



The economic impacts of the Gold Coast 2018 Commonwealth Games

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Executive summary

The report estimates the economic impacts of the Gold Coast 2018 Commonwealth Games in terms of increased gross state/domestic product and employment in regional Queensland and Australia. Results are determined over a period of nine years: four pre-Games years (2012-13 to 2016-17), the Games year (2017-18) and four post-Games years (2018-19 to 2021-22).

The key findings for Queensland are as follows:

- In Queensland, over the course of the nine years, Gross State Product is estimated to increase by \$2 billion and employment is estimated to increase by 16,440 full time equivalent units.
- The \$2 billion increase in Queensland Gross State Product is generated from a net stimulus of \$3.023 billion, of which the contribution of the government sector (primarily, the Queensland Government) amounts to \$1.78 billion. Therefore, every dollar spent by the government on the Games attracts 70 cents from private source injection into the economy.

The regional Queensland economy will most significantly benefit from the Games by virtue of the construction investment for venues, Games Village and other infrastructure (slightly more than \$1.1 billion) in the pre-Games years. Queensland regions will also benefit over time from increased tourism expenditure, exports, and business migration investment inflows. The Games will generate direct revenue including million in broadcast rights, million in sponsorship and \$64 million in ticket sales.

The Games will increase revenue from tourism in two ways. First, the Games year will attract an estimated 672,000 visitors who are directly interested in the event (spectators, athletes, officials). These include 356,000 day trippers, 265,000 domestic overnight visitors, and 50,000 visitors from overseas, who will contribute a total of \$323 million in tourism expenditure. Second, by promoting the Gold Coast, Queensland, or Australia as tourist destinations, the Games will generate an additional 490,000 visitors over the period of nine years – 100,000 visitors from overseas and 390,000 from within Australia – who will contribute approximately \$550 million in tourism related expenditure.

In the four years following the Games and the related promotion of major Queensland and Australian industries and products, such as food and agribusiness, professional services, education, health and environment, the induced exports are estimated to amount to \$81 million per year. In addition, the Games will showcase investment opportunities for foreign business, resulting in an increase in the inflow of foreign direct investment of approximately \$41 million per year over the post-Games period.

Contents

Executive summary.....	3
1. Introduction.....	5
2. Terms of Reference.....	7
3. Extended summary and key findings.....	9
4. The Games cost schedule and revenue stream.....	13
Pre-games period: 2012-13 to 2016-17 (from June 2013 to June 2017 – four years)	13
Games Year: 2017-18 (from June 2017 to June 2018 – one year)	17
Post-games: 2017-18 to 2021-22 (from June 2018 to June 2022 – four years).....	19
5. Simulation results and discussion	22
Pre-Games simulation and results.....	22
Games-year simulation and results	28
Post-Games simulation and results	33
6. A brief summary on previous mega-event studies.....	37
7. Delphi survey	41
8. Technical Section.....	43
The Tourism CGE Model	43
Games input data.....	46
Allocation of government budget	46
The embryonic CGI industry	51
Appendix 1: Cost schedule and revenue stream of the Games.....	56
Appendix 2: TERM model structure.....	58
Appendix 3: Tourism database structure	61
References.....	64
The authors.....	66

1. Introduction

In 2011, Queensland was awarded the right to host the 2018 Commonwealth Games in the Gold Coast City. Staging such an important international event, no doubt, will raise awareness of the Gold Coast and the *Sunshine State* of Queensland to many countries around the world. Since the announcement of the award, there has been a tremendous commitment from the Queensland government to construct world class infrastructure, not only for the Commonwealth Games event but also for future use to generate more economic benefits to the regions, particularly the Gold Coast and Brisbane areas. The Games will bring more international visitors to the state, create business opportunities, and further facilitate multi-cultural exchange. The State and the country as a whole are meant to benefit for years to come. As such, the potential impacts of the 2018 Commonwealth Games are multifaceted and include not only economic, but also social and environmental aspects. This study only focuses on the economic aspect. The other benefits are beyond the scope of this report and remain as further research areas.

The economic impacts of the 2018 Games were estimated previously in the 2014 report using an input-output (IO) multiplier approach. The IO modelling framework did not take into account the crowding out effects of limited resources in the economy when prices are changing. The previous modelling approach stated that the funding for the Games infrastructure and the operational expenses was sourced from “supplementary capital”, thus the use of capital in the modelling was clearly assumed *free of charge*. These assumptions were unrealistic and tended to over-estimate the impacts. In addition, ‘tourists’ were defined on a generic term, no differentiation between day trip visitors (hereafter day trippers) and overnight visitors was made. It was also assumed that tourists travel within regions of Queensland only. In reality, there are day trippers and overnight visitors with distinct expenditure patterns; and, most inbound visitors would also travel across states.

The impact assessment in this current report is based on a regional Computable General Equilibrium (CGE) model that captures the crowding out effect through the movements of relative prices. The impacts of the Games are not the same as the perceived increases in the demand generated by the Games spending and the tourism expenditure derived from visitors coming from elsewhere. The impacts are determined simultaneously by both the demand as well as the supply side of the economy. When resources are added to the economy, this will help the economy grow. But if resources are just relocated from other industries to tourism-related industries in response to tourism (Games) demand, then this will have counter effects, discounting the positive impacts that the Games can bring to the economy.

The tourism CGE model developed for this study incorporates explicitly *day trips*, *overnight trips* and *inbound* markets. The day trippers and overnight visitors are further disaggregated into *intra-regional*, *inter-regional* and *interstate* while the inbound visitors are captured by individual *top ten markets* to differentiate tourism expenditure patterns of visitors from different countries of origin. Arguably, the tourism CGE model used in this present research offers the most sophisticated treatment of tourism that a tourism event impact analysis could be undertaken. All of the above specifications allow the analysis to distinguish differences

between expenditure patterns of tourist types, as well as a clear distinction between tourism consumption and the day-to-day household consumption. The modelling also recognises broader travel patterns of inbound visitors to other destinations than the Queensland regions. And most importantly, the funding for Games infrastructure and the operating expenses is clearly accounted for. Given these treatments, results from this study are not compatible with the 2014 report as they are not measured on the same basis.

The tourism CGE model in this report was augmented from a regional CGE model, namely The Enormous Regional Model (TERM), developed by Centre of Policy Study at Victoria University (Horridge, Madden and Wittwer, 2005; Horridge, 2012). The tourism extension was developed at the Griffith Institute for Tourism (GIFT) of Griffith University. The combination of TERM and the tourism extension allows users to analyse effects of broad macro-economic policies on tourism and vice versa. It facilitates analysis of the impact of tourism policies and tourism events on the rest of the country. To a full extent, the model is used to analyse the interaction between the tourism sector and many other industries in regions of the Queensland economy and in other states.

This report is undertaken by Griffith Institute for Tourism (GIFT) and the Griffith Business School (GBS). The authors acknowledge the support of the Department of Tourism, Major Events, Small Business and Commonwealth Games (DTEsb), which provided data inputs to the modelling tasks. Inputs were also sought from other government departments including Tourism Research Australia, Transport and Main Roads, Trade and Investment, State Development and City of Gold Coast

The report is aimed to cater for both policy-oriented and technical readers. As such, the report will start with an Extended Summary to present main inputs into the model and summarise the key findings. All technical aspects are presented subsequently in individual sections to explain the modelling tasks in detail. Sections in the report are designed to be self-contained, thus at times they might appear to be repetitive. This approach was chosen, however, as it allows government departments to focus on any particular section individually, depending on the particular interest or perspective.

2. Terms of Reference

The economic impact of the 2018 Commonwealth Games to be held on the Gold Coast will be evaluated in this study under the following Terms of Reference (TOR).

Scenario A

1. Examine the impact of Direct investment in GC2018 in relation to
 - a. Government investment in hosting GC2018. Namely:
 - i. Whole of Games budget – approximately \$2 billion expenditure over the period 2011/12 to 2019/20
 - b. Public/ private partnership investment GC2018 infrastructure. Namely:
 - i. Commonwealth Games Village (Grocon – Parklands redevelopment) – value of \$551 million.
 - ii. New and upgraded venues (including Village Roadshow – Oxenford Sound Super Stage 9) – value of \$327million
2. Examine the impact of Tourism visitation – capturing international and inter-state visitation to QLD due to GC2018. This will include:
 - a. Pre-Games visitors (such as officials, sponsors, athletes, spectators, etc.);
 - b. Games visitors; and
 - c. Post Games visitors.

Scenario B

3. Examine the impact of Supporting investment in GC2018 – capturing the acceleration of government and private investment in projects supporting the hosting of GC2018. Namely:
 - a. Government investment
 - i. Gold Coast light rail stage 2 - \$420 million
 - ii. Coomera to Helensvale rail duplication - \$163 million
 - iii. Gold Coast major roads upgrade program - \$160 million

Scope and Objectives

The research team will develop tourism scenarios for item (2) based on research of visitation and expenditure patterns associated with comparable events in Australia and overseas. These will be workshopped with the OCG and other stakeholders.

As outlined in the TOR in the contract, the main objectives of our modelling exercise are:

- a) To provide estimates of the impact of GC2018 on Gross State Product and employment (direct and flow-on jobs) across:

- Industry;
 - Regionally (Gold Coast, Brisbane, Queensland, Australia);
 - Separately for each scenario and activity in the Scope;
 - Cumulatively for the scenarios and activities in the Scope.
- b) To appropriately examine the impact of public and private funding sources for the investments identified in the TOR;
- c) To design a model with the ability to undertake ‘what-if’ scenarios of different investment profiles;
- d) To isolate the economic contribution of GC2018 with a range of scenarios that capture different categories of impact set out in the TOR;
- e) To develop tourism visitation assumptions and/or projections for Scenario A2 of the TOR using the Delphi technique.

3. Extended summary and key findings

The level of economic impacts depends on a range of factors from both the demand and supply sides of the economy that are estimated (demand) and assumed (supply) in the modelling process. These include:

- The magnitude of construction expenditure and revenue received directly from games activity;
- The estimated level of tourism demand from the Games and the induced effects;
- The induced exports that the games could facilitate for domestic businesses;
- The response of the labour market, and;
- The labour productivity gain.

The construction investment for venues and infrastructure of slightly more than \$1.1 billion is the main contributing factor to the overall impacts during the pre-games years. This includes contributions from both the government and private sectors. The role of the private sector is important. The larger the contribution of the private sector, the more impacts it will generate, as the government contribution is often constrained by other budgetary commitments that could have implications across the whole economy.

Among the revenue generated by the games, the key components are broadcast rights and sponsorship. The proportion of the broadcast and sponsorship revenue in total spending for this 2018 Commonwealth Games is approximately 8 per cent, which is slightly higher than that of the 2006 Melbourne Commonwealth Games (6.5 per cent). The higher the ratio, the larger the impacts will be on the economy. This ratio for the Commonwealth Games is smaller than the one of the Olympics Games, as the level of coverage in the Olympic Games includes a much broader audience, with large markets such as China and the USA contributing substantially to advertising value.

It is estimated that the Games themselves will attract approximately 672,000 visitors, of whom 356,000 are day trippers, 265,000 domestic overnight visitors, and 50,000 overseas visitors, including over 6,000 athletes and officials. However, the contribution of segment-specific tourism expenditure will not be proportional to the number of visitors for each group. The average estimated spend for the Gold Coast is \$97 for day trippers, and \$849 for overnight visitors. For overseas visitors, the average spend varies from \$919 per trip to \$1750 per trip, depending on which countries of origin the visitors are from. Combining these together, the amount of tourism expenditure generated from all visitors is estimated to be \$323 million in total, with \$225 million from the domestic overnight visitors, \$63 million from overseas visitors, and only \$35 million from day trippers. The broader the visitor base that tickets are allocated to, the higher impacts the Games will have, due to tourism spend of visitor groups.

Apart from those visitors attending the Games, the event is estimated to attract an additional 490,000 visitors over a period of nine years (pre-, during and post-Games) as an induced effect, with 100,000 visitors from overseas and 390,000 from within the country. These

induced visitors generate an amount of \$550 million, with \$143 million from overseas visitors and \$407 million from domestic visitors.

The Games and its advertising campaigns can become a catalyst that promotes export opportunities for other major Queensland industries such as food products, professional services, education, health and entertainment. The induced exports are estimated to amount to approximately \$81 million per year. In addition, the Games provide opportunities for overseas businesses to understand the conditions of the domestic economy much more effectively through show cases that various government departments have been working on. Among all foreign investment inflow, data show that over recent years, the exposure of the Games and business-related advertising campaigns have attracted business migration to the Gold Coast region, with a subsequent foreign direct investment of \$41 million. It is important to note that these businesses migrate to the region *not* because of the Games. Rather, the Commonwealth Games and its advertising campaign play an important role to entice them into the region. The resulting benefit though can be legitimately included in assessing the impacts of the investment under the same induced effect category.

All in all, it is estimated that the total expenditure that the Games could bring to the economy is approximately \$3 billion across nine years of the whole Games period. Table 1 provides the cumulative sum of stimuluses at current prices for all nine years. It covers a wide range of stimuluses, including the revenue that visitors bring to the economy during the Games, exports from domestic industries that can benefit from the Games, benefits from utilising event facilities, and construction development of facilities. An important point to note here is that the total stimulus in Table 1 is *net of* all the required government budget adjustments to keep the state government budget in a neutral position before and after the games. The amount of spending on the Games as presented in Table 1 does not require any changes to tax rates imposed on the residents, and no budget deficit will incur to the economy.

Table 1: Summary of net stimuli

Games stages	Net stimulus
(million, current prices)	
Pre-games year period	524
Games year	1,853
Post games year period	646
Total	3,023

The timing of the Games is opportune: it occurs at the tail end of the recent mining boom, when the unemployment rates have already climbed up from less than 4 per cent to 6 per cent of the pre-boom level. As the labour market has slack capacity, it is very likely the unemployed people will be willing to accept the wage rates that the industries can offer in order to get a job. This means that there is no pressure for wage rates to rise significantly during the pre-Games period. In this case, the real wage rates will not rise as much as expected in a standard long-run closure, where the real wage rates are the only factor that settles the labour market at a fixed employment level. Thus, we assume that the real wage

rates will rise only by half of the full extent that is often used in a standard long-run closure. This approach was also adopted by NSW Treasury previously in their impact study of the 2000 Sydney Olympics.

Finally, an assumption on the productivity gain that labour in the tourism-related industries in Brisbane and Gold Coast attain through the Games year. Historical data show that labour productivity has averaged at 0.8 per cent over the past four years. We assume that during the post-Games years, the average of labour productivity will be at 1.2 per cent, slightly higher than the historical average. The level of our assumption is within the band of historical record. This was also an assumption that NSW Treasury adopted. However, they applied it across all industries in the economy whilst we narrow it down to just accommodation, retail and restaurant industries, where tourism has a large proportion of demand. The productivity is only applied to the Brisbane and Gold Coast regions.

Results in this study are estimated impacts of the 2018 Commonwealth Games on the economy compared to what otherwise would have been the case, referred to as the base case. They are not forecasts in nature. The analysis here is an exercise to estimate effects or impacts of the Games alone on the local economies, in a controlled environment of an economic model. In reality, there are more changes that affect the economy than just a few selected ones specifically related to the Games. As such, a comparison of results from this study with the observed data is not advisable.

Table 2: Macro results for Queensland and Australia

	QLD	Australia	QLD	Australia
	annual average growth (per cent)		sum values ¹ , 2017-18 prices (\$ million)	
<i>Pre-Games year (4 years)</i>				
Real HH consumption	0.040	0.006	303	224
Real GSP/GDP	0.036	0.003	495	246
<i>Games year (1 year)</i>				
Real HH consumption	0.439	0.170	833	1,655
Real GSP/GDP	0.230	0.068	802	1,243
<i>Post-Games year (4 years)</i>				
Real HH consumption	0.046	0.005	342	202
Real GSP/GDP	0.052	0.006	710	398
<i>Total</i>				
Real HH consumption			1,478	2,082
Real GSP/GDP			2,007	1,888

Whilst Gross State Product (GSP) represents the changes on the whole Queensland economy, it is arguable that household consumption could represent welfare of domestic consumers in

¹ Multiply by 4 for both pre-games and post-games periods.

the State. Table 2 contains results for both of them; and, similarly for Gross Domestic Product (GDP) and national household consumption. The growth rates reflect the typical annual average basis within a period of interest, hereafter referred to as typical year results. As expected, the impacts are much stronger in the year the Games occur than in other periods. Household consumption in Queensland is estimated to rise 0.4 per cent above the base case in the Games year, much stronger than the impact of only 0.04 per cent per year during the period before the Games, and marginally higher (0.046 per cent) in the post-Games years.

In absolute terms, the right-hand side of Table 2 presents the impacts in a cumulative sum for the pre-Games and post-Games periods. These values are measured at current prices (2017-18), which can be compared with the Games expenses identified in the government budget. Over the course of the whole nine year period, GSP in Queensland is estimated to increase by \$2 billion, whereby nearly \$495 million comes from the pre-games period (4 years), and \$710 million is attributed to *all* four years after the Games. The Rest of Australia attains growth in the Games year only, while it contracts slightly in the pre-Games and post-Games periods, displaying small declines below the base line.

Over the whole nine years, it is estimated that the Games will generate many thousands of jobs on the full-time equivalent (FTE) basis (Table 3). The actual number of people employed could go up higher, as there could be more than a few part-time workers to make up one FTE worker. Results for pre-Games and post-Games periods are on the typical year basis and the FTEs will stay on jobs across the whole four years of each period. This means the people involved in the 894 FTE jobs created in a pre-Games year will stay on in their jobs for at least four years, as long as the effects of pre-Games shocks are considered to last in the simulations.

Table 3: Impacts on employment

	QLD	Australia
	FTEs	
Pre-games years	894	538
Games year	15,089	18,420
Post-games years	459	0
Total	16,443	18,958

Comparing the total stimulus of \$3000 million and the total spending of \$1780 million (Table A2, Appendix 1) that the government sector² put into this 2018 Commonwealth Games event, it indicates that for every dollar the government spends on the games, it can attract 70 cents from other sources to inject into the economy ($\$3023/\$1780 = 1.7$). The leverage is an important indicator to demonstrate how much government's seed funding could create additional stimuluses to the economy.

² This includes all levels: local, state and federal government. However, the contribution of the Queensland Government is largest.

As shown in the government budget approval (Table A1, Appendix 1), total expenditure of the Games is equivalent to \$2024 million. Comparing the net GSP of \$2007 million with the total expenditure, this gives a ratio of 0.99 ($=\$2007m/\$2024m$) meaning that *leveraging on all stimulus*, every dollar spent on the Games will add 99 cents to the economy.

We do not have data from the 2006 Commonwealth Games to compare this leveraging ratio, but it is very clear from KPMG's report on the 2006 Commonwealth Games that post-Games effects were not incorporated in their analysis due to data limitation. This implies somewhat a smaller leveraging ratio for the 2006 Commonwealth Games. Using the relativity of GSP to total stimulus, the 2006 Commonwealth Games had a ratio of 0.55³ compared to 0.66⁴ from this current study on the 2018 Commonwealth Games. The higher the ratio, the more economical or effective the expenditure of the Commonwealth Games. The difference between the two ratios here partly reflects the fact the post-Games effects were not counted in the 2006 Commonwealth study, as previously mentioned. The higher ratio is consistent with the difference between the full-time equivalent (FTE) jobs estimated for the 2018 Commonwealth Games here compared to the 13,584 FTE jobs of the 2006 Commonwealth Games indicated in KPMG report.

The implication here is that the 2018 Commonwealth Games will not actually finish until 2021-22. To some extent, the post-games period from 2017-18 to 2021-22 is more important than the preparation period, as it determines whether or not all potential benefits will be realised. The tasks to organise more events and activities beyond the Commonwealth Games are important for all benefits to materialise and reach the full potential level.

4. The Games cost schedule and revenue stream

Games activities occur within a very short time frame of only twelve days, from the 4th April to the 15th April 2018. However, the preparation and implication of the Games spread over an extended period. The economic impacts are therefore analysed in different stages depending on the nature of main activities within the whole time frame. This section will provide more details of stimulus that are used as shocks to the model.

Pre-games period: 2012-13 to 2016-17 (from June 2013 to June 2017 – four years)

This period is characterised mainly by the construction of Games venues and infrastructure, namely:

- (i) Gold Coast light rail stage 2: \$420 million (public funding, current prices)
- (ii) Major road upgrade: \$160 million (public funding, current prices)
- (iii) Helensvale to Coomera Rail Duplication: \$163 million (public funding, current prices)

³ 0.55 = \$1,629m / \$2,913m (KPMG, 2006, p. 5)

⁴ 0.66 = \$2007m/\$3023m.

- (iv) New and major upgrades to venues: \$327 million (public funding, current prices)
- (v) Games Village: \$550 million (jointly public and private funding, current prices)

Among the five construction projects, the first three from (i) to (iii), were not included in the modelling process as capital construction of the Games. They were funded independently of the Games budget, and were initially committed to address capacity and operational constraints in the region. However, they were brought forward to accelerate the delivery of services in time for the Games. As such, their contribution to the Games is not as an economic stimulus, but more for the convenience during the Games time. In particular, those ground transport construction developments were aimed to improve traffic condition in the area. The improvement can be estimated by time saving of passenger cars and freight vehicles. Of the three projects, travel time statistics⁵ were available for the Gold Coast light rail stage 2 only. The modelling incorporates the time saving as productivity gain for passenger and freight transportation within the Gold Coast region.

It is important to note that there might be some costs involved in the process to bring forward these construction investments such as betterment levies. These levies would certainly have impacts on the regional economies of Queensland. However, these costs are not incorporated in this report mainly for two reasons. The first is due to a limitation of explicit data reflecting precisely the magnitude of these levies. The second reason is that including extra levies could bundle up the impacts of the Commonwealth Games together with the impacts of extra tax revenue that is not directly related to the Games budget.

Whilst the new and upgraded venues are mainly funded by the public sector, the Games Village is also partly funded by the private sector. Table A1 in Appendix 1 provides details of the capital expenditure contributed by the public sector for both of them, thus the capital expenditure in the Table for the Games Village is smaller than the above mentioned value of \$550 million (measured at current prices).

As the model database year is in 2012-13, and all financial data for the Games such as above are in current prices, it is inevitable that data measured at both prices are presented in the report. Thus, we adopted an approach that data related to the original budget planning of the government are presented at current prices so that it is easier for relevant government departments to identify the transactions. For the modelling purpose, these data at current prices are converted to the 2012-13 prices⁶ to be used along with all other data that are calculated directly at 2012-13 prices, as will be seen in the following sections. Hereafter, unless explicitly stated, all values will be reported at 2012-13 prices.

The total construction cost injected to the Gold Coast economy is calculated to be \$1001 million for the whole period, of which \$610 million is from the government. This total is larger than the sum of both the new and upgraded venues and the Games Village estimates because it also includes all construction-related costs brought out of the operating costs in the Games year (will be explained in section 9). Taking an average per year, the construction

⁵ We would like to thank the Department of Transport and Main Roads for valuable information.

⁶ We adopted a constant annual 3 per cent discount rate.

stimulus for each year in the pre-games period is \$250.4 million, and the proportion of government contribution is \$152.4 million. Although governments at all levels – local, state and federal – provide funding to the Games, they are all combined as one government in this study because the model does not differentiate government jurisdiction.

The amount of funding from the government (\$152.4 million) is assumed to be a re-prioritisation transfer, or re-allocation, of government expenditure from other areas in the budget towards the Games program under an assumption of budget neutrality. This way, the results will not benefit from any unaccounted sources of stimulus. At the same time, it also implies that all *government construction costs* for the Games are fully accounted for within the pre-games period. An alternative approach could be an exercise raising tax revenue through higher tax rates. However, we did not consider this option for a practical reason that making changes to tax rates always requires legislation or regulation that the government has to go through which is often not an easy process. More importantly, the government has not provided any advice that suggested this was the case for the Games.

During the pre-Games years, the Office of the Commonwealth Games estimates that there is likely to be a total of 2184 athletes and Games officials from overseas countries visiting Brisbane and the Gold Coast prior to the event. Their visits generate an estimate of \$3 million of tourism revenue over the whole pre-Games period. This translates into \$0.7 million of revenue per year (Table 4).

As part of the impact assessment in this study, GIFT conducted a survey to seek experts' opinion on the likelihood of increased visitor numbers to the Gold Coast due to the Games. This is referred to as the *induced effect*. Initially, the induced effect was attempted using the econometric technique, in which tourism demands from specific countries of origin were regressed against their associated economic variables such as GDP, exchange rates and so on, in order to calculate elasticity coefficients. The attempt focused on estimating the post-event effect on visitor numbers of the Sydney 2000 Olympics and the Melbourne 2006 Commonwealth Games. Unfortunately, the 9/11 attacks in 2001 and the global financial crisis in 2007 overrode the trends and created serious structural breaks in the tourism demand over a very short series of data. This prevented any meaningful results from the econometric estimation. As a result, information on the induced effects was obtained from a Delphi survey. Knowledge and opinions from a panel of experts around the country were sought, as indicated above, through two rounds of questionnaire – initial and revised opinion.

Results from the survey indicate that the marketing exercise for the Games could attract a small increase of 0.25 per cent in visitors, on the annual average basis, from the Commonwealth countries and 0.08 per cent from the non-commonwealth countries, who would like to visit the Gold Coast specifically or other areas of Queensland when they have an opportunity even before the Games. Unlike many other studies that allocated entire inbound tourism expenditure using the national average spend to the host region only, this present study adopted a more realistic approach whereby inbound tourism expenditure from the induced visitors is derived using the average spend specifically to the Gold Coast for each inbound market. This is estimated to generate \$1.4 million per year.

The survey also indicates an annual average increase of 0.35 per cent for overnight visitors from regions outside of the Gold Coast. Using the specific average spend of overnight visitors to the region, it is estimated that the revenue of domestic induced visitors would be \$11 million per year.

Table 4: Annual Games expenditure and revenue during the pre-games years

		Pre-games years, 2012-13 prices
		\$ million
Construction		
	total investment	250.4
	Re-prioritising transfer	(152.4)
Tourism expenditure		
	Athletes and games officials	0.7
	Athletes spill-over	0.6
	Delphi inbound (0.0025 CW; 0.0008 non-CW)	1.4
	Delphi inbound spill-over	1.2
	Delphi Domestic (.35%)	10.9
Net stimulus		112.9

A distinct feature of modelling the inbound tourism expenditure in this study is a representation of the *spill-over* effect that was not captured in most previous mega-event studies. Data from Tourism Research Australia (TRA) show that the actual sum of inbound tourists across tourism destinations is actually larger than the number of inbound visitors registered at the Immigration Department. This reflects the fact that a tourist from overseas visiting Australia will travel to more than one location. The data also reveal major destinations that a representative tourist from a certain country of origin would visit. Depending on the country of origin, the patterns could vary. Based on this historical distribution, visitors to the Gold Coast are estimated to generate another round of *spill-over* effect, \$0.6 million⁷ per year for the Games athletes and \$1.2 million from the induced visitors. This effect only applies to inbound visitors, as domestic visitors are not assumed to travel to multiple destinations in a trip. Table 4 summarises all effects to the Queensland economy, providing a specific focus on the Gold Coast region.

⁷ The spill-over effect measures the supplementary effect of the initial inbound (induced) visits. The ratio of spill-over to the induced inbound revenue is high (85%) in this case compared data in Tables 5 and 6 (40%), as will be seen. This is because a large proportion of athletes came in the pre-Games period for training actually stayed in Brisbane (induced visitors). Whilst the shocks are accurately specified, the presentation in Table 4 includes the induced inbound expenditure in Brisbane as the spill-over revenue from visits to the Gold Coast. Thus, it artificially increases the spill-over effect of visitation in the Gold Coast, including the Delphi.

Games Year: 2017-18 (from June 2017 to June 2018 – one year)

The total operational cost of the event is estimated to be \$1.43 billion at current prices (Table A1). Included in the operational expenses is an amount of \$231 million (current prices) for construction activities in the Games year. These include the venue overlay, village overlay, public domain improvement and contingency venue overlay. To simplify the modelling process, these construction items are shifted to, and included in, the capital expenditure of the new and upgraded venues and Games Village development in the pre-Games years. Thus, the non-construction operating expense is now equivalent to \$1.2 billion (current prices) and the total capital expenditure (construction costs) in the pre-Games years is adjusted upward by \$231 million (current prices).

Direct revenue from the Games operation includes broadcast rights, sponsorship, ticket sales, licensing, accommodation services, interest and other income, and finally funding from Local, State and Federal governments (Table A2, Appendix 1). The government funding takes up 88 per cent of the total revenue, of which the majority (85 per cent) is contributed by the Queensland Government. Part of the government funding is used to finance the capital construction costs (the new and upgraded venues and Games Village) and the other part is used to pay for the shortfall of operational expenses that the revenue from ticket sales, broadcasts, sponsorship and licencing could not match up to the total operational costs. This shortfall (\$958 million at current prices) is modelled as a subsidy from the government to the operation of the Games.

In the CGE framework, the total of \$1.2 billion reflects not only the operational costs of the Games (supply side), but also the revenue (demand) side of the Games simultaneously. Thus, values of broadcast rights, sponsorship, ticket sales and licensing are all included in this total.

It is estimated that spectators of the Games would generate a total of \$323 million for tourism expenditure in the Games year, of which nearly \$35 million is from day trippers, \$225 million from domestic overnight visitors and \$63 million from inbound visitors. The additional spill-over effect of the inbound visitors during the games year is estimated to be an amount of \$26.6 million for the inbound tourism expenditure, benefiting regions other than the Gold Coast.

Apart from spectators, the expert panel from the Delphi survey also suggested that there are visitors whose interests in the Gold Coast could be aroused by the advertising campaign and would visit the City but their visits do not necessarily coincide with the event – an induced effect during the Games year. Specifically, it was suggested that visitors from the Commonwealth countries would increase by 4 per cent and from the non-Commonwealth countries by 2 per cent. This is estimated to generate \$37 million of induced visitors, and an additional \$16 million of spill-over revenue to other states.

For the domestic visitors, the panel of experts suggested an increase in the induced tourism effect of 5.5 per cent for domestic visitors from outside Queensland and 3 per cent from within Queensland. This amounts to a total of \$118 million for domestic tourism revenue.

Data from the Gold Coast 2018 Commonwealth Games Corporation (GOLDOC) indicate that there will be approximately 6,600 athletes and games officials. Arguably, these visitors, and similarly for those in the pre-games training, would have different expenditure patterns compared to those of the spectators. However, as the proportion of athletes is small compared to the entire number of visitors to the Gold Coast during the Games, it is very unlikely that the variation of expenditure patterns would result in significant differences in tourism expenditure if we were to derive a specific set of expenditure patterns for the athletes and Games officials. Thus, we apply the same patterns for spectators as for the athletes and games officials. An estimate of tourism expenditure from these athletes and games officials, including the spill-over effect, is estimated to be \$13 million.

GOLDOC indicates that there will be approximately 15,000 volunteers, who would assist with the logistics of the games operation over the twelve-day period. Many of them will come from close proximity, but some will come from interstate. However, we assume that not all of them will attend all twelve days. For those who could make day trips to the Gold Coast (65 per cent of the total), we assume that they will help out for four days. Further, we assume that the remaining 35 per cent, who have to stay overnight in the Gold Coast, will help out for six days; a little longer for the effort of travelling overnight. On average, there will be approximately 5,875 volunteers every day over the period. Given an estimate of 1.5 million tickets sold over the period of 12 days, there will be approximately 125,000 people on site per day. Thus, the ratio of 4.7 of volunteers supporting 100 visitors per day seems to be realistic.

For the overnight volunteers, we assume that their accommodation is provided for, either by friends and relatives or the Games organisers. The accommodation costs are of an imputed nature, thus will have no impacts on the regional economy. Also, it is very unlikely that overnight volunteers would spend as much as a normal overnight visitor. In general, volunteers can have different expenditure patterns from normal visitors. However, there is no data available for rigorous calculations or estimation of volunteer expenditure. While the accuracy of such an exercise would provide a marginal benefit to the modelling tasks, we assume that all volunteers will spend in a similar pattern to day trippers to the Gold Coast. Although all the volunteers might have their food and drinks provided for or paid by themselves, the cost of food and drinks in this case must be accounted for and captured in the modelling. In total, expenditure for the volunteers is estimated to be \$6.9 million.

Arguably, there might be visitors who try to avoid visiting the Gold Coast and Brisbane during the *peak* time when the event occurs, simply because they do not want to compete with Games-attending visitors for accommodation and seats on flights or quite possibly pay higher prices. However, given that the Games represent only a twelve-day period, these visitors could re-schedule their visitation quite easily and make a visit earlier or after the Games. Thus, the loss of visitor number is very likely insignificant. Given the fact that data to support analysis on time substitution is not available in this case, we assume that the time-switching factor is zero. This assumption is commonly found in most previous mega-event studies. Table 5 summarises all estimated direct revenue presented in the above.

Table 5: Operational costs and revenue in the games year

Games year, 2012-13 prices	
	\$ million
Total operational expenses	1058
Games inbound tourism expenditure	63.0
Games Inbound tourism spill-over	26.6
Games Day Trip Tourism expenditure	34.7
Games Overnight trip tourism expenditure	225.4
Delphi inbound (4% CW; 2% non-CW)	37.3
Delphi inbound spill-over	15.9
Delphi domestic (3% within QLD; 5.5% ROA)	118.0
Athletes and team officials \$m (6,600 people)	9.4
Athletes spill-over	4.0
Volunteers 15,000 people - day trip productivity on road transport	6.9
Net stimulus	1,598.6

Post-games: 2017-18 to 2021-22 (from June 2018 to June 2022 – four years)

The legacy of a large event such as the Commonwealth Games often brings further opportunities for domestic businesses, an aspect that all governments of the host economies try to capitalise on. The benefits range from additional exports sales, more output generated from Games facilities, and of course a prolonged induced effect on tourists' visitation and expenditure.

The induced export effect is well documented in most previous mega-event studies. In a post-event analysis of the Melbourne 2006 Commonwealth Games, KPMG detailed results of a business survey on members of the Business Club Australia that ORIMA research conducted. More than 50 per cent of the respondents confirmed a significant increase in awareness of business opportunities for both domestic and international businesses. At least 3 per cent of the respondents had achieved additional export sales due to the Melbourne 2006 Games in the same year, another 31 per cent of those would expect the same outcome shortly after the Games; and, 70 per cent of the respondents who expected export sales indicated that the expected export sales would materialise within the following 12 months. Evidence of induced exports from countries hosting large events exists but has not been quantified. The main reason is due to a lack of intention (or too costly) to record such data for statistical analysis.

This report approaches the induced exports issue from a pragmatic point of view in order to estimate the increased exports for the domestic businesses in the post-event years. The approach is based on (i) the ratio of advertising cost to sales of an industry, and (ii) the sponsorship amount that the industries pay to the Games organiser for advertisement.

Ideally, the (elasticity) coefficient of advertising cost to sales should be estimated using time series data so that the confidence interval can be assessed. Unfortunately, the required data

for the estimation of such coefficient was not available. Even if the data had been available and the elasticity had been derived, it would not have been used appropriately. The reason is that elasticity is based on percentage changes of variables. In the case of advertising expenses, we only know a one-off advertising payment to the Games, not the base of the total advertising cost in the previous year for those paying industries/companies. Thus, the percentage change of advertising cost remains unknown; hence, the elasticity cannot be used correctly. We adopted an average ratio over a few recent years. The advertising to sales ratios are obtained from an international database⁸ that covers companies across many countries, including Australia, to reflect a relevance of *world markets* in the approach.

The induced sales represent total sales for both domestic and export markets. Using the export to output ratio for specific industries and regions in the CGE model database, the corresponding export sales is derived. Given the level of sponsorship detailed in Table A1, a total of \$70 million is estimated for additional exports per year, of which Queensland takes up a 72 per cent of the total. The main industries benefiting from this induced effect include education, health services, food and agricultural products, professional services and some manufacturing products.

For business migration and subsequent investment, it takes place in a process that businesses search for opportunities to relocate. Hosting an international event could be a catalyst for business migration to occur when the hosting government implements a strategic advertising campaign to demonstrate business opportunities effectively. In essence, the decision on migration and investment is still based on the conducive domestic economic conditions but the trigger is the opportunities arising from the Games advertising.

Recent data from Trade and Investment Queensland show that there has been a total of \$41 million (current prices, or \$35.4 million at 2012-13 prices) of inflow investment following Games-driven business migration to the Gold Coast region. Although this has happened before the Games, it is grouped together with other benefits that can be classified as the Games legacy in the post-Games period. This amount is assumed to spread across Brisbane and the Gold Coast in industries directly related to the tourism industry, namely *retail trade*, *accommodation* and *restaurant*.

One of the most critical legacies of mega-events is the way that facilities are utilised beyond the scope of those large events to generate additional benefits to the hosting region. The level of planning, what and where to build as well as the extent of marketing and organising extra activities for those facilities, is so crucial for the success of post-Games utilisation. However, only is the use of Games-facilities considered post-Games legacy benefits when the *need for the facilities* would not materialise if the event, and its facilities, never took place. For example, sales and rental revenue of the Games accommodation after the Games could not be considered as post-Games benefit, as buyers or tenants of these properties mainly look for a convenient location for work, schools or suitable prices. Whether or not the property was built for the Games is not part of the reason why they need the Games accommodation specifically. They could acquire properties nearby, which were not built for the Games at all.

⁸ This was available from Schonfeld and Associates, Inc.

However, it is entirely legitimate to consider the use of the Village Roadshow Soundstage for the film scenes in Thor (2016) and Aquaman (2017) movie production as the post-Game benefits, as without the Village Roadshow Soundstage these two movies would have been produced somewhere else outside the Gold Coast region.

Based on those reasons, this study considers activities at the following four venues as the Games legacy. These include the National Junior Track Series (2016) and the 2017 Cycling Australia Track National Championship (Anne Meares Velodrome), the 2014 Pan Pacific Swimming Championships (Gold Coast Aquatic Centre), the Total BWF Surdiman Cup (Carrara Sport Leisure Centre), and the production of Thor and Aquaman movies (Village Roadshow Soundstage). Among these four venues, the Gold Coast Aquatic Centre is the one that already existed but received major upgrades for the Games, while the other three are new construction developments.

Table 6: Annual post-Games stimulus (2017-18 to 2021-22)

	Post-games year, 2012-13 prices
Exports	69.8
Investment	35.4
Village Roadshow Soundstage (new)	77.9
Day trip event utilisation	4.0
Overnight event utilisation (from Rest of QLD)	3.4
Overnight event utilisation (from Rest of AUS)	5.0
Inbound event utilisation	8.3
Inbound event utilisation spill-over	3.8
Delphi inbound induced	10.2
Delphi inbound induced spill-over	4.7
Delphi induced domestic - Day Trip	9.1
Delphi induced domestic - Overnight	38.4
Re-prioritising transfer	(112.8)
Net stimulus	139.4

Although these activities occurred well before the Games year, their impacts are allocated to the post-Games period so that the modelling tasks can be more focused for each stage. Data for the above legacy activities are available for the last few years. On this basis, we assume that the same level of activity will continue throughout the post-Games period. Essentially, these sport activities continually bring streams of visitors to the regions in Queensland. Their estimated post-Game tourism revenue is presented in Table 6.

In addition, the region could continue to attract visitors well after the event finishes – an induced visitor effect. This is because visitors with positive experiences during their Games visit have a greater likelihood to return to the Gold Coast, Brisbane and other parts of

Australia. Also, the marketing campaign of the Games could have a strong delayed effect to stimulate visitors' interests in visiting the Gold Coast and Brisbane.

There is a required annual amount of re-prioritisation transfer (\$112.8 million) in the post-Games years. This is due to the fact that the revenue from ticket sales, broadcast rights, sponsorship and licensing could not match up with the total operating costs in the Games year. To balance this, the modelling assumes that all tax revenue collected within Queensland in the Games year, together with those revenue above, are used to cover part of the operational costs. The shortfall is then financed by a short-term loan so that all costs in the Games years are completely covered. The short-term loan is then paid back by future re-prioritisation transfer from other areas of the state budget toward the loan. As the loan is spread over four years, cumulative interests will incur every year and this interest is already included in the required re-prioritisation transfer presented in Table 6.

In this present impact assessment, the post-Games period is rather short, only four years, compared with previous studies such as the 2006 Commonwealth Games in Melbourne (16 years: 2007 to 2022). The short time span, particularly in the same length with the Commonwealth Games interval, is more realistic. The main assumptions here are that all induced effects are not long lasting; the effects of the 2018 Commonwealth Games event will be diluted by the next Commonwealth Games in 2022, or by other large events in Queensland or Australia.

5. Simulation results and discussion

Pre-Games simulation and results

This section should be read in conjunction with Table 4.

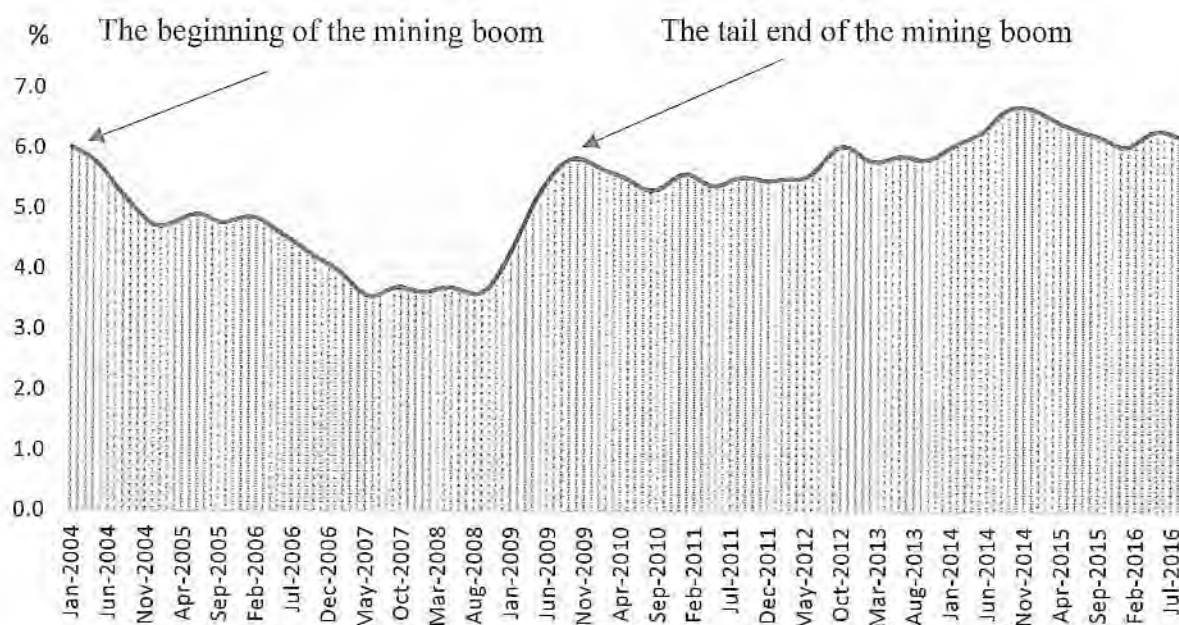
Simulation results from CGE models depend largely on the adopted assumptions that are often referred to as a closure. For a comparative static CGE model, the solution path over time is NOT known. Rather, it is assumed that the economy operates within a certain timeframe either a long run or a short run, depending on the purpose of a simulation.

The pre-Games simulations are set in a long-run closure in which capital stocks can change. This can be seen by large construction developments such as new and upgraded venues and the Games Village over the past several years. At the industry level, rates of return are set to be positively correlated to their capital growth, as industries require increases in their rates of return in order to attract high capital growth. This would provide incentive for new investment to flow into industries with high demand for capital (high rates of return) and constrain investment flows into industries with lower demand in such a way that the overall nation-wide rate of return remains at the pre-shock level.

For the labour market, often the long-run closure assumes that everyone who would like to get a job will get a job, provided that they are willing to accept the wage rates that the industries can afford to pay. As such, employment is always fully utilised at the level before

shocks. In this case, the real wage rates will adjust to settle the labour market at a pre-determined employment level.

Figure 1: Queensland unemployment rates - trend



Source: ABS, 6202.0 Labour Force Status by Sex, Queensland

Between the capital and labour markets, we adopt the standard setting for the capital market but modify the standard setting of the labour market to suit the condition of the Queensland labour market. Figure 1 shows that the labour market in Queensland had been affected by the tail end of the mining boom by the time all construction developments for the Games started (2012-13). The level of unemployment started rising by June 2009. Thus, it is very likely that all construction developments helped to alleviate the rising unemployment rates in the State. The real wage rates do not have to be the only factor that settles the labour market, and the employment number could rise above the pre-Games level when job opportunities are created by the Games construction developments. Thus, we assume that the real wage rate particularly in Queensland rises only half way of what it would be in the standard setting. The other half is settled by an increase in employment in the State, implying a reduction in the unemployment rates⁹. This approach was also adopted by NSW Treasury in their impact analysis of the 2000 Sydney Olympics study.

Although total investment also includes private sector's contribution, the total is combined and modelled as an increase in demand for construction by the government sector. The

⁹ This is a two-stage procedure. First, the model was run with the standard long run closure to obtain the result for the real wage rate. In the second stage, only half of the increase in the real wage rate is imposed on to the model with employment being endogenous to settle the labour market.

amount of re-prioritisation transfer only matches the proportion of government contribution and is assumed to spread across all regions in Queensland, namely Brisbane, Gold Coast and the Rest of Queensland. Apart from the expenditure that the government sector spends on the Games infrastructure, we explicitly assume that there is no other government spending in the modelling process, across all states and territories. This approach will ensure that the results, at the state as well as at the national level, will not be receiving unintended stimulus from other government programs.

Table 7 shows the impacts in a *typical year* for the pre-Games period. Results are in percentage changes compared to a baseline scenario where the Games activities did not take place.

Among all regions in Table 7, the Gold Coast has the strongest impact, with an increase of approximately 0.6 per cent (row 6) of gross regional product (GRP). Among the results for final demands in the Gold Coast region, government expenditure is the strongest (4 per cent), reflecting the construction development that the government puts into the region. This raises both wage and capital income in the region, leading to a higher level of household consumption (0.6 per cent). The overall higher level of domestic consumption in the region creates a higher level of demand not only for domestic output, but also from overseas sources. Thus, imports increase subsequently by 0.7 per cent (row 5). Overseas imports to the Gold Coast are also driven by an appreciation in the exchange rate. Essentially, a higher level of overall demand in the domestic economy will strengthen the domestic currency relative to the foreign currency. The exchange rate variable in Table 7 (row 10) is measured as a ratio of the domestic currency to the aggregate foreign currency. Although it is only a small change, a decline in the ratio means that it requires a smaller amount of the Australian dollars to obtain the same unit of the foreign currency – an appreciation of the Australian dollar. An appreciation of the domestic currency makes imported goods relatively cheaper, thus domestic users will substitute imported goods for the domestically produced ones. As investment is linked to capital demand, the increased investment (row 2) in the Gold Coast is driven by the increased demand for capital stocks (row 9) in the region. To some extent, the increase in investment is also facilitated by the appreciation of the exchange rate.

Table 7: Macro results for a typical pre-Games year

	Gold Coast	Brisbane	Rest QLD	QLD	Rest AUS	Australia
<i>percentage change</i>						
1 Real HH consumption	0.595	-0.023	-0.022	0.040	-0.002	0.0057
2 Real investment	0.514	-0.052	-0.035	0.009	-0.006	-0.0034
3 Real GOV consumption	4.017	-0.278	-0.278	0.179	0.000	0.0364
4 Real exports	-0.099	-0.033	-0.022	-0.032	-0.016	-0.0183
5 Real imports	0.669	-0.036	-0.036	0.031	-0.002	0.0049
6 Real GRP/GSP/GDP	0.575	-0.028	-0.025	0.036	-0.004	0.0034
7 Employment	0.589	-0.028	-0.027	0.038	-0.005	0.0039
8 Real wage	0.005	0.005	0.006	0.005	0.002	0.0027
9 Real capital stocks	0.680	-0.037	-0.031	0.040	-0.005	0.0032
10 Exchange rate	-	-	-	-	-	-0.0098
<i>Cumulative nominal at current prices, \$m</i>						
11 GRP, GSP,GDP	829	-200	-134	495	-249	246

Although TERM is a sub-state CGE model, the labour market is set up with a flavour of a state model, in which wage rates across all regions of Queensland will move closely with each other, compared to the Rest of Australia (ROA hereafter), to reflect labour mobility within the state. Therefore, the real wage rates in the Brisbane and Rest of Queensland regions are broadly the same as the level in the Gold Coast, making the cost of production across these two regions relatively more expensive for most industries. Together, the combination of appreciation of the exchange rate and the increase in the real wage rates has an adverse impact on exports from Brisbane and Rest of Queensland, exports decline below the base case by -0.03 per cent and -0.02 per cent, respectively. As the re-prioritisation transfers under the budget neutrality assumption applies proportionally across all regions in Queensland (under the same Government jurisdiction – budget), government expenditure in both Brisbane and the Rest of Queensland have a similar magnitude of impacts (row 3). The combined effect of lower exports and less demand from government consumption lead to small declines in the GRP of Brisbane and Rest of Queensland by just a little more than 0.025 per cent (row 6), discounting the positive impact on the Gold Coast’s GRP. As a result, Queensland’s GSP is estimated to increase by 0.036 per cent per year in the pre-Games period.

For the ROA, the far reaching impacts on the real wage rates and employment is much smaller. They are also affected by the appreciation of the exchange rate, which subsequently reduces overseas exports by -0.016 per cent – the highest among all adverse impacts on the ROA’s economy. That subsequently leads to lower income, hence household consumption (row 1). The economy of the ROA contracts marginally by 0.004 per cent per year.

To put results into perspective, Table 7 also presents the impacts in the form of a *cumulative* measure at current prices (2017-18) for the whole pre-Games period (four years). In total,

GRP of the Gold Coast region is estimated to increase by \$829 million (row 11) above the base case, much higher than the counter effects that Brisbane, the Rest of Queensland and the Rest of Australia experience.

Over the whole period, the preparation for the 2018 Commonwealth Games is estimated to boost Queensland's GSP by **\$495 million** and create approximately **894 FTE jobs** (Table 8). It is important to note that the number of FTE jobs is generated for one typical year in the pre-Games period, and is assumed to continue throughout all four years of the period.

Table 8: pre-Games employment effects (FTEs)

	Gold Coast	Brisbane	Rest QLD	QLD	Rest AUS	Australia
Pre-Games years	1,374	-273	-206	894	-356	538

Table 9 presents output of selected (representative) industries across all regions for each year in the pre-Games period. The impacts at the industry reflect closely the pattern of changes in final demand at the macro level in Table 7.

The appreciation of the exchange rate is a mechanism that reallocates resources from the tradeable sectors to non-tradeable sectors across all regions, raising the relative price of the non-tradeable goods to tradeable goods, strengthening the domestic currency (an appreciation of the exchange rates). The declines in output below the base case of all industries in all regions, except the Gold Coast, reflect the overall reduced export demand from all regions. Although it is small, results show that the exchange rate mechanism moves resources from less productive regions to the higher productive region (Gold Coast). For Queensland as a whole, the industries that are positively affected by the Games in this period are mainly the non-tradeable ones, including construction, construction-related industries (structural metals, non-metal miner products, wood products and electrical appliances), and other industries for tourism and household consumption (retail, accommodation, restaurant, transportation, personal services). It is clear that the construction and construction-related industries increase across all regions of Queensland as the Gold Coast region itself cannot supply enough materials for the construction development. But for the others, output increases mainly in the Gold Coast areas, whilst subdued in Brisbane and Rest of Queensland due to the losses in export demand as well as household consumption from these regions.

Table 9: Industry impacts in the pre-Games year – percentage deviation

	Gold Coast	Brisbane	RoQLD	QLD	ROA	AUS
Live stocks	-0.099	-0.018	-0.011	-0.012	-0.008	-0.009
Broad acreage crop	-0.095	-0.016	-0.013	-0.013	-0.011	-0.011
Fruit Veg Growing	-0.085	0.003	-0.001	0.000	0.000	0.000
Coal (black)	-0.129	-0.020	-0.017	-0.019	-0.015	-0.017
Oil	-0.020	-0.002	-0.003	-0.003	-0.005	-0.005
Meat Products	0.134	-0.023	-0.009	-0.010	-0.008	-0.008
Dairy Products	-0.010	-0.004	-0.005	-0.005	-0.005	-0.005
Other Food	0.094	-0.011	-0.006	-0.001	-0.005	-0.004
Wine Spirits Tobacco	-0.306	0.002	-0.001	-0.030	-0.005	-0.006
Textile Clothing Footwear	0.072	-0.003	-0.002	0.010	-0.009	-0.006
Wood Products	1.654	0.091	0.055	0.254	0.006	0.057
Petrol	0.206	0.034	0.013	0.038	0.001	0.009
Aviation Fuel	0.078	0.007	-0.004	0.009	-0.005	-0.002
Chemicals	0.399	-0.016	-0.019	0.044	-0.012	-0.004
Plastic Rubber Products	1.005	0.062	0.008	0.135	-0.002	0.022
Non Metal Mineral Products	1.926	0.156	0.009	0.284	0.004	0.063
Basic Metals	0.505	0.016	-0.015	0.019	-0.013	-0.005
Structural Metals	1.032	0.034	-0.006	0.134	-0.005	0.027
Electrical appliances	0.371	-0.003	-0.017	0.030	-0.009	-0.003
Electricity Distribution	0.325	0.016	-0.002	0.021	-0.001	0.004
Construction	2.741	0.042	0.003	0.354	-0.002	0.082
Wholesale Trade	0.406	-0.037	-0.032	0.015	-0.007	-0.003
Retail Trade	0.332	-0.056	-0.044	-0.010	-0.004	-0.005
Accommodation	0.243	-0.009	-0.002	0.027	-0.002	0.004
Restaurant	0.295	-0.017	-0.006	0.021	-0.003	0.002
Road Freight	0.385	-0.003	-0.014	0.025	-0.005	0.002
Road Passenger	0.104	0.002	0.003	0.017	-0.002	0.003
Air Transport	0.119	-0.002	-0.007	0.011	-0.005	-0.002
Postage Transport Storage	-0.162	-0.408	-0.382	-0.382	-0.016	-0.093
Info Media Telecom	0.099	-0.016	-0.019	0.004	-0.005	-0.003
Internet Telecom	0.346	-0.014	-0.020	0.028	-0.002	0.002
Finance Banking Insurance	0.271	-0.003	-0.014	0.026	-0.001	0.002
Rent Hire	0.509	-0.010	-0.016	0.047	-0.004	0.009
Professional Science Tech Services	0.198	-0.080	-0.083	-0.043	-0.007	-0.014
Education	0.156	-0.004	-0.007	0.012	-0.001	0.001
Health	0.234	-0.008	-0.009	0.019	-0.001	0.003
Personal Services	0.550	-0.030	-0.025	0.030	-0.005	0.002
day trip	-0.016	0.172	0.028	0.064	0.002	0.018
overnight trip	0.350	0.023	0.025	0.097	0.001	0.039
China inbound market	0.132	0.019	0.025	0.045	0.002	0.017
UK inbound market	0.324	0.045	0.020	0.066	0.006	0.040
NZ inbound market	0.296	0.021	0.009	0.117	0.003	0.032
USA inbound market	0.108	0.051	0.000	0.036	0.002	0.017

In contrast, the net positive impacts on industries in the Gold Coast is mainly driven by the income effects that the pre-Games development projects and induced inbound tourism demand provide to the region. The most prominent increases are in the construction and its related industries.

Games-year simulation and results

This section should be read in conjunction with Table 5.

A short-run closure is applied for the Games year simulation to reflect the brief nature of the Games. In a conducive environment for higher production level, a producer would immediately acquire more labour to produce the additional amount of output whilst maintaining the same level of the wage rates. In contrast, an adverse condition would prompt a producer to cut down his production level, release employment. By nature, wages are not changing in the short-run whilst employment will adjust in response to changes in demand for labour. Thus, nominal wages are fixed in this simulation, very similar to the approach adopted in the impact analysis for the 2000 Sydney Olympics by NSW Treasury.

For the capital market, a short-run time frame is not sufficient for industries to build up their capital; any changes in demand for capital are reflected by changes in the rates of return. This standard set-up is commonly applied in all short-run simulations. In this Games year simulation, we adopt a slight variation in the set-up, which was also adopted in the study of the 2000 Sydney Olympics by NSW Treasury.

To prepare for such a large event as the 2018 Commonwealth Games, almost all of tourism-related industries in Queensland would gradually gear up their capacity well in advance during the pre-Games years. Examples are many, ranging from accommodation to venues and infrastructure, such as the Games village, the Village Roadshow Soundstage, Queensland State Velodrome, Gold Coast light rail stage 2 and Helensvale to Coomera Rail Duplication, and many others at smaller scale levels. In a dynamic simulation, these incremental changes in capital stocks are captured in such a way that the supply side changes can be built up to match up with the surge in demand in the Games year. Using a comparative static model, such cumulative changes in the supply side are not picked up, the model does not capture capital stocks explicitly. Thus, in the Games year simulation, there will be a mismatch between demand and supply of capital stocks for tourism even though the supply side has been built up. Simulations in such conditions often result in low impacts, or an adverse outcome due to an artificially constrained capital supply. One way to overcome this situation is to impose the new level of capital stocks on simulations for the tourism industries. However, we do not know exactly the level of changes from the supply side so far, as the level of capital stocks are not available in a comparative static model. Therefore, in an effective approach, we adopt a scenario that the supply side of capital stocks will respond fully to the demand side at the pre-determined level of the rates of return, only for tourism-related industries in Queensland such as hotel, restaurant, food and drinks, etc. Capital stocks in other industries of Queensland are fixed, and similarly across all industries in other states.

Other assumptions include:

- The short-term nature of the Games will not affect other non-tourism exports across all regions.
- Governments of all states, including Queensland, will not change their spending (row 3, Table 10).
- Road and freight transports in the Gold Coast improve their productivity by 0.07 per cent and 0.02 per cent, respectively after the completion of Gold Coast Light Rail Stage 2.

During the Games, the net stimulus of \$1.598 billion at 2012/13 prices (Table 5) not only provides strong stimulus but it also brings high inflation for a small region like the Gold Coast. Given the fact that the nominal wages are fixed (omitted from Table 10), the increased inflation in the region makes the real wages decline slightly in the Gold Coast (row 8, Table 10). Wage income in the region, however, still effectively continues to rise due to the fact that there are more jobs (4.66 per cent) created in the region, far stronger than the drop in its real wages (-1.9 per cent). This partly explains the strong increase in household consumption of the region (2.67 per cent, row 1). The other reason for high level of household consumption in the Gold Coast region can be explained by the appreciation of the domestic currency.

The amount of Games-related spending in Queensland strengthens the domestic currency by 0.16 per cent (row 10). This is the key that drives results across all regions because the appreciation in the exchange rate makes imported goods cheaper, thus increasing demand for overseas imports for household consumption as well as materials for investment across all regions (row 5); this is very prominently for the Gold Coast (5.7 per cent).

The inbound tourism expenditure from the inflow of athletes and spectators from overseas countries helps improve total exports of Gold Coast significantly, 7 per cent (row 4), above the base case scenario. Given the Gold Coast region is the centre of the Games, and the level of inbound tourism expenditure in the region is much smaller than those of other regions, the increase in total exports is more significant (larger) for the Gold Coast in percentage change term. The small increases in total exports in other regions are due to the fact that inbound tourism expenditure in other regions is on the basis of the spill-over effects, at a smaller magnitude than the induced effects as presented in Table 5.

The Gold Coast is a small regional economy, it cannot be self-sufficient for all goods and services required by the Games. A large proportion of inputs for the operating expenses will be supplied through imports from other regions. Together with the exchange rate effect on overseas imports, these turn Gold Coast to a net importer for both, domestically and internationally sourced goods and services.

It is the inter-linkages between the Gold Coast and other regions that the benefits are passed onto through the demand for inputs required by the Games, and in the first instant Brisbane and the Rest of Queensland. These flow-on demands generate small increases in employment and income in other regions which help increase their household consumption (row 1). This

is relatively more significant for Brisbane (0.17 per cent) and the Rest of Queensland (0.21 per cent) than for the Rest of Australia (0.11 per cent).

The real wage rates in the ROA increase, as opposed to those of Queensland's regions, mainly because inflation in ROA is much lower than the increase in the nominal wage rates due to two reasons: (i) a relatively lower level of stimulus from small spill-over effects of inbound tourism; and (ii) the cheaper import costs through the appreciation of the exchange rate.

Table 10: Impacts in the Games year

	Gold Coast	Brisbane	Rest QLD	QLD	Rest AUS	Australia
<i>percentage change</i>						
1 Real HH consumption	2.67	0.17	0.21	0.44	0.11	0.17
2 Real investment	4.53	0.28	0.09	0.58	0.00	0.11
3 Real GOV consumption	0.00	0.00	0.00	0.00	0.00	0.00
4 Real exports	7.11	0.06	0.05	0.49	0.01	0.08
5 Real imports	5.72	0.46	0.45	0.96	0.17	0.33
6 Real GRP/GSP/GDP	0.66	0.18	0.18	0.23	0.03	0.07
7 Employment	4.66	0.28	0.20	0.72	0.04	0.18
8 Real wage	-1.90	-0.11	0.00	-0.27	0.06	0.00
9 Real capital stocks	1.68	0.13	0.12	0.29	0.00	0.05
10 Exchange rate	-	-	-	-	-	-0.16
<i>Nominal at current prices, \$m</i>						
11 GRP, GSP, GDP	251	319	233	802	441	1243

Table 11: Employment effects from Games year (FTEs)

Gold Coast	Brisbane	Rest QLD	QLD	Rest AUS	Australia
10,860	2,681	1,548	15,089	3,331	18,420

Through the inter-regional linkages, the whole \$1.598 billion stimulus in the Games year is not entirely contained within the Gold Coast's economy, nor within the Queensland's economy. It spreads across all regions. As a result, GRP in the Gold Coast increases only by 0.66 per cent, far much less than the initial stimulus. The majority of it is passed on to the Brisbane, the Rest of Queensland and the Rest of Australia. Table 10 shows the impacts across all region in dollar terms measured at current prices. Queensland as a whole attains approximately \$800 m, and \$440 m for the Rest of Australia.

As notice, employment increases across all regions in this Games year. These increases are mainly from the unemployment pool, or spare capacity, that all regional labour markets have currently. The impacts of the Games year on regional employment are presented in Table 11.

Output increases above the base case across most industries in all regions in the Games year. In the Gold Coast region, *road passenger transport* increases significantly, 22 per cent. This reflects the level of passenger movements during the Games as well as the productivity gain of transportation that the Gold Coast light rail stage 2 delivers to the region. This is indeed an indication prompting the Games operator to maximise the use of public transport in and out of the Gold Coast to avoid road congestion, as well as road accidents that this economic modelling cannot capture.

As expected for the Gold Coast region, most output increases in the Games year are in the industries providing goods and services for tourism and household consumption as well as the Games operation. For the Games operation, this includes *professional science and technical services* (3.28 per cent), *information media telecommunication* (7.4 per cent) and *internet telecommunication* (5.3 per cent). For tourism and household consumption, both *accommodation* and *restaurants* increase significantly by 7 per cent each, *petrol* (5.5 per cent), *aviation fuel* (4.5 per cent), *meat product* (4.5 per cent), *other foods* (3.3 per cent), and *rent and hire* (2.2 per cent).

Given the brevity nature of the Games, the surge in tourism demand does not affect exports of other industries, as assumed. Most industries in other regions benefit from supplying their goods and services to the Gold Coast, as inputs to the Games, or supplying to their own regional household consumption. Thus, the relative prices of non-tradeable goods to tradeable goods increases mainly due to higher demand for non-tradeable goods such as *meat products* (0.4 per cent nationally), *petrol* (1.5 per cent nationally), *accommodation* (1.2 per cent nationally), *restaurant* (0.75 per cent nationally) and *retail trade* (0.2 per cent nationally). Resources required by the non-tradeable sectors are NOT coming from the tradable sectors in this scenario, but mainly from the slack capacity (unemployment) that the economy has. This reflects the macro result of higher employment growth above the base case across all regions.

Table 12: Industry impacts in the Games-year – percentage deviation

	Gold Coast	Brisbane	RoQLD	QLD	ROA	AUS
Live stocks	0.227	0.128	0.186	0.179	0.146	0.153
Broad acreage crop	0.070	0.095	0.103	0.103	0.076	0.079
Fruit Veg Growing	-0.054	-0.049	-0.052	-0.051	-0.065	-0.063
Coal (black)	-0.082	-0.004	0.003	0.000	0.004	0.001
Oil	0.071	0.049	0.043	0.048	0.028	0.028
Meat Products	4.518	0.269	0.695	0.643	0.357	0.443
Dairy Products	0.802	-0.109	-0.151	-0.035	-0.176	-0.159
Other Food	3.292	0.166	0.313	0.454	0.115	0.194
Wine Spirits Tobacco	0.300	0.084	0.145	0.129	0.043	0.047
Textile Clothing Footwear	1.255	-0.472	-0.012	-0.031	-0.040	-0.039
Wood Products	0.804	0.183	0.108	0.222	0.026	0.067
Petrol	5.541	1.867	2.502	2.104	1.308	1.485
Aviation Fuel	4.494	1.588	1.708	1.723	0.618	0.866
Chemicals	0.926	0.109	0.095	0.226	-0.001	0.031
Plastic Rubber Products	0.775	0.125	0.048	0.170	-0.029	0.006
Non Metal Mineral Products	0.924	0.251	0.080	0.263	0.014	0.066
Basic Metals	0.401	0.052	0.011	0.042	0.002	0.012
Structural Metals	0.748	0.124	0.053	0.173	-0.014	0.029
Electrical appliances	2.152	0.120	0.054	0.303	-0.036	0.019
Electricity Distribution	1.051	0.137	0.040	0.131	-0.030	0.006
Construction	1.569	0.237	0.105	0.350	0.030	0.108
Wholesale Trade	2.907	0.237	0.229	0.540	0.030	0.124
Retail Trade	4.463	0.191	0.383	0.724	0.035	0.174
Accommodation	7.231	0.966	1.897	2.169	0.945	1.212
Restaurant	7.917	0.343	1.635	1.651	0.531	0.745
Road Freight	1.919	0.224	0.167	0.344	0.051	0.114
Road Passenger	22.161	0.843	1.883	4.420	0.744	1.673
Air Transport	5.579	1.275	1.743	1.881	0.678	0.957
Postage Transport Storage	1.037	0.233	0.141	0.264	0.050	0.095
Info Media Telecom	7.438	0.071	0.143	1.429	-0.039	0.162
Internet Telecom	5.337	0.233	-0.018	0.799	-0.047	0.072
Finance Banking Insurance	0.666	0.072	-0.012	0.122	-0.059	-0.034
Rent Hire	2.220	0.357	0.312	0.551	0.134	0.239
Professional Science Tech Services	3.283	0.351	0.275	0.727	0.079	0.203
Education	1.482	-0.028	-0.094	0.105	-0.132	-0.085
Health	3.084	0.019	-0.071	0.332	-0.139	-0.040
Personal Services	3.143	0.168	0.068	0.424	-0.080	0.023
day trip	0.953	1.720	2.100	1.788	0.754	0.595
overnight trip	4.162	5.419	5.529	5.195	6.289	5.882
Chinese inbound market	3.306	0.565	0.750	1.226	0.064	0.450
UK inbound market	5.638	0.517	0.751	1.240	0.235	0.766
NZ inbound market	4.885	0.555	0.240	2.039	0.074	0.579
USA inbound market	2.703	0.500	0.000	0.551	0.142	0.365

Post-Games simulation and results

This section should be read in conjunction with Table 6.

The post-Games period includes a range of stimuluses from induced exports, event utilisation and tourism induced demands for both domestic and inbound sectors. We assume that the post-Games period lasts for four years. Given this time span, it is appropriate to apply a standard long-run closure for this post-Games period without any adjustments. Thus, we assume no further changes in the employment level at the national level while the real wage rates can vary depending on the level of labour demand in the economy; capital stocks change to respond to capital demand to remain the pre-shock nation-wide rate of return. Government consumption in the ROA is no longer fixed as there is no reason to constrain their spending in this case. However, government consumption in Queensland is still aiming at restoring the neutral budget position, thus only a few selected areas of government consumption are subject to changes (by shocks) while all others remained unchanged.

Apart from the productivity gain of the passenger and freight transports, which is still applied in this post-Games period, we made another assumption on labour productivity improvement of two tourism-related industries. This is adopted from the 2000 Sydney Olympics study (NSW Treasury). Essentially, it is assumed that large events provide opportunities for workers to gain and improve their skills. As such, the 2000 Sydney Olympics study assumed an improvement of labour productivity by 0.05 per cent across the whole economy.

While we agree on the principle of the assumption, it appears that not all types of labour across all industries will improve their skills through the 2018 Commonwealth Games. Rather, it is more specific to a group of industries, and might even be specific groups of occupations, that can benefit from the experience. Therefore, our assumption is more directly related tourism. Data from the ABS indicates that labour productivity growth in the Accommodation and Food Services sector fluctuated in a range of -2.4 per cent to 4.1 per cent over the last four years. This averages out just slightly at 0.8 per cent (Table 13). Using this historical information, we assume that labour productivity for industries in this group in the Gold Coast and Brisbane will improve marginally above the average, at 1.2 per cent through the post-Games period. This improvement is well within the historical range that the industry could attain. Thus, we apply this labour productivity gain for the two sectors *accommodation* and *restaurant* in the Brisbane and Gold Coast regions.

Of the total induced exports, nearly \$51 million come from Queensland, mainly Brisbane (75% of the \$51 million), and another \$20 million from ROA. For the inbound tourism demand of event utilisation, the Gold Coast takes up most of the revenue as venues are located in this region. Thus, increases in exports from Brisbane (0.23 per cent) and Gold Coast (1.03 per cent) are much larger than all other regions (row 4, Table 14). In absolute terms, it is larger in Brisbane than in the Gold Coast.

Table 13: Labour productivity growth by industry

Hours worked basis	2011-12	2012-13	2013-14	2014-15	2015-16	average
A Agriculture, Forestry and Fishing	6.3	6.1	-3.9	2.2	-8.3	0.48
B Mining	-11.5	2.3	9.6	29.6	3.4	6.67
C Manufacturing	3.9	-1.8	0.7	-1.0	2.5	0.89
D Electricity, Gas, Water and Waste Services	-1.7	8.1	-8.1	8.6	-0.7	1.25
E Construction	11.2	3.2	0.1	-1.4	1.3	2.88
F Wholesale Trade	7.1	-1.3	7.3	1.8	10.8	5.15
G Retail Trade	3.5	2.9	1.7	0.6	0.8	1.89
H Accommodation and Food Services	4.1	-2.4	3.4	-1.3	0.2	0.81
I Transport, Postal and Warehousing	6.5	1.5	-1.4	-3.2	-1.0	0.48
J Information, Media and Telecommunications	-2.9	-2.8	16.0	-1.1	9.0	3.62
K Financial and Insurance Services	-3.3	7.2	2.6	5.7	0.6	2.58
L Rental, Hiring and Real Estate Services	4.4	10.6	5.4	-0.4	10.5	6.09
M Professional, Scientific and Technical Services	1.4	0.9	-0.1	-3.8	-2.8	-0.89
N Administrative and Support Services	-4.9	3.9	3.9	0.6	-6.5	-0.59
R Arts and Recreation Services	0.9	-2.0	10.4	-7.6	-3.9	-0.46

Source: ABS (Dec 2016), Cat.no. 5260.0.55.002, Estimates of Industry Multifactor Productivity

Table 14: Post-Games impacts

	Gold Coast	Brisbane	Rest QLD	QLD	Rest AUS	Australia
<i>percentage change</i>						
1 Real HH consumption	0.440	0.010	-0.014	0.046	-0.004	0.005
2 Real investment	0.511	0.049	-0.025	0.058	-0.006	0.006
3 Real GOV consumption	-0.191	-0.200	-0.200	-0.199	-0.005	-0.045
4 Real exports	1.032	0.231	0.048	0.204	0.012	0.039
5 Real imports	0.450	-0.002	-0.035	0.030	-0.007	0.001
6 Real GRP/GSP/GDP	0.427	0.025	-0.016	0.052	-0.005	0.006
7 Employment	0.227	0.002	-0.011	0.023	-0.006	0.000
8 Real wage	0.213	0.008	-0.003	0.026	0.001	0.006
9 Real capital stocks	0.146	0.000	-0.024	0.006	-0.006	-0.004
10 Exchange rate	-	-	-	-	-	0.011
<i>Cumulative nominal at current prices, \$m</i>						
11 GRP, GSP, GDP	625	168	-83	710	-312	398

One of the targets in the post-Games simulation is that the Queensland Government will continue to transfer budget from other programs toward financing the amount the government provides during the Games year to balance the mismatch between the operating expenses and the revenue the Games generates. As the transfer is assumed to be proportionally applied to all regions within Queensland, the result for government consumption is the same (-0.2 per cent per year) for all regions in Queensland (row 3).

Results for investment in Brisbane (0.049 per cent) and Gold Coast (0.51 per cent) do not increase proportionally to the changes of capital in the regions as usually defined in the long-

run relationship because these changes reflect the increases in investment for those tourism related industries, *accommodation*, *restaurant* and *retail trade* that business migration are bringing in to the State in the post-Games scenario.

There is a very small degree of labour re-allocation from the Rest of Queensland and the Rest of Australia toward both Brisbane and Gold Coast (row 7). This reduces income in the two regions that lose resources, leading to a decline in their household consumption (row 1). This is the main reason for the adverse impacts in both Rest of Queensland and Rest of Australia.

An interesting result in this scenario is a depreciation of the exchange rate (row 10), compared to other simulations. This is due to the composition of large export values and the reduction in government demand (Table 6), these make the relative price of tradeable to non-tradeable goods increase, leading to a (required) depreciation of the exchange rate. This is accompanied by a deterioration of the terms of trade by -0.006 per cent (not shown in the table). The depreciation of the exchange rate adds further constraint to household consumption in terms of ability to purchase from overseas markets. This explains why imports decline in most regions, except Gold Coast where the strong growth in exports and investment generates high income (both employment and real wages, rows 7 and 8) driving strong demands for both domestic and overseas sources in the region. Employment effects of the post-Games years across regions are presented in Table 15.

Table 15: Employment effects of the post-Games years (FTEs)

Gold Coast	Brisbane	Rest QLD	QLD	Rest AUS	Australia
527	17	-85	459	-459	0

The net impacts of the post-Games period are estimated to be \$710 million above the base case for Queensland, and a small decline of \$310 million in the Rest of Australia. These impacts are on a cumulative basis, which is the total changes of GSP over the whole four years in the post-Games period. Impacts on employment are calculated on a typical year basis, and are assumed to continue over the course of four years in the post-Games period.

Among the post-Games venue utilisation, the prominent output growth is in the film production that both Thor and Aquaman movies were shot in the Gold Coast. Output of the *Information media telecommunication* industry of the region is estimated to increase by 8.5 per cent above the base case (Table 16). Apart from the film production, the utilisation of other venues continues to attract tourists to the region, which is estimated to raise output growth of *accommodation* (1.2 per cent), *restaurant* (1.2 per cent), *retails* (0.6 per cent) and *air transport* (0.6 per cent) above the base case.

Although the proportion of induced exports is relatively larger in Brisbane than in the Gold Coast, impacts of the induced exports are reflected marginally in Brisbane and relatively more noticeable in the Gold Coast regions. This is because exports of industries in Brisbane are so much larger than the exports from the Gold Coast.

Table 16: Industry impacts in the post-Games year – percentage deviation

	Gold Coast	Brisbane	RoQLD	QLD	ROA	AUS
Live stocks	0.041	0.117	0.047	0.055	0.019	0.028
Broad acreage crop	-0.047	0.071	0.030	0.030	0.009	0.011
Fruit Veg Growing	-0.079	0.069	0.024	0.037	0.005	0.010
Coal (black)	-0.118	0.053	0.018	0.022	0.008	0.016
Oil	-0.027	0.036	0.015	0.026	0.002	0.002
Meat Products	0.593	0.145	0.051	0.132	0.034	0.063
Dairy Products	0.130	0.043	-0.005	0.037	-0.004	0.001
Other Food	0.433	0.063	0.020	0.063	0.002	0.017
Wine Spirits Tobacco	0.068	0.306	0.048	0.185	0.038	0.044
Textile Clothing Footwear	0.319	0.226	0.060	0.186	0.010	0.037
Wood Products	-0.008	0.098	0.018	0.050	-0.006	0.006
Petrol	0.821	0.093	0.009	0.112	-0.002	0.024
Aviation Fuel	0.456	0.128	0.032	0.129	0.003	0.032
Chemicals	0.198	0.078	0.021	0.080	0.000	0.011
Pharmaceutical	-0.535	-0.558	-0.495	-0.549	-0.059	-0.114
Plastic Rubber Products	0.093	0.100	0.013	0.085	-0.004	0.011
Non Metal Mineral Products	0.080	0.075	-0.004	0.049	-0.006	0.006
Basic Metals	0.015	0.054	0.013	0.026	0.003	0.009
Electrical appliances	0.211	0.195	0.019	0.149	0.003	0.026
Electricity Distribution	0.143	0.040	0.003	0.027	-0.004	0.003
Construction	0.174	0.056	-0.011	0.044	-0.007	0.005
Wholesale Trade	0.297	0.035	-0.014	0.050	-0.002	0.007
Retail Trade	0.630	0.002	-0.034	0.058	-0.003	0.009
Accommodation	1.211	0.200	0.040	0.277	-0.002	0.059
Restaurant	1.209	0.160	-0.019	0.214	-0.006	0.036
Road Freight	0.181	0.039	0.004	0.038	0.001	0.009
Road Passenger	0.581	0.030	0.010	0.111	-0.004	0.026
Air Transport	0.597	0.105	0.018	0.142	-0.001	0.032
Postage Transport Storage	-0.200	-0.244	-0.264	-0.247	-0.012	-0.062
Info Media Telecom	8.491	-0.598	-0.278	1.162	-0.076	0.078
Internet Telecom	0.468	0.042	-0.013	0.083	-0.006	0.007
Finance Banking Insurance	0.148	0.040	-0.007	0.042	-0.006	0.001
Rent Hire	0.265	0.049	0.000	0.053	-0.006	0.009
Professional Science Tech Services	0.158	0.027	-0.046	0.025	-0.007	-0.001
Education	0.242	0.037	-0.005	0.044	-0.006	0.004
Health	0.206	0.010	-0.018	0.023	-0.005	0.001
Personal Services	0.379	0.013	-0.017	0.037	-0.006	0.003
day trip	1.808	0.093	-0.029	0.319	-0.006	0.186
overnight trip	1.399	0.090	0.003	0.334	-0.010	0.139
Chinese inbound market	1.711	0.239	0.318	0.596	0.027	0.228
UK inbound market	0.526	0.022	0.032	0.090	0.010	0.064
NZ inbound market	0.752	0.052	0.023	0.307	0.007	0.087
USA inbound market	2.697	0.166	0.000	0.409	0.047	0.310

For the Gold Coast, growth in output for those induced exports includes *education* (0.2 per cent), *health services* (0.2 per cent), *professional, science and technical services* (0.2 per cent) and *Internet telecommunication* (0.5 per cent).

The re-prioritisation transfer in this scenario is estimated to affect the most on *pharmaceutical, postage transport and storage* in all three regions of Queensland. Compared to the previous two stages, the demand for government consumption contracts relatively more than the positive effect on the demand for exports, thus making the exchange rate depreciate slightly. On this basis, exports increase above the base case for most industries in all regions except for the Gold Coast. This can be seen clearly in results for the ROA. Output of major exporting industries such as broad acreage crop, coal mining, basic metals products all increases above the base case.

6. A brief summary on previous mega-event studies

Hosting a mega sporting event like Olympics, Commonwealth Games or FIFA World Cup can generate a considerable amount of economic benefits for the host city or region.

Therefore, undertaking an economic impact study of such an event has become common practice among policy analysts and policy makers. An impact study of a mega event can either be undertaken as a pre-event or post-event study. In common with the usual practice, a number of impact studies of mega sporting events hosted by Australian cities have been carried out over the last two decades. For example, there have been a number of impact studies on the Sydney 2000 Olympics and the Melbourne 2006 Commonwealth Games. Although it is very difficult to compare economic benefits of one sporting event with another one, a summary of the results for selected impact studies of a few Commonwealth Games and two Olympic Games is given in Table 17. The economic impact study of the Gold Coast 2018 Commonwealth Games can be considered within this context.

Australian cities such as Sydney, Brisbane, Perth and Melbourne have hosted the Commonwealth Games since 1936. It is difficult to find any information on the economic impact of the 1938 Commonwealth Games held in Sydney or the 1962 Commonwealth Games held in Perth. To our knowledge, the first systematic impact analysis on hosting the Commonwealth Games by an Australian city was carried out by Lynch and Jensen (1984) on the event held in Brisbane in 1982. Using an I-O model, this study carried out an economic impact of capital expenditure, event expenditure and visitor expenditure related to the Brisbane Games and has estimated direct, indirect and total economic effects of the games. Obviously, this study has been subjected to the limitations of I-O studies highlighted in the literature.

After the 1982 Brisbane Games, Melbourne hosted the 2006 commonwealth games. Two main impact analyses of the 2006 games have been carried out. KPMG (2006) has estimated direct and indirect impact of hosting the 2006 games in Melbourne and prepared a report for the Office of Commonwealth Games Coordination in Melbourne. According to this report, the economic benefits of hosting the event in Melbourne have exceeded the costs to the Victorian economy. The results of this study demonstrated that the 2006 Games generated an additional \$1.6 billion to the Gross State Product (GSP) of Victoria and created full time equivalent

13,600 jobs. Insight Economics (2006) has also carried out an impact study for the Office of Commonwealth Games Coordination under the heading of “Triple Bottom Line Assessment of the XVII Commonwealth Games”. In addition to the economic benefits, this study has noted possible social benefits such as the number of people willing to engage in volunteer work, public interest in attending future cultural and art events, the willingness of people to participate in community events, interest in involvement in school education and participation in sport. The results of a number of studies carried out on the 2002 Manchester Commonwealth Games and the 2014 Glasgow Commonwealth Games have also been summarised in Table 17. These are presented with the results of the impact study of the 2006 Melbourne Commonwealth Games, in order to provide the nature and the magnitude of economic benefits of staging Commonwealth Games.

The most comprehensive study using a CGE model was carried out by the NSW Treasury and the Centre for Regional Economic Analysis of the University of Tasmania in November 1997 to estimate the economic impact of the Sydney Olympic Games. As shown in Table 17, the economic impact of the Olympics are much higher than the impact of the Commonwealth Games since the Olympics involve almost all countries around the world. The results of the impact studies of the 2000 Sydney Olympic Games and the 2012 London Olympic Games shown in Table 17 demonstrate this feature of economy impact of these two types of sporting events.

Table 17: Statistics for selected previous mega event studies

Study	Venue and dates	Attendance	Period Covered	Assessment model	Spending	Economic benefits	Comments
Commonwealth Games							
Lynch and Jensen (1984)	Brisbane -1982	2,200 athletes Visitors 6,000 overseas 5,000 interstate 15,000 intra-state Total 26,000	1978-1982	I-O model	Capital cost Aus\$53.7 million Event expenditure Aus \$12.4 m Tourist expenditure: \$19.0m	Total impact on the economy: Aus\$188mi	Post-event Analysis
KPMG (1998)	Manchester 2002 25 July-3 Aug	n.a	n.a	n.a	Capital cost 670 m Pound Operating cost 130 m Pounds	4,500 FTE job creation	Pre-game
Cambridge Consultants (2002)	Manchester 2002 25 July-3 Aug	n.a	n.a	Cost-benefit analysis		6,300 FTE job creation	Post-game
KPMG (2006)	Melbourne 2006 15-26 March	5,770 –athletes and officials Visitors 64,966 overseas 62,049 interstate 37,035-intrastate 3,763 domestic destination switching for Games	2002-2008	CGE Modelling	Capital direct\$712m Induced capital\$812 Event ex:.\$198m Tourist Ex: \$252m	\$1.6 billion to GSP the study period and employment generation of about 13,600 in FTE terms.	Post-event Analysis
Social Research (2015)	Glasgow 2014 23 July 3 August	Visitors 7,000 athletes and officials 690,000 visitors	2007-2014	I-O model	Total expenditure 543 m Pounds	740 m Pounds GSP of the Scottish economy 2,100 FTE jobs Annually	Post event

Olympic Games

NSW Treasury and CREA (1997)	Sydney 2000 15 Sep-1 Oct	10,651 Athletes and officials	1994/95- 2005/06	CGE Model	Capital ex: \$2.5 Billion Operating cost \$1.463 Billion	Average Annual Average of GDP and Employment Pre-Games 94/95-99/00 – \$750m (NSW) (10,100 employment) 94/95-99/00 - \$775m (Aus) (11,000 employment) Games Year 2000/01 - \$1,700m (NSW) (24,000 employment) 2000/01 – \$1,550 (AUs) (29,400 employment) Post-Games 01/02-05/06 – \$400m (NSW) (3000 employment) 01/02-05/06 - \$425m (Aus) (400 employment) 16.5 billion pounds to GDP (at 2012 prices) 354,000 FTE employment	Pre- Games
Oxford Economics (2012)	London 2012 27 July to 12 August	16,500 and 8,000 officials 21,000 media officials during 2012 and 10 million attendance to the event	2005- 2017	I-O Multipliers	Capital ex: 11.9 billion pound Staging the game 1.7 billion pound expenditure by tourists		Pre- Games

7. Delphi survey

Delphi technique is a widely used tool for measuring and aiding forecasting in a variety of disciplines. The procedure accesses the opinions of a group of experts and aims to obtain the most reliable consensus of opinion within the group (Dalkey & Helmer, 1963). Delphi technique is based on four key features: anonymity, iteration, controlled feedback and the statistical aggregation of group responses. The structure of the technique enables experts to express opinions on the basis of merits only, rather than social pressures (Rowe & Wright, 1999; Okoli & Pawlowski, 2004). Most of previous economic impact analyses did not specify their approaches in estimating induced visitor numbers. In this study, a Delphi survey was conducted to estimate direct and induced visitor numbers generated by GC2018. Panel members for the Delphi survey were from various relevant government and non-government organisations. The Delphi was conducted over two rounds, with the second round questionnaire integrating statistical aggregation of group responses of the first round, together with aggregated rationales for their estimates.

In the questionnaire, induced visitors refer to those who visit the Gold Coast due to the increased destination awareness, improved infrastructure and services, and enhanced destination brand as a result of hosting the Games. Induced visitor numbers were measured by 'percentage increase', which refers to an increase above and beyond the natural rate of increase, i.e., visitation increase would not have occurred in the Gold Coast had the event not taken place. This concept is in line with the 'in-scope' visitors in current event evaluation literature (e.g., Dwyer, Mellor, Mistilis & Mules, 2000; Jago & Dwyer, 2006).

The counter effects such as time switching and crowding out effects are acknowledged in previous event impact studies and in literature, although estimates were mostly implicit, case-based and inconsistent among studies. In estimating the percentage increase for overnight domestic and international visitors, the panel was aware of time switching and crowding out effects and the results were presented net of any time switching or crowding off effects.

Feedback from the Delphi survey generally reflected two groups: "no change" and "small positive change". The "no change" group posited that visitor growth or decline due to the hosting of the Games would be negligible after accounting for the induced and counter effects. Estimates reported in Table 18 refer to the 'positive' scenario, i.e., upper bound estimates of induced tourism are reported. A comparison of the positive results of this Delphi survey with those of previous economic impact analysis studies (e.g., NSW Treasury Sydney report, KPMG Melbourne 2006 report, BTR IVS survey on the influence of the Olympics on travelling decisions, London 2012 impact studies) indicates that the positive scenario aligns well with the estimates of the induced effect in the previous studies.

As the induced effects are expressed as a percentage change, the absolute numbers of visitors can vary over time. The table provides the average changes of visitors using the latest data from Tourism Research Australia (TRA FY14, FY15, and FY16) for illustrative purposes. The ratio between international visitors from the Commonwealth (CW) countries and international visitors from the non-Commonwealth (non-CW) countries was calculated based on the International Visitor Survey (IVS) data (41.4% of international visitors from CW

countries and 58.6% from non-CW countries). The corresponding revenues were based on the 2012-13 tourism expenditure data, to be consistent with the CGE model database that is used for the economic impact analysis.

Table 18: Induced effect on tourism number – typical year

Induced visitors	TRA baseline	Pre-Game Year - percentage increase /number	Game Year - percentage increase/number s	Post-Game Year - percentage increase/number s
Overnight intrastate intra-region	140,107	0.33% (462 persons)	3% (4,203 persons)	1.52% (2,130 persons)
Overnight from within QLD (intrastate_interregion)	1,673,118	0.33% (5,521 persons)	3% (50,193 persons)	1.52% (25,431 persons)
Overnight interstate	1,716,782	0.35% (6,009 persons)	5.5% (94,423 persons)	1.23% (21,116 persons)
International visitors (Commonwealth countries)	366,610	0.25% (917 persons)	4% (14,664 persons)	3.67% (13,455 persons)
International visitors (non-Commonwealth Countries)	518,922	0.08% (415 persons)	2% (10,378 persons)	0.75% (3,892 persons)

8. Technical Section

In the following sections, the report describes the Tourism CGE model applied in this study and other data derivation that are the constituents of the results above. As such, it will be technical-oriented in nature.

The Tourism CGE Model

Economic impact analysis of events requires a modelling framework that captures the inter-linkages of industries in the host economy as well as the surrounding economies if the research interests primarily are on the regional areas of a country. As such, the econometric modelling technique would not be suitable for this purpose due to the lack of data and lack of flexibility to address changes in assumptions for comparing policy scenarios. While the Input-Output (IO) modelling technique can account for the inter-linkages of industries and sectors in an economy, this modelling technique does not take into account the crowding out effects of price changes and resource constraint. Consequently, results of the IO modelling technique are unrealistic in nature. To overcome the limitation of the IO modelling technique, the CGE modelling technique incorporates the IO database with micro-economic theories that allow agents in an economy to respond to price changes in such a way that they can maximise their objectives: profits for the producers and “consumer satisfaction” for the household sector. Price changes are due to resource scarcity: the more limited the resources are, the higher the costs will be when they are demanded. A CGE model can be applied easily in various scenarios to assess the outcome of the “what-if” policy questions. For the above reasons, the CGE modelling technique is chosen for this study.

Currently, there are three main CGE models to correspond with the fiscal separation and differences of three levels of jurisdiction in Australia – national, state and sub-state. Among them, the state model (VURM) has the most comprehensive treatment for vertical fiscal relationship between federal and state governments, between governments and the household sector in terms of tax, subsidy and grants transferred. The national (VU-National) and sub-state (TERM) models are similar to each other in the way that both focus on the core functionality of an economy, with the sub-state model being expanded further to cater for the aspect of regional contribution and trade flows among small regions. To accommodate such detailed treatment of the spatial dimension and commodities, the structure in TERM is simplified much further from a standard CGE structure as specified in VU-National and VURM to reduce simulation time and overcome data limitation, particularly the input demand by an industry in a destination from all other destinations.

In this project, the Queensland Government is interested in the potential differentiated outcome for the Gold Coast, Queensland and the rest of the country that the 2018 Commonwealth Games could possibly bring about. This warrants the need for the TERM model as a base model for tourism to be developed upon.

Typical CGE models are built on traditional IO databases and do not reflect tourism explicitly. Tourism consumption is defined on the basis of spending for a visitor “*who is a traveller taking a trip to a main destination outside his/her usual environment, for less than a year, for many purpose (business, leisure or other personal purpose) other than to be employed by a resident entity in the country or place visited.*” (World Tourism Organisation, 2010, p 10). Thus, if a meal is paid to a local restaurant by a household as part of a usual dining out, it is not classified as tourism consumption. However, if it is paid for by the same household to a restaurant on a holiday trip, it is defined as tourism consumption. More meals required by tourists will increase the costs for local residents to dine out – a crowding out effect. In the traditional IO database, both tourism and normal household consumption are combined in the total household consumption vector. As they are not separated, a shock to examine an increase in tourism consumption, for *restaurant* for example, will have no effect on normal household consumption of *restaurant*, an unrealistic condition for impact analysis. Having an explicit tourism component in the model will capture accurately the impacts of tourism consumption on other final consumptions such as *normal* household consumption and exports. In this project, domestic tourism consumption is separated from non-tourism household consumption. Similarly, inbound tourism consumption is separated from exports.

The full set of the TERM database has 182 commodities and 205 destinations. This report applies a slightly more aggregated version of the database that contains 75 commodities/industries and four main regions for 2012/13. The destinations include:

Gold Coast	(GC)
Brisbane	(Brisbane)
Rest of Queensland	(RQld)
Queensland	(Qld)
Rest of Australia	(ROA)
Australia	(AUS)

The TERM model structure is fully explained in Horridge, Madden and Wittwer (2005). A summary of TERM is provided in Appendix 2. However, for a brief description, a CGE model contains a set of equations to reflect:

- Demands for goods and services by industries, investment, household, government and exports.
- Demands for labour and capital by industries;
- All demands are driven by changes in relative prices in such a way that users can maximise their objectives. For example, if the cost of goods produced locally is cheaper than a similar product imported from overseas, domestic users will switch more toward the local source than the imported source in order to minimise the cost.
- Total production costs of industries;
- Market prices containing explicit components of industry production costs, government net production/commodity taxes, import costs and add-on costs such as transportation and retail margin;
- Market clearing conditions for supply and demand for all individual goods;

- Total commodity and production net taxes; and,
- Trade flows of commodities across regions.

The incorporation of tourism into TERM was first implemented in Pham, Simmons and Spurr (2010). Appendix 3 describes the essential steps for modifying the traditional IO database to incorporate tourism sectors in a CGE model. The tourism sector is developed further in this report to distinguish clearly between *day trips* and *overnight trips* amongst domestic tourism. Both are differentiated by *intra-regional*, *inter-regional* and *inter-state* tourism demands. Intra-regional tourism demand is tourism within a destination itself, Gold Coast for example. Inter-regional demand captures visitors from one destination travelling to another region within the same state, Brisbane to the Gold Coast for instance. Furthermore, inter-state tourism demand captures domestic trips from one region to another region in a different state, between Sydney in New South Wales to Gold Coast in Queensland.

As inbound visitors from different countries have different expenditure patterns, the inbound sector is disaggregated to represent the top ten markets explicitly, namely China, the United Kingdom, New Zealand, the United States, Singapore, Korea, Malaysia, India, Japan, Hong Kong and Rest of the World. Among them, the United Kingdom, New Zealand, Singapore, Malaysia, India and Hong Kong are members of the Commonwealth countries. All other countries are included in the Rest of the World group.

The detailed treatment of tourism above was designed to address explicitly the different expenditure patterns among different types of visitors that previous mage-event studies have not captured.

Another important model development is the representation of the Games operation in the model database. Although many activities have occurred in the preparation for the 2018 Commonwealth Games, the event currently is still in an embryonic phase, with lots of preparation and logistics for it to bloom over a very short time frame. To capture that blooming moment in modelling, a symbolic embryonic industry is introduced to the TERM database to embed with the essential relativity of activities such as ticket sales, sponsorship, TV rights, and so on, as well as the costs of operation such as venue management, media broadcast and so on. The embryonic industry is calibrated in the database with a very small total output value of \$1 million in order to ensure the integrity of the existing economy (in the model). The embryonic Commonwealth Games Industry, CGI hereafter, will then be simulated to rise to the expected level of revenue in the Games year so that input demands from the 2018 Commonwealth Games can generate flow-on effects throughout the whole economy. The input demands include not only ticket sales to other regions or overseas, but also the tourism expenditure that those visitors will spend in the Gold Coast, and with some *spill-over* to other regions. This modelling technique is often used to examine the potential impacts of an industry that has not existed in an economy. As the approach to modelling tourism sectors in TERM has been explained previously in Pham et al (2010) and is reproduced in Appendix 2, the next section will explain how the CGI cost structure and other related Games activities are derived from the Games budget data and implemented in the TERM database. The model is run using the GEMPACK software (Harrison, Horridge, Jerie, & Pearson, 2014).

Games input data

Allocation of government budget

This section explains how data in Table A1 and A2 (Appendix 1) are converted and embedded in the Tourism TERM model (TERM-TOUR hereafter). Data in these Tables are on the nominal basis (current prices) over time. In their time profile, data up to 2015/16 are actual spend while data over the period 2016/17 up to 2019/20 are *projected* spend.

Table A1 contains two accounts: (1) *capital expenditure* and (2) *Games operating expenditure*. **Capital expenses** are the contribution of government to the construction costs of games facilities, but not necessarily reflecting the total construction costs. Supplement data for the private contribution will be discussed subsequently. **Operating expenditure** is mainly for the operation of the Games.

Table A2 contains the estimated revenue generated by the games, namely ticket sales, broadcast rights, sponsorship, and also government contribution to the Games.

As expenditure and revenue in Tables A1 and A2 are in current prices and spread over a period of nine years, the modelling task has to condense the series into a single year data consistent with the model database in 2012-13 and suitable for comparative static simulations. The rate for discount is an annual 3 percentage change, which could be higher or lower compared to the annual price movements. The same rate, however, is applied later on to convert the results from the 2012-13 prices to current prices in 2017-18 for the purpose of comparison with data specified in the budget (Tables A1 and A2). Thus, the value of the rate itself will not affect final results in the end. Tables 19 and 20 present the final data of this conversion process.

Included in the amount of [] million (Table 19) for the Game Village project is an amount for the construction cost [] million), land value and road improvement ([] million). []

Table 19: Games expenditure, \$ million 2012-13 prices

EXPENDITURE	Gov. Approved budget (\$ million, 2012-13 prices)
CAPITAL EXPENDITURE	
Venues and Facilities	299
Games Village (Grocon)	<input type="text"/>
TOTAL CAPITAL	<input type="text"/>
OPERATING EXPENSES	
Ceremonies	<input type="text"/>
Arts and culture	
Games benefits	
Corporate and Administration	
Workforce	
Games operation	
Anti-doping	
Medical	
Venue management	
Village operations	
Event City operation	
Venue overlay	
Village overlay	
Marketing and communications	
Media and broadcast costs	
Technology	
Transport	
Security	
Games fee	
Public domain improvement	
Contingency - operations	
Contingency - Venue overlay	
TOTAL OPERATING EXPENSES	<input type="text"/>
TOTAL EXPENDITURE	1790 ¹⁰

Source: Department of Tourism, Major Events, Small Business and the Commonwealth Games

¹⁰ The nominal value is A\$ 2,024 million

Table 20: Games revenue, \$ million, 2012-13 prices

REVENUE	(\$ million, 2012-13 prices)
Broadcast rights	
Sponsorship	
Ticket sales	
Licensing/Merchandising	
Accommodation Services	
Mascot	
Local government	105
Federal government	141
State government	1333
Interest and other income	4
TOTAL REVENUE	1790

Source: Department of Tourism, Major Events, Small Business and the Commonwealth Games

Table 21: capital expenditure by public and private sector (\$ million, 2012-13 prices)

	Construction	Industry support
Games Village		
Government contribution		
Government: Land and road improvement		
Private		
Total Games Village		
New and upgraded venues		
Government contribution	299	
Private	4	
Total new and upgraded venues	304	
Total		

Source: derived from data provided by the Department of Tourism, Major Events, Small Business and the Commonwealth Games

On the operating expenditure account (Table A2), there are a few construction cost items, which do not reflect the nature of the operational stage. The approach here is that all construction costs are grouped together in the pre-Games period, leaving the non-construction costs for the operation only. This assumption helps simplify the modelling tasks without compromising the results. Thus, those expenses such *venue overlay*, *village overlay*, *public domain improvement* and *contingency-venue overlay* are added to the capital section. The revenue received early in the process for *Accommodation Services*, *Interest and Other Income* are used to offset (pay) the capital construction costs during this process as indicated in Table 22. This will simplify the modelling tasks without affecting final outcome of the impact analysis.

Total capital expenditure is now amounting to \$1,002 million, [redacted]

As all construction cost items ([redacted] million) have been allocated to the capital account, the total operating expenditure ([redacted] million, Table 19) is reduced to [redacted] million. Total cost and revenue in Tables A1 and A2 are matching each other to reflect the balance in the financial accounting framework. In the economic modelling framework of an Input Output table, the total cost of the Commonwealth Games Industry (CGI), which is being built into the model database, the total cost is [redacted] million and the total sales is approximately [redacted] million (the sum of broadcast rights, sponsorship, ticket sales, and licensing/merchandising). The difference between total cost and total sales is matched up by the government contribution equivalent to [redacted] million, which is modelled as subsidy (*operational support*) to the CGI industry.

Table 22: Net capital expenditure (\$ million, 2012-13 prices)

	Total	Government
Construction costs		
Games Village	[redacted]	[redacted]
New and upgraded venues	304	299
Construction for operation		
Venue overlay	[redacted]	[redacted]
Village overlay	[redacted]	[redacted]
Public domain improvement	[redacted]	[redacted]
Contingency - Venue overlay	[redacted]	[redacted]
Return to capital		
Accommodation Services	[redacted]	[redacted]
Interest and other income	[redacted]	[redacted]
Total construction cost	1002	[redacted]

Source: derived from data provided by the Department of Tourism, Major Events, Small Business and the Commonwealth Games

Table 23: Government contribution (2012-13 prices)

Category (\$million)	
Capital construction	\$610
Industry support	\$114
Operational support	\$855
Total	\$1,579

Source: derived from data provided by DTESB

Table 23 now properly allocates the total government contribution of \$1,579 million (presented earlier in Table 20) into different categories for modelling tasks.

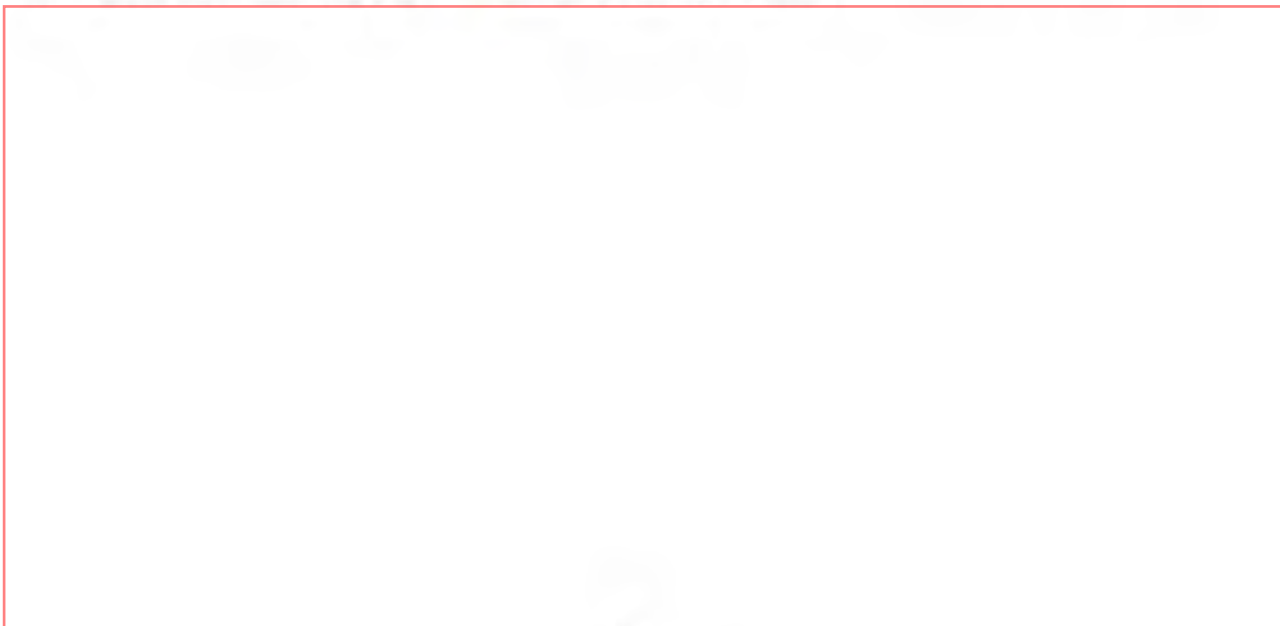
The amount of [] million spreads over the four years pre-Games period. As the model is run in a comparative static manner, which reflects changes in a typical year in this period, an amount of [] million was added to Table 4 as re-prioritisation transfer for the budget neutrality assumption. Thus, at the end of the pre-games simulation, this total [] million is completely accounted for.

The other amounts in Table 23 are accounted for in the Games-year and post-Games simulations. Table 24 estimates the government budget position by the end of the Games year. In each pre-Games year, it is estimated that there would be [] million of tax payable to the Queensland Government from across all sources, commodity tax and production tax. Given the assumption of no other government expenditure in the pre-Games year, this [] million is assumed to be used for games purposes. Ticket sales, sponsorship, broadcast rights and licensing contribute [] million. *Net tax revenue in games year* is the sum of all taxes estimated for the year minus the operational support amount ([] million).

Table 24: Government budget balance by end of Games year

Source of revenue	\$ million
Tax rev pre-Game years	
Games revenue	
Net tax in Games year	
Balance	

The amount of [] million is treated as a short-term loan which will be paid (with interest) by a fixed annual amount regularly in the subsequent four years in the post-Games period. The annual amount is required as this is how the model is used in a comparative static mode. This part is accounting for the [] million operating support.



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The embryonic CGI industry

The CGI industry requires a cost structure and a sales pattern. These will be addressed in turn.

The cost structure

The intermediate inputs of this CGI industry are derived from the operating expenses. In principle, the operating expenses are mapped into the industries in the TERM-TOUR database. Using the corresponding margin rates, tax rates, input sources among supplying regions, these operating expenses are then further decomposed into different components required by the CGE model.

The component *workforce* of the operating expenses includes payment to workers, training expenses, and uniform. Thus, the amount of labour payment is included in the cost structure as labour income while the others are located to the corresponding industries. The amount of *operational support* is entered in the production tax area to account for the subsidy from the government.

The sales pattern

Sales components include:

- Ticket sales: within the Gold Coast, to other regions and to exports (for inbound visitors). These are denoted as S1, S2 and S3 in Figure 2.
- Broadcast rights (denoted as S4 in Figure 2): although it could be acquired by both domestic and overseas TV networks, we allocate the total sales to exports. This approach was adopted by NSW Treasury for their 2000 Sydney Olympics study. The rationale is that as we are one of the commonwealth countries and have athletes competing in the Games, if we were not the host, then we would have to subscribe to a foreign country to broadcast the Games in Australia. But as we are the host, the cost of subscription is avoided and considered as a net benefit to Queensland exports.
- Sponsorship and Licensing/Merchandising (denoted as S5 in Figure 2): Revenue from sponsorship and licensing is allocated to domestic companies among the three tiers that GOLDOC indicated. These companies are presented in Table 25.

Table 25: Advertising tiers

Tier one	Tier two	Tier three
Jupiters	KPMG	Centium software
Griffith University	MinterEllison	GPY&R
TAFE QLD	Seek	MediaCom
Longines	Ticketek	GL events
	Atos	ExpoNet
	Aggreko	Tourism Australia
	Hard Kakka	Diadora
		Isentia

Source: <https://www.gc2018.com/sponsors> (extracted in March 2017)

Figure 2 presents a structure describing the mechanism for the CGI to be incorporated into the TERM-TOUR model. While all S1, S2, S3, S4 and S5 are from the revenue side (Table A2), the associate tourism expenditure are derived from tourism expenditure data provided by Tourism Research Australia. The total cost and sales of TS (Figure 2) are scaled to 1, so are those expenditure patterns (in the same proportion). Note, B is entered in the IO data of other regions. In simulation, A, B, C and S5 are shocked to the expected levels, all sales and costs of the Games will activate to pull inputs demands through those expenditure patterns.

Figure 2: CGI cost sales structure – the Gold Coast region

	C1	CGI	GC	IS	OS	HH	EXP	TOTAL
IO_1		x						
IO_2		x						
IO_3		x						
IO_4		x						
IO_5		x						
IO_6		x						
IO_7		x						
IO_8		x						
IO_9		x						
IO_10		x						
CGI	S5	0	S1	S2	S3	0	S4	TS
GC	0	0	0	0	0	A	0	
IS	0	0	0	0	0	0	0	
OS	0	0	0	0	0	0	C	
Labour		x	0	0	0			
Qld Gov't returns		x	0	0	0			
		TS	A	B	C			

Value for A, B and C are derived from the estimated number of visitors and the latest tourism expenditure pattern in the Gold Coast.

Visitor numbers

In nominal terms, GOLDOC's estimate for the Games ticket sales is approximately \$64 million. At 2012-13 prices, this is equivalent to million, of which million is expected from overseas visitors, and the rest is from the domestic visitors. Table 26 presents our assumption on the allocation of ticket sales across regions in Australia. Day trips are assumed to come mainly from Queensland and, to a lesser extent, from regions of NSW within a driving distance to the Gold Coast. We also make an assumption that visitors from the Gold Coast do not engage in overnight trips.

The GC2018 web site provides ticket prices for all games at three different sessions: preliminary, semi-final and finals. In each session, each game has three prices from category A, category B and category C (most expensive to cheapest). The price lists are separate for adults and kids. We take the average ticket across all sports in category B as a proxy for middle range prices, adults and kids separately (Table 27). We assume that when watching a game, spectators would like to go through from preliminary to semi-final and final competition of the game. Thus, we assume that an adult spectator would spend \$169, for three tickets, and similarly \$73 for kid. A family of three people, two adults and one kid, would spend around \$411 on the tickets. Using data from Table 26 and 27, we derive the estimated number of visitors for day trippers, overnight visitors and inbound visitors in Table 28. The number tickets sold is estimated to be 1.5 million.

Table 26: Allocation of ticket sales

	Day trips	Overnight	Total
	(\$ million, 2012/13 prices)		
NSW	6.00	11.22	17.22
VIC	0.00	11.21	11.21
Brisbane	6.00	0.90	6.90
Gold Coast	3.45	0.00	3.45
Rest of QLD	3.00	3.90	6.90
SA	0	1.29	1.29
WA	0	1.73	1.73
Tasmania	0	0.43	0.43
NT	0	0.43	0.43
ACT	0	0.26	0.26
Inbound	0	5.18	5.18
Total	18.45	31.38	55.01

Source: authors' estimates

Table 27: Ticket prices

	Adult			Kids		
Preliminary sessions	46.5	42.2	32.5	23	21	16
Semi-final sessions	65.6	48.6	40.0	15	21	20
Finals sessions	80.2	78.3	62.0	20	31	31
Average price	169.1			73		

Source: derived from <https://www.gc2018.com/>

Table 28: Estimated number of visitors

	Day trippers	Overnight visitors	Inbound
NSW	115,927	94,955	-
VIC	-	94,872	-
Brisbane	115,927	7,622	-
GC	66,666	-	-
Rest of QLD	57,964	33,002	-
SA	-	10,947	-
WA	-	14,596	-
Tasmania	-	3,649	-
NT	-	3,649	-
ACT	-	2,189	-
Inbound	-	-	43,787
Total	356,485	265,481	43,787

Table 29 presents a comparison of the average spend in our tourism CGE database with the national average published by the ABS. Using this specific spend per person in the Gold Coast, tourism expenditure is derived.

Table 29: Average spend per person in 2012/13

	Gold Coast ¹	National average ²
Day trippers	\$ 97	\$ 117.3
Overnight visitors	\$ 849	\$ 865.3

1: TRA unpublished data

2: ABS, cat no. 52490DO001_201516: Australian Tourism Satellite Accounts, 2015-16, Table 9

However, the average spend by overseas tourists in the Gold Coast region is well below the national average across all top ten markets. For each country of origin, data from both Tourism Research Australia and the ABS on visitor numbers indicate that the sum of visitors over all destinations is greater than the number registered at the national level. This implies that visitors from overseas travel to more than one destinations in Australia while they are here. Using this data and distribution (Table 30), the extra inbound tourism revenue is derived, and defined as spill-over effects.

Table 30: Distribution of inbound visitors

	Visitors numbers		Ratio	Distribution
	Total regional ¹	Aggregate national ²		
NZ	1,340,780	1,173,100	1.143	Brisbane
USA	849,351	485,000	1.751	Syd, Mel, Brisbane
UK	1,220,962	622,200	1.962	Syd, Mel, Brisbane, RoQLD
China	1,267,676	678,800	1.868	Syd, Mel, Brisbane/GC
Japan	447,395	333,600	1.341	Syd, RoQLD, GC
HK	250,545	169,600	1.477	Syd, Mel, Bris/GC
Singapore	367,992	316,500	1.163	Syd, Mel, Brisbane/GC
Malaysia	290,985	249,700	1.165	Mel, Syd, WA, Bris/GC
Korea	301,728	199,000	1.516	Syd, Bris/GC
Canada	257,632	125,100	2.059	Syd, Mel, RoQLD

Source: (1) Unpublished TRA data; (2) ABS, 52490DO001_201516 Australian National Accounts: Tourism Satellite Account, 2015-16

Appendix 1: Cost schedule and revenue stream of the Games

Table A1: Cost schedule of the Games

	2011-12	2012-13	ACTUAL			PLANNED				Gov. Approved budget
			2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20 onwards	
EXPENDITURE										
(\$ million, current prices)										
CAPITAL EXPENDITURE										
Venues and Facilities	0	8.0	35.5	30.1	135.2	107.5	10.7	0	0	327.1
Games Village										
TOTAL CAPITAL										
OPERATING EXPENSES										
Ceremonies										
Arts and culture										
Games benefits										
Corporate and Administration										
Workforce										
Games operation										
Anti-doping										
Medical										
Venue management										
Village operations										
Event City operation										
Venue overlay										
Village overlay										
Marketing and communications										
Media and broadcast costs										
Technology										
Transport										
Security										
Games fee										
Public domain improvement										
Contingency - operations										
Contingency - Venue overlay										
TOTAL OPERATING EXPENSES										
TOTAL EXPENDITURE	17.8	24.9	64.6	91.6	245.8	476.1	1022.5	63.0	18.0	2024.3

Table A2: Revenue stream of the Games

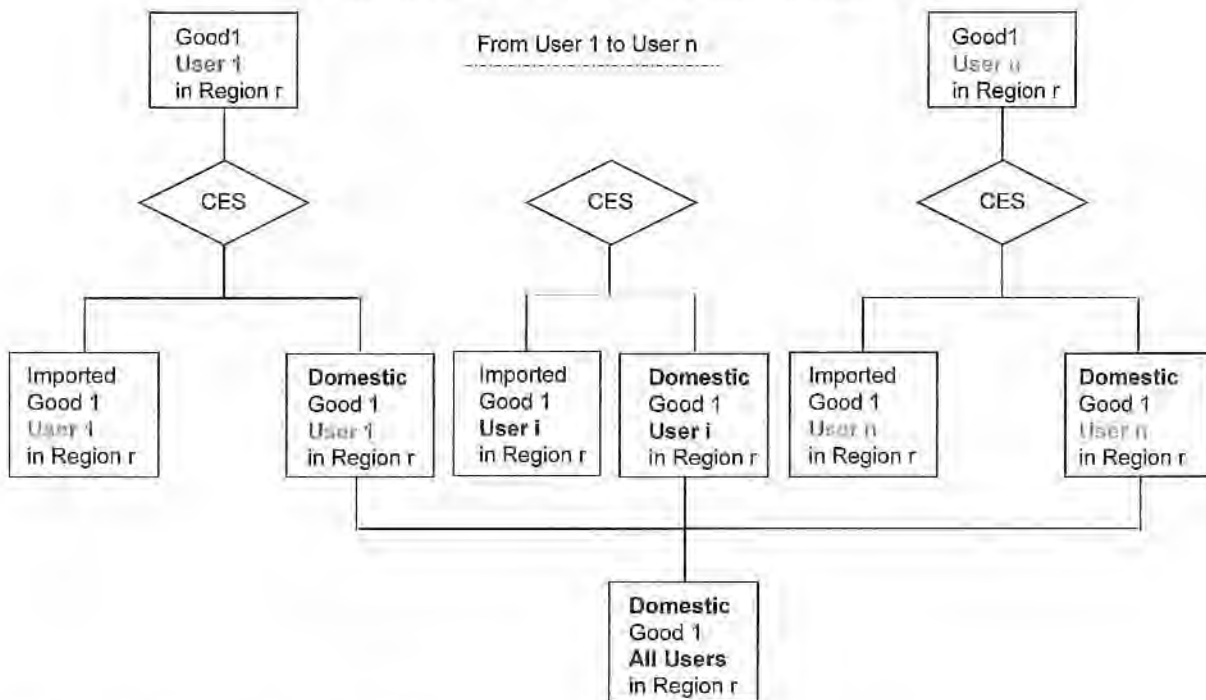
	ACTUAL					PLANNED				Gov. Approved budget
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20 onwards	
REVENUE	(\$ million, current prices)									
Broadcast rights										
Sponsorship										
Ticket sales										
Licensing/Merchandising										
Accommodation Services										
Mascot										
Local government	0	0	20.4	22.0	25.9	26.7	20.03	0	0	115
Federal government	0	0	0	0	98.4	56.1	1.5	0	0	156
State government	19.0	24.1	46.7	74.3	127.3	362.2	777.3	60.4	18.0	1509.4
Interest and other income	0.0	0.1	0.2	0.4	2.2	1.1	0	0	0	3.9
TOTAL REVENUE	19.0	24.2	67.3	96.7	254.9	448.5	1034.7	60.9	18.0	2024.3

Appendix 2: TERM model structure

Figures A.1 and A.2 represent the demand system in TERM. Users in TERM include industries, household sector, government, investment, inventory, and overseas export. Figure A.1 shows that all users will choose Good 1 from overseas and domestic sources in such a way to minimise their costs, represented by a CES functional form. Once all users in region r determine the level of output of good 1 from the domestic source, an aggregate demand in region r for good 1 from the domestic source is calculated.

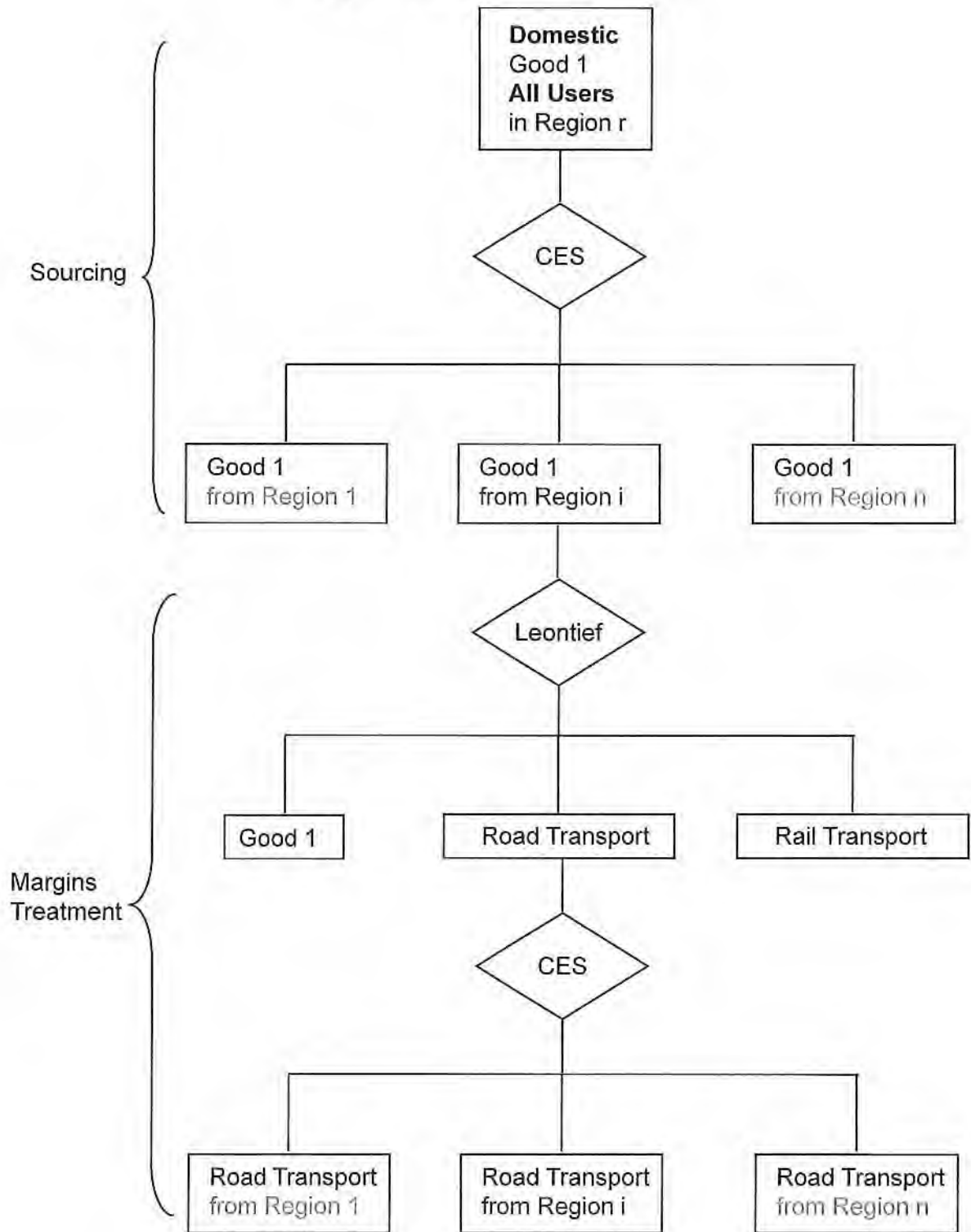
In the top part of Figure A.2, on behalf of all users in the region, region r then selects goods 1 from a combination of regions in the domestic economy in the same way of a CES function to minimise the cost. As shown, the model does not explicitly map a specific user to a specific supplier across regions. The model assumes that all users in region r will have purchased good 1 in the same proportions of region mix.

Figure A. 1: Imports versus domestic demands



Source: Pham, Simmon and Spurr (2010)

Figure A. 2: Domestic sourcing



Source: Pham, Simmon and Spurr (2010)

The bottom part of Figure A.2 shows how transports are used to facilitate good 1 from another region to region r . Regardless where good 1 is purchased from, the same constant proportions of transports are applied to the amount of goods 1 purchased. And the supplier of the transport services will be selected across all regions using a CES function to minimise transport costs.

The supply side of the model is very similar to that in the pioneer ORANI model (Dixon *et al.*, 1982). In this structure, an industry pays for intermediate inputs, composite demand for labour and capital, production tax to the government in fixed proportions. Industry can choose the combination of capital and labour using a CES function to minimise costs. As this treatment is standard, it is not necessary to include a figure for it.

The compact structure of the demand side reduces significantly the memory requirement and simulation time compared to a conventional multi-regional and multi-sectoral CGE model such as MMRF (Peter, Horridge, Meagher, Naqvi, & Parmenter (1996); Adams, Horridge and Wittwer, (2002)). A distinctive difference between TERM and MMRF is that TERM does not have a full treatment of government financial accounts. Thus, the government expenditure in TERM is not driven directly by government budget, nor directly related to tax instruments in the model.

Appendix 3: Tourism database structure

A typical IO database of a CGE model is presented in the simplest form in Figure A.3. The format of an IO database published by any national statistical office is often more complicated than the representation in Figure A.3. This simplest form makes it is easier to explain the general mechanism of a CGE model without losing the essence of the technique. Each column in the Input-Output table represents a user in an economy. Users include all industries, household consumption (HH), investment by industries (INV), government consumption (GOV) and overseas export (EXP). Users purchase commodities from the rows for their consumption. For example, the amounts $C_{11}, C_{21} \dots C_{n1}$ represent the amounts of all n commodities that industry 1 purchases as intermediate inputs in the production process; the household sector purchases the amounts $HH_1, HH_2 \dots HH_n$ of those n commodities for their final consumption; and the amounts of $E_1, E_2 \dots E_n$ are exports to overseas market. Total sale of a locally produced commodity is the sum across all sales across a row, such as TS_2 for commodity 2. In addition to the usage of intermediate inputs, industries will also pay wages to employees (P1), capital rental (P2), net commodity taxes on intermediate inputs (P3), net production taxes (P4), and imported goods (P6). The Total Cost (TC) of production for an industry is the column total. The total cost has to equal total sales for every industry, for example $TC_2 = TS_2$.

At the aggregate level, Gross Domestic Product from the expenditure and income sides is calculated as follows.

Gross Domestic Product (Expenditure side) =

+	Total Household consumption	(C)
+	Total Investment	(I)
+	Total government consumption	(G)
+	Total Export	(E)
–	Total Imports	(M)

Gross Regional Product (Income side) =

+	Total wages	(COE)
+	Total Gross operating Surplus	(GOS)
+	Total net commodity taxes	(CTAX)
+	Total net production taxes	(PTAX)

Figure A. 3: A conventional input-output database

	Industry					Final Demands				Total Supply
	J1	J2	J3	.....	Jn	HH	INV	GOV	EXP	
C1	C ₁₁					HH ₁			E ₁	TS ₁
C2	C ₂₁	C ₂₂	.....		C _{2n}	HH ₂			E ₂	TS ₂
	·					·			·	·
	·					·			·	·
	·					·			·	·
	·					·			·	·
	·					·			·	·
Cn	C _{n1}					HH _n			E _n	TS _n
T1: Total Intermediate use										
Value Added										
P1: Compensation of employees (COE)						(not applicable)				COE GOS PTAX CTAX M
P2: Gross operating surplus & mixed income						(not applicable)				
P3: Net taxes on products										
P4: Net taxes on production						(not applicable)				
P6: Imports										
T2: Australian Production										
Total	TC1	..	TC3	.....	TCn	C	I	G	E	

Structure of a Tourism CGE model with Tourism Satellite Account data

The conventional IO table in Figure A.3 does not present tourism expenditure data explicitly. The domestic tourism expenditure is embedded in household final consumption and the overseas tourism expenditure is included in the export vector. That is, final demand data in the conventional CGE database include both tourism and non-tourism data for the same final demand category. As a result, tourism impact analysis using the conventional CGE database will not be able to capture the impact of tourism shocks on the non-tourism consumption for the same commodity.

Given the importance of tourism in an economy, the ability that CGE model can offer for impact analysis, and the availability of the Tourism Satellite Account (TSA) data, the tourism sector has been incorporated into the CGE framework more explicitly in recent years (Madden and Thapa, 2000). Figure A.4 is an extension of Figure A.3, in which the process to modify the original CGE IO database is carried out in order to incorporate the tourism sector into a CGE model (Pham, Simmons and Spurr, 2010). In a Tourism CGE database, the original elements remain unchanged, except that two new industries *Dtour* and *Etour* have been created, for domestic tourism and overseas tourism respectively. The final household consumption by commodity is decomposed into tourism and non-tourism parts, and the

tourism part is moved to the intermediate quadrant to represent the domestic tourism supplier. Similarly, elements of *Etour* are extracted from the export vector. The tourism sectors *Dtour* and *Etour* do not require primary inputs. They each act as a ‘middle man’ to select all goods and services for tourism activity, and then sell all tourism services to the corresponding tourists. This follows closely the approach adopted in the construction of the Tourism Satellite Account (Pham, Dwyer and Spurr, 2009), where the tourism sector is not a commodity or industry *per se*, as tourists consume a wide range of commodities and services for their tourism activity. *Dtour* is not purchased by any users in the economy other than the household sector, and similarly *Etour* for export only. These purchases of tourism services are defined as domestic and inbound tourists’ consumption respectively.

Figure A. 4: A tourism input-output database

	Industry						Final Demands				Total Supply	
	J1	J2	J3	...	Jn	Dtour	Etour	HH	INV	GOV		EXP
C1	C ₁₁					HH _{1T}	E _{1T}	HH _{1NT}			E _{1NT}	TS ₁
C2	C ₂₁	C ₂₂	.....			C _{2n}	HH _{2T}	E _{2T}	HH _{2NT}		E _{2NT}	TS ₂
	-					-	-	-	-	-	-	-

	-					-	-	-	-	-	-	-
Cn	C _{n1}					HH _{nT}	E _{nT}	HH _{nNT}			E _{nNT}	TS _n
Dtour						0	0	Tot_Dtour			0	Tot_Dtour
ETour						0	0	0			Tot_ETour	Tot_ETour
T1: Total Intermediate use												
Value Added												
P1: Compensation of employees (COE)						0	0	(Not available)			COE	
P2: Gross operating surplus & mixed income						0	0	(Not available)			GOS	
P3: Net taxes on products											PTAX	
P4: Net taxes on production						0	0	(Not available)			CTAX	
P6: Imports											M	
T2: Australian Production												
Total	TC1	..	TC3TCn		Tot_Dtour	Tot_ETour	C	I	G	E	

Source: Pham, T. and L. Dwyer (2013)

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