April 2018

RESEARCH PAPER

Queensland Productivity Update
2016–17

Contents

Foreword ii
Queensland productivity growth in 2016–17 2
Labour productivity growth and the terms of trade 3
Contributions to labour productivity growth 4
Changes in labour utilisation 6
Multifactor productivity growth 7
Feature article: Non-market sector productivity 12
References 23
Appendix A: Comparison of state estimates of MFP 26
Appendix B: Statistical appendix 27

Foreword

Growth in productivity is important to the Queensland economy. It drives real per capita income growth and therefore increases in standards of living over the longer term.

This QPC Queensland Productivity Update is the first in a planned series providing information on productivity trends in Queensland. The series will inform decisions about how to realise Queensland's productivity potential, and forms part of the Commission's legislated function to promote public understanding of matters relating to productivity.

The update provides an overview of key productivity trends in Queensland. More detailed analysis on specific issues may be undertaken in the Commission' s inquiry work and through discrete research projects.

As part of each productivity update, we intend to include a short feature article on a topical issue. This year's feature is on the measurement of productivity in non-market sector industries, such as education and health. No official productivity estimates are available for Australian or Queensland non-market sector industries. However, a number of overseas countries produce estimates that raise interesting questions both about how to measure productivity in these industries, and about industry performance trends.

We would welcome your feedback on this publication. This can be provided at https://www.qpc.qld.gov.au/contact-us/.

Kim Wood

Principal Commissioner

Key points

- In 2016–17, Queensland labour productivity increased 3.1 per cent and multifactor productivity (MFP) increased 1.9 per cent. These are the largest year-on-year growth rates since 2011–12.
- Various factors caused the changes in Queensland's labour productivity and MFP between 2011–12 and 2016–17:
  - Queensland labour productivity increased at an average annual rate roughly equal to the Australian average, while MFP grew at roughly half the rate of the Australian average. Causes of the subdued MFP performance in Queensland include droughts and natural disasters, as well as potential measurement issues associated with strong investment in some industries (for example, liquid natural gas production).
  - Declines in labour intensity (average working hours per employed worker), employed persons as a share of the labour force, and participation (the ratio of the number of people working or looking for work as a share of the population) contributed to a reduction in labour utilisation and detracted from per capita growth in gross state product (GSP).
  - MFP growth made a stronger contribution to labour productivity growth in Queensland and Australia compared to the preceding period (2001–02 to 2011–12). This is partly due to a decline in the rate of capital services growth, combined with problems in accurately measuring the contribution of capital when there are strong investment cycles (as occurred during the mining investment boom).
- The non-market sector forms a large and growing proportion of the Queensland economy accounting for roughly a third of GSP. Measuring the performance of the sector and analysing influences on performance, including the role of government policies, is hampered by the lack of official productivity statistics. Some progress is being made internationally and in Australia, albeit slowly. A renewed focus on progressing productivity measurement in non-market sector industries is needed.
- Exploratory MFP estimates for the Queensland education and training, and healthcare and social assistance industries are constructed and compared to estimates from the United Kingdom and New Zealand. The comparisons highlight both issues in output measurement and the desirability of constructing indicators to capture changes in the quality of services provided.

Queensland productivity growth in 2016–17

Both the Queensland and Australian market sectors experienced positive multifactor productivity (MFP) and labour productivity growth in 2016–17 (see the definitions in Box 1.1). Queensland productivity growth was considerably higher than the national average, and growth rates in MFP (1.9 per cent) and labour productivity (3.1 per cent) were the highest in the state since 2011–12 (Table 2).[1]

Box 1.1 Definitions and background to the ABS data

MFP can be defined as the efficiency with which capital and labour are combined to produce outputs. It is measured in terms of output per unit of combined inputs. Labour productivity is a partial productivity measure, as it considers the relationship between output and a single input—labour. It is measured as output (value added) per hour worked. It provides an indication of how efficiently labour is being used to produce outputs (for further background on concepts and definitions, see QPC 2016 and PC 2013).

Productivity can increase due to one or more of:

- an increase in output, holding inputs constant
- a decrease in inputs, holding output constant
- output growth increasing faster than input growth
- a decline in output at a rate less than the decline in inputs (Statistics New Zealand 2013).

Productivity estimates in this update are based on the newly released Australian Bureau of Statistics (ABS) state productivity estimates published in cat. no. 5260.0.55.002. The ABS state productivity estimates are compared to the previously published state estimates prepared by the QPC (based on work by the former Queensland Treasury and Trade (QTT) and Office of Economic and Statistical Research (OESR)) (see Appendix A).

The industry scope of the estimates is defined according to the ABS's definition of the market sector, consistent with ABS national productivity estimates (see the notes to Table 1). Based on industry output, market sector industries accounted for 71 per cent of Queensland Gross Value Added.

The measure of state capital builds on the experimental estimates of state net capital stocks recently constructed by the ABS (ABS 2016a, 2017a). Capital includes dwellings, ownership transfer costs, non-dwelling construction (non-residential buildings, and other structures, such as highways, railways, bridges, harbours, dams, pipelines and communication power lines), machinery and equipment (transport equipment and other machinery and equipment, such as computer equipment), weapons systems, cultivated biological resources (livestock, vineyards, orchards and other plantations), and intellectual property products (research and development, mineral and petroleum exploration, computer software, entertainment, literary or artistic originals).

While the rate of Queensland and Australian output growth was similar (1.7 versus 1.9 per cent), inputs in Queensland declined slightly overall (driven by a fall in hours worked), while both hours worked and capital services increased nationally.

The increase in Queensland's labour productivity received strong contributions from both MFP (1.9 percentage points) and capital deepening (an increase in the ratio of quantities of capital to labour—the amount of capital employed per hour worked) (1.2 percentage points).

[1] Caution is required when interpreting short-term and annual movements in productivity estimates as later data revisions can sometimes impact on annual estimates of productivity growth.

Table 2 Queensland and Australian market sector[a] output and productivity growth, 2016–17[b]

	Queensland	Australia[c]
Output growth	**1.7**	**1.9**
Combined labour and capital contribution	-0.2	1.3
Labour input[d]	-0.8	0.5
Capital input[e]	0.6	0.8
Multifactor productivity contribution	1.9	0.7
Multifactor productivity growth	**1.9**	**0.7**
Labour productivity growth	**3.1**	**1.1**
Capital deepening contribution	1.2	0.4
Multifactor productivity contribution	1.9	0.7
Other annual growth rates		
Labour input[d]	-1.4	0.8
Capital input[e]	1.5	1.9

(a) The 'market sector' includes: agriculture, forestry and fishing; mining; manufacturing; electricity, gas, water and waste services; construction; wholesale trade; retail trade; accommodation and food services; transport, postal and warehousing; information media and telecommunications; financial and insurance services; rental, hiring and real estate services; professional, scientific and technical services; administrative and support services; arts and recreation services; and other services. It excludes: public administration and safety; education and training; health care and social assistance; and ownership of dwellings.
(b) Growth rates are the 'per cent change' from 2015–16 to 2016–17. Contributions are the percentage point contributions to a growth rate. For example, Queensland labour productivity increased by 3.1 per cent with capital deepening contributing 1.2 percentage points and MFP contributing 1.9 percentage points (1.2 + 1.9 equals 3.1). Totals may not add due to rounding.
(c) For the Australian growth rates, labour inputs are measured on an 'hours worked' basis with no quality adjustment to be consistent with the state data. Quality adjusted labour input indices are also available from the ABS for national market sector industries, but not at the state level.
(d) Labour input is measured as hours worked.
(e) Capital is measured as 'capital services' (see the definitions of capital in Box 1.2).
Source: ABS 2018a (cat. no. 5260.0.55.002).

Labour productivity growth and the terms of trade

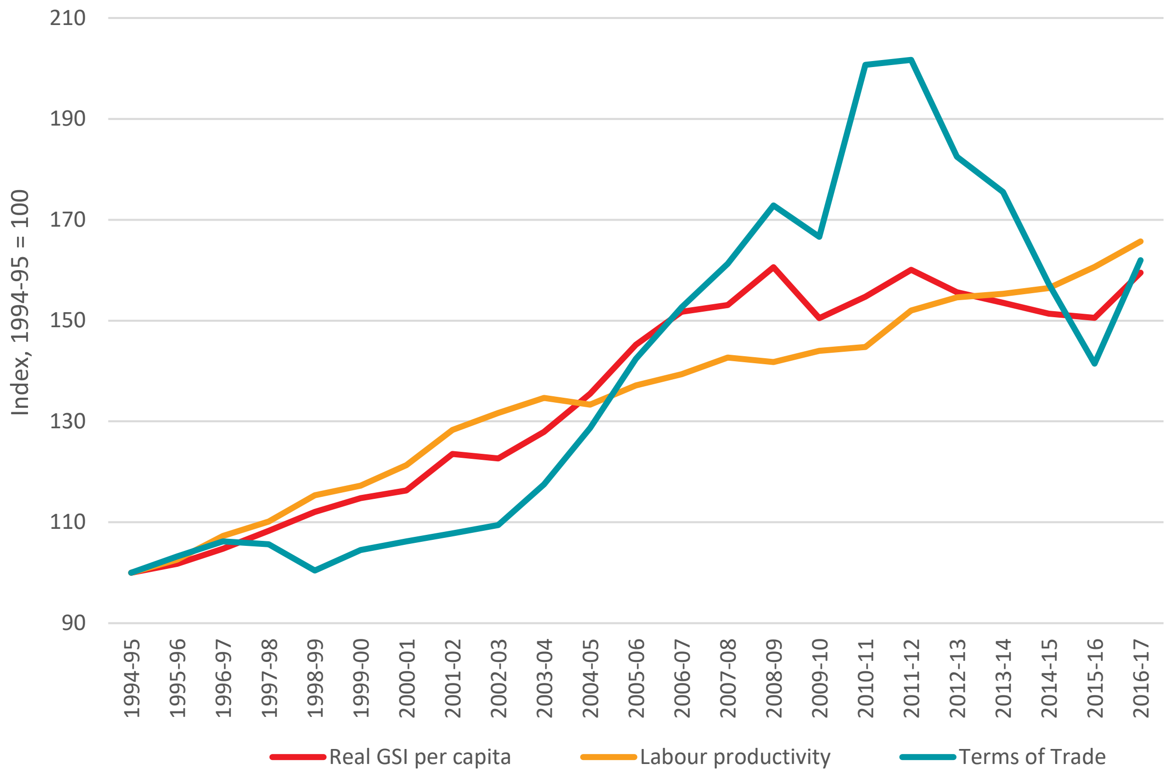
Both labour productivity and movements in the terms of trade impact on Queensland household incomes.

Growth in labour productivity means that workers and businesses can produce more output per hour worked, increasing real wages over time and per capita income growth.

The terms of trade is the ratio of export prices to import prices. An increase in the terms of trade means that for the same volume of exports Queensland's exports generate more income. Conversely, a fall in the terms of trade reduces incomes for the same volume of exports.

Real gross state income (GSI) per capita grew very strongly from 2000–01 to 2008–09, driven by the value of mining exports combined with strongly increasing minerals prices, reflected in the sharp rise in the terms of trade (Figure 1). From 2011–12, the positive impact of solid growth in labour productivity on incomes has been offset by a sharp reduction in the terms of trade, so that real GSI at 2016–17 is largely unchanged from 2008–09.

Figure 1 Queensland incomes and labour productivity growth, 1994–95 to 2016–17



Notes: Real gross state income (GSI) measures gross state product (GSP) adjusted for changes in the terms of trade and foreign income. The terms of trade is calculated by the ABS as the implicit price deflator for exports divided by the implicit price deflator for the import of goods and services. GSP is the total market value of goods and services produced in Queensland 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. Labour productivity is measured as output (gross value added) divided by hours worked. GSP measures the volume of goods and services produced in each state. If the terms of trade for a state changes significantly (i.e. the prices for a state's exports and imports change at different rates), then GSP will not accurately reflect the change in real purchasing power of the income generated within a state.
Source: ABS 2018a (cat. no. 5260.0.55.002); ABS 2017d (cat. no. 5206.0).

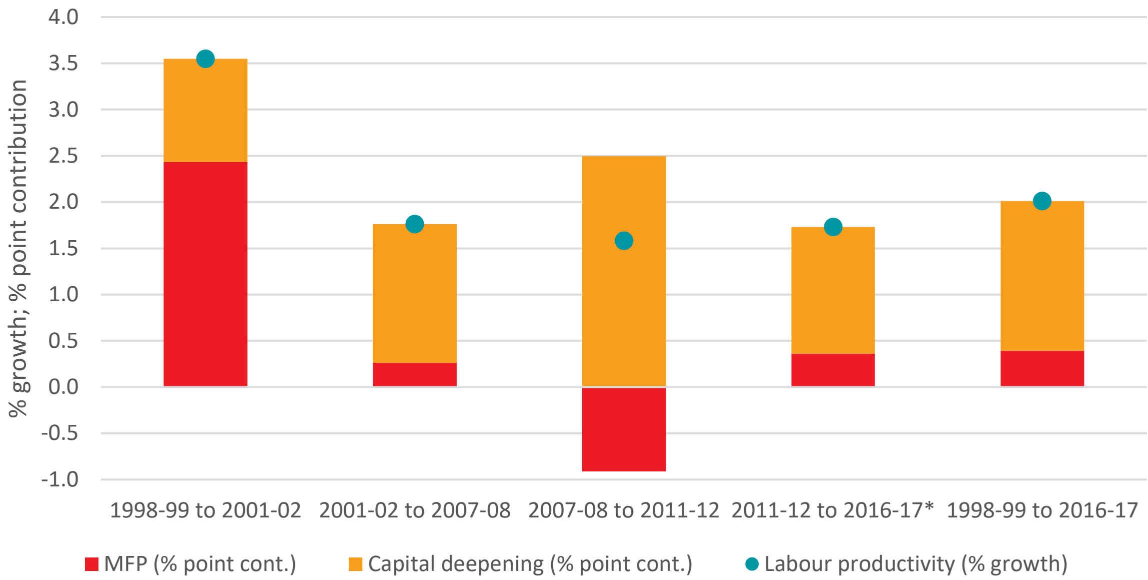
Contributions to labour productivity growth

From 2007–08 to 2011–12, capital deepening increased strongly, driving the increase in labour productivity growth (Figure 2). However, the overall efficiency with which both labour and capital inputs were used to produce outputs—that is, MFP—declined, detracting from labour productivity growth.

From 2011–12 to 2016–17, labour productivity grew at an annual average rate of 1.8 per cent per annum. Of this growth, MFP growth contributed 0.4 percentage points and capital deepening contributed 1.4 percentage points. The contribution of capital deepening resulted from continued growth in capital services (given strong capital investment) combined with a reduction in hours worked (declining 1.3 per cent between 2011–12 and 2016–17).

In the latest two financial years (not separately shown), MFP growth contributed more towards labour productivity growth than capital deepening for the first time since the 1998–99 to 2001–02 cycle.

Figure 2 Contributions to Queensland labour productivity growth by period

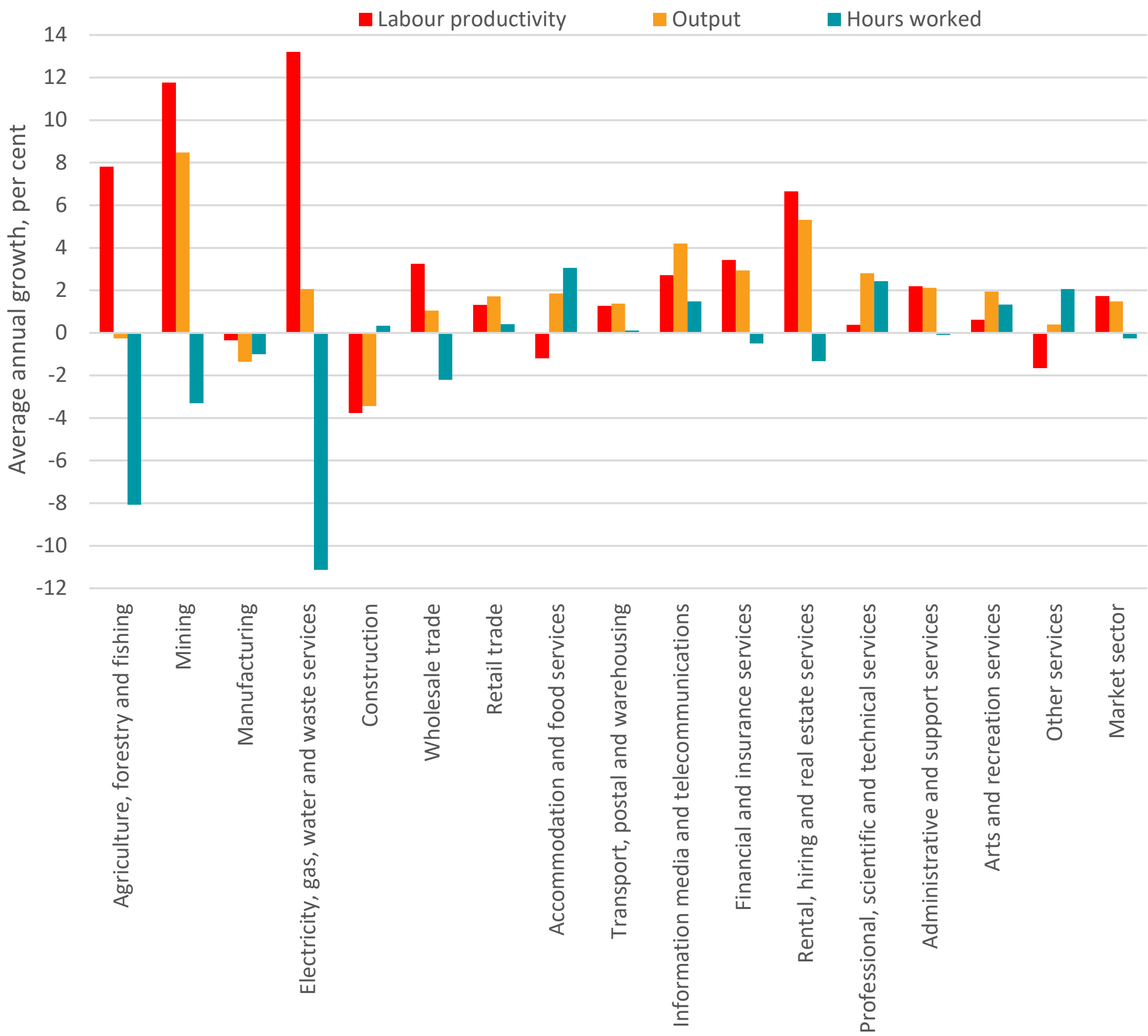


** Incomplete cycle.*
Notes: Short-term movements in productivity should be regarded with caution as year-on-year productivity growth estimates can display significant variation reflecting unmeasured changes in capital utilisation, lags between investment and output, and measurement error. To improve the reliability of growth comparisons, productivity cycles are identified so that comparisons can be made between similar points in a cycle (e.g. peak to peak). As displayed in Figure 5, identified peak years for Queensland MFP cycles are 1998–99, 2001–02, 2007–08, and 2011–12. Peaks were identified by the QPC by observing turning points in the deviation between measured MFP and a trend measure of MFP.
Source: QPC calculations based on ABS 2018a (cat. no. 5260.0.55.002).

At an industry level, labour productivity increased strongly from 2011–12 to 2016–17 in electricity, gas, water and waste services, and agriculture, forestry and fishing, driven primarily by a reduction in hours worked (Figure 3). Labour productivity also grew strongly in mining and rental, hiring and real estate services, driven more by increases in industry output.

For the market sector as a whole, labour productivity increased primarily through increases in output. Output increased in all industries, with the exceptions of agriculture, forestry and fishing, manufacturing and construction. Roughly half of market sector industries experienced reductions in hours worked.

Figure 3 Industry average annual growth rates, 2011–12 to 2016–17



Source: QPC calculations based on ABS 2017b (cat. no. 5220.0); ABS 2017c (cat. no. 6291.0.55.003).

Changes in labour utilisation

Growth in GSP per capita can be decomposed into growth in labour productivity and changes in labour inputs per capita (or labour 'utilisation', including changes in average hours worked, employment and participation). In Figure 4, growth rates and percentage point contributions are shown for the period 2011–12 to 2016–17 (orange bars) and 1998–99 to 2016–17 (gold diamond markers).

From 2011–12, and starting from the left of the chart, GSP per capita grew at an average annual rate of 0.6 per cent per annum. This can be decomposed into increases in labour productivity (contributing 1.7 percentage points to growth) and a reduction in labour utilisation (contributing negative 1.1 percentage points to growth in GSP per capita). The reduction in labour utilisation can be further decomposed into three components:

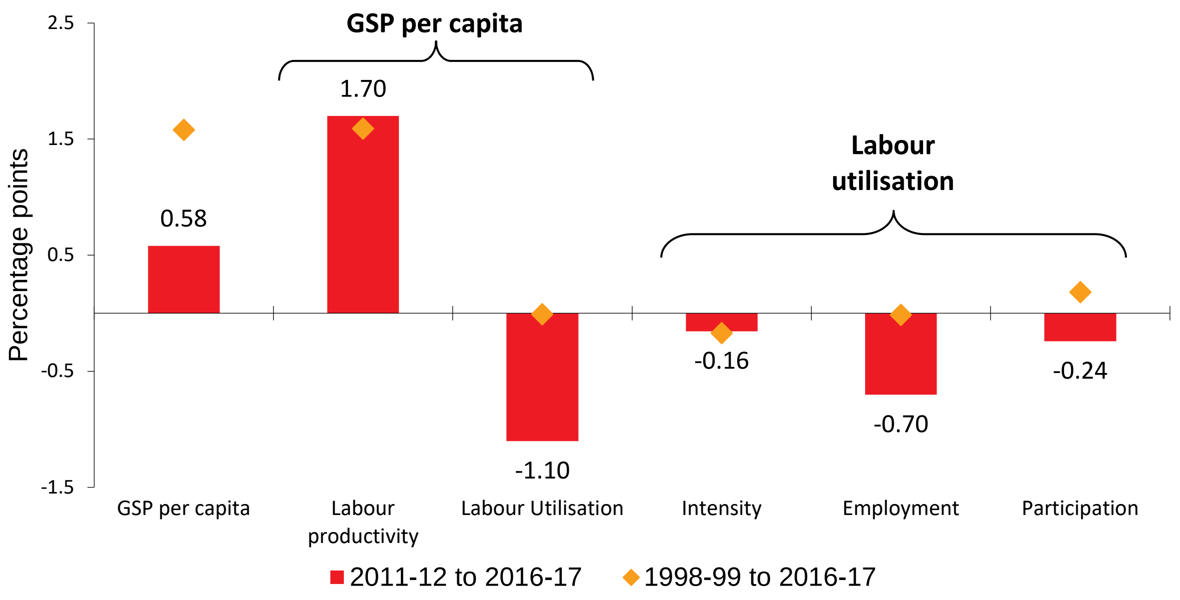
- intensity (–0.2 percentage points): average working hours per employed worker declined, caused principally by an increase in part-time employment relative to full-time employment
- employment (–0.7 percentage points): employed persons as a share of the labour force declined (i.e. the rate of unemployment increased). The labour force grew at an average rate of 1.3 per cent per annum, while total employed persons increased at a slower rate of 1.0 per cent. Full-time employed

persons increased at 0.3 per cent per annum, while part-time employed increased at 2.6 per cent per annum

- participation (–0.3 percentage points): the ratio of the number of people either working or looking for work (the labour force) declined as a share of Queensland's population.

Over the longer period from 1998–99, GSP per capita grew at just over 1.5 per cent per annum. Labour utilisation remained unchanged, with declines in average hours worked offset by increases in participation.

Figure 4 Decomposition of growth in GSP per capita



Note: Sum of component contributions may not add due to rounding.
Source: QPC estimates based on ABS 2018a (cat. no. 5260.0.55.002); ABS 2018b (cat. no. 6202.0).

Multifactor productivity growth

Previous studies have highlighted Queensland's 'subdued to negative' MFP performance for much of the period from the early 2000s. A number of significant factors or events have detracted from measured MFP growth, including:

- the very strong and sustained mining investment boom, lags between investment and subsequent output growth, and the extraction of more 'marginal deposits' when export prices are high (Topp et al. 2008; QTT 2013a, 2013b; Syed et al. 2013; QPC 2016; PC 2017a)[2]
- poor agricultural productivity growth over the second half of the 2000s linked to a prolonged drought which has since eased in most areas (Gordon 2016, pp. 175–76)
- the impact of natural disasters, such as cyclone Debbie (Queensland Treasury 2017, pp. 34–38)
- heavy investment in the manufacturing industry in the early 2000s, which has experienced lags in capital utilisation. While there is potential for future MFP growth as capital utilisation increases, much of this manufacturing investment occurred in an environment of heavily optimistic growth expectations

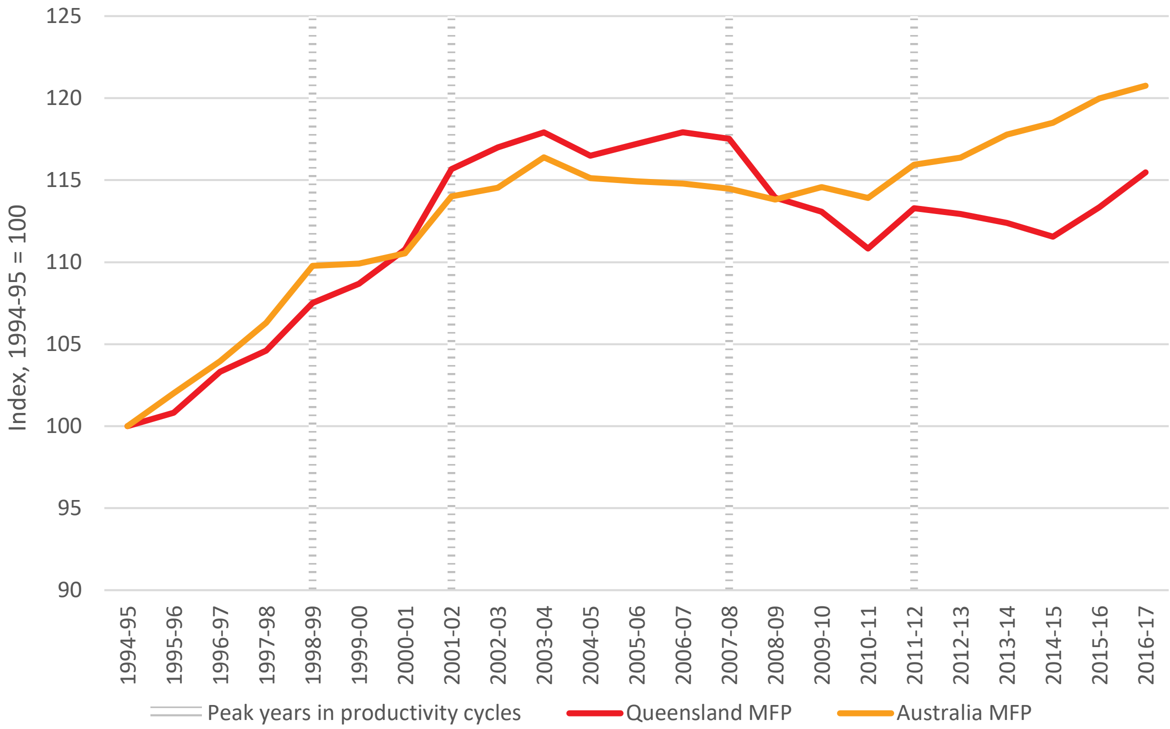
[2] Queensland Treasury 2017, p. 34 illustrates strong period influences on economic growth including the housing boom, mining boom, global financial crisis, natural disasters, and LNG investment and ramping-up of LNG exports.

prior to the GFC and resources boom. Hence, productivity growth has been low in the manufacturing sector since the GFC and may remain low in the future (QPC 2017, p. 29).

Queensland MFP decreased significantly between 2007–08 and 2011–12 (Figure 5), declining at an average annual rate of 0.9 per cent per annum (see statistical appendix B).

Over the most recent (incomplete) cycle, from 2011–12 to 2016–17, MFP has grown at a rate of 0.4 per cent per annum, and it appears to have grown strongly over the last two years (although, as noted earlier, caution needs to be exercised in interpreting short-term movements).

Figure 5 Queensland and Australian MFP growth, 1994–95 to 2016–17

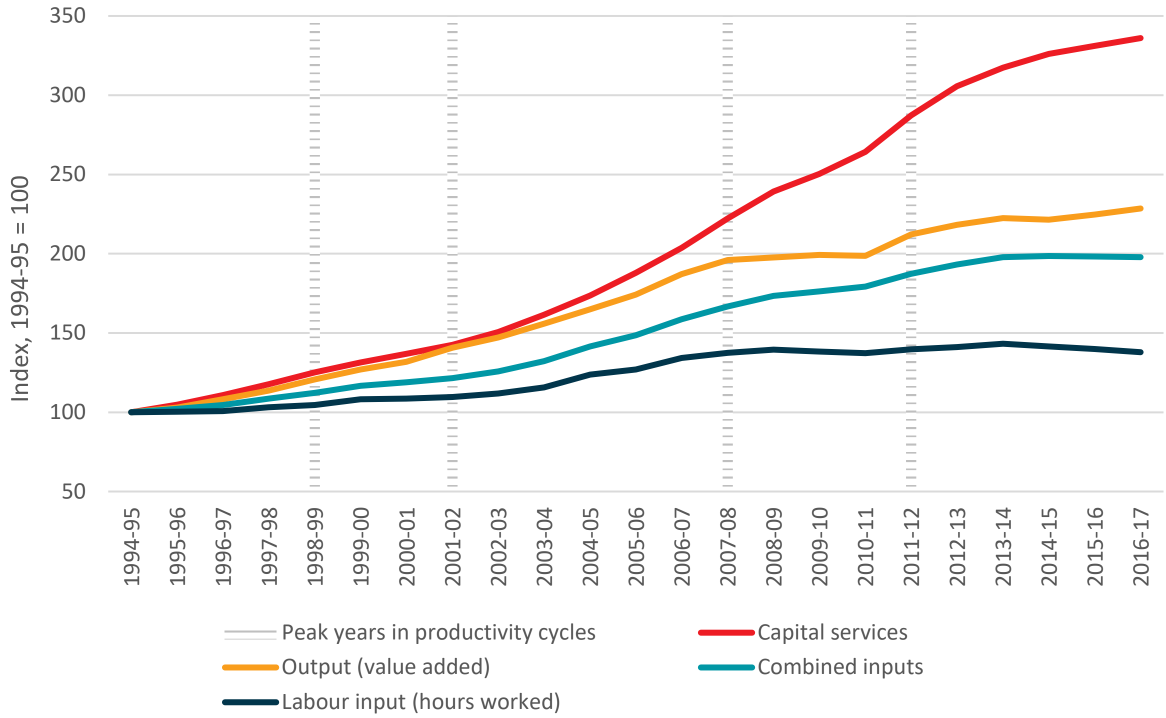


Note: Peak years identified as per the notes to Figure 2.
Source: ABS 2018a (cat. no. 5260.0.55.002).

Over the period 1998–99 to 2016–17, Queensland MFP has grown at a slightly slower rate at 0.4 per cent per annum compared to nationally at 0.5 per cent. Outputs have grown faster in Queensland at 3.5 versus 3.1 per cent per annum. However, the differential in the rate of growth in combined inputs was larger, with inputs in Queensland increasing at 3.2 per cent per annum versus 2.5 per cent per annum nationally.

While output growth in Queensland has grown strongly, what stands out is the rate of growth in capital services (Figure 6). Over the periods 2001–02 to 2007–08 and 2007–08 to 2011–12, capital services grew at the very rapid average annual rate of 7.4 and 6.5 per cent respectively.

Figure 6 Growth in Queensland output and labour and capital inputs, 1994–95 to 2016–17



Note: All measures are for the Queensland market sector.
Source: ABS 2018 (cat. no. 5260.0.55.002).

The published capital services index shown above is for the Queensland market sector and is not available for each Queensland industry. However, other capital measures are available for each industry, such as net capital stocks and consumption of fixed capital (Box 1.2). These measures provide information on industry contributions to the change in market sector capital services.

Growth in Queensland's net capital stock has been driven by strong increases in investment in a number of industries, but especially mining. From 2001–02 to 2011–12, mining's net capital stock grew rapidly at 11.2 per cent per annum (Figure 7). The size of the mining industry's net capital stock is now more than double the next-largest industry, which is transport, postal and warehousing (6.2 per cent per annum). Other large industries also experienced strong growth in their net capital stocks over this period, including manufacturing (7.4 per cent per annum), electricity, gas, water and waste services (7.1 per cent per annum), and construction (8.6 per cent per annum).

The period of rapid growth in mining capital suppressed measured MFP due to the significant lead times between initial investment and the output increases flowing from that investment:

> *The impact of mining investment (which rose from approximately 2 per cent of GDP in 2002–03 to over 9 per cent in 2012–13) on measured productivity has been profound. There is often a lag between capital investment and output growth for large lumpy investments. This is particularly the case for capital investment in the mining industry, where new projects, such as developing new iron ore mines, can involve lengthy construction periods before any output is generated. High commodity prices witnessed during the boom also created incentives for firms to pursue more marginal reserves of commodities, which further reduced measured productivity. (PC 2017a, p. 14, based on Topp et al. 2008)*

Box 1.2 Different measures of capital

Productive capital stocks: Productive capital stock estimates are derived by writing down each asset in accordance with its decline in efficiency due to age. If, for example, an asset is 75 per cent as efficient as a new asset of the same type, then the productive value of that asset is 75 per cent of the value of the new asset. Efficiency tends to decline with age, as older assets require more frequent and extensive maintenance and more replacement parts. Productive capital stock estimates are a measure of productive capacity and they form the basis for the measure of capital services required for productivity analyses.

The productive capital stocks underpinning Queensland's market sector capital services index are not separately published.

Capital services: Capital services are the preferred capital measure for productivity analysis. 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. In equilibrium, the value of capital services is equal to the gross returns (or rentals) to owners of capital—that is, the sum of consumption of fixed capital (COFC) during the period and a return on the net capital stock of assets.

Capital services indices are published at a national level for the market sector as a whole and for each market sector industry. In January 2018, the ABS began publishing a capital service index for each state's market sector as a whole, but not for the individual industries that form the market sector.

Gross capital stock: The value of an economy's gross capital stock is obtained by valuing each asset in use at the current price of a new asset of the same type, regardless of the age of the asset. It is calculated as the accumulation of past investment flows less retirements, at 30 June each year, before the deduction of any allowances for consumption of fixed capital.

Gross capital stocks, net capital stocks and consumption of fixed capital are published at the state level for each market sector and non-market sector industry.

Consumption of fixed capital: COFC represents the value of a capital asset that is 'used up' in a particular period. The real consumption of fixed capital of an asset in a period is the difference between the real economic value of the asset at the beginning of the period and at the end of the period. COFC is based on the concept of the expected economic lifetime of an asset and is designed to cover the loss in value due to normal wear and tear, foreseen obsolescence, and the normal amount of accidental damage that is not made good by repair. Unforeseen obsolescence is treated as a capital loss rather than as COFC.

COFC is always less than the value of the capital services, since the return to the owner of the asset must also cover the interest (or capital) cost of holding the asset. The value of the service has to not only cover depreciation but also provide a return to the owner of the asset sufficient to cover the interest cost.

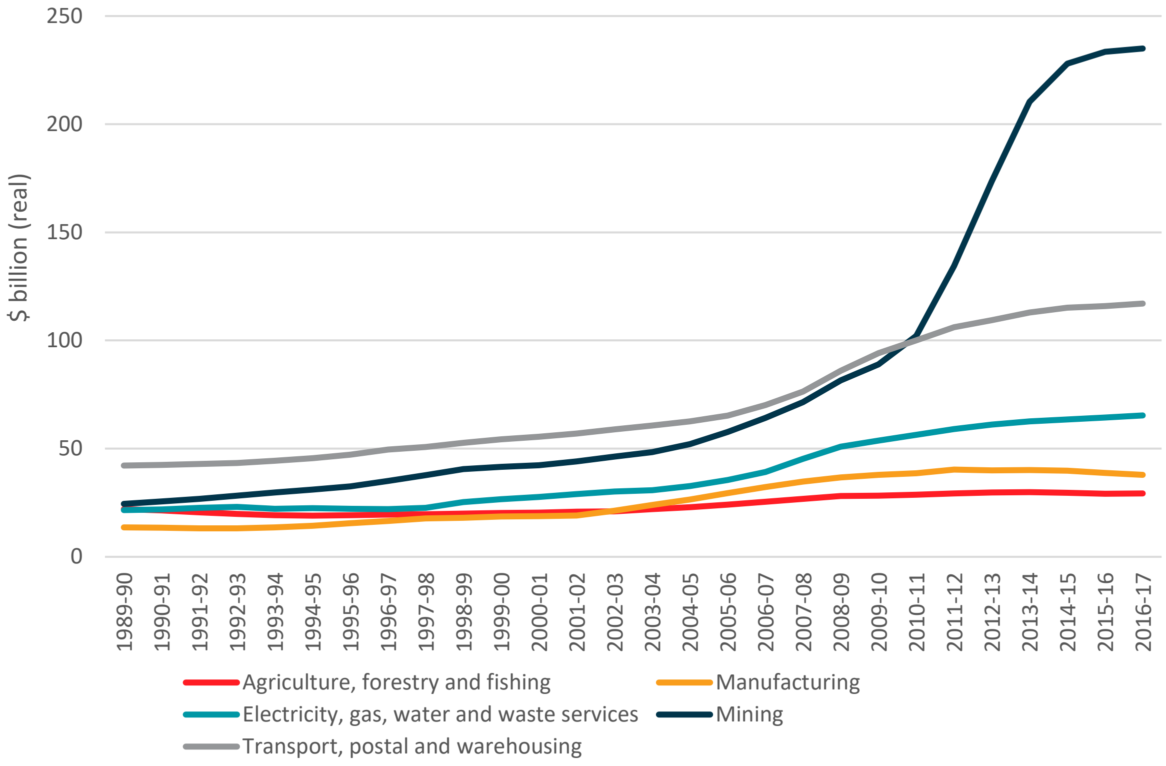
Net capital stock: Net capital stock estimates are the written down values of an economy's gross capital stocks. They represent the net present values of the future capital services to be provided by the assets. The difference between the net and gross value of an asset is accumulated depreciation. Net capital stock is essentially a measure of wealth and is shown in an economy's balance sheet.

Source: ABS 2015.

With the completion of large investments, such as liquefied natural gas projects in 2014–15, the sector has transitioned from the 'investment phase' into a 'production phase' (PC 2016, p. 1). For the national market sector as a whole, mining MFP made a positive contribution to labour productivity growth in 2015–16 for the first time since 2001–02:

> *The impact of the mining investment boom is unwinding and, in the most recent annual results, is no longer contributing to negative MFP growth.*[3] *(PC 2017a, p. 16)*

Figure 7 Queensland net capital stock growth by industry, 1989–90 to 2016–17



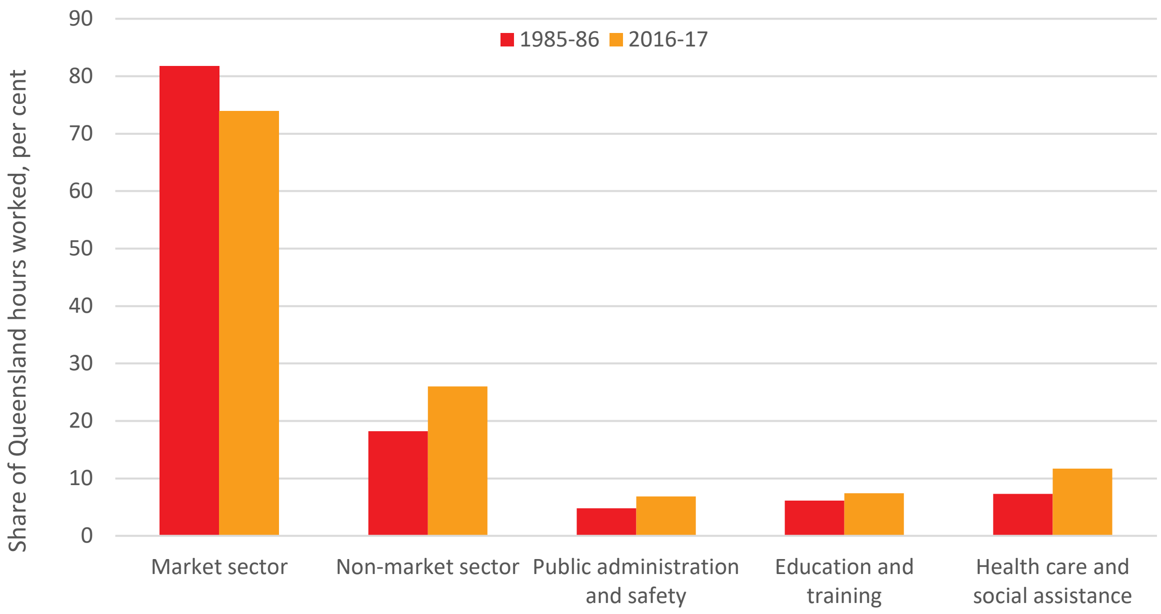
Source: ABS 2017a (cat. no. 5220.0).

Feature article: Non-market sector productivity

A large and increasing non-market sector

The productivity of the non-market sector has an important impact on living standards in Queensland. Non-market sector industries, such as healthcare and social services (the largest industry in the sector), public administration and safety, and education and training, make up a significant and growing share of the economy. For example, the share of total hours worked by the sector's employees in Queensland increased from 18 per cent in 1985–86 to 26 per cent in 2016–17 (Figure 8).[3] The sector is expected to become increasingly important as, for example, the healthcare requirements of an ageing population continue to grow, increasing the relative size of the healthcare industry (Australian Government 2015).

Figure 8 Growth of the non-market sector, 1985–86 to 2016–17



Source: ABS 2017c (cat. no. 6291.0.55.003).

Measuring productivity in the non-market sector

Non-market sector industries form part of the Australian System of National Accounts (ASNA). Most of the information provided by the ABS for market sector industries is also available for non-market sector industries, such as information on industry output (value added), employment and compensation of employees. Non-market sector industries are included in the aggregate indicators of production, income and expenditure, for example, estimates of gross domestic product (GDP).

However, for non-market sector industries, accurately measuring the volume of industry output and adjusting for quality changes pose significant measurement challenges (Box 1.3).

[3] The equivalent increase in the number of employed was 20 to 28 per cent.

Box 1.3 Challenges to measuring non-market productivity

Absence of reliable price information

The non-market sector is largely controlled by government, with goods often being provided at subsidised prices or free of charge. Hence, while in the market sector prices are easily observable, in the non-market sector it is very difficult to find appropriate price data that can be used to value outputs. Services provided by the government are particularly difficult to not only value, but also to quantify and adjust over time for changes in quality.

Difficult to define outputs

The New Zealand Productivity Commission (2017, p. 8) referred to non-market output itself as 'fuzzy'; it is often intangible and, in activities such as training and hospital care, hard to separate from the process of its creation. The lack of prices and difficulty in defining output hampers effective productivity measurement, as it becomes difficult to accurately value outputs and create volume measures of output.

Quality adjustment

Where the quality of a good or service changes significantly over time, it is important to adjust output measures for quality change. If quality is improving over time, then the absence of a quality adjustment underestimates output growth and will bias productivity measures downwards. If quality is declining over time, then the absence of a quality adjustment overstates output growth and will bias productivity measures upwards. Similarly, quality adjustment can be important for the accurate measurement of the inputs consumed in providing goods and services.

The methods and specific indicators chosen for quality adjustment may involve a degree of subjectivity, which will impact on measured productivity trends (Atkinson 2005, p. 183; NZPC 2017, p. 5). Even where specific indicators are intuitively appealing, there can still be problems. In the case of exam scores, scores are subject to potential grade inflation and ignore factors such as teacher quality (Gemmell, Nolan & Scobie 2017, p. 29). Other quality adjustments, such as using the 'real expected incomes' of students given their education, may be better suited as they incorporate the outcomes of education, although income is also imperfect due to its dependence on factors other than education (Gemmell, Nolan & Scobie 2017, p. 47).

Statistical agency approaches to output measurement

A 2016 OECD survey found that very few countries have made significant progress in the measurement of public sector productivity. Most countries relied partly or fully on an inputs-based measurement approach to measuring outputs (Lau et al. 2017, p. 184). Quality adjustment of government's direct volume estimates of output was undertaken by only four countries: the United Kingdom, Ireland, the Slovak Republic and Hungary (Lau et al. 2017, p. 192). Overall, progress in non-market sector productivity measurement has been slow:

> *[S]tatistical agencies in several countries, including New Zealand, have made some progress in the development of public sector productivity measures. These efforts built on major methodological studies in the early 2000s. However, since the mid-2000s, international progress in the development of productivity measures has stalled somewhat. Productivity measurement in most countries is limited to health and education sectors, and little progress has been made in the area of quality adjustment. (NZPC 2017, p. 27)*

Sources: Eurostat 2001; Atkinson 2005; ABS 2001.

The ABS historically measured non-market sector industry output using the 'outputs = inputs' method, in lieu of an available alternative (PC 2017b, p. 4). Under this method of measuring output:

> *More often than not, growth in input volumes have tended to be used as a proxy for growth in volumes of service industry output and value added. Hours worked or costs deflated by wage and other input price indexes have been primary components of these input-based methods.*

> *The main disadvantage of using input methods is that they do not reflect changes in output resulting from increased productivity. (ABS 2001, p. 13)*

In 2001, the ABS began collecting and aggregating direct volume measures of output for some subdivisions within the healthcare and social assistance and education and training industries. When the direct volume measures were first introduced into the national accounts, the ABS published an analysis of their effect on the estimates of industry output. Over the period 1993–94 to 1999–00, estimated output increased for both industries:

- output for health and community services increased significantly from an average annual rate of 1.6 per cent (under an inputs-based approach) to 4.0 per cent per annum
- output for education services increased modestly from 1.5 per cent per annum to 1.9 per cent per annum (ABS 2001).

ABS current measurement practice for the production of annual estimates of the volume of industry output includes the use of a large range of direct volume indicators. For the education and training industry, direct volume measures of output include information on, for example:

- full-time equivalent enrolments for different types of schooling
- for university research, the number of research publications and the number of student research completions.

The measurement of the volume of output for pre-schools and 'other' education services remains inputs-based (PC 2017b, p. 18), similar to public administration and safety, and social services (Figure 9).

In healthcare, output volume estimates use information on private and public hospital separations and the number of non-hospital services provided, stratified at various levels of procedure type, and weighted together by their respective current price value of expenditures (ABS 2015, p. 152). The ABS is investigating changing its method from the number of procedures administered (an activities-provided approach) to a direct volume measure based on completed courses of treatment (the diseases-managed approach) (PC 2017b, pp. 18–20).

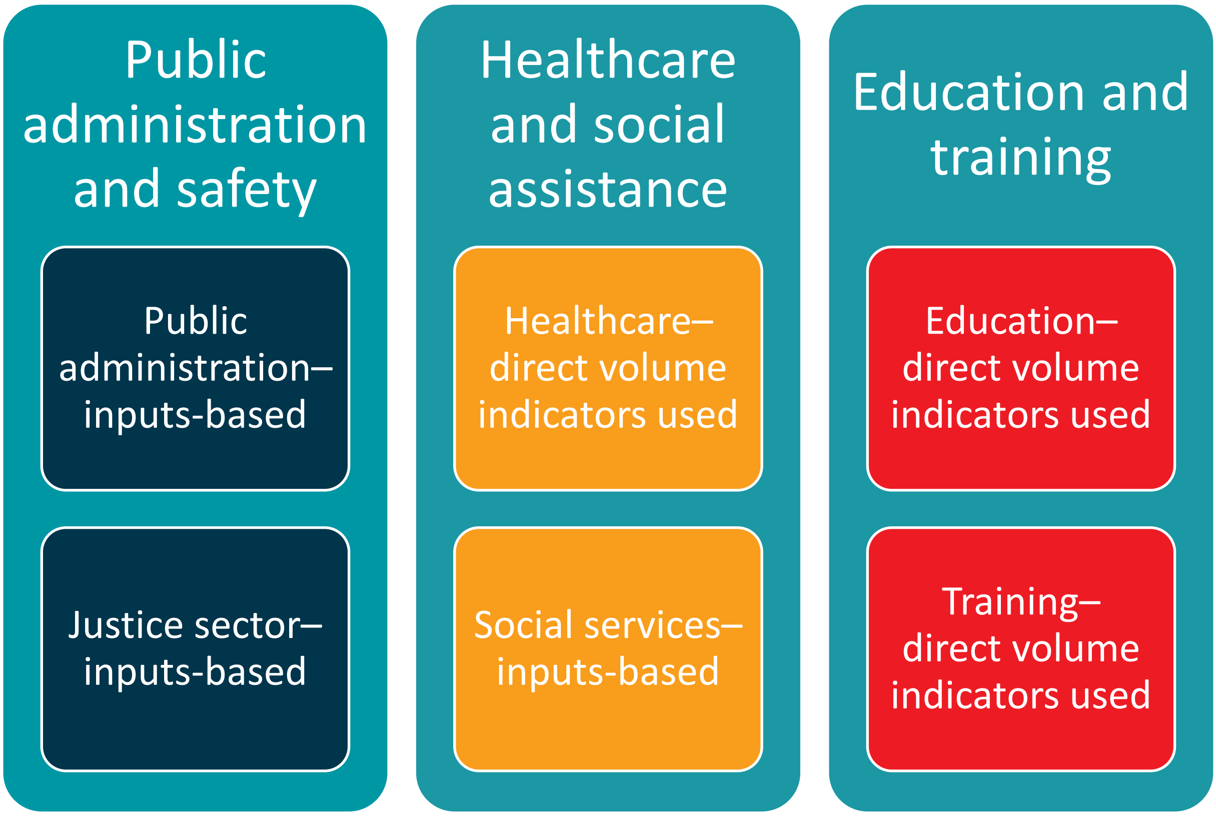
While direct volume indicators assist the ABS in constructing output volume estimates for the healthcare and education and training industries, industry output chain volume estimates are not 'direct volume measures' of output. The annual output estimates are constructed through a process involving current price output estimates based on costs, direct volume indicators, deflation methods and the use of supply–use tables to maintain internal consistency within the national accounts. The end result is that the output volume estimates cannot be said to be measured fully independently of input (cost) estimates.[4]

The industry output estimates in the national and state accounts do not include adjustments for changes in quality. Overseas evidence (shown below for the United Kingdom and New Zealand) suggest that the absence of quality adjustments could introduce significant biases to productivity estimates.

Given output measurement challenges, and that output measures are not quality-adjusted, the ABS continues to construct productivity measures for market sector industries only (PC 2017b, p. 18).

[4] Personal communications with ABS, March 2018.

Figure 9 Where direct volume indicators contribute to non-market sector industry output measurement



Source: PC 2017b; ABS 2015.

Case studies: United Kingdom and New Zealand

The United Kingdom’s Office for National Statistics (ONS) publishes productivity estimates for market sector industries similar to the estimates discussed earlier in this update. A notable difference is that the ONS includes an ‘Education, health and social work’ industry in its definition of the market sector. The non-market sector components of the industry are removed, including the whole of public administration and defence (ONS 2017a). In Australia, there is no attempt to identify those elements of education or health that are provided under market conditions, include them as part of the market sector, and estimate their productivity performance.

The ONS also produces a separate set of productivity estimates focused on non-market sector (public service) productivity. Wherever possible, the ONS uses direct quality-adjusted output estimates—74 per cent of education outputs are measured on this basis, as is 80 per cent of healthcare outputs, and 71 per cent of public order and safety outputs (ONS 2018a). Direct volume measures of output are generally used for services provided to ‘individuals’. The output of ‘collective’ services[5], such as police and defence, as well as parts of healthcare, use the 'outputs = inputs' method.[6] There is no set of equivalent estimates produced in Australia.

The methods used by the ONS to measure public service education and healthcare outputs, and make quality adjustments, are briefly outlined in Box 1.4.

[5] For service areas where it is difficult and complex to estimate the quantity of output (due to the lack of market transactions and/or the services are collectively consumed) the ONS assumes that the volume of output in a given year is equal to the volume of inputs used in producing them (the outputs = inputs method).

[6] The remainder of education outputs use direct quantity measurement without quality adjustment. The remainder of healthcare outputs is split between direct quantity measurement without quality adjustment as well as the outputs = inputs approach for the collective services component.

Box 1.4 United Kingdom public sector education and healthcare output and quality adjustment

Education

Output quantity

- The number of full-time equivalents (FTEs) for publicly funded students in education (pre-school, primary, secondary and special schools), plus Initial Teacher Training (ITT), Health Professional Training and Further Education
- FTEs adjusted for attendance
- Adjusted FTEs for each output combined into a single output index using cost weights

Output quality adjustments

- Average Point Score (APS) or Level 2 attainment of students in GCSE exams normally taken at the end of their eleventh year of schooling
- Proportion of students on ITT courses who attain Qualified Teacher Status each year

Healthcare

Output quantity

- Hospital and Community Health Services (HCHS): number of episodes for hospital inpatient, outpatient and day cases
- Family Health Services (FHS) – number of general practitioner (GP) and practice nurse consultations, publicly-funded dental treatment and sight tests
- GP prescribing – includes all drugs prescribed by general practitioners
- Non–National Health Service (NHS) provision – includes services funded by the government but provided by the private or third sector. For non-NHS provision, the outputs = inputs method is used
- Outputs weighted into a single output index using cost weights

Output quality adjustments

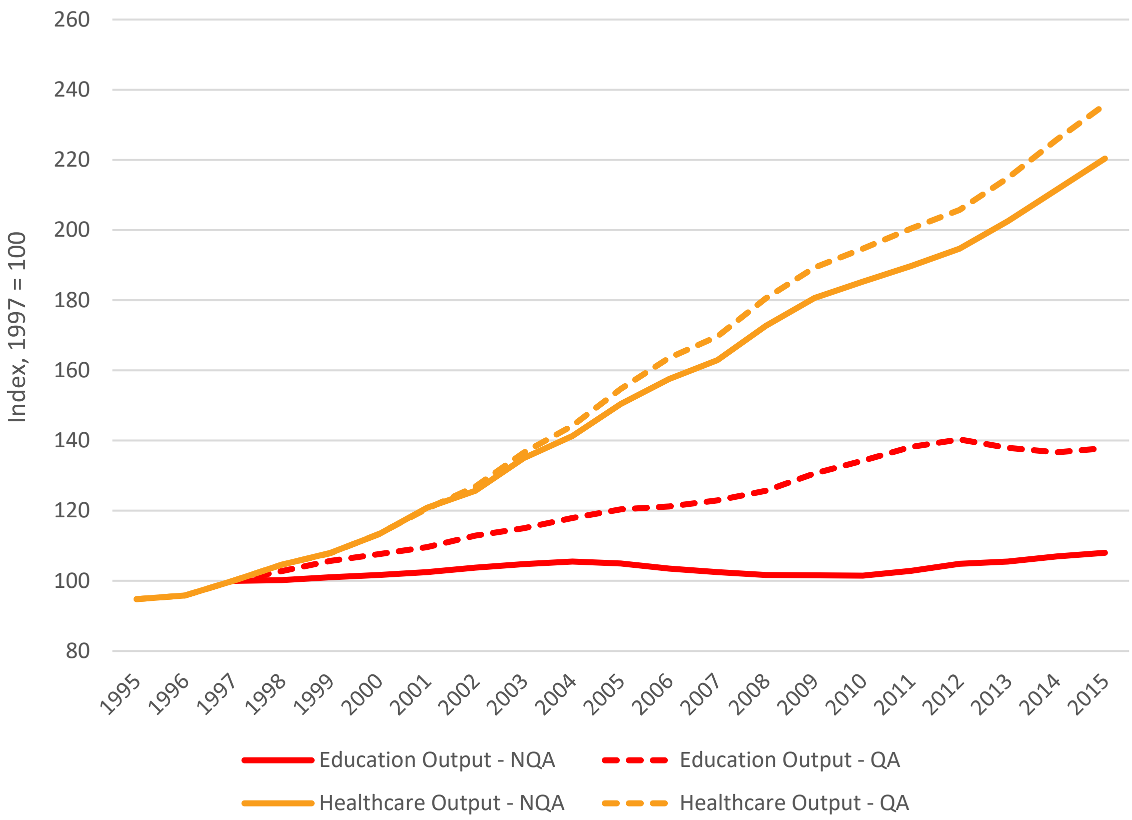
- Indicator of the extent to which the health service succeeds in delivering its intended outcomes: for HCHS services, this is measured using short-term survival rates, health gain following treatment in hospital and changes in waiting times; and for primary care, this is measured with a selection of measures from the GP Quality and Outcomes Framework, including measures for the percentage of certain groups of patients meeting target ranges for blood pressure
- Indicator of the extent to which the health service is responsive to users' needs: National Patient Survey results are used to measure patient experience of hospital inpatient services, mental health services, primary care, outpatient, and accident and emergency services

Source: ONS 2017a, 2018a.

ONS data indicates that adjusting outputs for changes in quality can make a significant difference to estimated growth in public sector outputs (Figure 10). Indices of non-quality adjusted outputs (NQA) for both education and health grew more slowly than quality-adjusted (QA) indices.

As education 'quantity' is largely driven by changes in the school age population (ONS 2015), almost all of the change in the quality-adjusted output index is being driven by quality change. In contrast, most of the growth in the quality-adjusted output index for health is being driven by increases in the volume of outputs and not quality change, although quality change does contribute.

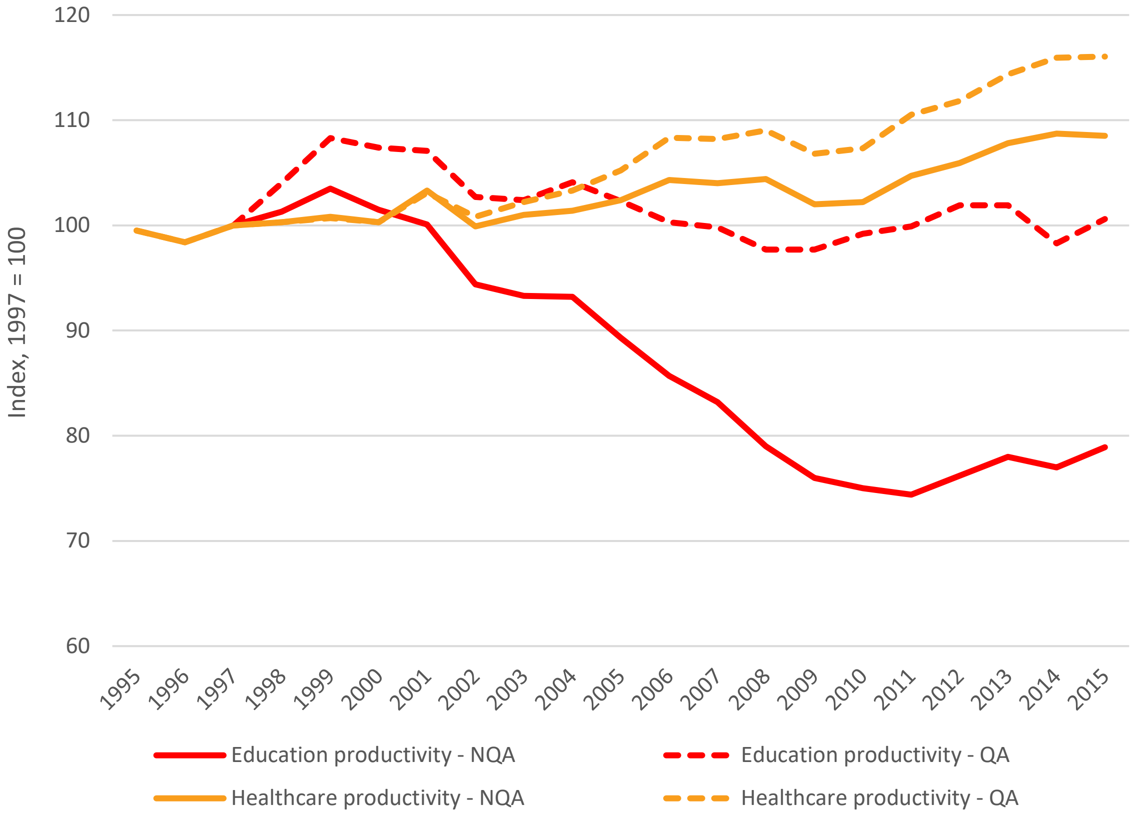
Figure 10 United Kingdom public sector education and healthcare output, 1995 to 2015



Source: ONS 2018b,c.

Quality adjustment of public sector outputs has a significant impact on public sector productivity estimates in the UK. The impact of quality adjustment is most dramatic in education: over a 20-year period, productivity declined steeply when based on non-quality adjusted output, but changed when quality adjustments were introduced (Figure 11).

Figure 11 United Kingdom public sector education and healthcare productivity, 1995 to 2015

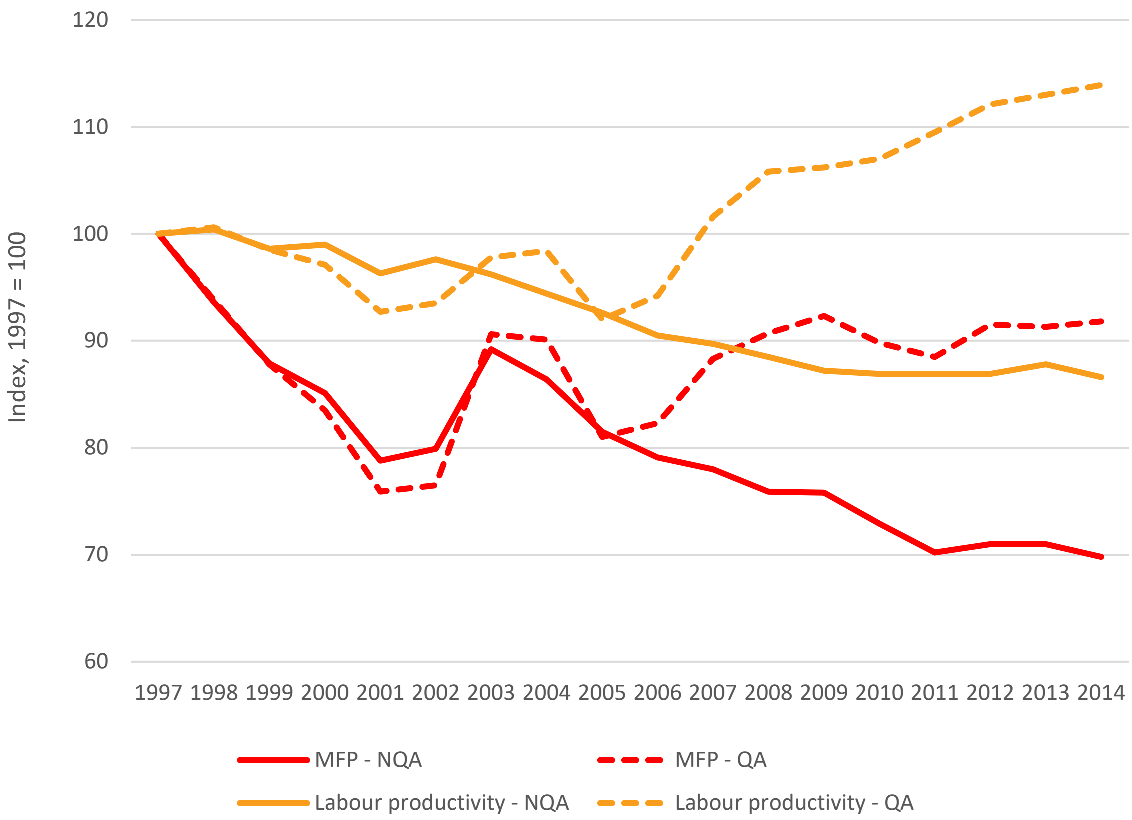


Note: Inputs to the MFP indices include labour, goods and services and consumption of fixed capital. The inputs are weighted using expenditure shares.
Source: ONS 2018b,c.

Estimates of education and healthcare productivity for New Zealand show similar patterns as in the United Kingdom. Both sets of estimates emphasise the importance of direct volume measures of output and quality adjustments.

For New Zealand schools, non-quality adjusted MFP and labour productivity declines over the entire 1997 to 2014 period, whereas, when education outputs are quality-adjusted, the series declined until to 2005 and then increased solidly (Figure 12). For education in both the United Kingdom and New Zealand, the decline in non-quality adjusted productivity is attributed, in part, to policy choices supporting smaller class sizes (Gemmell, Nolan & Scobie 2017, p. 10).

Figure 12 New Zealand schools' productivity, 1997 to 2014



Notes: 'Schools' refers to primary and secondary schools. Unadjusted MFP is measured as an index of student numbers divided by school revenue. Adjusted MFP is measured as an index of students leaving school with National Certificate of Educational Achievement (NCEA) level 2 (or equivalent) or greater divided by school revenue. School revenue is deflated using the full CPI. Unadjusted labour productivity is measured as an index of student numbers over teacher FTEs. Adjusted labour productivity is measured as an index of students leaving school with NCEA level 2 (or equivalent) or greater over teacher FTEs.
Source: Gemmell et al. 2017.

Exploratory Queensland estimates

To examine non-market sector productivity in Queensland, the Commission constructed exploratory estimates for the education and training, and health and social assistance industries using published data on industry hours worked, output and capital. Industry output for education and health at the state level is measured on a consistent basis with national aggregates: the sum total of all state and territory education output equals the output of the education industry at the national level. Therefore, the measure of output at the state level incorporates both the progress that has been made in introducing direct volume measures of output, and the ongoing weaknesses where the 'outputs = inputs' methodology is still used. Importantly, no output quality adjustments have been made for the exploratory MFP estimates below.

Ideally, the contribution of capital would be measured using the same method used by the ABS to produce capital services measures. As these measures are not available, an alternative approach is required (Box 1.5). The approach adopted provides a 'bound' within which the 'true', but unmeasured, estimate of MFP would lie.

Box 1.5 Options for measuring the contribution of capital

The ABS publishes net capital stocks (NKS) and consumption of fixed capital (COFC) for each industry at the state level, including for non-market sector industries (see Box 1.1).

Different measures of capital will grow at different rates depending on how their prices and quantities change in combination with the index number and other methods used to create the capital estimates (Schreyer 2003; ABS 2015). For the Australian market sector, the divergence between the net capital stock and capital services growth rates from the early 1990s is due to 'a compositional shift in Australian investment towards more short-lived capital goods with higher-than-average rates of depreciation' (OECD 2009, p. 150). An example is the increasing share of information and communications technologies, subject to strong real price declines, in the structure of capital inputs.

From 1999–00 to 2016–17, the capital services growth rate is higher than the NKS growth rate, and lower than the COFC growth rate, for all service sector industries, plus electricity, gas, water and waste services, and construction. This applies for both the national and state industry estimates.

	Australia			Queensland	
Industry	**NKS**	**Capital services**	**COFC**	**NKS**	**COFC**
Electricity, gas, water and waste services	3.3	3.7	4.1	5.3	5.6
Construction	4.8	5.4	7.0	6.6	8.6
Wholesale trade	1.5	3.0	3.9	0.0	3.4
Retail trade	4.5	5.3	6.8	3.5	6.1
Accommodation and food services	1.2	2.6	4.2	0.4	3.5
Transport, postal and warehousing	3.8	3.9	4.1	4.5	5.4
Information media and telecommunications	3.8	4.2	5.2	3.1	5.0
Financial and insurance services	1.0	2.8	7.0	3.0	8.8
Rental, hiring and real estate services	3.8	6.3	7.0	3.5	7.5
Professional, scientific and technical services	4.9	6.8	7.3	5.5	8.3
Administrative and support services	2.2	5.5	7.7	5.4	11.1
Public administration and safety	3.4	na	4.9	3.8	5.1
Education and training	3.3	na	4.6	3.7	5.3
Health care and social assistance	4.9	na	6.6	5.9	7.3
Arts and recreation services	3.3	4.9	6.1	1.5	4.7
Other services	0.5	8.7	9.1	8.2	8.5
Market sector	*3.3*	*4.3*	*4.7*	*4.1*	*6.0*

Notes: Average annual growth rates from 1999–00 to 2016–17. Capital service measures are not available by industry at the state level.
Source: ABS 2017b.

This suggests, in the absence of properly constructed capital services measures, a bounds approach can be adopted to estimating MFP. MFP based on the change in NKS provides an upper bound estimate of the growth in MFP, and MFP based on the change in COFC provides a lower bound estimate of MFP growth. As the contribution of capital measured by NKS grows slower, estimated MFP grows faster. Conversely, as COFC grows faster, estimated MFP grows slower.

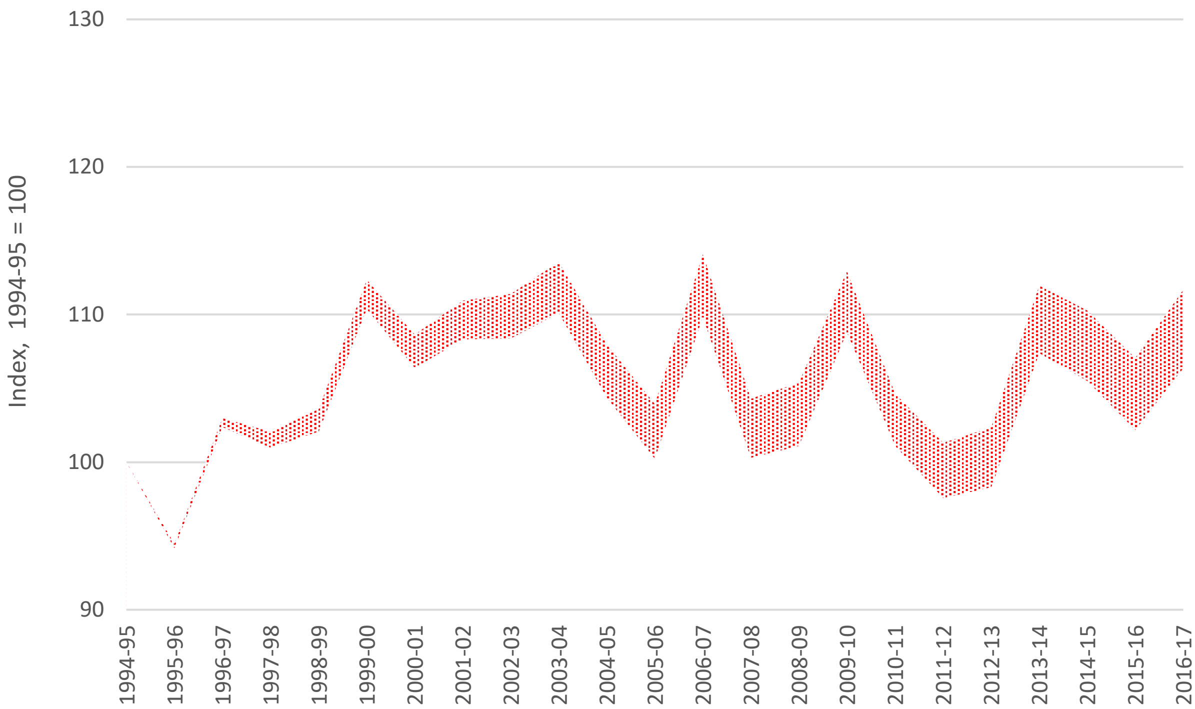
Assuming the same pattern holds as for other service sector industries, it is very likely that an estimate of MFP based on capital services would fall somewhere between the growth path bounded by the NKS- and COFC-based MFP estimates.

From 1999–00 to 2016–17, estimated growth in MFP in the education and training industry has been flat, growing at an average rate of between –0.2 and 0.0 per cent per annum (Figure 13). Output is estimated to have increased at a rate of 2.8 per cent per annum, and hours worked at 2.7 per cent. Capital grew between 3.7 per cent per annum (based on NKS) and 5.3 per cent per annum (based on COFC). As the capital share of industry factor income is low, changes in hours worked have a much larger influence on estimated MFP.

Although there are differences in the methodologies used in the construction of MFP estimates between countries[7], this performance contrasts against the strong decline in non-quality adjusted education MFP in the United Kingdom and New Zealand.

In Queensland and Australia, it is not clear whether quality adjustment in the education sector would make a significant difference to measured outputs and productivity. Even the direction of the quality adjustment is unclear. At least on some indicators, academic results appear to have deteriorated (for example, PISA scores for reading, mathematics and science) for Australian students since 2000 (OECD 2015). Results from the National Assessment Program—Literacy and Numeracy (NAPLAN) for years 3, 5, 7 and 9 for reading, writing, spelling, grammar/punctuation and numeracy skills give mixed results (PC 2017b, p. 11).

Figure 13 Exploratory MFP estimates for education and training, 1994–95 to 2016–17

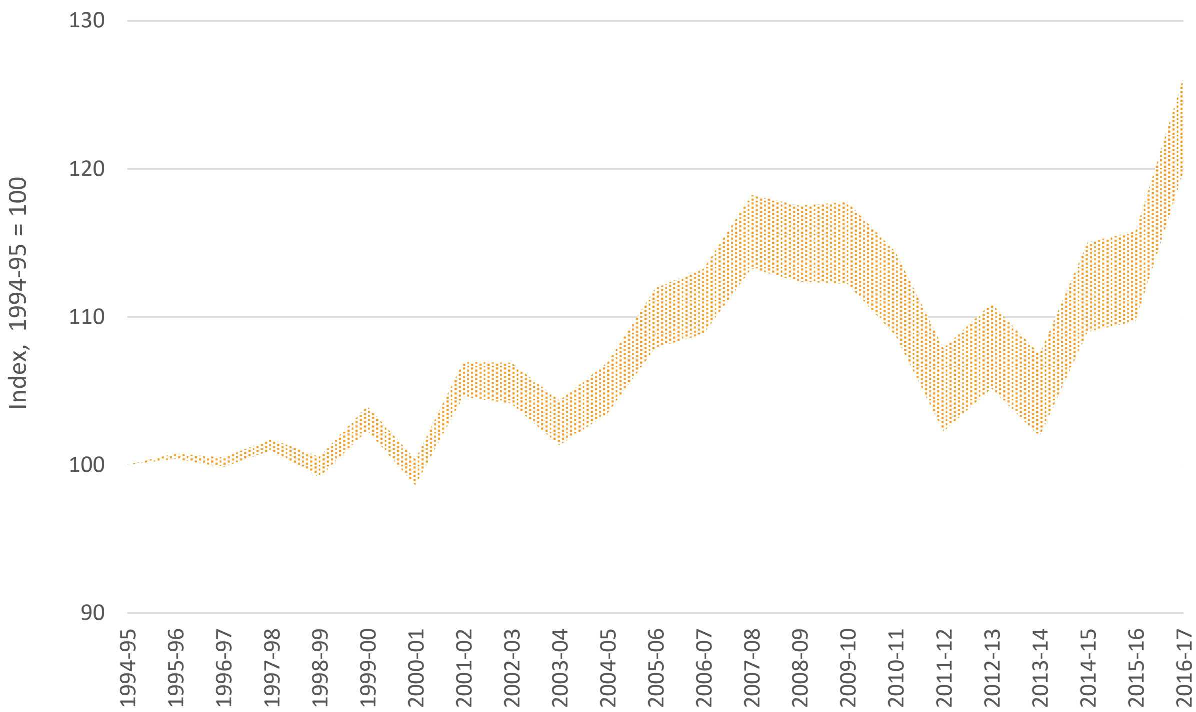


Note: The labour income share used to construct the MFP index does not include an income component for the unincorporated sector split–out from Gross Mixed Income (see ABS 2015, p. 437). For Queensland market sector industries as a whole in 2016–17, this adjustment raised the labour share from 50 per cent to 53 per cent. Given the lessor role of the unincorporated sector in non-market sector industries, the adjustment would be even smaller. As hours worked grew slower than capital (NKS- or COFC-based), growth in combined inputs may be slightly overstated (and MFP growth slightly understated). This small bias also applies to the MFP estimates for the healthcare and social assistance industry. Visually, there would be almost no change in *Figure 13* or *Figure* 14.
Source: ABS 2017a (cat. no. 5220.0); QPC calculations.

[7] Different countries construct their direct volume measures of education output using different indicators and weights. Another source of difference is that the United Kingdom estimates, for example, are a KLEMs-based MFP measure, while the exploratory estimates presented in this update are a value-added based measure of MFP.

For the healthcare and social assistance industry, the pattern of estimated MFP growth is similar to the estimates for public sector healthcare in the United Kingdom. Over the period 1999–00 to 2016–17, Queensland industry MFP is estimated to have increased between 0.9 and 1.2 per cent per annum. Output is estimated to have increased at 5.7 per cent per annum, and hours worked at 4.3 per cent per annum. Capital increased between 5.9 and 7.3 per cent per annum.

Figure 14 Exploratory MFP estimates for healthcare and social assistance, 1994–95 to 2016–17



Note: The strong increase from 2013–14 is mainly driven by output growth combined with reductions in hours worked.
Source: ABS 2017a (cat. no. 5220.0); QPC calculations.

Benefits of improving performance information

Exploratory estimates provide a starting point for examining non-market sector productivity in Queensland. But, further work is needed to improve the volume measures of output (including ongoing ABS work and testing of output volume measurement methods that measure outputs more independently from inputs), constructing experimental indices of quality change, and improving the measurement of capital.

Measurement of non-market sector productivity can contribute to a more informed debate and help ensure—along with other performance measurement frameworks— that taxpayers obtain good value for money. Measurement of performance is the first step in investigating drivers of change and linkages to policies, potentially contributing to improved outcomes and the freeing-up of resources for other uses.

It is important to achieve productivity gains in non-market sector industries over time, given the scale of resources consumed by the industries and the importance of the services they provide. An industry's performance must be measured before the causes of good or bad performance can be considered.

Productivity improvements in non-market sector industries can also benefit market sector industries and households through a number of channels, including improving human capital through training and better health, and lowering taxes through reducing the level of resourcing required to achieve a certain service delivery outcome.

References

ABS (Australian Bureau of Statistics) 2001, *Australian National Accounts: National Income, Expenditure and Product, Mar 2001*, *Feature article 1: New Chain Volume Estimates for the Services Sector*, cat. no. 5206.0, Canberra.

—— 2015, *Australian System of National Accounts: Concepts, Sources and Methods*, cat. no. 5216.0, at http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/C5ACA29422243B56CA257F7D00177D09/$File/52160_2015_.pdf.

—— 2016a, *Emphasising the State perspective: Experimental estimates of State capital stock, 2015–16*, cat. no. 5220.0.55.005, Canberra.

—— 2016b, *Labour Force, Australia, Nov 2016*, Summary: Spotlight on Underemployment, cat. no. 6202.0, at http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/6202.0Main%20Features5Nov%202016.

—— 2017a, *Australian National Accounts: State Accounts, 2016*–17, Summary: Experimental estimates of capital stock by state, 2016–17, cat. no. 5220.0, Canberra.

—— 2017b, *Australian National Accounts: State Accounts, 2016–17*, cat. no. 5220.0, Canberra.

—— 2017c, *Labour Force, Australia, Detailed, Quarterly, Nov. 2017,* cat. no. 6291.0.55.003, Canberra.

—— 2017d, *Australian National Accounts: National Income, Expenditure and Product, Dec. 2017*, cat. no. 5206.0, Canberra.

—— 2018a, *Estimates of Industry Multifactor Productivity, 2016-17*, cat. no. 5260.0.55.002, Canberra.

—— 2018b, *Labour Force, Australia, Dec 2017*, cat. no. 6202.0, Canberra.

Atkinson, T 2005, *Atkinson Review: Final Report—Measurement of Government Output and Productivity for the National Accounts*, Palgrave Macmillan, at www.ons.gov.uk/ons/guide-method/methodquality/specific/public-sector-methodology/articles/atkinson-review-final-report.pdf.

The Treasury 2015, *2015 Integenerational Report: Australia in 2055*, Australian Government, Canberra, March.

Eurostat 2001, *Handbook on price and volume measures of national accounts*, European Communities, at http://ec.europa.eu/eurostat/ramon/statmanuals/files/KS-41-01-543-__-N-EN.pdf.

Gemmell, N, Nolan, P & Scobie, G 2017, *Public sector productivity: Quality adjusting sector-level data on New Zealand Schools*, working paper 2017/2, New Zealand Productivity Commission, Wellington NZ.

Gordon, J 2016, 'Australia's Productivity: Some Insights from Productivity Analysis', *Asia & the Pacific Policy Studies*, vol. 3, no. 2, pp. 173–186.

Lau, E, Lonti, S & Schultz, R 2017, 'Challenges in the measurement of public sector productivity in OECD countries', *International Productivity Monitor*, vol. 32, pp. 180–195.

NZPC (New Zealand Productivity Commission) 2017, *Measuring and improving state sector productivity*, draft report, at https://www.productivity.govt.nz/sites/default/files/DRAFT%20REPORT%2014%20DEC%20%20Measuring%20and%20improving%20state%20sector%20productivity.pdf.

OECD 2009, *Measuring Capital: OECD Manual 2009*, second edition, OECD Publishing, Paris.

—— PISA 2015, Results by country, at http://www.oecd.org/pisa/.

ONS (Office for National Statistics) 2015, *Public Service Productivity Estimates: Education 2013*, 10 December 2015 release, at https://www.ons.gov.uk/peoplepopulationandcommunity/educationandchildcare/articles/publicserviceproductivityestimates/education2013.

—— 2017a, *Multi-factor productivity estimates: Experimental estimates to 2015*, 5 April 2017 release, at https://www.ons.gov.uk/economy/economicoutputandproductivity/productivitymeasures/articles/multifactorproductivityestimates/experimentalestimatesto2015#abstract.

—— 2017b, *Sources and Methods: Public service productivity estimates: Education*, 12 January 2017 release, at https://www.ons.gov.uk/economy/economicoutputandproductivity/publicservicesproductivity/methodologies/sourcesandmethodspublicserviceproductivityestimateseducation.

—— 2018a, *Public service productivity estimates: total public service, UK: 2015*, 5 January 2018 release, at https://www.ons.gov.uk/economy/economicoutputandproductivity/publicservicesproductivity/articles/publicservicesproductivityestimatestotalpublicservices/2015.

—— 2018b, *Public service productivity estimates: healthcare QMI*, 5 January 2018 release, at https://www.ons.gov.uk/economy/economicoutputandproductivity/publicservicesproductivity/methodologies/publicserviceproductivityestimateshealthcareqmi.

—— 2018c, *Public service education productivity estimates, 1997–2015*, dataset, 5 January 2018 release, at https://www.ons.gov.uk/economy/economicoutputandproductivity/publicservicesproductivity/datasets/publicserviceproductivityestimateseducation.

PC (Productivity Commission) 2013, *PC productivity update*, Canberra, May.

—— 2017a, *Productivity and Income—The Australian Story, Shifting the Dial: 5 year Productivity Review,* supporting paper no. 1, Canberra.

—— 2017b, *Non-market Sector Productivity, Shifting the Dial: 5 year Productivity Review,* supporting paper no. 2, Canberra.

QPC (Queensland Productivity Commission) 2016, *Productivity: Concepts, Measurement & Performance*, research paper, Brisbane, December.

—— 2017, *Manufacturing in Queensland*, final report, Brisbane, October.

QTT (Queensland Treasury and Trade) 2013a, *Queensland Productivity Update: 2011–12*, Queensland Government, Brisbane, February.

—— 2013b, *Estimates of Queensland Mining and Productivity Performance, 1989–90 to 2011–12*, Queensland Government, Brisbane, February.

Queensland Treasury 2017, *Queensland Budget 2017–18, Budget paper 2: Budget Strategy and Outlook,* Queensland Government, Brisbane, chapter 2, at https://s3.budget.qld.gov.au/budget/papers/2/2-Economic-performance-and-outlook.pdf

Schreyer, P 2003, 'Capital stocks, capital services and Multi-Factor Productivity measures', *OECD Economic Studies*, no. 37, 2003/2, Paris, pp. 163–184.

Stats NZ 2013, *Education and health industry productivity 1996–2011*, New Zealand Government, at https://www.stats.govt.nz/.

Syed, A, Grafton, Q & Kalirajan, K 2013, *Productivity in the Australian Mining Sector*, discussion paper series 13.01, Bureau of Resources and Energy Economics, March.

Topp, V, Soames, L, Parham, D & Bloch, H 2008, *Productivity in the Mining Industry: Measurement and Interpretation*, staff working paper, Productivity Commission, December.

Appendix A: Comparison of state estimates of MFP

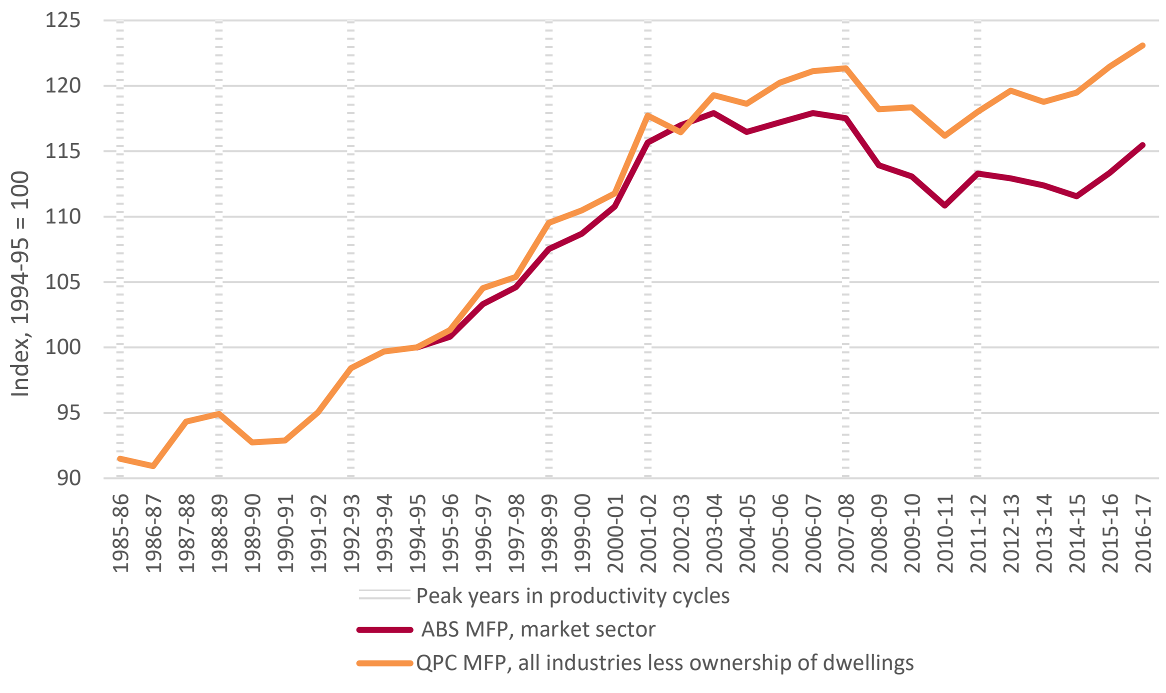
Prior to the new state productivity estimates published by the ABS, estimates of Queensland's productivity performance were produced by the Office of Economic and Statistical Research (OESR), Queensland Treasury and Trade (QTT) and, more recently, the QPC.

There is a reasonably significant difference in the rate of growth of MFP between the ABS estimates and earlier Queensland estimates, with the ABS estimates providing for a slower rate of MFP growth over the longer term (Figure 15). The primary reason why the estimates differ is that the estimates are based on a different industry scope. The ABS estimates are restricted to market sector industries, whereas QPC and earlier estimates are based on the whole of the state economy less the ownership of dwellings industry. For the ABS estimates, removing the non-market sector industries means that the effects of the mining boom, and other influences on measured MFP noted in the body of this update, have a larger influence on the MFP index.

Another source of the difference in MFP growth rates is differences in the methodology used to construct capital services measures, combined with differences in labour-capital shares. These differences in methodology are due to earlier data constraints which did not permit estimates based on the market sector only. Over the period 1998-99 to 2015-16, the key comparisons are:

- the ABS MFP compound annual growth rate for Queensland was 0.3 percentage points less than the QPC growth rate (0.4 versus 0.7 per cent per annum). While there are differences in growth rates, the direction of MFP growth rate for each cycle is consistent between the alternative sets of estimates
- ABS market sector output grew 0.1 percentage points slower (3.8 versus 3.9 per cent per annum)
- ABS combined inputs (labour + capital) grew 0.2 percentage points faster. ABS market sector hours worked grew 0.5 percentage points slower, while capital services grew 0.6 percentage points faster.

Figure 15 Comparison of Queensland MFP estimates



Notes: Productivity cycles denoted by vertical grey lines. Cycles prior to 1994–95 (the first year of the ABS state estimates) are based on the QPC estimates of MFP.
Source: ABS 2018a (cat. no. 5260.0.55.002); QPC estimates based on ABS data (primarily cat. no. 5220.0).

Appendix B: Statistical appendix

Table 2 Market sector productivity growth by state and period, average annual growth rate, per cent[a]

Jurisdiction	1998-99 to 2001-02	2001-02 to 2007-08	2007-08 to 2011-12	2011-12 to 2016-17[b]	1998-99 to 2016-17
Labour Productivity (value added per hour worked)					
Queensland	3.6	1.8	1.6	1.7	2.0
New South Wales	1.0	0.9	2.4	1.8	1.5
Victoria	2.9	1.3	0.8	1.1	1.4
South Australia	3.1	0.4	1.0	1.4	1.3
Western Australia	2.2	2.5	3.1	3.1	2.7
Tasmania	0.9	0.9	2.7	0.3	1.1
Australia	2.4	1.4	2.1	1.8	1.9
Multifactor Productivity					
Queensland	2.4	0.3	-0.9	0.4	0.4
New South Wales	0.2	-0.2	1.4	1.4	0.7
Victoria	1.3	0.0	-0.1	0.8	0.4
South Australia	1.9	-0.7	0.1	0.3	0.2
Western Australia	1.4	0.8	-0.8	-0.3	0.2
Tasmania	0.0	0.1	0.5	-0.2	0.1
Australia	1.3	0.1	0.3	0.8	0.5
Output (value added)					
Queensland	5.1	5.5	2.0	1.5	3.5
New South Wales	2.8	2.0	2.4	2.7	2.4
Victoria	3.4	3.4	1.5	2.5	2.7
South Australia	3.4	2.1	1.4	0.4	1.7
Western Australia	3.2	6.0	5.5	2.3	4.4
Tasmania	0.8	3.4	1.5	0.3	1.7
Australia	3.4	3.6	2.7	2.5	3.1

Table 2 cont'd

Jurisdiction	1998-99 to 2001-02	2001-02 to 2007-08	2007-08 to 2011-12	2011-12 to 2016-17[b]	1998-99 to 2016-17
Combined inputs					
Queensland	2.7	5.3	2.9	1.1	3.2
New South Wales	2.5	2.2	1.0	1.4	1.8
Victoria	2.1	3.4	1.7	1.7	2.3
South Australia	1.4	2.8	1.3	0.1	1.5
Western Australia	1.9	5.2	6.4	2.6	4.2
Tasmania	0.8	3.3	0.9	0.5	1.6
Australia	2.2	3.5	2.4	1.7	2.5
Labour input (hours worked)					
Queensland	1.7	1.1	0.0	1.0	0.9
New South Wales	0.5	2.1	0.8	1.4	1.4
Victoria	1.6	3.8	0.4	-0.3	1.5
South Australia	0.3	1.7	0.4	-1.0	0.4
Western Australia	1.0	3.5	2.5	-0.8	1.7
Tasmania	-0.1	2.5	-1.2	0.0	0.6
Australia	1.0	2.2	0.6	0.7	1.2
Capital services					
Queensland	4.0	4.1	2.6	2.0	3.2
New South Wales	4.5	5.5	3.0	2.1	3.8
Victoria	4.3	7.4	6.4	3.1	5.5
South Australia	2.9	4.4	2.4	1.5	2.9
Western Australia	2.6	6.7	9.5	5.8	6.4
Tasmania	1.7	4.2	3.3	1.1	2.7
Australia	3.9	5.4	4.7	3.0	4.3

(a) Periods based on Queensland productivity cycles and peak-to-peak comparisons.
(b) Incomplete cycle.
Source: QPC estimates based on ABS 2018a (cat. no. 5260.0.55.002).

qpc
Queensland
Productivity
Commission