Regional Variations in Tourist Consumption Patterns: A Model of Demand for Domestic Tourism in Australia

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This article analyses the demand for Australian tourism goods and services by Australian households distinguished by the region of origin. A system of demand equations based on the Almost Ideal Demand System that incorporates seasonality is estimated using tourists' consumption data collected through quarterly National Visitor Surveys. The demand system consists of five commodity aggregates representing the major consumables of tourists: accommodation, food, transportation, shopping, and entertainment. Nine demand systems were estimated, eight based on regional consumption data representing regional demand, and one aggregate (national) model based on a pooled sample. Estimated models are statistically significant and the derived elasticities are theoretically consistent and empirically plausible. Overall, demand for the five commodity aggregates is found to be relatively price-inelastic, while the degree of price sensitivity varied across the commodity aggregates and regions. Of the five commodity aggregates, the demand for food is found to be the most price-elastic, followed by accommodation; the least elastic is the demand for transportation. In contrast, expenditure elasticities associated with regional demand reveal relatively expenditure-elastic demand for most commodity aggregates, with significant variations across the regions, particularly in the demand for transportation, followed by accommodation and shopping. The cross-price elasticities derived from all models reveal gross complementarity of demands. This implies that tourists' overall utility depends on their joint consumption of a bundle of goods and services. The observed relatively price-inelastic demands, coupled with the apparent complementarity of demands, may reflect the possibility that a latent price sensitivity is associated with tourist demand.

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I. INTRODUCTION

Domestic tourism has been a 'poor cousin' to the seemingly more glamorous international tourism market worldwide, attracting little public or academic interest. It has received limited attention in official promotional activities, despite the fact that domestic tourists constitute over 80 per cent of world tourist flows. In Australia, domestic tourism is the major driver of the national tourism sector accounting for 74 per cent of total tourist expenditure (of $110 billion) and 73 per cent of tourism GDP Australian Bureau of Statistics (ABS) 2013, Tourism Research Australia (TRA) 2014). Australia's distinct geo-political features pave the way for extensive domestic travel and tourism activities. This mass landscape (of 7.7 million square kilometres) has four time zones, and its population is concentrated into eight divisions or regions (six states and two territories), each with its own political and economic identities. These coupled with the diversity of a land of varied natural and man-made attractions offer a wide range of leisure opportunities.

Australia is endowed with abundant natural and man-made attributes located in different regions. For example, landmarks such as Uluru and the Kakadu National Park in the Northern Territory, sandy tropical beaches in northern Queensland, temperate rain forests and breathtaking scenery in Tasmania, opal mines and wineries in South Australia, unique flora and fauna in Western Australia, the Sydney Harbour and Opera House in New South Wales; unique geographical features such as the Great Ocean Road and the Twelve Apostles in Victoria; and aboriginal culture and historical sites across the land make Australia a unique destination for the wanderlust traveller. Further, division of the Australian population geographically into the eight divisions of states and territories adds an additional dimension to its domestic tourism—interstate and intrastate tourism. It is within this environment that Australian domestic-tourism activity grew over the years, with distinctive tourist infrastructure and attractions, both within and across the eight regions. Further, domestic tourism in Australia has significantly contributed to regional development and has emerged as an important growth strategy for all eight states and territories.

With ever-increasing reliance on tourism as an alternative growth strategy, aggressive promotional strategies are being adopted by the states and territories to lure tourists. This has resulted in a renewed interest in domestic tourism within policy circles, including the national and regional agencies. Much of the focus has been on regional tourist spending, and this is understandable given that the economic benefits flowing from tourism depend primarily on the level of tourists' spending. Level of spending, on the other hand, depends on the consumption patterns of tourists and the associated demand for goods and services. Consumption patterns are governed by preferences of tourists as consumers. From a policy perspective, it is important to understand the determinants and the level of tourist expenditures associated with tourist consumption and the allocation of such expenditures on various goods and services.

In this study we attempt to shed light on consumption patterns of domestic tourists, with particular emphasis on geographic diversity. In the process, we aim to incorporate geographical diversity on the aggregate demand for tourism goods and services, as well as the consumption patterns of tourists from different regions. This is achieved by modelling and estimating the consumer expenditure-allocation model in a preference-consistent utility-maximisation framework. The remainder of the paper is organised in five sections. In the next section, an overview of Australian domestic tourism activity is presented highlighting its salient features. This is to set the background for the study. The conceptual framework and modelling strategy are set out in Section 3, along with a discussion on variable specification, data, and model-estimation methods. Empirical results are presented in Section 4, and the final section summarises our major findings, and our broad policy inferences.

II. DOMESTIC TOURISM IN AUSTRALIA: AN OVERVIEW

Domestic travel and tourism took place in Australia for decades; however, only in the late 1980s has the significance as a viable economic activity been formally recognised. Of the two types of trips undertaken by Australians—day and overnight—the day trips are the dominant category. In 2013 for example, Australians made 168 million day trips compared with 75 million overnight trips. However, in terms of the expenditure associated with the trips, overnight trips are the leading category, with estimated spending accounting for $63 billion compared with the spending of $19 billion by the day-trippers. The focus in this study is overnight leisure tourism.

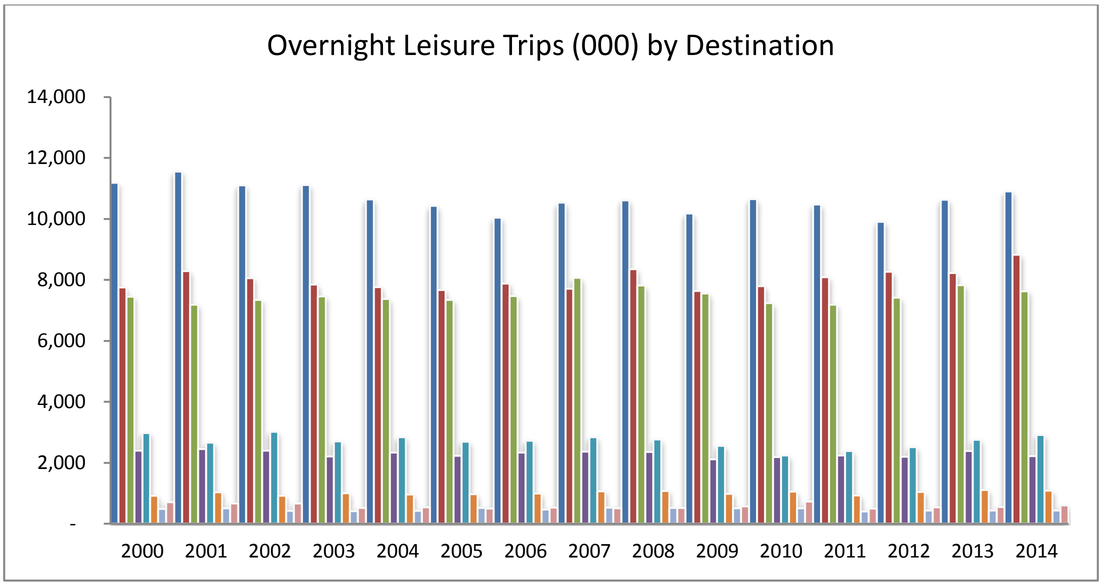

Figure 1: Domestic Tourist Nights

The key driver of domestic tourism in Australia is its geo-political diversity. For centuries, Australians have been moving between different states and territories for economic, political, and social reasons. While many travel between and within the states for leisure, visiting friends and relatives is also a major component of Australian domestic tourism, followed by business travel (Ref) . Among the different geo-political regions, New South Wales (NSW) is the premier tourist destination, followed by Victoria (VIC), Queensland (QLD), Western Australia (WA), South Australia (SA), Tasmania (TAS), the Northern Territory (NT), and the Australian Capital Territory (ACT). This pattern remained consistent over the 2000–2014 period, as Figure 1 shows, wherein overnight leisure trips by destination are graphed.

As NSW is the premier destination for local tourists, it is also the largest generator or origin of domestic tourists. For example in 2013, NSW residents (aged 15 and over) undertook nearly 11 million overnight leisure trips. The second largest generator of tourists are Victorians (9 million), followed by Queenslanders (8 million), Western Australians (3 million) and South Australians (2 million). Of the remaining small divisions, fifth in significance is Tasmania followed by the ACT, and the smallest numbers originate from the NT. As is evident from Table 1, another feature of Australian domestic leisure tourism is that the majority of the local tourists spend their leisure time in their home state (intrastate). An overwhelming majority of Western Australians spend their leisure time in their own state (87 per cent), followed by VIC (80 per cent), SA (72 per cent), and NSW (71 per cent). In contrast, the ACT residents choose to spend their leisure time interstate, as do a significant proportion of the NT residents. The majority of Tasmanians also travel interstate for leisure and they tend to spend relatively more nights away. Overall, a majority of leisure tourists spend their leisure time intrastate, thus it is the dominant component of Australian domestic tourism. While tourism takes place within and between all states, the three states of NSW, VIC, and QLD dominate the domestic leisure tourism market. These three states account for over 80 per cent of total trips undertaken by Australians in 2013.

Table 1: An Overview of the Australian Domestic Leisure Tourism (2013)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
Leisure Trips	10897	8823	7625	2213	2909	1079	431	595
Trips: Intrastate	70.90%	80.20%	62.30%	72.20%	87.00%	52.70%	30.90%	0.80%
Trips: Interstate	29.10%	19.80%	37.70%	27.80%	13.00%	47.30%	69.10%	99.20%
Leisure Nights	38556	30009	34519	8070	12939	4596	2176	1445
Nights: Intrastate	64.40%	72.80%	43.80%	59.20%	74.20%	29.60%	11.60%	0.90%
Nights: Interstate	35.60%	27.20%	56.20%	40.80%	25.80%	70.40%	88.40%	99.10%
Average Stay (nights)	3.54	3.4	4.53	3.65	4.45	4.26	5.05	2.43
Expenditure	$6,168,960	$4,921,476	$5,799,192	$1,444,530	$2,406,654	$877,836	$552,704	$332,350
Expenditure Shares	27.4%	21.9%	25.8%	6.4%	10.7%	3.9%	2.5%	1.5%
Expenditure per Trip	$566	$558	$761	$653	$827	$814	$1,282	$559
Expenditure per Night	$160	$164	$168	$179	$186	$191	$254	$230

Source: National Visitor Survey–December 2013, Quarterly Results of the National Visitors Survey, Tourism Research Australia, Canberra.

The three dominant states account for the lion's share of tourism spending on the various goods and services demanded and consumed by the tourists. The largest demand comes from the two states of QLD and NSW, which account for over 58 per cent of total tourists’ spending, followed by VIC (22 per cent), WA (11 per cent), and SA (6 per cent). The remainder is shared by the three small regions of TAS (4 per cent), NT (3 per cent), and the ACT (2 per cent). Per capita demand, measured in terms of average expenditure per trip, is highest in the NT with an average spending of $1282, followed by WA ($827), TAS ($814), and QLD ($761). The lowest average spending is found in VIC ($558); however, no significant variation is evident in average spending between VIC and the other two divisions—NSW and the ACT.

As with the average trip expenditures, noteworthy variations in spending per night are evident across the regions. The highest spending per night is evident in the NT ($254 per night), followed by the ACT ($230), TAS ($191), WA ($186), and SA ($179). In the case of the NT, we observe that tourists tend to stay much longer than in any other destination (the longest time is five nights), while tourists in the ACT stay the shortest time (two nights). Yet, average spending per night is appreciably higher in the ACT. Overall, it appears that the NT and the ACT are the most expensive destinations in Australia, followed by TAS, WA, and SA. The daily costs of staying in the three remaining destinations are not significantly different; they range from $160 to $168. Overall, apparent variations in tourist spending may reflect the differences in tourist preferences from different origins, differences in the cost of the consumption bundle at different destinations, and the lengths of stay. We explore these issues in detail in the next section where we model the consumption behaviour of tourists in a preference-consistent utility-maximising framework.

III. CONCEPTUAL FRAMEWORK AND THE MODEL

Following Divisekera (2003, 2013a), we begin with the assumption that a representative tourist chooses a destination to maximise utility. The tourist derives utility from being in a particular destination and enjoying available leisure attributes. Their utility stems from attributes of the destinations, such as pleasant climate, beautiful scenery, and (or) participating in socio-cultural events and features. These attributes are consumed jointly with other goods and services—henceforth tourism goods and services—available at the destination.

The tourist's utility function representing the preferences for consuming tourism and other goods and services is assumed to be weakly separable. The assumption of weak separability implies that the consumer's overall utility-maximising problem may be represented by a multi-stage budgeting process (Deaton and Muellbauer, 1980b). In the first stage, expenditure or income is allocated across various goods and services, inclusive of tourism. In the second stage, consumers allocate their budget among various tourism goods and services.

The tourist’s utility function representing preferences for various tourism goods and services are given by an expenditure function, c(u, p), which defines the minimum expenditure necessary to attain a specific utility, u, at given prices, p. The particular functional form used in this study to approximate the expenditure function is the one proposed by Deaton and Muellbauer (1980a), known as the Almost Ideal Demand System (AI).[2] The AI expenditure function takes the following form:

$$\log e(p,u) = \alpha_0 + \sum_{i=1}^{n} \alpha_i \log p_i + \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n} \gamma_{ij}^{*} \log p_i \log p_j + u\beta_0 \prod_{k=1}^{n} p_k^{\beta_k} \qquad (1)$$

[2] Among a variety of functional forms, the choice of AI is motivated by several considerations: First, given the objective of this research, the AI possesses all of the desirable properties of a flexible functional form, as suggested by Lau (1986) in his criteria for functional-form selection and the Lewbel (1989) empirical findings regarding the relative merits of the AI. The AI is consistent with the Barten (1993) criteria—simplicity, theoretical consistency, and ease of estimation.

where p_i is the vector of tourism prices, u is the level of utility, and $\alpha_0, \alpha_i, \beta_0, \beta_i$, and γ^*_{ij} are parameters (i, j = 1,… .n). Applying Shephard's Lemma, and after appropriate substitutions, AI demand functions in expenditure shares take the following form (Deaton and Muellbauer, 1980a: 313):

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log(X / P) \quad (2)$$

where w_i ($w_i \equiv p_i q_i / X$; $X \equiv \Sigma_i p_i q_i$) is the share of expenditure of the i^{th} commodity, p_j is the price of j^{th} commodity, X is the total expenditure on all tourism goods and services, and P is an aggregate price index defined as:

$$\log P = \alpha_0 + \sum_i \alpha_i \log p_i + 1/2 \sum_i \sum_j \gamma_{ij} \log p_i \log p_j. \quad (3)$$

For the model to be consistent with the basic axioms of demand and utility theory, the adding up, homogeneity, and symmetry conditions imply the following restrictions on parameters of the AI demand system.

$$\sum_{i=1}^{n} \alpha_i = 1, \sum_{i=1}^{n} \gamma_{ij} = 0, \sum_{i=1}^{n} \beta_i = 0; \sum_{i=1}^{n} \gamma_{ij} = 0; \gamma_{ij} = \gamma_{ji}; \quad (4)$$

It follows from the definition of budget shares, w_i,, and total expenditure, X, that the sum of the budget shares over n commodities adds up to total expenditure ($\sum w_i = 1$). This property which is referred to as the adding-up (aggregation) condition is automatically satisfied by the construction of the data. The homogeneity condition implies that the consumer does not exhibit money illusion; that is, decisions on purchases of goods and services are made on the basis of relative prices and income alone. The symmetry condition, ensuring the consistency of consumer choices implies that the total effect of a unit change in p_j on q_i is identical to the total substitution effect of a unit change in p_i on q_i. Given the theoretical restrictions, Eq. (2) represents a system of demand functions, which add up to total expenditure, are homogeneous of degree zero in prices and total expenditure, and satisfy Slutsky symmetry.

Demand and substitution elasticities can be computed based on the estimated model parameters. The implied expenditure or income elasticities, η_i, reflecting the sensitivity of demands to changes in expenditure or income can be calculated using the formula:

$$\eta_i = \beta_i / w_i + 1 \quad (5)$$

Price elasticities can either be derived from the Marshallian (uncompensated) demand equation or the Hicksian (compensated) demand equation. The Marshallian price elasticity for good i with respect to good j is defined as:

$$\varepsilon_{ij}^M = \frac{\gamma_{ij} - \beta_i (w_j - \beta_j \ln(X / P))}{w_i} - \delta_{ij} \quad (6)$$

where δ_{ij} is the Kronecker delta; δ_{ij} = 1 if i = j and 0 otherwise ($\delta_{ij} \neq 1$). The corresponding formula to calculate the Hicksian elasticities is:

$$\varepsilon_{ij}^{H} = \varepsilon_{ij}^{M} + w_j \eta_j \qquad (7)$$

Uncompensated price elasticities indicate how a change in the price of a commodity affects its own demand (own-price elasticity) and the demands for all other commodities (cross-price elasticities) included in the group. Compensated elasticities measure these effects, assuming that real expenditures are held constant. Cross-price elasticities allow the classification of commodity pairs as substitutes or complements; negative cross-price elasticities indicate that two commodities are complements; positive values indicate substitutes.

Variable Specification and Data

The model specified above attempts to explain the allocation of tourist expenditure among various goods and services in terms of relative prices and real expenditures. Expenditures represent the value of the goods and services consumed or demanded by tourists while visiting a destination. One distinct characteristic of a tourist's consumption—compared with most other goods and services that they consume daily—is that their consumption involves a bundle of goods and services such as food, accommodation, tranaport, and many other services (Copeland, 1991; Divisekera, 2013b). Thus, for analytical purposes, tourism consumption may be defined as a composite of commodities consisting of all goods and services that a tourist or visitor consumes while visiting a destination. Accordingly, the demand for tourism for a given destination may be measured in terms of tourist expenditure—the aggregate value of the consumption bundle. Further, total expenditure may be expressed as a product of three factors: visitor numbers, visitor nights, and expenditure per day. Thus, with the use of tourist expenditure as an indicator of the consumption level, one can use either tourist numbers (or trips) or tourist nights to measure tourism demand. The chosen measure of demand (implicitly) used in this study is the number of tourist nights.

Table 2: Commodity Classification

Major Commodity Aggregates	**NVS commodities (expenditure items)**
Food	Take-away and restaurant meals; alcohol, drinks, groceries for self-catering
Accommodation	Accommodation
Transportation	Taxi fares, airfares, car hire, fuel, long-distance transport, other local transport
Shopping	Shopping, gifts, souvenirs, other
Entertainment	Entertainment, museums, movies, package tours, organised tours, gambling

Consumption or expenditure data available for this study represent actual spending on 21 commodities by overnight tourists. These itemised expenditures are aggregated into five broad commodity groups as presented in Table 2.[3] These

[3] Of the 21 different itemised tourist-expenditure data available from the National Visitor Survey (NVS), expenditures on conference fees, educational course fees, vehicle maintenance or repairs, and

aggregate expenditures are used to construct the dependent variable, expenditure shares (w_i), defined in Eq. 2 above.

The lack of and the difficulties associated with identifying and measuring quantities of goods and services in tourist consumption bundle leads to an important empirical problem; that is, how to measure the prices of the basket of goods and services.[4] One approach is to design and price a given basket of goods that tourists usually consume while on a trip (see for example Bakkal, 1991). Another is to use average observed spending by tourists at destinations as the representative price of the consumption bundle (Divisekera, 2012). We opt to use the second approach, as it eliminates bias arising from choosing an arbitrary bundle of goods and services. Further, observed spending represents the actual costs borne by the tourists and the use of this avoids measurement problems concerning intangible services, which are an integral part of a tourist's consumption bundle. Accordingly, we use average spending per night as the proxy for relevant prices.

While our price definition is consistent with the chosen measure of tourist demand, it may not adequately capture the effects of prices on the level of tourist consumption. This is because an increase (decrease) in average spending per night may not necessarily be an indication of an increase (decrease) in the level of consumption if there are, for example, substantial inflationary pressures. This is particularly the case where consumption is measured over time; that is, using time series data as in the present study. Therefore, to counter this problem, average spending per night on each broad commodity group was deflated using appropriate price indices. For example in relation to the commodity group food, the Australian Consumer Price Index (CPI) sub-group series "Meals away from home and restaurant meals" was used as the deflator. For accommodation, a price index was developed based on the average takings per room-night occupied as published by the ABS. A weighted average of the CPI sub-group series transportation was used to deflate transport prices, the weights being the tourists' expenditure shares on each item under the broad commodity group transportation. For shopping (including other goods), a price index was derived by averaging six CPI sub-group price indices (clothing and footwear, glassware, tableware and household utensils, toiletries and personal care products, toys, games and hobbies, and communication). Finally, for the entertainment category, a price series was approximated using a weighted average of the CPI sub-group series leisure travel and accommodation (domestic), and recreation.

The price series derived above is in conformity with an ideal tourism price measure as proposed by O'Hagan and Harrison (1984): average daily spending represents the actual cost of a basket of goods and services consumed by tourists, which is adjusted for inflationary pressures allowing the capture of the true price effects on the level of consumption. Finally, of the two remaining variables, total

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the purchase of motor vehicles were excluded in this study. The necessary data are extracted from the Tourism Australia Database.

[4] In modelling tourism demands one key difficulty is to quantify the consumption bundle, as tourists consume a wide variety of goods and services. For example it is not possible to measure the quantities of food a tourist consumes precisely, as a range of food items is available. The same applies to transportation, where there are a number of transport modes available to choose from, and actual purchases are difficult to measure or quantify. Similarly, other major commodity aggregates such as entertainment and shopping are not practically measurable.

expenditure (X) is the sum of all expenditures borne by overnight tourists and is expressed on a per capita basis.

The data necessary for this study were extracted from the Domestic Tourism Database maintained by TRA. This is an extensive database and is updated on a quarterly basis. The database provides extensive data on both international and domestic tourism. The data are collected through two quarterly surveys: the International Visitor Survey (IVS) and the National Visitor Survey (NVS). All the necessary tourism expenditure data were extracted from this source. The quarterly time series extends from 1998:1 to 2013:4.

Model Estimation and Econometric Issues

The data used for model estimation refer to overnight leisure trips by Australians, and the sample consists of quarterly expenditure data from 2000:1 to 2013:4. With the use of quarterly data and the inherent seasonality associated with tourist demand, it is necessary to employ an appropriate modelling and estimation strategy. Tourists' demand for goods and services and their associated purchasing patterns are affected by seasonal cycles. For example demand for accommodation and transportation tends to be higher during the summer (peak period) and lower during the winter (off-peak), which is reflected in the market price of commodities. The common approach to model time series data with seasonality is to use deterministic seasonal dummy variables. More recently, questions have been raised regarding the underlying validity of the seasonal-adjustment approach, since seasonal adjustment introduces a "non-reversible" moving average (MA) component into time series data. Fraser and Moosa (2002) pointed to the possibility of biased estimates when predetermined dummy variables are used to account for seasonality. Further, seasonal fluctuations tend not to remain constant over time. Having the flexibility for a model to determine the existence and location of the season is especially appealing when there are clear structural shifts in seasons (Carlos and Gehlhar, 2004). This is the approach used in this study, which allows the seasonal cycle to be dictated by the data, rather than by the use of deterministic dummy variables that define the season. Accordingly, to incorporate seasonality and trends in tourist consumption data, the model given in Eq. 1 was augmented with seasonal trigonometric variables and a time trend. Thus, the share equations to be estimated are expressed as follows:

$$W_i = \alpha_i + \sum_{i=1}^{n} \gamma_{ij} \log p_j + \beta_i \log (X/P) + \theta_i^c \cos\frac{2\pi t}{4} + \theta_i^s \sin\frac{2\pi t}{4} + \theta_i^t . t \quad (1.1)$$

where $\theta^c{}_i$ and $\theta^s{}_i$ represent parameters on the trigonometric variables, and $\theta^t{}_i$ is the parameter on the time-trend variable. Since the budget shares sum to 1, these parameters should satisfy the following conditions:

$$\sum_{i=1}^{n} \theta_i^c = 0, \quad \sum_{i=1}^{n} \theta_i^s = 0, \quad \sum_{i=1}^{n} \theta_i^t = 0.$$

The general version of the model used for estimation is obtained by adding an additive disturbance term in Eq. 1.1. Following the standard practice (Barten, 1969; Berndt and Savin, 1975; Pollak and Wales, 1992), it is assumed that the error terms are distributed normally with expectation zero, the covariance matrix of the share disturbance is the same for all observations, and they are uncorrelated across observations.

The two basic theoretical restrictions of homogeneity and symmetry were imposed prior to the estimation, and the third restriction additively (budget shares sum to unity) is automatically satisfied by the data. Given that the dependent variables are shares (w_i) and they add to unity (by construction) the contemporaneous covariance matrix is singular. Dropping one equation to account for the singularity of the contemporaneous covariance matrix, the system is estimated using a multivariate regression technique. Parameters of the dropped equation are derived from the adding-up restriction and the parameters of the remaining equations. Thus only n-1 equations are estimated; the equation for Entertainment is left out during the estimation. The model is non-linear and a non-linear multivariate regression technique is required for estimation. The chosen method was the Maximum Likelihood Estimator and the models were estimated using the TSP econometric package.

IV. EMPIRICAL RESULS

Parameter estimates of the model are reported in Table 3 and the corresponding elasticity estimates are in Table 4. The overall statistical fit of the aggregate model is satisfactory; most estimated parameters were statistically significant at the levels of 5% or less (only two of the trigonometric variables were found be statistically insignificant). All the direct (γ_{ii}) and indirect or cross-price coefficients (γ_{ij}), were statistically significant at 5% or less. Similarly, all of the income or expenditure coefficients (β_i) were statistically significant at 5% or less. These coefficients measure 100 times the effect on the i^{th} budget share of a 1 per cent increase in real expenditures and prices, respectively. The remaining coefficients, which are associated with state dummy variables, are also highly statistically significant and, overall, the model seems to fit the data extremely well.

Prior to introducing the economic parameters associated with the model, it is useful to comment on the coefficients associated with the dummy state variables that can be used to evaluate the significance of the 'state of origin' as a determinant of aggregate demand. The origin effect, as reflected in the parameter estimates of state and territory dummy variables, varies across the nation reflecting the diversity of preferences for tourism by tourists from different regions. For example in relation to the commodity aggregate FOOD (accommodation and transport as well), the estimated coefficients for NSW, VIC, QLD, and SA are positive in sign and highly statistically significant. The positive coefficients imply that tourists from the respective regions effectively raise aggregate demand for food, accommodation, and transportation. That is, an increase in tourist numbers from NSW (as well as from VIC, QLD, and SA), *ceteris paribus*, will raise aggregate demand for the commodities in question. In contrast, the estimated coefficients for shopping and entertainment are negative. These suggest that tourists from NSW (as well as from VIC, QLD, and SA) are unlikely to influence the demand for the two commodity aggregates appreciably.

The dummy coefficients for the remaining four divisions—WA, TAS, ACT, and NT—have opposite signs; they are negative for Food, Accommodation and Transport, but positive for Shopping and Entertainment. Thus the four divisions have little effect on the demand for Food, Accommodation, and Transport while they positively affect the demand for Shopping and Entertainment. Given that the demand is modelled in share form, the negative dummy coefficients suggest that an increase in the tourist numbers from the respective states and territories will not bring about an across-the-board increase in the demand for all of the commodities. Overall, an increase in tourist numbers from NSW, VIC, QLD, and SA will boost the aggregate demand for Food, Accommodation, and Transportation while increases in tourist numbers from WA, TAS, ACT, and NT will boost the aggregate demand for Shopping and Entertainment. These differing outcomes may reflect the variations in preferences and consumption patterns of tourists from different regions.

Table 3: Parameter Estimates: National Demand Model with State/Territory Dummy Variables

	Equations									
Parameters	FOOD (1)		ACCOM (2)		TRANS (3)		SHOP (4)		ENTER (5)	
α_i	0.622	[.000]	-0.101	[.006]	-0.123	[.001]	0.504	[.000]	0.098	[.025]
γ_{ij}	0.144	[.000]								
γ_{ij}	-0.017	[.002]	0.107	[.000]						
γ_{ij}	-0.022	[.000]	-0.042	[.000]	0.112	[.000]				
γ_{ij}	-0.046	[.000]	-0.033	[.000]	-0.038	[.000]	0.129	[.000]		
γ_{ij}	-0.058	[.000]	-0.015	[.000]	-0.010	[.013]	-0.012	[.001]	0.096	[.000]
β_i	-0.075	[.000]	0.022	[.007]	0.034	[.000]	-0.024	[.000]	0.044	[.000]
δ_i NSW	0.197	[.000]	0.116	[.000]	0.128	[.000]	-0.200	[.000]	-0.242	[.000]
δ_i VIC	0.148	[.000]	0.067	[.000]	0.092	[.000]	-0.140	[.000]	-0.167	[.000]
δ_i QLD	0.087	[.000]	0.063	[.000]	0.044	[.000]	-0.088	[.000]	-0.131	[.000]
δ_i SA	0.031	[.000]	0.018	[.000]	0.018	[.000]	-0.031	[.000]	-0.036	[.000]
δ_i WA	-0.019	[.000]	-0.010	[.029]	-0.020	[.000]	0.023	[.000]	0.026	[.000]
δ_i TAS	-0.093	[.000]	-0.065	[.000]	-0.034	[.001]	0.081	[.000]	0.111	[.000]
δ_i ACT	-0.197	[.000]	-0.082	[.000]	-0.157	[.000]	0.189	[.000]	0.246	[.000]
δ_i NT	-0.155	[.000]	-0.107	[.000]	-0.072	[.000]	0.166	[.000]	0.169	[.000]
θ_i^c	-0.002	[.118]	0.002	[.228]	-0.006	[.000]	0.003	[.061]	-0.003	[.061]
θ_i^s	0.015	[.000]	-0.001	[.408]	-0.003	[.064]	-0.005	[.001]	0.005	[.001]
θ_i^t	0.001	[.000]	0.000	[.000]	0.001	[.000]	-0.001	[.000]	0.001	[.000]
W_i	0.272		0.237		0.216		0.158		0.108	

The estimated price and expenditure or income elasticities (evaluated at sample means) drawn from the aggregate model are reported in Table 4. All of the key elasticities—own-price and expenditure/income—are highly statistically significant and have the expected theoretical signs; income elasticities are positive, and own-price elasticities (diagonal elements of the elasticity matrix) are negative, implying that all commodities are normal goods. Ranking of income elasticities indicates that tourists' demand for Entertainment is the most income-elastic (with a coefficient of 1.4), followed by Transportation (1.15), Accommodation (1.1), and Shopping (0.8); the least elastic is the demand for Food (0.7). With elasticity greater than unity, an increase in the tourist budget will increase the demand for Entertainment, Transport and Accommodation, while the demand for Food and Shopping will rise less than proportionately. Thus, tourists perceive the three commodity aggregates of Entertainment, Transport and Accommodation as luxuries, whereas Food and Shopping are normal goods.

Own-price elasticities associated with each commodity aggregate are negative and less than unity in absolute value, implying that tourists' demands for the various goods and services are price-inelastic. Overall, demand for Accommodation is relatively the most price-elastic (-0.6), followed by Transportation (-0.5), Food (-0.3), Shopping (-0.13), and Entertainment (-0.03). Relatively, price-inelastic demand revealed for the five commodity aggregates indicates that tourists perceive these five commodity aggregates as necessities. Among the estimated elasticities, the elasticity of demand for accommodation is of particular importance, as it serves as an indicator of consumer preferences for domestic tourism, given that the unit of measurement of demand is tourist nights. For example relatively elastic demand (1.1) for Accommodation indicates that increases in a tourist's budget or income lead to a more than proportionate increase in the demand for domestic tourism. Moreover, we observe that the price elasticity of demand for Accommodation is also the highest among all of the commodity aggregates. This, coupled with income-elastic demand would suggest that household income and prices have a significant effect on the accommodation sector and, by inference, on the demand for domestic tourism. In relation to Transportation, the second most important commodity that facilitates domestic tourism reveals an income-elastic demand. This would suggest that a rising tourist budget leads tourists to spend more time away from home to travel to various destinations.

Table 4: Elasticities of Demand for domestic tourism

	Marshallian 'Own' and 'Cross-price' elasticities					Expenditure
	FOOD	*ACCO*	*TRAN*	*SHOP*	*ENTER*	*Elasticity*
FOOD	**-0.259**	-0.143	-0.222	-0.173	-0.854	0.724
	[.000]	[.000]	[.001]	[.000]	[.000]	[.000]
ACCO	-0.038	**-0.557**	-0.210	-0.192	-0.176	1.091
	[.000]	**[.069]**	[.000]	[.002]	[.000]	[.000]
TRAN	-0.083	-0.177	**-0.479**	-0.242	-0.093	1.158
	[.000]	[.000]	**[.000]**	[.108]	[.000]	[.000]
SHOP	-0.081	-0.167	-0.227	**-0.135**	-0.244	0.845
	[.000]	[.000]	[.000]	**[.001]**	[.690]	[.000]
ENTER	-0.265	-0.046	-0.020	-0.105	**-0.036**	1.406
	[.026]	[.390]	[.002]	[.002]	**[.000]**	[.000]

Note: Diagonal elements are 'own' price elasticities. Off-diagonal elements are cross-price elasticities

The consumption behaviour of tourists is better understood by examining how they respond to changes in the price of a particular commodity and the resulting change in the demand for other commodities in the bundle. These relationships can be evaluated using the cross-price elasticities of tourists associated with their consumption bundle—the off-diagonal elements of the elasticity matrix. For example with uncompensated own-price elasticity of -0.26, an increase in food prices reduces the demand for food as well as the demand for other commodity aggregates, as indicated by negative cross-price elasticities (row FOOD). All of the cross-price elasticities associated with the commodity aggregates are negative implying that commodities in the tourist consumption bundle are complementary—an increase (fall) in the price of one commodity leads to fall (rise) in the demand for all of the commodity pairs. This result is consistent with *a priori* expectations, as tourists consume a bundle of goods and services while on tour. This result also has important implications for judging the sensitivity of tourists to prices, which is not well reflected in the estimated own-price elasticities. Note that relatively low own-price elasticities, as revealed, imply that tourists are less sensitive to prices. At the same time, negative cross-price elasticities suggest that even a small increase in the price of one commodity could reduce the demand for all goods and services. Thus, it appears that there is a latent price sensitivity associated with tourism demand.

Demand for Tourism by States and Territories of Origin

The own price and income elasticities drawn from regional models are reported in tables 5 and 6.[5] To facilitate comparison, summarised in the tables are the corresponding national aggregate elasticities. The estimated elasticity coefficients are significantly different from zero, as revealed in the corresponding p values and they have the expected theoretical signs: All expenditure/income elasticities are positive and the Marshallian own-price elasticities (diagonal elements of the elasticity matrix) are negative.

Table 5: Comparison of Regional Demand Elasticities: Price Elasticities

Commodities	NSW	VIC	QLD	WA	SA	TAS	ACT	NT	NATIONAL
Food	-0.54 [.000]	-0.70 [.000]	-0.33 [.001]	-0.43 [.000]	-0.32 [.007]	-0.60 [.000]	-0.46 [.000]	-0.41 [.000]	-0.26 [.000]
Accommodation	-0.34 [.000]	-0.61 [.000]	-0.45 [.000]	-0.51 [.000]	-0.45 [.000]	-0.71 [.000]	-0.49 [.000]	-0.30 [.000]	-0.56 [.069]
Transport	-0.43 [.000]	-0.82 [.000]	-0.33 [.000]	-0.35 [.000]	-0.10 [.058]	-0.37 [.000]	-0.37 [.000]	-0.56 [.000]	-0.48 [.000]
Shopping	-0.28 [.003]	-0.27 [.001]	-0.20 [.004]	-0.30 [.000]	-0.14 [.015]	-0.41 [.000]	-0.32 [.000]	-0.22 [.000]	-0.13 [.001]
Entertainment	-0.12 [.273]	-0.09 [.229]	-0.27 [.000]	-0.24 [.014]	-0.30 [.000]	-0.23 [.021]	-0.15 [.108]	-0.12 [.084]	-0.04 [.000]

Magnitudes of price elasticities of demand for Food reveal significant variations among the eight states and territories ranging from -0.32 to -0.7. Most importantly, magnitudes of regional price elasticities for Food are appreciably higher than that of the national aggregate elasticity. The tourists most sensitive to prices are seen in the demand by VIC (with an elasticity of -0.7), followed by TAS; the least sensitive are NSW and NT tourists. In relation to Accommodation, demands are quite price-inelastic and closer to the national average, with the exception of the demand from TAS. In the Transport category VIC tourists are the most sensitive to prices followed by the NT, and the least sensitive are those from SA. The demands for Shopping and Entertainment are quite price-inelastic, and regional elasticities are above the national average. Overall, price elasticities of demand for the commodity aggregates from each region reveal quite inelastic demand, while the degree of price sensitivity varied across the nation.

As with the price elasticities, the income elasticities of demand also vary across Australia. Elasticities of demand for FOOD are around unity across the states and territories and are above the national average. Elasticities of demand for Accommodation also around unity, but are below the national average with the exception of TAS. Similarly, Transport elasticities are around unity and below the national average. Elasticities of demand for Shopping showed significant variations across the states and territories, with NT having the highest elasticity; the lowest is for TAS. Demand for Entertainment is the most elastic among all commodities, with

[5] The full set of parameter and elasticity estimates of demands from each state and territory are not reported in the text for space reasons. These estimates are available from the author on request (Sarath.divisekera@vu.edu.au).

the exception of the NT. Income-inelastic demand is evident in the case of the NT, while demands from all other regions showed elastic demand. The most elastic is the demand from QLD followed by VIC, SA, WA, and NSW.

Table 6: Comparison of Regional Demand Elasticities: Expenditure Elasticities

Commodities	*NSW*	*VIC*	*QLD*	*WA*	*SA*	*TAS*	*ACT*	*NT*	*NATIONAL*
Food	1.01	1.02	0.84	0.93	0.87	0.94	1.05	0.97	0.72
	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]
Accommodation	0.98	0.89	0.91	0.97	1.06	1.14	1.02	0.97	1.09
	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]
Transport	1.08	0.94	1.05	1.12	0.98	1.04	0.92	1.02	1.16
	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]
Shopping	0.74	0.80	1.04	0.81	0.92	0.70	0.90	1.12	0.85
	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]
Enter	1.18	1.48	1.53	1.25	1.31	1.32	1.11	0.77	1.41
	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]

V. SUMMARY AND CONCLUDING REMARKS

An attempt was made to examine the consumption behaviour of local leisure tourists based on a model of consumer choice, distinguished by the state or territory of origin of the tourists. The consumption bundles of the tourists were accumulated into five commodity aggregates. The results indicate that, overall, demand for the five commodity aggregates are price-inelastic, while income elasticities range from unity to greater than unity. Relatively price-inelastic demands for most commodities would suggest that the five commodity aggregates are necessities from a tourist's point of view. Another important finding is the apparent complementarity of demands. This finding confirms the proposition that tourists consume a *bundle* of goods and services, and their purchase decisions are based on a bundle rather than on individual commodities.

The study has generated substantial new economic parameters—expenditure/income, own and cross-price elasticities of demand—that enhance our understanding of the consumption behaviour of domestic tourists from the eight geo-political regions in Australia. These economic parameters can be used to develop appropriate policy measures aimed at both promoting and maximising the gains from domestic tourism for individual states and territories. Moreover, these can be used as inputs for economic modelling and, in particular, in the regional general equilibrium models that are widely used in Australia for evaluating the economic impacts of domestic-tourism policy simulation. Finally, the methodology adopted and developed in this study should provide a useful source for future such studies, and the results may serve as benchmarks for national and international comparisons. To conclude our findings of substantial variations in the magnitudes of demand elasticities between the national and regional models, as well as across various states and territories, we would suggest that caution should be exercised when using aggregate economic parameters for developing policy measures. This is because if one is to use national elasticity estimates as the basis for policy formulations, they may not necessarily bring about the expected outcomes. The magnitude of elasticities varies across divisions.

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