

Taking on the West Island:

Steps towards levelling the playing field

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## Abstract

### New Zealand’s productivity performance has gained considerable attention in recent times, particularly compared with Australia’s. *Taking on the West Island: How does New Zealand’s labour productivity stack up?* (Statistics NZ, 2010b) examined some of the methodology, data, and coverage differences underlying the measurement of output and labour productivity growth rates between in New Zealand and Australia.

### Since 2010, coverage of official productivity statistics in both countries has increased to around 80 percent of their respective economies. Levels of industry labour volume (hours paid) for measured sector industries have also been made available for New Zealand, enabling industry labour productivity level comparisons to be made within New Zealand.

### This paper examines the impact of these changes on some of the conclusions drawn from *Taking on the West Island: How does New Zealand’s labour productivity stack up?*, as well as providing some new analysis of how capital services in New Zealand are measured and the implications that this has for multifactor productivity.

### 1 Introduction

Productivity is a key determinant of a country’s material standard of living over time. The 2010 paper *Taking on the West Island: How does New Zealand’s labour productivity stack up?*, examined differences in methodology, data, and industry coverage underlying the measurement of labour productivity growth rates for New Zealand and Australia.

The present paper has four objectives. The first is to update the previous comparisons to account for the increased industry coverage that is now available through official statistics, and to compare these official statistics with economy-wide estimates produced by the OECD. The second objective is to highlight and explore any remaining unresolved data or methodological issues in measurement between Australia and New Zealand, including future developments. The third objective is to shed new light on labour productivity levels and to highlight the difficulties in making levels comparisons. The fourth objective is to set out some preliminary analysis of differences in capital measurement and multi-factor productivity growth.

Although this paper outlines progress made to resolve data and methodological issues, using alternative data sources, methods, and sample periods can result in a trade-off between what is judged best for national productivity statistics and what makes cross-country comparisons consistent. There is generally less of a trade-off in the case of output, but more of a trade-off in the case of labour and capital inputs. Using different data sources and methods can also mean that the robustness of data can vary over time. This is because quality of data sources can vary and/or specific judgements made about methodological changes can affect final productivity statistics.

The introduction of wider industry coverage and the results of the preliminary analysis on variations in capital measurement discussed in this paper (section 5) reinforce these conclusions. While there is no single best measure of productivity it is important to document the differences.

Finally, these trans-Tasman comparisons are still work-in-progress given forthcoming work on aligning industry classification systems (see Section 3 below). We are planning to include these changes in an updated version of the paper later in 2012.

### 2 Key findings of *Taking on the West Island: How does New Zealand’s labour productivity stack up?*

Key points of *Taking on the West Island: How does New Zealand’s labour productivity stack up?* (Statistics NZ, 2010b) were as follows.

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, being the main source of the per capita GDP gap (as opposed to a gap in labour utilisation).

Over the period for which there are both economy-wide and comparable official productivity statistics (1978 to 2008), the average annual growth rate of Australian economy-wide labour productivity was 1.7 percent, compared to 1.4 percent for New Zealand. For the (then) measured sector, New Zealand’s average annual labour productivity growth of 2.2 percent exceeded growth in Australia of 2.0 percent.

Differences in labour productivity growth rates were found to be 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 exceeded those of New Zealand.

The differences in the Australian and New Zealand economy-wide and measured-sector labour productivity performances were investigated over the 1988 to 2008 period. The choice of labour input appeared to explain a part of the difference. The use of hours-worked, as opposed to hours-paid for measured-sector labour input in New Zealand reduced measured-sector labour productivity growth from 2.4 percent to 2.2 percent – the same as the Australian growth rate.

The allocation of the appropriate proportion of ‘financial intermediation services indirectly measured’ (FISIM) to final consumption was judged to lift New Zealand’s GDP level by around 1 percent to 2 percent. However, the effect on labour productivity growth was considered to depend on the actual allocations. This effect was likely be small.

In the case of residential dwellings, Statistics NZ and the Australian Bureau of Statistics (ABS) use different methodologies with regard to quality adjustment and the allocation of private rental dwellings (with Statistics NZ including them in ‘property services’ and the ABS including them with owner-occupied dwellings). The Statistics NZ approach, when applied to Australian data, lowered Australian economy-wide labour productivity growth by approximately 0.15 percent points per year over the period 1991 to 2008. This is around half of the gap in the economy-wide labour productivity growth rates.

Notwithstanding that the three government dominated industries outside the measured sector (‘government administration and defence’, ‘education’, and ‘health’) do not have independent measures of output and productivity. The evidence did not point to differences in these industries explaining any significant part of the economy-wide productivity growth gap.

‘Property and business services’ was a large industry outside the then measured sector whose (unofficial) productivity growth rate was negative in New Zealand and close to zero in Australia over the period 1998 to 2008. While some of this difference could reflect measurement problems, it was concluded that there was enough evidence to suggest a real difference in performance.

The gap in growth rates between the New Zealand and Australia began to accelerate in the mid-1990s. Figure 1 shows how the gap between New Zealand and Australia economy-wide GDP per hour has widened since the late 1990s.

Figure 1  
Economy wide labour productivity levels – New Zealand and Australia



### 3 What has changed since *Taking on the West Island* (2010)

Since 2010, the Australian Bureau of Statistics (ABS) and Statistics NZ, and the Organisation of Economic Co-operation and Development (OECD) have made developments in how they measure productivity.

The ABS now reports their productivity statistics using the new Australian and New Zealand Standard Industrial Classification 2006 (ANZSIC06). Statistics NZ is currently using an older version of this classification (ANZSIC1996), but will publish productivity statistics under ANZSIC06 later in 2012.

Because the ABS now uses the new industry classification when publishing their national accounts and productivity data, trans-Tasman industry comparisons are less valid. However, aggregate productivity measures can still be compared. The trans-Tasman industry growth rate comparison will be updated, when Statistics NZ publishes productivity statistics using ANZSIC06.

The ABS market sector coverage has increased to include the following ANZSIC06 industries: rental, hiring and real estate services; professional, scientific, and technical services; administrative, and support services; and other services. This has increased the coverage of the ABS market sector to around 77 percent of the Australian economy, compared with the previous 62 percent. The associated productivity statistics are termed ‘MFP16’ and data is available from 1995[[1]](#footnote-1) onward.

Statistics NZ has also expanded the coverage of their productivity statistics. New Zealand’s ‘measured sector’ now includes the following ANZSIC1996 industries: property and business services; and personal and community services. The measured sector now covers around 80 percent of the economy, and is comparable in size and coverage to the ABS’s expanded market sector (MFP16). Data for property and business services; and personal and community services is included in New Zealand’s productivity statistics from 1996 onward.

However, there is still a significant difference in coverage between the ABS MFP16 and Statistics NZ measured sector. Statistics NZ include in their measured sector the economic activity of private landlords while the ABS does not.

Statistics NZ now produces estimates of the level of hours paid by industry (for aggregated industries in the measured sector). This enables users to compare labour productivity levels between industries in New Zealand.

It is still difficult to compare industry labour productivity levels with Australia, but the labour hours paid series go some way towards achieving this goal. Although there have been some recent attempts to compare New Zealand and Australian productivity levels on an industry basis (NZIER, 2011), further work is scheduled for 2012 that will revisit these comparisons in terms of industry-specific purchasing power parities (PPPs). Earlier work comparing trans-Tasman industry productivity levels was undertaken before Statistics NZ and ABS released official productivity statistics (International Monetary Fund, 2002). A detailed comparison of New Zealand and UK industry productivity levels was carried out by Mason and Osborne (2007).

Since 2003, the OECD Productivity Database (PDB) has provided time series of productivity measures and their components. The database primarily contains economy-wide data. The OECD has recently published new productivity measures by industry (PDBi), for twenty OECD countries. However, the OECD did not publish any information about Australia or New Zealand (see Arnaud, Dupont, Koh and Schreyer, 2011).

Table 1 shows the industries included in the ABS MFP16 series, the Statistics NZ current measured sector, together with other industries and components of nominal GDP.

Table 1  
Coverage of official statistics – Australia’s MFP16 and New Zealand’s measured sector (1)



### 4 Puzzles, reconciliations, and outstanding methodological issues

Table 2 is based on the wider official productivity definitions used by New Zealand and Australia (the measured sector and MFP16). Statistics NZ and ABS now measure productivity for 80 and 77 percent of their respective economies. The industries not included in MFP16 and the measured sector are government-dominated industries that do not have output measures suitable for the calculation of productivity estimates [[2]](#footnote-2).

The analysis in this table will be updated when Statistics NZ starts publishing productivity statistics using ANZSIC06 later in 2012. Table 2 is an updated and modified version of table 2 in *Taking on the West Island: How does New Zealand’s labour productivity stack up?* (Statistics NZ, 2010b).

One reason for emphasising the post 1996 is that this period is less prone to data quality issues. For example, *Taking on the West Island: How does New Zealand’s labour productivity stack up?* (pg.12) noted some that there was some evidence that redesign of the Household Labour Force Survey (HLFS) in 1993-94 overstated growth in actual hours worked over this period. Significant economic reform took place before 1996. So, a second, perhaps more subjective reason, is that the using data after 1996 means that observed productivity is potentially less affected by adjustment processes and more reflective of structural trends.

Table 2

**Labour productivity growth (average annual growth) 1996-2011(1)**



Table 2 and figure 2 indicate that labour productivity growth was greater in Australia than New Zealand (MFP16 and current measured sector) from 1996–2011, growing an average of 2.0 percent and 1.4 percent a year, respectively. Australia’s average annual output growth was significantly higher, at 3.5 percent compared with New Zealand’s 2.5 percent. However, this additional output growth was partly accounted for by input growth. This is consistent with the findings of *Taking on the West Island: How does New Zealand’s labour productivity stack up?* over the period from 1996 to 2008, both Australia’s economy-wide and (narrower) measured-sector labour productivity growth rates exceeded New Zealand’s growth rates.

Figure 2

Measured sector labour productivity indexes



Labour productivity growth is often a focus of analysis because it is associated with real wages and because labour productivity has an intuitive link to ‘output per unit of time’. Growth in multifactor productivity (MFP) reflects the part of output growth that cannot be attributed to the growth of labour or capital inputs. MFP can be equated with technology change only if certain conditions are met (e.g., 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 technology change, include the effects of model misspecification and errors in the measurement of variables. Notwithstanding these caveats, the partial nature of labour productivity means it is useful to also consider developments in capital and multifactor productivity. Table 3 shows growth rates in key productivity variables in both Australia and New Zealand (for MFP16 and the current measured sector). The OECD economy-wide perspective is covered in Section 5.

Table 3



**Source**: Statistics NZ and Australian Bureau of Statistics

Based on relatively similar industry coverage, productivity in Australia’s MFP16 and New Zealand’s measured sector differed over the 1996–2011 period. New Zealand was slightly ahead in terms of MFP, with average growth of 0.6 percent, compared with 0.4 percent for Australia. Capital productivity also grew faster in New Zealand.

In contrast to the new wider measures of productivity, Parham (2012, p1, footnote 1) has focused his recent analysis of Australian productivity trends on a 12-industry market sector (or MFP12[[3]](#footnote-3)) “...because of the longer time series available and because of some concerns, shared by the ABS, about the quality of estimates for the additional industries in the 16-industry series”.

There is significant debate about Australia’s recent productivity performance, and in particular the role of the terms of trade shock. For example, Parham notes that the investment boom in mining has led to rapid growth of market sector capital (see table 3). Parham (p5) concludes that Australian productivity trends over the 2000s appear to be the result of strong input growth driven by marked changes in prices and profits.

Parham’s comments about the robustness of the wider productivity measures and their shorter time coverage suggest we should continue to also examine trans-Tasman productivity performance based on the narrower definition of the measured sector. Growth rates based on Australia’s MFP12 and New Zealand’s former measured sector are shown in table 4 and figure 3.

Table 4



**Source**: Statistics NZ and Australian Bureau of Statistics

Figure 3

Former measured sector labour productivity indexes



The coverage versus time period trade-off in table 3 and 4 (and figures 2 and 3) reinforces the point that there is no single best way to measure productivity over all time periods. Nonetheless, the broad message from the alternatives, as per the first West Island paper, is that New Zealand is not closing the productivity gap in any substantive way.

The following sub-sections revisit the remaining measurement issues considered in 2010.

* Alternative labour input measures
* Residential dwellings
* Financial intermediation services indirectly measured (FISIM).

An initial analysis of capital measurement and multifactor productivity is covered in section 5.

#### 4.1 Labour input

*Taking on the West Island: How does New Zealand’s labour productivity stack up?* relied on hours worked labour input from labour force statistics tofacilitate the economy-wide analysis with respect to the OECD data and to analyse labour productivity in those industries outside the then measured sector. For New Zealand this is the Household Labour Force Survey (HLFS) and Australia it was their Labour Force Survey (LFS).

*Taking on the West Island: How does New Zealand’s labour productivity stack up?* found that in New Zealand, between 1988 and 2008, labour input grew by an average of 0.3 percent per year in the former measured sector (using the productivity labour volume series) and by an average of 0.6 percent per year using HLFS data for the same group of industries. The gap between the two labour input measures was largest in the period from 1992 to 1995 (March years). Growth rates based on the HLFS increased strongly after the early-1990s recession. Using the HLFS labour input measure for New Zealand increased comparability with Australia conceptually, and lowered New Zealand’s former measured sector labour productivity growth from 2.4 percent per annum to 2.2.

Figure 4 shows the index of the New Zealand current measured sector labour volume series (LVS) relative to that of the HLFS. The two series converge in 2011, and the gap that was evident up to 2008 is no longer as apparent. Over the period from 1996 to 2011, the annual change in hours paid at the aggregate measured sector level from the LVS was 1.06 percent, compared to the annual change in actual hours worked from the HLFS of 1.00 percent. Therefore, the annual growth in hours paid is a good proxy for the growth in actual hours worked at an aggregate level.

Figure 4  
Measured sector household labour force survey vs. labour volume series index

In March 2012, Statistics NZ published estimates of the level of hours paid in the industries that make up the Statistics NZ measured sector. The release also discussed the rationale for using the LVS to calculate official productivity statistics. This work goes some way towards validating the LVS as a measure of labour volume for both growth and levels comparisons with the ABS’s survey based labour input series.

Conceptually, it is preferable to use ‘actual hours worked’ to measure productivity, as derived from a household-based survey, instead of the ‘hours paid’ data used in New Zealand’s official productivity analysis. However, to produce high-quality estimates of productivity, it is important that labour input data is robust and aligns with output and capital measures. At a total-economy level, this is not an issue. Actual hours worked provide the best measure of labour input when calculating measured-sector (or economy-wide level) estimates of productivity without any industry splits.

However, at the industry level, the hours-paid measure is more robust than the hours-worked measure. Statistics NZ has more confidence in aligning industry labour inputs with corresponding industry outputs using hours-paid data. Given that the methodology used to calculate Statistics NZ’s LVS is based on the aggregation of industry-level data, it is desirable to have good alignment of industry input and outputs[[4]](#footnote-4).

Figure 5 compares the levels of actual and usual hours worked from the HLFS with the labour hours-paid series used by Statistics NZ for productivity analysis. These series are compared using the same industry coverage (the productivity measured sector). While all three series grow at roughly the same rate from 2000 to 2010, there are level differences between the series.

These differences reflect the different nature of each measure. The series with the highest level is HLFS usual hours worked. It is around 8 percent higher than HLFS actual hours worked. These series differ because holidays and sickness absences are included in the usual hours series.

The series with the lowest level is the labour volume series (LVS). The LVS is around 5 percent lower than HLFS actual hours worked. As mentioned earlier, the LVS is a measure of paid hours. It excludes hours worked that are not compensated, such as unpaid overtime and voluntary work, and includes hours paid for that are not worked, such as holiday or sick leave. There are also coverage differences between the HLFS survey estimates and the LVS data.

Figure 5  
Measured sector HLFS vs. LVS level



Comparing these new measures of industry labour volume with Australian data sheds light on the labour composition of the two countries. Figure 6 shows the distribution of hours worked in the measured sector[[5]](#footnote-5) from the ABS Labour Force Survey compared with Statistics NZ LVS. In general, hours are distributed similarly across the two countries. New Zealand has relatively more hours in manufacturing and agriculture, forestry, and fishing, while Australia has more in retail trade and mining.

Figure 6

Industry share of measured sector hours work New Zealand and Australia 2008



While it would be ideal to compare levels of GDP per hour for New Zealand and Australian industries, this is problematic for several reasons, including:

* an absence of industry-level purchasing power parities
* differences in industrial classification between the two countries
* a lack of understanding around the impact of comparing hours paid and hours worked between the two countries.

What can be gleaned from the new data however is a better understanding of how GDP per hour paid differs between New Zealand industries (See figure 7). This comparison comes with some caveats:

* considering GDP per hour across industry does not take capital intensity into account. Therefore, technological change is not adequately considered
* differences in the quality of labour across industries are not accounted for.

Figure 7 shows the change in the level of GDP per hour paid in 2000 and 2010. This measure combines data about the level and growth in labour productivity for the Statistics NZ measured sector industries. Some key points are: shows that

* the industries with a high level of labour productivity are capital-intensive industries
* the industries with a high level of labour productivity are relatively small industries in the New Zealand economy (in both output and labour input)
* the industries with a low level of labour productivity (such as accommodation, cafes, and restaurants, or construction) are characterised by high proportions of part-time workers, and are generally labour-intensive.

Figure 7

New Zealand GDP per hour paid by industry



#### 4.2 Residential dwellings, property services, and business services

Imputed rents of owner-occupied dwellings 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.

However, there are two fundamental differences in the approaches used by Statistics NZ and the ABS. Firstly, the ABS ‘ownership of dwellings’ industry in the National Accounts covers private rental dwellings as well as owner-occupied 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.

Secondly, Statistics NZ’s 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, as well as implicitly adjusting for quality, using location and the number of bedrooms as proxies (refer to section 4.3 of *Taking on the West Island: How does New Zealand’s labour productivity stack up?).*

To get a sense of the difference that this adjustment makes, the analysis in *Taking on the West Island: How does New Zealand’s labour productivity stack up?* removed the quality component and simply captured increases in the number of dwellings in each country. Over the 17 years from 1991 to 2008, the growth rates were very similar. Annual growth was 1.4 percent for Australia and 1.3 percent for New Zealand. This adjustment amounted to approximately 0.15 percentage points of the growth in economy-wide output per year, over the period 1991 to 2008.

Statistics NZ is looking further into accounting for quality change for their volume measures of owner-occupied dwellings. This would involve using deflated current price techniques for their volume estimates of dwellings. This methodology involves using quality-adjusted price deflators that would implicitly account for changes in quality of the housing stocks.

In 2011, Statistics NZ published *Property Services Productivity: 1996–2009* (Statistics NZ, 2011). This examined the role of residential dwellings in productivity analysis. The main points from this recent work include:

* Measurement of productivity in the property services industry is difficult. This has meant it was excluded from the measured sector until recently. Recent methodological improvements mean that the property services industry can now be included in New Zealand productivity statistics.
* In the output measure, recent enhancements made within the National accounts can now more accurately capture the activity of commercial property operators and developers[[6]](#footnote-6). This affects the output measure used to calculate productivity statistics.
* The activity of private landlords is included within the output measure, but no estimate of their labour input is included. This is because it is difficult to get an accurate estimate of paid hours for private landlords. Many private landlords have another primary occupation, and so their role as a private landlord is not captured in survey data.
* Also, many landlords are not GST-registered, and therefore are not captured in administrative data. The absence of survey, administrative data, or robust estimates from industry sources, means that it is not possible to accurately estimate the labour input of private landlords. Excluding the labour input of private landlords implies inconsistent coverage between the labour productivity numerator (output) and denominator (labour input). While the level of labour productivity in the industry will be overstated, the impact on growth rates cannot be determined. However, it is likely to be small.
* Residential land is included as a capital asset within the property services industry. Land is not used up in the production process like other assets, but it is essential for enabling firms within the industry to produce output[[7]](#footnote-7). The property services industry includes privately rented residential buildings and land. This has implications for the comparability of capital between Australia and New Zealand (and MFP) – discussed in section 5 below.

Under ANZSIC06, ‘property services’ was re-classified as ‘rental, hiring, and real estate services’ (industry L), with some real estate activity[[8]](#footnote-8) shifting to the ‘construction’ industry. Within industry L, the sub-industry ‘property operators and real estate services’ contains private residential landlords, commercial property operators, property management groups, real estate agents, and other services.

Although Statistics NZ will not publish productivity measures using ANZSIC06 until later in 2012, we do have information about industry contributions to New Zealand GDP that use new industrial classification. The ‘property operators and real estate services’ sub-industry makes up around 80 percent of industry L’s output in New Zealand. Approximately half of this sub-industry is private landlords. Statistics NZ’s inclusion of private landlords in this industry explains the difference in the size of the ‘rental, hiring, and real estate services’ industry relative to the industry measured by the ABS (6.7 percent of GDP in and 2.7 percent of GDP respectively).

Finally, tables 5 and 6 present some trans-Tasman comparisons of ‘property services and business services’. Comparison between industries is complicated because Australian figures are for ANZSIC06 industries while New Zealand’s are for ANZSIC96 industries.

However, the key message is that in the period from 1996–2010, productivity growth in the Australian professional, scientific, and technical services, and administrative and support services industries (1.6 and 0.6 percent per year, respectively) is higher than the New Zealand business services industry (0.2 percent per year). These two ANZSIC06 industries are roughly equivalent to the ANZSIC96 ‘business services’ industry.

The growth in labour productivity in New Zealand’s ‘property services’ industry is considerably higher than growth in labour productivity in the ‘rental, hiring, and real estate services’ industry in Australia. It is unknown whether this is driven by Statistics NZ’s inclusion of private landlords.

Statistics NZ will do a comprehensive industry comparison when we release our ANZSIC06 productivity estimates later this year.

Table 5  
Property and business service labour productivity growth – New Zealand



**Source**: Statistics NZ

Table 6  
Property and business services labour productivity growth – Australia



**Source**: Australian Bureau of Statistics

#### 4.3 The non-measured sector

The health and education industries are currently excluded from Statistics NZ’s productivity statistics. More complete volume estimates of output for the health and education industries are scheduled to be included in the annual national accounts in late 2012/early 2013. Productivity estimates for these industries will be compiled once the national accounts are updated. Updated estimates of output will better capture the volume of economic activity in these hard-to-measure industries. There are no plans to develop productivity measures for the ‘central and local government administration and defence’ industries.

#### 4.4 Outstanding methodological issues – Financial Intermediation Services Indirectly Measured (FISIM) and the 2008 System of National Accounts

The allocation of FISIM to final consumption, exports, and intermediate use will be complete by the end of 2012. This will bring the Statistics NZ GDP estimates more in line with that of our Australian counterparts.

Statistics NZ is about to commence a two year work programme to update its national accounts to adhere to the latest international standards. This involves the introduction of the *Balance of Payments manual version 6* and the *2008 System of National Accounts*. This work is required to meet the OECD guidelines for national accounts of member nations.

### 5 Capital measurement and multifactor productivity

Analysis of productivity performance should ideally go beyond partial productivity measures. Tables 3 and 4 included comparisons of New Zealand and Australian capital input, capital productivity, total input, multifactor productivity, and capital-to-labour changes for both broad and narrow definitions of official productivity statistics.

Table 7 provides compares New Zealand’s MFP growth rates at the economy-wide and measured sector level with Australia’s. Note that OECD capital services estimates for Australia are only available up to 2009.

Table 7

Multifactor productivity growth (average annual growth) 1996–2009(1) 

While the measured sector comparison shows identical growth for MFP from 1996 to 2009 between Australia and New Zealand, the OECD total economy measure tells a different story.

In New Zealand, the implied growth in capital services from the non-measured sector is large for New Zealand (because of the difference between the 3.3 percent per year growth for the measured sector and 4.6 percent per year for the total economy).

The story in Australia is the opposite – implied non-measured sector capital services growth is slower than that of the measured sector. If this analysis is extended to 2011 for New Zealand, the difference is even greater compared with the OECD estimates. However, as discussed below, differences in how the OECD measures capital can explain some of this gap.

One motivation behind understanding differences in capital measurement is the question of whether New Zealand is ‘capital shallow’ in the sense that it has a relatively low capital per worker ratio (i.e., low capital intensity).

Over the last decade, there have been a number of studies investigating New Zealand’s capital intensity. The International Monetary Fund (IMF, 2002) examined trans-Tasman productivity and capital intensity levels at an industry level. Hall and Scobie (2005) confirmed the IMF findings of relatively low capital intensity in New Zealand’s economy, but noted their results were affected by the definition of capital (particularly the role of land).

A United Kingdom (UK) study (Mason and Osborne, 2007) compared New Zealand and UK capital intensity for various industries. Largely drawing on 2002 estimates of New Zealand’s aggregate capital intensity made by Schreyer (2005), Treasury (2008) further investigated the capital shallowness and its determinants, including how it affects multifactor productivity (MFP). Measures of MFP and capital intensity are problematic. Guillemette (2009) notes that the decomposition of relative labour productivity into MFP and capital intensity is difficult, in part because of the difficulty in obtaining reliable and comparable capital stock data.

#### 5.1 The measurement of capital in New Zealand productivity statistics

In practice, it is not the actual physical stock of capital that is considered the input into the productive process, rather the ongoing flow of capital services that capital stock generates. Capital services are calculated using the ‘productive capital stock’ as a starting point. This is the stock of a particular type of assets surviving from past periods, which is corrected for its loss in productive efficiency. It is assumed that the flow of capital services – the actual capital input into production – is proportional to the productive stock of an asset class (Organisation of Economic Co-operation and Development 2009, p.38).

Statistics NZ uses a perpetual inventory method (PIM) to estimate stocks of a range of capital assets. Capital input series for the ‘measured sector’ include 24 of the 26 produced assets accumulated in the PIM[[9]](#footnote-9). In addition to these assets, capital services are estimated for various land types (agricultural and forestry; commercial; industrial; mining; residential; and other non-agricultural), and inventories (which includes livestock and standing timber).

The PIM is used to derive an estimate of the capital stock by accumulating past purchases of assets over their useful lives. Each asset type has an average expected useful life based on a distribution about this life and a pattern of (hyperbolic) efficiency decline. These parameters and gross fixed capital formation are used to estimate productive capital stock by asset type.

The capital services input index measures the flow of capital services generated by the use of the stock of productive capital assets for a given March year. Because many different types of capital goods are used in production, an aggregate measure of capital services must be constructed. Capital service flows are aggregated to industry level using a Törnqvist index. Weights are based on asset-specific rental prices (user costs). User costs represent the implied cost to the user of each type of capital. The industry-level capital service flows are aggregated to the measured sector using industry shares of the measured sector current-price capital income as weights.

No allowance is made for differences (across industry and time) in asset capacity utilisation[[10]](#footnote-10) rates. Capital services are assumed to be proportional to the capital stock. Therefore swings in the rates of capacity utilisation are reflected in measures of multifactor productivity (MFP)[[11]](#footnote-11).

#### 5.2 The measurement of capital in OECD productivity statistics

When looking at OECD capital services growth data[[12]](#footnote-12), it is important to note that their measures are compiled differently from how capital services growth is measured in individual member countries. This section also examines some of the fundamental differences in how Statistics NZ, ABS, and the OECD measure capital. These differences fall into three broad categories.

* Asset coverage
* Industry coverage
* Compilation methodology

##### Asset coverage

Capital measures produced by Statistics NZ, the ABS and the OECD all have slightly different asset coverage. These are outlined in Table 8. Aside from the explicit differences in coverage, there are also some differences in how the three agencies compile estimates of productive capital stock for certain assets.

For example, the ABS capital estimates of non-agricultural land for each industry are calculated by taking the land’s balance sheet value for the reference year as a benchmark, and assuming that the growth rate is half that of the productive capital stock of non-dwelling construction. This approach recognises that changes in the capital services provided by land can be disproportionately influenced by changes in the value of the buildings on that land. Statistics NZ uses direct volume measures of land compiled by Quotable Value – New Zealand’s largest valuation and property information company.

Both the OECD and the ABS exclude residential buildings from their asset mix. The ABS does this because private rentals are included in their ownership of dwellings (OOD) industry. This industry sits outside their market sector. However, in New Zealand, private rentals sit within the property services industry, and therefore residential buildings that are rented are included in the measured sector. The OECD excludes both land and inventories, which means (especially in the case of land) that their measures are likely to grow at a faster rate.

Table 8  
Capital asset coverage for productivity at Statistics NZ, the ABS, and OECD



1. Livestock estimates are calculated using the PIM by the ABS

2. Inventories include livestock and standing timber which are estimated independently from the PIM

##### Industry coverage

The OECD measures capital services across the total economy, whereas Statistics NZ only measures capital services for the measured sector. This creates several differences between the two series. Including the non-measured sector (which is now comprised of predominantly government industries) can cause differences in the rate at which aggregate capital services grow. The non-measured sector is characterised by some relatively slow growth asset types (such as buildings, and land). In the non-measured sector industries, capital (relative to labour) has a low weight, and therefore is not likely to have a large impact on the total if included into an aggregate measure.

Table 9  
Major assets in non-measured sector industries in New Zealand



**Source**: Statistics NZ

##### Methodological differences

Table 10 summarises the key characteristics of capital measurement across Statistics NZ, the OECD, and ABS.

Table 10  
Key characteristics of capital measurement: Statistics NZ, OECD, and the ABS



#### 5.3 Reconciling the OECD capital services growth

Figure 8 presents the OECD growth in capital services (the top bar) relative to several tested scenarios, which combine different asset, and industry mixes (using Statistics NZ data). The bottom bar represents the baseline growth in the current measured sector for New Zealand. Each of the other series in this graph represents a different mix of industry and asset coverage. These examine the differences between the Statistics NZ measured sector and OECD measures of growth in capital services.

The growth in the OECD capital services measure from 1996–2011 is considerably higher than any of the other scenarios. Growth was 1.4 percent per year stronger than the baseline measured sector (2.9 percent – see table 3), and 1.0 percent per year stronger than the scenario with the highest growth over this period (which is the authors’ attempt to calculate total economy capital services growth with the same asset and industry coverage as the OECD measure).

Figure 8  
Capital services growth in New Zealand using different asset/industry scenarios



Figure 9 displays time series of the different scenarios against OECD estimates of capital services growth for New Zealand. Throughout the period from 1996–2011 the OECD series has grown faster than any of the series based on Statistics NZ data.

Figure 9  
Capital services indexes using different asset/industry scenarios



Several conclusions can be drawn based on these scenarios about industry and asset coverage impact on capital services growth.

Firstly, industry coverage has a fairly minimal effect on the growth rate of capital services, as shown by the minimal difference between baseline measured sector growth and total economy growth (the bottom two lines in figure 9).

Secondly, removing non-PIM capital inputs has a slightly larger effect on the growth of capital services relative to changing the industry mix after 1996. This is because non-agricultural land is now included in calculations. Non-agricultural land is a slow-growing asset relative to the other asset types. Removing it leads to noticeably stronger growth in capital services.

Lastly, removing residential buildings from the asset mix has a relatively small impact on growth. Residential buildings are a slow-growth, long-life asset. Including residential buildings is likely to bring down the growth rate of total capital services.

The main conclusion that can be drawn from our scenario testing is that asset coverage seems to have a larger impact on growth rates than industry coverage, due to the nature of the assets excluded by the OECD in their capital measures. Future work to reconcile further the OECD and Statistics NZ measures of capital services could include adjusting various PIM parameters and how those parameters are applied to the mix of assets included in productivity calculations. A similar exercise could be done to harmonise Statistics NZ and ABS capital stock and capital service estimates.

### 6 Conclusion

This paper presents further steps towards a better understanding the differences in productivity measurement between New Zealand and Australia. Several of the outstanding issues identified by *Taking on the West Island: How does New Zealand’s labour productivity stack up?* (Statistics NZ, 2010b) have had progress updates, and new analysis on the measurement of industry labour volume levels and capital input have been considered.

The paper used as a starting point the wider coverage afforded by updates to official statistics in both New Zealand and Australia. Official statistics in both countries now cover approximately 80 percent of their respective economies. This means that there is a broader set of industries for which growth in productivity can be compared. Analysis in this paper focused on productivity growth from 1996 onwards, as this is the point for which the broader measured sector statistics are available for both countries. Analysis in *Taking on the West Island: How does New Zealand’s labour productivity stack up?* (Statistics NZ, 2010b) also identified that the gap between New Zealand and Australia labour productivity growth began to widen in 1996.

Statistics for the whole economy (from the OECD), show Australia’s average annual labour productivity growth rate (1.6 percent) was higher than New Zealand’s (1.2 percent) from 1996–2011. New Zealand does not fare well in official statistics either, with Statistics NZ’s (expanded) measured sector (1.4 percent per year) growing slower than the ABS’s MFP16 (2.0 percent per year).

The differences in economy-wide productivity now seem to largely fall within industries in the measured sector (given the increased coverage of official statistics). This confirms some of the conclusions drawn by analysis in *Taking on the West Island: How does New Zealand’s labour productivity stack up?* around the poor productivity growth of the business services industry in New Zealand.

A comparison of growth rates in this industry and its Australian counterpart is still not possible, due to the change in industrial classification used by the ABS. Current data suggests that productivity growth in the New Zealand business services industry is lagging significantly behind its Australian equivalent. However, Statistics NZ will update their productivity estimates to the same industrial classification in the second half of this year. This will allow us to make more meaningful industry comparisons between the two countries.

Another issue that was prominent in *Taking on the West Island: How does New Zealand’s labour productivity stack up?* (Statistics NZ, 2010b) was the choice of labour input, which was seen to explain a part of the productivity puzzle. While conceptually, ‘hours worked’ remain the best measure of labour input for productivity, it appears that for the period from 1996–2011 growth in ‘hours paid’ and ‘hours worked’ for the (expanded) measured sector are roughly the same.

Statistics NZ have also completed a significant piece of work on industry labour input for productivity, and published *Labour Hours Paid for Productivity* in March 2012. *Labour Hours Paid for Productivity* presented official levels of labour volume that enabled the calculation of labour productivity levels for industries in New Zealand. Trans-Tasman comparisons of labour productivity at the industry level would be ideal, but this is complicated by the lack of industry-level purchasing power parities.

There are still some non-industry related methodological issues which contribute to the measurement puzzle between the two countries (i.e. FISIM and residential dwellings). Statistics NZ is currently addressing these differences.

Finally, this paper included some initial analysis around the measurement of capital, examining some of the methodological differences between Statistics NZ, the ABS, and OECD. The impact of changing the industry and asset mix of Statistics NZ capital services estimates was tested, in an attempt to reconcile some of the difference with the OECD measures. It is still not completely apparent why the OECD estimates of capital services for New Zealand grow at such an accelerated rate. However, changing the asset and industry coverage of Statistics NZ capital services estimates did explain some of the difference between the two measures.

Statistics NZ is still working to better understand differences in how the ABS and Statistics NZ measure capital. This would better enable a breakdown of labour productivity into multifactor productivity and capital deepening for comparison across the two countries. This paper has provided the first steps towards better understanding why these differences exist, and enabling a harmonised comparison with Australia in the future.

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1. The ABS series are available on their website www.abs.gov.au. [↑](#footnote-ref-1)
2. The effects of residential dwellings and Financial Intermediation Services Indirectly Measured (FISIM) are covered in the previous West Island paper. An update on the work around these areas is provided in section 4.4. [↑](#footnote-ref-2)
3. MFP12 excludes ANZSIC06 industries L, M, N, and S in addition to the industries excluded from MFP16. See table 1 for more information. [↑](#footnote-ref-3)
4. For more detail, see *Labour hours paid for productivity* (Statistics NZ, 2012c). [↑](#footnote-ref-4)
5. For this comparison, ANZSIC96 industries were used for both countries to maintain consistency. [↑](#footnote-ref-5)
6. These enhancements incorporated data from Statistics NZ’s Annual Enterprise Survey, to which the commercial property industry was added in 2004. See *Improvements to the Annual National Accounts* for further detail (available from www.stats.govt.nz). [↑](#footnote-ref-6)
7. A production process cannot take place without a physical location, whether that land is rented or owned. Residential land enables the production of output, in the form of the services provided by a rented residential dwelling. All industries within the measured sector have one or more land types feeding in as a capital input. [↑](#footnote-ref-7)
8. The ‘Land development and subdivision’ industry moves from ANZSIC96 division L to division E. [↑](#footnote-ref-8)
9. Central government and local government roading, from the ANZSIC96 industry ‘government administration and defence’ (ANZSIC96 division M), are assets excluded from the measured sector. None of the measured sector industries bears the cost of using these assets, which are essentially public goods in the sense that they are non-excludable and non-rival in consumption. The roading network, like other public goods, does not represent a capital asset with an allocable user cost. Rather, its existence enhances the facility of other transport equipment assets and is absorbed into the calculated multifactor productivity residual. [↑](#footnote-ref-9)
10. Tipper and Warmke (forthcoming) test this assumption in a New Zealand context and find there is little to no impact on MFP growth in the long term, when capital stocks are adjusted for variable capacity utilisation. [↑](#footnote-ref-10)
11. For more detail on how capital input indexes are calculated for use in productivity measurement, see *Productivity Sources and Methods* (2012). A comprehensive description of Statistic NZ’s PIM is provided in *Measuring Capital Stock in the New Zealand Economy* (Statistics NZ, 2008). [↑](#footnote-ref-11)
12. For more information on the compilation of capital stocks and estimates of aggregate capital services by the OECD see Schreyer, Bignon and Dupont (2003). For industry estimates see Arnaud, Dupont, Koh and Schreyer (2011). [↑](#footnote-ref-12)