Queensland Productivity Update: 2011-12

A publication prepared by Queensland Treasury and Trade

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1.0 Introduction

This Queensland productivity update provides measures of multifactor productivity (MFP) for Queensland and Rest of Australia for the period 1985-86 to 2011-12. It examines Queensland's productivity performance in terms of productivity cycles, the last of which is estimated to have ended in 2007-08, together with Queensland's recent productivity performance.

The *Queensland State Accounts* (QSA), published quarterly by Queensland Treasury and Trade, provides a measure of Queensland's economic performance. In addition to these quarterly estimates of Gross State Product (GSP), Queensland Treasury and Trade has recently developed a methodology to estimate MFP growth which provides a more comprehensive understanding of the drivers of economic growth. This update follows the publication *Estimates of Queensland Productivity Performance, 1985-86 to 2009-10*. For a more in-depth discussion on productivity concepts and Queensland's historical productivity performance, see *An Historical Analysis of Productivity in Queensland*.

One advantage of estimating MFP growth is that it allows economic growth to be decomposed into the contribution from accumulation of inputs: labour and capital, and MFP. In this update, MFP is analysed from the following five perspectives:

- productivity cycles;
- recent productivity performance;
- 2001-02 to 2007-08 productivity cycle;
- long term average; and
- contribution to living standards.

Annual data are also presented in Appendix 1.

2.0 Productivity cycles

Short term movements in productivity should be interpreted with caution as productivity estimates are volatile from year-to-year. Such movements in measured productivity may not be truly indicative of productivity trends as these short term fluctuations may reflect the degree to which firms are utilising their capital stock or the fact that employment growth tends to lag output growth. A conventional method of examining changes in productivity over time involves identifying and dividing the data into productivity 'growth cycles'. These growth cycles are determined by comparing the annual MFP estimates with their corresponding long term trend estimate[1]. The maximum deviation of the MFP index above its trend is the primary indicator of a growth cycle peak. Alternatively, over the longer period movements in the trend estimates can also be examined.

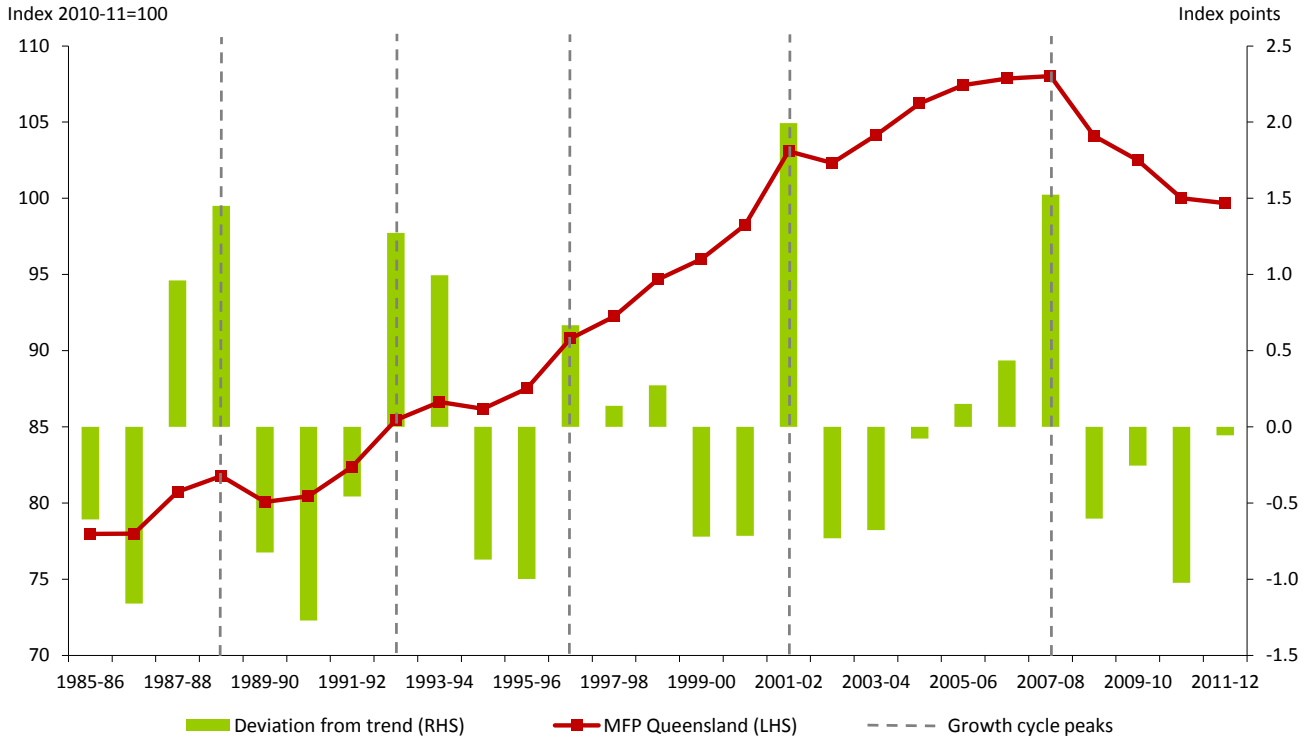
The green bars in Figure 1 represent the deviation of the original MFP series from the trend MFP series, where a positive deviation indicates that the original MFP estimate is greater than its trend equivalent in that year.

For Queensland, the obvious growth cycle peaks are 1988-89, 1992-93, 1996-97, 2001-02 and 2007-08[2]. Although there are some small differences between these growth cycle peaks and those identified for Rest of Australia, the use of the four peaks mentioned above facilitates the comparison of productivity performance between Queensland and Rest of Australia in this update.

[1] For more information on productivity growth cycles see *An Historical Analysis of Productivity in Queensland* (http://www.oesr.qld.gov.au/products/publications/historical-analysis-productivity-qld/index.php).

[2] The periods 1985-86 to 1988-89 and 2007-08 to 2011-12 represent only partial productivity growth cycles due to their unidentifiable start and end-point respectively. In general, due to the likelihood of data revisions in the years immediately following a release, productivity cycles may only be identified sometime after the reference year. In addition, due to data revisions growth cycle peaks may change as additional data become available.

Figure 1: MFP index and deviation from trend, Queensland



Source: Queensland Treasury and Trade estimates

MFP growth in Queensland accelerated over the first three productivity growth cycles, before moderating in the most recent cycle of 2001-02 to 2007-08 and has continued to moderate since 2007-08. Productivity gains were particularly strong in the mid-to-late nineties and continued into the early part of the subsequent decade. This acceleration through the 1990s coincided with an extended period of economic expansion in Queensland in an environment where productivity gains were also contributing to robust growth in the national economy following the recession earlier in the decade.

Nationally, the productivity surge of the 1990s was attributed to some combination of microeconomic reforms (such as reduced trade barriers and competition reform), workforce human capital and the introduction and use of new technologies[3]. It should be noted that these factors are interconnected and, for example, reform induced exposure to competition may have encouraged the adoption of new technologies.

Research by the Productivity Commission[4] indicates that the lagged impact of microeconomic reforms of the 1980s is likely to have played "at least some underlying part" in the acceleration of productivity growth over the two cycle period from 1992-93 to 2001-02.

[3] See Productivity Commission: Commission Research Paper, *Microeconomic Reform and Australian Productivity: Exploring the Links*, 1999.

[4] *Microeconomic reforms and the revival in Australia's growth in productivity and living standards,* Paper presented to the Conference of Economists, Adelaide, 1 October 2002.

3.0 Recent productivity performance

Queensland recorded relatively weak output growth[5] of 1.4 per cent average annual growth over the four years to 2011-12 (Table 1) compared with average annual growth of 5.0 per cent over the period 1985-86 to 2007-08. By comparison, Rest of Australia experienced average annual growth in output of 2.7 per cent over the four year to 2011-12.

Table 1: Recent productivity growth [(a)]

2007-08 to 2011-12	Queensland	Rest of Australia
	Average annual growth (per cent)	
Output	**1.4**	**2.7**
Multifactor productivity	**-2.0**	**0.0**
Labour productivity	-0.1	1.4
less Capital deepening	1.9	1.4
Combined labour and capital inputs[(b)]	**2.4**	**2.1**
Hours worked	1.5	1.3
Capital services	6.9	5.4

(a) Sum of component contributions to growth may not add due to rounding.
(b) Weighted in terms of labour and capital income shares.
Source: Queensland Treasury and Trade estimates

Although officially not a growth cycle, Queensland MFP recorded a decline of 2.0 per cent per annum over the period 2007-08 to 2011-12, compared with an unchanged MFP result in the Rest of Australia. This recent decline in Queensland MFP can be attributed to two main reasons.

Firstly, Queensland has recorded below average economic growth over the four years since 2007-08. This reflects the impact of the global financial crisis in 2008-09 together with the impacts of widespread flooding and Cyclone Yasi in 2010-11. Secondly, over the period 2007-08 to 2011-12, Queensland has recorded average annual growth in capital services of 6.9 per cent per annum. Mining investment is at record levels in Queensland with a substantial proportion relating to liquefied natural gas projects with the corresponding output growth not expected before 2014.

Estimates of labour productivity can be decomposed into the contribution of MFP growth and the rate of capital deepening[6]. This distinction is important as while labour productivity is a more commonly used measure, it can mask the true rate of change in productivity due to variations in capital deepening. Over the period 2007-08 to 2011-12, Queensland's labour productivity declined by 0.1 per cent per annum compared with an increase of 1.4 per cent over the corresponding period for the Rest of Australia. The decline in Queensland labour productivity reflects the 1.9 per cent per annum contribution from capital deepening being more than offset by the 2.0 per cent per annum decline in MFP.

3.1 Factors affecting recent performance

Analysis by the Productivity Commission[7] suggests that special developments in three industries can explain much of the recent decline in MFP at the Australian level. The industries identified by the Commission were mining; electricity, gas and water; and agriculture.

[5] For the purposes of this publication, output is defined as GSP less the ownership of dwellings industry.

[6] Defined as the ratio of the growth in capital to the growth in labour.

[7] Productivity Commission Submission to House of Representative Standing Committee on Economics, *Inquiry into Raising the Level of Productivity Growth in the Australian Economy, 2009.*

The Productivity Commission indicated that the decline in MFP in Australia's electricity gas and water industry is due to very low rainfall during the five year period from 2003-04 to 2007-08 exerting downward pressure on water consumption and consequently water output together with a large increase in capital investment on infrastructure to secure future water supply.

Queensland was significantly affected by the drought which extended through the majority of last decade. This resulted in significant investments in water infrastructure throughout the State[8], particularly in South East Queensland, to help alleviate the impacts of the severe drought and ensure long term security of supply. Despite recent periods of higher rainfall, household water consumption remains low. As such, output of the water industry also remains subdued.

Further, the Queensland electricity industry MFP has been recently impacted by increased capital investment (particularly in distribution) to meet peak demand, which occurs less than one per cent of the year. In addition, the increasing amount of electricity generated by roof top solar photovoltaics (PV) is reducing measured output.

Queensland Treasury and Trade has recently developed estimates of Queensland Mining MFP[9]. Analysis of mining industry productivity performance found that declining resource quality explains some, but not all, of the recent fall in Queensland mining industry MFP. A number of other factors are likely influencing the recent mining industry productivity performance.

- Firstly, it was found that the recent increase in prices received for Queensland mining exports have coincided with a substantial moderation in mining industry MFP. This outcome supports the notion that profit maximising firms are willing to forgo short term productivity growth in response to strong increases in output prices.

- Secondly, there is generally a lag between investment and output growth but this relationship has broken down in recent years. This may reflect the impact of the global financial crisis in 2008-09 and the flooding of mines and related disruption to transport corridors impacting on production level in 2010-11. Further, the strong growth in mining capital investment over the past 2 years relates to liquefied natural gas projects with the corresponding output not expected to be recorded until 2014.

4.0 2001-02 to 2007-08 productivity cycle

Queensland MFP grew, on average, by 0.8 per cent between 2001-02 and 2007-08 (Table 2), down from 2.6 per cent growth in the previous productivity cycle. However, Queensland growth was 0.8 percentage point above the MFP estimate for Rest of Australia. The moderation in Queensland MFP was largely due to a substantial increase in capital services over this period. Growth in capital services accelerated to 6.2 per cent in the most recent productivity cycle, 2.0 percentage points higher than the 4.2 per cent average annual growth recorded between 1996-97 and 2001-02. In addition, growth in hours worked also accelerated to 4.1 per cent, up from 1.7 per cent average annual growth recorded in the previous cycle.

Average annual growth in Queensland MFP between 2001-02 and 2007-08 has been revised up to 0.8 per cent from 0.2 per cent in the 2009-10 Queensland productivity publication. This upward revision to MFP is almost entirely explained by revisions made to Queensland's GSP. The September quarter 2012 issue of the QSA incorporated the ABS implementation of full historical revisions cycle implemented in the *Australian National Accounts: State Accounts 2010-11* (ABS 5220.0) release together with the revisions incorporated in the 2011-12 release of this ABS publication[10]. This resulted in average annual growth in output between 2001-02 and 2007-08 being revised up to 5.6 from 5.0 per cent in the 2009-10 Queensland productivity publication.

[8] See *Queensland State Budget 2008-09, Capital Statement* (Budget Paper No. 3).

[9] For the full publication see Estimates *of Queensland Mining Productivity Performance, 1989-90 to 2011-12* on the Queensland Treasury and Trade website.

[10] For further information see *Queensland State Accounts: September quarter 2012* (http://www.oesr.qld.gov.au/products/publications/qld-state-accounts/index.php).

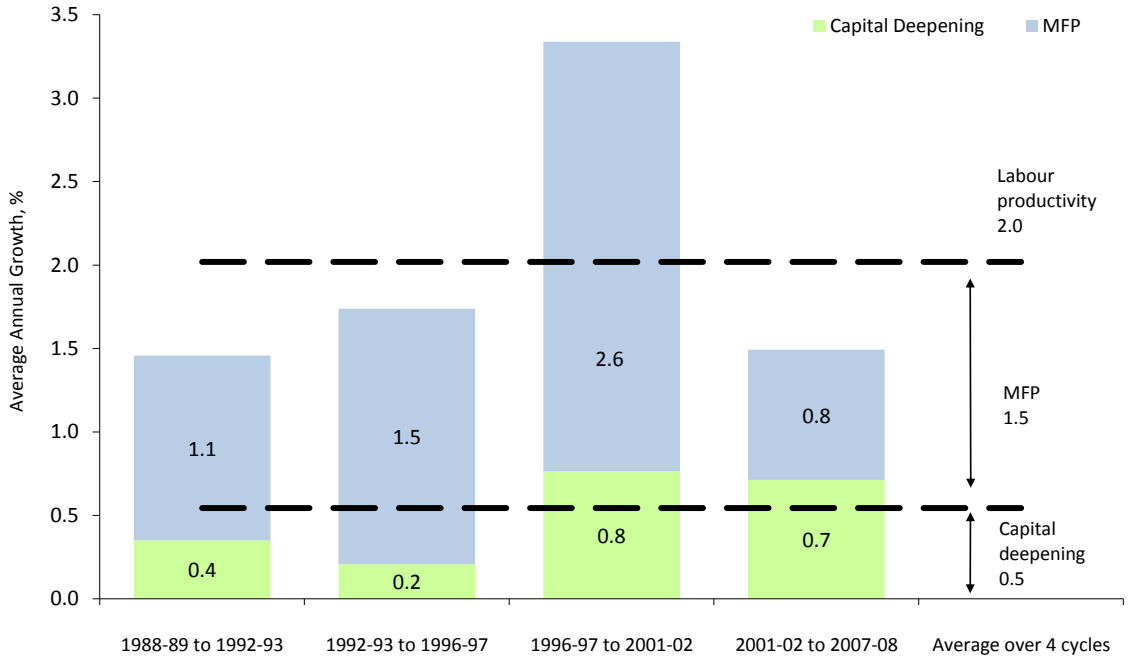
Table 2: Economic and productivity growth over productivity cycles [(a)]

Average annual growth (per cent)	1988-89 to 1992-93	1992-93 to 1996-97	1996-97 to 2001-02	2001-02 to 2007-08
		Queensland		
Output	**3.3**	**4.8**	**5.1**	**5.6**
Multifactor productivity	**1.1**	**1.5**	**2.6**	**0.8**
Labour productivity	1.5	1.7	3.3	1.5
less Capital deepening	0.4	0.2	0.8	0.7
Combined labour and capital inputs[(b)]	**2.2**	**3.2**	**2.5**	**4.8**
Hours worked	1.8	3.0	1.7	4.1
Capital services	3.0	3.7	4.2	6.2
		Rest of Australia		
Output	**1.5**	**3.9**	**3.6**	**3.1**
Multifactor productivity	**0.8**	**1.3**	**1.7**	**0.0**
Labour productivity	1.9	1.6	2.6	1.0
less Capital deepening	1.1	0.3	0.9	0.9
Combined labour and capital inputs[(b)]	**0.7**	**2.5**	**1.9**	**3.1**
Hours worked	-0.4	2.2	1.0	2.1
Capital services	3.3	3.2	3.9	5.1

(a) Sum of component contributions to growth may not add due to rounding.
(b) Weighted in terms of labour and capital income shares.
Source: Queensland Treasury and Trade estimates

Figure 2 below decomposes labour productivity into the contribution of MFP growth and the rate of capital deepening for each of the productivity cycles. In the most recent productivity cycle, 2001-02 to 2007-08, Queensland MFP growth of 0.8 per cent was almost half the average recorded over the four cycles (1.5 per cent). At the same time, growth in capital deepening, 0.7 per cent, was largely in line with the average over the four cycles (0.5 per cent). In comparison, over the four cycles, Rest of Australia recorded 0.9 per cent and 0.8 per cent average annual growth in MFP and capital deepening, respectively.

Figure 2: MFP and capital deepening over productivity cycles, Queensland [(a)]

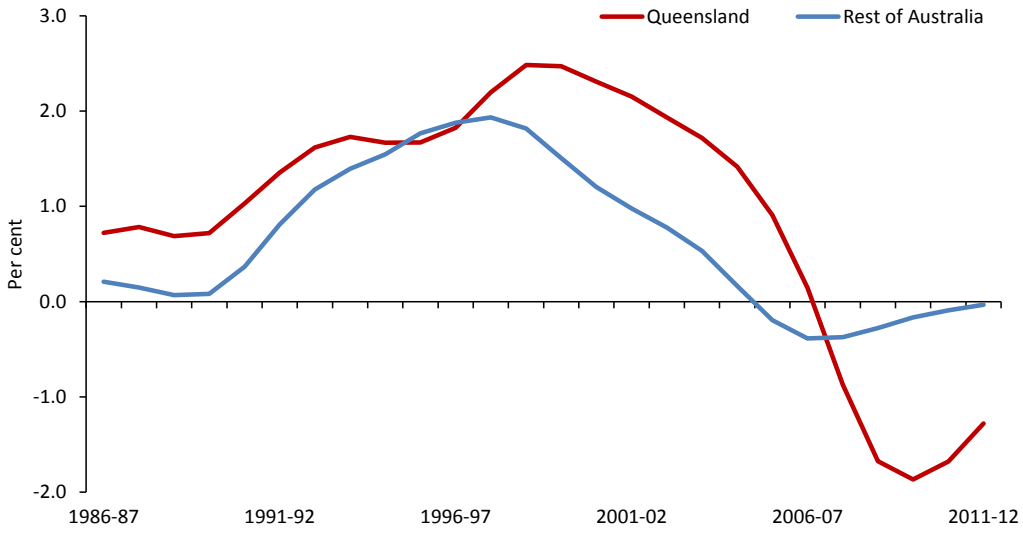


(a) Sum of component contributions to growth may not add due to rounding.
(b) Incomplete cycle due to unidentifiable end-point.
Source: Queensland Treasury and Trade estimates

5.0 Long term average

This section summarises estimates of long term (1985-86 to 2011-12) economic growth for Queensland and Rest of Australia and provides a decomposition of economic performance. Figure 3 shows the annual per cent change in MFP on a trend basis for Queensland and Rest of Australia over the long term. In terms of productivity growth, Queensland has outperformed the Rest of Autralia for the majority of the period leading up to 2006-07, however, since then Queensland productivity performance has recorded a sharp decline and growth has been lower than the Rest of Australia.

Figure 3: MFP growth, Trend [(a)], 1985-86 to 2011-12



(a) Trend estimates are derived using an 11-term Henderson-weighted moving average.
Source: Queensland Treasury and Trade estimates

Queensland's output growth has exceeded that of Rest of Australia in all but five of the past 26 years and has averaged 4.5 per cent per annum, 1.4 percentage points above that recorded in Rest of Australia (3.1 per cent) (Table 3).

Over the period 1985-86 to 2011-12, Queensland's stronger economic performance relative to Rest of Australia was primarily due to higher growth in combined labour and capital inputs of 3.5 per cent per annum compared with 2.4 per cent for Rest of Australia. Queensland MFP growth between 1985-86 and 2011-12 was 0.9 per cent per annum on average, 0.2 percentage point higher than Rest of Australia growth of 0.7 per cent.

Table 3: Long run productivity - average annual growth [(a)]

1985-86 to 2011-12	Queensland	Rest of Australia
	Average annual growth (per cent)	
Output	**4.5**	**3.1**
Multifactor productivity	**0.9**	**0.7**
Labour productivity	1.6	1.5
less Capital deepening	0.7	0.9
Combined labour and capital inputs[(b)]	**3.5**	**2.4**
Hours worked	2.8	1.5
Capital services	4.8	4.3

(a) Sum of component contributions to growth may not add due to rounding.
(b) Weighted in terms of labour and capital income shares.
Source: Queensland Treasury and Trade estimates

Queensland labour productivity grew by 1.6 per cent per year on average between 1985-86 and 2011-12. By comparison, labour productivity in Rest of Australia grew by 1.5 per cent in average annual terms over the same period. In Queensland, the major contributor to labour productivity growth was MFP (0.9 percentage point) with capital deepening contributing 0.7 percentage point. This indicates that growth in Queensland labour productivity on average over the past 26 years has been primarily driven by improvements in production efficiencies (MFP) as opposed to increasing workers' access to capital.

The slightly lower level of capital deepening in Queensland does not imply under-investment or a decline in the level of capital. It simply reflects labour inputs relative to capital inputs growing at a faster rate in Queensland than in Rest of Australia. In fact, Queensland capital services grew at a faster rate (4.8 per cent) per annum than that of Rest of Australia (4.3 per cent), while Queensland hours worked grew at an average rate of 2.8 per cent per annum, 1.3 percentage points higher than Rest of Australia growth of 1.5 per cent.

6.0 Contribution to living standards

Growth in productivity is a key driver of growth in per capita income and consequently living standards. Productivity growth contributes to growth in per capita income as it increases the outputs of goods and services produced per unit of physical input. Gross State Income (GSI) is a traditional indicator of living standards and is defined as GSP adjusted for the terms of trade. GSI is not intended to be an all encompassing measure of wellbeing. Instead, it is a purposefully defined measure that is constructed within the scope of economic measurement and which does not capture, for example, social and environmental changes which may impact on the wellbeing of a region's inhabitants.

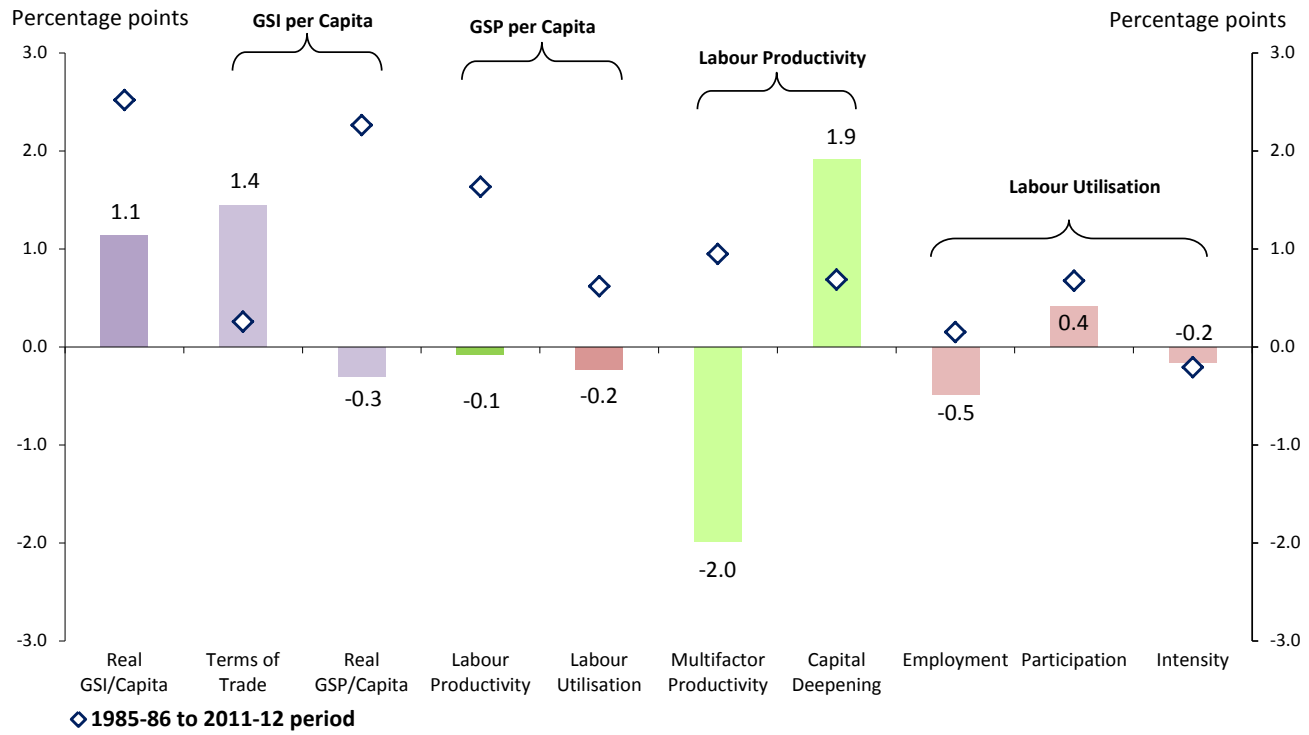
A conventional way of quantifying the contribution of productivity to material living standards at the state level is by decomposing the increase in real GSI per capita into its components. Real income growth per capita can be achieved by

improvements in the terms of trade, increasing labour inputs (average hours worked, employment rate and participation rate[11]), increased capital input (via capital deepening) and MFP improvements.

6.1 2007-08 to 2011-12 period

Queensland real GSI per capita (in 2010-11 dollars) rose from $29,682 in 1985-86 to $56,655 in 2011-12[12]. Figure 4 illustrates a decomposition of Queensland GSI per capita growth into its components over the four years to 2011-12, as well as the full period 1985-86 to 2011-12.

Figure 4: Decomposition of average annual growth in Queensland GSI per Capita, 2007-08 to 2011-12 and Long Term Average [(a)]



(a) Sum of component contributions to growth may not add as they are multiplicative rather than additive.
Source: Queensland Treasury and Trade estimates and ABS 3101.0 and 6202.0

Over the four year period to 2011-12, real GSI per capita in Queensland grew at an average rate of 1.1 per cent per annum. The terms of trade contributed 1.4 percentage points while real GSP per capita detracted 0.3 percentage point from real GSI per capita.

The main detractor from the decline in real GSP per capita was labour utilisation (0.2 percentage point) while labour productivity also detracted, 0.1 percentage point from real GSP per capita. Average annual decline in labour productivity reflects that the 1.9 percentage points contribution from capital deepening being more than offset by the 2.0 per cent per annum decline in MFP.

The main detractors to the decline in labour utilisation were declines in employment growth (an increase in the unemployment rate) and intensity which more than offset the increase in the labour force participation rate. Employment

[11] In this publication, the participation rate is calculated as the labour force divided by the 'total population'. Alternatively, this calculation can also be based on 'population aged 15 years or over', instead of 'total population'.

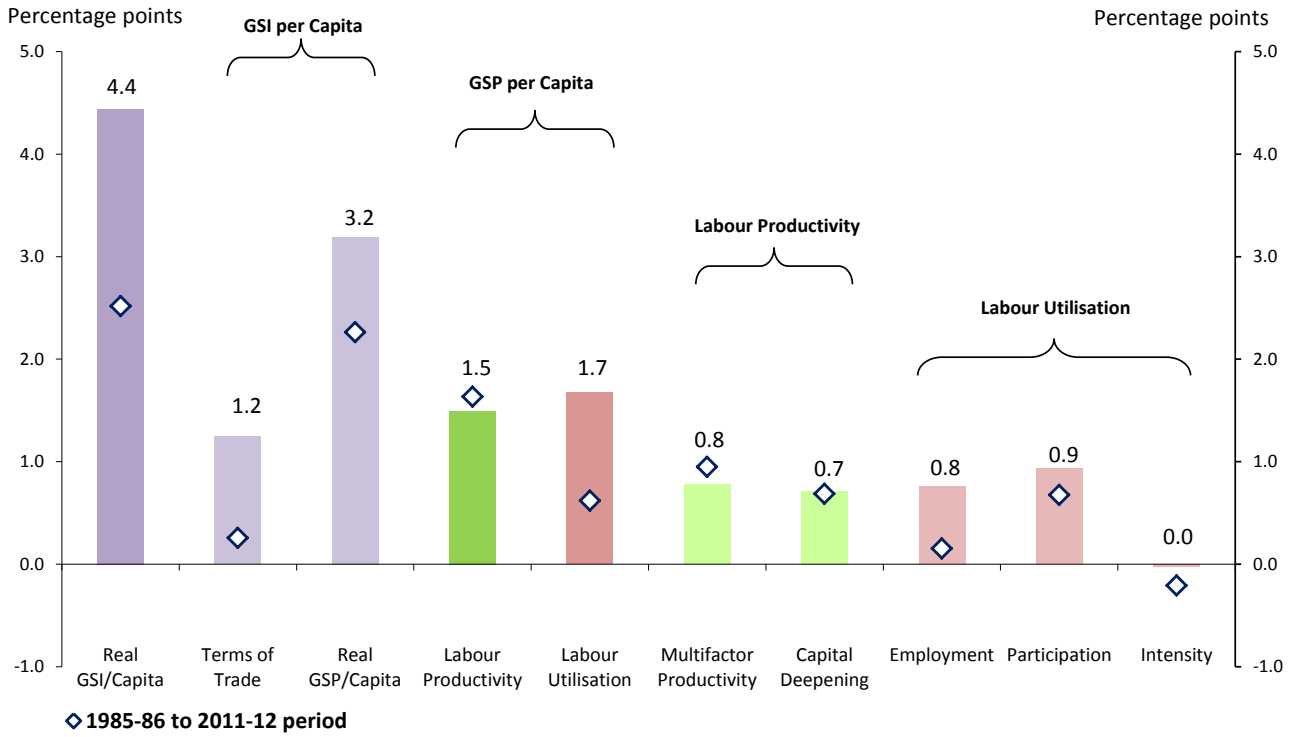
[12] For the purpose of this publication GSI excludes the ownership of dwellings industry.

and intensity detracted 0.5 and 0.2 percentage point respectively, while labour force participation contributed 0.4 percentage point over the period 2007-08 to 2011-12.

6.2 2001-02 to 2007-08 productivity cycle

Figure 5 illustrates a decomposition of Queensland GSI per capita growth into its components over the most recent productivity cycle, 2001-02 to 2007-08, as well as the full period 1985-86 to 2011-12.

Figure 5: Decomposition of average annual growth in Queensland GSI per Capita, 2001-02 to 2007-08 and Long Term Average [(a)]



(a) Sum of component contributions to growth may not add as they are multiplicative rather than additive.
Source: Queensland Treasury and Trade estimates and ABS 3101.0 and 6202.0

Over this six year period of the most recent productivity cycle, real GSI per capita in Queensland grew at an average rate of 4.4 per cent per annum. The terms of trade contributed 1.2 percentage points and real GSP per capita the remaining 3.2 percentage points.

The main contributor to growth in real GSP per capita was labour utilisation (1.7 percentage points) while labour productivity contributed 1.5 percentage points to growth in real GSP per capita. Average annual growth in labour productivity consists of 0.8 percentage point and 0.7 percentage point contribution by MFP and capital deepening respectively.

The main contributors to the 1.7 per cent growth in labour utilisation were employment growth (a reduction in the unemployment rate) and an increase in the labour force participation rate. Employment and participation contributed 0.8 and 0.9 percentage point respectively, while intensity had a neutral impact over the period 2001-02 to 2007-08. The intensity component implies that the average hours worked per employee was unchanged over this period.

Appendix 1 – Long term indexes of productivity and related measures (2010-11 = 100)

	Productivity				Output		Inputs					
	MFP		Labour				Total inputs		Hours worked		Capital services	
	QLD	ROA	QLD	ROA	QLD	ROA	QLD	ROA	QLD	ROA	QLD	ROA
1985-86	78.0	85.0	66.8	69.0	33.4	46.9	42.9	55.2	50.1	68.0	31.7	35.5
1986-87	78.0	84.6	66.7	69.1	34.9	48.0	44.7	56.7	52.3	69.4	32.9	37.0
1987-88	80.7	86.0	69.4	70.4	37.3	50.7	46.2	58.9	53.8	72.0	34.5	38.7
1988-89	81.8	85.4	69.8	70.3	40.1	52.4	49.1	61.3	57.5	74.5	36.0	40.6
1989-90	80.1	85.8	68.1	71.0	41.2	54.3	51.4	63.3	60.4	76.5	37.5	42.6
1990-91	80.5	85.3	69.4	71.7	41.3	53.9	51.3	63.1	59.5	75.1	38.5	44.0
1991-92	82.4	85.3	71.3	72.7	43.0	53.6	52.2	62.8	60.3	73.8	39.5	45.1
1992-93	85.4	88.2	74.0	75.8	45.7	55.6	53.5	63.1	61.8	73.4	40.6	46.3
1993-94	86.6	89.6	74.9	77.1	47.8	57.9	55.2	64.6	63.8	75.0	41.7	47.6
1994-95	86.2	89.8	74.0	77.1	50.2	60.1	58.2	66.9	67.8	77.9	43.3	49.1
1995-96	87.5	91.2	75.6	78.5	52.1	62.6	59.6	68.7	69.0	79.7	44.9	50.6
1996-97	90.8	92.9	79.3	80.7	55.2	64.7	60.8	69.7	69.7	80.2	47.0	52.5
1997-98	92.3	95.3	80.7	83.6	58.0	67.7	62.9	71.0	71.8	81.0	48.8	54.6
1998-99	94.7	98.2	83.5	86.9	61.0	71.2	64.5	72.5	73.1	81.9	51.0	56.8
1999-00	96.0	98.3	85.3	87.2	63.9	73.8	66.6	75.1	74.9	84.6	53.5	59.3
2000-01	98.3	98.4	88.2	88.3	66.3	74.8	67.5	76.0	75.2	84.7	55.6	61.5
2001-02	103.1	101.0	93.4	91.8	70.9	77.3	68.8	76.5	75.9	84.2	57.7	63.6
2002-03	102.3	101.1	92.6	92.4	73.6	79.7	71.9	78.8	79.5	86.2	60.3	66.3
2003-04	104.1	102.5	94.6	94.5	78.0	82.8	74.9	80.8	82.4	87.6	63.1	69.3
2004-05	106.2	102.1	96.5	95.3	83.7	84.6	78.8	82.9	86.7	88.8	66.5	72.7
2005-06	107.4	101.5	98.9	95.7	88.1	86.8	82.0	85.6	89.1	90.7	70.9	76.7
2006-07	107.9	101.6	100.0	96.8	93.9	89.7	87.0	88.3	93.8	92.7	76.3	80.8
2007-08	108.0	101.1	102.1	97.2	98.4	92.9	91.1	92.0	96.4	95.6	82.7	85.6
2008-09	104.1	100.5	100.1	98.2	99.4	94.6	95.5	94.1	99.3	96.3	89.2	90.4
2009-10	102.5	100.9	100.7	100.3	99.7	97.0	97.3	96.1	99.1	96.7	94.2	95.1
2010-11	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2011-12	99.7	100.9	101.8	102.8	103.9	103.5	104.3	102.5	102.1	100.7	108.2	105.8
Average annual growth over productivity cycles (%)												
1988-89 to 1992-93	1.1	0.8	1.5	1.9	3.3	1.5	2.2	0.7	1.8	-0.4	3.0	3.3
1992-93 to 1996-97	1.5	1.3	1.7	1.6	4.8	3.9	3.2	2.5	3.0	2.2	3.7	3.2
1996-97 to 2001-02	2.6	1.7	3.3	2.6	5.1	3.6	2.5	1.9	1.7	1.0	4.2	3.9
2001-02 to 2007-08	0.8	0.0	1.5	1.0	5.6	3.1	4.8	3.1	4.1	2.1	6.2	5.1
2007-08 to 2011-12 (a)	-2.0	0.0	-0.1	1.4	1.4	2.7	3.4	2.8	1.5	1.3	6.9	5.4
Average annual growth over full period (%)												
1985-86 to 2011-12	0.9	0.7	1.6	1.5	4.5	3.1	3.5	2.4	2.8	1.5	4.8	4.3

(a) Incomplete cycle due to unidentifiable end-point.

Source: Queensland Treasury and Trade estimates