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Productivity growth and its sources: How do NZ and Australia compare?

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This version of the paper incorporates minor revisions to the version presented at the Workshop to reflect comments received on statistical practices in New Zealand.

1. Introduction and key points

A productivity comparison between New Zealand and Australia ought to be instructive. The two countries are similar enough, for example in industry and institutional structures, to make a comparison valid. Yet there are sufficient differences in policy approaches and performance to make a comparison potentially instructive and valuable.

Both countries have implemented substantial packages of 'liberalising' policy reforms over the past two decades, designed in large part to raise productivity performance and living standards. It is commonly held that New Zealand implemented a deeper and faster package of reforms. Yet Australia is perceived to have had a stronger productivity acceleration and has opened up a wider gap in terms of average income per head. Does this cast doubt on the significance of policy reforms as an influence on growth in productivity and living standards? Or are there other factors that (also) help to explain the recent performance of the two economies?

The central objectives of this paper are to:

- provide a soundly-based comparison of productivity trends in New Zealand and Australia;
- find the sources of any difference in productivity trends; and
- draw out any policy implications for either or both countries.

Our approach is 'data driven', essentially due to our lack of familiarity with the operation of the NZ economy and with much of the relevant analytical literature. This leaves our assessment vulnerable to data weaknesses (of which we may not be aware) and to the possibility that our impressions are not new or are contradicted or better supported by other work. The comparisons developed and views expressed in this paper are therefore tentative. We nevertheless hope to identify issues that might warrant further investigation.

A comparison of productivity growth in the two countries is not straightforward.

One impression we form is that labour market developments have affected labour productivity growth over the medium term in a way that should be explicitly taken into account.

An important part of the New Zealand story is a decline in real labour costs over 1992-96, following the implementation of the Employment Contracts Act. In conjunction with welfare reform, this induced an employment expansion and held back growth in labour productivity. However, slow productivity growth in these circumstances is not such a concern, as the labour expansion also serves the higher objective of promoting growth in living standards. New Zealand's labour productivity growth after 1996 provides a truer indication of underlying performance.

The correction in real wages in Australia and the attendant labour expansion and reduction in labour productivity growth were completed by the end of the 1980s. Whilst changes in Australia's labour market arrangements continued to evolve thereafter, it seems safe to compare labour productivity growth in the two countries after 1996.

The second area that clouds comparisons is measurement. We find that definitions of the market sectors in the two economies — their industry coverage — makes a major difference. We also find that information and communications technology (ICT) is treated differently in each national accounts and could have a significant effect on comparability of estimates. We understand that there may be more general issues with comparability of measurement of capital input, but do not explore these in this paper.

On the evidence we present, we reckon that New Zealand's labour productivity growth is probably about half a percentage point behind Australia's. We attribute this gap to both less capital deepening and less multifactor productivity (MFP) growth. On balance, we think the MFP growth gap is a little bigger than the capital deepening gap.

In terms of underlying sources — and it must be said that we do not have a very clear information base for a comparison — it seems that New Zealand has not experienced the same acceleration in uptake of ICT or an associated uptick in productivity growth in services. Whether this represents a difference in scope in New Zealand or whether it stems from deficiencies in investment in technology and innovation or in accumulation of knowledge and human capital seems to be a central issue for New Zealand's productivity outlook.

The paper is structured as follows:

- Section 2 highlights labour market developments that have induced expansions in the employment of labour over the medium term.
- Section 3 argues that periods of labour expansion should be isolated from comparisons of (labour) productivity growth.
- Section 4 compares the proximate sources of labour productivity growth — capital deepening and MFP growth.
- Section 5 compares underlying sources of productivity growth.
- Section 6 presents our tentative conclusions and a couple of thoughts for further investigation.

2. Labour market developments have been a major influence

Figure 1 presents a broad perspective on the levels and growth of average income and productivity in the two countries. It is based on the familiar decomposition of average income:

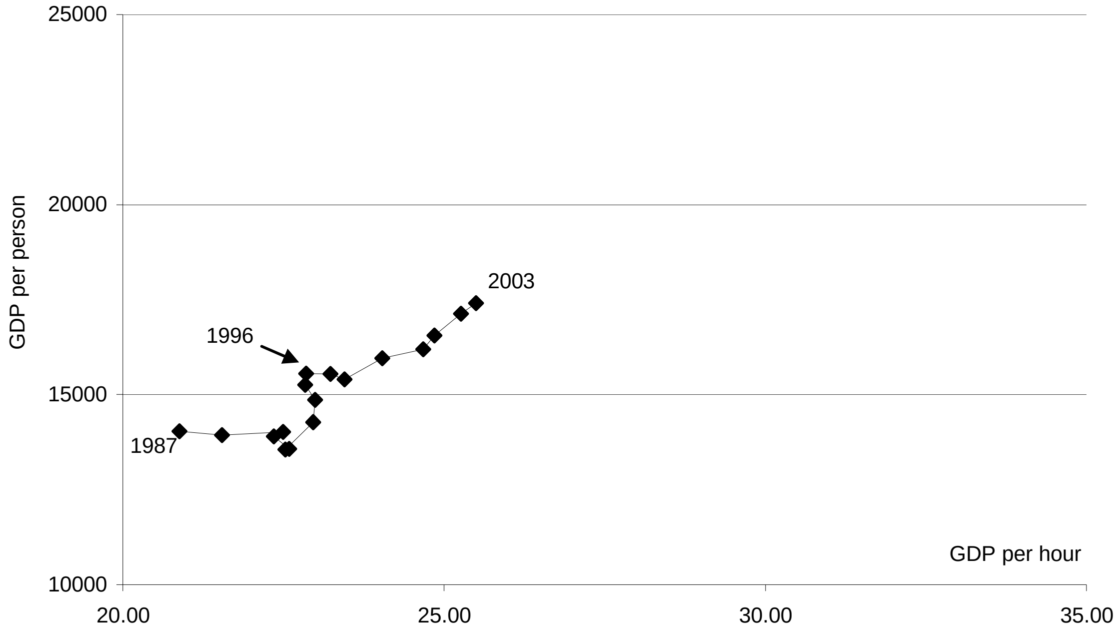
$$\frac{\text{GDP}}{\text{Persons}} = \frac{\text{GDP}}{\text{Hours}} \times \frac{\text{Hours}}{\text{Persons}}$$

GDP per capita = Labour productivity x Labour utilisation

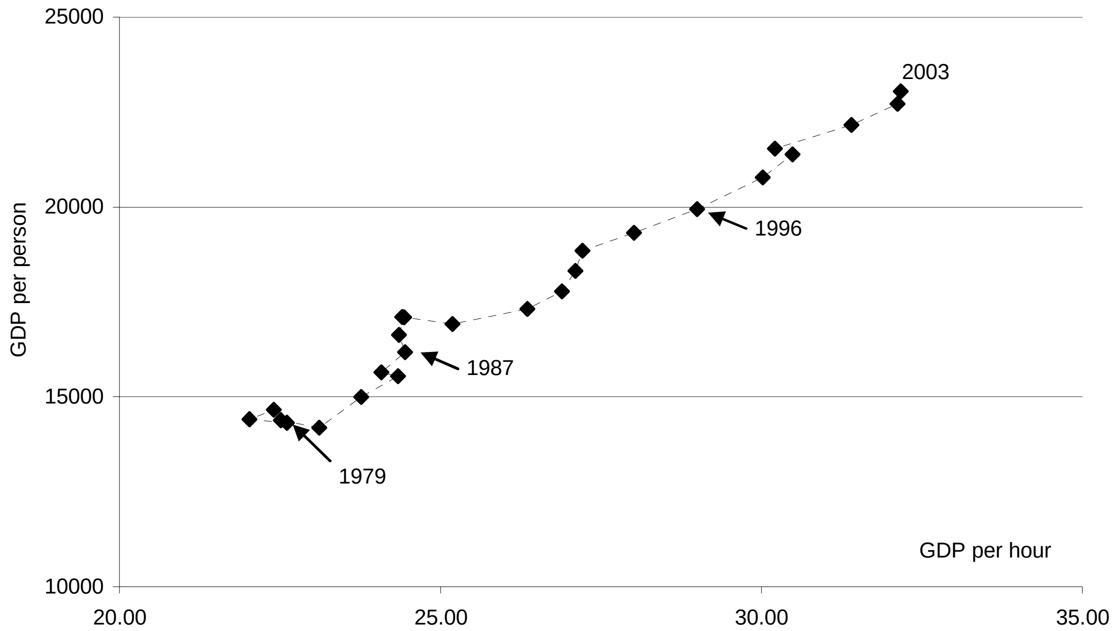
Figure 1 Growth paths for average income

$US (1999) at PPP

Panel A: New Zealand, 1987-2003



Panel B: Australia, 1979-2003



Data source: GGDC (2004)

Figure 1 shows paired annual observations of GDP per capita and economy-wide labour productivity (GDP per hour worked). In 1987, New Zealand's average income in US dollar purchasing power parity terms was $14 000 (87 per cent of Australia's level at $16 200) and labour productivity was $20.88 per hour (85 per cent of Australia's at $24.45 per hour). It can be readily seen from the figure that there was stronger growth after 1987 in Australia's labour productivity and average income. By 2003, New Zealand's average income had increased to \$17 400, but had fallen to 76 per cent of Australia's level at \$23 000; and New Zealand's labour productivity at \$25.50 per hour was 79 per cent of Australia's at \$32.17 per hour.[1]

There are periods of strong increase in labour utilisation and slow or no growth in labour productivity that appear as vertical shifts in the growth paths — in New Zealand in the early 1990s and in Australia in the late 1980s. These periods are important to the productivity trends in both countries and warrant closer examination as background to the productivity comparisons.

Labour market institutions, labour costs and labour productivity

A decomposition of the labour income share provides a useful relationship between labour costs and labour productivity.[2]

$$\text{Labour income share} = \frac{\text{Nominal wage bill}}{\text{Nominal GDP}}$$

$$= \frac{\text{Nominal av. hourly wage}}{\text{Output (GDP) price deflator}} \text{ x } \frac{\text{Hours worked}}{\text{Real GDP}}$$

$$= \frac{\text{Real product wage}}{\text{Labour productivity}}$$

This expression can alternatively be viewed as an indicator of changes in real unit labour costs. If any increases in the real product wage (increases in nominal wages in excess of increases in output prices) are not matched by labour productivity growth, the real unit costs of labour rise.

A long period of correction followed a sharp increase in Australia's labour income share in the mid-1970s, when increases in real wages were not matched by labour productivity growth (Figure 2B).[3] Initially, the correction proceeded slowly through increases in unemployment (Figure 3B).[4] However, a reduction in real wages was engineered between 1984-85 and 1988-89 through the Prices and Income Accords and the centralised bargaining

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[1] The remainder of the paper does not dwell on comparisons of levels, as this is the focus of the paper from Graeme Davis and Robert Ewing for this Workshop.

[2] The decomposition is taken from Parham et al (2000). Further decomposition of the relationship is possible.

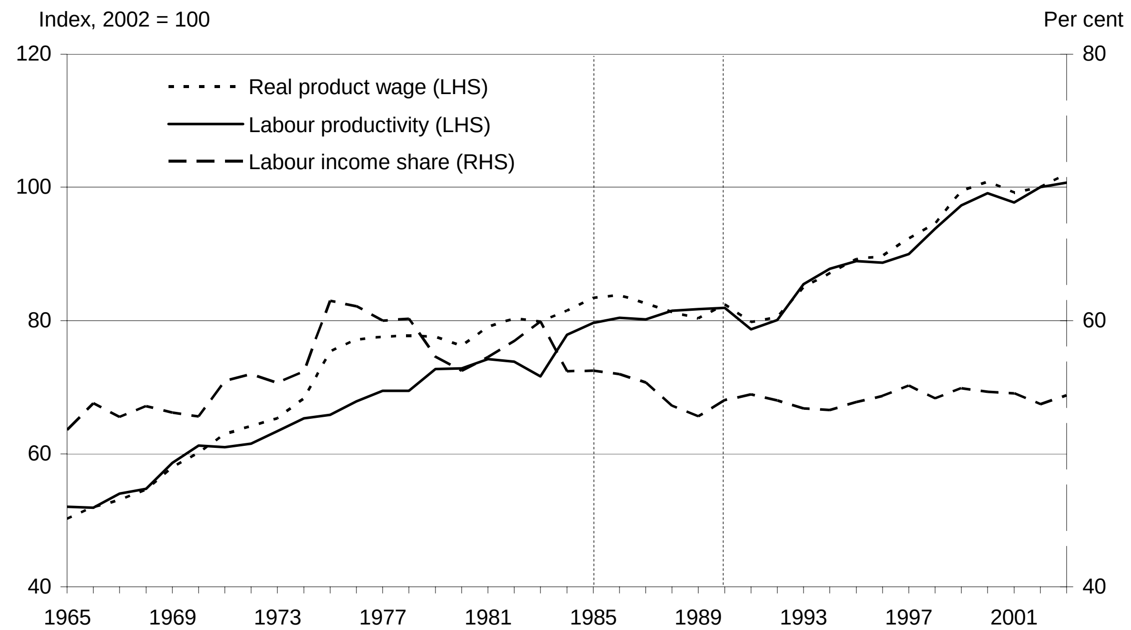
[3] See Parham et al (2000) for more details.

[4] Part of the unemployment growth was 'classical' — ie labour was priced out of employment in favour of relatively cheap capital, as the real product wage continued to increase through to the mid-1980s. Part was also due to deficient growth in aggregate demand. Parham et al (2000) show that increases in unemployment are associated with increases labour productivity.

Figure 2 **Labour income share (per cent), real product wage (index) and labour productivity (index), total economy**

Panel A: New Zealand, 1987 to 2003

Panel B: Australia[a]*, 1965 to 2003*



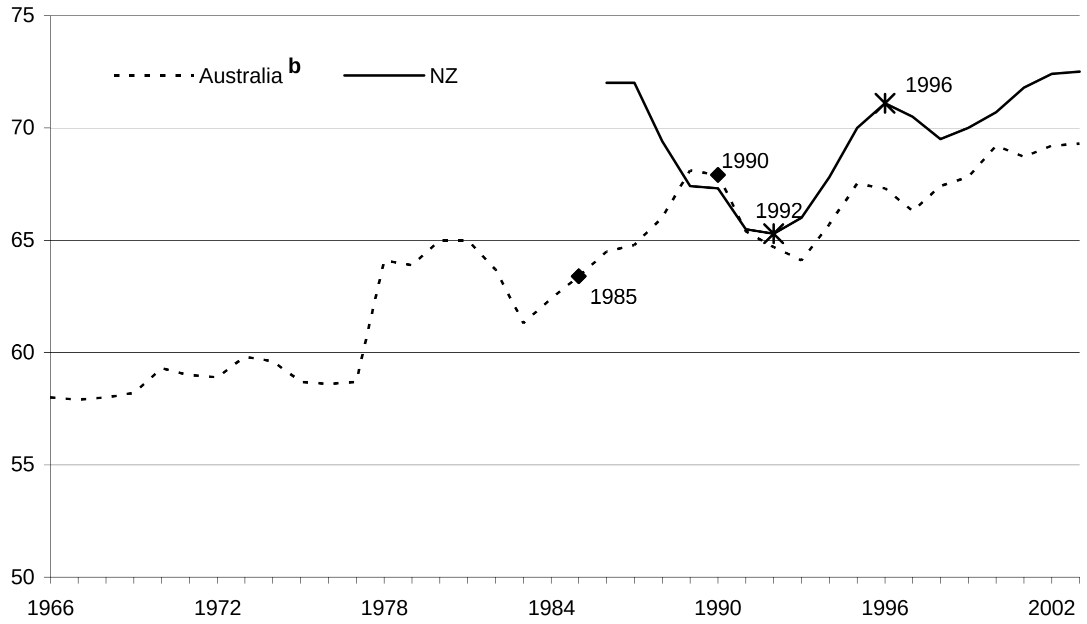
[a] Years for Australia refer to the 12 months ending 30 June.

Data sources: SNZ and ABS.

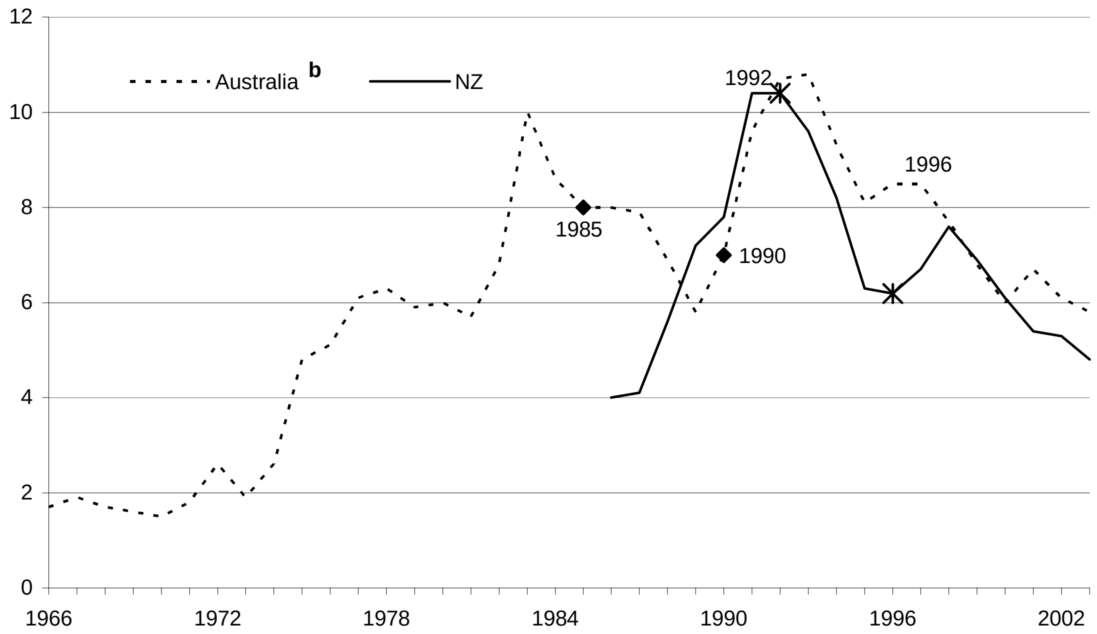
Figure 3 **Employment and unemployment rates**

Per cent

Panel A: Employment rate[a]



Panel B: Unemployment rate



[a] Employment rate is the ratio of employed 15-64 year olds to population of 15-64 year olds. [b] For Australia, observations refer to August of the calendar year.

Data sources: Productivity Commission, based on OECD Labour Force Statistics database.

processes. This returned the labour income share to its long-term level. It was also around the end of the 1980s that Australian labour markets started to become more flexible and decentralised, initially through such avenues as award restructuring and later through the introduction of the Workplace Relations Act of 1996.

The NZ data do not provide such long series (Figure 2A). But it seems reasonable to speculate that there was a similar increase in the labour income share in New Zealand and an elongated period of correction. As far as the series indicate, there was a high in the labour income share in 1988 (Figure 2A). An increase in unemployment up to the late 1980s (Figure 3B) brought some correction in the labour income share. A reduction in the real product wage between 1992 and 1996 was also part of the correction. The labour income share stabilised from 1994.

The fall in New Zealand's labour costs was very marked. Black, Guy and McLellan (2003) report that NZ labour costs fell 22 per cent relative to capital costs from 1992 to 1996 and attribute the reduction to the introduction of the Employment Contracts Act and welfare reform.[5] New Zealand's real product wage fell at 1.4 per cent a year between 1992 and 1996, compared with a relatively mild 0.2 per cent a year decline in Australia in the second half of the 1980s (Table 1).

In principle, a decline in real wages could have been brought about by a reduction in nominal wages (or by holding them fixed in the presence of output price growth) or by changes in the composition of employment toward lower-paid, lower-skill workers.

Whilst there could have been some reduction in labour on-costs and penalty rates, it is not obvious to us that the Employment Contracts Act led to reductions in standard nominal wages. Statutory minimum wages were imposed at 41 per cent of average ordinary-time wages (Grimes and Lewis 1996). It was also purported that the Act lessened pressure on existing labour costs and the cost of hiring. They also cited other studies about a tendency for increases in ordinary time rates of pay, but for reductions in overtime and penalty rates of pay.

Whilst we are not well informed on this point, we speculate that a large part of the reduction in real wages came through employment of lower-skill workers. The combination of the Employment Contracts Act and welfare reform seems to have induced an expansion of employment of labour (Figure 3A) and the expansion took a lot of workers from the unemployment pool (Figure 3B) and it is likely that these were of lower skill.

[5] Centralised bargaining structures were replaced with decentralised enterprise bargaining under the Act.

Table 1 **Decomposition of growth in the labour income share, total economy** (per cent per year)

	Labour income share	*Real product wage*	*Labour productivity*[a]
New Zealand			
1987 – 1992	-1.0	0.8	1.8
1992 – 1996	-1.5	-1.4	0.2
1996 – 2003	-0.1	1.8	1.9
1987 – 2003	-0.7	0.7	1.5
Australia			
1979 – 1985	-0.3	1.2	1.5
1985 – 1990	-0.8	-0.2	0.6
1990 – 2003	0.1	1.7	1.6
1996 – 2003	0.0	1.8	1.8
1979 – 2003	-0.2	1.1	1.4

[a] Economy-wide GDP per hour worked.

Data sources: SNZ and ABS.

Two additional features of the 1990s experience are worth highlighting, using Table 1.

- The new institutional arrangements in both countries aligned real wage growth with labour productivity growth, and provided opportunity for strong real wage growth (after 1996 in New Zealand) that did not raise real unit labour costs.[6]
- Since 1996, the wage and productivity experience has been virtually identical, in domestic currency terms, in the two countries at the economy-wide level.

3. Periods of labour expansion should be quarantined from the productivity comparisons

The comparison of productivity growth in the two countries should be on the basis of underlying trends. Ideally, factors that have only short- to medium-term influence on productivity growth should be quarantined from the comparison. Two factors that could have such influence are now considered:

- increases in labour utilisation; and
- the business cycle.

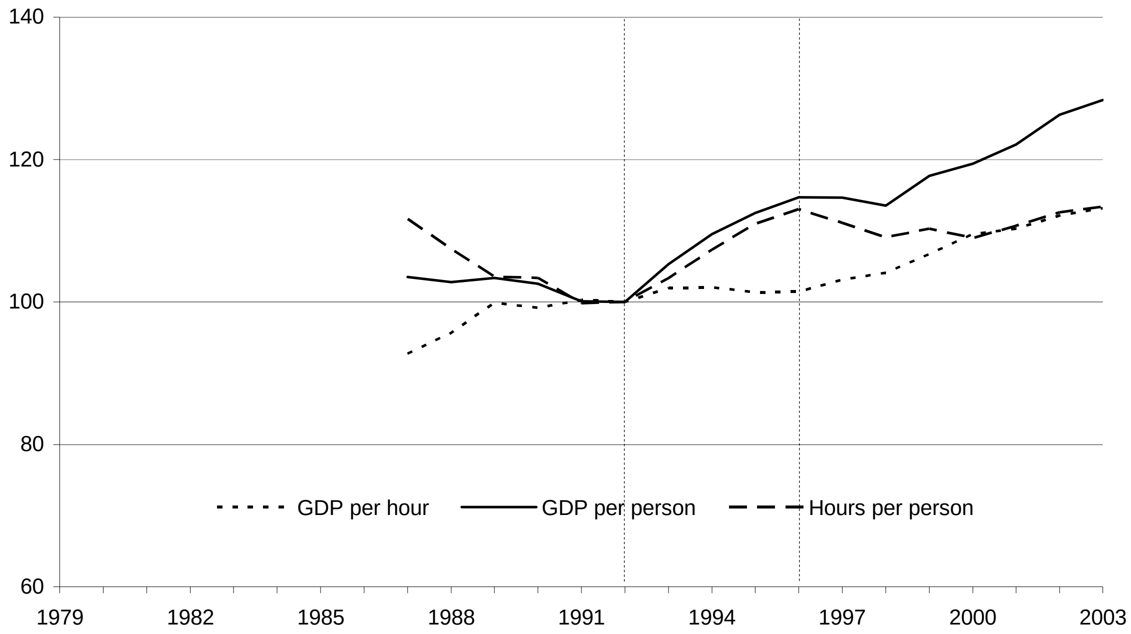
Increases in labour utilisation

The periods of real wage reduction brought increases in labour utilisation in the two countries (Figure 4 and Table 2).

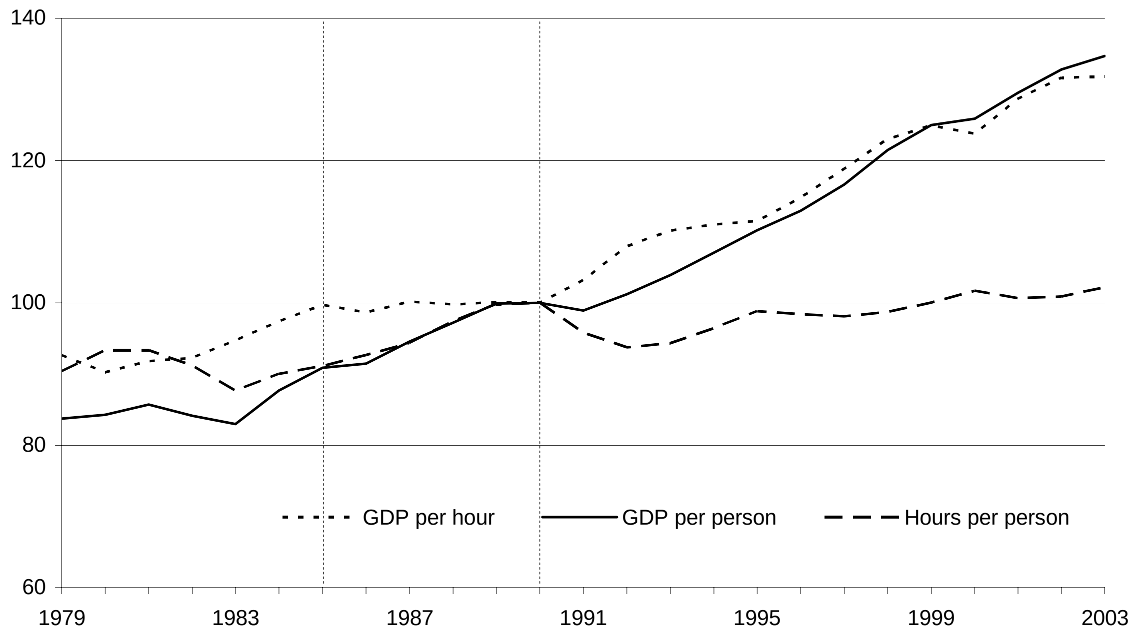
[6] There have been further periods of wage moderation in both countries (Figure 2). These appear to be associated with downturns in output growth — in 1998 in New Zealand and in 2000-01 in Australia.

Figure 4 **Indexes of average income, labour productivity and labour utilisation**

Panel A: New Zealand 1992 = 100



Panel B: Australia 1990 = 100



Data source: GGDC (2004)

Table 2 **Decomposition of growth in average income**[a]
(per cent per year)

	GDP per capita	*Labour productivity*[b]	*Labour utilisation*[c]
New Zealand			
1987 – 1992	-0.7	1.5	-2.2
1992 – 1996	3.5	0.4	3.1
1996 – 2003	1.6	1.6	0.0
1987 – 2003	1.4	1.3	0.1
Australia			
1979 – 1985	1.4	1.2	0.1
1985 – 1990	1.9	0.1	1.9
1990 – 2003	2.3	2.1	0.2
1996 – 2003	2.5	2.0	0.5
1979 – 2003	2.0	1.5	0.5

a GDP is measured in $US at purchasing power parity. **b** Economy-wide GDP per hour worked. **c** Hours worked per head of population.

Source: GGDC (2004).

The increased labour utilisation translated into growth in per capita income in both countries (Table 2). The period 1992-1996 stands out as showing *very* strong growth in both labour utilisation (3.1 per cent a year) and average income (3.5 per cent a year) in New Zealand. For Australia, the period 1985-1990 was similar in terms of direction of trends, but the magnitudes involved were considerably smaller.

Labour productivity growth was correspondingly low in these labour-expansion periods. Table 2 shows labour productivity growth in international currency terms, whereas Table 1 shows different rates — though still relatively slow — in domestic currency terms.

There are arguments for isolating these periods of strong growth in labour utilisation from the assessment of productivity trends. Productivity growth was relatively weak in these periods, but it is not such a concern in these circumstances, since it is linked to strong growth in labour utilisation, and strong growth in labour utilisation takes on the role of serving the higher objective of promoting growth in average income (Table 2). Including these periods in the assessment of trends would drag down the average rates of labour productivity growth in a way that would not reflect the strength of growth in average incomes.

Whilst, in principle, smoothing the series would make allowance for the effects of increased utilisation, it is difficult to effectively quarantine a one-off factor with this method. It is preferable and easy to remove the period affected by increased utilisation; and determine productivity trends on the basis of observations from 1996 (or before 1992).

The business cycle

The business cycle can have spurious effects on productivity growth in the short term. In particular, productivity often falls going into a recession as firms reduce utilisation of capital capacity and underutilise hoarded labour. Conversely, coming out of a recession, firms can meet additional production from underutilised capital and labour.

There were recessions in both economies in the early 1990s and milder downturns in New Zealand in 1998 and in Australia in 2000-01.

Business cycle effects can be minimised by smoothing the series or by defining periods that conform to the same stages in the business cycle. The ABS measures productivity growth rates between peaks in successive *productivity* cycles, which have the effect of also controlling for business cycle effects. The ABS defined 1993-94 and 1998-99 to be peaks, but has not determined a peak in the 2000s as yet.

In this paper, however, we only make allowance for the increase in utilisation, by comparing productivity growth after 1996. This strikes us as the most important allowance to make in this context. It is then difficult to make further allowance for business cycle effects by defining periods that conform precisely to the same stage of the business cycle (without losing scarce observations in the late 1990s). We assume that productivity growth calculated from 1996 to 2002 or 2003 is not greatly or differently distorted by business cycle effects in the two countries.

4. Differences in productivity growth: NZ has a gap

In this section, we move from the economy-wide perspective to the relatively well-measured market-sector, in order to examine productivity trends more closely and to determine the proximate sources of labour productivity growth in terms of capital deepening and MFP growth.

It turns out, however, that the comparison of productivity trends is quite sensitive to industry coverage. For example:

- As noted above, in domestic currency terms, there is little difference in economy-wide labour productivity in the two countries since 1996. Both are at around 1.9 per cent a year (Table 2).
- But there is a very substantial difference (2.8 per cent a year in Australia v. 1.5 per cent a year in New Zealand) when labour productivity growth in the market sector (as commonly defined in the two countries) are compared (Table 3).
- However, much of that difference disappears when the NZ market sector (which includes more of the hard-to-measure industries than does Australia's) is defined on an 'ABS-equivalent basis', as constructed by Black, Guy and McLellan (2003). Although termed

Table 3 **Decomposition of labour productivity growth, market sector**
(per cent per year)

	Labour productivity	*MFP*	*Capital deepening*[a]	*Capital*	*Labour*	*Output*
New Zealand						
1988 – 1992	1.9	0.0	1.9	0.7	-2.3	-0.5
1992 – 1996	0.4	1.8	-1.3	2.3	4.4	5.0
1996 – 2002	1.5	0.9	0.7	2.2	1.2	2.7
1988 – 2002	1.3	0.9	0.4	1.8	1.1	2.4
1996 – 2002[b] (ABSE)	2.2	0.9	1.3	2.7	0.2	2.5
Australia[c]						
1979 – 1985	1.9	0.5	1.3	4.2	0.4	2.2
1985 – 1990	0.6	0.1	0.5	4.6	3.3	3.9
1990 – 2003	2.6	1.2	1.4	3.8	0.5	3.0
1996 – 2002	2.8	1.2	1.6	4.8	0.8	3.6
1979 – 2003	2.0	0.8	1.2	4.1	1.0	3.0

[a] Capital deepening for NZ calculated by subtracting MFP growth from labour productivity growth. [b] From the 'ABS-equivalent' series. [c] Years for Australia refer to the 12 months ending on 30 June.

Sources: Black, Guy and McLellan (2003) and Productivity Commission, based on ABS data.

'ABS-equivalent', there are some important divergences from the ABS definition.[7] But, on that basis, the NZ rate climbs back to 2.2 per cent a year — 0.6 of a percentage point behind Australia's.

As an aside, the different market sector definitions affect the estimated rate of New Zealand's labour productivity growth through differences in capital deepening and not MFP growth. New Zealand's MFP growth post-1996 has been 0.9 per cent a year on both the commonly-used and the ABS-equivalent definitions. But the rate of capital deepening is about 0.6 of a percentage point higher when the ABS-equivalent definition is used. Table 3 also shows that growth in capital input is 0.5 of percentage point higher and labour input is a full percentage point lower.

The post-1996 growth rates, with New Zealand defined on an ABS-equivalent basis, are the most valid for comparative purposes. On this basis, New Zealand's labour productivity growth, at 2.2 per cent a year, has been 0.6 of a percentage point behind Australia's. On the estimates in Table 3, this gap is evenly divided between gaps in rates of capital deepening and MFP growth.

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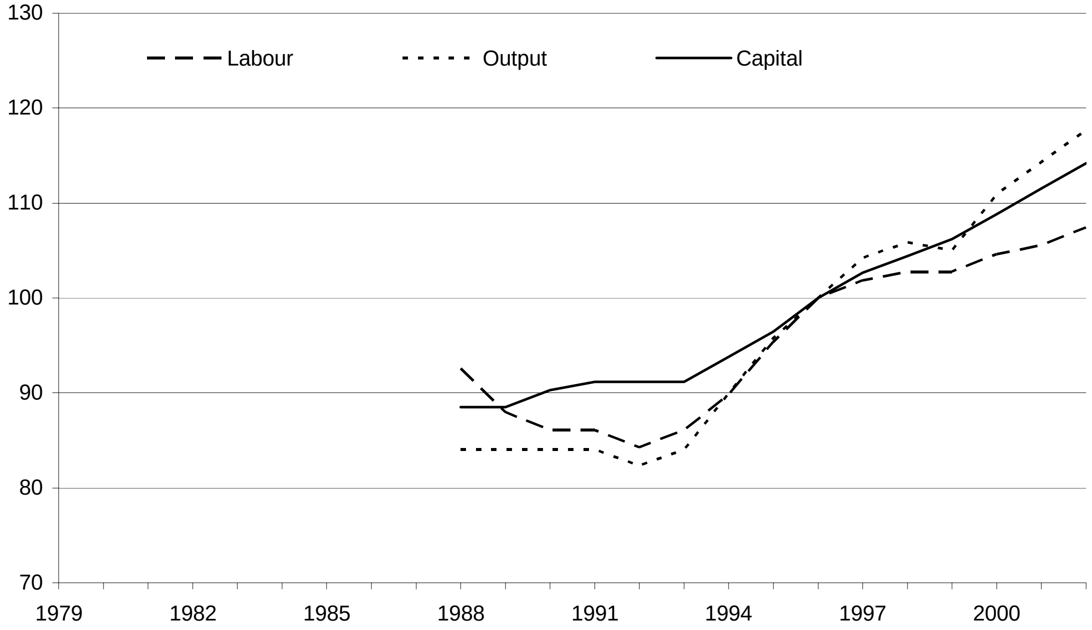
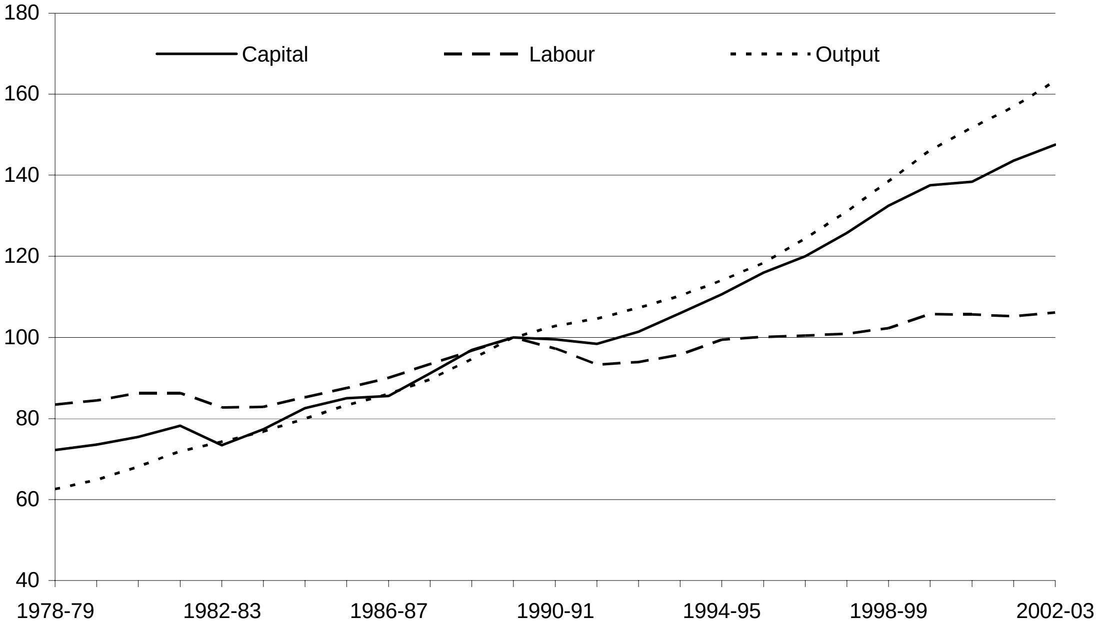
[7] Compared with Australia's market sector, New Zealand market sector adds property & business services, education, health & community services and personal & other community services. The 'ABS-equivalent' series excludes these sectors, but also excludes finance & insurance and cultural & recreational services as these cannot be separately identified in the NZ data (Guy, Black and McLellan 2003).

Figure 5 **Growth in output, capital services and labour input (hours worked), market sector**

Panel A: New Zealand, Index: 1996 = 100



Panel B: Australia, Index: 1989-90 = 100



Data sources: SNZ and ABS.

There are a few other points of note.

Unsurprisingly, the periods of relatively strong growth in labour utilisation also show weak capital deepening in both countries (Table 3). In fact, there was capital ‘shallowing’ between 1992 and 1996 in New Zealand (as observed by Black, Guy and McLellan 2003). Weaker capital deepening was a major proximate influence on weaker labour productivity growth in the labour expansion periods in the two countries.

However, the very strong MFP growth in New Zealand during its labour expansion period stands in marked contrast to the very weak MFP growth in Australia during its labour expansion period. In New Zealand, capital growth over 1992-96 was weaker than the very strong growth in labour input (Figure 5A and Table 3). High MFP growth over the period suggests that labour was (re)allocated efficiently during the expansion.[8] In the late 1980s in Australia, on the other hand, output growth was based firmly on the accumulation of both capital and labour inputs, with little MFP growth (Figure 5B and Table 3). During the 1990s, Australia’s MFP growth was high, which is also consistent with an efficient allocation of labour under more flexible and decentralised labour market arrangements.[9]

Differences in capital deepening: ICT is a contributor

According to the estimates, the difference in capital deepening between the two countries since 1996 has been due, in part, to faster labour growth in New Zealand and, in part, to faster capital growth in Australia (Table 3).

In the absence of disaggregated capital stock data for New Zealand, we compare investment trends in the two countries. Figure 6 suggests that business investment (as a share of nominal GDP) has followed similar trends in the two countries, although the rate of investment in Australia has remained above that in New Zealand.

But there has been a change in the composition of investment toward information technology (IT), with a much greater increase in the proportion of (nominal) investment devoted to IT in Australia (Figure 7). By comparison, New Zealand has not invested a much higher proportion in IT.

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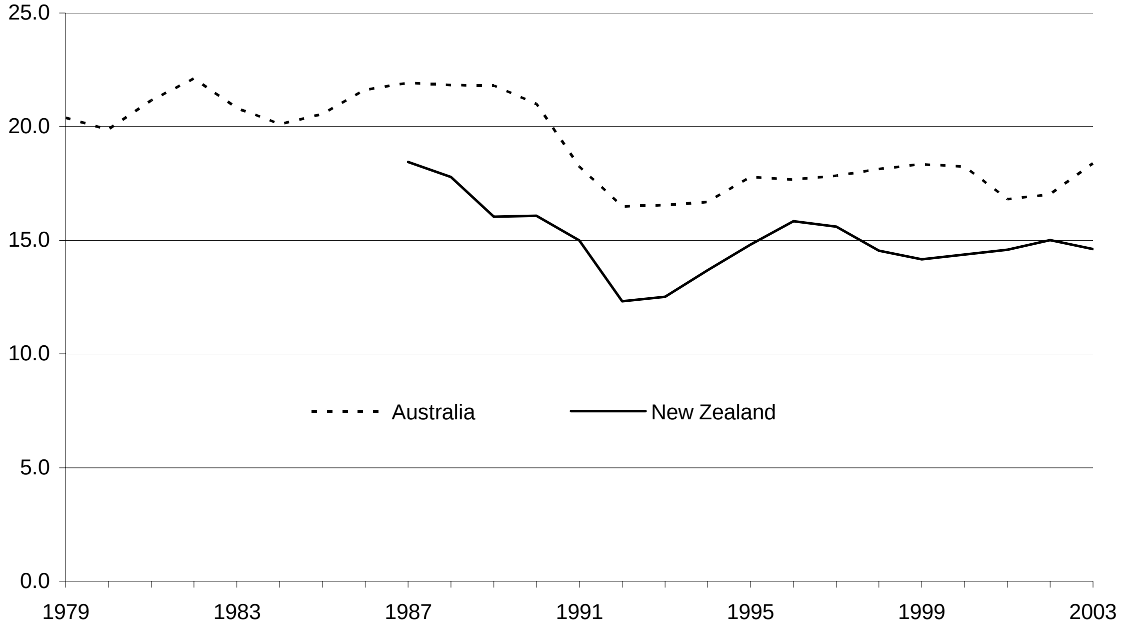
8 Another possibility is that the expansion of labour involved workers with above-average skill. However, as will be discussed later, it was more likely that the opposite was true — ie the expansion involved more lower-skill workers.

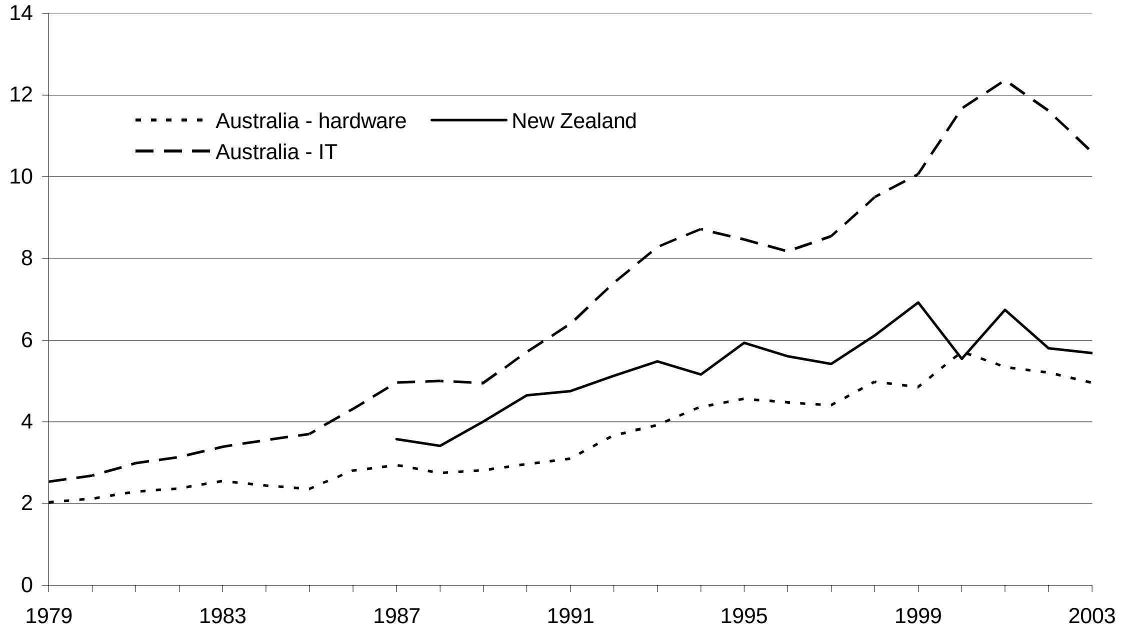
9 Arguably, Australia’s early-1990s recession played a part in one side of a reallocation of labour through the shedding of jobs in industries and activities that were not perceived to have a long-term future.

Figure 6 Non-residential investment as a proportion of GDP



Data sources: SNZ and ABS.

Figure 7 ICT investment as a proportion of non-residential investment



Data source: SNZ and ABS.

A closer look at the volumes of hardware investment[10] also shows acceleration in Australia, but not in New Zealand. Growth in the volume of hardware investment accelerated from around 26 per cent a year over 1987-95 to around 32 per cent a year in Australia after 1995, whereas it only lifted marginally in New Zealand from around the same 26 per cent a year growth over 1987-95. OECD estimates put New Zealand's rate of investment in ICT, and specifically in software, well below that of Australia's (OECD 2002, 2003).

Uptake of IT and its national accounts treatment could be a significant part of the difference in capital input growth in the two countries. First, as just seen, it seems that New Zealand has not had the same acceleration in uptake of ICT as has Australia. Second, different statistical treatment of IT would contribute further to the divergence in growth in aggregate capital inputs. Rental price weights are used to aggregate different asset stocks in Australia, but apparently not in New Zealand. IT has a relatively high rental price due its high capital loss over a relatively short economic life. An additional dollar of IT capital therefore has a bigger effect on aggregate capital input in Australia than an equivalent dollar in New Zealand.[11] The different statistical treatment of IT will not only tend to increase the measured rate of capital deepening in Australia in comparison to New Zealand, but it will also tend to reduce the rate of MFP growth.[12]

We have not investigated the quantitative importance of differences in uptake of IT and in its statistical treatment, because of time constraints. However, this is a potentially important issue that does warrant further investigation.

5. Underlying sources of productivity growth: Is there a gap in technology and innovation?

The sources of Australia's productivity revival were surveyed in Parham (2004). The applied literature identified three factors that were likely to have contributed to Australia's strong productivity performance in the 1990s:

- increased openness to trade and investment;
- more investment in R&D; and
- an acceleration in uptake of ICT.

These factors were specific to a surge in MFP growth and were on top of the foundation for productivity growth over the long-term provided by the accumulation of physical and human capital. There were changes in the policy and institutional environment — importantly,

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[10] Hedonic price deflators, based on US-derived deflators, are used in both countries.

[11] A further possible complication concerns difference in treatment of quality improvements. We understand that the statistical agencies in both countries use adjusted US hedonic (quality-constant) price deflators for IT hardware. The ABS uses an hedonic deflator for software, but we do not know how SNZ treats software. Compared with other OECD countries, Australia's hedonic deflator for software shows more rapid decline (OECD 2004).

[12] Although the Australian treatment of software would have some effect on output growth, greater capital input growth from the software and rental price treatment would mean less residual MFP growth.

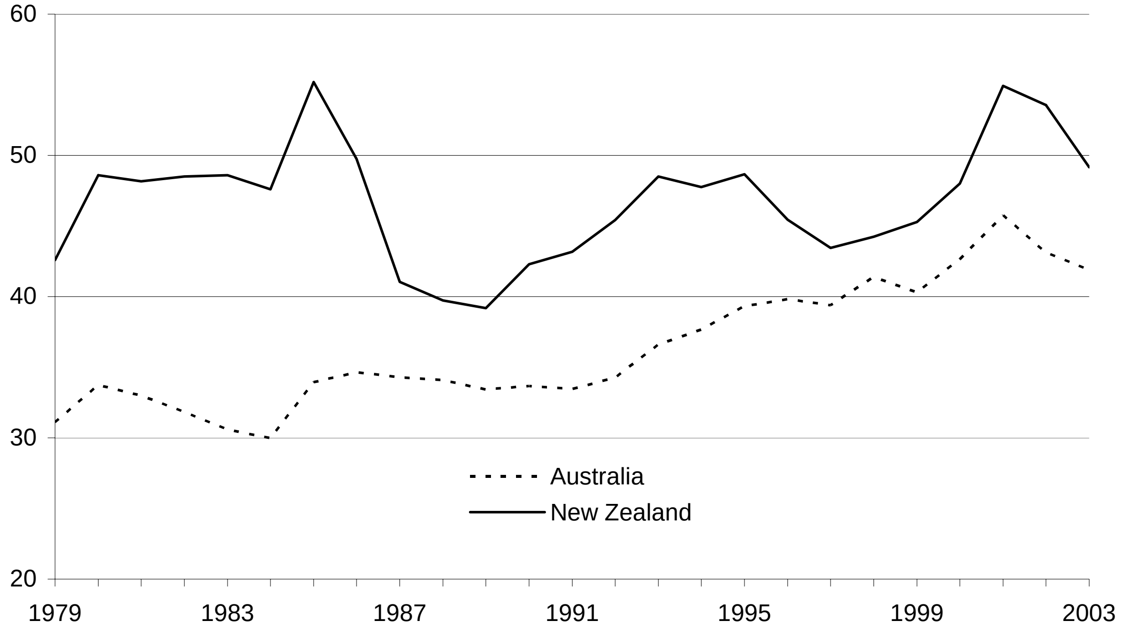
through the agency of microeconomic reforms — that drove and enabled the increased openness, investment in R&D and uptake of ICT.

Openness

One of the intermediate objectives of the reform programs in both countries has been to open each economy up to greater trade and investment.

Australia's trade intensity has increased steadily since the late 1970s (Figure 8). The literature survey identified elasticities that implied that increases in trade intensity of the order observed in Australia would raise annual MFP growth by around half a percentage point (Parham 2004).

Figure 8 **Trade intensity ratios**[a]
Per cent



[a] Exports plus imports as a percentage of GDP.

Data source: SNZ and ABS.

An increase in New Zealand's trade intensity is a little more difficult to discern because of the large swings it exhibits (Figure 8), which may have something to do with a high proportion of agricultural exports from, and lumpy imports into, a relatively small economy. There is a definite increase in trade intensity from the mid-1980s to the end of the 1990s, but Australia has narrowed the gap that existed prior to the mid-1980s. If we take the 1984 trade intensity ratio (ie around the time liberalisation began) and compare it with the 2001 value, the elasticity used in the exercise for Australia implies an MFP growth addition of around 0.15 percentage points.

However, aside from the magnitude, it is arguably more significant that a *direct* productivity response in Australia has been difficult to detect (Parham 2004). Manufacturing is the sector affected most immediately by reductions in trade barriers and opening up of export opportunities and yet it has shown little or no productivity uplift.[13] Nevertheless, there is evidence that the effects of increased competition in Australia have been referred on to related services areas — in particular, wholesale distribution.

The evidence suggests that there has not been a productivity uplift in either manufacturing or in distribution in New Zealand (Black, Guy and McLellan 2003).

Although this would need further investigation to be sure, we do not think that a difference in openness could be a major direct influence on New Zealand's gap in productivity growth, given that neither economy has shown much response in this regard. However, the lack of referred response in services industries in New Zealand could be a genuine area of difference.

R&D

The data suggest that Australia's R&D intensity has increased since the mid-1980s (Figure 9). The literature survey suggested that the increase in business R&D evident in Australia would contribute about a third of a percentage point of annual MFP growth. Work currently underway at the Productivity Commission suggests that the increase in Australian business R&D has been concentrated in services industries and has been significantly ICT-related

On the other hand, the NZ data show only a comparatively marginal increase in gross R&D expenditure intensity and hardly any increase at all in business R&D intensity. Whilst R&D is not necessarily an accurate indicator of innovation activity, these data do suggest that New Zealand has not stepped up its innovative activity in pursuit of productivity improvements as much as has Australia. Whilst we have not seen the data, perhaps it is also true that there has not been a similar increase in services and ICT-related R&D activity in New Zealand.

ICT

As previously noted, New Zealand does not appear to have had the same acceleration in use of ICT as has Australia. It seems reasonably clear that there has not been the same acceleration in hardware use and that investment in software has been at a much lower level (about half Australia's level of investment as a proportion of total investment, according to OECD estimates). Other OECD figures show that New Zealand had 50 PCs per hundred white collar workers in 1997, compared with 80 in Australia. However, business use of the Internet and the number of secure servers per capita have been similar.

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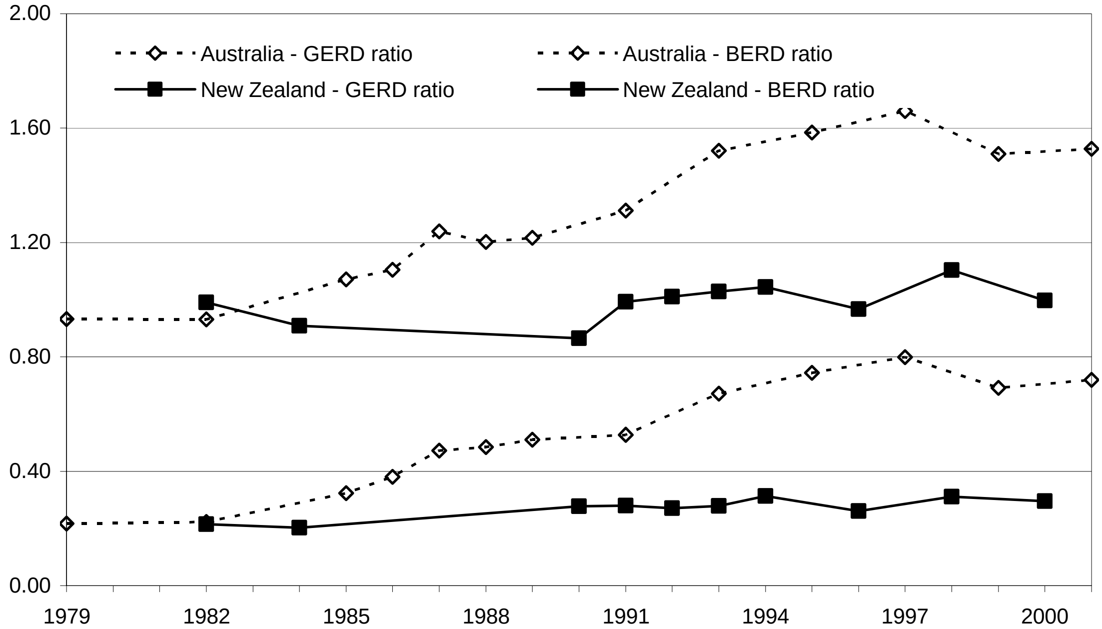
[13] There is evidence of productivity upturns in more narrowly-defined manufacturing industries, suggesting that the lack of response for manufacturing as a whole is an aggregation issue.

Figure 9 **GERD and BERD intensity**[a]

Per cent



[a] Gross Expenditure on R&D and Business Expenditure on R&D in proportion to GDP.

Data source:

Estimates for Australia suggest that the greater use of hardware and software from 1995 lifted Australia's MFP growth by 1 or 2 tenths of a percentage point (Parham 2004, PC 2004). These gains have stemmed from ICT's status as a general-purpose technology that enables users to introduce innovations in products, processes and organisational structures (PC 2004). At the industry sector level, the Australian evidence of ICT-enabled productivity gains is strongest in finance & insurance and to a lesser extent in wholesale trade.

The lack of NZ evidence (Black, Guy and McLellan 2003) of a pickup in productivity in ICT-intensive industries, such as financial intermediation, wholesale and retail trade and property and business services (OECD 2004), provides further evidence that NZ businesses have either not accelerated their investment in ICT or not used it as a platform for innovation — or both.

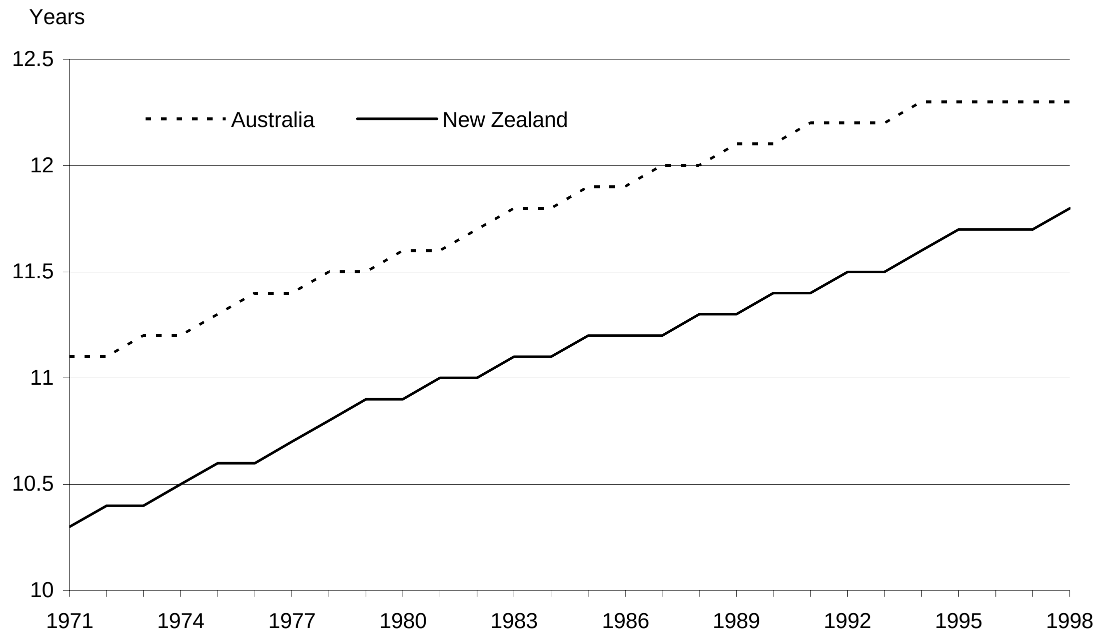
Other underlying factors

We leave the discussion of changes in the policy and institutional environment to Graeme Davis and Robert Ewing in their paper for the Workshop. We add a few remarks on human capital and keep it to only a few because the data are scarce or murky.

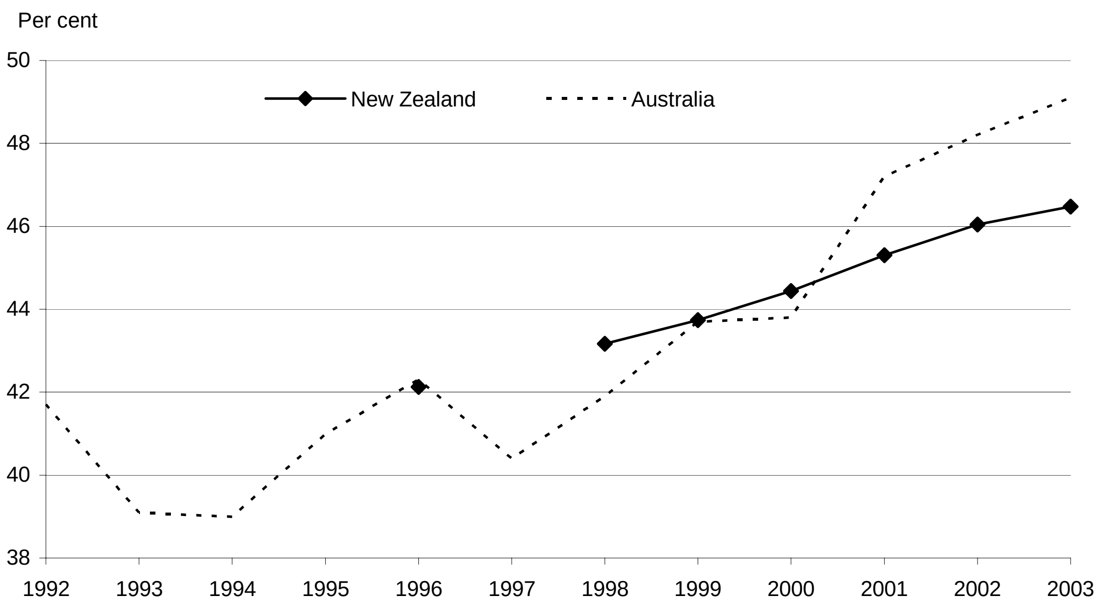
In Australia, there has not been additional growth in education attainment and experience in work in the 1990s to match the surge in productivity growth. Using experimental ABS data, Barnes and Kennard (2002) found that there was acceleration in the average skill of the Australian workforce but that it occurred in the 1980s.

Figure 10 **Education attainment**

Panel A: Average years of education of working age population



Panel B: Proportion of working age population with a post-school qualification



Data source: Panel A Bassini and Scarpetta (2001). Panel B SNZ (Labour Market Statistics 1997-2003), ABS (Education and Work Cat No. 6227.0, 2002 and 2003).

This did not mean, however, that the level of skill was unimportant to the 1990s productivity acceleration. Barnes and Kennard observed that there was a correlation across OECD countries between uptake of ICT and average year of schooling.

Figure 10 shows some comparative data on average years of schooling and attainment of higher qualifications. The schooling data show similar trends and, although the higher qualifications data show a stronger increase in Australia, this may be more of a quirk in the data, given definitional differences.

However, it is not just formal training that matters. For example, on-the-job training and learning-by-doing are seen as increasingly important in the information economy (PC 2004).

6. Tentative conclusions

It appears that labour market frameworks have had important influence on the performance of the New Zealand and Australian economies. The NZ changes affect the way 1990s labour productivity growth should be viewed in that country.

Three issues needed to be tackled in both countries after average real wages had moved ahead of average labour productivity growth, under centralised systems of wage negotiation, and had raised the relative cost of employing labour. There needed to be:

- a correction to the labour income share (or real unit labour costs);
- a system for aligning wage movements with productivity growth; and
- a mechanism for (re)allocating labour efficiently in an environment of more liberal markets.

The process was more gradual in Australia, with a real wage correction engineered through the centralised system in the second half of the 1980s. Wage alignment and efficient allocation came later as, progressively, labour markets became more flexible and bargaining became more decentralised from the late 1980s and firms increased their employment of labour after the shakeout during the early-1990s recession. In New Zealand, the changes were concentrated over 1992 to 1996 with the introduction of the Employment Contracts Act.

As a result of the NZ changes, labour utilisation increased markedly during the 1992-96 period. Labour productivity growth was consequently reduced over this period because of capital shallowing. But MFP growth was high, suggesting efficient allocation of resources during the labour expansion.

Because of the influence of New Zealand's labour expansion, comparisons of labour productivity growth from 1996 are more valid.

However, there are measurement issues that confound the inter-country comparisons. Different definitions of market sectors present one set of problems. The different statistical treatment of ICT presents another. Comparisons cannot be made with a very high degree of precision or confidence.

Nevertheless, it seems reasonable to suggest that New Zealand's rate of labour productivity growth has been about half a percentage point behind Australia's since 1996 — around 2.2 per cent a year v. 2.8 per cent a year, in domestic currency terms. In international purchasing parity terms, New Zealand's economy-wide labour productivity growth has been 0.5 of a percentage point behind.

Available estimates suggest that the productivity gap is evenly divided between the rate of capital-deepening and the rate of MFP growth. However, there are grounds, based on different statistical treatment, to suggest that New Zealand's capital deepening is understated and its MFP growth is overstated.

That aside, there seems to be a genuine sense in which capital accumulation is lower in New Zealand. Perhaps there are differences in capital markets, but they have not been examined in this paper. One factor that is identified in the paper is the absence in New Zealand of a strong acceleration in uptake of ICT, as has occurred in Australia from the mid-1990s.

Perhaps this is still a matter of time, although it is approaching a decade since Australia's use of ICT took off. It could be of concern to New Zealand's productivity outlook if the absence of a pick up in ICT investment was part of a larger picture in which New Zealand is falling behind on investment in technology, human capital and innovation. If this is so, future productivity growth may be constrained. And, with limits on further increases in labour utilisation, a further upturn in New Zealand's growth in average income may be similarly constrained.

This does not necessarily mean that policy should jump immediately to provide more support for diffusion of technology, skill formation and innovation. Perhaps NZ policy makers are already clear, but it would be very valuable to understand why New Zealand has apparently not engaged as much with technology and in innovation. Two immediate thoughts on possible lines of further inquiry are these.

- Is there the same scope in New Zealand for use of technology and for innovation in services industries? Financial services, distributive trades (wholesale and retail) and business services are generally regarded as being at the forefront in this regard.
- Aside from formal education, are there sufficient incentives to develop more specific skills from learning-by-doing and on-the-job training? Is there the ability to hire relatively cheap unskilled labour and is job/career tenure low, in which case, are incentives to develop specific skills too low?

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