[7] The New South Wales, *General Government Debt Elimination Act*, 1995, calls for the elimination of general government net debt by 2020.

[8] Simulations with the Econtech MM2 model suggest that higher productivity growth would translate into faster output, investment and employment growth, lower prices and a lower exchange rate, but no long-run change in nominal interest rates. Hence real interest rates would rise.

[9] RBA, *Statement on Monetary Policy*, August 2001, p51.

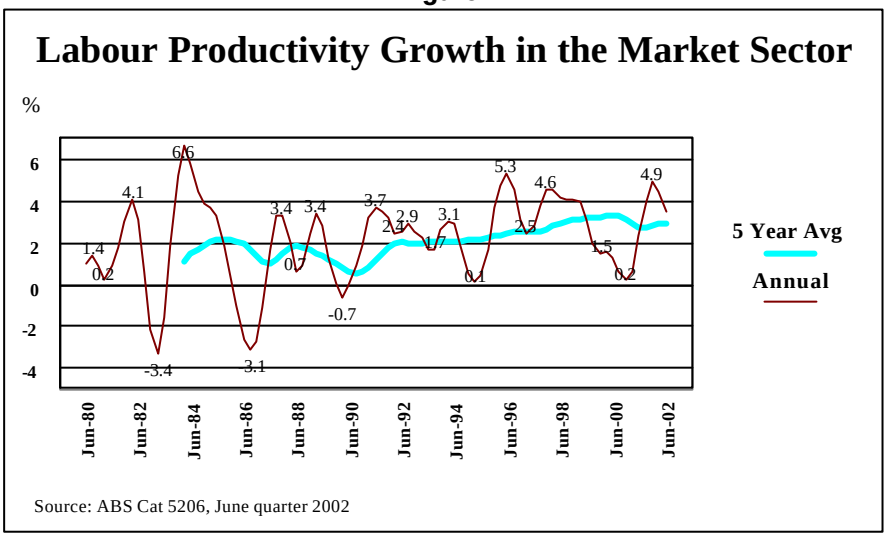
3. RECENT EXPERIENCE

Evidence on productivity can be drawn from both Australian and international sources. In this section we inspect labour productivity trends from the national accounts, multifactor productivity estimates by the ABS, and a growth accounting study by the RBA. We conclude by inspecting the available data on trends in New South Wales.

3.1 National Productivity

Trends in market sector labour productivity (trend GDP per hour worked) are reported in the quarterly National Accounts. The series is highly sensitive to the business cycle, with annual growth (thin line in graph) reaching a recent peak at 4.6% in December 1997, slowing to 0.2% in December 2000 and reaccelerating to 4.9% in December 2001[10].

Figure 1



Source: ABS Cat 5206, June quarter 2002

The trailing five-year moving average of the same national accounts measure (thick line) provides a somewhat clearer case for a "productivity acceleration" in the late 1990s. Average labour productivity growth picked up from around two percent in the period ending 1992 to about 3.5% in the period ending 2000, with most of the acceleration taking place during the second half of the 1990s. The five-year average growth rate was 3% at June 2002.

The more comprehensive ABS annual multifactor productivity series (reported in Table 1) includes both labour and capital inputs, separates MFP effects from input growth effects, and reports on a standardised business cycle basis. It shows that MFP growth in the market sector more than doubled from 0.7% in 1989-90 - 1993-94 to 1.8% in 1993-94 - 1999-2000. Since capital deepening was constant between the first and second halves of the 1990s, MFP acceleration was responsible for all gains in labour productivity in the second half. Average MFP growth over the two cycles of the 1990s was 1.3%; this was double the rate over the two cycles of the 1980s, although not better than cycles of the late 1960s and early 1970s.

[10] ABS Cat. 5206, National Accounts, June quarter 2002. These quarterly Henderson trend indexes may be substantially revised from one release to the next.

Table 1: Productivity Growth in the Market Sector
(annual average % change)

Productivity Cycle (Peak to peak)	A Multifactor Productivity	B Capital Deepening	C Labour Productivity = A + B	D Hours Worked	E Mkt GDP = C + D
64/65 - 68/69	1.2	1.3	2.5	2.6	5.1
68/69 - 73/74	1.5	1.4	2.9	1.7	4.6
73/74 - 81/82	1.0	1.4	2.4	-0.3	2.1
81/82 - 84/85	0.8	1.4	2.2	-0.4	1.8
84/85 - 88/89	0.4	0.4	0.8	3.3	4.1
88/89 - 93/94	0.7	1.3	2.0	-0.2	1.8
93/94 - 99/00	1.8	1.2	3.0	1.7	4.7

Source: ABS Cat. 5204, *National Accounts 2000-01*; NSW Treasury.

Recent studies in the United States and in Australia have used growth accounting methods to further disaggregate the MFP model in order to separate out the contribution of information technology. The RBA published a comparison of two such studies for Australia and the United States respectively in February 2001 and commented[11]:

Table 2: Contribution of Information Technology to Labour Productivity Growth (%)

	Australia Market Sector		**United States** Non-farm business sector	
	1991-95	1996-99	1991-95	1996-99
Annual labour productivity growth	2.1	4.1	1.5	2.6
Contributions from:				
A. Information technology	0.9	1.3	0.5	1.0
Of which: Hardware	*0.4*	*0.8*	*0.2*	*0.6*
Software	*0.5*	*0.5*	*0.2*	*0.3*
Communications	*na*	*na*	*0.1*	*0.1*
B. Other capital	0.4	0.6	0.1	0.1
C. Labour quality	na	na	0.4	0.3
Multifactor productivity	0.8	2.2	0.5	1.2

Source: RBA Bulletin, February 2001

- Australian productivity growth outstripped the United States by an increasing margin during the 1990s;

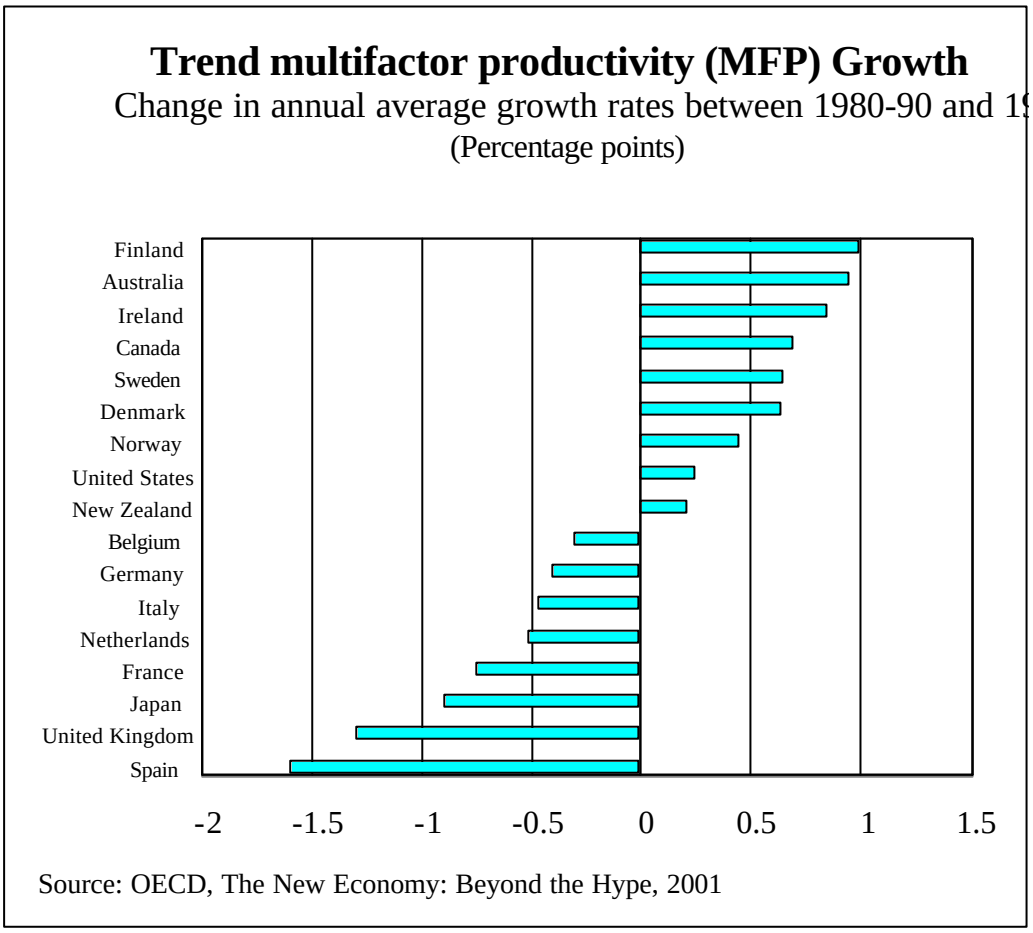
- Information technology capital accounted for more of productivity growth than other forms of capital in both Australia and the United States; and

[11] David Gruen, *Australia's Strong Productivity Growth: Will it be sustained?*, RBA Bulletin, February 2001 (originally speech to CEDA on 2/2/01). Updated results on a slightly different basis are reported in Simon & Wardrop, *Australian use of information technology and its contribution to growth*, RBA Research Discussion Paper 2002-2, but the authors state that these revisions are minor and do not alter their previous conclusions in any significant way.

- Contrary to common presumptions that Australia is a "technology poor" economy, information technology capital appears to have made a larger contribution to growth in Australia than in the US (though the RBA warns that this finding should be treated with some scepticism).

While productivity improved in a number of countries, it would appear that Australia's gains have been particularly large. A recent OECD study[12] identified Australia as achieving one of the strongest MFP growth accelerations of any OECD country between the 1980s and the 1990s.

Figure 2



3.2 Trends in New South Wales

While the capital services data needed to estimate multifactor productivity is not available at the State level, there is sufficient information to assess trends in overall labour productivity for the State economy as a whole and, more tentatively, by sector. As consistent output data is not available for the first cycle (1988-89 to 1993-94), this analysis concentrates on the second cycle (1993-94 to 1999-2000) and the calendar (rather than cycle-based) decade of the 1990s. Analysis of trends beyond 1999-2000 is more problematic due to cyclical effects and data breaks[13].

[12] OECD, *The New Economy: Beyond the Hype*, final report on OECD Growth Project, 2001.

[13] Changes to labour force survey methodology produced a data break in April 2001 for most labour series other than national and state totals, for which the ABS produced back cast estimates. The net effect (for series not back cast) was to raise estimated employment (and to reduce estimated productivity) from April 2001.

Table 3: Labour Productivity Growth in NSW and Australia
(Average annual % change)

		1993/94 to 1999/2000	Decade of the 1990s
NSW	GSP	4.5	3.4
	Hours Worked	2.3	1.3
	GSP/Hr	2.2	2.0
Australia	GDP	4.3	3.4
	Hours Worked	2.2	1.2
	GDP/Hr	2.1	2.2

Source: ABS Cat 5220, 6203.

Aggregate labour productivity, in terms of real GSP per hour worked, averaged $36 in NSW (5% higher than the national mean) during the ten years 1990-91 to 1999-2000. NSW productivity growth averaged nearly the same as Australia during the decade, but cyclical variation was more pronounced, with NSW stronger at the peaks and weaker at the troughs[14].

Figure 3

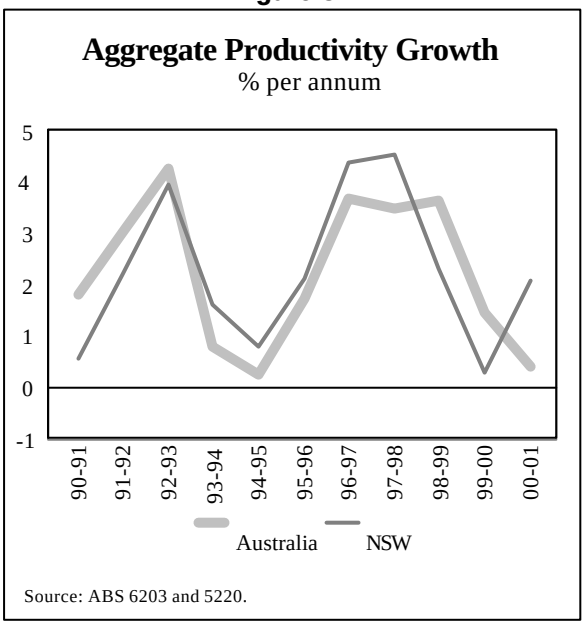
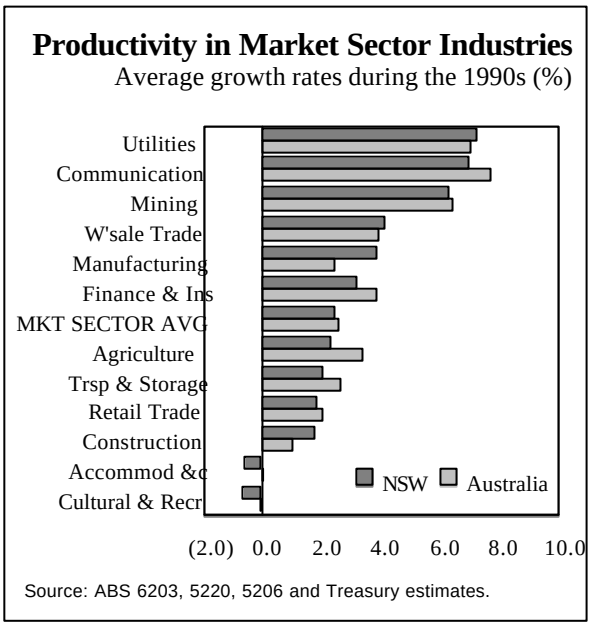


Figure 4



By industrial division[15], average labour productivity growth in New South Wales during the 1990s appeared to be strongest in utilities, communications, mining and wholesale trade. Growth was weakest in cultural and recreational services, accommodation and construction.

[14] Volatility due to one-off factors also is greater at the State level. Export transactions associated with the 2000 Sydney Olympics, for example, caused a break in NSW output and productivity trends in 2000-01.

[15] Sectoral estimates by Treasury using nominal industry output at factor cost (NSW and national) as recorded in the annual state accounts, and its ratio (national only) to real (chain volume) output as recorded in the national accounts. This assumes (among other things) that prices in NSW (not published by ABS) are identical to Australia.

Growth was stronger in NSW than nationally in manufacturing and construction, but weaker than the national average in agriculture and communications. Productivity growth in the market sector as a whole was similar in NSW (2.5%) and Australia (2.6%).

NSW productivity growth also matched the national average in the non-market industries, appearing weaker in health and personal services but stronger in general government (such industries normally are excluded from productivity measurement because some outputs are estimated from inputs).

It is fair to conclude that NSW productivity performance during the 1990s was on par with the national average.

4. INTERPRETING THE PRODUCTIVITY STORY

The evidence for a productivity surge during the past decade is fairly persuasive, although it is not beyond dispute. Total labour productivity appears to have accelerated by more than a percentage point, and multifactor productivity growth seems to have nearly tripled, between the first and second halves of the decade. However, supporters and critics of the "productivity story" offer widely diverging interpretations.

4.1 Proponents

Earlier studies by the Productivity Commission[16], the IMF[17], the Reserve Bank[18] and others have attributed Australia's performance primarily to structural reform over the past two decades, and partly to the diffusion of information and communications technology. A third (but related) factor is globalisation: the increasing international linkage of markets for goods, investment and information yielding gains in technology transfer, scale of production and distribution, and price/quality competition.

Compared to the United States, Australia's productivity acceleration began earlier in the decade (rather than being concentrated in the final half) and was balanced more broadly across the economy (rather than being concentrated in the ICT sector).

According to Peter Forsyth,[19] both the magnitude and timing are consistent with the view that microeconomic reform has been a primary contributor to the productivity boom. He remarks that the Industry Assistance Committee estimated in 1989 that micro reforms would add some five to ten percent to GDP in the medium term, and this is the magnitude of the cumulative differential between Australian and other OECD productivity growth rates over the decade of the 1990s.

A similar conclusion was reached by the IMF in its 1999 review of the Australian economy:

[16] Dean Parham, *The New Economy? A New Look at Australia's Productivity Performance*, Productivity Commission, May 1999.

[17] IMF Staff Country Report No 00/24, *Australia: Selected Issues and Statistical Appendix*, March 2000 (hereafter: IMF 2000)

[18] Papers by Gruen & Stevens (RBA), Bean (LSE), Forsyth (U. Melbourne) and discussion by Quiggin (U. Queensland) in RBA, *The Australian Economy in the 1990s*, Conference Proceedings, July 2000 (hereafter: RBA 2000).

[19] Peter Forsyth, "Microeconomic Policies and Structural Change" in RBA(2000) pp 235-267).

> In recent years, productivity growth in Australia has increased to rates not seen since the golden age of the 1960s. This chapter has examined the contribution of both cyclical and structural factors to the performance, and has attempted to link the structural improvements to a variety of microeconomic reforms implemented since the 1980s... The results suggest that structural reforms have lifted Australia's trend TFP growth rate by between 0.5 and 0.9 percentage points since the 1980s[20].

State governments including New South Wales can claim a substantial part of the credit for microeconomic reform during the past two decades (refer box on following page). Acting independently and in collaborative frameworks including the Council of Australian Governments, they have helped by dismantling regulatory barriers to free competition, corporatising and privatising public sector businesses, establishing independent pricing review mechanisms, reforming taxation, and applying greater weight to effectiveness and efficiency benchmarks in resource allocation.

More recent RBA research using the growth accounting framework[21] attributes a larger share of total labour productivity gains to investment in information and communications technology.

The wholesaling and retailing industry's experience illustrates how information technology uptake has underwritten major upward shifts in productivity over the past ten to 15 years. Their success was the rapid and widespread application of an already mature technology, bar-coding and optical character recognition, to the mundane process of distributing goods to consumers[22].

- In the first phase, bar-coding technology and associated computer systems developments revolutionised retail distribution by more than tripling the flow-through at checkout counters, providing instant price checking and repricing capability, and enabling real time capture of sales, stocks and replenishment data.

- Later, bar-coding and scanning of products became widespread in the wholesale trade sector. From the mid 1990s it allowed accurate electronic records to be kept all along the supply chain, reducing handling and inventory requirements, and response times. In turn, this led to warehouses operating with paperless ordering systems and automated stock handling.

This contributed to a 56% increase in productivity in the wholesale trade sector, compared to 29% for the market sector as a whole, between 1990-91 and 1999-2000.

[20] IMF (2000) Appendix, p 13

[21] Gruen (2001)

[22] Gruen (2001) citing Johnston, Cobbold and Dolamore (2000), "Productivity in Australia's wholesale and retail trade," Productivity Commission Staff Research Paper.

Box 1
Role of New South Wales Government In Implementing Microeconomic Reform

The desire to maintain and improve living standards underpins all government policy in Australia. The two arms of economic policy, macroeconomic policy and microeconomic policy, operate in tandem to this end.

Microeconomic policy aims to improve the efficiency with which the economy's scarce resources are used to produce goods and services. Successfully implemented, such reform will:

- increase the amount of goods and services that may be produced for a given level of inputs (improve productive efficiency); and
- direct resources to the sectors that generate the most community benefit (improve allocative efficiency).

Such progress is essential to improve the State's future economic performance, international competitiveness and societal welfare. The value of microeconomic reform may be seen in Australia's improved productivity growth in the 1990s.

Over the past two decades, gradual implementation of a wide program of microeconomic reform has enriched Australia's economic landscape. The major reforms over this time include:

- financial deregulation;
- dismantling of barriers to foreign trade;
- corporatisation and privatisation of government business enterprises;
- labour market reform; and
- pro-competitive industry and legislative reforms.

The NSW Government has been actively implementing microeconomic reforms for the past two decades and competition policy reform for over a decade. In 1995, the Council of Australian Governments (COAG) agreed on a package of competition reforms known as 'National Competition Policy' (NCP), thereby committing to a more co-ordinated approach to reform.

More competitive markets are expected to reduce the production costs for goods and services (improve technical efficiency). Competition also gives firms the incentive to utilise entrepreneurial flair, new technologies and innovative practices in an attempt to gain advantage over competitors (improve dynamic efficiency). Competition policy enhances living standards by promoting a higher level of output and greater employment growth. In addition, it improves the sustainability of economic growth by improving the economy's responsiveness to external shocks.

The effectiveness of microeconomic reform in the NSW government business sector can be measured in part by the 69% weighted improvement in labour productivity in the sector between 1994-95 and 2000-01, including gains of 255% in Electricity Generators, 97% in Electricity Distributors, 219% in rail freight, 76% in Sydney Water, 43% in Hunter Water, and 13% in State Rail.

The Government Charges Index (GCI) provides a second broad measure of the benefits to the NSW people and economy from microeconomic reform in the NSW government business sector. Between 1994-95 and 2000-01 the GCI fell by 6.7% in real terms. This is consistent with the financial trends showing that most of the cost input savings from reforms have been passed on to consumers through lower prices rather than paid back as dividends to Government.

For more details on the NSW Government's progress in implementing microeconomic reform and National Competition policy, refer to NSW Treasury, *Performance of NSW Government Business 2000-01* (OFM Research & Information Paper TRP 02-2), from which this summary has been drawn.

4.2 Sceptics

Not all analysts accept the "productivity acceleration" thesis. The main criticisms advanced by the sceptics include:

(a) the acceleration proponents fail to completely eliminate cyclical effects;

Robert J. Gordon's decomposition of growth in United States labour productivity between 1995 and 1999 suggests that, after netting out cyclical effects, there was virtually no structural acceleration in MFP during this period; and indeed MFP decelerated in the non-farm business sector excluding durable manufacturing[23].

Table 4: Gordon's Decomposition of US Growth in Output per Hour
(annual % growth, 1995:4 - 1999:4)

	NFPB (Non-farm Pvt Business)	NFPB ex Computer Hardware Mfg	NFPB ex Durable Manufacturing
1. Output growth 1995:4 - 1999:4	2.75	2.30	1.99
2. Contribution of cyclical effect	0.50	0.51	0.63
3. Growth in trend (= 1 - 2)	2.25	1.79	1.36
4. Trend, 1972:2 - 1995:4	1.42	1.18	1.13
5. Acceleration in trend (= 3 - 4)	0.83	0.61	0.23
6. Contribution of price & quality data adjustments	0.19	0.19	0.19
7. Structural labour productivity (= 5 - 6)	0.64	0.42	0.04
8. Contribution of capital deepening	0.33	0.33	0.33
9. Contribution from MFP in computer manufacturing	0.29	0.19	-
10. Structural MFP (= 7 - 8 - 9)	0.02	-0.10	-0.29

Source: R.J. Gordon in *Journal of Economic Perspectives*, Vol. 14, No. 4

These findings are disputed by Oliner and Sichel[24] in the same journal who comment:

> Separating cycle from trend is always difficult in the midst of an expansion, and it is particularly challenging now because the current expansion has not conformed to cyclical norms. Despite this uncertainty, Gordon takes a strong stand on how much of the recent improvement in the nation's productivity performance has been cyclical. Whatever opinion one has of the particulars of Gordon's cyclical adjustment, the fact remains that his numbers embed our basic finding - that the *production* and *use* of information technology have contributed importantly to the actual pickup in productivity growth since 1995.

(b) the acceleration proponents underestimate the increase in labour input;

John Quiggin[25] claims that the productivity acceleration of the 1990s was exaggerated by a failure to account for increased labour intensity of effort: by an increase in unrecorded working hours (of around five percent), and an acceleration in the pace of work (Taylorism) during that decade. If

[23] Robert J Gordon, "Does the 'New Economy' Measure up to the Great Inventions of the Past," *Journal of Economic Perspectives*, Vol 14 No 4 (Fall 2000) pp 9-74

[24] Stephen D. Oliner & Daniel E Sichel (Federal Reserve Board), "The Resurgence of Growth in the Late 1990s: Is Information Technology the Story?" in *Journal of Economic Perspectives*, Vol 14 No 4 (Fall 2000) pp 3-22.

[25] John Quiggin, discussion note on Peter Forsyth's article in RBA, *The Australian Economy in the 1990s*, Conference Proceedings 2000, pp 268-271.

labour input were adjusted upward to reflect "effort intensity", then residual productivity growth would be small or even negative:

> The lesson of everyday life is that people are running harder to stay in the same place. More formally, an increase in the intensity of work has only partially offset a continued decline in the underlying rate of productivity growth.

Supporters of microeconomic reform of course would argue that poor workplace practices were one of the most glaring deficiencies in Australian industrial performance at the start of the 1980s, and workplace reforms raising the intensity of effort were essential to improve productivity. In addition, trends in absenteeism (considered a good indicator of work satisfaction) have improved, suggesting general acceptance of the increase in work intensity that has taken place.

(c) acceleration proponents include high productivity sectors and exclude low productivity sectors.

Gordon[26] argues that

> ..a major fraction of the revival in multifactor productivity growth in the US has occurred within the part of the economy engaged in producing computers and peripherals, and within the rest of the durable manufacturing sector, which together comprise only 12 percent of the private business economy. This raises the question of how far the New Economy actually reaches into the remaining 88 percent of economic activity.

Critics claim that the Australian productivity growth statistics are biased upward by the exclusion of the property and business services (PBS) sector from the ABS definition of the Market Sector. Quiggin has argued that since the ABS assumes zero labour productivity in the PBS sector, it effectively undervalues PBS inputs to (and overstates productivity in) the Market Sector. However the ABS has shown that a consistent if weaker acceleration story still emerges when the same analysis is run for economy-wide data[27].

(d) the productivity acceleration has been revised away by more recent data.

Critics claim that recent ABS data revisions have wiped out the productivity gains identified in previous studies. Indeed, the latest ABS statistics revised annual average multifactor productivity gains during the latest growth cycle[28] down from 2.4% (1997-98 series) to 1.7% (1999-2000 series). In particular, changes to the ABS methodology for estimating capital services led it to sharply reduce its capital productivity estimate from +0.8% (1997-98 series) to -0.3% (1999-2000 series)[29]. According to John Quiggin the productivity record now showed that

> Far from miraculous, Australia's performance over the 1990s has been pretty ordinary.[30]

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[26] Gordon (2000)

[27] ABS (2001) estimates that excluding PBS from the market sector may lead to over estimation of market sector MFP growth by perhaps 0.1 to 0.3 percentage points per annum. This discrepancy appears fairly stable for cyclically adjusted data and hence cannot explain the productivity acceleration of the 1990s.

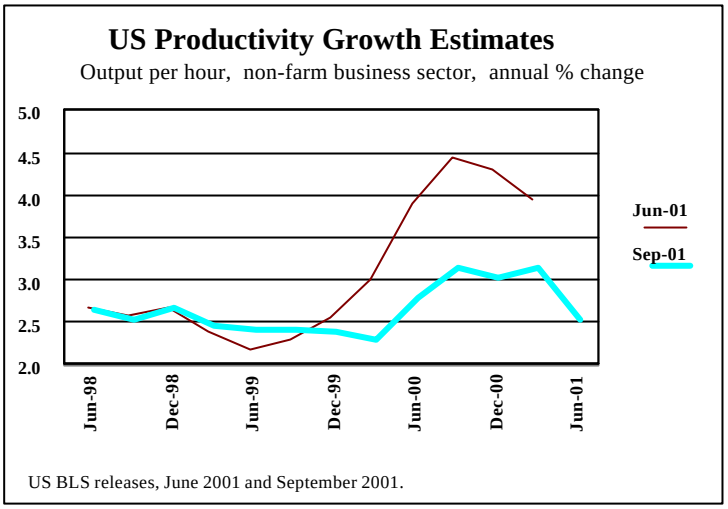
[28] The latest growth cycle is dated from 1993-94 to present in both the 1997-98 and the 1999-00 ABS studies. Hence average growth rate revisions would also reflect the extension of the series being averaged.

[29] The ABS revised these annual average growth rates again in the 2000-01 series to 1.8% for multifactor productivity and 0.0% for capital productivity.

[30] John Quiggin, "Golden age myth exposed", *Australian Financial Review*, 15 February 2001

However this claim was sharply rebutted by the Productivity Commission[31], who noted that the latest results then available (1999-2000 series) revised down the productivity estimates for all years, leaving intact the basic thesis of a productivity acceleration in the latest decade.

Figure 5



The sensitivity of productivity results to data revisions, however, should not be ignored. For example, a reanalysis of the US national accounts in mid-2001 revised away a substantial part of the "productivity boom" of the late 1990s, trimming its 2001 peak rate of expansion from about 4.5% (initial) to 3% (revised).

In summary, while the complexity of productivity accounting provides substantial scope for arriving at differing estimates and differing interpretations, it would appear that academic criticism has yet to undermine in any fundamental way the claim that productivity did indeed accelerate appreciably during the 1990s. The acceleration thesis is more credible because it can be explained fairly persuasively by three preceding or concurrent developments: microeconomic reform, globalisation, and the rise of information and communications technology.

5. OUTLOOK

The productivity surge of the 1990s was associated with exceptionally high and sustained rates of output growth both in the United States and Australia. A long period of declining unemployment and persistently low inflation led to claims that the US economy had entered a "new paradigm," closely associated with the technology revolution, which suspended previous capacity limits on sustainable growth: it seemed possible (to some) that productivity gains would allow growth to continue even though the economy had exceeded conventionally-estimated full employment.

The economic slowdown during 2000-01 may have been precipitated in part by the bursting of the financial markets bubble in technology shares. The financial bubble reflected unsustainably high market growth rates built into technology share prices, finally colliding with a (temporary) saturation of business and consumer demand for ICT products. The downturn was amplified by the high

[31] Gary Banks (PC Chairman), "Get it right on productivity growth," *Australian Financial Review*, 6 March 2001

gearing of the technology sector to its own investment demand. Therefore the downturn, like the preceding acceleration, appeared closely linked to a cycle in technology.

The lagged relationship between employment and output automatically translated the growth slowdown into a steep cyclical productivity fall during 2001 (with partial recovery in early 2002), but it has no direct implications for the trend rate over the next decade. The important question, from the medium term perspective of this study, is whether productivity growth beyond the current cycle is likely to return closer to the path of the 1990s, or of the previous decade.

The arguments for a return to a higher trend rate include:

- The new information and communications technology is unaffected by the downturn, its application has only just begun, and it will continue to spread through the economy, lifting growth rates for the next decade or more[32];

- Future gains are likely to flow increasingly to ICT users (such as Australia) rather than ICT producers, with the latter (based on historical parallels with previous waves of technological progress) facing growing competition and declining prices[33];

- A second wave of innovation, in biotechnology, is only in its initial stages yet potentially could yield equally large benefits to final users and enhancements to productive processes;

The innovation process is being reinforced by rising human capital formation, through improved education, training and research. Both the Commonwealth Government and Opposition have expressed their commitment to the reform and strengthening of education and research[34]. Commitment by State governments is of even greater importance, since they are responsible for over 70% of public funding for education in Australia[35]. Indicative of this resolve, the NSW 2002-03 Budget provides nine billion dollars in the budget year for education, and announces major multi-year initiatives to expand literacy and numeracy, strengthen school information technology, enhance teacher quality and availability, and increase the number of schools and upgrade their facilities.

The second and arguably more important driver of productivity gains over the recent past has been microeconomic reform. It could be claimed that public enthusiasm for productivity reforms has waned due to greater visibility of costs than benefits, and their popular (if uninformed) association with ideological preferences for efficiency over equity. It might also be argued that the easier phase of microeconomic reform is now past (e.g., most public trading enterprises have been sold or subjected to competition reform, and most tariffs excluding the automotive, clothing, textiles and footwear industries have already been reduced to near zero) so only the "hard yards" remain.

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[32] Bradford Delong (2002) suggests that declining prices and high demand elasticity for technology may continue to drive strong productivity growth for perhaps another four decades. Michael Cho and Brent Neiman (McKinsey & Co, 2002), on the other hand, argue that the productivity surge of the late 90s was due to a confluence of extraordinary events (Y2K, the internet, and corporate networking): with demand now saturated, output and productivity will flatten.

[33] The steady falling prices of ICT products categorises them as "the commodities of the new economy" (Commonwealth Treasury Secretary Ken Henry, in an address to the Australian Business Economists, 21 May 2002).

[34] The Federal Government's program was outlined in *Backing Australia's Ability — An Innovation Action Plan for the Future*, in January 2001. The ALP program was outlined in their *Knowledge Nation Report*, in July 2001.

[35] Of the total $34.7 billion public expense on education in 2000-01, the States provided $24.9 billion, the Commonwealth $10.9 billion, and $9.2 billion was multi-jurisdictional. ABS Cat. 5512, *Government Finance Statistics 2000-01*.

Reasons for optimism as to future gains from microeconomic reform effects include:

- Many of the gains are "locked in" by past reforms and will continue to boost productivity for years to come, even if the pace of new reform were to moderate;

- It is generally accepted that political dynamics tend to advantage the more identifiable and easily organised "losers" over the relatively dispersed and passive "gainers" from reform. Many of the direct benefits to families and businesses from recent reform, however, have been large and specific[36]:

  – Consumers now enjoy more flexible hours and pay lower fees for some professional services. For example, conveyancing fees in New South Wales fell by 17% between 1994 and 1996 following reforms to the legal profession;

  – Residential and business customers benefited from an average six to seven percent real reduction in NSW Government business charges from 1994-95 to 2000-01; and

  – Businesses and consumers enjoy greater choice in supplier, which (in the case of electricity) had already saved NSW consumers around $1.3 billion by end-2000.

- It would be wrong to underestimate the strength of public recognition and support for the "non-targeted" benefits achieved: higher and more stable economic growth, lower inflation and interest rates, higher real incomes and lower unemployment.

- As reformers now have more "runs on the board" to point to, and have gained experience in publicising achievements and compensating losers, resistance to reform may seem less daunting now in many respects than two decades ago when the process had only begun.

- It could also be argued that the dynamics have tilted slightly in favour of reform as a consequence of continued national economic achievement, and a generational shift towards greater acceptance of individual responsibility for personal success and security.

Globalisation, the third major driver, should continue to operate strongly over the next decade. Regulatory and cost barriers to exchange of goods, services, capital and knowledge will continue to decline, typified by China's entry into WTO and Australia's negotiations with NAFTA. This will provide further opportunities to exploit economies of scale and comparative advantage, raising productivity and restraining costs.

Overall there appear to be reasonable grounds to expect that productivity growth during the decade to 2010 will average closer to that achieved in the 1990s than in the preceding two decades. This acceleration is founded in robust analysis, and is unaffected by the exaggerated "new economic paradigm" claims briefly brandished in the general hubris of the late 1990s information technology

[36] These benefits are more fully discussed in NSW Treasury, *Performance of NSW Government Businesses 2000-01*

bubble, only to be swept away in its subsequent collapse. After reviewing Australian progress in microeconomic reform, for example, the IMF concluded in 1999 that:

> .. the structural reforms that have been implemented in Australia during the last decade could lift TFP growth between 0.5 and 0.9 percentage points over the long run. As a comparison, the estimates of the long-run impact of structural reform range from 0.3 to 0.4 percentage points for New Zealand and from 0.1 to 0.2 percentage points for the United States.
>
> While some of this improvement in Australia's TFP growth is already apparent in the data, productivity growth should continue to strengthen above what would have occurred without these reforms - including, for example, recent or planned reductions in tariffs and trade protection and the National Competition Policy which was adopted in 1995 - may not be felt for as long as a decade[37].

A recent RBA study[38] concludes that both microeconomic reform and ICT developments will continue to boost productivity performance over the next decade:

- The microeconomic reforms of the past two decades (particularly the reductions in tariff protection) have a long lag in their impact on economic behaviour, and should continue to boost productivity growth for many years to come);

- While Australia is not a major ICT producer, it has one of the highest technology uptake rates in the OECD; and it is use rather than production of ICT equipment and software which delivers the largest economic benefits;

- While producers (particularly the USA) captured much of the initial gains from the ICT revolution, the distribution of gains from the ICT revolution (as from previous technology revolutions such as electricity and rail) will increasingly shift towards users (including Australia).

The Productivity Commission (PC) also finds reason to expect that while the underlying rate of productivity growth may not continue at the rate of the 1990s, it should remain faster than in the two preceding decades[39].

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

How long can the boost from technology, microeconomic reform and globalisation continue to hold productivity growth at these levels? As noted by a recent commentator, eventually "all good things must end[40]." In the longer run, the declining marginal returns implied by the classical growth model might be expected to prevail and, in the absence of further positive shocks, productivity growth might perhaps trend somewhat lower. The experience of the 1990s, however, has shown that such a decline is by no means imminent.

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[37] IMF (2000) Appendix, pp 11-13

[38] Gruen (2001)

[39] Gary Banks, *The Drivers of Australia's productivity surge*, presentation to DITR-ABARE Outlook 2002.

[40] Terry O'Brian, Commonwealth Treasury (PC/ICA Conference, 21 June 2001).

The PC suggests that the lagging performance of some Australian industries (notably manufacturing and retail) leaves scope for further progress, perhaps supported by increased external competitive pressure and internal flexibility for firms to respond[41]. While labour reforms remain a central concern, raising ability and incentive for innovation in management and in the workforce will become increasingly important as the economy moves closer to its technological and productive frontier. Lifting this capacity for innovation will require improving the effectiveness of the education and training systems. Given their preponderant role in public funding for education, State government bear a major share of responsibility for attaining such outcomes.

6. IMPLICATIONS FOR THE BUDGET

Productivity acceleration could help offset the expected demographic slowdown during the next decade as natural population growth continues to decline and "baby boomers" phase out of the workforce .

In the *Intergenerational Report*[42] the Commonwealth Treasury projects that annual employment growth will slow by almost a percentage point between the decade of the 2000s and the decade of the 2010s. If productivity growth during the next decade equals the average rate of the last three decades (their *base case* assumption), then GDP growth will slow to 2.3% in the 2010s. The report also considers the implications of productivity growth rates faster or slower than the base case:

- If labour productivity growth continues at the same rate as achieved in the 1990s (the *high productivity growth* scenario), then GDP growth would average around 2.6%.

- If productivity slows to the average rate experienced during the 1980s (the *low productivity growth* scenario), then GDP growth would decline to 1.8%.

Table 6: IGR Estimates of Growth in Australian GDP
Average annual growth rates (%)

Decade	Employment Growth	Productivity growth (base case)	Real GDP Growth		
			Base case	High productivity growth	Low productivity growth
1970s	1.6	1.8	3.4		
1980s	2.4	1.2	3.4		
1990s	1.3	2.0	3.4		
2000s	1.5	1.7	3.1	3.2	2.9
2010s	0.6	1.75	2.3	2.6	1.8
2020s	0.2	1.75	2.0	2.2	1.4
2030s	0.1	1.75	1.9	2.1	1.3

Source: Commonwealth Treasury, *Intergenerational Report*; and ABS 5206.0

[41] Banks (2002).
[42] Commonwealth Treasury, *Intergenerational Report 2002-03*, Commonwealth 2002-03 Budget Paper No. 5, 14 May 2002

While the three quarters of a percentage point difference between these "high" and "low" scenarios is small in comparison to typical fluctuations within the business cycle, the cumulative effect on levels of income and output over the space of a decade would be substantial.

The consequences for NSW medium term fiscal outcomes of even a half a percentage point improvement in macroeconomic productivity are explored in Box 2.

Box 2
Sensitivity of Fiscal Outcomes to Productivity Growth in the Economy

Treasury used a budget model to test the impact of a 0.5 percentage point improvement in productivity between 2007 (the first year after the forward estimates period) and 2020. The model suggests that, relative to the current "base" estimates:

- The annual budget result might improve by about one billion dollars by 2020;
- The worst single-year budget result during the 13-year period might improve by close to $500m; and
- The target of zero net debt might be attained four years earlier.

This test assumes that the improvement in productivity translates directly into an equivalent increase in real growth of Gross State Product (rather than a reduction in prices) and that all budget surpluses are applied towards debt reduction.

The implications of alternative scenarios such as these for New South Wales fiscal strategy and performance depend in part on whether comparable productivity gains and cost reductions are achievable in the government and non-government sectors. If performance across the two sectors is equivalent, then faster growth in productivity and economic output should lead to higher real growth in revenues, while exerting downward pressure on prices for service delivery. This would provide scope to further reduce net financial liabilities, lower tax rates or increase spending on priority programs.

Achieving these fiscal outcomes would require that costs of government (primarily wage rates) are reflective of productivity gains within government. Market forces tend to maintain that linkage in the private sector[43], but an equivalent mechanism is not automatically available in the State budget sector. The potential benefits of faster productivity growth to fiscal outcomes would be diminished if, for example, wage growth in the budget sector followed private sector trends, but productivity growth did not. This points to a need for more accurate and comprehensive productivity measurement in the budget sector[44], and strengthened links between such measurement and wage adjustment.

7. CONCLUSIONS

In summary, available evidence suggests a productivity growth acceleration of as much as one percentage point in Australia during the second half of the 1990s. The acceleration was stronger than in most other OECD countries including the United States. While a substantial part of the acceleration in the US is attributable to production and use of information and communication technology (ICT) equipment, most of the improvement in Australia appears to have been due to

[43] In a competitive market, wage rates reflect the marginal productivity of labour, and the cost of capital reflects its marginal productivity. This information is not given by aggregate labour productivity trends.

[44] NSW Treasury TRP 02-2 describes five of the measurement techniques employed in the government business sector. However measurement problems are far more difficult in the budget sector because, among other things, outputs often are less clearly defined and often are not priced.

other factors: liberalisation of product and factor markets, reduction in barriers to trade, greater public sector exposure to competition, and better macroeconomic management. Australia is likely to gain more from the ICT revolution than ICT producer countries as absorption proceeds in the future.

By implication, and provided that the policy environment remains supportive, Australia's average productivity growth over the current decade is likely to be closer to the experience of the 1990s than the preceding two decades. Strong productivity growth should go some way towards offsetting the effect of slower population growth on Australia's potential output, and should have a positive impact on the fiscal position during the current decade and beyond.

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