



Australian Government
Department of Resources, Energy and Tourism
Tourism Research Australia

Tourism Productivity in Australia



TRA TOURISM
RESEARCH
AUSTRALIA



Australian Government
**Department of Resources,
Energy and Tourism**
Tourism Research Australia

Tourism Productivity in Australia



TRA TOURISM
RESEARCH
AUSTRALIA

© Commonwealth of Australia 2010

ISBN 978-1-921812-15-6

This work is copyright. In addition to any use permitted under the Commonwealth *Copyright Act 1968*, the Commonwealth through Tourism Research Australia permits copies to be made in whole or in part for the purpose of promoting Australian tourism, provided that Tourism Research Australia (representing the Commonwealth) is identified on any copies as the author and the material is reproduced in its current form. In addition, a statement similar to the following must be included on any copy – *Tourism Research Australia 2010*.

Copies may not be made for a commercial purpose, that is, for sale, without the permission of Tourism Research Australia (representing the Commonwealth).

The information in this data is presented in good faith and on the basis that neither the Commonwealth, nor its agents or employees, are liable (whether by reason of error, omission, negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any statement, information or advice given in this publication.

Data derived from Tourism Research Australia surveys are subject to sample error. Users of the data are advised to consult the sample error tables contained in Tourism Research Australia publications or otherwise available from Tourism Research Australia before drawing any conclusions or inferences, or taking any action, based on the data.

This work should be referenced as: *Tourism Productivity in Australia*, Tourism Research Australia, Canberra.

Tourism Research Australia
Department of Resources, Energy and Tourism
GPO Box 1564
Canberra ACT 2601

Email: tourism.research@ret.gov.au

Web: www.ret.gov.au/tra

Publication date: December 2010

ABN: 46 252 861 927

Contents

Summary	iii
1. Introduction	1
2. Overview of productivity estimates in Australia.....	3
3. Data and methodology	5
3.1. Data limitations.....	5
3.2. Model assumptions.....	6
4. Results	7
4.1 Labour productivity	7
4.3 Capital productivity	9
4.4 Multi-factor productivity	11
4.5 Industry contribution to labour productivity.....	13
5. Conclusion	15
5.1 Future research.....	16
References	17
Appendix A: Data and Methodology	18
Data requirements and availability.....	18
Tourism industry classification by sub-division	19
Data transformation	20
Productivity measurements	21
Quantity Index of Capital and Labour	23

Summary

Productivity is the key benchmark of how efficiently and effectively an industry or an economy is performing. It refers to the efficiency with which the output is produced by combining the resources of labour and capital. The concept of productivity relates to long-term economic competitiveness of an industry and not short-term benchmarks¹.

Productivity estimates are published in Australia on a regular basis for some industries (all these industries combined are referred to as the ‘market sector’) by the Australian Bureau of Statistics (ABS) and the Productivity Commission. However, there has been little research undertaken on tourism supply and productivity. This is mainly due to the lack of supply side data (particularly for investment and capital stock) at the required detailed industry level (ANZSIC² subdivision, group and class levels), which would underpin a sound methodology to estimate tourism productivity.

This report provides for the first time, estimates of tourism productivity components: capital, labour and multi-factor productivity (MFP) in the Australian tourism industry. While data on labour productivity are extensive (including international comparisons for tourism), it is the MFP that is most important for policy measures and it reflects the productive synergies on changes to capital, labour and other inputs.

This analysis was carried out for a time period of 12 years (1997-98 to 2008-09). The tourism industry results were analysed and compared with the ABS market sector for two periods (1997-98 to 2003-04 and 2003-04 to 2008-09) and for the whole period 1997-98 to 2008-09.

The main findings of this research are that tourism productivity has been generally lower than for the market sector average over the 12 years to 2008-09. In detail:

- Multifactor productivity (MFP) growth in the tourism industry is less than the Australian economy. Between 1997-98 and 2008-09, the MFP growth rose at a rate of 0.2 per cent annually for tourism as compared with 0.4 per cent for the Australian market sector.

¹ This long-term focus of productivity is expressed by Krugman’s famous line ‘productivity isn’t everything, but in the long run it is almost everything’ (Krugman cited in PC, 2009)

² Australia and New Zealand Standard Industrial Classification

- MFP growth³ of the tourism industry declined in the second period (2003-04 to 2008-09) by 0.8% per year, as compared to the first period (1997-98 to 2003-04) growth of 1.0% per year.
- The decline in MFP in the second period was larger in the tourism industry (0.8%) compared to the 0.7% per year decline in the market sector.
- Tourism industry labour productivity (LP) growth increased 0.9% per year in the second period; lower than first period growth of 1.3% per year. The second period growth was the same (0.9%) for both the tourism and the market sector.
- Tourism industry capital productivity (KP) growth was negative (-0.1%) in first period, and declined further (- 3.9%) in the second period. The decline in tourism industry capital productivity was larger compared to the market sector (-2.4%).
- The second period demonstrated a higher substitution of labour for capital or ‘Capital Deepening’ (KD) in the Australian tourism industry. The annual growth of KD in the first period was 0.2% which increased to 1.8% in the second period. The higher growth indicated a higher substitution of labour for capital. This higher growth in capital deepening – when looked in combination with negative growth in capital and multifactor productivity – indicated that business investment was increasing but the growth in output was not keeping pace with the investment.

³ Growth in the text refers to an annual average growth rate.

1. Introduction

In simple terms, productivity is the ratio of a unit of output of goods and services produced per unit of physical input. Over time, productivity growth is the key measure of how efficiently and effectively the economy is performing and is a fundamental means for society to improve its living standards (Gretton and Fisher 1997).

Productivity growth may take place through a number of ways, for example: a measured and better allocation of resources; introduction of better and new technology/innovation leading to;

- efficient ways of doing things;
- changes in business operating environments;
- increasing the scale of operation;
- removing social, economic and physical impediments etc.

Tourism makes a significant contribution to the Australian economy through export earnings and employment. In 2008-09, the tourism industry contributed \$33 billion (2.6%) to Australia's Gross Domestic Product (GDP), \$30 billion to Gross Value Added (GVA) and employed 486,000 people. In 2008-09, tourism's contribution to the Australian economy was higher than that of *Agriculture, forestry and fisheries* and *Electricity, gas, water and waste services* industries.

Despite this, little research has been undertaken on tourism supply and productivity. The main reason for this deficiency is that tourism is not an industry or product in international statistical standards but is defined according to the nature of the products consumed by the visitors. The industries or part of industries (ANZSIC divisions, sub-divisions, group and classes) supplying the tourism products constitute a tourism industry. The tourism industries supply these products as services (education, entertainment, and travel services), non-services (fuel, food, drinks) and a combination of both services and non-services (such as food in restaurants and drinks and entertainment in clubs, pubs, taverns and bars etc.)

Productivity is measured correctly for the market sector⁴ where prices provide an indicator of quality that can be used to compare the value of new goods and services to the old versions that they replace.

Productivity measurement in some service industries is difficult particularly in the non-market sector such as education, health and social services because of non-availability of market prices to value output. The difficulty in estimating the productivity growth is reduced when the service industries are mostly in the market sector and market prices are available for inputs and outputs. The ability to capture changes in quality of services provided is, however, still a cause of concern (Long and Shah, 2010).

‘Tourism industries’ mainly consists of market sector industries (it is represented by 9 out of 15 industry sub-divisions) for which data on input and output prices are readily available. However, some of the important data (for which a number of assumptions have been made) is still not available at the required level. The nine tourism industries selected for this analysis constitute 73% of total tourism industry GVA and 83% of total tourism industry employment.

The analysis was carried out for a time period of 12 years (1997-98 to 2008-09) to meet the following specific objectives;

- To present a methodological framework to generate tourism industry productivity;
- To measure the performance of the tourism industry in terms of labour, capital and multifactor productivity; and
- To compare the performance of the tourism industry with the Australian market sector.

The report is organised as follows: Chapter 2 contains an overview of productivity studies in relation to service industries, followed by a chapter on data and methodology adopted, data limitations and the main assumptions. Chapter 4 presents results and discusses the labour, capital and multifactor productivity growth in these industries and their comparison with the market sector and the contribution to labour productivity in tourism industry. Chapter 5 contains conclusions with future research plans on this topic.

⁴ Market sector refers to a group of 12 industries in the ABS annual publication “Experimental estimates of industry multifactor productivity, Australia, Detailed productivity estimates, 5260.0.55.002”. These industries include *Agriculture, forestry and fisheries; Mining; Manufacturing; Electricity, gas, water and waste services; Construction; Wholesale trade; Retail trade, Accommodation and food services; Transport, postal and warehousing; Communication services; Information, media and telecommunications; Financial and insurance services; and Arts and recreation services.*

2. Overview of productivity estimates in Australia

Multifactor productivity (MFP) estimates in Australia were first developed in 1985. Since then, these estimates for the market sector as a whole have been produced each year by the ABS in its annual National Accounts statistical release (ABS cat. no. 5204.0) and more recently for 12 industries that comprise the market sector.

Between these periods, productivity estimates for individual industries at sub division levels were generated by the Productivity Commission. Some prominent studies relating to industry specific productivity estimates are those by Gretton and Fisher 1997, Johnston *et al* 2000, and Topp *et al* 2008.

In recent times, the issue of productivity improvement has gained significant importance among researchers and policy makers as a long term solution to the impact of major trends faced by the world economy in general, and Australia in particular – namely, the ageing population; climate change; changes in economic environment; and the rise of China and India. Long and Shah (2010) highlighted the role of productivity in economic growth while discussing the role of the ‘3Ps’: Population growth; Participation in the workforce; and Productivity.

There is plenty of evidence of productivity performance in the market sector industries especially mining, manufacturing, agriculture and utilities, however, the measurement difficulties in service industries productivity has been highlighted from time to time by various researchers. For example Li and Prescott (2007) mentioned the difficulty of standardising the inputs and outputs due to their differing elements and because of the presence of an additional element - “customer and customer satisfaction”. This element is outside the organisational position of a conventional industry such as *Mining* and *Manufacturing* but is the main problem in the productivity analysis of the service industries. Similarly, Long and Shah (2010) quoted views of some commentators about the service industries productivity measurement that; measurement of productivity in the service industries was close to impossible; the estimates of long-term decline in productivity, often associated with some services industries, does not make any sense because of prevalence of the productivity growth cycles over the long-term.

The study by Long and Shah (2010) noted that historically, productivity improvement in the service industries was low because of their labour intensive nature and non-quantifiable

nature of their services. However, they observed that higher productivity growth was possible by accurately measuring all aspects of outputs and inputs. They also highlighted that it is feasible to estimate the productivity growth of the service industries which are in the market sector, and that market prices are available for inputs and outputs.

The ABS has recently adopted the new framework of ANZSIC 2006 and United Nations World Tourism Organisation's (UNWTO) 'Recommended Methodological Framework' (RMF) in the National Tourism Satellite Account. Under this framework, 'tourism industries' has been classified so that a large part (71% of the market sector) is matched to the ANZSIC industry sub-divisions for which price information – from various published and unpublished sources – is available.

3. Data and methodology

The methodology adopted in this paper is a mix of approaches adopted by the ABS, the Productivity Commission and the UNWTO and was guided by the availability of data and comparability of results from the other sources. This approach is distinct from other approaches as the GVA and employment⁵ estimates are sourced directly from the latest ABS Tourism Satellite Account (2008-09), whilst the capital services estimates are derived indirectly using industry value added ratios from this publication (please refer to Appendix A for details on the methodology adopted).

The robustness of the methodology was verified by comparing the results at aggregate industry levels with that of ABS productivity estimates (ABS cat. no. 5260.0.55.002). The analysis was carried out for a time period of 12 years (1997-98 to 2008-09).

The estimates generated by Tourism Research Australia (TRA) methodology closely aligns with published ABS estimates. The tourism industry results were analysed and compared with ABS market sector for two periods (1997-98 to 2003-04 and 2003-04 to 2008-09) and for the whole period 1997-98 to 2008-09. For detailed explanation on methodology and data transformations please refer to Appendix A. **Figure 1** shows the main data sources used in the development of these statistics.

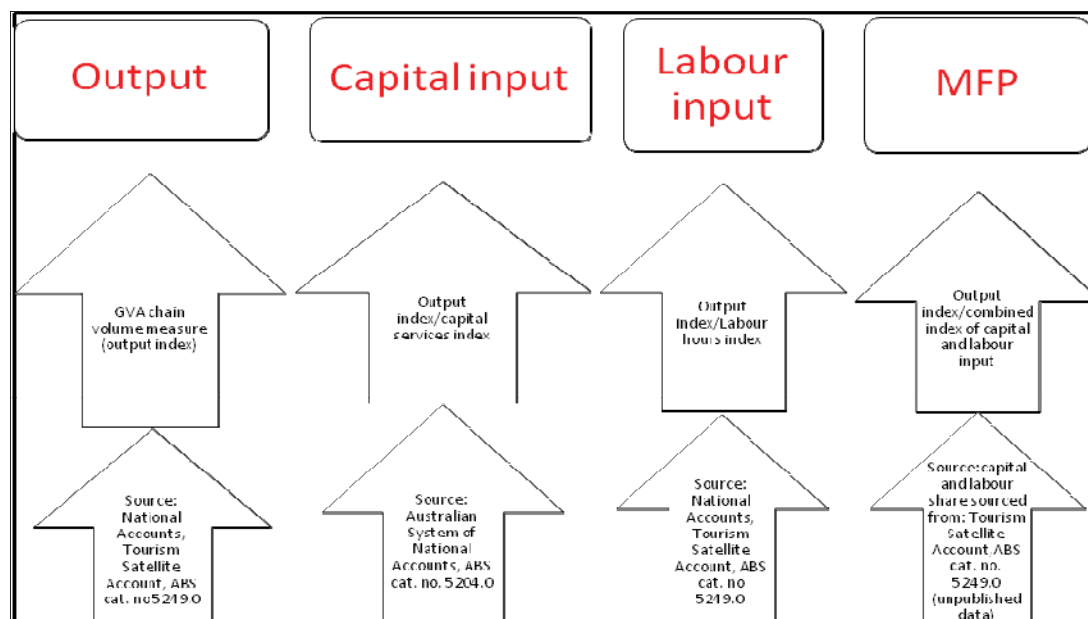
3.1. Data limitations

Tourism is not identified as an industry in the international statistical standards given in the ANZSIC standards. 'Tourism industry' is defined according to the status or the characteristics of the consumer and the commodities they consume. Therefore, in the absence of a clear identity and definition, the data required for the analysis were not always available and indicator proportions needed to be generated and applied to the industry level data to generate tourism industry estimates. The main limitations in the analysis were related to the Gross Fixed Capital Formation (GFCF) and related deflators data. The GFCF data were only available at aggregate level for industry sub-divisions from ABS publication "Australia industries", cat no. 8155.0 from 2001-02 to 2008-09. This data is on ANZSIC 2006 basis from 2006-07 onwards; the rest is on ANZSIC 1993 basis. The implicit price deflators for capital assets were only available at aggregate industry level.

⁵ The employment estimates from the TSA were converted into FTE (Full Time Equivalent) employment and then into actual hours worked using data from the Labour Force Survey of the ABS.

Figure 1: Data sources for the productivity analysis

$$\text{MFP growth} = \text{Output growth} - \text{growth in (Labour + Capital inputs)}$$



3.2. Model assumptions

Most of the assumptions mentioned below were guided by the data limitations at the levels required for tourism industry analysis.

Tourism industry coverage: The Tourism Satellite Accounts (ABS cat. no. 5249.0) provides a list of industries which comprise the Australian tourism industry. From this list, we were able to provide detailed productivity estimates for about 71% (in terms of sub division coverage) of these industries. The selected industries represented 73% of tourism industry GVA and 83% of total tourism industry employment. It was assumed that this coverage of tourism industries will provide a broad representation of the tourism industry as a whole.

Tourism GVA and capital formation: It was assumed that the capital investment (GFCF) in tourism industries is guided by the tourism industry GVA. This means that share of tourism in the industry GVA will be the same for capital investment as well.

Effect of holiday period: It was assumed tourism industry growth is driven by holidays (public or otherwise), unlike other industries. Therefore labour employment does not require adjustment for seasonality caused by holiday periods such as Christmas closedown, as is the case in the ABS productivity estimates for Australian conventional industries.

4. Results

The present analysis provides estimates for the productivity components: capital, labour and multi-factor productivity. This required independently estimating the productivity components for each of the nine tourism-related industries: *Accommodation, Food services, Automotive fuel retailing, Other retail trade, Road transport, Rail transport, Air, water and other transport, Cultural services* and *Sports and recreation services* for a period of 12 years to 2008-09. These industries together referred to as ‘tourism industry’ in this analysis.

4.1 Labour productivity

Labour productivity is defined as the ratio of the index of output to index of labour input (actual hours worked).

Tourism industry labour productivity growth has been more volatile than the market sector (**Figure 2**). Decline in labour productivity relates to decline in output per unit of labour. Between 1997-98 and 2008-09, tourism labour productivity increased by 1.1% per year, indicating higher growth in tourism output compared to increases in labour inputs. The market sector on the other hand achieved higher labour productivity growth (1.8% per year). The labour productivity growth in tourism was highest during 2006-07 due to an increase in output where the labour input declined. The current price tourism output (GVA) in 2006-07 increased 10% over 2005-06 where as employment in the tourism industry declined 6.5%. This growth in GVA during 2006-07 was the highest since 1998-99, resulting from a similar output growth in the Australian economy (ABS, 2008). The growth in labour productivity declined during the second period (2003-04 to 2008-09) as compared to the first period (1997-98 to 2003-04) in both the tourism industry (from 1.3% to 0.9% per year) and the market sector (2.5% to 0.9% per year). A reason for declining labour productivity could be that to increase output, businesses were forced to employ individuals with lower ability and less relevant qualifications in an increasingly supply constrained Australian labour market, leading to slower rates of productivity growth (Productivity Commission 2009).

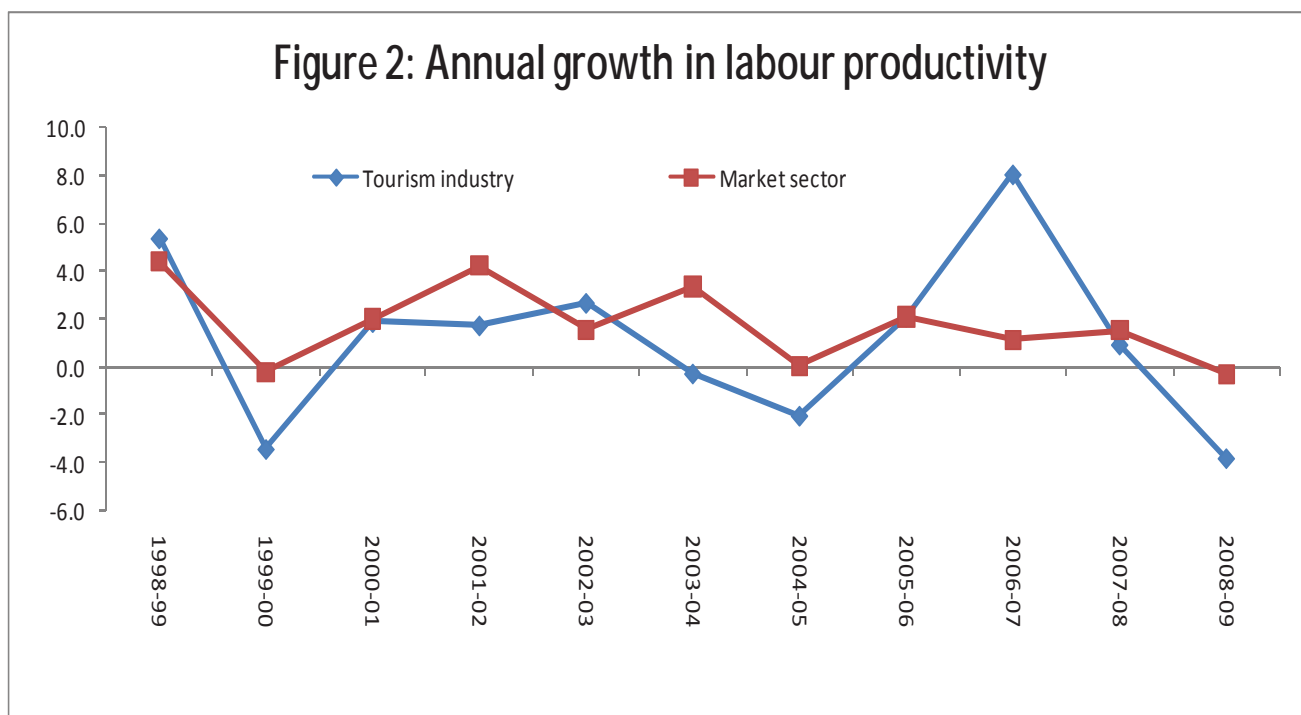
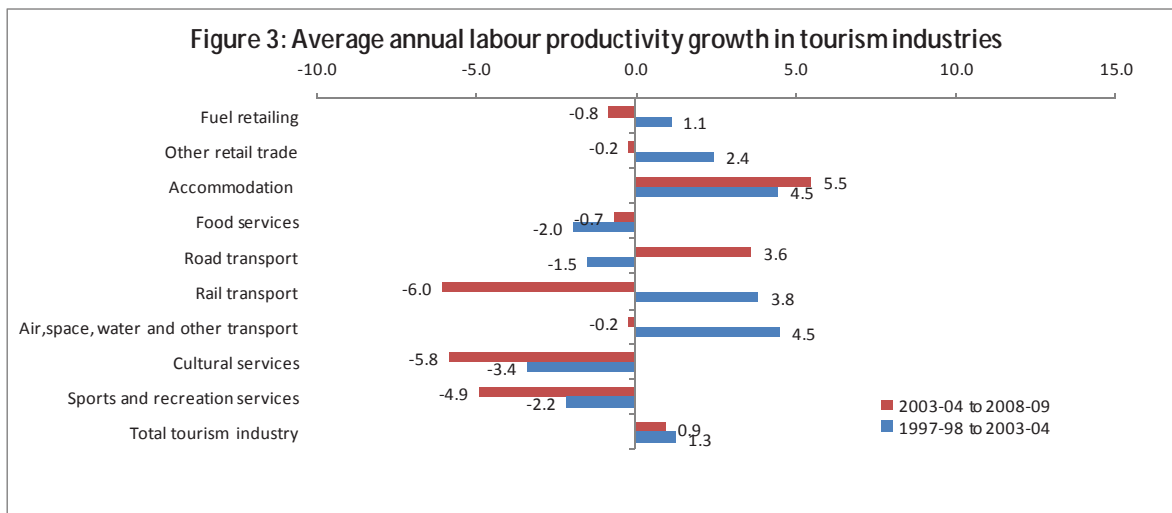


Figure 3 presents the productivity growth of labour input in tourism related industries. The results showed that;

- Only the *Accommodation* industry maintained a positive labour productivity growth during both periods;
- Labour productivity was higher in *Accommodation* industry in the second period as compared to the first period;
- The tourism industry as a whole experienced positive labour productivity growth in both the periods contributed mainly by the *Accommodation* and *Transport services* industries.
- During the second period, the *Accommodation* and *Road transport* industries provided a cushion against a total tourism industry labour productivity decline caused by a fall in labour productivity growth in most other tourism industries;
- *Accommodation* and *Road transport* industries reversed the trend of declining labour productivity in the second period.

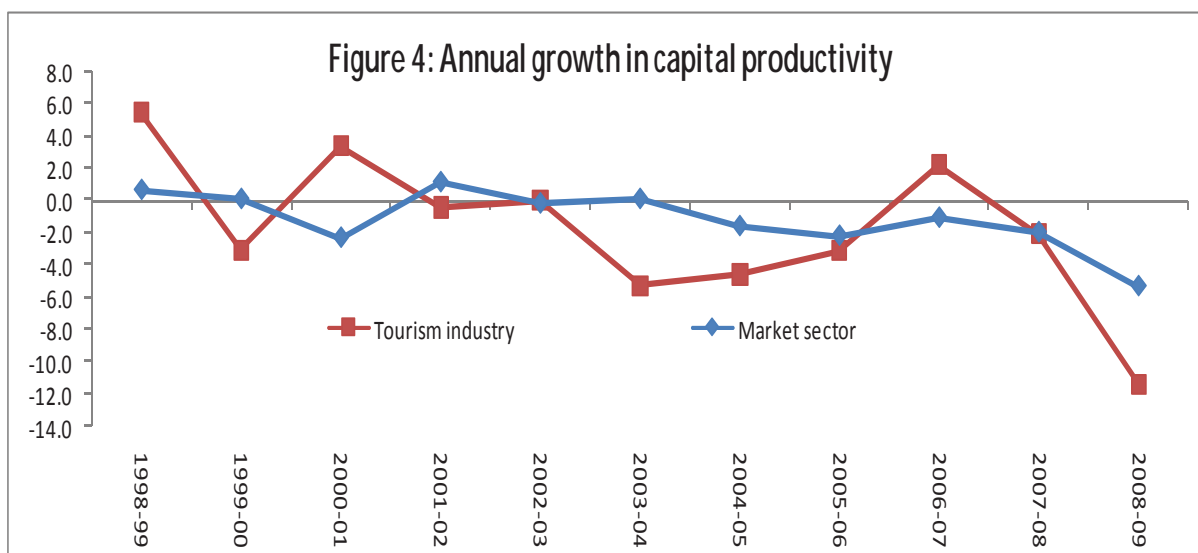


4.3 Capital productivity

Capital productivity is defined as the ratio of indexes of output to capital inputs. **Figure 4** compares annual growth in capital productivity of the market sector with the tourism industry. Tourism industry capital productivity growth followed market sector trend in general. Between 1997-98 and 2008-09, tourism industry capital productivity contracted by 1.8% per year a larger fall compared to a 1.2% per year decline in the Australian market sector.

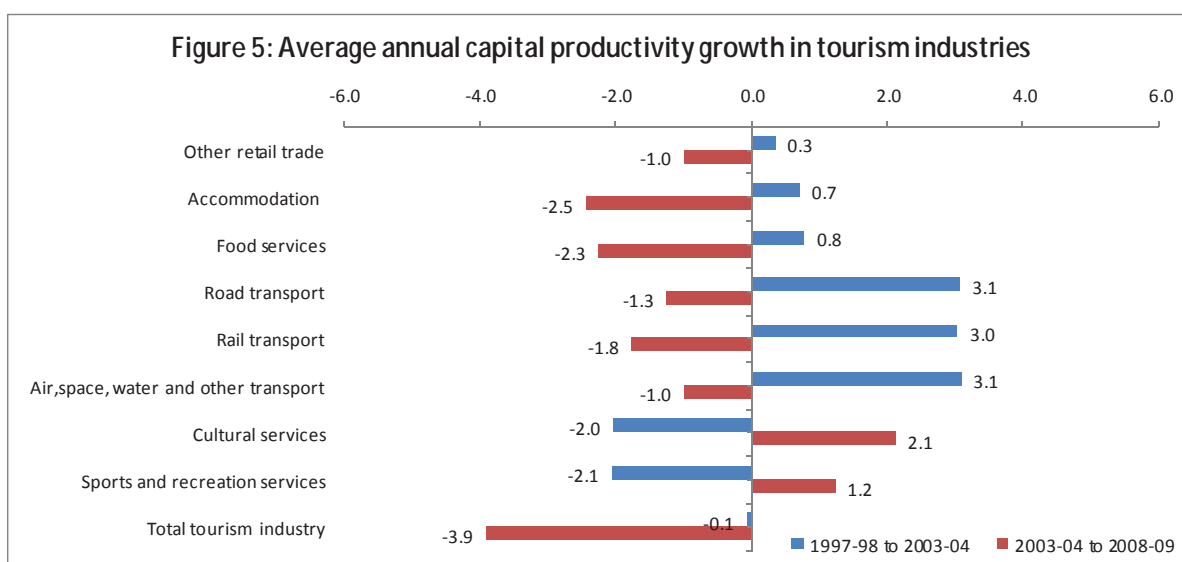
The decline in capital productivity was much steeper in both tourism and the market sector in the second period as compared to the first period. In the second period (2003-04 to 2008-09) tourism industry capital productivity declined 3.9% per year – much higher than the market sector decline of 2.4% per year.

In 2000-01, productivity in the tourism industry increased due to the organisation of the Sydney Olympic Games which resulted in a higher increase in output. However, it declined to its lowest point in 2003-04 due to the decline in domestic visitor numbers, and in 2008-09 due to the decline in output as a result of the global financial crisis.



Average annual growth in capital productivity in tourism related industries was lower than growth in labour productivity (**Figure 5**). The results showed that;

- The capital productivity grew around 3% annually in *Road transport, Rail transport* and *Air, water and other transport* industries during first period, but declined by 1.0% to 2.0% in the second period;
- *Accommodation* and *Food services* industries registered a growth of about 1.0% each in the first period, but declined by around 2.0% to 2.5% in the second period.
- *Cultural services* and *Sports and recreation services* showed a trend opposite to all other tourism industries, where capital productivity contracted during the first period but grew over the second.
- At the aggregate level, the tourism industry capital productivity growth was near zero during 1997-98 to 2003-04. Capital productivity then declined by 3.9% annually in the second period.



4.4 Multi-factor productivity

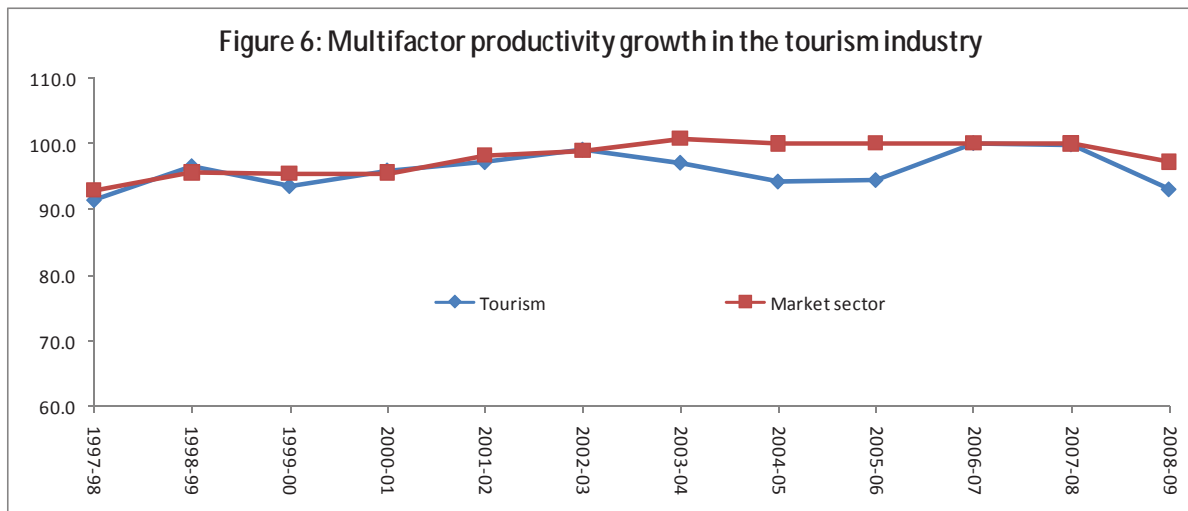
This key measure showed that tourism underperformed relative to the market sector. Average annual MFP growth for tourism in both periods (1997-98 to 2003-04 and 2003-04 to 2008-09) was lower compared to the market sector average (**Figure 6**):

Tourism: 1997-98 to 2003-04: +1.0% per year (market sector: 1.4% per year) and
2003-04 to 2008-09: -0.8% respectively (market sector: -0.7%).

This result is despite the poor performance of key market sector industries: *Mining, Electricity, Gas and water* and *Agriculture*. The Productivity Commission (2009) cited depletion of in-situ mineral resource deposits especially in case of coal and oil and gas extraction and also lag between capital investments in mining due to price boom which had not yet been transformed into output as the main cause of productivity decline the mining sector. Electricity, gas and water sector has suffered increased cost of labour and capital inputs, together with significant decline in output growth caused mainly by reduced rainfall. Agriculture industry suffered due to extended drought period causing output to fall more quickly than the structural adjustment required.

Higher output coupled with higher prices and profits over the past few years have resulted in a situation where it may have been profitable for businesses to focus on meeting increased demand than on seeking more cost-effective means of production (Productive Commission, 2009). Between 2003-04 and 2007-08, Australian industry output (GVA) increased 8.4% annually and tourism industry output 5.6% (ABS 2010). The investment in tourism in the

form of private capital formation has grown in recent years (mainly before the global financial crisis) and has kept pace with growth in total investment in the Australian industry. The capital investment (GFCF) in Australian industries as a whole and in the industries related to tourism increased at a rate of about 8% per annum (ABS 2010a) during 2003-04 to 2007-08. Similarly, tourism industry employment during this period rose at an annual rate of 1.3%. A higher growth in inputs as compared to the growth in output leads to a reduced level of MFP growth.



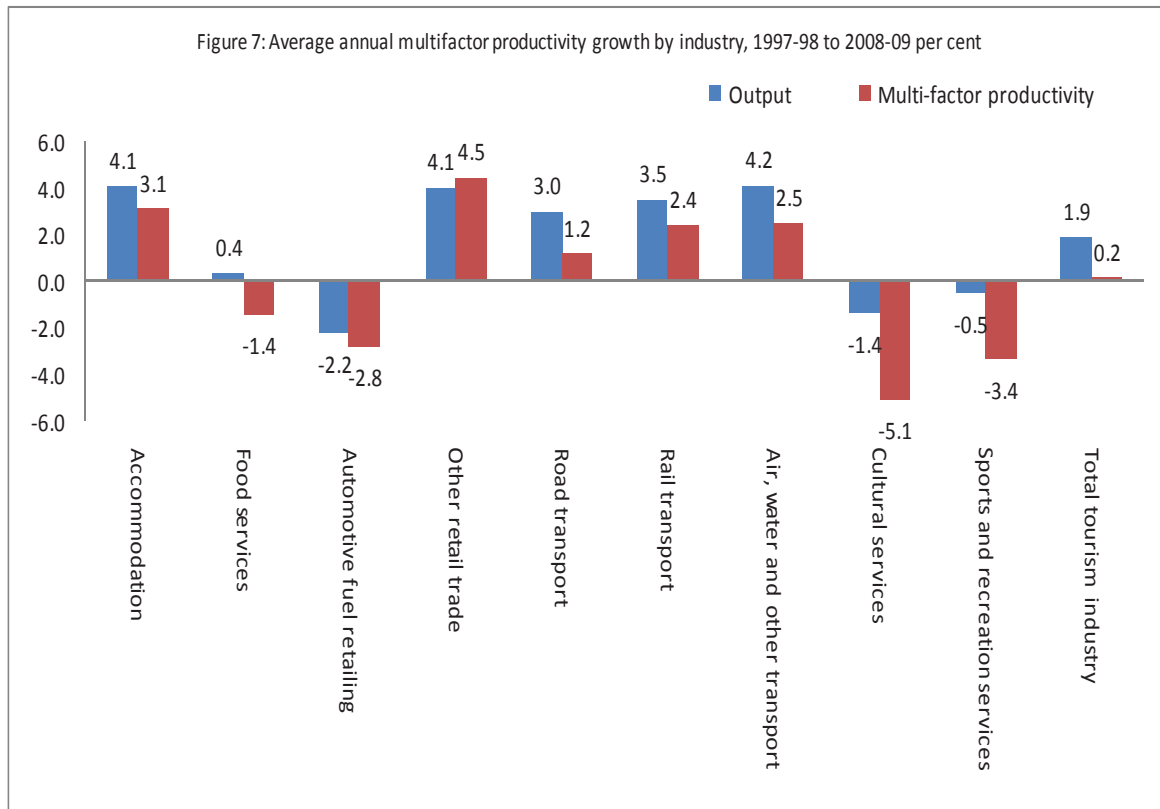
Accommodation and *Transport services* industries were the main contributor to tourism industry output and multifactor productivity growth over the period under study (**Figure 7**). In terms of output growth, most of the industries increased well above the aggregated rate of growth (1.9%). *Automotive fuel retailing*, *Cultural and Sports* and *Recreation services* industries output and the multifactor productivity growth remained negative during the whole period.

Growth in *Other retail trade* and *Accommodation, Road transport, Rail transport and Air, water and other transport* industries was underpinned by growth in multifactor productivity. This means that these industries experienced a output growth higher than the growth in combined labour and capital inputs.

Growth in *Automotive and fuel retailing* and the *Arts and recreation services* on the other hand has been driven entirely by declining output growth and in efficient use of labour and capital inputs as shown by a negative multifactor growth and output growth.

The negative multifactor productivity and output growth in *Arts and recreation services* industry (*Cultural services* and *Sports and recreation services*) may not be fully understood

because of the size of the industry which contributed only 0.8% in Australian GVA in 2008-09, and a relatively high (15%) public sector and non-market sector contribution (Long and Shah, 2010). Tourism industry output growth as a whole also resulted from an efficient use of inputs (positive multifactor productivity). This output growth was mainly driven by *Accommodation*, *Transport services* and *Retail trade* industries.

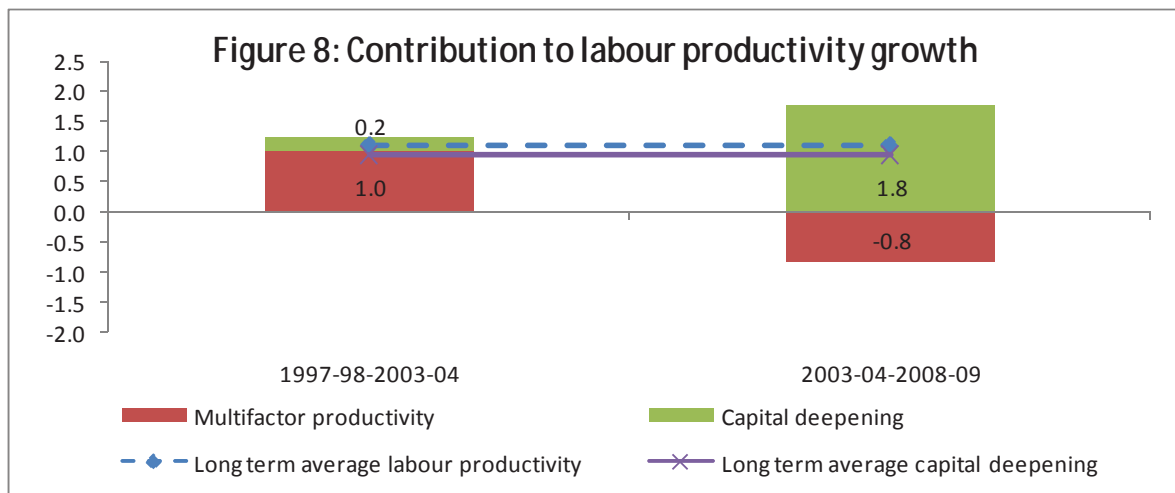


4.5 Industry contribution to labour productivity

The tourism industry is a labour intensive industry and the productivity of the labour plays a significant role in determining the MFP growth in the industry. Labour productivity can arise from two sources; one from growth in MFP (solely due to efficient use of labour input without affecting the level of capital input), and the other due to substitution of capital for labour. This substitution of capital input for labour input is also known as ‘Capital Deepening’ (KD). In other words, the output growth in an industry may come from an increase in the level of one input and decreasing the level of another input (in a perfect substitution situation). The KD occurs where technology replaces labour employment, for example, introduction of an on-line booking system in a hotel replacing a booking clerk. Looking in isolation, this example shows improvement in labour productivity as a higher output is achieved using fewer employees, but this operation has increased the capital cost by

introducing an on-line booking system. When combined, the labour and capital inputs may result in higher growth in inputs when compared with the output, thereby leading to negative multifactor productivity growth.

Wherever this substitution takes place, it is important to determine its extent as this capital deepening comes at a cost which must be offset against the value of the additional output (Productivity Commission, 2009). **Figure 8** presents the extent of capital deepening in the tourism industries during the period under study. Australia’s tourism productivity growth measured in terms of both labour productivity and multifactor productivity has slowed in the last five years in particular. In the latest period, the tourism industry experienced 0.9% growth in labour productivity as opposed to a 1.1% whole period average. Falling multifactor productivity has driven this decline. In contrast, the rate of capital deepening has averaged 0.9% per year – a trend similar to the Australian market sector which reflects a strong business investment as a result of Australia’s recent terms of trade boom (Australian Treasury 2009).



Source: TRA estimates based on ABS data

5. Conclusion

The analysis was undertaken to determine the productivity growth in selected tourism industries. Despite the lack of data availability at detailed tourism industries levels and the exclusion of some of the industries from the analysis, the analysis can be used as a broad indicator of the tourism industry. The results showed two distinct periods; 1997-98 to 2003-04 and 2003-04 to 2008-09. During these two periods, growth in output and inputs exhibited different trends. Some of the key findings are:

- During the first period from 1997-98 to 2003-04, average annual MFP growth in the tourism industry (1.0%) was lower than Australia's market sector (1.4%).
- The MFP growth declined sharply (-0.8% in tourism and -0.7% in the market sector) in the second period (2003-04 to 2008-09).
- Relatively better productivity performance in the first period may be the results of the economic reforms and breakthrough in information and communication technologies during the business cycle 1993-94 to 1997-98. These reforms enabled businesses to change production processes and redesign workplaces to raise productivity.
- During the period 1997-98 to 2008-09, average annual labour productivity growth was highest in *Other retail trade* (3.1%) followed by *Accommodation* (2.8%) and the *Air, water and other transport* industry (1.3%). Of these industries, *Accommodation* and *Other retail trade* industries maintained higher labour productivity growth during both periods.
- Labour productivity growth declined in all industries during the second period, apart from the *Accommodation* industry which remained stable. The *Road transport* industry experienced increased labour productivity growth (1.3%) during the second period compared to the first period (-1.4%).
- The better performing industries in terms of multifactor productivity growth were *Accommodation* followed by *Other retail trade* and *Air, water and other transport* industries. On the contrary, *Cultural services*, *Sports and recreation services*, *Fuel retailing* and *Food services* industries experienced negative multifactor productivity growth.
- Labour productivity growth was driven to a large extent by capital deepening in the tourism industry, particularly in the last five years, reflecting large business investment in the industry.

5.1 Future research

The current analysis is constrained by the data availability especially the capital formation series by asset which hinders TRA from making any specific policy suggestion. TRA aims to continually improve the productivity estimates by adopting improved and longer time series of relevant data sets.

References

- Australian Bureau of Statistics (2008), *Australian System of National Accounts -Tourism Satellite Account*, Australian Bureau of Statistics, cat. no. 5249.0, Canberra.
- Australian Bureau of Statistics (2010), *Australian System of National Accounts -Tourism Satellite Account – 2008-09*, Australian Bureau of Statistics, cat. no. 5249.0, Canberra.
- Australian Bureau of Statistics (2010a), *Australian System of National Accounts*, Australian Bureau of Statistics, cat no. 5204.0, Canberra.
- Gretton, P.K. and Fisher, B. (1997), *Productivity Growth and Australian Manufacturing Industry*, Industry Commission Staff Research Paper, AGPS, Canberra.
- Johnston, A., Porter, D., Cobbold, T., and Dolamore, R. (2000), *Productivity in Australia's Wholesale and Retail trade*, Productivity Commission staff research paper, AusInfo, Canberra.
- Li, X. and Prescott, D. (2009), *Measuring productivity in the service sector*, Canadian Tourism Human Resource Council, Canada.
(http://cthrc.ca/en/research_publications/productivity_and_tourism.aspx)
- Long, M. and Shah, C. (2010) *Productivity in the service industries*, part of Labour and skills forecasting for the services industries, Centre for the Economics Education and Training, Monash University, Victoria.
- Productivity Commission (2009), *Submission to the House of representatives Standing Committee of Economics: Inquiry into raising the level of productivity growth in Australia*, September.
- Topp, V., Soames, L., Parham, D. and Bloch, H. 2008, *Productivity in the Mining industry: Measurement and interpretation*, Productivity Commission staff working paper, December.

Appendix A: Data and Methodology

Productivity is the ratio of a unit of output of goods and services produced per unit of physical input. The latter measure is also known as capital labour multifactor productivity and is the single most frequently computed productivity statistics after the value-added based labour productivity (OECD, 2001)⁶.

$$\text{Labour productivity} = \text{QVAL/QLAB}$$

$$\text{Capital productivity} = \text{QVAL/QCAP}$$

$$\text{Multifactor productivity} = \text{QVAL/QLABCAP}$$

Where: QVAL is quantity index of value added

QLAB is quantity index of labour input

QCAP is quantity index of capital input

QLABCAP is quantity index of combined labour and capital inputs

Data requirements and availability

Data used in this analysis were sourced mainly from the Australian Bureau of Statistics (ABS). The ABS publications namely “Tourism Satellite Account” Cat No. 5249.0, “Australian System of National Accounts” Cat. No.5204.0; “Australian Industries” Cat No. 8155.0 and Cat No. 6291.0.55.003, “Labour Force, Australia” were the main data sources. A majority of the data available is on division/industry basis but some important data is also available on sub – division level. The following section briefly lays out the requirement and availability of data for measuring tourism productivity. Table A1 shows the source of various data sets used in the analysis.

Table A1. Data requirements and availability

Data Items	Fuel retailing	Other retail trade	Accommodation	food services	Road transport	Rail transport	Air, water and other transport	Cultural services	Sports and recreation services
Industry Sub-division(two digit ANZSIC)	40	39,41,42,43	44	45	46	47	48,49,50	89,90	91,92
GVA current price measures	Data available from Tourism Satellite Account, ABS Cat. No. 5249.0								
Hours worked	Not Available								
Data source	Total employed persons are available for all these industries from ABS Cat no. 5249.0. Hours worked estimated using ratios of tourism industry employed person to total employed persons for that industry sourced from ABS Cat. No.6291.0.55.003								
GFCF aggregate	Not Available								
Data source	ABS Cat. No. 8155.0								
GFCF by asset type	Not Available								
Data sources	Asset wise tourism industry GFCF estimates from ABS Cat No. 5204.0 were derived using sub-divisional proportions (sub division total GFCF to industry GFCF) derived from ABS Cat. No. 8155.0. The resulting estimates were then apportioned to tourism industry using tourism industry GVA ratios from ABS Cat. No. 5249.0								
Asset life	ABS Cat No. 5216.0								
Labour and capital input share in GVA	ABS Cat. No. 5249.0 unpublished data								

⁶ OECD (2001), *Measuring Productivity – OECD Manual: Measurement of Aggregate and Industry – Level Productivity Growth*, Paris.

Tourism industry classification by sub-division

Under the new framework of ANZSIC 2006 classification and UNWTO Recommended Methodological Framework (RMF) adopted recently in the ABS National Tourism Satellite Account, the tourism industries has been such classified that a large part (about 71 per cent) of tourism industries is matched to the ANZSIC industry sub-divisions which make it possible to aggregate some of the groups and classes into sub-divisions without losing the broad tourism industry characteristics.

Remaining tourism industries namely; ANZSIC group 722 “Travel agency and tour arrangement services” of SD (Sub-Division) 72 “Administrative services”, ANZSIC classes 6611 “MV hiring” of SD 66 “Rental and hiring services (Except real estate)” and 6711 “Residential property operators” of SD 67 “Property Operators and Real estate services” constituted a very small part of their respective SD and therefore could not be included in the analysis. Education and training industry was also excluded from the analysis because of the qualitative nature of the industry and the non-availability of relevant data. Moreover related industries to the above mentioned sub-divisions are excluded from ABS productivity analysis as well. For the current analysis, the aggregated tourism related industries are termed as “Tourism industry”

In 2006-07, the tourism industries aggregated here accounted for about 15 per cent of industry Gross Value Added (GVA) (Table A2). The table below demonstrates the contribution of selected industries in tourism and total industry output and GVA during 2006-07. These industries together constituted about three quarters of tourism industry GVA and more than 83 per cent of tourism industry employment. In their respective industry GVA, the share ranged from as low as 8 per cent in the *Retail trade* to as high as 76 per cent in *Accommodation* industry. The share of all excluded industries remained less than 5 per cent showing a significant coverage of industries achieved for the productivity analysis. *Accommodation and Air, water and other transport services* industry were the main contributor to tourism industry output over the period under study.

Table A2: Tourism industry share, 2006-07* (per cent)

ANZSIC 2006 Group, Subdivision or Class	Tourism industries	Share in tourism industry GVA	Share of tourism employment	Share in total industry GVA**
Included industries				
44	Accommodation	17.5	15.3	75.7
45	Food services (cafes, restaurants and takeaway food services and Clubs, pubs, taverns and bars)	15.6	29.8	23.1
40	Fuel retailing	0.5	20.2	8.4
39,41,42,43	Other retail trade	12.9		8.0
46	Road transport including taxi transport	3.4	4.3	11.2
47	Rail transport	1.7	0.0	9.1
48,49, 50	Air, space, water and other transport	17.0	7.0	59.1
89,90	Cultural services	1.5	1.8	13.1
91,92	Sports and recreation services (Casinos and other gambling services and Other sports and recreation services)	2.3	4.3	11.0
Sub-total	Tourism industry	72.4	82.7	14.8
Excluded industries				
6711	Residential property operators	6.8	-	2.7
6611	Motor vehicle hiring	2.3	-	2.1
722	Travel agency and tour operator services	5.1	5.7	5.3
80,81,82	Education and training	6.4	6.2	3.9
All other industries	All other industries	7.3	4.8	-
Sub-total	Remaining industries	27.9	16.7	4.5
Total		100.0	100.0	4.7

Column totals may not add due to rounding. *Data relates to the latest benchmark year in the ATSA

**These shares are from their respective industry GVA. Industry GVA and employment shares are from ABS cat. no. 5249.0, *Tourism satellite Account, Australian National Accounts, 2008-09*.

Data transformation

This section presents methodology adopted for generating data set for the tourism industry and deriving labour, capital productivity and the GVA based MFP estimates.

Sub-division level shares

As mentioned above the tourism industries requires sub-division and/or class level information for any analysis and in the absence of data availability at the required levels, indicator proportions need to be generated and applied to the industry level data to generate tourism industry estimates.

Where information was not available at sub-division level, an alternative source of information used in this study, the latest (2008-09) ABS publication “Australian Industries” Cat No. 8155.0 for Gross Fixed Capital Formation (GFCF) (for 2006-07 to 2008-09 on the new ANZSIC 2006 basis and from 2001-02 to 2005-06 on ANZSIC 1993 basis). The two series were combined using ANZSIC 1993-2006 concordances available from ABS to generate a longer time series of proportions.

The eight years average proportions were used to derive subdivisational shares for each tourism related industry.

Tourism industry data on GVA, labour and capital inputs

- GVA chain volume measures for the tourism industries were derived by deflating the current price estimates obtained from the ABS Cat No. 5249.0 “Tourism Satellite Account, 2010” by sub-division level deflators obtained from ABS.
- The quarterly estimates of ‘total actual hours worked’ were obtained from ABS Cat No. 6291.0.55.003, “Labour Force, Australia”. The data were available for industry divisions except for *Transport services* industry sub-divisions. However, sub-division level information was available for total employed persons from the same publication. Estimates of actual hours worked for tourism industries were derived by applying hours worked per day (total hours worked divided by total employment in an industry) to the tourism employment in an industry sourced from ABS Cat. No. 5249.0.
- Total employed persons were also converted to Full Time Equivalent (FTE) by adjusting part time employment equal to half of full time employment. This data was available at industry division only and was sourced from the “Australian Labour Market statistics” ABS Cat No 6105.0 Apr 2010. The actual hours worked data were available for February, May, August and November quarters. To obtain a financial year annual series an average of August, November, February and May was divided by 7⁷ and multiplied by 365.25⁸. The sub-divisional shares were then applied to the industry wide annual estimates of actual hours worked.

⁷ The hours worked reported in LFS relates to a week within the reference month (ABS cat no. 5204.0.55.003, 2006 *Implementing new estimates of hours worked in to the Australian National Accounts*)

⁸ This method to estimate annual labour force hours worked is based on the ABS old method used prior to 2005–06 release of Australian System of National Accounts (cat. no. 5204.0) on 1 November 2006. Currently, ABS uses a new method based on the methodology currently used by Statistics Canada. This method seems to have corrected the problems of overestimation and not capturing the seasonal variations in labour employment. ABS however, did a comparison between the old and new methods and reported that “using the new method of estimating the level of hours worked, there was a reasonably large fall in the total number of hours worked but the index of total hours worked showed little change when compared to the previous method. Thus there is little impact on annual productivity growth rates or on the identification of peaks in productivity growth cycles”. TRA currently applies the old method but will attempt to use the new method depending upon the data availability.

- The sub-divisional shares of GFCF (derived from ABS Cat. No. 8155.0) were applied to the current price value of all asset types in an industry. These estimates were then allocated to tourism industries by applying tourism industry GVA ratios. The corresponding constant price value for all asset types were derived using industry level implicit price deflators (IPD) for each capital asset.

Productivity measurements

Productivity measurement requires deriving quantity indexes for value added, inputs of labour and capital;

Quantity index of value added

Quantity index of value added shows a change in constant price value in current year with reference to a base year. This index for an industry is calculated as the current year constant value of GVA divided by the base year constant value of GVA. In this analysis the base year was 2007-08.

Quantity index of labour input

In productivity analysis the labour input is measured as an index of actual hours worked during a year.

Quantity index for capital inputs

The following capital asset types were used for the analysis

- Six types of machinery and equipments: computers and computer peripherals; electronic and electrical machinery and communication equipment; industrial machinery and equipment; motor vehicles; other transport equipment; and other plant and equipment
- Building and structure (non-dwelling constructions)
- Research and development
- Two types of intangible fixed assets: artistic originals; and computer software

Following steps are used in calculating the quantity index of capital inputs⁹

1. *Calculating of productive capital stock*

The capital services – the actual capital input into production - by an asset over its life is directly related to the productive capital value of the asset. By weighting together volume indexes of the productive capital stock of different assets using their rental prices as weight (ABS 2007)¹⁰. The productive capital stock for a single asset is measured through direct application of the perpetual inventory method (PIM)¹¹. To apply PIM, six parameters are generally required; the average length of asset lives i.e. average of the length of time they are used in production; the extent to which assets are retired before, on or after the average asset life for that asset – the retirement distribution; the age price function of asset (used to derive net capital stock and consumption of fixed capital); the age efficiency function of asset to derive the productive capital stock; GFCF for the period for which the capital stock estimate is required and for periods prior to that period equal to the maximum life of the asset; and price indexed for the entire time span of GFCF (ABS 2000)¹².

⁹ Sourced: OECD (2009), Measuring capital – OECD manual, Paris and the working out with an example

¹⁰ Australian Bureau of Statistics (2007), Experimental estimates of industry multifactor productivity, ABS cat. No. 5260.0.55.001

¹¹ PIM involves the compilation of a rolling inventory of capital stocks; in any particular period investment in capital asset is added to stocks, and retired assets are deducted

¹² Australian Bureau of Statistics (2000), *Australian system of national accounts: concepts, sources and methods*, ABS cat no. 5216.0

Productive capital stock in industry i and year t K_i^t (geometric profile) = $GCapex_i^t/2 + N_i^{te}$

Where

$GCapex_i^t$ volume of capital asset in an industry in year t
 N_i^{te} is the net capital stock at the end of year t-1

Note: The methodology adopted here is from OECD, 2009. *Measuring Capital- OECD manual*, Paris. This method is called Simplified PIM. This method is useful where only the most basic information is available.

Net capital stock: this analysis uses a constant, age dependent rate of consumption of fixed capital (geometric rate). This allows formulation of a straight forward link between capital stocks, investment and consumption of fixed capital (OECD 2009)¹³

Net capital stock at the end of the year $N_i^{te} = N_i^{tb} + GCapex_i^t - \delta(GCapex_i^t/2 + N_i^{tb})$

Where

N_i^{tb} is the net capital stock at the beginning of year t
 δ rate of depreciation and is calculated as declining balance rate of R (value of this parameter is around 2 (OECD 2009)) divided by average service life of an asset¹⁴

Net capital stock at the beginning of year t - the computation of an initial stock or net capital stock at the beginning of year t is required in analysis based on geometric pattern where sufficiently long term GFCF time series is not available (OECD 2009)¹⁵.

Initial stock $N_i^{tb} = GCapex_i^{t0} / (\delta + \theta)$

Where

θ is long term growth rate of the GFCF series of the asset i
 $GCapex_i^{t0}$ the first period for which there is information on volume of capital expenditure

Depreciation/ consumption of fixed capital - For each year the depreciation is computed by applying the rate of depreciation to the net stock at the beginning of the period plus half the current period's investment and revaluing the depreciation to current price by multiplying through by price index of capital goods. In the above equation ' $\delta(GCapex_i^t/2 + N_i^{tb})$ ' is the consumption of fixed capital at the price of reference year (in this analysis the reference year is 2007-08). The consumption of fixed capital at average prices of each reporting year ('current replacement costs') ($COFC_i^t$) is given by;

$COFC_i^t = \delta(GCapex_i^t/2 + N_i^{tb}) * P_t / 100$

Where

P_t is the price index of GFCF

¹³ OECD (2009), *Measuring capital – OECD manual*, Paris

¹⁴ We have adopted the value of R as 2 and the average service life of an asset is from ABS 2000

¹⁵ To reduce the measurement error of initial stock, it is worth attempting to estimate a series of investment data some years into the past (OECD 2009)

2. Calculating user cost of assets:

Rate of return: In the construction of user costs the choice of the rate of return is an important element. There are two approaches commonly used in the derivation of user cost; ex-post endogenous rate of return where a period to period internal rate of return is computed by imposing the condition that the estimated value of capital services exactly corresponds to gross operating surplus plus the capital element of gross mixed income.

Other approach is an ex-ante approach where the rate of return is chosen such as best reflect economic agents' expectations about the required return from investment such as the interest rate on government bonds. ABS uses a mixed approach a combination of endogenous and exogenous rate of returns to overcome the problem of negative rental prices in some industries in some years. According to this approach when the returns are low it applies a floor to the rate of return equal to 4% plus the consumer price index which could be considered as an exogenous rate (ABS 2007).

In our analysis an ex-ante exogenous approach assuming a 4% real rate of return from capital investment has been adopted. However, TRA intends to use other approaches once the required data become available.

Once the rate of return is decided the user cost of an asset is determined as follows;

$$\text{User cost} \quad U_i^t = (1 + \rho^*) \cdot (r^t + \delta^* (1 + i^{t*}) - i^{t*}) \cdot K_i^t$$

Where

ρ^*	is an average of % change in consumer price index over the whole time period
r^t	rate of return in year t (4% per year)
i^{t*}	average of real price index of a capital asset over the whole time period. The real price index of capital asset in period t is calculated by deflating the nominal asset price indices by price index of GFCF or $((P_t/P_{t-1})/(1 + \rho^t)) - 1$ where ρ^t the consumer price index in period t (% change)

3. Calculating index of capital services for an industry:

The aggregate index of capital services in an industry is done by using Tornqvist index of aggregate capital service.

Quantity Index of Capital and Labour

The combined input indexes required for MFP estimation are constructed by using the respective income shares of capital and labour for value added, and the respective cost shares for capital, labour and intermediate inputs for gross output. The input indexes are combined to form an aggregate input index using a Tornqvist methodology. These income shares are derived from total industry income, however for the current analysis the capital and labour input shares were taken from ABS.

$$\text{Quantity index of combined inputs in industry } j = (L_t^j / L_{t-1}^j)^{S_L^j} \cdot (K_t^j / K_{t-1}^j)^{S_K^j}$$

Where

L_t^j	labour input in industry j and period t
K_t^j	capital input in industry j and period t
S_L^j	average of current and last year labour share in gross value added
S_K^j	average of current and last year capital share in gross value added

Tourism Research Australia
Department of Resources,
Energy and Tourism
GPO Box 1564
Canberra ACT 2601
ABN: 46 252 861 927

Contact us at www.ret.gov.au/tra



Australian Government
**Department of Resources,
Energy and Tourism**
Tourism Research Australia



TRA TOURISM
RESEARCH
AUSTRALIA