

Productivity Statistics: 1978–2016

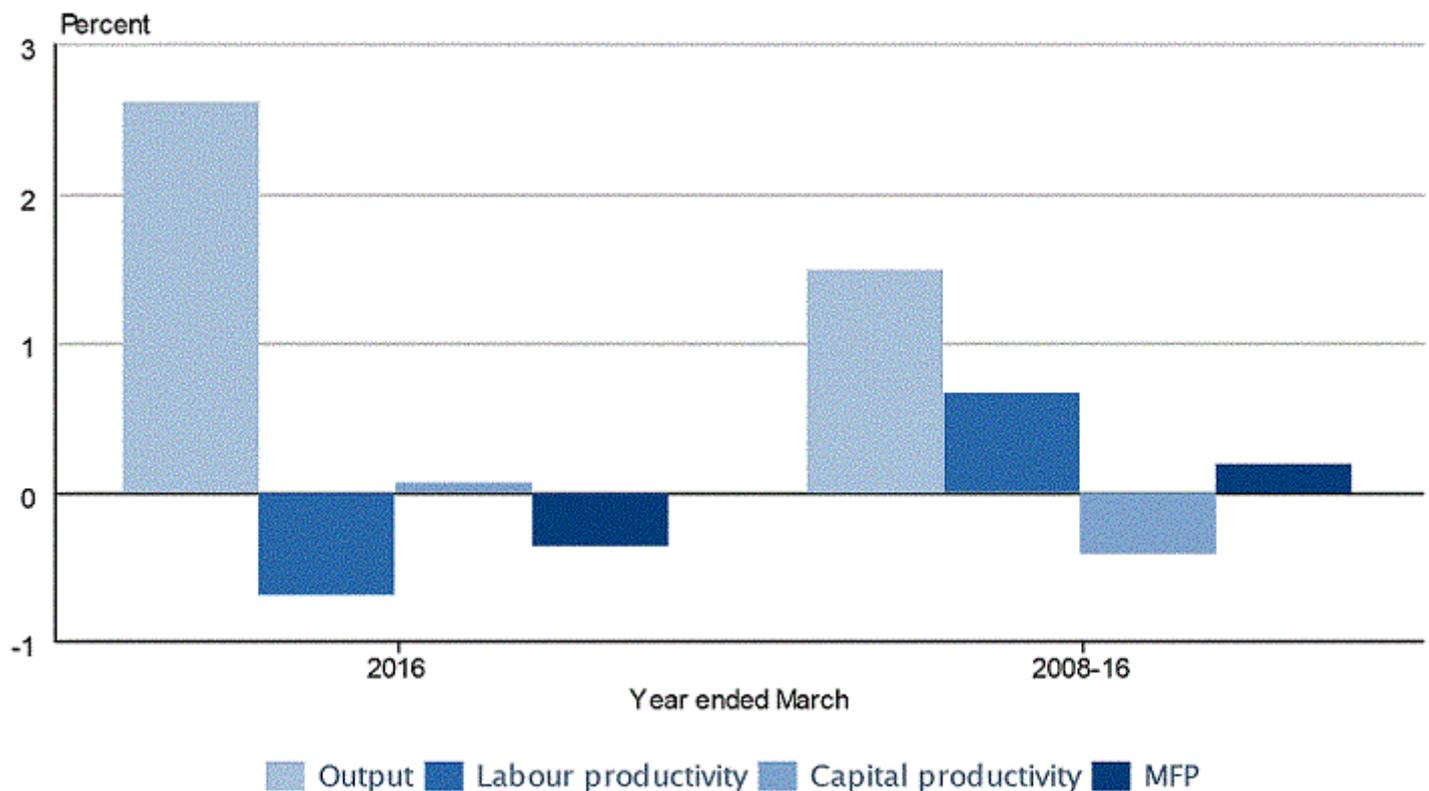
Embargoed until 10:45am – 22 March 2017

Key facts

For the measured sector, in the year ended March 2016:

- the output index increased 2.6 percent
- labour productivity decreased 0.7 percent – due to stronger growth in inputs (up 3.3 percent) than in outputs (up 2.6 percent)
- capital inputs increased 2.6 percent; capital productivity was up 0.1 percent
- multifactor productivity (MFP) decreased 0.4 percent.

Measured sector output and productivity indexes
Percentage change



Source: Stats NZ

Note: Productivity is best observed in growth cycles (the span of years between the peak of one cycle and that of the following cycle). Over the current incomplete cycle, 2008–16, average annual changes in the measured sector were:

- the output index increased 1.5 percent
- labour inputs increased 0.8 percent; labour productivity was up 0.7 percent
- capital inputs grew 1.9 percent; capital productivity was down 0.4 percent
- MFP increased 0.2 percent.

The measured sector series begins in 1996. It includes all industries except public administration and safety, education and training, health care and social assistance, and ownership of owner-occupied dwellings.

Liz MacPherson, Government Statistician
ISSN 1178-0630
22 March 2017

Commentary

- [Key aggregates for the measured sector](#)
- [Output growth driven by contributions of labour inputs](#)
- [Small decrease in multifactor productivity](#)
- [Labour productivity falls in 2016](#)
- [Capital productivity flat in 2016](#)
- [An Australia–New Zealand comparison](#)

See [Definitions](#) for explanations of terms used in this commentary.

Key aggregates for the measured sector

The changes in the key variables for the year ended March 2016 showed strong growth in inputs while output growth returned to rates more in line with 2011 to 2014, after a strong rise in 2015. As the growth in total inputs (3.0 percent) was greater than the growth in output (2.6 percent), this resulted in negative growth in labour and multifactor productivity (MFP) and flat capital productivity. This growth had mixed results on the current incomplete cycle, 2008–16.

Labour productivity growth of -0.7 percent in 2016 was markedly lower than the current incomplete cycle average of 0.7 percent, and the long-term average of 1.3 percent. Capital productivity growth of 0.1 percent had a positive influence on the current incomplete cycle average of -0.4 percent, and the long-term average of -0.2 percent. MFP growth of -0.4 percent was lower than the current incomplete cycle average of 0.2 percent, and the long-term average of 0.6 percent.

The table below shows average annual growth rates across growth cycles. The benefit of showing the data in cycles is that we better account for factors that tend to vary within a cycle, such as capacity utilisation. This way, we can make comparisons of productivity performance between periods with the effect of these additional factors minimised. A growth cycle is the span of years between the peak of one cycle and the peak of the following cycle; the 2008–16 period will not be complete until the next peak in output occurs.

See [DataInfo+](#) for more information on growth cycles.

Key aggregates for the measured sector⁽¹⁾					
Variable	1997–2000 ⁽²⁾	2000–08 ⁽²⁾	2008–16 ⁽²⁾	2016 ⁽³⁾	1996–2016 ⁽²⁾
	Percent				
Output (value added)	2.9	3.4	1.5	2.6	2.6
Labour input	0.0	2.1	0.8	3.3	1.3
Labour productivity	2.9	1.3	0.7	-0.7	1.3
Capital input	2.4	3.9	1.9	2.6	2.9
Capital productivity	0.5	-0.4	-0.4	0.1	-0.2
Total input	1.0	2.8	1.3	3.0	1.9
Multifactor productivity (MFP)	1.9	0.6	0.2	-0.4	0.6

1. The measured sector series begins in 1996.
 2. Average annual growth rates, year ended March.
 3. Year ended March.

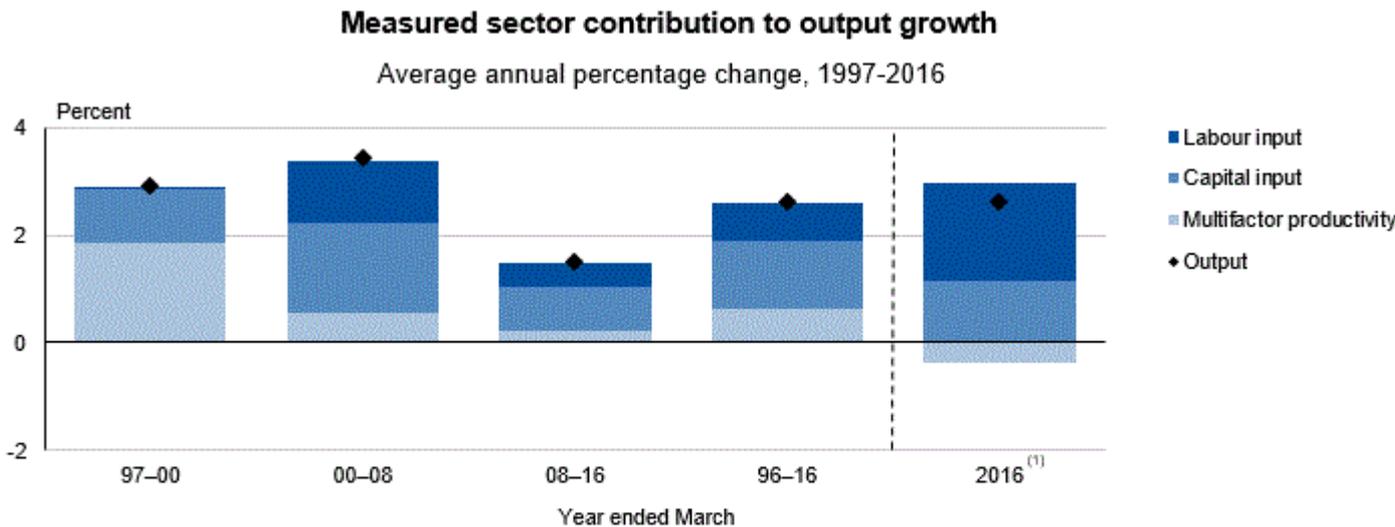
Output growth driven by contributions of labour input

Growth accounting examines how much of the economy's growth in output can be explained by one or more of the following:

- contribution of additional labour
- contribution of additional capital
- MFP.

The 2.6 percent increase in output growth in the year ended March 2016 was driven by increased contributions from labour inputs (up 1.8 percent) and capital inputs (up 1.1 percent) which were offset by a fall in MFP (down 0.4 percent). The contribution to output from labour is significantly higher in the latest year than for the latest incomplete growth cycle and the long-term average.

The following graph presents the contribution of additional labour, additional capital, MFP, and growth in output, measured across three growth cycles (the latest cycle incomplete), for the whole series and for the year ended March 2016.



1. Change from year ended March 2015.

Source: Stats NZ

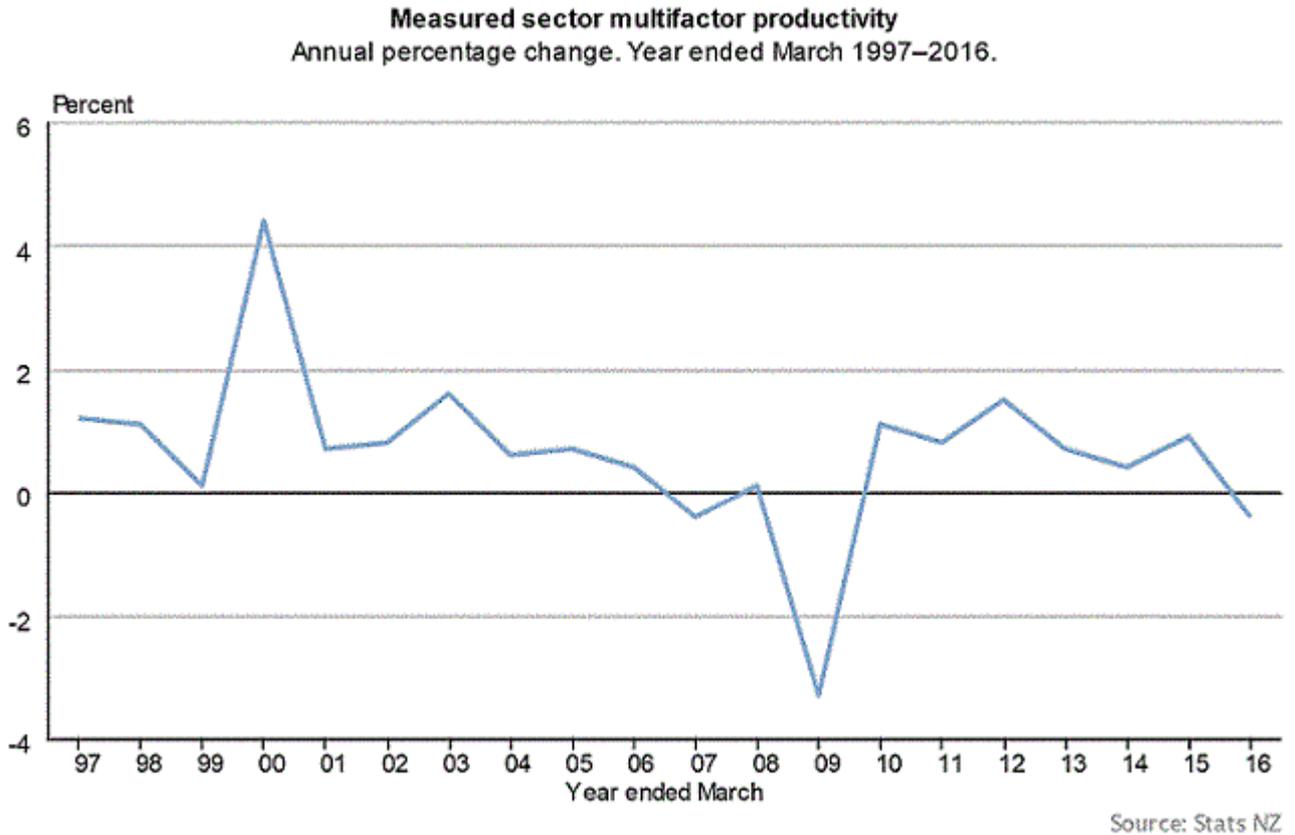
Small decrease in multifactor productivity

MFP is measured as a ratio of output to combined capital and labour inputs. It reflects growth that cannot be attributed to capital or labour, such as technological change or improvements in knowledge, methods, and processes.

In the year ended March 2016, MFP fell 0.4 percent (following a revised 0.9 percent in 2015) – the first fall since the year ended March 2009. Total inputs grew 3.0 percent, compared with a 2.6 percent increase in output.

In the latest period (2008–16), MFP increased slightly, with an average annual rise of 0.2 percent. Over the same period output grew 1.5 percent, while total inputs rose 1.3 percent a year. Growth in MFP has increased an average of 0.6 percent annually since the series began in

1996. Since then, both output and total inputs (capital and labour combined) have risen (up 2.6 percent and 1.9 percent a year, respectively).



Labour productivity falls in 2016

The -0.7 percent growth in labour productivity in the year ended March 2016 was due to stronger growth in labour inputs (up 3.3 percent) than in output (up 2.6 percent). Provisional data shows the growth in labour inputs for the year ended March 2016 was largely driven by increased labour hours in the construction, accommodation, and business services industries.

See [Labour Market Statistics: March 2016 quarter](#) for more information about annual movements.

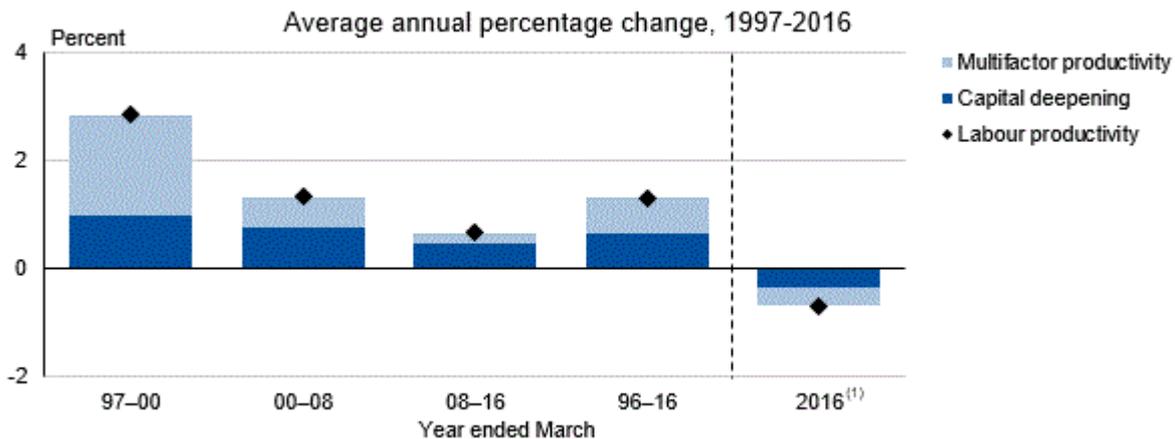
We will publish detailed labour information for 2016 in next year’s productivity statistics release.

Growth in labour productivity can also be broken down into components. A change in labour productivity can come from two possible sources:

- the contribution of more capital per hour of labour
- a change in MFP.

The following graph presents the contributions to labour productivity.

Measured sector contribution to labour productivity growth



1. Change from year ended March 2015.

Source: Stats NZ

In the year ended March 2016, labour productivity decreased 0.7 percent. This was due to 0.3 percent fall in the amount of capital available per worker (capital shallowing) and a 0.4 percent fall in MFP.

The average labour productivity for the most-recent growth cycle, 2008–16 (an incomplete cycle), was 0.7 percent. This was the lowest average cycle growth in labour productivity for the series. Over the same period, capital deepening grew 0.5 percent.

Capital productivity flat in 2016

In the year ended March 2016, capital productivity rose 0.1 percent. Capital input (which includes land, building, machinery) grew 2.6 percent, compared with a 2.6 percent increase in output.

The 0.4 percent a year decline in the growth of capital productivity between 2008 and 2016 reflects strong growth in capital input (1.9 percent a year), compared with lesser growth in output.

Capital productivity can be influenced by how much capital assets are used over growth cycles. See [Capacity utilisation](#) in the Definitions section for more information.

An Australia–New Zealand comparison

The data used in this comparison starts in 1996, as this is when the industry coverage of the series are comparable.

New Zealand experienced higher rates of growth in capital productivity and MFP than Australia over the long-run average of the period 1996–2016. Australia had relatively higher growth in labour productivity over the period, with growth in capital-to-labour ratio that was more than double that of New Zealand's.

<p>Australia and New Zealand productivity⁽¹⁾ Average annual growth rates</p>
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1996–2016		
Variable	Australia	New Zealand
	Percent	
Output	3.4	2.6
Labour productivity	2.2	1.3
Capital productivity	-1.4	-0.2
Multifactor productivity	0.7	0.6
Labour input	1.2	1.3
Capital input	4.8	2.9
Total inputs	2.7	1.9
Capital-to-labour-ratio	3.6	1.6

1. Australia's market-sector industries aggregate, compared with New Zealand's measured sector series.
See [Datainfo+](#) for more detail.

For more detailed data see the Excel tables in the 'Downloads' box.

Definitions

About the productivity statistics

Productivity is a measure of how efficiently inputs (capital and labour) are used within the economy to produce outputs. Productivity is commonly defined as a ratio of a volume measure of output to a volume measure of input.

Growth in productivity means that a nation can, for example, produce more output from the same amount of input, or the same level of output from fewer inputs. Productivity growth is an important contributing factor to a nation's long-term material standard of living.

More definitions

ANZSIC 2006: the Australian and New Zealand Standard Industrial Classification 2006. We use this classification to allocate enterprises undertaking similar productive activities to the same industry.

Average annual growth rate: reflects the average increase (or decrease) in a variable across a period of time. Rates are calculated as geometric means, which take account of growth rates compounding over time. Arithmetic averages give higher growth rates and would lead to a different index figure for the latest year when applied to the base year.

Capacity utilisation: the difference between the potential and actual use of an input. Capacity utilisation is high when actual output is close to potential output because most use is being made of labour and capital. In the productivity measures we produce, we assume that capital and labour are utilised at a constant rate over time.

Capital-to-labour ratio: a measure of the capital input index divided by the labour input index.

Capital deepening: positive growth in the capital-to-labour ratio. See also 'contribution of capital deepening'.

Capital income: that part of the cost of producing gross domestic product (GDP) that consists of gross payments to capital. It represents the value added by capital in production, and is equivalent to the gross operating surplus, less the labour income of working proprietors, plus the capital proportion of taxes, less subsidies on production.

Capital productivity: is measured as a ratio of output to capital input. We derive the ratio by dividing the index of the chain-volume measure of GDP by an index of capital services. Capital productivity reflects not only the contribution of capital to changes in production, but also the contribution by labour and other factors affecting production.

Capital services: reflect the amount of 'service' each asset provides during a period. For each asset, the services provided in a period are directly proportional to the asset's productive capital value in the period. As an asset ages and its efficiency declines so does the productive capital value and the services the asset provides. Capital services is the appropriate measure of capital input in production analysis.

Capital shallowing: a decline in the capital-to-labour ratio.

Chain volume measures: annually-reweighted chain Laspeyres volume indexes referenced to

the current-price values in a chosen reference year (ie the year when the quarterly chain volume measures sum to the current-price annual values). We compile Chain Laspeyres volume measures are compiled by linking together (compounding) movements in volumes, calculated using the average prices of the previous financial year, and applying the compounded movements to the current-price estimates of the reference year.

Compensation of employees: total remuneration, in cash or in kind, payable by an enterprise to an employee in return for work done by the employee during the accounting period. It has two sub-components: wages and salaries; and employers' social contributions. Compensation of employees is not payable for unpaid work undertaken voluntarily, including the work done by members of a household within an unincorporated enterprise owned by the same household. Compensation of employees excludes any taxes payable by the employer on the wage and salary bill (eg payroll tax, fringe benefits tax).

Contribution of capital deepening: growth in the capital-to-labour ratio, weighted by capital's share of total income. Given that capital's share of total income is always less than 100 percent, the contribution of capital deepening is always less than the growth in capital deepening. It is used for growth accounting for labour productivity.

Contribution of capital input: growth in the capital input index, weighted by capital's share of total income. Given that capital's share of total income is always less than 100 percent, the contribution of capital input is always less than the growth in capital input. It is used for growth accounting for output.

Contribution of labour input: growth in the labour input index, weighted by labour's share of total income. Given that labour's share of total income is always less than 100 percent, the contribution of labour input is always less than the growth in labour input. It is used for growth accounting for output.

Former measured sector: this is similar to the measured sector, but has a narrower industry coverage and longer time series. It includes industries AA1-KK1 and RS1. The series are available from 1978.

Gross domestic product (GDP): total market value of goods and services produced in New Zealand within a given period, after deducting the cost of goods and services used up in the process of production, but before deducting allowances for the consumption of fixed capital. Thus, GDP is 'at market prices'. It is equivalent to gross national expenditure, plus exports of goods and services, less imports of goods and services.

Gross mixed income: surplus due to owners of unincorporated businesses. It is often referred to as profit, although only a subset of total costs is subtracted from the output of unincorporated businesses to calculate it. Gross mixed income is split and allocated to capital and labour as factors of production.

Growth accounting: decomposes the growth rate of an industry's output into the part due to the increase in factors of production (labour and capital) – and that which we cannot account for by changes in labour and capital utilisation. This residual growth in output that can't be accounted for is known as multifactor productivity (the extent to which an industry is getting more output from the same amount of inputs).

Growth cycle: span of years between the peak of one cycle and the peak of a following cycle. We determine peaks using statistical techniques; they represent high points in capacity utilisation of the economy. Productivity is best analysed over growth cycles, as annual movements can be volatile and don't usually represent true changes to the underlying production

function.

Index: a simple way of expressing, in percentage terms, the change in some variable from a given point-in-time to another point-in-time.

Inventories: a class of produced non-financial assets consisting of: stocks of outputs that are still held by the units that produced them before being further processed, sold, delivered to other units, or used in any other ways; and stocks of products acquired from other units that are to be used for intermediate consumption or for resale without further processing.

Labour income: the part of the cost of producing GDP that consists of gross payments to labour. It represents the value added by labour in production, and is equivalent to compensation of employees, plus the labour income of working proprietors, plus the labour proportion of taxes, less subsidies on production.

Labour input index: index of the weighted number of hours paid in the measured sector. We create it by weighting together the industry-level labour volume series using labour income weights.

Labour productivity: measured as a ratio of output to labour input. Labour productivity estimates are indexes of real GDP per hour paid. Labour productivity reflects the contribution of labour to changes in product per labour unit, but is also influenced by the contribution of capital and other factors affecting production.

Labour volume series (LVS): estimate of the total number of hours paid in paid employment per week, for the whole economy or for a given industry.

Measured sector: we define industry coverage of the productivity statistics as the 'measured sector'. It consists of industries AA1-MN2 (except LL2), RS1, and RS2. These industries mainly contain enterprises that are market producers. This means they sell their products for economically significant prices that affect the quantity that consumers are willing to purchase. The series is available from 1996.

Multifactor productivity (MFP): estimates are indexes of real GDP per combined unit of labour and capital. We derive them by dividing chain-volume estimates of market sector GDP by a combined measure of hours paid and capital services. An increase in value is referred to as technical change or efficiency growth. However, it is more accurately interpreted as some combination of technological progress, efficiency gain, deviation from constant returns to scale, unobserved change in capacity utilisation, or departure from economy-wide long-run equilibrium. MFP is essentially a residual, and so also captures the impact of unobserved inputs on production.

Output: chain-volume value added. We derive annual value added for the measured sector by following the same procedures used to derive constant-price GDP, a chained Laspeyres volume index of the constant-price value added of the industries making up the measured sector. The resulting chained volume series is re-expressed as an index, with an expression base of 1000 in the March 1978 year.

Productive capital stock: measure of productive capacity that forms the basis for the measure of capital services. We derive productive capital stock estimates by taking the written-down value of each asset as it declines in efficiency due to age. This stock is measured in units of 'standardised efficiency'.

Rental prices: also referred to as the 'user cost of capital'. It is the unit cost for using an asset

for one period. That is, the price for employing or obtaining one unit of capital services. The rental price for an asset is determined by its price index when new, its rate of economic depreciation, the average tax rate on production within the industry, and an exogenous real rate of return (set at 4 percent).

Total income: the part of the cost of producing GDP that consists of gross payments to factors of production (labour and capital). It represents the value added by these factors in the process of production and is equivalent to current-price GDP.

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Data quality

[National accounts productivity – DataInfo+](#)
General methodology used to produce these statistics.

Revisions

Updates in data sources and ongoing methodology improvements led us to make revisions to the previously published productivity series.

Please refer to tables 1.07, 1.08, 2.07, and 2.08 in the downloadable Excel spreadsheets for the magnitude and direction of these revisions.

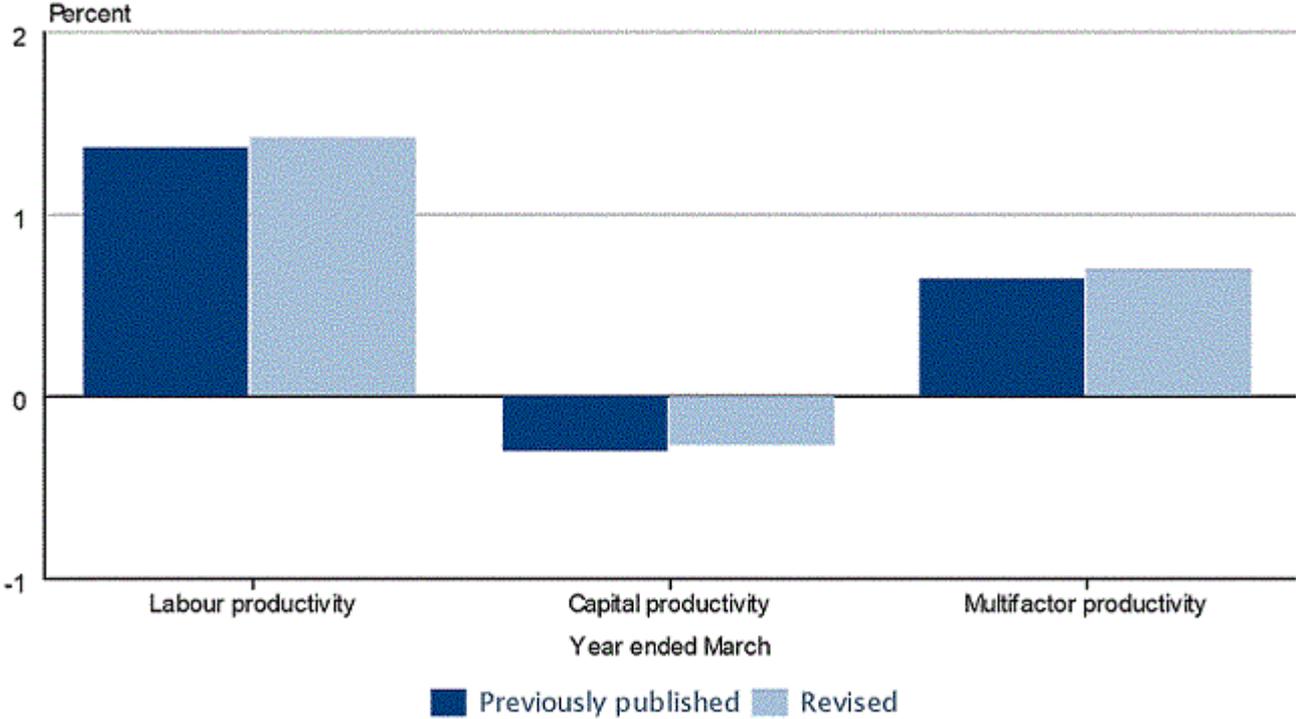
Regular revisions (due to updates in data sources) arose from:

- revised constant-price GDP data – feeding into the output series. See [Preview of 2016 national accounts improvements](#) for information regarding recent methodology changes, particularly for the construction industry
- revised current-price national accounts data – feeding into the industry income-based weights
- revised current- and constant-price productive capital stock data – feeding into the capital input series
- revised labour data – feeding into the labour volume series
- adding LEED, to replace survey-based data for working-proprietor counts for the March 2015 year, and employee counts for the March 2015 quarter – feeding into the labour input series.

Incorporating the business register

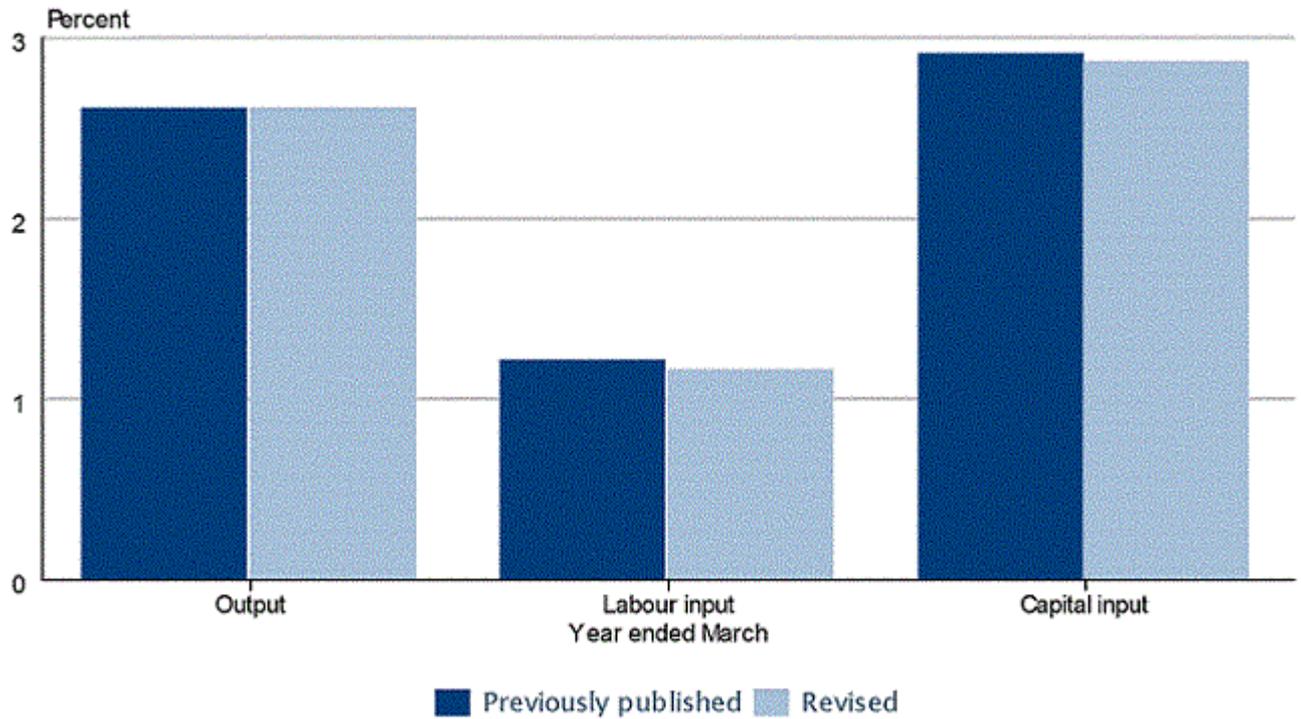
In this productivity release we have incorporated the business register. This has replaced the business frame. The business register allows easier updating of longitudinal history tables and has resulted in improved and some corrected historical data. This has caused minor revisions in the time-series estimate for the labour volume series.

Revisions to measured sector productivity
Average annual percentage change, 1996–2015



Source: Stats NZ

Revisions to measured sector output and inputs
Average annual percentage change, 1996–2015



Source: Stats NZ

Due to the amount of provisional data we used in productivity calculation for the most-recent years, data for the last two years of the series are provisional.

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Tables

See the following Excel tables in the 'Downloads' box on this page. If you have problems viewing the files, see [opening files and PDFs](#).

Measured sector

- 1.01 Productivity indexes and output measure
- 1.02 Productivity indexes and output measure – annual percentage change
- 1.03 Input measures
- 1.04 Input measures – annual percentage change
- 1.05 Growth accounting analysis – contributions to growth
- 1.06 Growth accounting analysis – contributions to labour productivity
- 1.07 Productivity indexes and output measure, revisions summary
- 1.08 Productivity indexes – annual percentage change, revisions summary
- 1.09 Indexes – average annual growth rates

Former measured sector

- 2.01 Productivity indexes and output measure
- 2.02 Productivity indexes and output measure – annual percentage change
- 2.03 Input measures
- 2.04 Input measures – annual percentage change
- 2.05 Growth accounting analysis – contributions to growth
- 2.06 Growth accounting analysis – contributions to labour productivity
- 2.07 Productivity indexes and output measure, revisions summary
- 2.08 Productivity indexes – annual percentage change, revisions summary
- 2.09 Indexes – average annual growth rates

Composition-adjusted

- 3.01 Productivity indexes and output measure
- 3.02 Productivity indexes and output measure – annual percentage change
- 3.03 Input measures
- 3.04 Input measures – annual percentage change
- 3.05 Growth accounting analysis – contributions to growth
- 3.06 Growth accounting analysis – contributions to labour productivity

Productivity inputs and outputs by industry

- 4.01 Labour productivity index, by industry
- 4.02 Labour productivity index, by industry, annual percentage change
- 4.03 Capital productivity index, by industry
- 4.04 Capital productivity index, by industry, annual percentage change
- 4.05 Multifactor productivity index, by industry
- 4.06 Multifactor productivity index, by industry, annual percentage change
- 4.07 Output measure index, by industry
- 4.08 Output measure index, by industry, annual percentage change
- 4.09 Labour input index, by industry
- 4.10 Labour input index, by industry, annual percentage change
- 4.11 Capital input index, by industry
- 4.12 Capital input index, by industry, annual percentage change
- 4.13 Total input index, by industry
- 4.14 Total input index, by industry, annual percentage change
- 4.15 Capital-to-labour ratio index, by industry
- 4.16 Capital-to-labour ratio index, by industry, annual percentage change

4.17 Labour hours paid, by measured sector industry

Productivity growth cycles by industry

5.01 Labour productivity, by sector and industry

5.02 Capital productivity, by sector and industry

5.03 Multifactor productivity, by sector and industry

Unit labour costs

6.01 Unit labour costs for aggregates, nominal and real

6.02 Nominal unit labour costs for aggregates, index and annual percentage changes

6.03 Real unit labour costs for aggregates, index and annual percentage changes

6.04 Nominal unit labour costs, by industry

6.05 Real unit labour costs, by industry

6.06 Nominal unit labour costs index, by industry

6.07 Real unit labour costs index, by industry

6.08 Nominal unit labour costs annual percentage change, by industry

6.09 Real unit labour costs annual percentage change, by industry

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