Modelling the Visitor Economy

A Report for Victoria University's
School for the Visitor Economy

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Centre of Policy Studies, Victoria University

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1 Introduction

This report discusses a study undertaken for Victoria University's School for the Visitor Economy to develop improved modelling tools for analysing the visitor economy. The study involved the incorporation into the Centre of Policy Studies' (CoPS) multiregional dynamic computable general equilibrium (CGE) model of an explicit treatment of the visitor economy, coupled with an enhanced regional labour market forecasting capacity. These developments allow for better analysis of the sector and for detailed assessments of future skill requirements for the visitor economy.

In the next section, we first provide in sub-section 2.1 background to the present study in terms of the visitor economy literature on past economic modelling research. The broad features of a CGE model are overviewed in sub-section 2.1. We then proceed to describe the new visitor-economy features introduced into the CGE model developed as part of the present study in sub-section 2.3. A more detailed discussion of the process of introducing these new features is provided in the Appendix to this report.

In Section 3 the new model is used to measure the visitor economy. We first take a snapshot of the current visitor economy with the aid of the new model's data base (sub-section 3.1). We then report in sub-section 3.2 on a number of simulations of increases in the growth rate of the various types of tourism. Sub-section 3.3 provides some conclusions from the measurement exercise. The visitor economy is shown to be an important component of Australia's economy, making up around 5 per cent of GDP and employment, and contributing 15 per cent of the nation's export income. The visitor economy sector is growing rapidly and the simulations show that the sector is well placed to provide job opportunities for less skilled workers facing reduced employment opportunities in other sectors, such as retail, due to technical change and automation.

Finally, in Section 4, we provide some brief concluding remarks on our study.

2 Framework for modelling the visitor economy

2.1 Past Studies

2.1.1 Measuring tourism economic impacts

The visitor economy has been seen as one of Australia's growth areas for a number of decades. For instance, short-term visitor arrivals to Australia which were around 1 million annually in the early to mid-1980s, had doubled to just over 2 million per annum by the start of the 1990s, and have now grown to 9.3 million in the 2018-19 year (ABS, 2019a).

During this period there have been numerous economic studies into tourism issues, including many evaluations of the sector's effects on the Australian economy and its regions and the economic impacts of particular visitor-related events. A variety of methods have been used to examine tourism economic issues, both singly and in combination (see Dwyer, et al., 2012). The most prominent method for examining the economy-wide effects of tourism activity, and tourism policies and events has been inter-industry computer economic models. Some decades ago the standard inter-industry technique in tourism studies was input-output (I/O) analysis (see Archer, 1977, and Fletcher, 1989, for discussion and examples). While I/O incorporates inter-industry linkages and thus can provide estimates of direct and indirect economic effects, it has very well-known limitations including ignoring resource and other constraints and not allowing for price substitution effects. These

limitations lead to a considerable over-estimation of economic effects, particularly at the national level. In the 1990s computable general equilibrium (CGE) models, which do not carry these limitations, began to replace I/O in economy-wide modelling of tourism issues (Dwyer, et al., 2000, and 2004a).[1] We provide an overview of a CGE model in the next sub-section.

An early example of CGE modelling of the impacts of the visitor economy was a CoPS study for the Bureau of Tourism Research in the 1990s (Adams and Parmenter, 1991, 1995 and 1999). This study showed that international visitor expenditure, while having little long-run effect on GDP, raised Australian economic welfare through positive effects on the terms of trade and real wages. It also revealed an interesting pattern of the effects of international visitors on the state economies. Victoria, followed by NSW, were shown to experience increases in the sizes of their economies through international tourism, attracting labour from the other states. Queensland, often considered to be the most tourism-oriented state, was shown to be slightly negatively affected in terms of output and employment. This resulted from Queensland, while having a large tourism sector, also having relatively large agricultural and mining sectors whose exports are crowded out by tourism exports. Our current study shows (in Section 3.1) that these effects still persist today.

Over the past two decades there have many CGE studies of visitor economy issues, both for Australia (e.g. Ho, et al., 2009a, and Dwyer, et al., 2004b) and for overseas countries (e.g. Blake, 2009, Blake, et al., 2006, and Wittwer, 2017). While studies such as the two Australian studies just cited are concerned with the economy-wide impact of the visitor economy, many studies are concerned with the impact that more general economic shocks have on the visitor economy. We discuss some of these latter studies in the next sub-section (2.1.2), before considering in sub-section 2.1.3, a topic subject to frequent CGE studies, the impact of visitor attractors, such as national parks and the hosting of mega events.

2.1.2 Economic shocks and the visitor economy

A major advantage of VURM-VE, the CGE model developed in the current study, is that it models the visitor economy within a comprehensive economic framework that has been used to model a wide variety of economic shocks to Australia and its regions. Instances of CGE analyses undertaken by CoPS of shocks which impact across the economy are in areas such as: trade policies; tax and regulatory reforms by federal, state and local governments; financial reforms; educational and health policies; energy and environmental policies; transport policies; major projects, infrastructure and urban policy; regional development initiatives; migration; the impact of major events; and the impact of disasters, droughts and terrorism events.

Some of the above shocks may have reasonably direct effects on the visitor economy (e.g. a bed tax, new transport facilities in tourism areas), while the direct effects of other economic shocks (e.g. government provided facilities for the mining sector) might fall largely outside the visitor economy. Nevertheless, such economic shocks while not obviously related to the visitor economy can carry substantial implications for it (for instance, by putting upward pressure on the exchange rate, thus causing a crowding-out effect on the visitor economy). Because CoPS' CGE models incorporate large numbers of detailed interactions between the various sectors of the economy, it is an ideal method for analysing the degree to which such shocks might affect the visitor economy. Similarly, CGE models enumerates the feedback effects from the visitor economy to the general economy. An instance of this two-way interaction between the visitor economy and the rest of the economy can be found in CoPS' study for the Australian Senate at the time of the introduction of the GST (Dixon and Rimmer, 2000, and Dixon, et al., 2001). The study showed that administrative costs of replacing

[1] I/O modelling of tourism has not entirely disappeared. It is still often used in examining economic impacts of tourism at the regional level (e.g. Tohmo, 2018), where there is lest fixity of resources in the medium to long run. Some I/O modelling exercises at the regional level employ enhanced forms of the basic model, such as Guy West's econometric-I/O study of Queensland tourism (West, 1993).

the wholesale trade tax with the GST, and various features of the new tax system, meant that the GST would not bring the promised benefits, but rather a small loss in economic welfare was likely. One of the negative factors was damage to Australia's international visitor sector which did not get the GST-free exemptions given to mining and agricultural exports. Previous modelling by others had significantly underestimated this effect because they only considered the size of tourism at that point in time. CoPS had just introduced multi-year modelling and thus recognised that the rapidly growing size of international tourism meant that damage to that sector would have substantially greater negative effects on Australia's economic welfare.

The development of VURM-VE will facilitate an analysis of the detailed effects on the visitor economy of many of the key issues facing the Australian economy – many of which have already been subject to CoPS CGE studies, but without a particular focus on the visitor economy. Such analysis could include many of the possible threats to which the visitor economy might be exposed. This would include: the effects of climate change and climate change policy (on which CoPS has done intensive CGE research for the Garnaut Report, Federal Treasury and other organisations);[2] terrorism events;[3] and pandemic outbreaks.[4]

2.1.3 Evaluating tourism attractors

One area of visitor economy analysis for which the CoPS group has undertaken a large number of studies is of activities that are major tourism attractors, such as education services (Giesecke, 2004, and Giesecke and Madden, 2006), national parks (Giesecke, et al., 2000, and Madden, 2004), tourist facilities - such as convention centres (Adams, 2003 and 2012) - and infrastructure - such as international airports (Madden, 2003a). In particular, the Centre has undertaken numerous studies of major events, including mega sporting events. Examples are studies of: a world trade expo (Giesecke and Madden, 1996), World Cups - e.g. Rugby World Cup (Madden, 2003b), FIFA (Madden, 2008) - the Australian Tennis Open[5], the Ashes Series (Madden, 2007), the Grand Prix (Adams, 2008) and the Spring Racing Carnival (Adams, 2006).

Most notable perhaps has been the modelling of the Sydney 2000 Summer Olympics, undertaken in the 1990s for the NSW Treasury and Arthur Andersen (Madden, 1997, 2002 2006), and subsequently in post-event studies (Giesecke and Madden, 2011). These latter studies took advantage of CoPS' developments in the area of historical modelling that enabled actual statistical outcomes to be incorporated into the analysis, while isolating the effects of the Games from the effects of other contemporaneous events (such as September 11 and the collapse of Ansett Airlines). CoPS analysis was careful to avoid common sources of benefit overestimation, such as elastic labour supply, excess capacity and costless public inputs. In particular, historical modelling showed that while there was a boost to international sports tourism at the time of the Games, the event did not induce a post-Olympics tourism boom. Such free-advertising effects are most strongly felt in host countries which do not have well established tourist industries. This turned out not to be the case for Sydney. The modelling showed that the Sydney Olympics in the end came with a cost of over $2 billion in decreased household consumption in NSW, roughly the cost of the publicly-funded sporting facilities built especially for the Games. On the other hand this must be balanced against the non-economic benefits that

[2] See Adams, 2007a, and Adams et al., 2014, as examples of CoPS' economic modelling on climate change issues. Adams (2007b) discusses the implications of climate change for tourism. Other analysis which could be undertaken might relate to the greenhouse gases footprint of the visitor economy (Dwyer et al., 2010) and abatement efforts in the tourism sector (Dwyer et al., 2013).
[3] See for instance: Giesecke et al., 2012 and 2015, and Nassios and Giesecke, 2018. Dixon et al. (2001) examined both the tourism and economy-wide effects in Australia of the September 11 terrorism event.
[4] See Verikios et al. for an example of one of CoPS' studies on the economic effects of a global influenza pandemic. See Moss et al. (2016) and Geard et al. (2020) for modelling of a possible Ebola outbreak in the Asia-Pacific. Geard et al. (2020) find that countries with a large visitor economy are likely to experience more severe economic effects, and highlight the importance of surveillance to guard against the virus entering the country.
[5] Annual CoPS studies of the Australian Open for Tennis Australia (sub-contracted through Nielsen Sports).

the Games brought, in terms of the pleasure in hosting the Games, improved sporting success, and the like. Each event and host location can have different effects. Melbourne, for instance, with its existing much-used facilities, is likely to be better placed to gain economically from mega sporting events (Madden, 2014).

2.2 Measuring tourism's economic impacts: the CGE approach

2.2.1CGE modelling

CGE models contain a detailed treatment of the behaviour of economic agents within a comprehensive modelling of the economic system. CGE models may be focussed on one or many nations. Within a nation a CGE model may focus on a single region or decompose the national economy into multiple regions linked by interregional trade, interregional migration, government activities and economy-wide constraints.

Typically a national CGE model will contain many industries with each producer assumed to seek to maximise profits while facing particular technological constraints. Capital and labour are modelled as having limited substitutability, while occupations and skills are typically modelled as imperfect substitutes. On the demand side, householders are assumed to choose goods and services so as to maximise their utility, based on their tastes, in the face of income constraints. Investment across industries is typically dependent on industry profitability. Governments undertake expenditure, make transfer payments and collect taxes and other revenues. Foreigners' behaviour is standardly modelled via export demand curves and import supply curves.

The current study uses as its starting point CoPS' multi-period multiregional CGE model, VURM (Victoria University Regional Model). VURM models 8 regions: Australia's six states and two territories.[6] The number of industry sectors in VURM is flexible, but usually is around 60 to 100 industries producing a similar number of commodities. VURM incorporates a standard multiregional CGE framework, but also incorporates many other features which enhance its capabilities in many regional modelling areas such as fiscal federalism, transport, energy and climate change. Standardly, VURM determines the supply and demand for each regionally-produced commodity as the outcome of optimising behaviour of economic agents. Regional industries are assumed to choose labour, capital and land so as to maximize their profits while operating in a competitive market. In each region a representative household purchases a particular bundle of goods in accordance with the household's preferences, relative prices and its amount of disposable income.

Investment is allocated across regional industries so as to maximise rates of returns to investors (households, firms). Capital creators assemble, in a cost-minimizing manner, units of industry-specific capital for each regional industry. Each region has a single representative household and a state/territory government. There is also a federal government.[7] Finally, there are foreigners, whose behaviour is summarised by export demand curves for each products from each state and by supply curves for international imports to each state.

Regions are linked via interregional trade, interregional migration and capital movements and governments operate within a fiscal federal framework.

[6] VURM, and its predecessor MMRF, has been the workhorse model for CoPS' state-level analysis for the past two and a half decades. It does have a facility which allows decomposition of simulation results to sub-state regions. However, VURM is not well equipped to model heterogeneous regional shocks, particularly those on the supply side. Analysis of such regional questions are best handled by CoPS' TERM model (Horridge, et al., 2005, and Wittwer, 2012).

[7] VURM contains a Government Finance module which provides a comprehensive treatment of revenues, expenditures and budget balances for all Australian governments.

VURM provides results for economic variables on a year-on-year basis. The results for a particular year are used to update the database for the commencement of the next year. In particular the model contains a series of equations that connect capital stocks to past-year capital stocks and net investment. Similarly debt is linked to past and present borrowing/saving and regional population is related to natural growth and international and interstate migration.

For a detailed description of the theoretical structure of the VURM model, see (Adams, *et. al*, 2015). For a diagrammatic illustration of the detailed industry/commodity multiregional input-output data base underlying the VURM model, see Figure 7.1 of Giesecke and Madden (2013).

2.2.2 VURM-VE

VURM contains a conventional CGE treatment of economic activity, including activity associated with the visitor economy. For the current project, CoPS created VURM-VE, specially designed for analysis of the visitor economy.

A major component of developing VURM-VE involved a reconfiguration of the data base to explicitly pull together all visitor-economy activities into three tourism industries.[8] These industries are:

i. *AusTourism*, which covers visitor expenditures by Australians. This includes tourism expenditure undertaken domestically, either locally or interstate, and undertaken overseas (i.e. imported AusTourism);
ii. *ForTourism* – which covers expenditures by foreigners in Australia not travelling for education purposes; and
iii. *ForStudent* – which covers the expenditure of foreign students in Australia.

The new tourism industries do not use capital and labour resources directly, but rather purchase goods and services, such as accommodation and transport, which are then on-sold by these tourism industries to travellers. Thus the tourism industries can be seen as assembling the outputs of an array of industries, some of them which are not obviously tourism industries, so that all tourism sales are placed within the three visitor economy industries. The process of developing these three new industries is described in detail in the Appendix to this report. The data base for the new industries is populated with information from the latest Tourism Satellite Accounts (ABS, 2019b).[9]

Another feature added in the construction of VURM-VE is the detailed occupational classification used in CoPS' national labour market forecasting model. This allows analysis of occupational effects at a much finer level than has been possible in past visitor economy studies. For instance, the current enhancements help to identify occupations that are in high demand from the visitor economy, such as hospitality workers, accommodation managers, cleaners and food trades workers. It also allows for the identification of occupations that are in decline as the economy becomes more visitor-oriented. As shall be seen in Section 3, greater demand for activities such as hospitality and education strengthens the exchange rate, making other activities less internationally competitive, so occupations such as farm manager or machinery operator will be in less demand.

Like VURM, VURM-VE results are calculated on an annual year basis, therefore the model is not well-suited to picking up seasonal variation which can be a feature of tourism activity.

[8] Tourism is defined as usual as travellers who are holidaying, visiting friends and relatives, on business or travelling for educational purposes.
[9] Earlier work on state level tourism satellite accounts was undertaken by Ho et al. (2007b).

2.2.3 Adding regional detail

As VURM and VURM-VE treat each state and territory of Australia as a separate region, simulations run with these models produce a solution for the price and quantity of every commodity (goods and services or factors of production) identified in the model, in each state/territory of Australia. To compute results at a greater level of regional disaggregation, we describe two possible approaches.

2.2.3.1 Top down disaggregation

Top down disaggregation is an efficient technique for computing regional advantage. The top down disaggregation allocates the results for industry output and employment from a national (or state/territory) model to the regions with the country (or state/territory). This method combines external shocks to a region with local multipliers. For example, regions which have a relatively large share of activities with above-average growth will experience above-average growth in output and employment, generating a positive regional multiplier effect on local service activities such as retail and residential construction.

The top down disaggregation provides a measure of regional advantage at little computational cost. The top down method is effective when evaluating regional responses to external or national shocks, such as shocks to commodity prices (where there is little or no difference in the regional varieties of commodities) or economy-wide tax rates. Because the top down method does not compute regional prices, it is not as effective in evaluating the effects of shocks that are specific to a particular region, for example, a regional investment or region-specific demand stimulus. For these types of shocks, which are likely to have an impact on region-specific prices including wages and property prices, bottom-up regional modelling is required.

2.2.3.2 Bottom-up regional modelling

Bottom-up regional modelling requires a framework in which all regions of interest are modelled as separate economies, which may be linked by trade in commodities, common (but imperfectly mobile) factor markets, a common government and a common exchange rate. VURM and VURM-VE are bottom-up regional models, in which the "regions" are the states and territories of Australia. The same principle may be applied for sub-state regions.

The bottom-up methodology enables the computation of results for quantities *and prices* at the regional level. Regionally targeted policies often have impacts on local employment, wages and property prices. If impacts are negative, a region may experience an increase in unemployment, and decline in wages and property prices. Owner-occupiers may become trapped in declining regions as property prices fall relative to those in other regions. Conversely, if impacts are positive, owner-occupiers will enjoy a windfall gain in the form of increased property prices.

The CoPS TERM model (Wittwer 2012, 2017) is based on a master database in which over 200 separate regions[10] are identified. For practical reasons, any simulation with the TERM model is run with an aggregated version of this database. The TERM model enables the identification of impacts on sub-state regions such as Bendigo in Victoria or Port Douglas – Daintree in Queensland.

[10] Regions are defined according to the ABS SA3 classification, which "generally have populations between 30,000 and 130,000 persons. They are often the functional areas of regional towns and cities with a population in excess of 20,000, or clusters of related suburbs around urban commercial and transport hubs within the major urban areas." (ABS, 2016).

Outputs from the economic modelling framework are restricted to the prices and quantities of the commodities and factors in the regions identified in the model. Measurement of concepts such as regional amenity, environmental damage, and congestion are beyond the scope of most CGE applications.

Modelling of regions smaller than Australia's states and territories, while possible with the CoPS TERM model, is beyond the scope of the current project.

3 The visitor economy in Australia

Tourism Research Australia statistics show that Australia had over 9 million in-bound visitors in 2019, spending on average almost $5,000 each. Included in these in-bound visitors were around 600,000 international students. Larger still is domestic tourism, with almost 400 million visitor nights – 16 nights per person in 2019 – accounting for twice as much expenditure as inbound tourism.

We take two approaches to measuring the visitor economy. The first is the "snapshot" approach, where we look at how large the visitor economy is according to measures such as value added, employment, and exports. The snapshot refers only to visitor economy activities, and does not account for second-round effects.

The second approach is the "simulation" approach. Here we conduct experiments, using the VURM-VE economic model to show us how the economy would look if the visitor economy were one per cent larger relative to total output. The simulation approach reveals second-round effects, which can be either positive or negative. The main conduits of second round effects are:

- intermediate linkages, reflecting dependencies between industries, e.g. restaurants purchase food, so when restaurants expand, food manufacturing will expand;
- income linkages, reflecting the effect of income (mainly wage) growth on household expenditure, e.g. when incomes grow, expenditure on residential building grows;
- exchange rate linkages, reflecting the effect of exchange rate movements, e.g when demand for tourism strengthens, the exchange rate goes up, reducing demand for other export commodities such as mining and agriculture; and
- substitutions, reflecting the tilt in expenditure towards visitor economy activities and away from other activities, e.g. households allocating a larger proportion of their budgets to tourism leaves a lower proportion for expenditure on health or education.

The simulation approach helps to quantify the importance of the visitor economy as well as to identify downside risks to expansion in visitor economy activities.

Throughout the text, charts are included for illustrative purposes. Results are tabulated at the end of the main text of this report (immediately prior to the list of references).

3.1 Snapshot of the Visitor Economy

3.1.1 Value added

In total, the visitor economy sector comprises almost 5 per cent of GDP, of which 3.1 percentage points is attributed to domestic residents' tourism, foreign non-education tourism 0.8 percentage points and foreign students 0.7 per cent (Figure 1).

Tasmania is the most tourism oriented economy with 5.6 per cent of its GDP in the sector, while Western Australia is the least tourism oriented.

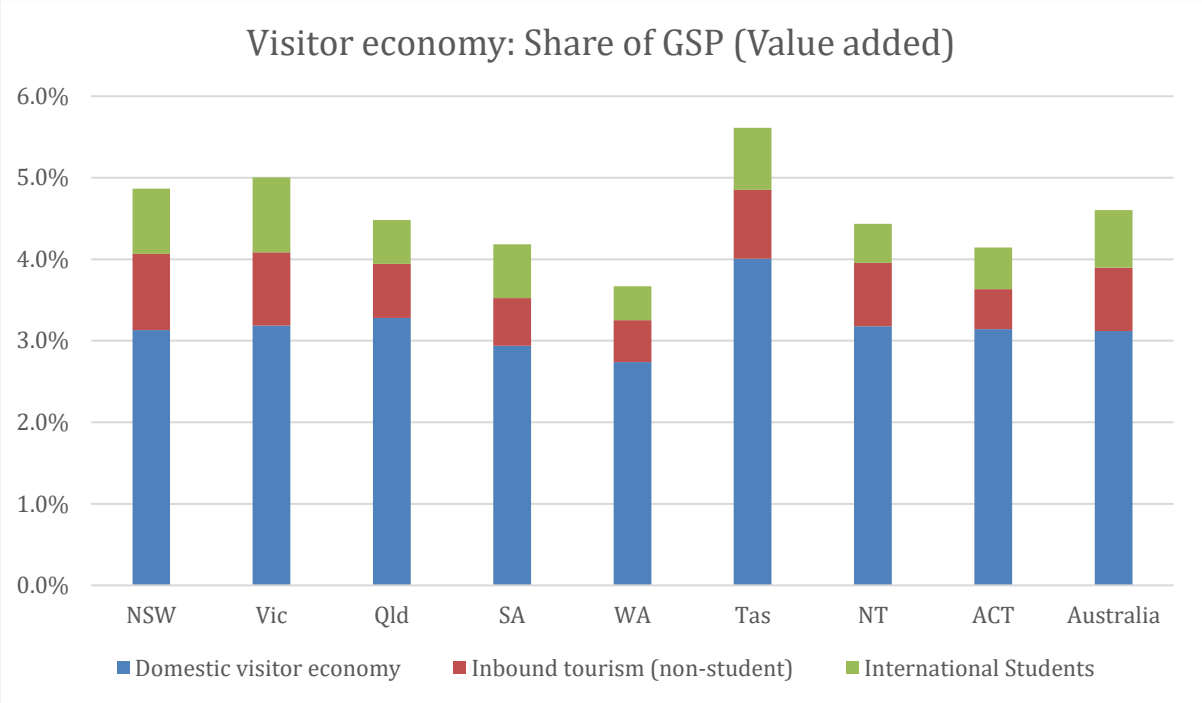

Figure 1: Value added of the visitor economy

3.1.2 Employment

In 2019 an estimated 655,000 people were directly employed in the visitor economy, accounting for 5.4 per cent of the total workforce, or one in every 18 jobs. Over 400,000 of these jobs were supported by domestic tourism activities. The main occupations employed in the visitor economy include hospitality workers, sales assistants, hotel managers, food workers, cleaners and drivers (Figure 2).

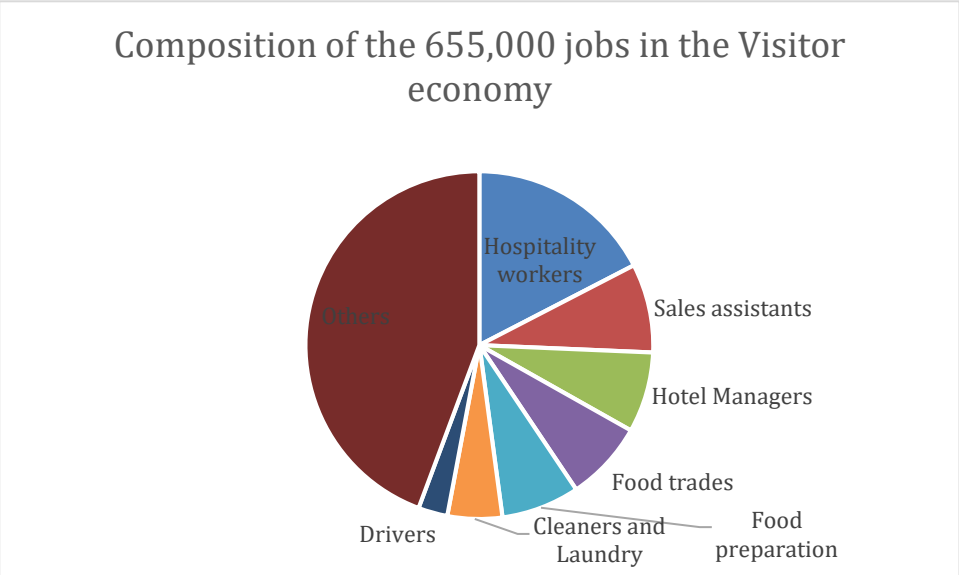

Figure 2: Composition of employment in the visitor economy

The importance of the visitor economy to the occupations is indicated by the share of employment accounted for by the visitor economy. This share is greatest for accommodation and hospitality managers and workers, food preparation assistants and food trade workers and transport workers (Figure 3).

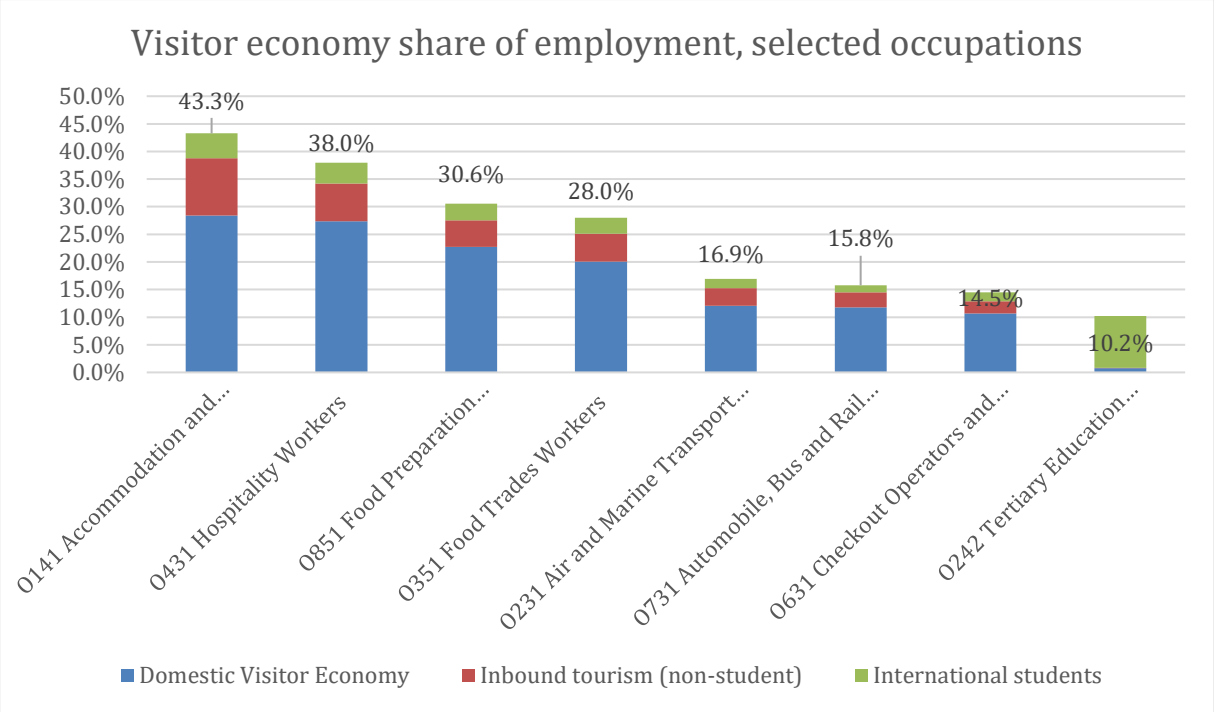

Figure 3: Visitor economy share of employment, top 7 occupations and Tertiary Education Teachers

3.1.3 Exports

The visitor economy is also an important source of export income, accounting for over $50 billion in 2019 (Figure 4) or almost 15 per cent of Australia's export income. Around half of this income is due to foreign students. The visitor economy is the largest source of export income in NSW and Victoria, however in the resource-rich states of WA and Queensland, the visitor economy is relatively less important (Figure 5).

Almost half of international in-bound visitor expenditure is by international students, who typically stay for a longer duration and pay tuition fees. International students make up around 6 per cent of all international arrivals, but spend around 14 times as much per visitor.

The combined (student and non-student) value of in-bound visitor economy expenditure is commensurate with export revenue from Iron Ore, and greater than export revenue from Coal (Figure 6). In all states except Queensland, SA and WA (dominated by coal, non-ferrous metals and iron ore respectively), the visitor economy is the largest source of export revenue.

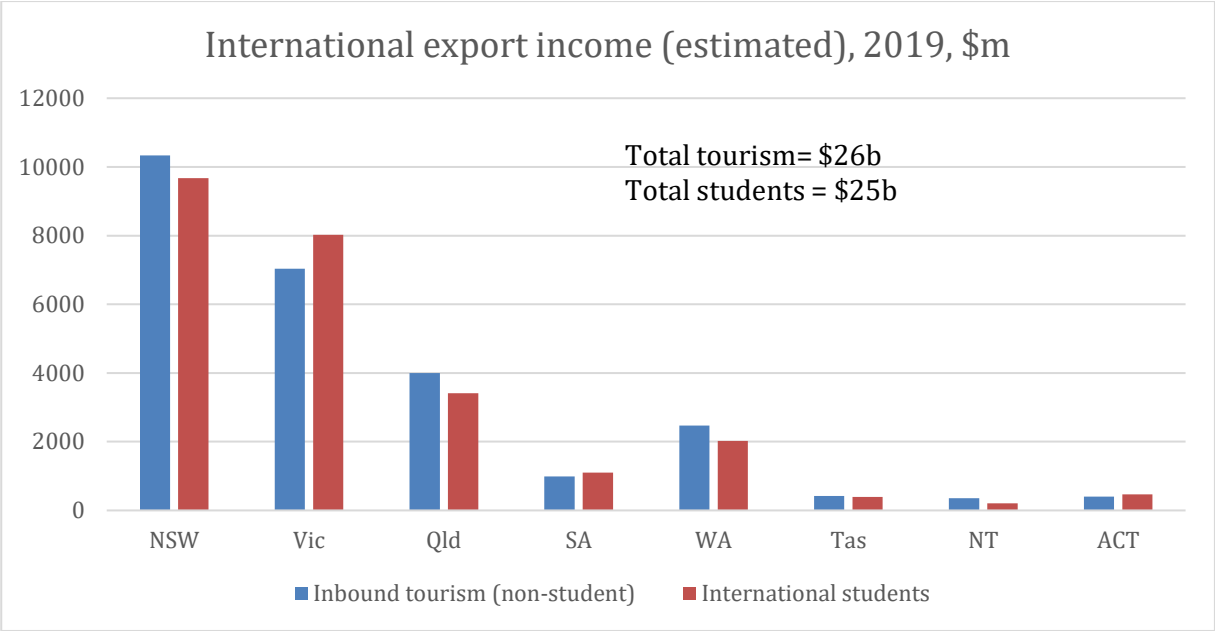

Figure 4: In-bound visitor expenditure by state, 2019

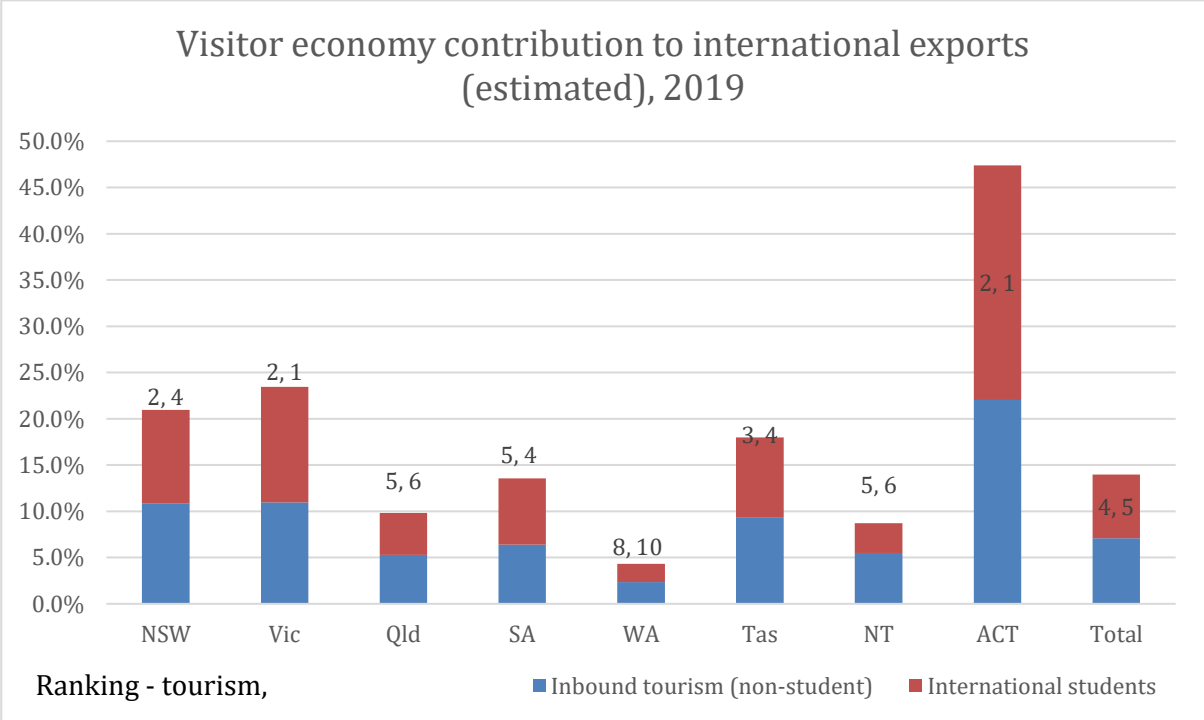

Figure 5: In-bound visitor expenditure as a share of total exports. Rankings shown, e.g. Tourism (non-student) is 2nd largest source of export revenue in NSW.

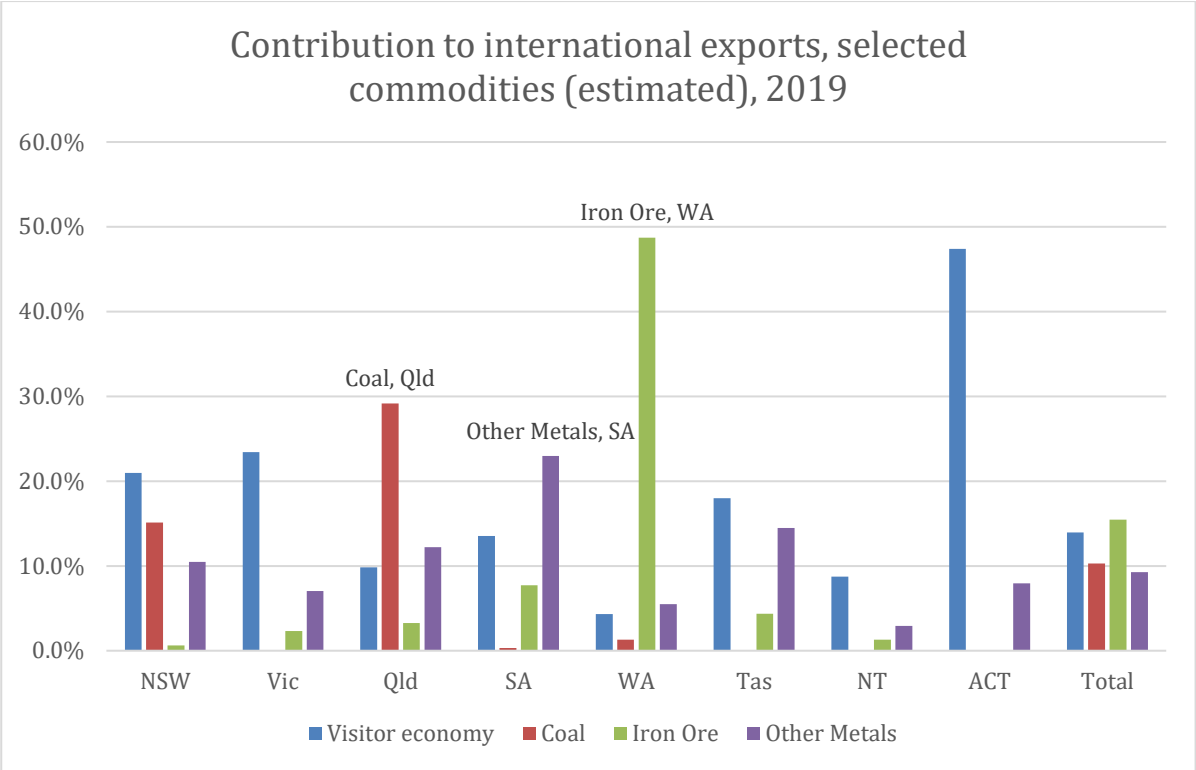

Figure 6: Contribution of Visitor Economy (non-student and student) and other selected commodities to export income

3.1.4 Expenditure

Total expenditure in the visitor economy in 2018-19, by in-bound and domestic tourists in Australia, is estimated to be $160 billion. The vast majority of this amount is spent on domestic output, with just 12 per cent spent on imports, which include manufactured goods and food. Visitor economy expenditure includes $12 billion dollars in indirect taxation (such as GST), the majority of which is derived from domestic visitors.

3.1.4.1 Domestic tourists

Expenditure by domestic tourists accounted for $109 billion, or 68 per cent of visitor economy spending in 2018-19. The major components of domestic visitor economy expenditure were restaurants and air transport, which account for around one-third of domestic visitor economy expenditure (Figure 7).

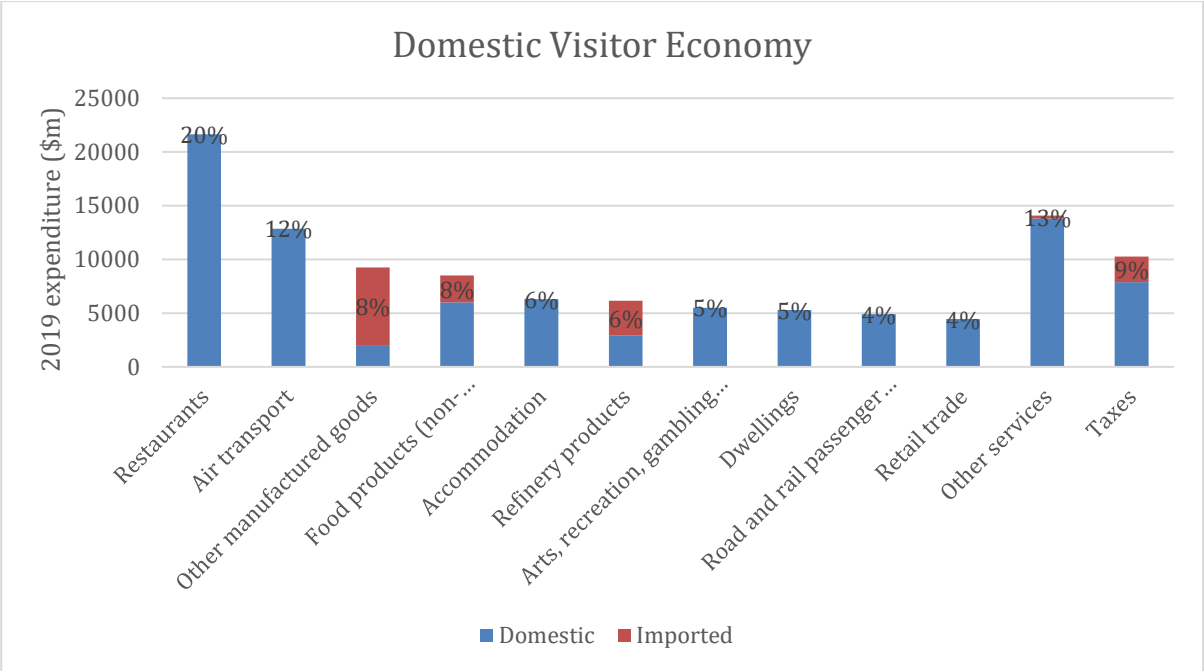

Figure 7: Domestic visitor economy expenditure, 2018-2019

3.1.4.2 In-bound non-student visitors

In comparison, inbound (non-student) tourist expenditure includes a greater proportion of accommodation, and smaller proportions of air transport and refinery products (petrol). Expenditure on air transport only includes expenditure incurred within Australia, that is, the cost of getting to Australia is excluded (Figure 8).

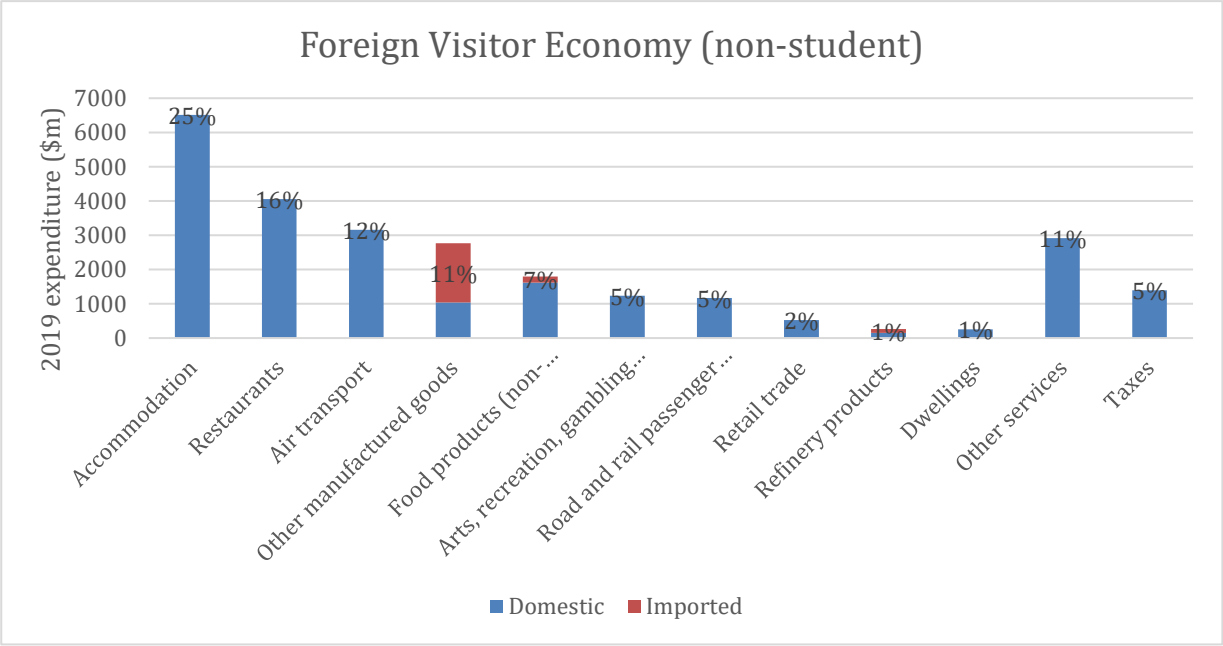

Figure 8: In-bound (non-student) visitor expenditure, 2018-19

3.1.4.3 In-bound student visitor economy

The profile of in-bound student expenditure differs again, with the majority of expenditure accounted for by tertiary education (Figure 9). In-bound student expenditure reflects living expenses, including food and dwelling expenditure. In-bound student expenditure also includes the cost of foreign students' holidays in Australia.

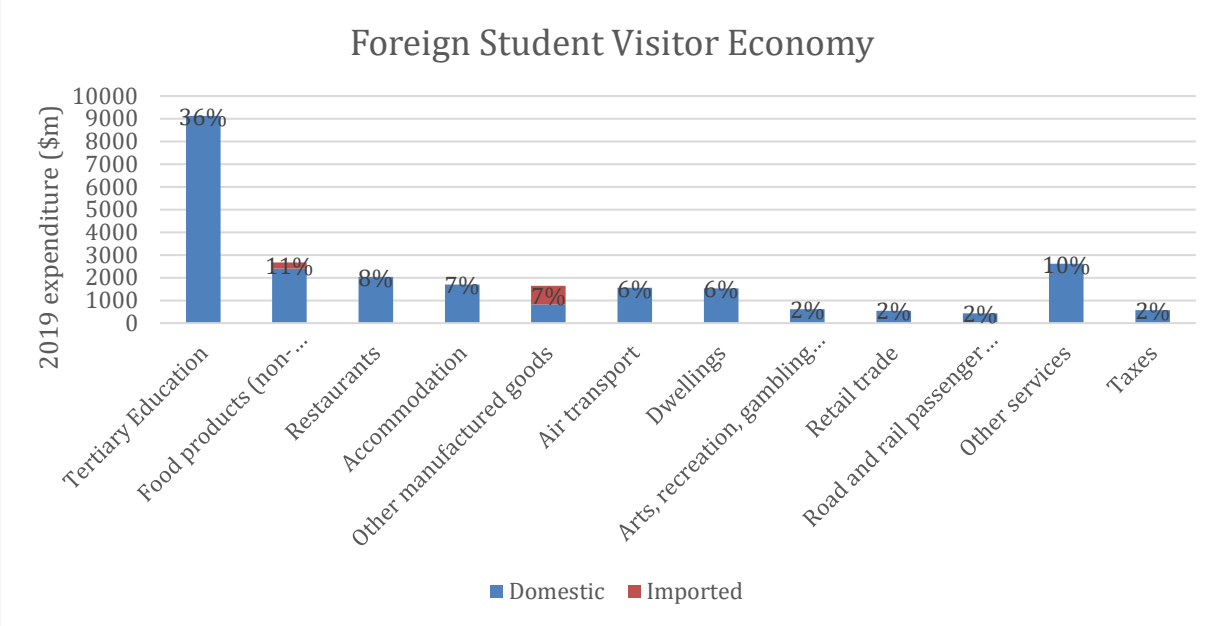

Figure 9: In-bound student expenditure, 2018-19

3.2 Simulations

The second approach to measuring the visitor economy is to examine the impact of the "next one per cent", that is, to simulate the effect of an increase in demand of one per cent using the VURM-VE model.

We examine the effects of increases in demand for three major classes of tourism expenditure: (i) foreign in-bound travellers (excluding students), (ii) Domestic travellers, and (iii) foreign students.

In all simulations, the impact on Australian real wages (wage deflated by CPI) and industry composition take around 5 years to become fully apparent, so simulation results reported here are for 2025. We report percentage deviation from base case, that is, the percentage difference between economic measures (e.g. GDP) in 2025 with and without a one per cent increase in the three types of visitor economy activity.

3.2.1 Simulation 1: Domestic tourists

We simulate a one per cent increase in domestic tourism activity, equivalent to an extra 4 million domestic visitor nights in 2019. This is facilitated by changing household tastes, so that the proportion of the household budget allocated to domestic tourism increases, and the proportion allocated to all other expenditure (except outbound tourism) is adjusted downwards.

3.2.1.1 Long run Macroeconomic effects

The impact on GDP of a one per cent increase in domestic visitor expenditure is negligible (Figure 10). This should be unsurprising, as the simulation is concerned with a change in the composition of expenditure, and adds no extra resources or productivity to the macroeconomy.

While there is no impact on aggregate employment, which is constrained by the size of the population, there is a slight negative impact on labour input. This is because the composition of employment is slightly tilted towards relatively low-wage occupations and industries. This small decrease in labour input underpins the small negative impact on GDP.

The tilt towards tourism expenditure and away from other expenditure reduces demand for capital-intensive activities, particularly dwellings. As a result, investment expenditure is lower than in the base case.

Although aggregate investment (and capital stocks) decline relative to the base case, real wages increase. This is because the decline in capital stocks is mostly confined to the dwelling sector. In employing sectors, including accommodation and restaurants, the capital-to-labour ratio increases, which underpins an economy-wide increase in real wages.

The measure of real wage reported here is based on industry and occupation wages. Although wages in all industries and occupations increase, aggregate wage *income* falls. This is because, relative to the base case, many more individuals work in relatively low-wage occupations as a result of the hypothetical tourism stimulus.

With lower wage income, aggregate consumption is slightly lower. Reduced consumption and investment expenditure weaken the exchange rate and stimulate demand for exports.

Overall, the simulation illustrates that the impact of tilting the composition of domestic expenditure towards tourism activities is small, as it has no impact on the productive capacity of the economy. Sectoral results given in the following sections show more significant findings.

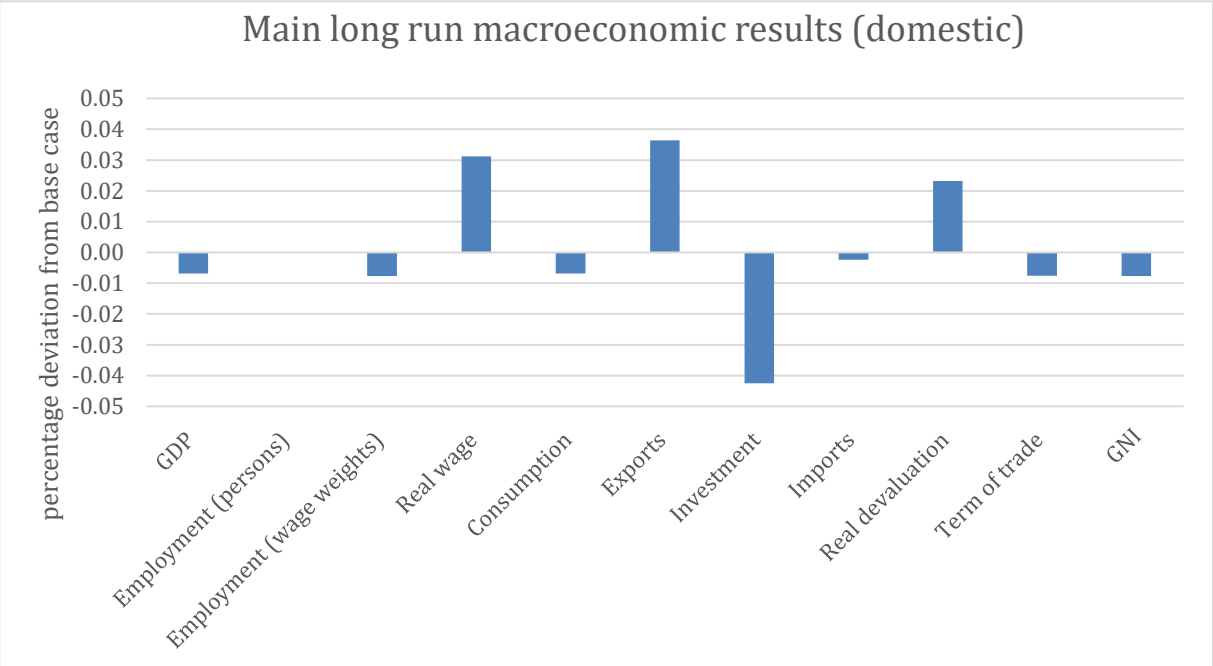

Figure 10: Long run macroeconomic effects of a 1 per cent increase in domestic visitor economy expenditure

3.2.1.2 Industry effects

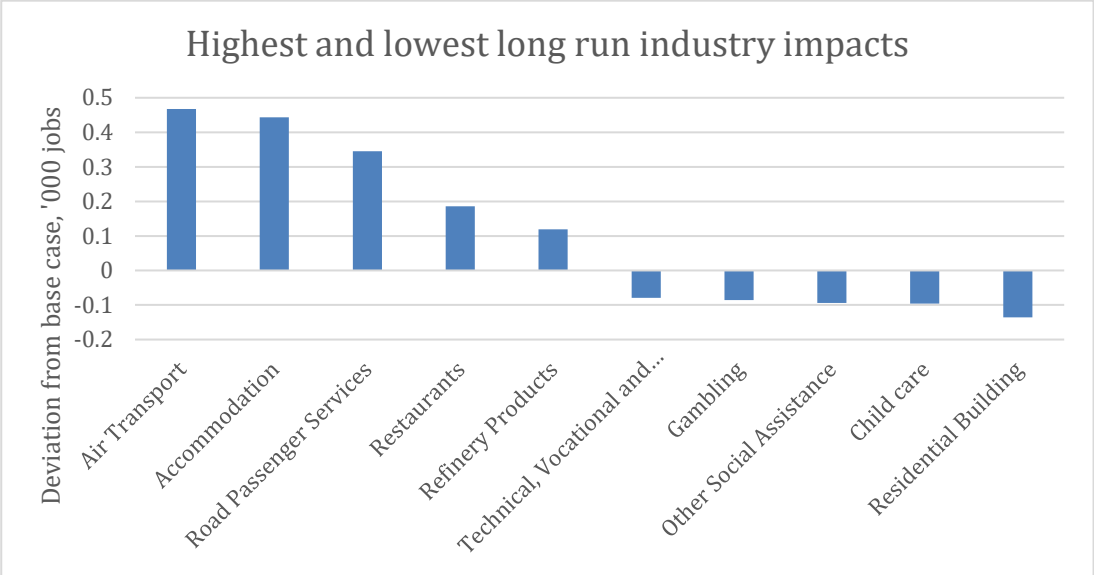

Figure 11: Industry effects of a 1 per cent stimulus to the domestic visitor economy

The largest sectoral impacts are in activities directly related to the visitor economy. The impacts are related to the share of demand for each sector accounted for by domestic visitor activity. For example, the increase in one per cent in demand from the domestic visitor economy leads to an increase of 0.47 per cent in demand for air transport, commensurate with the share of air transport sold to domestic visitors (44 per cent). The top five industry impacts all have direct links to the domestic visitor economy, as discussed earlier in Section 3.1.4.1.

On the downside, there are fewer jobs in the activities that are replaced by the tilt towards domestic tourism. Employment contracts in activities that are significant in the household budget, including residential building[11], child care, other social assistance and technical, vocational and other education.

We also find that an increase in domestic tourism creates cost pressures (for example, in accommodation and restaurants) which are detrimental to foreign visitor numbers. A one per cent increase in domestic tourism expenditure crowds out around 1,000 international visitors. While the net impact on most visitor economy activities, particularly accommodation, is positive, there is a negative impact on the gambling sector. The impact on gambling in particular highlights a difference in the expenditure profiles of the domestic and foreign visitor economies. The stimulus to domestic spending has only a small positive impact on gambling, which is outweighed by the loss of foreign spending.

The impact on foreign student numbers is mixed. On the one hand, greater domestic tourism creates cost pressures on some components of foreign student expenditure, such as accommodation. On the other hand, the increase in domestic tourism is accompanied by reduced household demand for other activities, including education and dwellings, providing a boost in supply of these activities to foreign students. The net effect is a small increase in foreign students.

[11] The impacts on other construction activities, including non-residential construction and civil engineering, while negative, are much smaller, suggesting that increased tourism brings about a change in the nature of construction activity. A population that is more tourism-oriented has a greater need for hotels and infrastructure and a lesser need for dwellings, which is reflected in the nature of the construction workforce.

3.2.1.3 Employment effects

Following from the industry results, an increase in domestic tourism leads to more jobs in Accommodation and Hospitality management and associated occupations (Figure 12). Similarly, there are reductions in occupations associated with household spending, such as child care, education and hairdressing. Employment of tertiary education teachers is also negatively affected by a reduction in in-bound student numbers.

Figure 12 also gives estimates forecast wage growth based on the Victoria University Employment Forecasts (VUEF) (J. Dixon, 2019). VUEF uses a dynamic CGE model with labour supply restrictions based on forecast availability of labour by skill to forecast employment and wages by occupation (J. Dixon 2017). Occupations with "high" wage growth are forecast to have wage growth above average, due to strong demand relative to the supply of suitably qualified labour. Three of the top five occupations – food preparation assistants, air and marine transport professionals and drivers – are forecast to have above-average wage growth as a result of relatively slow growth in the supply of suitably qualified workers. These occupations are where the visitor economy may encounter constraints to growth.

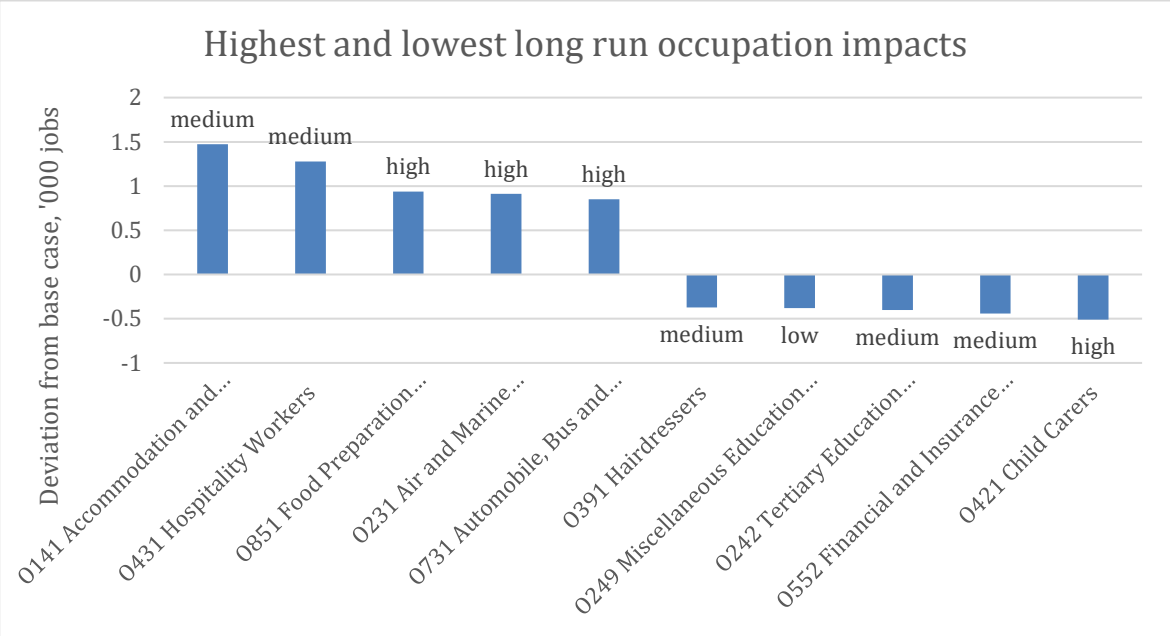

Figure 12: Occupation impacts of a one per cent increase in domestic visitor economy expenditure

3.2.1.4 State effects

The impact on gross state product (GSP) is similar to the average, or national impact on GDP, that is, we find a small negative impact in most states. Queensland and WA, with their resource-intensive economies less reliant on the visitor economy, are less affected by the increase in the domestic visitor economy. The

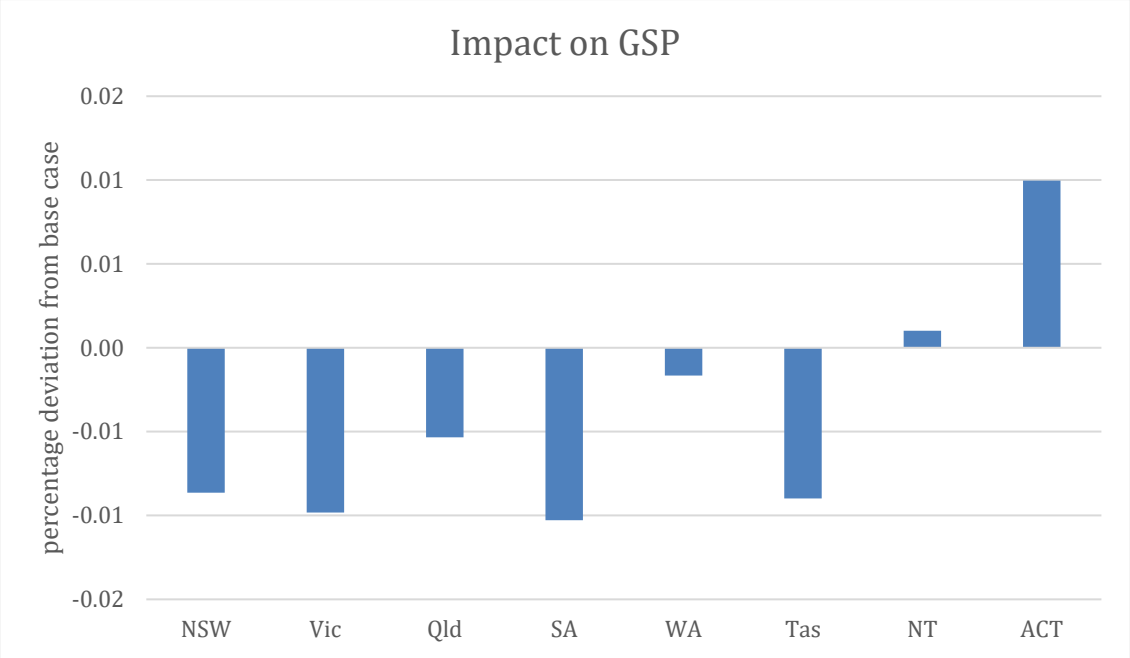

Figure 13: Impact on GSP of a one per cent increase in the domestic visitor economy

3.2.2 Simulation 2: in-bound travellers (other than students)

We simulate the effects of a one-off, permanent increase in-bound traveller expenditure of 1 per cent, or around 90,000 in-bound travellers in 2019. For context, in-bound traveller expenditure in Australia is forecast to grow by an average of 5 per cent per year for the next decade.

3.2.2.1 Macroeconomic results

As with the stimulus to the domestic visitor economy, a stimulus to in-bound visitor expenditure has a negligible impact on GDP and aggregate employment, and a small negative impact on wage-weighted employment (labour input) (Figure 14). The explanation for these results is the same as it is for the domestic visitor economy. However, the expenditure components of GDP, and the exchange rate, are affected quite differently.

Greater foreign demand for tourism exports strengthens Australia's terms of trade and real exchange rate. The greater willingness of foreign tourists to pay for, say, a restaurant meal in Australia, translates into more favourable terms of exchange, such that this restaurant meal which was exchanged for a quantity of imported electronic goods in the base case is exchanged for a slightly larger quantity of imported electronic goods under the simulated foreign demand stimulus.

The stronger exchange rate increases the purchasing power of the domestic wage, such that the "real" wage (wage deflated by consumer prices) increases relative to the base case. With the increased purchasing power of domestic incomes, consumption and imports also increase. There is a very slight negative impact on investment, as the economy becomes more service oriented. Despite the increase in foreign demand for tourism, there is a slight decrease in aggregate exports. This is because aggregate output (GDP) is unaffected, yet consumption is stronger, so the economy has fewer resources to allocate to export activities.

GNI, or gross national income, normally tracks very closely with GDP, or gross national output. In this simulation, GNP increases slightly although GDP does not. There are two underlying reasons. The first is that

the tilt towards tourism activities diverts resources away from other export activities, including mining, which has a large proportion of foreign ownership. The second is that the increased purchasing power of the local currency enables us to convert a unit of exports (say a bale of wool) into a greater quantity of imports, effectively increasing real incomes.

The impact on domestic and out-bound tourism is small. The increase in demand from international visitors for visitor economy services creates cost pressures for domestic tourists, but the increase in real wages and household incomes creates extra demand from domestic tourists. The net impact is close to zero.

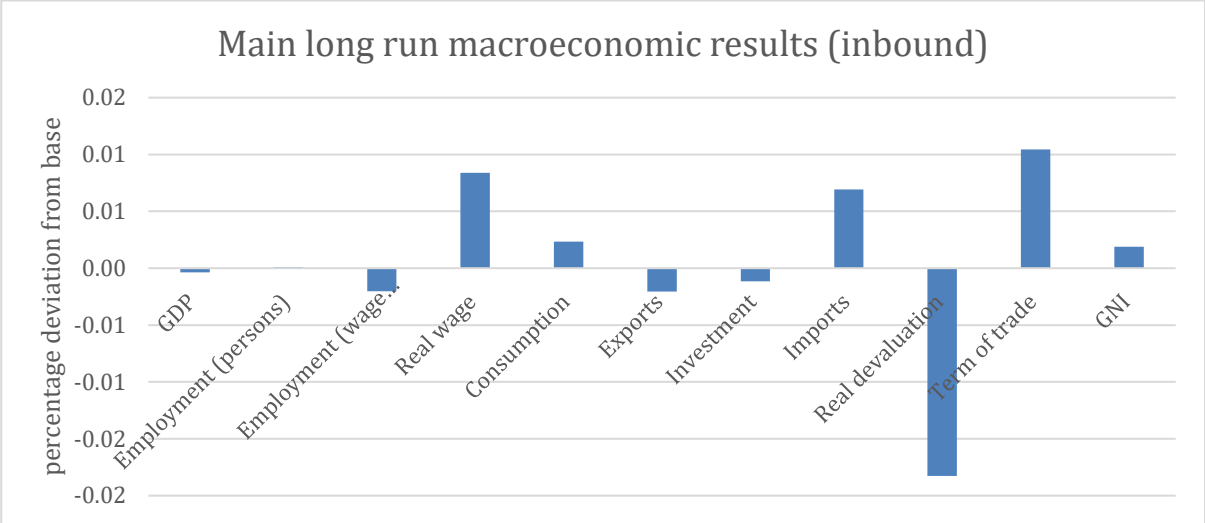

Figure 14: Main long run macroeconomic impacts of a 1 per cent increase in foreign non-student tourism

3.2.2.2 Sectoral results

As with the domestic stimulus, the industries which respond positively to an increase in in-bound visitor numbers are those linked most directly to tourism, particularly accommodation, for which a 1 per cent increase in inbound tourism leads to 2000 more jobs (Figure 15).

Greater in-bound tourism expenditure does have a negative impact on export industries as mentioned earlier. Given that there is no net gain in employment in the long run, due to the constraint on the size of the national population, there are also sectors in which employment is lower as a result of more in-bound tourism. An extra one per cent of tourism expenditure means that there will be several hundred fewer jobs in sectors such as non-ferrous metal ores, other metals, and mining services.

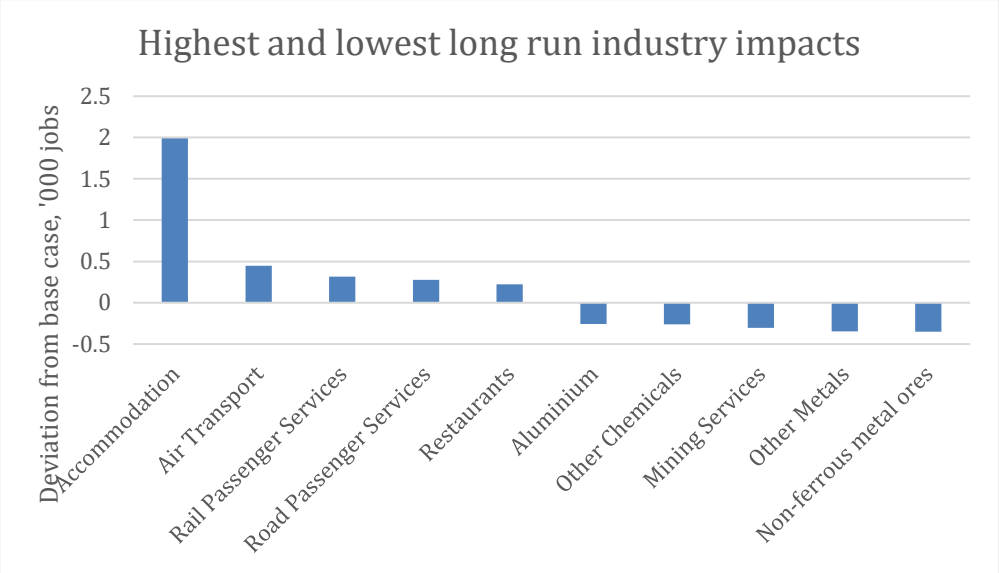

Figure 15: Impact on industry employment of a one percent increase in in-bound tourism

3.2.2.3 Occupation impacts

Classed by occupation, there are several hundred more jobs in accommodation and hospitality management, and for accommodation and hospitality workers and food trades workers and food preparation assistants, all occupations associated with accommodation and restaurants (Figure 16).

Occupations in which there will be fewer jobs are those associated with export activities, including farmers and farm managers and various occupations related to manufacturing and mining. By reducing non-visitor related exports, an increase in in-bound tourism also leads to fewer jobs for food process workers, an occupation associated with manufacturing or processing agricultural products. This is in contrast to the increase in jobs for food trades workers and food preparation assistants.

Figure 16 also indicates whether occupation wage growth is forecast to be higher than average (high), close to average (medium) or below average (low). Most of the occupations which expand have medium wage growth prospects. These occupations are generally performed by workers with Certificate level or lower qualifications, and often on a short term basis, for example by students. Relative to other similarly-skilled occupations such as sales occupations, these occupations are probably less subject to replacement by new technologies. The visitor economy, therefore, is well placed to offer entry-level employment opportunities to students and other relatively low-skilled workers.

Finally we note that an increase in international non-student inbound visitors has an impact on other visitor activities to some extent. An extra 100,000 non-student inbound visitors leads to around 550 fewer international students, which has a negative impact on jobs for tertiary education teachers. Given that international students spend 14 times as much as non-student visitors, the impact on in-bound student numbers is financially equivalent to a loss of around 8,000 non-student inbound visitors.

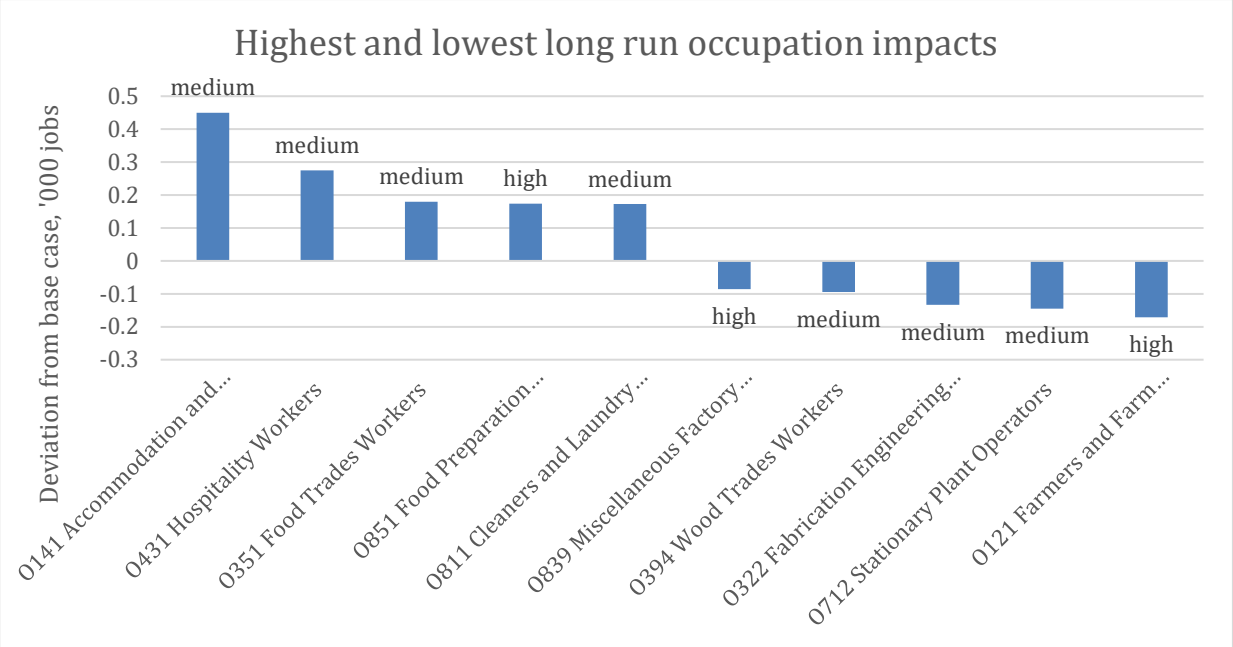

Figure 16: Occupation impacts of an increase in in-bound tourism of 1 per cent

3.2.2.4 State results

As with the national result for GDP, the impact on state economic output (Gross State Product, or GSP) is very small in all states (Figure 17). Queensland, WA, and NT with their greater dependence on mining and agriculture exports, fare relatively poorly, despite their reputations (particularly Queensland's) as tourism centres. In contrast, the ACT has little to lose in terms of non-tourism exports and therefore expands the most as a result of the in-bound tourism stimulus.

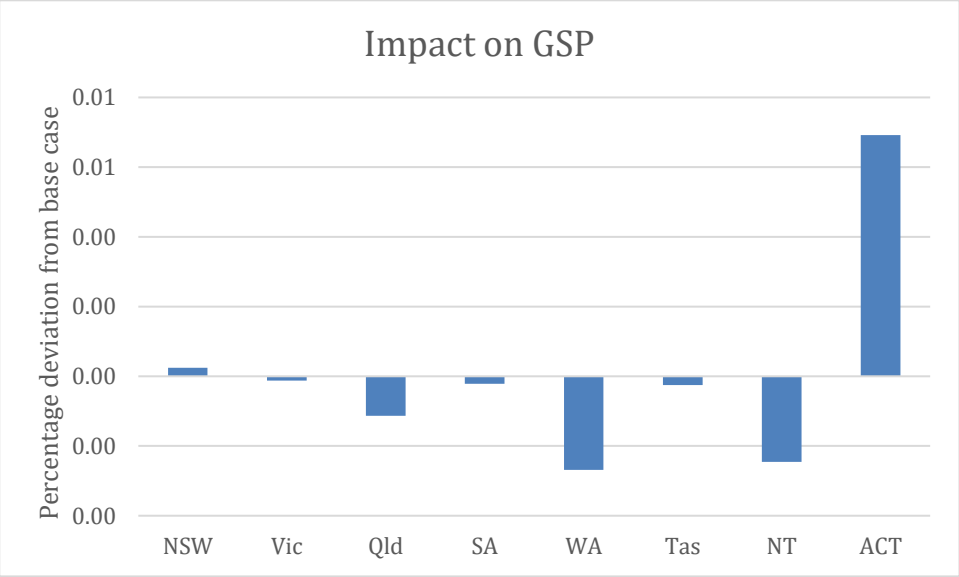

Figure 17: State impacts of a one per cent increase in in-bound tourism

3.2.3Simulation 3: Foreign Students

3.2.3.1 Macroeconomic impacts

Like the stimulus to in-bound non-student tourism described in Section 3.2.2, the macroeconomic results reflect the impacts of a conventional terms-of-trade stimulus. A key difference from the non-student demand stimulus is the impact on labour input, or wage-weighted employment. Whereas the tourism stimuli, both in-bound and domestic, redirected labour into lower-wage occupations, the student stimulus creates demand for higher-paid occupations such as tertiary educators.

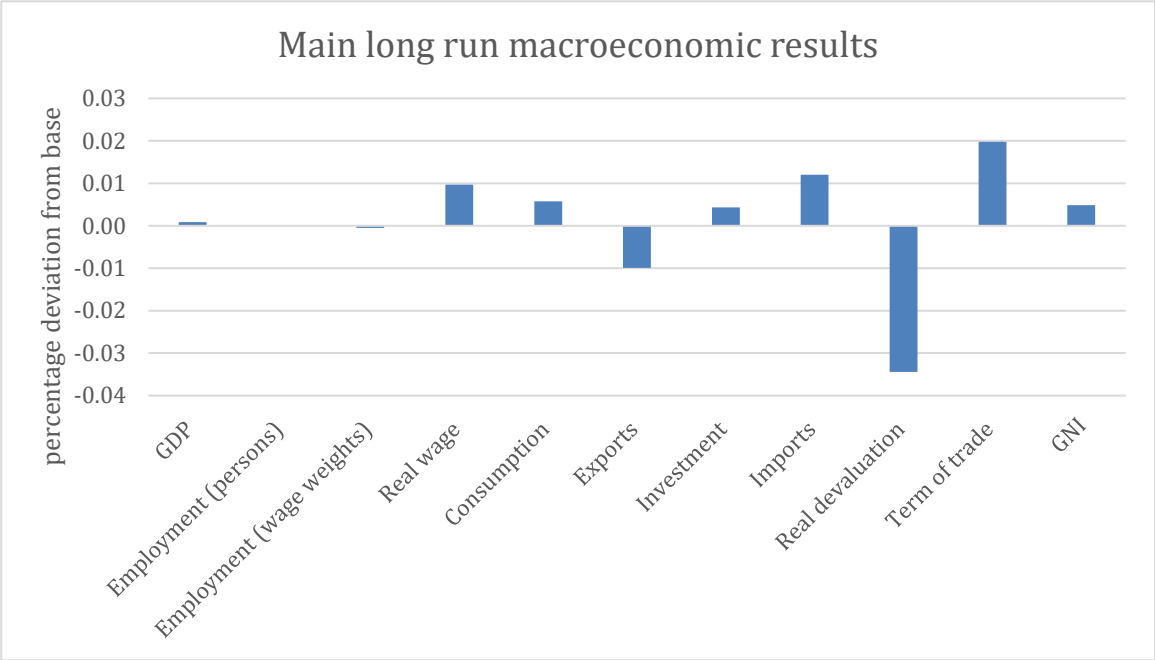

Figure 18: Macroeconomic impacts of a one per cent increase in in-bound students

3.2.3.2 Sectoral results

As with the other simulations, the positive sectoral impacts occur in industries most closely linked to the expanding sector, in this case, tertiary education, which is larger than the base case by over 1,000 jobs. There are small positive impacts on accommodation, air transport and residential building. Again, the industries with less employment as a result of an increase in in-bound visitors are the trade exposed sectors, including parts of mining and manufacturing.

An increase in international student demand of 1 per cent leads to an increase in output of Tertiary education of 0.17 per cent, commensurate with the proportion of Tertiary education consumed by international students. Cost pressures lead to a slight fall in consumption of tertiary education by domestic households (students).

Strategies to attract international students need to be implemented carefully to manage this downside aspect for the local population.

The model does not make any judgement about the quality of tertiary education and how this may be affected by larger numbers of international students. Nor does the model make any judgement about the welfare of international students in Australia. Yet we might assume that we have already attracted the best of the international students, and that every extra cohort of students are less well qualified in terms of subject matter knowledge and English language. There may be a case for additional checks and balances in the tertiary education sector.

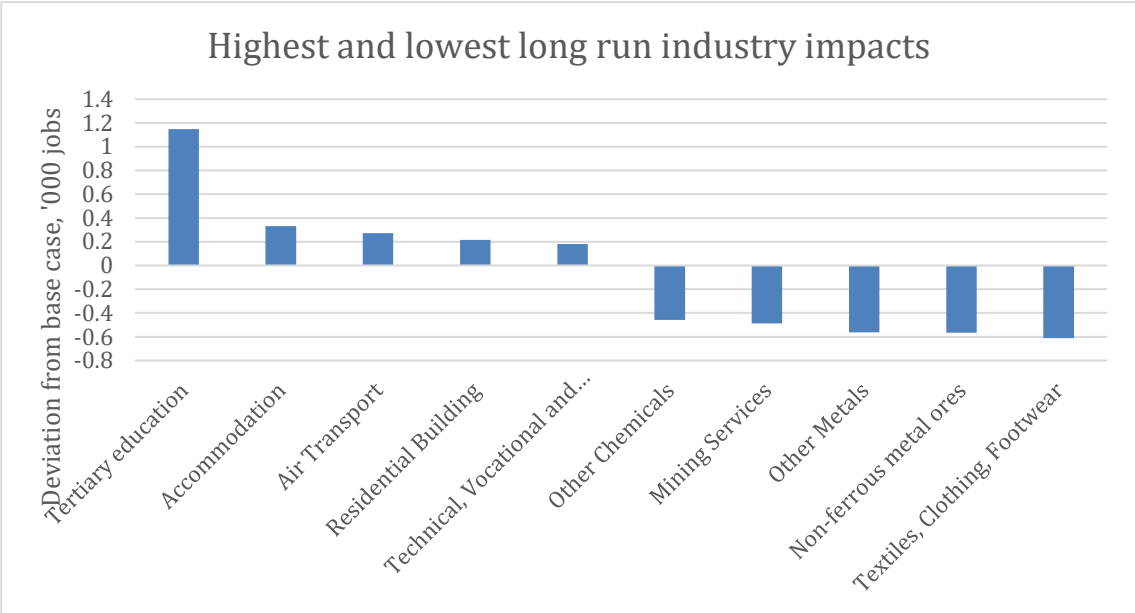

Figure 19: Sectoral impacts of a one per cent increase in in-bound students

3.2.3.3 Occupation results

Occupational employment (Figure 20) follows closely from sectoral employment (Section 3.2.3.2). The greatest impact is an increase in demand for tertiary education teachers. This occupation is forecast to have wage growth that is close to the economy-wide average through the forecast period, so employment shortages are not likely.

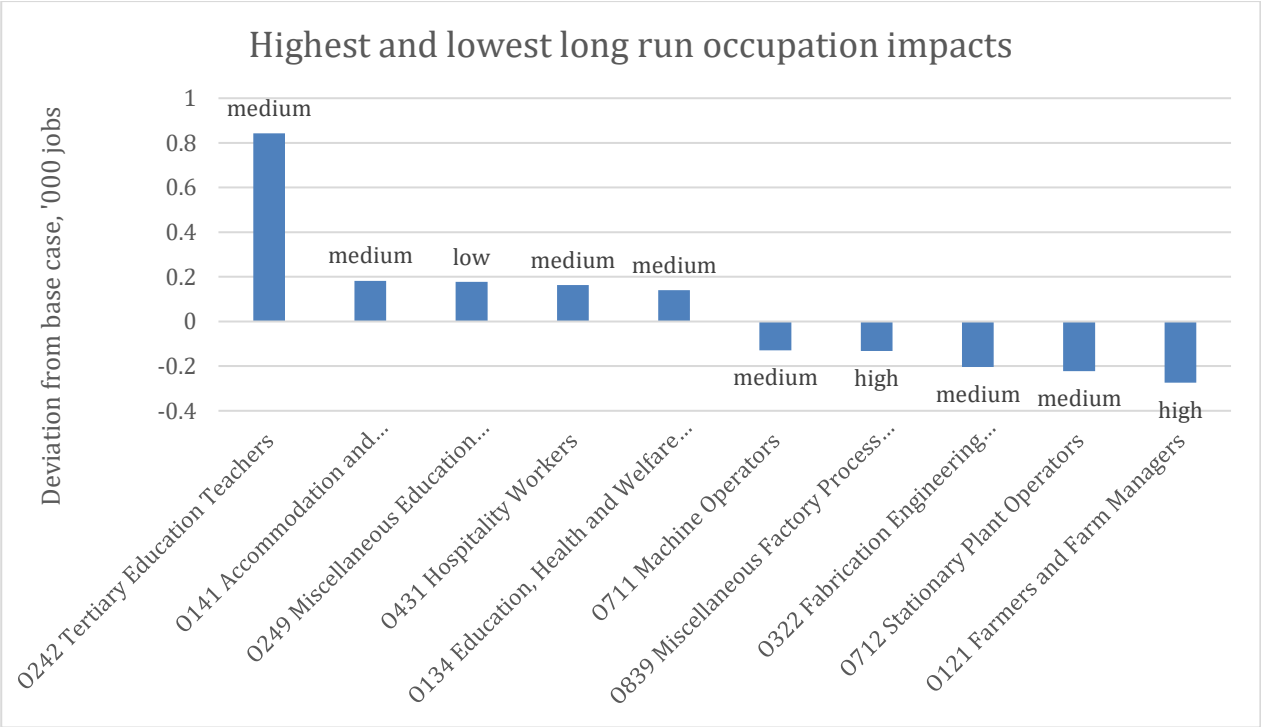

Figure 20: Impact of a one per cent increase in in-bound students on employment by occupation

3.2.3.4 State results

As with the previous simulations, the impact on GSP in most states is small. Again, the impact on the commodity exporting states of Queensland and WA is negative, while the ACT expands the most as it has the least reliance on non-tourism exports.

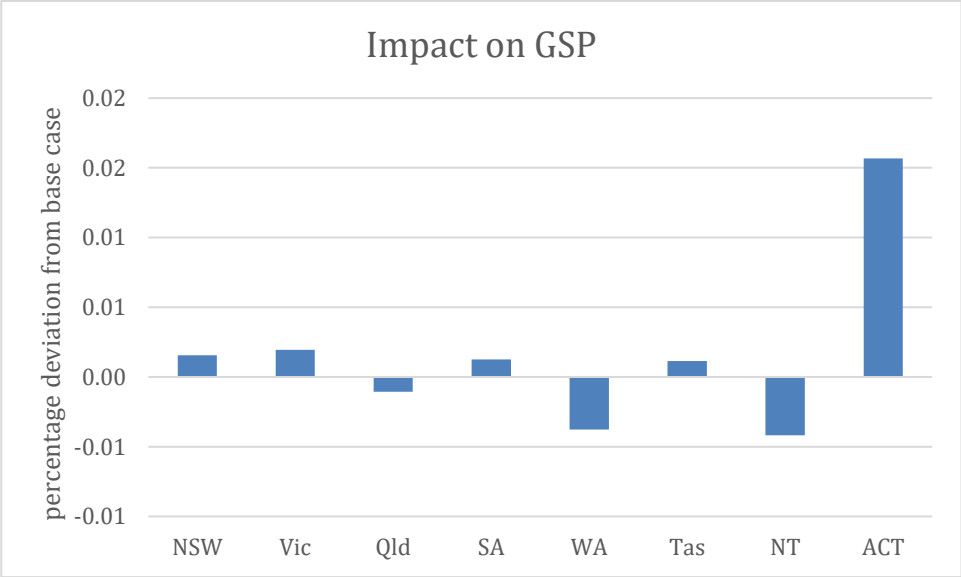

Figure 21: Impact of a one per cent increase in in-bound students on GSP

3.3 Snapshot and simulation conclusions

The visitor economy is a significant part of the Australian economy, accounting for 655,000 jobs, almost 5 per cent of Australian GDP and more than 5 per cent of Australian employment.

The visitor economy is a particularly important employer of low skilled service occupations in accommodation and hospitality. It will be increasingly important as other low skilled service opportunities, such as in retail, are automated.

Domestic visitors – Australian residents travelling within Australia for holidays, to visit friends or for business – are by far the biggest drivers of the visitor economy, accounting for more than double the expenditure of inbound tourists. Nevertheless, in-bound tourists account for a significant proportion of the Australian economy.

In 2019, Australia's 10 million inbound tourists, including international students, will account for over $50 billion in export income, or 15 per cent of the country's export income. This is almost as large as the export income generated by Iron Ore, and greater than export income from Coal, LNG, or agriculture. In Victoria and NSW, inbound tourists are the largest source of export income, while in the resource-rich mining states, particularly Queensland and WA, coal and iron ore still account for the overwhelming majority of export income.

Australia's limited export complexity recently led to a ranking of 93rd in the world,[12] a surprisingly low ranking for a high-income country. Hausmann et al (2017) find that low export complexity detracts from a country's economy growth. Growing the visitor economy will reduce the prevalence of mining and agricultural exports and potentially reduce lack of complexity as an impediment to growth.

Tourism is forecast to grow its share of the economy over the next decade. Yet tourism spending is discretionary, making it vulnerable to economic shocks that impact income growth and household confidence. To better understand this large and rapidly-growing sector, we model the impacts of the "next one per cent", that is, the impact of a one per cent increase in tourism, using its VURM-VE model.

A domestic population more oriented towards visitor economy activities will provide more job opportunities for hotel managers and staff, cooks, chefs and drivers. Reorientation in the domestic sector means there will be fewer opportunities in other areas such as child care and personal services, and a larger proportion of the construction sector will be devoted to non-residential rather than residential building.

The modelling finds that an economy more oriented towards inbound tourists and international students will have higher wages and a stronger exchange rate. There will be more jobs for hotel managers and workers, cooks and chefs, and tertiary educators. Growth in the visitor economy may provide the next big wave of relatively low skilled jobs as opportunities in the retail sector stagnate due to technical change and automation.

However, the reorientation of the economy, and the stronger exchange rate, mean there will be fewer jobs in other export-oriented sectors, including agriculture, mining and manufacturing.

The modelling does not address other aspects of inbound tourism, such as mutually beneficial cultural exchange. Nor does it address the linkages between tourism, migration, the labour supply and congestion. With regard to international students, the modelling does not address the impacts on the local students' experience of tertiary education, nor does it address concerns about the welfare of international and local students and university staff.

[12] http://atlas.cid.harvard.edu/rankings/2017?country=australia

4 Conclusions

This study developed a new visitor-economy-oriented multiregional CGE model of the Australian economy and put it to work to measure the current size of the visitor economy and to explore the effects of a faster growing tourism sector.

The new model, VURM-VE, builds on CoPS' existing multiregional CGE model VURM, which has been continually developed and applied in hundreds of policy-relevant applications over a period of twenty-five years. In developing VURM-VE, visitor-economy activities were assembled into three new visitor economy sectors, distinguishing Australian tourists (modelling their local, interstate and overseas travel), non-education in-bound international tourists, and foreign students. VURM-VE's data base was populated with the latest information from the Tourism Satellite Accounts. The model incorporates a detailed treatment of occupational classes in order to allow analysis of future skill requirements.

Section 3 of this report details the results from an analysis of the features of Australia's current visitor economy, as depicted in VURM-VE's comprehensive visitor-economy data-base, and from simulations of increased growth in each major part of the visitor economy. These results demonstrate the present day importance of the sector, with the visitor economy making up around 5 per cent of GDP and employment, and contributing 15 per cent of the nation's export income. The simulations show that a larger visitor economy leads to an increase in the real wage, a stronger exchange rate and increased job opportunities for less skilled workers.

The new VURM-VE model provides an excellent platform for new research on the visitor economy. As explained in sub-section 2.1.2 the new model is well equipped to analyse both economic shocks which fall directly on the visitor economy and also the effects on the visitor economy of more general shocks, such as, for instance, changes in the rate of state and federal taxes (e.g. company tax, the GST, insurance taxes), or issues related to climate change. Analysis could also be made of infrastructure changes which bear closely on tourism, such as Melbourne's third runway, or construction of a new Sydney airport at Badgerys Creek.

Tables

Table 1: Estimated Visitor Economy Expenditure in Australia, 2019 ($m)

	Domestic	Foreign (non-student)	Foreign students	Total VE	Imports (%)
Restaurants	21,629	4,060	2,041	27,731	0.0%
Air transport	12,868	3,157	1,558	17,583	0.0%
Accommodation	6,296	6,510	1,702	14,507	0.0%
Other manufactured goods	9,250	2,765	1,244	13,260	72.8%
Food products (non-restaurant)	8,511	1,799	2,668	12,979	22.6%
Tertiary Education	500	0	9,128	9,629	0.0%
Arts, recreation, gambling and other services	5,513	1,235	610	7,357	0.0%
Dwellings	5,287	259	1,529	7,075	0.0%
Refinery Products	6,169	265	394	6,828	51.4%
Road and rail passenger services	4,892	1,173	436	6,501	0.0%
Retail trade	4,463	528	548	5,540	0.0%
Other services	13,589	2,918	2,616	19,123	1.4%
Taxes	10,272	1,390	570	12,233	
Total	**109,241**	**26,059**	**25,045**	**160,346**	**11.7%**

Table 2: Estimated Visitor Economy Value Added in Australia, 2019 ($m)

	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Aust.
Value added ($m)									
Domestic visitor economy	19,233	14,289	11,200	3,319	7,524	1,245	931	1,626	59,367
Inbound tourism (non-student)	5,735	4,026	2,274	658	1,410	262	227	252	14,846
International Students	4,919	4,119	1,835	748	1,144	237	141	264	13,407
Total	29,888	22,434	15,310	4,725	10,078	1,744	1,299	2,143	87,620
Share of GSP/GDP (%)									
Domestic visitor economy	3.1	3.2	3.3	2.9	2.7	4.0	3.2	3.1	3.1
Inbound tourism (non-student)	0.9	0.9	0.7	0.6	0.5	0.8	0.8	0.5	0.8
International Students	0.8	0.9	0.5	0.7	0.4	0.8	0.5	0.5	0.7
Total	4.9	5.0	4.5	4.2	3.7	5.6	4.4	4.1	4.6

Table 3: Estimated Visitor Economy Employment by Occupation (ANZSCO), 2019

	Domestic visitor economy	Inbound tourism (non-student)	Inter-national students	Total visitor economy	VE as % of national employ-ment
O431 Hospitality Workers	82	21	11	114	38.0
O621 Sales Assistants and Salespersons	38	9	7	54	7.5
O141 Accommodation and Hospitality Managers	32	12	5	49	43.3
O351 Food Trades Workers	35	9	5	49	28.0
O851 Food Preparation Assistants	35	8	5	48	30.6
O811 Cleaners and Laundry Workers	20	10	4	33	12.9
O731 Automobile, Bus and Rail Drivers	13	3	1	18	15.8
O899 Miscellaneous Labourers	12	3	2	17	7.5
O142 Retail Managers	11	2	2	15	7.9
O149 Miscellaneous Hospitality, Retail and Service Managers	9	3	2	13	7.0
O631 Checkout Operators and Office Cashiers	9	2	1	12	14.5
O542 Receptionists	5	3	1	9	6.3
O551 Accounting Clerks and Bookkeepers	6	2	1	9	3.2
O242 Tertiary Education Teachers	1	0	8	9	10.2
O451 Personal Service and Travel Workers	6	2	1	8	10.1
O531 General Clerks	4	1	2	7	2.5
O639 Miscellaneous Sales Support Workers	5	1	1	7	11.2
O133 Construction, Distribution and Production Managers	4	1	1	7	2.7
O362 Horticultural Trades Workers	4	1	1	6	4.7
O131 Advertising, Public Relations and Sales Managers	4	1	1	6	3.9
Other	103	28	34	165	
Total	**437**	**122**	**96**	**655**	**5.4**

Table 4: Long run macroeconomic results, simulated one per cent increase in demand for domestic visitor economy, international (non-student) visitors and foreign students (percentage deviation from base case)

	Domestic visitors	International (non-student)	International student
GDP	-0.007	0.000	0.001
Employment (persons)	0.000	0.000	0.000
Employment (wage weights)	-0.008	-0.002	0.000
Real wage	0.031	0.008	0.010
Consumption	-0.007	0.002	0.006
Exports	0.036	-0.002	-0.010
Investment	-0.042	-0.001	0.004
Imports	-0.002	0.007	0.012
Real devaluation	0.023	-0.018	-0.034
Term of trade	-0.008	0.010	0.020
GNI	-0.008	0.002	0.005

Table 5: Long run impact on Gross State Product (GSP), simulated one per cent increase in demand for domestic visitor economy, international (non-student) visitors and foreign students (percentage deviation from base case)

	Domestic visitors	International (non-student)	International student
NSW	-0.009	0.000	0.002
Vic	-0.010	0.000	0.002
Qld	-0.005	-0.001	-0.001
SA	-0.010	0.000	0.001
WA	-0.002	-0.003	-0.004
Tas	-0.009	0.000	0.001
NT	0.001	-0.002	-0.004
ACT	0.010	0.007	0.016

Table 6: Long run impact on jobs of a simulated one per cent increase in demand for Domestic visitor economy activity (top 10 and bottom 10 ANZSCO occupations)

Occupation	Deviation from base case, '000 jobs
O141 Accommodation and Hospitality Managers	1.47
O431 Hospitality Workers	1.28
O851 Food Preparation Assistants	0.94
O231 Air and Marine Transport Professionals	0.91
O731 Automobile, Bus and Rail Drivers	0.85
O351 Food Trades Workers	0.82
O639 Miscellaneous Sales Support Workers	0.57
O441 Defence Force Members, Fire Fighters and Police	0.55
O451 Personal Service and Travel Workers	0.51
O811 Cleaners and Laundry Workers	0.39
O422 Education Aides	-0.34
O241 School Teachers	-0.36
O134 Education, Health and Welfare Services Managers	-0.36
O253 Medical Practitioners	-0.36
O252 Health Therapy Professionals	-0.37
O391 Hairdressers	-0.37
O249 Miscellaneous Education Professionals	-0.38
O242 Tertiary Education Teachers	-0.40
O552 Financial and Insurance Clerks	-0.44
O421 Child Carers	-0.51

Table 7: Long run impact on jobs of a simulated one per cent increase in demand for in-bound (non-student) visitor economy activity (top 10 and bottom 10 ANZSCO occupations)

Occupation	Deviation from base case, '000 jobs
O141 Accommodation and Hospitality Managers	0.45
O431 Hospitality Workers	0.28
O351 Food Trades Workers	0.18
O851 Food Preparation Assistants	0.17
O811 Cleaners and Laundry Workers	0.17
O231 Air and Marine Transport Professionals	0.10
O542 Receptionists	0.09
O451 Personal Service and Travel Workers	0.07
O639 Miscellaneous Sales Support Workers	0.07
O631 Checkout Operators and Office Cashiers	0.06
O323 Mechanical Engineering Trades Workers	-0.07
O242 Tertiary Education Teachers	-0.07
O831 Food Process Workers	-0.07
O233 Engineering Professionals	-0.08
O711 Machine Operators	-0.08
O839 Miscellaneous Factory Process Workers	-0.09
O394 Wood Trades Workers	-0.09
O322 Fabrication Engineering Trades Workers	-0.13
O712 Stationary Plant Operators	-0.15
O121 Farmers and Farm Managers	-0.17

Table 8: Long run impact on jobs of a simulated one per cent increase in demand for international student activity (top 10 and bottom 10 ANZSCO occupations)

Occupation	Deviation from base case, '000 jobs
O242 Tertiary Education Teachers	0.84
O141 Accommodation and Hospitality Managers	0.18
O249 Miscellaneous Education Professionals	0.18
O431 Hospitality Workers	0.16
O134 Education, Health and Welfare Services Managers	0.14
O851 Food Preparation Assistants	0.13
O351 Food Trades Workers	0.11
O452 Sports and Fitness Workers	0.09
O422 Education Aides	0.08
O631 Checkout Operators and Office Cashiers	0.06
O233 Engineering Professionals	-0.11
O831 Food Process Workers	-0.11
O841 Farm, Forestry and Garden Workers	-0.11
O323 Mechanical Engineering Trades Workers	-0.12
O394 Wood Trades Workers	-0.13
O711 Machine Operators	-0.13
O839 Miscellaneous Factory Process Workers	-0.13
O322 Fabrication Engineering Trades Workers	-0.20
O712 Stationary Plant Operators	-0.22
O121 Farmers and Farm Managers	-0.27

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APPENDIX

CONSTRUCTION OF VURM-VE: Detailed Description

1. Upgrading VURM to VURM-VE for analysis of the visitor economy

This appendix describes the construction of VURM-VE as a visitor-economy-oriented version of the VURM model.

In the VURM database, embedded in the expenditures of households and industries on products, such as *accommodation,* is expenditure by Australian tourists in Australia and overseas. Included in export expenditures is spending by foreign tourists in Australia. In short, products purchased by tourists are not identified, because "tourism" is not a separate industry or product.

2. VURM to VURM-VE

The VURM-VE model extends VURM by distinguishing the economic aspects of tourism in a way that allows tourism's contribution to major national accounting aggregates to be determined. It does so by the inclusion of three new "dummy" tourism industries.[1]

1. *AusTourism* – inputs are the visitor expenditures by Australians. Expenditure includes all associated taxes and margins. Spending on domestically produced AusTourism is spending associated with visitation, either in the local region or in other Australian regions. Because of the nature of data on tourism spending, that spending includes spending on holidays, on business, and for education. Spending on imported AusTourism is spending by Australians travelling overseas on holidays, on business, and for education. *AusTourism* uses no capital or labour. It sells in each state only to the representative consumer (non-business travel) or to industries (business travel).
2. *ForTourism* - inputs are expenditures by foreigners in Australia other than students visiting for education. Expenditure includes all associated taxes and margins. The industry uses no capital or labour and sells only to export.
3. *ForStudent* – inputs are expenditures by foreign students in Australia, including all associated taxes and margins. The industry uses no capital or labour and sells only to export.

The new industries share the same commodity input structures as existing regional industries in the model. Specifically, by assumption, each chooses a mix of inputs that minimises the costs of production for a given level of output. Intermediate-input bundles are used in fixed proportions to output. These bundles comprise combinations of international imported goods and domestic-good bundles. Inputs of domestic-good bundles are combinations of goods from each of the eight regions.

Any user in the model can purchase output of the new tourism industries. However, in practice, the sources of demand are restricted to those described above. Domestically-produced and imported *AusTourism* are used by industries for current production and households. In both uses, the ratios of domestically-produced and imported versions respond to changes in relative price. For example, an increase in the price of the domestically-produced *AusTourism* relative to the price of the imported good, causes industries and households to shift from domestic travel (domestic *AusTourism*) to foreign travel (imported *AusTourism).* Export demand is the only source of demand for *ForTourism* and *ForStudent.* That demand is also price-responsive. For example, an increase in the price of *ForTourism* due to real appreciation of the exchange rate will reduce the simulated number of foreign tourists entering Australia.

[1] Here we follow the approach of Wittwer (2017), which expands on work first reported in Dixon and Rimmer (2002).

3. Database changes

Data for the costs and sales of the three new industries are generated by splitting the existing VURM database using statistics from the Australian Bureau of Statistics (ABS)' *Australian National Accounts: Tourism Satellite Accounts* (catalogue number 5249.0).

Splitting involved the following steps.

A. Costs and Sales of AusTourism

Step A1 – Initial split for Australian tourists travelling overseas

ABS (5249.0) provides data on the purchasers' (market) value of *total external consumption* on tourism *characteristic products* and *connected products* by Australian households, businesses and governments. There are nine *characteristic* products and five *connected* products.

Based on a mapping between the tourism products and VURM commodities, the following national-level ratios were constructed:

$$A(c) = \frac{ABS(5249.0)\ Australians\ spending\ overseas(c)}{VURM\ \exp enditure\ on\ imported\ \ product(c)}, \qquad \text{(all c in set COM)}^{14} \qquad (1),$$

where data for the numerator is from ABS (5249.0) and data for the denominator is the sum of household and industry use of commodity c in purchasers' prices from the VURM database. Note that, due to data inconsistencies, it is possible for the initial value of A(c) to be greater than one. In such cases, the ratio is set to one.

Applying A(c) uniformly across all destination-regions and users (households and industries for current production) to the VURM database allows us to split out spending on commodity c by Australians travelling abroad. This procedure applies to the following VURM matrices:

- BAS1(c,"imp",i,q) and BAS3 (c,"imp",q), containing the basic value of spending on imported commodity c by industry i (BAS1) and by the household (BAS3) in region q;
- TAX1(c,"imp",i,q) and TAX3 (c,"imp",q), containing the sales taxes associated with spending by industry i and by the household on imported commodity c in region q; and
- MAR1(c,"imp",i,q,m) and MAR3 (c,"imp",q,m), containing the value of margin-type m associated with delivering to industry i and to the household imported commodity c in region q.

After removing these tourism-related values from the industry costs matrices, for each affected industry the sum of costs is less than the sum of sales. Similarly, consumption expenditure is below its initial level through the removal of overseas travel costs.

Step A2 - Use of imported and domestically-produced air transport by Australians travelling overseas

In the VURM database, air transport is used indirectly as a margin for freight and directly for passenger transport. Here we are concerned only with the second type of demand.

In Step A1, we separated out from existing flows of imported goods and associated taxes and margins, the expenditures of Australians travelling abroad, including *Air transport*. However, Australians travelling overseas also purchase domestically-produced air transport supplied primarily by Qantas and its low cost subsidiary Jetstar. We account for this spending as follows.

[14] COM is the set of all commodities in the VURM database.

First, we make an educated guess for the share of Qantas and Jetstar revenue generated by fares purchased by Australians travelling abroad.[15] This share is applied to the existing database value of domestically-produced air transport to calculate a $ value that can be attributed to fares paid by Australians travelling overseas. The allocation to industry and household users and regions is in line with the initial allocation of expenditure on imported *Air transport* using A(*Air transport*).

We add the expenditures on domestic airline fares into the margins matrices, MAR1 and MAR3, as the use of domestically-produced air transport in the purchase of imported *AusTourism.* Thus, for this one case, the *margins* use is for passenger transport, not for freight.

Finally, we reduce the basic value of imported *Air Transport* initially removed from BAS1 and BAS3 and the associated taxes and margins in step 2, so that the overall purchasers' value of *Air transport* associated with imported *AusTourism* is in line with that reported in ABS (5249.0).

Step A3 – Restoring database balance

Adding sales of imported *AusTourism* into the cost structures of industries and households restores database balance. At this point, in each region the household and industries spend *directly* relatively small amounts on imported tourism products such as accommodation and air transport. Their expenditures on these items are now accounted for *indirectly* through purchases of imported *AusTourism services.*

Step A4 – Initial split for Australians travelling in Australia

ABS (5249.0) provides data on the purchasers' (market) value of *total internal consumption* on tourism *characteristic products* and *connected products* by Australian households, businesses and governments. Using this information, the following national-level ratios are constructed:

$$B(c) = \frac{ABS(5249.0)\ Australian\ visitor\ domestic\ spending(c)}{VURM\ \exp enditure(c)}, \qquad \text{(all c in set COM)} \qquad (2),$$

where data for the numerator is from ABS (5249.0) and data for the denominator is the sum of household and industry use of commodity c in purchasers' prices from the VURM database (*post* Step A3).

Applying B(c) uniformly across all destination-regions and users (households and industries for current production) to the VURM database allows us to split out spending on commodity c by Australians travelling within Australia. Specifically, we apply the ratios to the following VURM matrices:

- BAS1(c,s,i,q) and BAS3 (c,s,q), containing the basic value of spending on commodity c from source s by industry i (BAS1) and by the household (BAS3) in region q;
- TAX1(c,s,i,q) and TAX3 (c,s,q), containing the sales taxes associated with spending on commodity c from source s by industry i and by the household c in region q; and
- MAR1(c,s,i,q,m) and MAR3 (c,s,q,m), containing the value of margin-type m associated with delivering to industry i and to the household commodity c from source s in region q.

Domestic tourism spending is then removed and placed in the cost structure of *AusTourism*. At the end of this step, for each affected industry other than AusTourism the sum of costs is less than the sum of sales through the removal of costs associated with domestic travel. For *AusTourism* cost exceeds non-existent sales. Finally, consumption expenditure is below its initial level through the removal of domestic travel costs.

[15] The educated guess is based on commentary and data in the Qantas annual report relating to the financial year 2015-16.

Step A5 – Restoring database balance

Adding sales of domestically-produced *AusTourism* re-establishes database balance. Those sales become costs for industries and households. At this point, in each region the household and industries spend *directly* relatively small amounts on imported and domestically-produced tourism products such as accommodation and air transport. Their expenditures on these items are now accounted for through purchases of imported and domestically-produced *AusTourism services.*

B. Costs and Sales of *ForTourism* and *ForStudent*

Step B1 – Initial split for foreign visitors generally in Australia

ABS (5249.0) provides data on the purchasers' (market) value of *total internal consumption* on tourism *characteristic products* and *connected products* by foreign visitors. At this point, we do not distinguish between visitors here for education (students) and non-students. This information, when mapped to VURM commodities, allows us to construct the following national-level ratios

$$C(c) = \frac{ABS(5249.0)\ Foreign\ visitor\ domestic\ spending(c)}{VURM\ \exp ort\ \exp enditure(c)}, \quad \text{(all c in set COM)} \qquad (3),$$

where data for the numerator comes from ABS (5249.0) and data for the denominator is the purchasers' value of exports from the VURM database.

C(c) is applied to the VURM database uniformly across all destination-regions to split out the visitor contribution to exports of commodity c. Specifically, the ratios were applied to the following VURM-data matrices:

- BAS4(c,s), containing the basic value of exports for commodity c from region s;
- TAX4(c,s), containing the sales taxes associated with exports of c from s; and
- MAR4(c,s,m), containing the value of margin-type m associated with delivering to the port of exit commodity c in region s.

Step B2 – Foreign visitors in Australia

Spending by foreign visitors in Australia by commodity and region of expenditure generated in step B1 is split into spending by students and non-students based on the number of foreign students arriving in Australia. We recognise that spending by foreign students in Australia after their first year of study is unlikely to be included as sales to export in the core input-output data.[16] Hence, we focus only on spending of new arrivals.

First, we assume that all spending by foreign visitors on the *Tourism connected product* "Education" is spending by students on domestically-produced higher education services. For the remaining VURM commodities, we calculate foreign student expenditure as the product of two items: the number of first year foreign students; and per capita spending by commodity reported for *lone person aged under 35* in the ABS publication *Household Expenditure Survey* (Catalogue No. 6530.0).

Step B3 – Foreign visitors in Australia

[16] Based on informal discussion with the ABS, expenditure by foreign students after their first year of study is almost certainly included in household consumption.

At this point we might simply finish the job by removing foreign tourist and student expenditures in Australia by commodity and region from the existing BAS4, TAX4 and MAR4 data and inserting these numbers directly into the cost structures of *ForTourism* (for non-students) and *ForStudent.*

However, doing so ignores the reality that some of the goods and services sold to foreign visitors (e.g., clothing) is imported. In other words, there should be imported inputs to *ForTourism* and *ForStudent* production. In the existing database, those imports are treated as re-exports. We assume that re-exports are reported as own-use of the imported product.

Based on this assumption we estimate the value of tourism *re-exports* in the existing database, based on the economy-wide ratio of imports to total sales of each commodity. For example, for Textiles, Clothing and Footwear (*TCF),* the economy wide import penetration ratio is around 0.75. If, according to the step B2-calculation, the basic value of foreign student spending on TCF is $100, then we assume that $75 is spent on imported TCF and $25 is spent on the domestically-produced product. Consequently, $75 of imported product is removed from the cost of TCF production and added as basic-value import cost to *ForStudent*, and $25 is removed from the basic value of TCF exports and added as basic-value Australia-produced input to *ForStudent.*

At the end of this step, for *ForTourism* and *ForStudent* the sum of costs is less than or equal to the sum of sales, and export expenditure is below its original level through the removal of visitor exports.

Step B4 – Foreign visitors in Australia

Database balance for industries is restored by removing export sales (equal to the previous value of re-exports to foreign visitors). In addition, export sales are added to *AusTourism* and *AusStudent* equal to equal the cost of domestically-produced and imported inputs. After this, export expenditure in total returns to its original level. In the new database, tourism-related industries such as *Accommodation* have little or no direct exports and reduced inputs of imported own-product. Visitor exports are now produced by the newly created *AusTourism* and *AusStudent* sectors.

4. A summary of the Costs and Sales of the three new industries

The table below shows national-level data for the costs and total sales of each new industry. These numbers come from the VURM-VE database for 2015-16.

Summary of Data for Tourism Industries in 2015-16
(purchasers' prices unless otherwise specified)

	AusTourism		*ForTourism*		*ForStudent*	
	$billion	%	$billion	%	$billion	%
Cost Structure						
Drink and tobacco products	3.78	4.0	0.70	3.2	0.70	5.0
Textiles, clothing and footwear	3.86	4.1	1.24	5.7	0.31	2.2
Petroleum products	10.29	11.0	0.26	1.2	0.26	1.9
Other manufacturing products	7.17	7.6	1.46	6.7	0.36	2.6
Accommodation	9.03	9.6	5.78	26.5	1.02	7.3
Restaurants and hotels	17.51	18.6	3.68	16.9	1.22	8.7
Road transport – passenger	4.05	4.3	0.95	4.3	0.26	1.9
Air transport – passenger	11.34	12.1	2.74	12.6	0.91	6.5
Dwelling services	4.30	4.6	0.21	0.9	0.82	5.8
Admin. support (travel operators)	4.28	4.5	0.32	1.4	0.04	0.2
Arts and recreation	3.54	3.8	0.67	3.1	0.22	1.6
Gambling	0.51	0.5	0.34	1.6	0.11	0.8
Tertiary Education	0.42	0.4	0.00	0.0	5.07	36.1
Other	*13.90*	*14.8*	*3.47*	*15.9*	*2.73*	*19.4*
Total costs = Total basic-value sales	93.97	100.0	21.81	100.0	14.04	100.0
Basic value of sales						
Households	58.71					
Business and students	35.26					
Exports			21.81		14.04	
Sales to import	48.15					
Includes the domestic air transport margin	1.78					

5. Appendix references

Dixon, P. and Rimmer, M.T. (2002), USAGE-ITC: Creating a 1992 Benchmark input-output database, further developments, item TPGW0134 on the CoPS archive downloadable at https://www.copsmodels.com/archivep.htm.

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