THE TREASURY
Kaitohutohu Kaupapa Rawa

Statistics New Zealand
TATAURANGA AOTEAROA

Taking on the West Island:

How does New Zealand's labour productivity stack up?

Citation

Statistics New Zealand and New Zealand Treasury (2010). *Taking on the West Island: How does New Zealand's labour productivity stack up?* Wellington: Statistics New Zealand and New Zealand Treasury

Published in October 2010 by

Statistics New Zealand
Tatauranga Aotearoa
Wellington, New Zealand.

Available on www.stats.govt.nz
and
www.treasury.govt.nz
in the New Zealand Treasury Productivity Paper series,
numbered TPRP 10/01

Persistent URL http://purl.oclc.org/nzt/p-1316

ISBN 978-0-478-35319-8 (online)

Summary

New Zealand's productivity performance has gained considerable attention in recent times, particularly compared with Australia's. Using a three-pronged approach, this paper seeks to shed new light on that relative performance. First, measures of labour productivity levels as opposed to growth rates are compared in order to provide insight into disparities in GDP per capita between the two countries. Secondly, the paper examines the puzzle of why measures of economy-wide labour productivity growth rates produced by the OECD differ from the estimates of productivity growth rates as captured in the domestically-produced official statistics on the so-called *measured* or *market* sectors in New Zealand and Australia. Thirdly, labour productivity growth rates are compared for the 12 common industries for which New Zealand and Australia compile official productivity estimates.

The economy-wide labour productivity *levels* gap between Australia and New Zealand started to open up in the late 1960s and widened in the 1970s. Between the early 1980s and mid-1990s the gap was broadly unchanged, before starting to widen again.

By the end of the 2000s, New Zealand's economy-wide labour productivity *level* was around 30 percent below that of Australia. There are some measurement differences that account for some of this gap but only a relatively small part of it.

For the whole economy, Australia's average annual labour productivity *growth rate* (1.7 percent) exceeded New Zealand's (1.4 percent) over the 1978 to 2008 period. Growth rates were similar up to the early-1990s with Australia then drawing away for several years before resuming a similar trend from the early 2000s.

In the comparable measured sectors of the two economies, New Zealand's average annual labour productivity *growth* (2.2 percent) exceeded Australia's (2.0 percent) over the 1978 to 2008 period. New Zealand's growth rate was generally higher from the late 1980s to the mid 1990s and was otherwise similar to Australia's.

The difference in the Australasian economy-wide and measured-sector labour productivity performances is the main puzzle we have investigated in this paper. The puzzle holds over the 1988 to 2008 period but the difference is sensitive to the time period chosen.

The choice of labour input series – hours worked or hours paid – appears to explain a modest part of the productivity puzzle. A larger part is explained by different methodologies that Statistics New Zealand (Statistics NZ) and the Australian Bureau of Statistics (ABS) use to measure the services from residential dwellings. The ABS includes an implicit adjustment for housing quality. The Statistics NZ approach, if applied to Australian data, would lower economy-wide labour productivity growth by approximately 0.15 percent per year over the period 1991 to 2008. We conclude that use of the same methodology in the two countries would act to reduce a significant portion of the gap in the economy-wide growth rates - perhaps by up to a half.

The three industries outside the measured sector that are dominated by government - Government administration and defence, Education, and Health - have slightly lower (unofficial) labour productivity growth in New Zealand over the period 1988–2008. However, if we focus on the period from the mid-1990s when the data are more robust, the New Zealand growth rate for these industries overtakes Australia's. Overall the evidence does not point to differences in these government-dominated industries explaining the puzzle.

'Property and business services' is a large industry outside the measured sector whose (unofficial) labour productivity growth rate is negative in New Zealand and close to zero in

Australia over the period 1988–2008. While some of this difference could reflect measurement problems, there is enough evidence (eg the official New Zealand measure of business services post-1996 confirms negative growth) to suggest that there is a real difference and that this contributes to explaining a significant part of the puzzle.

The New Zealand industry-level productivity dataset allows for robust growth comparisons with Australia at the industry level, including a growth-accounting decomposition that is currently unavailable for the non-measured industries.

We conclude that both economy-wide and measured-sector estimates of labour productivity growth are valid measures. They give different readings partly because of real differences that naturally arise owing to their different coverage of the economy, and partly because of measurement difficulties. We also note that the differences on both measures are sensitive to the time period chosen.

Over the period we examined most closely, 1988–2008, New Zealand's measured sector labour productivity growth was slightly ahead of Australia's corresponding sector but there was not a lot in it. On the other hand, Australia had faster labour productivity growth economy wide and this cannot all be dismissed as a statistical anomaly. The levels gap in economy-wide labour productivity decisively favours Australia and has remained roughly constant for the last 10 years at around 30 percent of the Australian level.

From a policy perspective our findings suggest that raising New Zealand's productivity growth remains its most important economic challenge: the levels gap is still large even after measurement issues are taken into account. While New Zealand measured-sector productivity growth has been at least on a par with Australia, it needs to be faster to close the large gap; and it is disappointing that the higher growth rate expected of an otherwise similar country coming from behind has not eventuated in New Zealand's case.

Standards and further information

Percentage changes

Percentage movements are, in a number of cases, calculated using data of greater precision than published. This could result in slight variations.

Rounding procedures

On occasion, figures are rounded to the nearest thousand or some other convenient unit. This may result in a total that disagrees slightly with the total of the individual items as shown in tables. Where figures are rounded the unit is in general expressed in words below the table headings, but where space does not allow this the unit may be shown as (000) for thousands, etc.

All counts in this report have been randomly rounded to base 3 to protect the confidentiality of respondents. For this reason not all figures will sum to stated totals.

Changes of base

Where consecutive figures have been compiled on different bases and are not strictly comparable, a footnote is added indicating the nature of the difference.

Source

All data is compiled by Statistics New Zealand, except where otherwise stated. Both administrative and survey data has been used in this report.

Acknowledgements

This paper was prepared by Brendan Mai (Statistics New Zealand), John Janssen, Geoff Lewis and Simon McLoughlin (New Zealand Treasury). Adam Tipper (Statistics New Zealand) provided analytical support. An earlier version was presented at the joint conference of the New Zealand Association of Economists and the Law and Economics Association of New Zealand, 30 June–2 July, University of Auckland Business School. The paper benefited substantially from a June 2010 workshop involving representatives from Statistics New Zealand, the Australian Bureau of Statistics, the New Zealand Treasury, and the Australian Treasury. Comments were also provided by Dean Parham, Donald Brunker, Derek Burnell, Tas Papadopoulos, and Grant Scobie.

Liability

Disclaimer

This is a joint paper between the New Zealand Treasury and Statistics New Zealand. Statistics New Zealand provided technical advice around data and methodologies so as to inform the analysis. The analysis and interpretation were provided by Treasury.

Further information

Email:	info@stats.govt.nz
Phone toll-free:	0508 525 525
Phone international:	+64 4 931 4600
Fax:	+64 4 931 4610
Post:	P O Box 2922, Wellington 6140, New Zealand
Website:	www.stats.govt.nz
Email:	information@treasury.govt.nz
Telephone:	+64 4 472 2733
Post:	P O Box 3724, Wellington 6015, New Zealand
Website:	www.treasury.govt.nz

Contents

List of tables and figures

Tables by chapter

Chapter 2 Definitions and measurement

Chapter 4 Puzzles and reconciliations

Figures by chapter

Chapter 3 Levels and growth rates

Chapter 4 Puzzles and reconciliations

Chapter 5 Industries within the former measured sector

1 Introduction

Productivity is the key determinant of a country's material standard of living over time. A series of Treasury Productivity Papers released over the course of 2008 and 2009 discussed New Zealand's productivity performance and the potential policy implications of that performance.[1] The second paper in that series focused on productivity-measurement issues and performance in the so-called *measured* sectors in New Zealand and Australia and, on an economy-wide basis, for a selected group of OECD economies (New Zealand Treasury, 2008). That 2008 paper also included some preliminary industry-level analysis aimed at investigating cyclical effects on productivity performance in the New Zealand construction industry.

Productivity measurement issues have been canvassed in detail in the various publications supporting the official productivity statistics published by Statistics New Zealand (Statistics NZ), including an analytical report prepared by Statistics NZ for the 2025 Taskforce[2] (Statistics NZ, 2009). The 2025 Taskforce examined the evidence on New Zealand's productivity performance (2025 Taskforce, 2009)[3] and Statistics NZ on 25 June 2010 has since released the first set of official productivity statistics for New Zealand at the industry level, covering the years 1978 to 2008. In this paper we draw on all of this work.

Section 2 of this paper briefly restates the definitions of productivity, measurement issues, and industry coverage. The remainder of the paper is concerned with interpreting productivity measurement and performance in New Zealand and Australia. We focus on the New Zealand and Australia comparison because such comparisons are common in economic debates and also because the two countries have comparable official measured sector productivity statistics.

In section 3 we set out the available evidence on productivity levels, noting the measurement challenges present in levels analysis, especially at the industry level. We start with levels analysis given its relevance to GDP per capita and the interpretation of growth rates. For example, even if we know that measured-sector productivity growth rates in New Zealand and Australia have been broadly similar since 1978, this in and of itself does not throw any light on whatever gap that may exist in the *levels* of measured-sector productivity.

Section 4 includes an examination of the puzzle of why economy-wide measures of productivity growth, including those published by the OECD, appear to present a different picture to the one that emerges from the official statistics published by Statistics NZ and the Australian Bureau of Statistics (ABS). We attempt to establish the extent to which these differences simply reflect measurement issues as opposed to meaningful underlying differences in economic performance. Doing this requires an examination of labour inputs, as well as the measurement methodologies of output in specific industries. It is worth noting that these types of puzzles are not unique to the New Zealand-Australia situation.[4]For example:

---

1. See http://www.treasury.govt.nz/publications/research-policy/tprp.
2. The New Zealand Government set up the 2025 Taskforce in 2009 with the central task of providing recommendations on closing the income gap with Australia by 2025, noting that this will require a sustained lift in New Zealand's productivity growth rate from its current level to around 3% a year or more
3. See Part I: Understanding the problem – multifactor productivity.
4. Drew (2007) discusses some of the New Zealand productivity measurement puzzles, including the apparent low productivity growth of the non-measured sector (see in particular table 6).

> "A comparison of aggregate labour productivity growth between Canada and the United States reveals a significantly different story depending on which measure of aggregate labour productivity is used. Business sector output per hour advanced at a 2.2 percent average annual rate over the 1981-2003 period in the United States versus 1.5 percent in Canada… The United States enjoyed a 0.7 percentage point advantage over Canada. Total economy output per hour grew 1.7 percent per year in the United States compared to 1.4 percent in Canada, a difference of 0.3 points, one half that registered for the business sector. The better relative productivity performance for Canada with the total economy measure is explained by the measured productivity growth in the non-business sector: 1.1 percent per year versus 0.1 percent in the United States. The key issue is which of these two productivity growth rates better captures the true productivity performance of the non-business sector. Non-business sector output is generally proxied by labour inputs. But Statistics Canada attempts to capture productivity gains in certain non-business industries by using output measures that are independent of inputs. The United States appears more reticent in the use of this practice." (Sharpe, 2004, p.21)

We focus on labour productivity because the methodological differences related to capital measurement (especially with regard to OECD data) are substantive and require further analysis. Section 5 utilises the new industry-level productivity dataset to provide a richer comparison between Australian and New Zealand labour productivity growth performance. Section 6 offers conclusions.

2 Definitions and measurement

2.1 Definitions

Productivity is a measure of the degree of efficiency with which an organisation turns inputs, such as labour and capital, into outputs (eg consumer goods and services). Producing more goods and services with a fixed amount of inputs, producing the same quantity of goods and services with fewer inputs, or producing goods and services at a faster rate than the rate of increase in inputs, are all examples of rising productivity.

Productivity is typically defined as the ratio of a volume measure of output to a volume measure of input. Beyond this basic definition a range of issues arise. Productivity can be defined in relation to a single input (eg labour) or to a combination of inputs (eg, labour and capital). Labour productivity can change as a result of a change in technology or additional capital. As a result, a limitation of partial productivity measures, such as labour productivity, is that they attribute to one factor of production, in this case labour, changes in efficiency attributable to other factors of production.

Multifactor productivity (MFP) is the part of output growth that cannot be attributed to the growth of labour or capital inputs. MFP reflects such things as business process innovations, advances in disembodied technology, or almost any other type of improvement in the efficiency of a firm's operations. When MFP rises in an economy, then that economy can produce more output with the same quantity of labour and physical capital. MFP can be equated with technological change if certain conditions are met (eg firms seek to maximise profits, markets are competitive, and the coverage of inputs is complete). Because these conditions are typically not met, measured MFP will, in addition to technological change, include the effects of model misspecification and errors in the measurement of the variables.

2.2 Measurement and coverage

In addition to the definition of productivity, choices exist about coverage – whether we are assessing the performance of the total economy (ie economy-wide), groupings of industries into particular sectors (eg market), or individual industries. Strengths of economy-wide measures of productivity include consistency with real GDP (and therefore the well established National Accounting procedures for that aggregate), real GDP per capita, and forecasts of these variables. Furthermore, they allow for economy-wide growth accounting analysis of GDP and GDP per capita. Economy-wide measures are generally better suited to international comparisons, because the definition of the measured sector is not uniform across countries and official measured sector series are only available for a limited number of countries (eg, Australia, New Zealand, Canada, the Netherlands, Switzerland, and the United States).[5] Economy-wide measures are also typically more up to date, being quarterly and sourced from current series, and provide information on productivity levels and not just growth rates.

However, the ability to gauge productivity varies across the economy. Measurement difficulties with regard to output are generally greater in the service industries, especially government activities in education, health, administration, and defence. Direct volume measures of output are often not obtainable, and so the widespread lack of market prices gives rise to difficulty for

5 . See OECD (2008).

statisticians in measuring these services. Market prices also provide weighting information, in order to combine a range of outputs into a single aggregate. In their absence, cost weights are used internationally. Productivity statistics that cover the 'business' or 'market' sector are less prone to output measurement issues and are more closely related to the entities (ie, firms) that are seeking the best mix of resources to exploit market opportunities and earn profits. In addition, the existence of market prices provides a set of weights to add a range of individual outputs into a single aggregate output.

For any given productivity series there are also issues of interpretation across time, including the role of the business cycle, and possibly changes in the terms of trade. Because the New Zealand and Australian business cycles do not match, we focus here on long spans of data. The effects of changes in the terms of trade on measured productivity have been extensively canvassed in the Australian context (see, for example, Ewing, Fenner, Kennedy and Rahman, 2007; Dolman, 2009; Australian Productivity Commission, 2009).

2.3 The measured and market sectors

The Statistics NZ and ABS official productivity statistics are consistent with OECD guidelines and comprise index series for labour productivity, capital productivity, and MFP. These series identify productivity growth rates but not absolute levels.

The Statistics NZ productivity statistics cover the so-called measured sector, which excludes industries in which the growth of outputs is difficult to measure and is sometimes proxied simply by the growth of inputs. In 2007, the present measured sector covered 74 percent of the economy.[6] This measured sector is available on a consistent basis from 1996.

Statistics NZ also publishes a series covering a subset of the measured sector. This subset is the former Statistics NZ measured sector before it was expanded to include business services, and personal and other community services. The continued publication of this series provides a link to previously-released Statistics NZ statistics and enables comparisons with Australia (where the ABS use the term "market sector" rather than "measured sector").

The use of the same industrial classification system (Australian and New Zealand Standard Industrial Classification or ANZSIC 1993/96) facilitates cross-Tasman comparisons. Under ANZSIC 1993/96, the ABS market sector has identical industry coverage to the former Statistics NZ measured sector. However, the ABS ANZSIC 1993/96 market sector was discontinued in 2008, so comparisons can only be made up to this year.

Table 1 sets out industry contributions to GDP in Australia and New Zealand. It includes the 12 industries in Statistics NZ's former measured sector and the ABS market sector (ie industries A to K and P).

6. 2007 is the most recent year for which current price industry value added is available.

Table 1

Industry contributions to GDP in New Zealand and Australia

Industry	Average contribution to nominal GDP (%) 1990 to 2007*	
	New Zealand	Australia
A – Agriculture, forestry, and fishing	7.2	3.6
B – Mining	1.3	5.3
C – Manufacturing	17.2	13.5
D – Electricity, gas, and water supply	2.9	2.9
E – Construction	4.6	6.3
F – Wholesale trade	7.8	5.4
G – Retail trade	6.1	6.6
H – Accommodation, cafes, and restaurants	1.8	2.3
I – Transport and storage	4.7	5.2
J – Communication services	3.4	3.1
K – Finance and insurance	6.2	6.6
L – Property and business services**	13.8	11.7
Ownership of occupied dwellings***	8.7	8.9
M – Government administration and defence	5.1	4.3
N – Education	4.2	4.7
O – Health and community services	5.3	6.1
P – Cultural and recreational services	2.0	1.4
Q – Personal and other community services**	1.4	2.0
FISIM****	-3.7	
Measured/market sector total	65.2	62.2
Economy total	100.0	100.0

* 1990–2007 is the period for which current price GDP by industry are commonly available for both countries; industries outside the former measured sector/market sector are shaded.

** 'Business services' and 'Personal and other community services' are in the current Statistics NZ measured sector, both from 1996 onward.

*** Statistics NZ separates dwellings into owner-occupied dwellings (OOD) and rental dwellings whereas the ABS combines these into a single category – ownership of dwellings (also designated as OOD).

**** Financial intermediation services indirectly measured (FISIM).

The ABS is now publishing productivity statistics under ANZSIC 2006, with Statistics NZ not making this change until 2012. Therefore, when undertaking trans-Tasman comparisons, the ANZSIC 1993/96 series must be used at this stage.

The two measured sectors are identical except that Australia allocates FISIM in accordance with the use of it as an input by individual industries (see section 4). The reference year for the productivity statistics matches that for National Accounts – March years in New Zealand and June years in Australia. Two rows in table 1 have value added recorded in the National Accounts but do not have corresponding labour input (ie, Ownership of occupied-dwellings, and FISIM). The effects of the five non-measured sector industries (ie L, M, N, O, and Q) and the other GDP components, on productivity comparisons is the focus of section 4.

The key data sources and methods used in compiling the Statistics NZ official productivity statistics can be summarised as follows:

- Output is measured using production-based real GDP for the measured sector.
- Labour input is based on hours paid for all employed persons (paid employees and the self-employed) in the measured sector. It is derived at an industry level from various firm surveys and household surveys (eg Quarterly Employment Survey, Census of Population and Dwellings, Household Labour Force Survey, Linked Employer-Employee Data). Although hours of work is the preferred conceptual measure of labour input, Statistics NZ has opted for hours paid because of greater confidence in aligning labour inputs with corresponding industry outputs and the availability of longer historical time series.
- Capital input is based on the flow of capital services generated by capital stocks, which are themselves developed using the Perpetual Inventory Method (PIM) for 24 of the 26 available produced-asset types by industry. Central government roading and local government roading are excluded as these two assets are 'owned' by ANZSIC division M (Government administration and defence) which is outside the measured sector.7 These are supplemented by estimates for other assets: livestock, exotic timber grown for felling, inventories, and six types of land (agriculture, forestry, commercial, industrial, mining, and other land).

An implication of these data sources and methods is that there can be a trade-off between what is judged best for official national productivity statistics and what is required for consistent cross-country comparisons. There is generally less of a trade-off in the case of output, but more of one with labour and capital inputs. As discussed in section 4, trade-offs also exist across time given the varying quality of data sources and/or specific judgments made about methodologies.

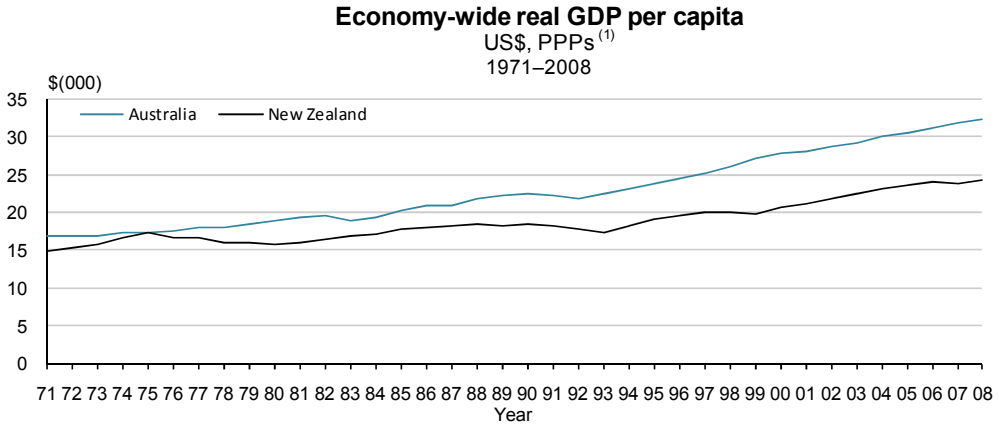
7 . Statistics NZ notes that because roading assets are essentially public goods in the sense they are non-excludable and non-rival in consumption, they do not have an allocable user cost. Rather they enhance other transport assets and are reflected in the calculated MFP residual. However, in Australia, the capital stock for general government roads is allocated to the Transport and Storage industry.

3 Levels and growth rates

Cross-country comparisons of productivity levels play an important part in decomposing the sources of cross-country differences in GDP per capita. However, levels comparisons are subject to more measurement issues than comparisons of growth rates. Comparisons of productivity *growth* across different countries rely on national estimates of real output based on nominal output and price deflators. Comparisons of productivity levels require common international price units such as those provided by Purchasing Power Parity (PPP) exchange rates. Economy-wide PPP exchange rates (derived from expenditure prices) are used in GDP per capita and economy-wide labour productivity levels comparisons. However, industry (and indeed sector) levels comparisons should ideally use industry-specific conversions based on production/commodity prices to allow for differences in relative prices and how they change over time.[8]

The OECD provides long-term time series for real GDP per capita for New Zealand and Australia (figure 1). Of 33 OECD countries in 2007/08, prior to the global financial crisis, GDP per capita in US dollars for 2000 (ie in constant prices and PPP exchange rates based on reference year 2000) was $32,400 in Australia (9th highest in the OECD) and $24,300 in New Zealand (21st in the OECD). The real GDP gap between New Zealand and Australia widened from the mid-1970s. In percentage terms, real GDP per capita in 2008 was around 33 percent higher in Australia than in New Zealand. Alternatively, real GDP per capita was around 25 percent lower in New Zealand than in Australia.

Figure 1



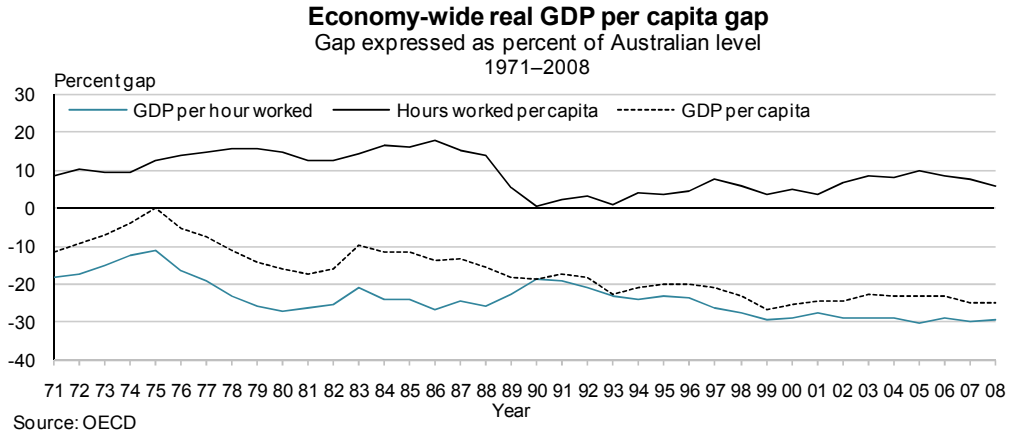
1. In constant prices and purchasing power parity exchange rates based on reference year 2000.
Source: OECD

Figure 2 indicates that the per capita GDP gap reflects a growing economy-wide labour productivity gap (GDP per hour worked) with some offset caused by higher labour utilisation (hours worked per capita) in New Zealand. The fall in labour utilisation in the late 1980s in

8. These points are a summary of the discussion in Dolman, Parham, and Zheng (2007) who undertake some preliminary industry levels comparisons between Australia and the United States. Australia has subsequently been included in the EU-KLEMS industry database. KLEMS stands for: capital (K); labour (L); energy (E); material (M); and service inputs (S).

New Zealand relative to Australia, is also evident in the Statistics NZ and ABS data. Based on Conference Board data, the labour productivity gap itself opened up prior to 1971, when this graph begins, and widened from the mid-1970s. Between the early 1980s and mid-1990s, although fluctuating, the gap was broadly unchanged, before starting to widen again.

Figure 2



Data from the Conference Board show a similar story to figures 2 and 3. Organisations such as the Conference Board and the OECD generally source their data from national statistical agencies. In order to make cross-country comparisons they will often adjust the data (eg, converting March to December years) and/or combine series to cover longer time periods. As discussed in section 4, this can create differences with official published productivity statistics.

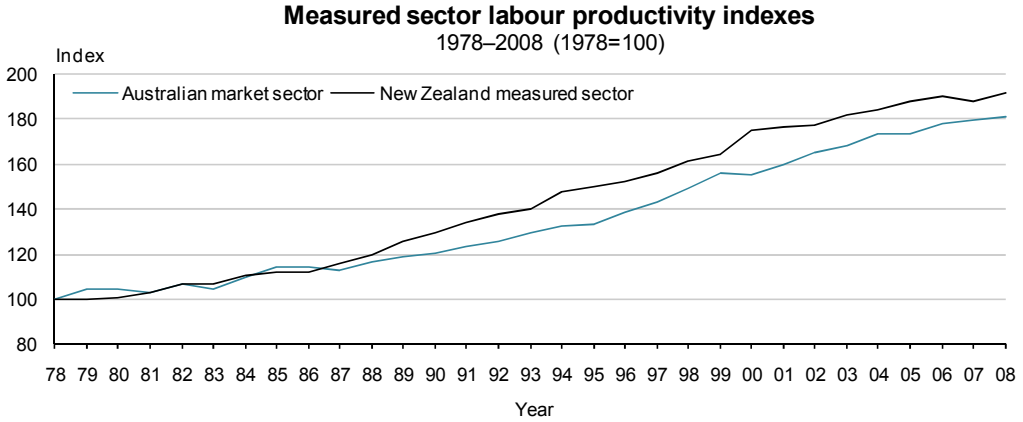
For New Zealand, official measured-sector productivity statistics are available from 1978. For this reason, figure 3 plots economy-wide labour productivity indexes to compare *growth* rates from 1978. Australia's average annual growth rate (1.7 percent) exceeds New Zealand's (1.4 percent) on this measure over the 1978 to 2008 period. As in figure 2, economy-wide labour productivity growth rates are similar over the early 1980s to mid-1990s, a period when the levels gap had already opened, before they began to diverge again.

Figure 3

Figure 4 uses indexes to illustrate cross-Tasman measured-sector productivity growth based on the sector definitions outlined in table 1. In contrast to figure 3, New Zealand's average annual

growth rate (2.2 percent) actually exceeds Australia's (2.0 percent) on this measure over the 1978 to 2008 period. New Zealand also exceeds Australia in measured-sector MFP growth over 1978 to 2008 with an MFP growth of 1.1 percent versus 1.0 percent.

Figure 4



Source: Statistics New Zealand and Australian Bureau of Statistics

Although we do not have official levels comparisons, analysis by the Department of Labour using aggregate PPP exchange rates suggests that, in 2008, New Zealand GDP per hour in the measured sector was around 25 percent lower than in Australia and the gap has been constant since the start of its analysis in 1996.[9]

9 . The New Zealand Institute has carried out some levels comparisons at an industry level, but without the benefit of industry-specific PPPs (The New Zealand Institute, 2009). Mason and Osborne (2007) undertake a levels analysis at the industry level for New Zealand relative to the United Kingdom (UK). They find New Zealand labour productivity exceeds the corresponding UK industry in 2002 in only six of these industries. This pattern largely persists throughout 1995 to 2004.

4 Puzzles and reconciliations

The similar labour productivity growth performance over 1978 to 2008 for the New Zealand and Australian measured sectors (figure 4) contrasts with the difference in economy-wide labour productivity performance (figure 3). Table 2 decomposes this puzzle by summarising output, labour input, and labour productivity growth for the economy as a whole, the former measured sector and other parts of the economy.

In order to analyse both the total economy and industries outside the measured sector, table 2 uses hours worked from the Household Labour Force Survey (HLFS) for New Zealand and hours worked from the Labour Force Survey (LFS) for Australia. The HLFS is available from the 1987 March year and so the use of this labour data restricts the start point relative to figure 3 and figure 4. For the reasons discussed in section 2, the decomposition ends in 2008.

For the measured sector, table 2 uses official statistics, and the associated labour input series, prepared by Statistics NZ and the ABS (see section 4.1 below).

As discussed in section 2, the economy outside the measured sector consists of not only industries for which output is difficult to measure but also components not allocated to industries (eg FISIM in the New Zealand case) and/or components with no labour input (eg residential dwellings). In the case of labour productivity outside the measured sector, it is therefore more appropriate to focus on the five relevant industries.

Table 2

Labour productivity growth (average annual growth) 1988-2008*

	Economy-wide		Measured sector**		Other industries***		Other industries plus other components****	
	Aus	NZ	Aus	NZ	Aus	NZ	Aus	NZ
ABS / Statistics NZ								
Output	3.3	2.6	3.3	2.7	3.6	2.9	3.5	2.4
Labour input	1.7	1.3	1.1	0.3	3.0	3.0	3.0	3.0
Productivity	1.6	1.3	2.2	2.4	0.5	-0.1	0.5	-0.5
OECD								
Output	3.3	2.7						
Labour input	1.7	1.2						
Productivity	1.6	1.5						

* OECD New Zealand data is calendar years (1987-2007) for hours worked and March years (1988-2008) for GDP. ABS is June years and Statistics NZ is March years (1988-2008).
** Former measured sector/market sector industries A to K plus P (refer to table 1 above).
*** Industries L, M, N, O, and Q (refer to table 1 above).
**** Other components include FISIM (for New Zealand) and ownership of occupied dwellings.

From table 2 we observe that over the 1988 to 2008 period:

- Australia's economy-wide labour productivity growth was higher than New Zealand's, and the gap also exists when using OECD data. This particular gap is sensitive to the time period used. For example, if the period is 1987 to 2007 then OECD-derived Australian labour productivity growth is 1.7 percent and for New Zealand it is 1.3 percent (ie a larger difference than that shown in Table 2 for the period 1988-2008).
- As with the 1978 to 2008 period, New Zealand's former measured sector labour productivity growth is slightly ahead of the comparable Australian measured sector (2.4 percent versus 2.2 percent).
- Labour productivity growth in the aggregate of the five industries in the non-measured sector has been slower in New Zealand, although average annual labour input growth has been identical in both countries at 3.0 percent.

In trying to reconcile the different pictures of productivity growth in Australia and New Zealand presented by economy-wide OECD measures and official measured-sector statistics from the ABS and Statistics NZ, there is a clear need to understand what is going on in the parts of the economy not included in the measured sector. A key question is whether the underlying productivity performance in these areas in Australia is sufficiently superior to that in New Zealand to explain its higher economy-wide productivity growth?

The following sub-sections examine measurement issues over the 1988 to 2008 period (where possible) in labour input as well as the areas outside the measured sector. In the latter case we start by looking at two components where treatment appears obviously different in New Zealand and Australia – FISIM and residential dwellings – and then at the industries which are not in the measured/market sectors that are used for trans-Tasman comparisons. As in table 2, for the industries outside the measured/market sectors we rely on unofficial measures of labour productivity.

4.1 Labour input

Labour input could be expected to be relatively easy to measure compared with other parts of the productivity equation, particularly capital input or non-measured sector output. However, there are a number of issues with measuring labour input in both New Zealand and Australia. Indeed, challenges in deriving New Zealand labour input was a major finding of Diewert and Lawrence (1999).

The OECD (2001) recommends using actual hours worked as the measure of labour input:

> "Notwithstanding some of the measurement issues, it is recommended that hours actually worked be the statistical variable used to measure labour input, as opposed to simple head counts of employed persons. Hours paid and full-time equivalent persons can provide reasonable alternatives. Significant differences in country practices for calculating hours worked and full-time equivalent persons persist, and raise issues of international comparability".

As noted above, official productivity data from Statistics NZ are for hours paid and based on data from a number of sources, particularly business datasets. This composite measure of labour input (or labour volume) is used because industry data are needed to build up the

measured sector. Industry-level data are also needed for the industry productivity series released recently. Hours paid data are judged by Statistics NZ as more robust at the industry level because they are sourced from business datasets (and thus are more likely to be industry classified in the same manner as for GDP, which is also constructed from business datasets) and have a longer time series than the HLFS.[10] Only at the economy-wide level is the annual change in hours worked from the HLFS considered as statistically robust as hours paid.

At the economy-wide level, no industry splits are needed, so the OECD uses hours worked from the HLFS to estimate growth in economy-wide labour input. As expected, the OECD and HLFS economy-wide measures match closely. The OECD data match best with the HLFS measure on a calendar-year basis.[11] In New Zealand, economy-wide labour input between the 1988 to 2008 calendar years grew by an average of 1.4 percent per annum on both the OECD and on HLFS measure. Table 3 below shows 1.2 percent for the OECD measure (1987 to 2007 calendar years) and 1.3 percent (1988 to 2008 March years) for the labour force survey so as to match table 2.

Official and labour force survey estimates of labour input for the measured sector differ moderately. In New Zealand, labour input between 1988 and 2008 grew by an average of 0.3 percent per annum in the official (former) measured sector and by an average of 0.6 percent per annum in the HLFS data for the same group of industries. The divergence between the two labour input measures is largest in the period from 1992 to 1995 (March years), when the HLFS measure grows more strongly coming out of the early-1990s recession. Though it is impossible to be definitive, there is some limited evidence that the redesign of the HLFS in 1993-94 overstated growth in actual hours worked over this period.

In contrast to New Zealand, official productivity statistics from the ABS for the market sector of the economy use a measure of labour input based on hours worked from its labour force survey. This is the same concept of labour input that is used at the economy-wide level by the OECD to estimate economy-wide labour productivity growth. The OECD economy-wide measure therefore matches the labour force measure. In Australia, although the time periods are slightly different (June versus calendar years), labour input between 1988 and 2008 grew by an average of 1.7 percent per annum on both the OECD and the ABS labour force measure. Australia has experienced issues with hours worked in the past (eg hours worked were surveyed at four points of the year but not adjusted for holidays). In Australia, labour input between 1988 and 2008 grew by an average of 1.1 percent per annum between 1988 and 2008 on the official market sector measure and on their labour force measure.

In conclusion, it appears that the choice of labour input does make a potentially important contribution to unravelling the puzzle over the varying pictures of productivity performance. The HLFS series in New Zealand overstates labour input growth (and thus understates labour productivity growth) relative to the measured-sector labour input series for the same group of

10. There are some drawbacks to using hours paid rather than hours worked. For example, increased minimum annual leave provisions in New Zealand from 2007 had the effect of reducing average hours worked per worker but had no direct effect on hours paid.

11. The use of calendar years aligns with the usual practise of the OECD. However, the OECD do not use calendar years for New Zealand GDP data. The OECD take New Zealand's GDP data on a March year basis as this is the way Statistics New Zealand publishes it (so 2007 in the OECD GDP figures actually refers to the year to March 2008).

industries by 0.3 percent points per annum. In Australia, the same approach is used in both the market-sector and economy-wide measures and so the issue does not arise. The New Zealand data are not wrong. The measured-sector estimates are "fit for purpose" as industry estimates are needed and this cannot be done with hours worked data, especially prior to 1996 when industry coding is less consistent. The issue arises when comparisons are made with other countries that have better hours worked data and so chose this as the basis of their official productivity measure, as Australia did. With the OECD using hours worked, New Zealand (but not Australia) runs into problems when comparing economy-wide and measured-sector labour input data.

Table 3

Labour input growth from 1988 to 2008 in New Zealand and Australia

Annual average % changes	New Zealand 1988–2008	Australia 1988–2008
Economy-wide		
OECD	1.2% (Dec)	1.7% (Dec)
Labour force survey	1.3% (Mar)	1.7% (Jun)
Measured/market sector		
Official	0.3% (Mar)	1.1% (Jun)
Labour force survey	0.6% (Mar)	1.1% (Jun)

Note: Measured/market sector here is as defined in table 1. See date in brackets above for years used. Technically, the OECD figures are December years 1987-2007 but we have shown labour force survey for March/June years to be consistent with table 2 (OECD use March years for New Zealand output and June years for Australian output but December years for both labour inputs). Measured sector labour input growth is calculated from the index number published by Statistics New Zealand. The index number is derived using a chained Tōrnqvist index in which weights are based on industry wage shares of the measured sector nominal labour income. The actual hours paid series, which consistent with the Australian series is not weighted by labour income, grew by 0.4 percent from 1988 to 2008.

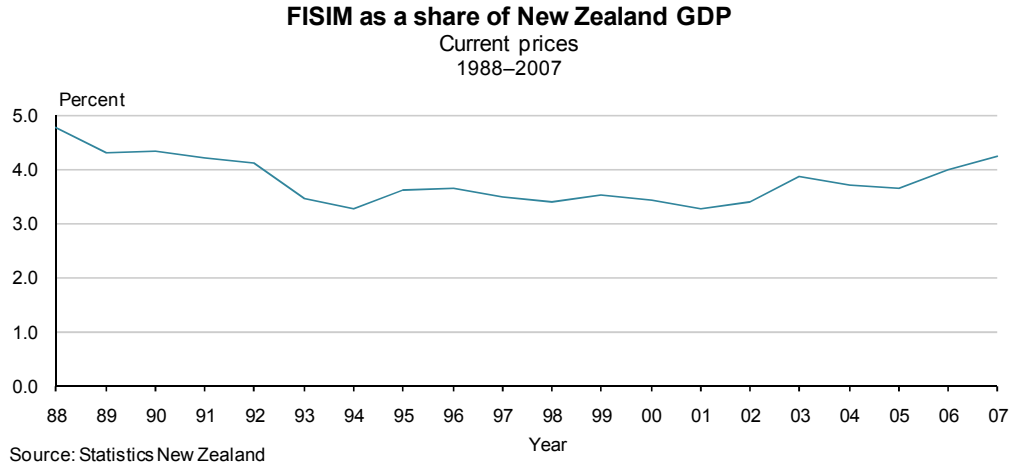
4.2 Financial Intermediation Services Indirectly Measured (FISIM)

FISIM are financial services that depositors and borrowers (both firms and households) pay indirectly to bank-type organisations through the depositor-borrower interest rate margin. These services are in the nature of security and convenience for depositors and liquidity and convenience for borrowers.

In New Zealand, total FISIM is treated as intermediate use rather than some of it being allocated according to use in final consumption or exports. Instead, FISIM is measured as intermediate consumption in a nominal industry outside the measured sector. Figure 5 plots FISIM as a share of New Zealand nominal GDP. In current price terms, FISIM grew by 4.5 percent per annum, while total GDP grew by 5.2 percent per annum, from 1988 to 2007. In contrast, the ABS attributes FISIM to individual industries, exports, and final consumption. The use of FISIM for dwellings (household mortgages) is deemed to be intermediate usage and not final consumption (ie, it is an intermediate input into the output of owner-occupied

dwellings). The Australian 'supply and use' tables for 2005 suggest that one-third of FISIM is in final consumption and two-thirds is for intermediate use (including that used by owner-occupied dwellings).

Figure 5



The current treatment of FISIM has three implications for New Zealand's GDP and productivity estimates. Firstly, it reduces the level of GDP and economy-wide productivity, as all FISIM is counted as an intermediate input, as opposed to some of it being allocated to final consumption or exports. Secondly, it inflates the level of output and productivity in the measured sector, as not all intermediate use is accounted for in calculating value added. Thirdly, it reduces the level of output and productivity in the non-measured sector, where all intermediate use is recorded and scored as a negative.

If New Zealand allocated one-third of FISIM to final consumption in 2005, the level of current price GDP would have increased between 1–2 percent. Overall, the effect of allocating FISIM on GDP growth and productivity growth will depend on the actual allocations, but is likely to be small. There are plans to allocate FISIM in the near future in accordance with the System of National Accounts 1993 (SNA93).

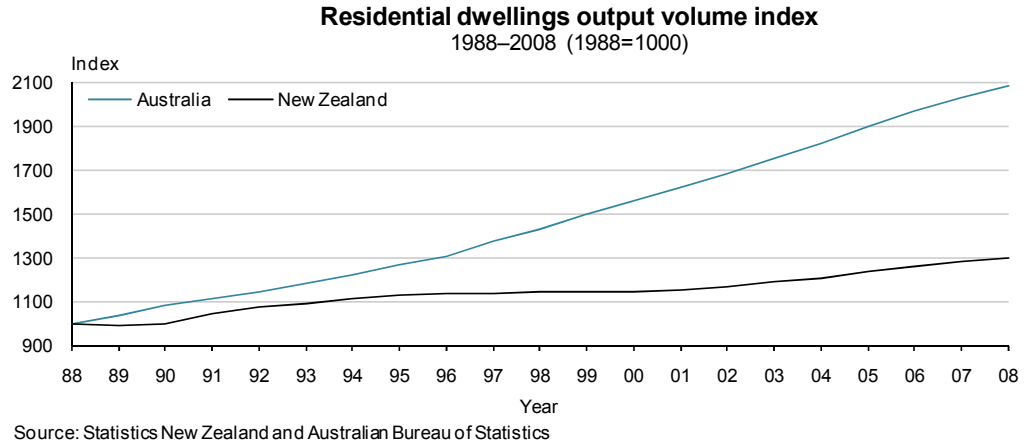
4.3 Residential dwellings

The value-added associated with residential dwellings reflects the provision of housing services by the owners of housing to occupants regardless of whether the owner is also an occupant. In this regard, rental housing is clearly a market activity with expenditure on rents and output of services. Under SNA93, *imputed* rents of owner-occupied dwellings (OOD) are included in the National Accounts so that GDP is not affected by relative shifts in the size of the owner-occupied and rental housing sectors. The size of the output is relatively large, with housing services consumed by owner-occupiers in New Zealand comprising 8.7 percent of nominal GDP from 1990 to 2007. In Australia, housing services consumed by owner-occupiers and private renters made up 8.9 percent of nominal GDP over the same period (see table 1).

Figure 6 below uses each country's chosen methodology for the output of residential dwellings. Over the 1988 to 2008 period the reported expansions are over 100 percent and 25 percent for Australia and New Zealand respectively. Given that both countries experienced long housing booms during the 1998 to 2008 period and that rates of owner-occupation have

not changed dramatically, the large difference in these growth rates suggests that differing measurement methodologies may be part of the explanation.

Figure 6



Source: Statistics New Zealand and Australian Bureau of Statistics

The approaches are similar in many respects, although there are fundamental differences which appear to cause significantly different growth rates over time.

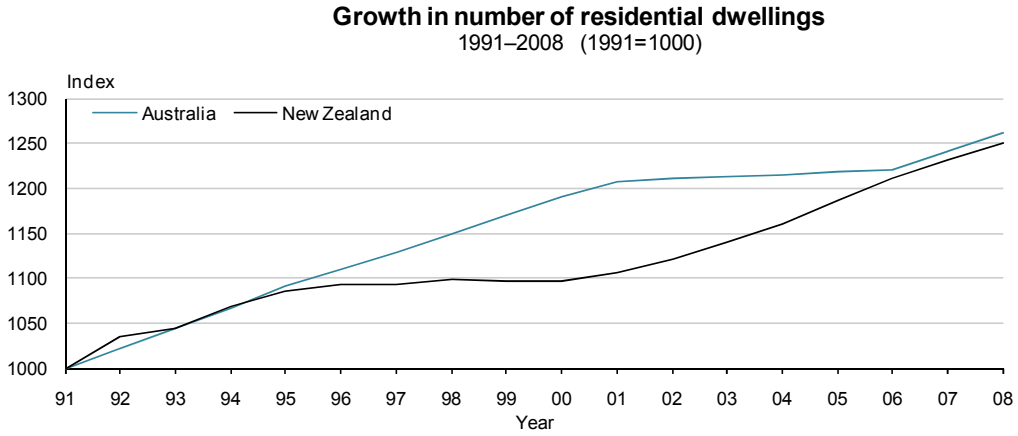
When calculating gross output, Statistics NZ uses the five-yearly census to benchmark dwelling numbers for owner-occupiers, and demography estimates are used to interpolate between census years. These totals are multiplied by an average rental price to calculate current price gross output. This average rental price is also benchmarked to the census. It is the volume indicator – essentially growth in census owner-occupied dwellings – which is of importance. The ABS approach is similar, in that the census is used as a benchmark. Interpolation between the five-yearly points is achieved by using movements in the productive capital stock of residential buildings owned by the household sector. While this interpolation technique is different to that of Statistics NZ, it is unlikely to create long-run divergences in growth rates between the two countries.

However, there are two fundamental differences in the approaches. Firstly, the ABS 'ownership of dwellings' industry (represented in figure 6) in the National Accounts covers not only owner-occupied dwellings, but also private rental dwellings. In the New Zealand National Accounts, private rental dwellings are included within the property services industry. While this has an impact on the relative size of the ownership of dwellings industry in the two countries, the impact on growth rates is less obvious and not thought to be significant. In fact, in volume terms owner-occupied dwellings have grown at 3.7 percent annually in Australia from 1988–2008, while private rental dwellings have grown at 3.0 percent annually. Owner-occupied dwellings comprise approximately 75 percent of the aggregate.

Secondly, the Statistics NZ gross output volume measure is essentially the growth in the number of owner-occupied dwellings. There is no distinction between differences in the type or quality of the dwelling. The ABS approach also measures growth in the number of owner-occupied dwellings. However, it distinguishes different types of dwellings based on their location (ie, urban or rural) and the number of bedrooms. Each of the dwelling types are expenditure-weighted; if a dwelling type with a relatively high weight is growing faster than the average, then aggregate growth will be higher than the growth in the count of dwellings. This approach implicitly adjusts for quality, using location and the number of bedrooms as proxies

for quality. To get a feel of the difference that this adjustment makes, figure 7 removes, for Australia, both private rented dwellings, and the implicit quality component. It commences in 1991 but for New Zealand, it is otherwise a replica of figure 6. Figure 7 simply reflects increases in the *number of owner-occupied dwellings* in both Australia and New Zealand. Over the 17 years from 1991 to 2008, the growth rates have been very similar, at 1.4 percent annually for Australia and 1.3 percent for New Zealand.

Figure 7



Source: Statistics New Zealand and Australian Bureau of Statistics

In conclusion, the difference between figure 6 and 7 indicates that the implicit quality adjustment by the ABS largely accounts for the trans-Tasman difference in the output growth of ownership of dwellings. This adjustment amounts to approximately 0.15 percentage points of growth in economy-wide output per year over the period 1991 to 2008.

4.4 Property and business services

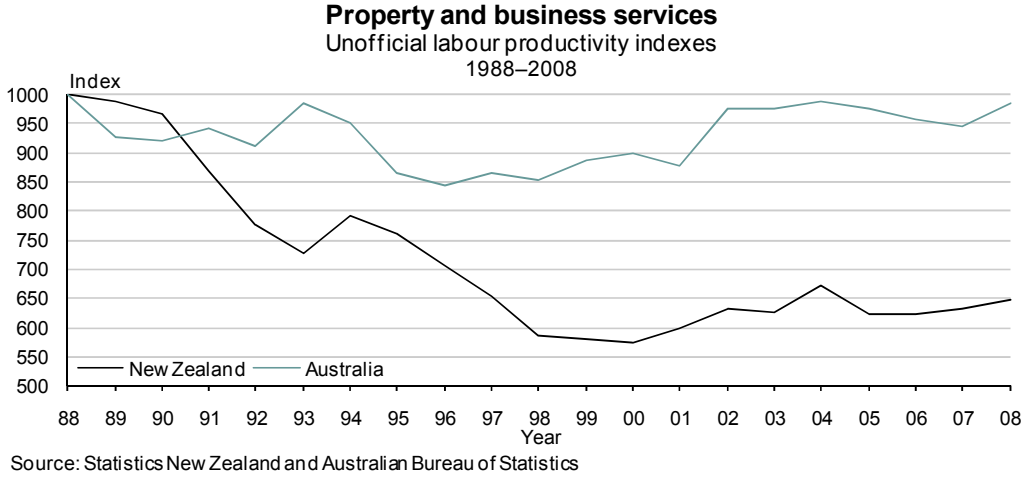
Property and business services' is a relatively large industry at around 14 percent of New Zealand GDP and around 12 percent of Australian GDP. This is a diverse industry and in New Zealand can be broken down into two working industries. Industry 'LA' (Property) includes: residential property operators; commercial property operators and developers; real estate agents; investors in intellectual property and other non-financial assets; and machinery equipment hiring and leasing. Industry 'LC' (Business services) includes: scientific research and technical services; computer services; legal and accounting services; and other business services.

From 1988 to 2008, business services contributed about 55 percent of the aggregate value added of property and business services. Figure 8 plots the HLFS-based labour productivity proxy series for property and business services and suggests that this industry could be a major part of the non-measured sector productivity puzzle, either due to real differences in productivity performance or simply different measurement.[12] Table 4 indicates that over the

12. Over the period 1988 to 1998, where the gap for this industry opens up, the HLFS-based labour productivity measure shows the largest decline compared to alternatives based on the QES or LEED. However, across the full 1988 to 2008 period the overall change persists under alternative labour input measures.

1988 to 2008 period, labour input growth in property and business services was similar in the two countries, whereas the output of the industry grew significantly more slowly in New Zealand.

Figure 8



Source: Statistics New Zealand and Australian Bureau of Statistics

Table 4

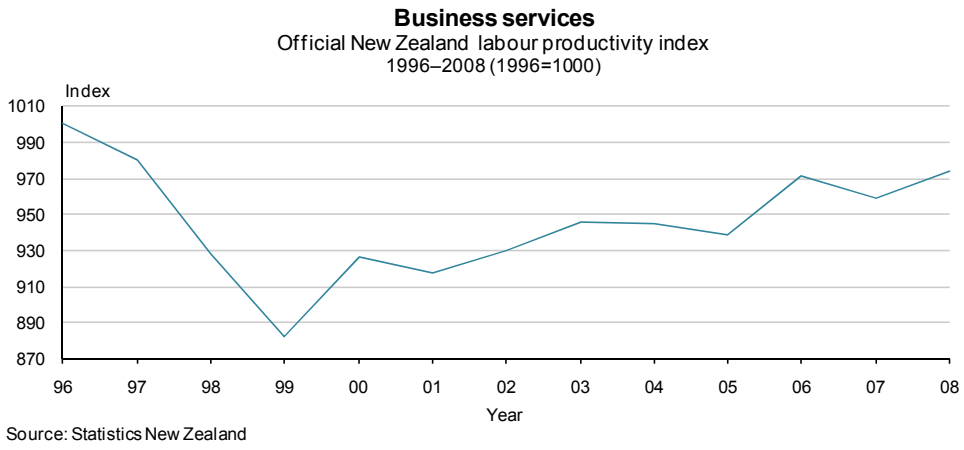
Average annual growth rates in property and business services 1988–2008

	Australia	New Zealand
Output	4.4	2.9
Labour input	5.0	5.2
Labour productivity	-0.5	-2.1

Importantly, the output growth of business services prior to 1996, was taken as equal to the growth of labour inputs to business services in the Statistics NZ National Accounts. Since 1996, Statistics NZ has had independent output measures and business services are now included in New Zealand's wider official measured sector. This has not yet happened in Australia. The official Statistics NZ series in figure 9 below shows a similar picture to the HLFS-based series used in figure 8, apart from the decline continuing for one more year, through to 1999.

There is some international evidence indicating that low labour productivity growth is common in the business services industry – output growth is strong by economy-wide standards, but labour input growth is just as strong. Kox, van Leeuwen, and van der Wiel (2007) build on earlier work to suggest that the cause of this sluggish productivity growth is sub-optimal scale. The overwhelming majority of firms in the industry operate at a level where potential scale economies are left unexploited. The increasing contracting out of activities to firms in business services from firms in other sectors may also explain this underperformance if labour input is being attributed to business services but output is being mis-attributed.

Figure 9



4.5 Government administration and defence, education, and health

Three of the five industries outside Statistics NZ's former measured sector consist of goods and services produced mainly by the public or government sector, with the role of the private sector varying between New Zealand and Australia (eg in education). These industries (M, N, and O as shown in table 1) are 'Government administration and defence', 'Education' and 'Health and community services'. Combined they comprise around 14.6 percent of GDP in New Zealand and 15.1 percent of GDP in Australia. Statistics NZ is undertaking work to include education and health in the measured sector. There are no plans to include government administration and defence.

Measuring outputs in public-sector or government industries represents a serious methodological challenge (the measurement of inputs is relatively straightforward, although far from trivial). First, government outputs are mainly services whose quantity let alone quality are inherently more difficult than goods to measure. Secondly, most government services are free at the point of use and do not have market prices associated with them. So the use of prices as weights to aggregate volume series of different outputs within an industry is unavailable.

SNA93 encourages direct measurement of the actual volume of goods and services produced in government industries, while recognising that this is not always practical given currently available data. In their absence SNA93 acknowledges that national income statisticians may have to proxy outputs by using deflated expenditure on inputs (labour, capital, and intermediate consumption). This is sometimes referred to as the 'output = inputs' approach. Given that the growth of productivity is the growth of output less the growth of inputs, this proxy method would tend to give productivity growth measures closer to a value of zero regardless of the economic reality. The output = input approach is used in Government administration and defence.

From the 1990s, Statistics NZ and the ABS have progressively introduced further direct output measures for significant parts of the government sector, for example in health Statistics NZ introduced a direct hospitals volume index in the late 1990s. Statistics NZ produces output

indexes of health and education services that feed into the measurement of aggregate output in the National Accounts.

Within the government industries, the extent and quality of direct volume measurement is variable. For example coverage is broader in education compared with health. Health outputs in New Zealand that are measured are hospital in-patient and day-patient services. Together they comprise only around 31 percent of total Ministry of Health expenditure (with out-patient and long-term care absorbing around 34 percent and 20 percent respectively of the remainder).[13] So for nearly 70 percent of government health expenditure[14], the output = inputs methodology is still the main method of estimating the contribution of health to overall output in the National Accounts.

In the case of education, Statistics NZ uses enrolment numbers as the main volume measure of output for the early-childhood, primary, and secondary sectors, and full-time student equivalents in the tertiary sector. Roll numbers are less than ideal for early-childhood education, where international best practice is to use actual pupil-hours. For the school sector, best practice is to adjust raw pupil numbers for attainment and at tertiary best practice is to use course credits as the output measure.

Both the current New Zealand and Australian National Accounts treatment of education falls short of international best practice. A 2006 Eurostat and OECD survey of methods of National Accounts estimates of outputs for education services puts them both in an intermediate category.[15]

Table 5

Output measures in education

Quality adjusted quantity measure	Austria, France, Hungary, Italy, Latvia, Lithuania, Malta, Spain, Sweden, UK
Quantity measure only, no quality adjustment	**Australia**, Belgium, Czech Republic, Finland, Germany, Greece, **New Zealand**
Output=inputs	Canada, Denmark, Japan, Korea, Luxembourg, Switzerland, US

Source: OECD

Input measures for labour, capital, and intermediate consumption in government industries are less contentious than for outputs. The methods and challenges for calculating them appear to be generally within the range of those for industries within the measured sector. As described above, Statistics NZ uses a variety of data sources to calculate its preferred labour input series by industry within the measured sector. Such series do not yet exist for the government and non-government industries outside the measured sector.

13. See Statistics NZ (2010), section 6.2.4.

14. The outputs of private health services such as those funded by private insurance and delivered in private hospitals do generally get measured independently of inputs.

15. For more detail on measuring education output in New Zealand see Statistics NZ (2010), Chapter 7.

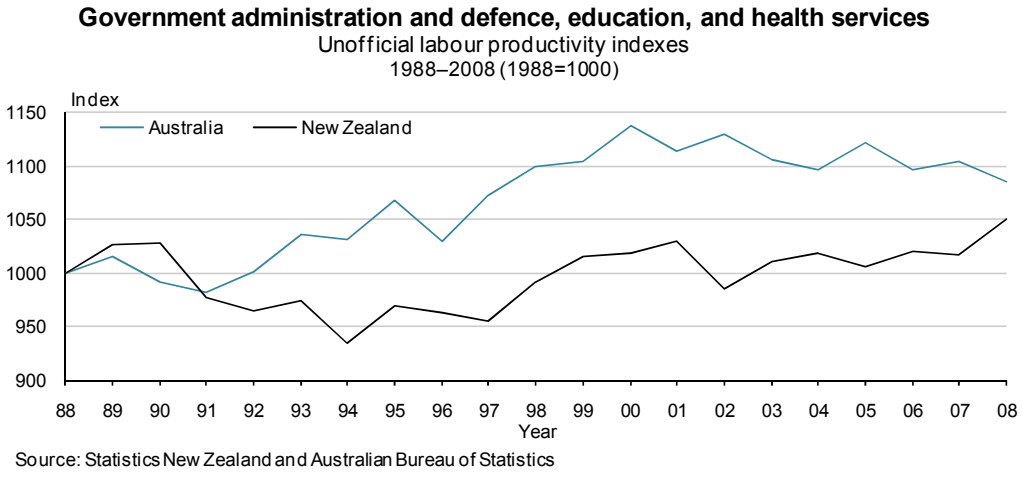
Table 2 uses measures of hours worked from the HLFS to calculate unofficial labour productivity series for industries outside the measured sector, including the three government dominated industries. Statistics NZ notes that the quality of industry coding prior to 1996 (and therefore the introduction of ANZSIC) is less robust and the three government industries display some marked changes in labour input in the early 1990s. This suggests combining them into a single government dominated sector, as is done in table 6 and figure 10.

Table 6

Average annual growth rates in government administration and defence, health, and education 1988–2008

	Australia	New Zealand
Output	2.8	2.6
Labour input	2.4	2.4
Labour productivity	0.4	0.2

Figure 10

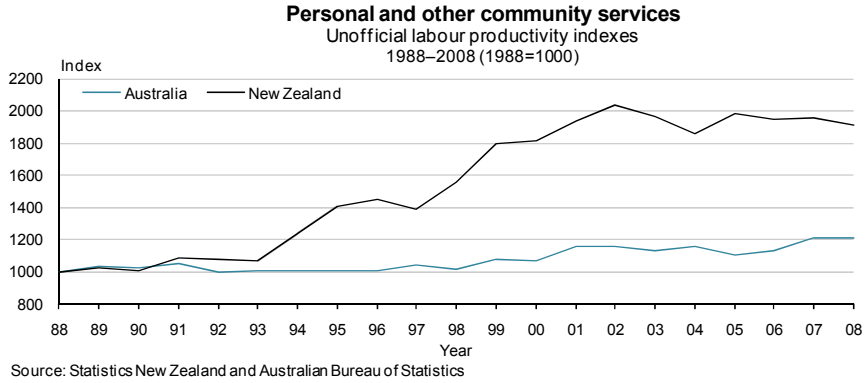


Notwithstanding the likely trans-Tasman difference in the roles of the public and private sectors in these industries, labour productivity growth across the 1988 to 2008 period was higher in Australia. However, given the issues around the robustness of HLFS industry data in the earlier part of this period, there is a case for treating the post-1996 estimates as having greater reliability. In the post-1996 period, labour productivity in the combined industries in New Zealand grew at an average rate of 0.7 percent per year, compared with 0.4 percent per year in Australia.

4.6 Personal and other community services

The last of the five industries outside the former measured sector is 'Personal and other community services', which includes a variety of activities (eg, hiring of personal and household goods; hairdressing; religious organisations; business, professional and labour organisations). This is a relatively small industry at around 1.4 percent of GDP in New Zealand and 2 percent of GDP in Australia. This industry is in the current official Statistics NZ measured sector from 1996. Figure 11 plots the unofficial productivity data for the ABS (GDP / LFS hours worked, under ANZSIC93) and an unofficial series for New Zealand (GDP / HLFS hours worked). Over the 20-year timeframe, labour productivity growth averaged 3.8 percent in New Zealand, and 1.0 percent in Australia. New Zealand experienced both higher output growth and lower labour input growth, relative to Australia.

Figure 11

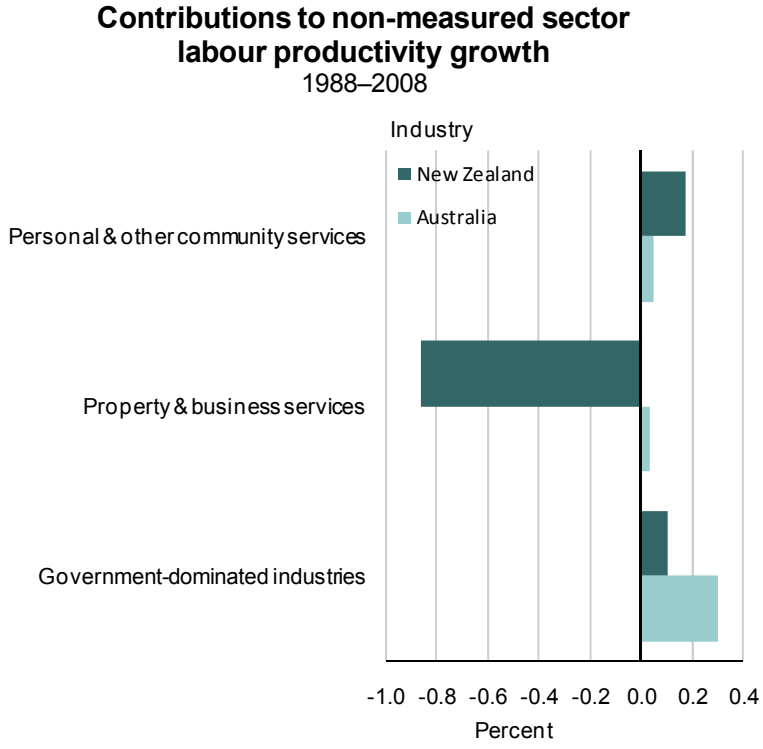


Source: Statistics New Zealand and Australian Bureau of Statistics

4.7 Contributions to the overall productivity performance of the non-measured industries

Figure 12 plots the percentage point contributions of the industries covered in sections 4.4, 4.5, and 4.6 to the combined labour productivity growth rate of these industries between 1988 and 2008 – that is, the 0.5 percent and -0.1 percent in table 2. The property and business services industry is the main explanation for this difference, although the government-dominated industries combined (government administration and defence, education, and health services) also contributed. There was only a small offset from stronger labour productivity growth in New Zealand's personal and other community services industry.[16]

Figure 12



Source: Statistics New Zealand and Australian Bureau of Statistics

16. There is also a residual not shown in figure 12.

5 Industries within the former measured sector

Overall, the reconciliation of the economy-wide versus measured sector labour productivity puzzle requires a detailed examination of the inputs used to calculate productivity and of the industries outside the measured sector. The non-uniform labour productivity growth across the non-measured industries, some of it measurement and some real, suggests we should also examine the possibility of trans-Tasman industry differences *within* the former measured sector – even if the aggregate growth rates are similar.

This section focuses on comparisons between New Zealand's and Australia's measured-sector industry growth performances (see Statistics NZ, 2010). Consistent with the earlier sections, comparisons are made over the 1988 to 2008 period, for output, labour input, and labour productivity. The one exception to this is the cultural and recreational services industry (division P in table 1) which commences in 1996.

From 1988 to 2008, measured-sector output increased by 2.7 percent annually in New Zealand, and by 3.2 percent in Australia. For both countries, output was higher in all measured-sector industries in 2008 than it was in 1988. Australia's output growth was higher in 11 industries, with just communication services growing faster in New Zealand. In the agriculture, forestry, and fishing industry, both countries had very similar average annual growth rates.

Australia's strongest performing industries relative to New Zealand were mining and construction. The mining industry recorded growth of 3.6 percent annually in Australia, compared with 1.9 percent in New Zealand. Growth in the construction industry was 4.3 percent and 2.4 percent, in Australia and New Zealand, respectively. From 1988 to 2008, Australia's fastest-growing industries were communication services, finance and insurance, construction, and cultural and recreational services. All grew at more than 4 percent per year over their respective time series.

From 1988 to 2008, measured-sector labour input in New Zealand grew by 0.3 percent annually, compared with 1.1 percent in Australia. In New Zealand, labour input fell in six of the industries, while rising in the other six. This compares with Australia, where labour input declined in three industries. Of these three – electricity, gas, and water supply; manufacturing; and agriculture, forestry, and fishing – labour input also declined in New Zealand.

The three industries with the fastest labour input growth were common to both countries, although ordered differently. These were cultural and recreational services (top in New Zealand but only from 1996 and third in Australia), accommodation, cafes, and restaurants (second in both New Zealand and Australia), and construction (third in New Zealand and top in Australia).

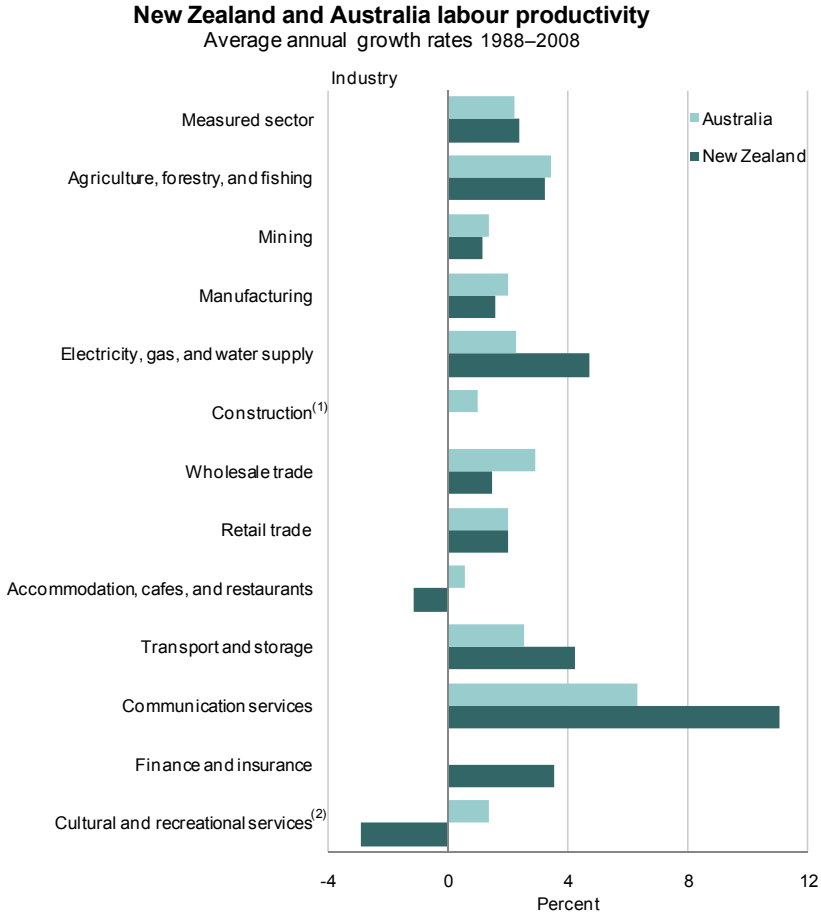
From 1988 to 2008, measured-sector labour productivity in New Zealand grew by 2.4 percent annually, compared with 2.2 percent in Australia (ie, table 2 above). However, there were some marked differences at the industry level. In both countries, the communications services industry was the strongest performer, growing at 11.0 percent per year in New Zealand, and 6.3 percent per year in Australia.

The other industries in which New Zealand outperformed Australia were electricity, gas, and water supply; transport and storage; and finance and insurance. Aside from electricity, gas, and water supply in Australia, these industries were among the strongest performers in both countries.

Industries in which Australia outperformed New Zealand were agriculture, forestry, and fishing; mining; manufacturing; construction; wholesale trade; retail trade; accommodation, cafés, and restaurants; and cultural and recreational services.

As noted above, three of these industries were the fastest growing in terms of labour input in both countries – cultural and recreational services; accommodation, cafes, and restaurants; and construction. In both countries, all three recorded weak productivity growth, or falling productivity.

Figure 13



1. Zero for New Zealand.
2. Average annual growth rates are for 1996–2008 in both Australia and New Zealand for cultural and recreational services.

Source: Statistics New Zealand and Australian Bureau of Statistics

Despite manufacturing productivity growth being lower than the measured-sector average in both New Zealand and Australia, it is easily the highest weighted industry in the measured sector, and therefore contributes strongly. Other key contributors in New Zealand are those industries which have had the highest growth rates – communication services; agriculture, forestry, and fishing; transport and storage; and finance and insurance. All have contributed more than 0.3 percent annually to productivity growth. In Australia, the industry drivers are slightly different. Finance and insurance is a key contributor, but this is followed by wholesale trade and retail trade, both contributing more than 0.25 percent to growth annually.

6 Conclusions

Statistics NZ has published official productivity statistics for the measured sector of the New Zealand economy since 2006, with the current version of the measured sector covering around 74 percent of GDP. Use of the same industrial classification system, as well as similar, internationally-accepted methodologies for measuring productivity, allows official New Zealand and Australian productivity data to be compared across 12 broad industries. These industries account for just over 60 percent of each economy.

The OECD publishes economy-wide productivity statistics for all its member countries. Both Australia's and New Zealand's economy-wide labour productivity growth performances are lower than their official measured-sector performances, and this is especially so in New Zealand. Our main conclusions about labour productivity levels and the different outcomes across the four labour productivity growth series and how we explain them are laid out below.

The economy-wide labour productivity levels gap between Australia and New Zealand started to open up in the late 1960s (ie before the start of the any of the series referenced in this paper) and widened in the 1970s. Between the early 1980s and mid-1990s the gap was broadly unchanged, before starting to widen again (figure 2).

By the end of the 2000s, New Zealand's economy-wide labour productivity level was around 30 percent below that of Australia (figure 2). There are some measurement differences (eg with regard to FISIM and OOD) that account for some of this gap but only a relatively small part.

For the whole economy, Australia's average annual labour productivity growth rate (1.7 percent) exceeded New Zealand's (1.4 percent) over the 1978 to 2008 period. Growth rates were similar up to the early-1990s with Australia then drawing away for several years before resuming a similar trend from the early 2000s (figure 3).

In the measured sector, New Zealand's average annual labour productivity growth (2.2 percent) exceeded Australia's (2.0 percent) over the 1978 to 2008 period. New Zealand's growth rate was generally higher from the late 1980s to the mid 1990s and was otherwise similar to Australia's (figure 4).

The differences in the Australian and New Zealand economy-wide and measured-sector labour productivity performances is the main puzzle we have investigated in this paper. The puzzle holds over the 1988 to 2008 period – for which we have (unofficial) industry data to help explain it. However, the differences are sensitive to the time period chosen. For example, over the period 1996 to 2008 both Australia's economy-wide and measured-sector labour productivity growth rates exceed those of New Zealand. From 2001 to 2008, New Zealand was ahead in economy-wide labour productivity growth but behind in the measured sector.

The choice of labour input appears to explain a part of the productivity puzzle. For example, over the period 1988-2008, use of HLFS hours worked for measured-sector labour input in New Zealand reduces measured-sector labour productivity growth from 2.4 percent to 2.2 percent. This is the same as the Australian growth rate and so removes a part of the puzzle, at least over this particular time period.

The allocation of the appropriate proportion of FISIM to final consumption would lift New Zealand's GDP level by around 1 percent to 2 percent. The effect on productivity growth will depend on the actual allocations but is likely to be small.

In the case of residential dwellings, Statistics NZ and the ABS use different methodologies with regard to housing quality and this contributes to the puzzle. The Statistics NZ approach, if applied to Australian data, would lower economy-wide labour productivity growth by approximately 0.15 percent per year over the period 1991 to 2008. We conclude that use of the same methodology in the two countries would act to reduce a significant portion of the gap in the economy-wide growth rates - perhaps by up to a half.

The three industries outside the measured sector that are dominated by government - government administration and defence, education, and health - have slightly lower (unofficial) labour productivity growth in New Zealand over the period 1988–2008. However, if we focus on the period from the mid-1990s when the data are more robust, the New Zealand growth rate for these industries overtakes Australia's. Overall the evidence does not point to differences in these government-dominated industries explaining any significant part of the puzzle, however there are known issues surrounding the robustness of the output data for parts of these industries.

'Property and business services' is a large industry outside the measured sector whose (unofficial) labour productivity growth rate is negative in New Zealand and close to zero in Australia over the period 1988–2008. While some of this difference could reflect measurement problems, there is enough evidence (eg the official New Zealand measure of business services post-1996 confirms negative growth) to suggest that there is a real difference and that this also contributes to explaining a significant part of the puzzle. It would be useful to understand better the reasons for the poor performance in this industry.

The new New Zealand industry-level productivity dataset allows for robust growth comparisons with Australia at the industry level, including a growth-accounting decomposition that is currently unavailable for the non-measured industries. Further comparative analysis at the industry level is likely to yield further insights and understanding.

Overall, both economy-wide and measured-sector measures of labour productivity growth are valid measures. They give different readings; this is partly because of real differences relating to their different coverage of the economy and partly because of measurement difficulties. They are also sensitive to the time period chosen.

Over the period we examined most closely, 1988–2008, New Zealand's measured-sector growth was slightly ahead of Australia's corresponding sector but there was not a lot in it. On the other hand, Australia had faster growth economy wide and this cannot all be dismissed as a statistical anomaly. The levels gap in economy-wide labour productivity decisively favours Australia and has remained roughly constant for the last 10 years at around 30 percent of the Australian level.

What does this all mean for policy? We would say that raising New Zealand's productivity growth remains its most important economic challenge: the levels gap is still large even after measurement issues are taken into account. While New Zealand measured-sector productivity growth has been at least on a par with Australia, it needs to be faster to close the large gap; and it is disappointing that the higher growth rate expected of an otherwise similar country coming from behind has not eventuated in New Zealand's case.

A further perspective is that Australia has had higher labour input growth and has managed to deploy a greater proportion of it to the measured sector that generally has had faster productivity growth. In fact New Zealand's measured sector saw particularly slow growth in its labour input. One hypothesis for further investigation is that the New Zealand economy was

less successful in allocating labour to industries with higher productivity growth than the Australian economy. This could have been due to fewer opportunities, greater rigidities, or greater imbalances.

Finally, we recognise that this paper has not looked at the trans-Tasman breakdown of labour productivity into multifactor productivity and capital deepening. This will require tackling a number of difficult issues connected with the measurement of capital inputs. This is an important topic for further investigation and analysis.

References

Australian Productivity Commission (2009). *Inquiry into raising the level of productivity growth in the Australian economy.* Submission to the House of Representatives Standing Committee on Economics. Canberra: Author.

Diewert, WE, and Denis, L (1999). *Measuring New Zealand's productivity*. (Working Paper No 99/5). Wellington: New Zealand Treasury.

Dolman, B (2009). What happened to Australia's productivity surge*? The Australian Economic Review*, *42*, (3).

Dolman, B, Parham, D, and Zheng, S (2007, March). Can Australia match US productivity performance? *Australian Productivity Commission, Staff Working Paper*, Canberra.

Drew, A (2007). New Zealand's productivity performance and prospects. *Reserve Bank of New Zealand, Bulletin, 70*, (1).

Ewing, R, Fenner, S, Kennedy S, and Rahman, J (2007, Winter). Recent productivity outcomes and Australia's productivity growth, *Australian Treasury, Economic Roundup*, Canberra.

Kox, HLM, van Leeuwen, G, and van der Wiel, HP (2007, December). Market structure, productivity and scale in European business services. *Statistics Netherlands Discussion Paper* (7013), Munich: University of Munich.

Mason, G, and Osborne, M (2007, January). Productivity, capital-intensity and labour quality at sector level in New Zealand and the UK, *New Zealand Treasury Working Paper*, Wellington.

New Zealand Treasury (2008, April). New Zealand's productivity performance. *New Zealand Treasury Productivity Paper,* Wellington.

OECD (2001). Measuring productivity: Measurement of aggregate and industry-level productivity growth. Paris: OECD.

OECD (2008). OECD compendium of productivity indicators, Paris: OECD.

Sharpe, A (2004). Ten productivity puzzles facing researchers. *International Productivity Monitor*, *9*.

Statistics New Zealand (2009). Comparing the income gap between Australia and New Zealand: A 2025 Taskforce analytical report. Wellington: Statistics New Zealand.

Statistics New Zealand (2010). Measuring government sector productivity in New Zealand: a feasibility study. Wellington: Statistics New Zealand.

Statistics New Zealand (2010). *Industry productivity statistics 1978-2008*. Wellington: Statistics New Zealand.

The New Zealand Institute (2009). *Towards an economic strategy for New Zealand*. Auckland: The New Zealand Institute.

2025 Taskforce (2009). Answering the $64,000 Question: Closing the income gap with Australia by 2025. Wellington: First report of the 2025 Taskforce.