Intrastate and interstate tourism demand in Australia: An empirical analysis

ABSTRACT

Few studies have investigated intrastate and interstate tourism demand in Australia despite these tourists have different travel characteristics. Using cointegration analysis and error-correction models, this study examines economic determinants of intrastate and interstate tourism, and assesses their relative importance for both types of tourism. Two main findings discovered from this research. First, most of the economic coefficients are not consistent with economic theory. Second, the coefficients for intrastate tourism demand are higher than the coefficients for interstate tourism demand in NSW and WA. This may be useful for developing separate policies and marketing strategies for intrastate and interstate tourism.

Keywords: intrastate tourism demand; interstate tourism demand; Australia; cointegration analysis

INTRODUCTION

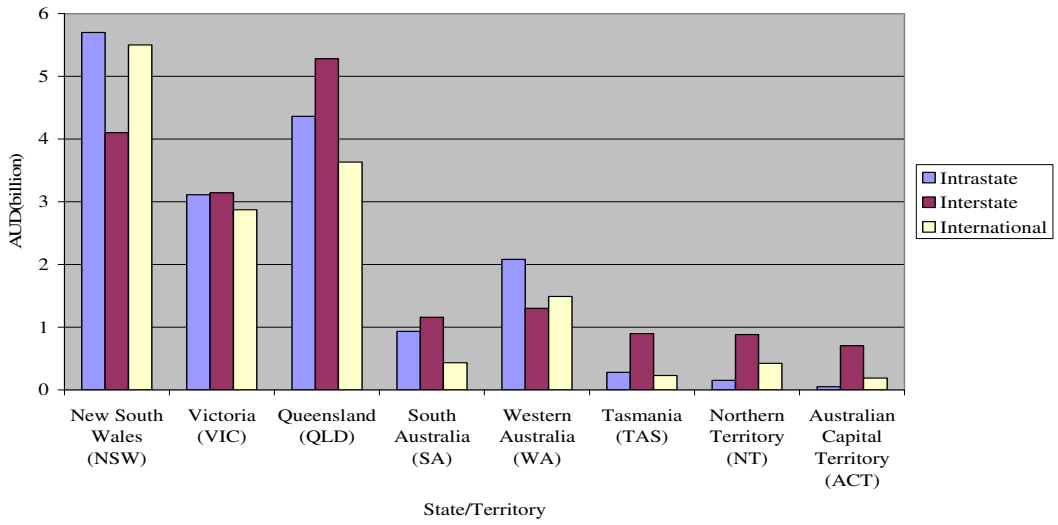
In Australia, domestic tourism can be segregated into two categories, namely intrastate and interstate tourism. Such segregation is important because, according to Tourism Research Australia (2007a), intrastate and interstate visitors have different travel characteristics. For instance, most of the interstate visitors travel by air whereas the majority of the intrastate visitors use private vehicles.

Interstate visitors differ from intrastate visitors in terms of the length of trips and travel expenditure. For the year ended 31 March 2007, interstate travellers in Australia stayed longer and spent more (averages of 5.4 nights and AUD710, respectively) than intrastate visitors (3.2 nights and AUD342.32, respectively).

Furthermore, expenditure by intrastate and interstate visitors are the main revenue source for tourism industry in Australia. Figure 1 shows that, in New South Wales and Western Australia, the expenditure by intrastate visitors exceeded the spending by international visitors. In Queensland, South Australia, Tasmania, Northern Territory and Australian Capital Territory, the expenditure by interstate visitors surpassed the amount of spending by international visitors. For Victoria, each segment market spent approximately AUD3 billion (Figure 1). Nevertheless, West and Gamage (2001) studied the impacts of tourism on the Victorian economy and they discovered that interstate tourism contributed the greatest amount of gross state product and employment to the Victorian economy in Australia, followed by international visitors.

Most of the literature on Australian domestic tourism demand examined the effects of economic variables on domestic visitor nights and expenditure, but did not distinguish between intrastate and interstate tourism demand. This study evaluates intrastate and interstate tourism demand separately, using a consumer demand model, which emphasizes domestic household income and tourism prices. The results of this study of economic determinants for intrastate and interstate tourism demand should influence pricing policies and marketing strategies for intrastate and interstate tourism in Australia.

Figure 1
Visitor expenditure in each State/Territory for the year ended 31 March 2007.
[Source: Based on Tourism Research Australia (2007a and 2007b)]



LITERATURE REVIEW

In Australia, Hamal (1996) argues that domestic holiday nights are strongly affected by tourists' income, prices of domestic goods and services, and prices of overseas holidays. To conduct the demand analysis, the author employed cointegration and error-correction models to estimate the economic determinants, based on annual data from 1978-79 to 1994-95. All of the above variables significantly affected the demand; the influences of income and prices of overseas holidays were positive, whereas prices of domestic goods and services were negative. This implies that increases in domestic household income and prices of overseas travel will increase demand for domestic holidays. However, demand will decline when tourism prices increase.

Nevertheless, the most recent study by Athanasopoulos and Hyndman (2008) reveals different findings. The authors proposed that the number of domestic holiday nights is a function of time trend, personal debts, GDP per capita, prices of domestic holidays, dummy variables for Bali bombings and Sydney Olympics, and seasonal dummies. The price of overseas holidays was omitted from above conclusions because the effects of this variable were not statistically significant. The authors combined an innovation state space model (Hyndman et al., 2002) with exogenous variables and employed quarterly data from 1998 to 2005. According to the empirical findings, the signs of coefficients of debt and GDP were positive and negative, respectively. This implies that a higher growth rate of borrowing can increase consumers' confidence to spend in domestic holidays. On the other hand, the negative coefficient of GDP indicates that, an increase in domestic tourists' income can suppress demand for domestic holiday travel due to Australians preferring overseas holidays as income rises.

Given the empirical research above, there are inconsistent findings about the effects of income and prices of overseas holidays on Australian domestic tourism. The underlying reasons could be the different models and data employed in the studies (Li et al., 2005).

Divisekera (2007) estimated economic determinants of Australian domestic tourism demand using an Almost Ideal Demand System (AIDS) model (Deaton and Muellbauer, 1980) for annual data on tourism expenditure by states of origin from 1998 to 2004. The empirical results showed that demand for tourism goods and services was elastic in terms of income but varied across different states of origin. However, the demands for tourism goods and services appear to be price inelastic for tourists from all states of origin. This shows that expenditure on tourism goods and services by domestic tourists is not affected by the changes in tourism prices but is strongly influenced by the tourists' income.

Apart from the above, Huybers (2003) investigated travel decisions by potential tourists living in Melbourne, who could choose to travel interstate or to other parts of Victoria. The study employed discrete choice modelling analysis. According to the empirical results, 1% increases in the expenditure for trips to Sydney and the Goldfields of Victoria reduce the number of Melbourne overnight tourists by around 1% and 0.5%, respectively. One of the possible reasons for such results is that the cost of travelling to Sydney (interstate) is relatively more expensive, being about twice of the cost of visiting the Goldfields of Victoria (intrastate). Hence, this indicates that the costs of intrastate and interstate tourism can determine domestic tourists' decision to travel within Australia.

THE MODEL

It is widely acknowledged in the literature of international tourism demand that income and tourism prices play a centre role in determining the demand (Crouch, 1995 and Lim, 1997). Based on economic demand theory, an increase in real household income will encourage more people to travel. As for prices, Seddighi and Shearing (1997) argued that there are two elements of tourism price, namely the cost of travel to the destination and the cost of living in the destination. Furthermore, price of travelling to competing destination is also an important determinant of tourism demand because it represents the substitute price of a destination in relation to its competitors.

In the context of domestic tourism demand, a study of how income and tourism price affect the demand is crucial. Maurer et al. (2006) analysed the causal relationships among economic variables and Australian domestic tourism variables and found that the main drivers of domestic tourism demand are discretionary income, consumer confidence index and prices. They concluded that tourism stakeholders should assess domestic tourism market by examining the consumers' financial constraints, Australia's economic outlook and costs of domestic travel.

Regarding domestic tourism prices, the costs of living at a region such as the prices of tourist accommodation, recreation and restaurants are the most crucial factors for Australian domestic tourism demand. This is because consumers decide to travel based on their financial affordability to stay at the destination (Gokovali et al, 2007). Hence, if the prices of these items increase, it is most likely that domestic tourism demand will decline. Furthermore, as overseas travel is a substitute product for Australian domestic tourism, the prices of overseas holidays could influence the demand for domestic tourism.

Apart from that, costs of fuel and domestic airfares are the main transportation costs for domestic travel in Australia. If unexpected increase in fuel prices occurs in Australia, domestic tourism industry could be largely affected because 86% of domestic tourists used self-drive transport to visit at least one region (Prideaux and Carson, 2003). Changes in domestic airfares could also influence the demand for domestic overnight travel.

Based on the literature above, a model of intrastate and interstate tourism demand can be written as:

$$DDT_{i,j,t} = f(Y_{i,t}, ACC_{j,t}, RR_{j,t}, F_{j,t}, DA_t, OC_{i,t}) \quad (1)$$

where DDT = Demand for domestic tourism from state of origin (i) to state of destination (j) at time t, Y = domestic household income in state of origin i, ACC = costs of accommodation in the state j, RR = prices of recreation and restaurants in state j, F = cost of fuel in state j, DA = the cost of domestic airfare, and OC = the price of overseas holidays in state i.

The null hypothesis is that the economic variables have no significant impacts on intrastate or interstate tourism, whereas the alternative hypothesis states otherwise. The expected signs for Y and OC are positive and negative for ACC, RR and F. For intrastate tourism demand, the sign for DA is anticipated to be positive because interstate tourism can be a substitute product for intrastate tourism. In other words, an increase in the airfare for interstate travel will encourage more Australians to travel within their own states. On the other hand, for interstate tourism, the expected sign of DA is negative, signifying that a fall in domestic airfares will promote more Australians to travel interstates.

METHODOLOGY

This study employs a vector autoregressive (VAR) model, developed by Sim (1980). Unlike single equation models, this model treats all variables as endogenous (Song and Witt, 2006). The model has been employed for international tourism demand (Mello and Nell, 2005; Song and Witt, 2006).

To illustrate the procedure, let $Z_{i,j,t} = \begin{pmatrix} \ln DIT_{i,j,t} \\ \ln Y_{i,t} \\ \ln ACC_{j,t} \\ \ln RR_{j,t} \\ \ln F_{j,t} \\ \ln DA_t \\ \ln OC_{i,t} \end{pmatrix}$, then, VAR model can be written as:

$$Z_{i,j,t} = \mathrm{B}_1 Z_{i,j,t-1} + \mathrm{B}_2 Z_{i,j,t-2} + \ldots + \mathrm{B}_p Z_{i,j,t-p} + U_{i,j,t} \quad (2)$$

where ln = natural logarithm, p = number of lags, B = an (m X m) matrix of parameters, and U_t = error term. The model is specified in log-linear form to assist interpretation of estimated coefficients in terms of elasticities (Lim, 1997).

Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests will be used to assess whether all variables have the same order of integration. If they do, Johansen's (1995) cointegration and error-correction methods will be considered in this research. These methods provide long-run and short-run estimations for the purpose of long-term tourism planning and short-term business forecasting (Song and Witt, 2000). The methods have been widely used for international tourism demand to Australia (Kulendran and King, 1997; Lim and McAleer, 2001), but have not been applied in the demand analysis of intrastate and interstate tourism.

To derive the error-correction model, as given in Johansen (1995), equation (2) is transformed as follows:

$$\Delta Z_{i,j,t} = \sum_{l=1}^{p-1} \Phi_l \Delta Z_{i,j,t-l} + \Phi Z_{i,j,t-p} + U_{i,j,t} \qquad (3)$$

where $\Phi_l = -(I - \mathrm{B}_1 - \mathrm{B}_2 - ... - \mathrm{B}_l)$, and $\Phi = -(I - \mathrm{B}_1 - \mathrm{B}_2 - ... - \mathrm{B}_p)$. Φ_i and Φ are short-run and long-run adjustments to the changes in Z_t, respectively. Equation 3 is vector error-correction model (VECM). The equilibrium relationship can be expressed as:

$$\Phi = \alpha\beta',$$

where α is the speed of adjustment to disequilibrium, and β' are cointegrating vectors. The existence of cointegration relationships can be determined by the rank of Φ, $r \leq (m-1)$. To choose *r*, maximal eigenvalue and trace tests will be employed.

Diagnostic tests will be carried out to investigate whether the error-correction model is correctly specified. The tests examine the robustness of the model, existence of serial correlation, non-normality and heteroscedasticity. According to McAleer (1994), if the model rejects null hypotheses of the tests, one of the reasons could be incorrect specification of functional form. Hence, this paper will use linear model if a log-linear functional form fails the diagnostic tests.

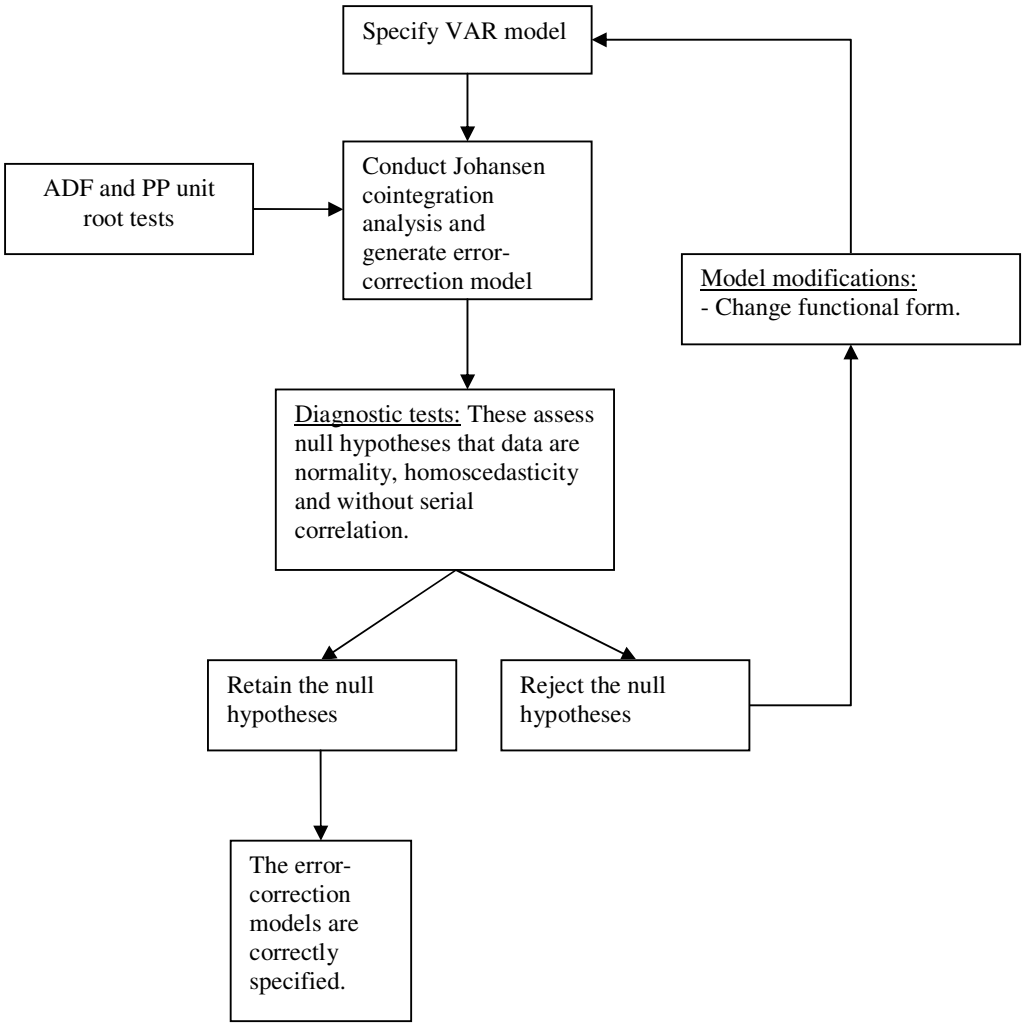
Figure 2 below summarises the abovementioned methodology.

DATA

In this paper, the data on intrastate tourism demand are based on the number of tourists travelling within their own states, and for interstate tourism demand, the number of tourists from a state of origin to a state of destination is used. The investigated states in this study are New South Wales, Queensland, Victoria and Western Australia because these states are the most visited destinations by intrastate and interstate tourists in Australia (See Figure 1). The data are available on quarterly basis from March 1999 to March 2007 and can be obtained from the *Travel by Australians* which is published by Tourism Research Australia.

The data on income and prices of tourism goods and services can be downloaded from the websites of the Australian Bureau of Statistics and Department of Transport and Regional Services. The income variable employed in this paper is the average weekly earnings per person from state of origin. Other potential income variables such as gross states products and disposable income have been considered but they are only available on annual basis. In terms of tourism prices, the average prices of accommodation per room night and household expenditure on recreation, restaurant and cafes in each state of destination are used as the proxy variables for the cost of accommodation and price of recreation and restaurants, respectively. Furthermore, domestic transportation costs can be measured in terms of the consumer price index (CPI) of automotive fuel in each state of destination and domestic economy airfares. This paper also employs data on CPI of overseas holidays, travel and accommodation to represent the price of substituting intrastate and interstate travel.

Figure 2
A summary of methodology



EMPIRICAL RESULTS

Table 1 summarises the empirical analysis of intrastate tourism demand and interstate visitor arrivals from a state of origin to a state of destination. The results show that linear models are preferred in only 28% of the cases. Because of limited space, the unit root test results are not reported here but available upon request. The ADF unit root test found that not all variables are stationary even after taking first difference, indicating the variables do not have the same order of integration. However, the PP test results reveal that all first differenced variables are stationary.

In the international tourism demand literature, Chan et al. (2005) and Shareef and McAleer (2007) argued that the PP test is preferred over the ADF test when analysing time series data. This is because the former test has higher power in finite samples than the latter. As PP test is more robust than ADF test, this study prefers the results of PP test which concludes that same order of integration exists in all economic variables. Hence, the Johansen cointegration analysis could be conducted.

Not all interstate tourism demand data have long-run relationships with the economic determinants (Table 1). The error-correction terms for interstate visitor arrivals from Queensland (QLD) to New South Wales (NSW), Tasmania (TAS) to NSW and Western Australia (WA) to QLD are not statistically significant at 5% level. In terms of diagnostic testing on the error-correction models, the null hypotheses of the tests are not rejected by all interstate and intrastate tourism demand data, except for the data on interstate visitor arrivals from South Australia (SA) to Victoria (VIC) and WA.

Table 2 provides the short-run coefficients for those variables that are statistically significant at 5% level. The results reveal that the changes in all economic variables, except income, affect interstate tourist arrivals to QLD in the short-run. In addition, domestic household income has a significant short-run effect on tourist arrivals from VIC to NSW. Another remarkable finding in Table 2 is that the changes in domestic airfares in the short-run can strongly influence the demand for intrastate tourism in WA.

In terms of economic effects on intrastate and interstate tourism demand in the long-run, this study finds that a large number of long-run economic coefficients are not consistent with economic theory (Table 3). For instance, the signs of domestic airfares variables for interstate tourist arrivals to NSW are positive. Similarly, there is a positive long-run relationship between fuel price and interstate tourist arrivals to QLD. Furthermore, most of the signs of income coefficients for intrastate and interstate tourism demand are negative, indicating that an increase in domestic household income will lead to a decline in both components of tourism demand. These results are supported by Athanasopoulos and Hyndman (2007), who argue that, when the domestic household income increases, Australian residents will likely choose not to travel domestically but travel overseas instead.

Nevertheless, there are several findings which are consistent with economic theory. Table 3 reveals that the signs of the RR and domestic airfares coefficients are negative for interstate tourist arrivals to VIC, implying that an increase in the costs of recreation and restaurants and domestic airfares in the long-run can cause a decrease in the number of interstate tourists in VIC. Similarly, this study discovers that a rise in the cost of fuel and domestic airfares will have negative impact on interstate tourist arrivals to WA. Overall, it is apparent that domestic transportation costs are important determinants for interstate tourist arrivals to VIC and WA.

By comparing the effects of economic variables on intrastate and interstate tourism demand, this study revealed mixed results. For NSW and WA, the long-run economic coefficients for

intrastate tourism demand are higher than the coefficients for interstate tourism demand (Table 3). This indicates that, in the long-run, changes in domestic household income and tourism prices will have a stronger influence on the demand for intrastate tourism than interstate tourism in NSW and WA. However, Table 3 exhibits different perspectives for QLD and VIC. When fluctuations in income and tourism prices occur, the long-run impacts on intrastate and interstate tourism demand are relatively similar for QLD and VIC.

In general, this study suggests that NSW and WA State Governments need to consider the facts that changes in economic conditions will have a stronger influence on the demand for intrastate tourism than interstate tourism in NSW and WA. Hence, in the light of planning effective marketing strategies, NSW and WA State Governments should develop separate intrastate and interstate tourism policies. However, based on the findings of this study, separate intrastate and interstate tourism policies may not be useful for promoting tourism in QLD and VIC.

CONCLUSION

For the first time, this study examines the economic determinants of intrastate and interstate tourism demand in Australia. It investigates whether economic impacts of income and tourism prices differ between intrastate and interstate tourism. To conduct such investigation, this paper employed Johansen's cointegration analysis and error-correction models.

This study found several distinct results. First, changes in all economic variables, except income, in the short-run affect interstate tourist arrivals to Queensland. Income did influence interstate tourist arrivals from VIC to NSW in the short-run. Second, the long-run income coefficients are mostly negative, implying that an increase in domestic household income will depress intrastate and interstate tourism demand in Australia. Furthermore, domestic transportation costs are the main economic factors that influence interstate tourism demand for Victoria and Western Australia in the long-run. Lastly, in terms of comparing economic coefficients for intrastate and interstate tourism demand, this study also revealed that the coefficients for intrastate tourism demand are higher than the coefficients for interstate tourism demand in NSW and WA. Hence, as intrastate and interstate tourists in NSW and WA response differently to the changes in economic conditions, it is imperative that these State Governments develop separate policies for intrastate and interstate tourism.

Despite the above findings, there is a limitation in this research. Most of the long-run economic coefficients are not consistent with economic theory. This issue could be caused by the choice of proxy variables or small sample size data. We suggest two possible solutions. First, future research should consider using the number of intrastate and interstate visitor nights and expenditure as proxies for dependent variables. Second, as to overcome small sample size issue, using panel data analysis may be useful.

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Table 1
A summary results of model specification, the significance of error-correction term and diagnostic tests

State of destination	State of origin	Functional form specification	Lag of VAR model	The significance of error-correction term at 5% level	Rejection of the null hypotheses of the diagnostic tests
NSW	ACT	Linear	1	YES	NO
	QLD	Log-linear	3	NO	NO
	NT	Log-linear	1	YES	NO
	SA	Log-linear	1	YES	NO
	TAS	Log-linear	1	NO	NO
	VIC	Log-linear	3	YES	NO
	WA	Linear	1	YES	NO
	Intrastate	Linear	1	YES	NO
QLD	ACT	Linear	2	YES	NO
	NSW	Log-linear	3	YES	NO
	NT	Log-linear	1	YES	NO
	SA	Log-linear	3	YES	NO
	TAS	Log-linear	1	YES	NO
	VIC	Log-linear	3	YES	NO
	WA	Log-linear	3	NO	NO
	Intrastate	Log-linear	1	YES	NO
VIC	ACT	Log-linear	3	YES	NO
	NSW	Log-linear	3	YES	NO
	NT	Linear	3	YES	NO
	QLD	Log-linear	1	YES	NO
	SA	Linear	3	-	YES*
	TAS	Log-linear	1	YES	NO
	WA	Log-linear	3	YES	NO
	Intrastate	Log-linear	3	YES	NO
WA	ACT	Linear	3	YES	NO
	NSW	Log-linear	3	YES	NO
	NT	Log-linear	1	YES	NO
	QLD	Log-linear	1	YES	NO
	SA	Linear	3	-	YES*
	TAS	Log-linear	3	YES	NO
	VIC	Log-linear	1	YES	NO
	Intrastate	Linear	3	YES	NO

Note: ACT= Australian Capital Territory; NSW=New South Wales; NT=Northern Territory; QLD=Queensland; SA=South Australia; TAS=Tasmania; VIC=Victoria; WA=Western Australia.
* Even after transformed from log-linear to linear models, the latter models still encounter the problems of model misspecification. The results for interstate tourist arrivals from SA to VIC and WA are not reliable, and hence, we choose not to disclose the results.

Table 2
The estimated short-run coefficients

State of destination	State of origin	Estimated coefficients												
		$d(DDT_1)$	$d(DDT_2)$	$d(Y_1)$	$d(ACC_1)$	$d(ACC_2)$	$d(RR_1)$	$d(RR_2)$	$d(RR_3)$	$d(F_1)$	$d(F_2)$	$d(DA_1)$	$d(DA_2)$	$d(OC_1)$	$d(OC_2)$
NSW	VIC	**4.6071**		**-1.35**					**4.5919**						
		1.562		0.585					1.4884						
QLD	ACT				**-1.913**							**3.7931**			
					0.6881							1.3112			
	NSW	**0.9741**			**4.8496**		**-2.8865**	**-1.2754**		**-1.5453**	**-0.9781**			**-1.8685**	**-1.5347**
		0.2981			1.1043		0.6407	0.4415		0.4623	0.3937			0.8223	0.579
	VIC	**0.8253**			**4.1293**			**-1.8934**							
		0.3264			1.7364			0.7344							
VIC	ACT					**-3.8951**									
						1.6853									
	NSW	**4.9864**													
		1.8873													
	NT	**0.8672**	**0.4012**												
		0.2786	0.1481												
	Intrastate	**1.3675**													
		0.5875													
WA	TAS	**0.8044**								**-7.7172**	**-5.9204**				
		0.3224								2.8749	2.1741				
	Intrastate												**-40.129**		
													15.8762		

Note: $d(Z_t)=Z_t - Z_{t-1}$, where d= difference, Z = economic variable, and t = time.
DDT=demand for intrastate or interstate tourism; Y=domestic income; ACC=the cost of accommodation; RR=the price of recreation and restaurants; F=fuel price; DA=domestic airfares; OC=the price of overseas holidays.
The two entries corresponding to each variables are their estimates (in bold) and standard errors, respectively.
The above figures are statistically significant at 5%. Non-significant variables are not reported here.

Table 3
The estimated long-run coefficients

State of destination	State of origin	Estimated coefficient					
		Y	ACC	RR	F	DA	OC
NSW	ACT	0.1204	-1.3294	-0.0129	-0.6314	**2.088**	**-0.0259**
	NT	**-0.5964**	-12.2817	**8.2958**	0.50721	**3.1042**	**-5.2487**
	SA	**-2.7725**	-2.8606	-0.4466	**1.114**	**5.2489**	0.76151
	VIC	**-0.7685**	**2.6177**	-1.2348	-1.9598	**5.1975**	2.3229
	WA	**-1.2056**	**6.1639**	-0.0065	-0.4362	**12.8511**	2.9081
	Intrastate	**-51.288**	-134.383	**3.6788**	-1.9411	167.6232	**-36.2944**
QLD	ACT	0.056392	**1.1395**	**0.007223**	-0.18219	-3.1877	**-0.39706**
	NSW	1.8679	-1.782	**0.79275**	**0.33552**	**0.3962**	0.77779
	NT	**-0.91892**	-6.8446	**19.9431**	**3.1149**	**36.03**	9.2823
	SA	**-42.8333**	1.4221	-1.9691	**14.0605**	**9.7342**	12.4527
	TAS	2.7633	-5.462	**2.6292**	**0.20849**	**7.5155**	**-2.5784**
	VIC	0.46704	-0.79492	**0.97668**	**0.56778**	-3.0291	0.042728
	Intrastate	4.7944	**0.3188**	-1.3175	-0.41	-4.6302	**-0.2547**
VIC	ACT	3.515	**6.3188**	-3.5221	-2.8955	**0.43267**	0.33651
	NSW	**-0.18561**	-2.4222	-1.2576	-0.28189	-1.0885	**-1.1696**
	NT	**-0.10993**	-0.72394	-0.00496	-0.17431	-0.86034	**-0.01637**
	QLD	3.5789	**1.6883**	-0.90997	**0.91794**	-8.7078	0.52741
	TAS	5.1953	**7.7825**	-3.7777	-1.0152	-7.6125	1.0176
	WA	2.4199	-0.3376	-0.5012	**0.8379**	-3.2076	**-0.6866**
	Intrastate	**-0.3864**	**1.867**	**0.0492**	-0.183	-2.5202	0.5464
WA	ACT	1.03	**7.0658**	-0.3262	-2.5547	-4.9428	0.7636
	NSW	**-12.4778**	-1.3732	**3.1233**	**14.5098**	-34.1795	5.751
	NT	**-33.753**	-15.512	-11.8524	-13.0254	-21.8047	**-13.8231**
	QLD	15.3223	**1.1865**	-1.9143	-0.1793	-4.2641	0.639
	TAS	4.5203	**14.8895**	-8.1034	-0.47	-8.3778	**-0.9789**
	VIC	3.9135	**1.3544**	-8.7713	-1.0713	-8.3356	**-9.005**
	Intrastate	**-11.3689**	**60.1969**	**0.5274**	-4.7868	66.9983	24.2846

Note: The long-run coefficients for interstate tourist arrivals from QLD to NSW, WA to QLD, SA to VIC and SA to WA are not significant. Hence, they are not reported in this paper.
Figures in **BOLD** denote the coefficients that are not consistent with economic theory.

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