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DOMESTIC AND OUTBOUND TOURISM DEMAND IN AUSTRALIA:

A System-of-Equations Approach

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Abstract
This study uses a system-of-equations approach to model the substitution relationship between Australian domestic and outbound tourism demand. A new price variable based on relative ratios of purchasing power parity index is developed for the substitution analysis. Short-run demand elasticities are calculated based on the estimated dynamic almost ideal demand system. The empirical results reveal significant substitution relationships between Australian domestic tourism and outbound travel to Asia, the UK and the US. This study provides scientific support for necessary policy considerations to promote domestic tourism further.

Key words: domestic tourism, substitution, almost ideal demand system, purchasing power parity, Australia

JEL classification: C39, L83.
INTRODUCTION

In a recent report by Tourism Research Australia (TRA) in June, 2011, a widening tourism trade deficit (calculated as the difference between total inbound revenue and total outbound expenditure) has been identified. A peak surplus of $AU 3.6 billion in 1999-2000 has turned into a deficit of $AU 5 billion in 2009-2010 (Tourism Research Australia, 2011a). The high value of the Australian dollar was said to be one of the key factors in contributing to the deficit.

For the financial year ending June 2011 international inbound tourism consumption was estimated to be $AU 23.6 billion while domestic consumption was estimated at $AU 71.9 billion, three times the size of the international inbound market. The consumption of Australian residents overseas was estimated to be $AU37.9 (Australian Bureau of Statistics, 2011). Figure 1 shows an average growth of outbound tourism consumption as a percentage of household final consumption expenditure of approximately 4% per annum over the period 2003-2011, in contrast to an average decline of approximately 3% per year for domestic tourism.

“The greatest impact of the high Australian dollar on the Australian industry is the increasing number of Australians able to afford, and choosing, to travel overseas ... this represents a significant challenge for the industry” (Tourism Australia, May 2011).

An initial warning of the decline in demand for the domestic market was first issued by Athanasopoulos and Hyndman (2008). Since then a few other academic studies have followed on the domestic market (see for example Allen, Yap, & Shareef, 2009, Deng & Athanasopoulos, 2011, Yap & Allen, 2011). However, despite the common belief among Australian tourism stakeholders, as expressed by the above quote, no study (academic or otherwise) to date has attempted to explicitly model and quantify the possible substitution between domestic and outbound tourism demand. This study therefore aims to fill the gap in the literature by investigating the potential substitution relationship between Australians’ demand for domestic tourism and for international outbound tourism, based on a theoretically sound system-of-equations model: the almost ideal demand system (AIDS) model.

LITERATURE REVIEW

In the tourism economics literature, demand for international tourism has attracted predominant research interests, while little attention has been paid to the demand for

*Substitution between International Tourism and Domestic Tourism*

International tourism is regarded as a special sort of international trade, and its economic significance is often discussed in relation to national balance of payments accounts. Inbound tourism is regarded as an export, an injection to the national economic output, recorded as a credit in the current account. On the contrary, outbound tourism is viewed as an import, which is a leakage of a national economy and appears as a debit entry into the current account (Smeral & Witt, 1996, Tribe, 1999). Therefore, a higher level of tourism receipts from inbound tourists, along with a lower level of tourism expenditure by outbound tourists, would contribute to the improvement of a country’s balance of payments (Baretje, 1982, Sugiyarto, Blake, & Sinclair, 2003). On the other hand, faster growing outbound tourism than inbound tourism would lead to greater balance of payments deficit, as we have seen from the Australian case.

With respect to the demand for domestic tourism, it forms the “proving grounds” for the tourism industry and contributes enormously to a destination’s tourism competitiveness. As Crouch & Ritchie (1999, p. 141) noted, “a high domestic demand confers static efficiencies and encourages improvement and innovation.... Foreign demand thrives more readily when domestic tourism is well established.” In many tourist destinations, domestic tourism contributes much more to the revenue of the tourism industry than inbound tourism does. For example, Australian domestic tourist expenditure has generally been four to five times higher than the inbound tourist spending (Huybers, 2003). Although the ratio dropped to three times last year, the dominance of domestic tourism is still clearly evident.

When a tourist faces the destination choice, he or she may first consider the options between a domestic destination and an international destination. Thus, domestic tourism
and international outbound tourism appear to be potential substitutes for each other. The relationships between domestic tourism and international outbound tourism were rarely discussed explicitly in the tourism literature with only a few exceptions. Pearce (1989) stressed that substitution was a major policy issue that arose from this discussion. Given the nature of outbound tourism in balance of payments accounts, a destination government attempts to encourage more domestic tourism in substitution of outbound tourism. As noted by Ashworth and Johnson (1990, p. 13), “import substitution policies may be devised to retain more of such expenditure within the country's boundaries and thereby to raise indigenous employment.” Similarly, Ashworth and Bergsma (1987) pointed out that governments tended to develop tourism policies to boost domestic tourism and reduce the outflow of foreign exchange.

Although the substitutability between domestic and outbound tourism is well accepted, little research has been carried out empirically to detect the statistical significance and extent of substitutability. Most international tourism demand studies focused on the substitution among alternative international destinations by introducing a substitute price variable (Li et al., 2005). The substitution between domestic tourism and outbound tourism was considered only implicitly by specifying a relative price variable—the destination’s price level against the domestic price level of the origin country, adjusted by relevant exchange rates (e.g., Smeral & Witt, 1996). Holmes and Shamsuddin (1997) seem to be the only exception. They examined the US demand for British Columbia tourism and incorporated both the US and British Columbia travel prices into the demand model to take account of the substitution relationship between domestic tourism in the US and outbound tourism in British Columbia. The study found that US air travellers considered tourism in British Columbia a close substitute for the domestic tourism. One per cent increase in US domestic travel price led to 1.61 per cent increase in the demand for outbound tourism to British Columbia. This study was based on single-equation log-linear transfer function models. The limitations of single-equation demand models are well noted, such as lacking an explicit basis in consumer demand theory, and being unable to test such theoretical restrictions as symmetry and adding-up that are associated with existing demand theories (Li, Song, & Witt, 2004, 2006). A systematic approach with a rigorous theoretical underpinning is yet to be employed to accurately quantify the substitutability between domestic and outbound tourism demand. The AIDS model can serve this research purpose well, and is thus selected for the present study.

**The AIDS Models**

The AIDS model was originally developed by Deaton and Muellbauer (1980). Economic theory of consumers’ demand underpins the AIDS model, in which all goods under investigation are represented in a system of equations and are analysed simultaneously. Expenditure elasticities, own-price elasticities, and cross-price elasticities can be calculated
using AIDS estimates. In particular, the sign of the calculated cross-price elasticity indicates the relationship between the two products being concerned. A positive sign suggests substitution while a negative sign indicates complementarity. In addition, the homogeneity and symmetry restrictions of demand theory can be tested within the AIDS framework. Applications of AIDS modelling in tourism studies have largely been of a static form (from here on referred to as STATIC-AIDS), in which case the results can be interpreted as the long-run behaviour of tourism demand if the cointegration relationship holds (see De Mello, Park, & Sinclair, 2002; Han, Durbarry, & Sinclair, 2006, Papatheodorou, 1999). However, recent demand studies have shown that demand systems often deviate from their long-term equilibrium (Anderson & Blundell, 1983; Duffy, 2002). Thus the STATIC-AIDS specification is usually subject to the misspecification problem and fails the tests for theoretical restrictions such as homogeneity and symmetry. As a result, the elasticity estimates based on the STATIC-AIDS model may be biased (Edgerton, Assarsson, Hummelmose, Laurila et al., 1996). Therefore it is necessary to incorporate short-term dynamic components into the LAIDS model. In tourism studies, Cortés-Jiménez, et al. (2009), Durbarry and Sinclair (2003), Li, et al. (2004, 2006) and Wu, Li, and Song (2011) incorporated error correction (EC) mechanisms into AIDS modelling (from here on referred to as EC-AIDS model). Empirical evidence has shown that EC-AIDS models can improve theoretical conformability as well as the forecasting performance (see, for example, Cortés-Jiménez et al., 2009, Li et al., 2004).

The applications of AIDS models in international tourism studies are related to two types of demand analyses: (a) tourists’ expenditure allocation among a number of selected international destinations (e.g., De Mello et al., 2002, Han et al., 2006, Papatheodorou, 1999); (b) tourists’ budget allocation among different product categories such as accommodation, food and drinks, and shopping in an outbound destination (e.g., Fujii, Khaled, & Mak, 1985, Wu et al., 2011). The substitution or complementary relationships among different outbound destinations and among different tourism product categories can be investigated through the calculated cross-price elasticities. In the studies where alternative outbound destinations were considered, the price variables of the AIDS model often took a relative term, that is, the price of each destination relative to that of the country of origin (i.e., domestic tourism price). Thus the substitution relationship between domestic and outbound tourism could not be explicitly tested. Despite the applicability of AIDS models to the analysis of domestic-outbound tourism substitutability, no attempt has been made to carry out an empirical study. This paper therefore aims to bridge the gap in the literature. Given the alarming situation of domestic tourism in Australia as outlined in the Introduction, this study aims to investigate the substitution relationships between Australian domestic tourism and outbound tourism in key destination countries and regions, and draw some useful policy implications based on the empirical findings.

METHODOLOGY
Assuming a priori weak separability of goods and services, an assumption necessary for practical reasons and common in demand system studies (Pollak & Wales, 1992), we argue that tourism consumption of Australians follows a two-stage budgeting process. In Stage one, Australians budget for tourism spending and non-tourism spending. In Stage two, Australians budget between spending on domestic tourism and outbound tourism. Practicality and data availability dictate that outbound tourism cannot be looked at for all the countries that Australians travel to. We select the following key outbound destination countries: the US, the UK, New Zealand, Japan, Hong Kong, Singapore, Malaysia, Indonesia, and Thailand. Total outbound tourism expenditure to these destination countries contributed to more than 50% of total Australian outbound expenditure over our sample period. Furthermore, given the same size constraints, the six Asian countries are combined as a weighted average for the Asia region where the weights are based on their share of total tourism expenditure by Australians in Asia. Ideally, we would like to have included European countries, but reliable outbound expenditure data on European countries are limited in the time dimension and could not be used in the present study. The following section will provide a brief explanation of the STATIC-AIDS and EC-AIDS specifications, and then give particular attention to the development of a new price variable.

**STATIC-AIDS**

A static AIDS model for modelling the demand of tourism by Australians can be written as

\[ w_{it} = \alpha_i + \sum_j \gamma_{ij} \ln p_{jt} + \beta_t \ln \frac{x_t}{p_t} + \varepsilon_{it}, \]

Where \( w_{it} \) is tourism destination \( i \)'s budget share in Australian tourism expenditure at time \( t \); \( p_{jt} \) is the price measure of tourism products at tourist destination \( j \) at time \( t \); \( i, j = 1, \ldots, N \) denote tourist destinations: Australia (for domestic tourism), Asia, US, UK, and New Zealand, respectively; \( N=5 \) the number of total tourist destinations considered; \( x_t \) is the total expenditure on all tourist destinations in the system at time \( t \); \( p_t \) is the aggregate price index at time \( t \); \( \frac{x_t}{p_t} \) is the real total expenditure per capita at time \( t \); and \( \varepsilon_{it} \) is the iid normal disturbance term. \( \alpha_i, \gamma_{ij}, \) and \( \beta_t \) are unknown parameters to be estimated. \( \gamma_{ij} \)'s represent the long-run effect of price changes on the budget shares of various tourist destinations while the \( \beta_t \)'s represent the long-run effect of the overall expenditure budget changes on the budget allocation.

Among a number of aggregate price indices being proposed in the literature, the Tornqvist (1936) index has superior properties such as being exact for linearly homogeneous functions and is less likely to be subject to substitution bias (Wu et al., 2011). Therefore in this study we use the Tornqvist index, which is computed as

\[ p_t = \prod_{i=1}^{N} \left( \frac{p_{it}}{p_{io}} \right)^{w_{it}}, \]
with weight $\tilde{w}_{it}$ is defined as

$$\tilde{w}_{it} = (w_{it} + w_{i0})/2,$$

where $w_i$’s are positive and add up to 1, and t=0 represents the base period.

**EC-AIDS**

The STATIC-AIDS model of Equation (1) assumes that the consumption behaviour of Australian tourists is always in equilibrium, but as argued by Durbary and Sinclair (2003) and Li, et al. (2006), habit persistence is likely to be important and that current budget share movements should be expressed in terms of both standard AIDS explanatory variables (i.e., $p_{jt}$ and $\tilde{z}_t$ ) and adjustments to consumer disequilibrium in the previous period through an error correction process. The dynamic EC-AIDS model, according to Chambers and Nowman (1997) and Duffy (2002), can be written as

$$A(L)w_t = B(L)z_t + \varepsilon_t \quad (2)$$

where $w_t$ is a $(N \times 1)$ vector of budget shares observed at time $t$, and $z_t$ is a $[(N + 2) \times 1]$ vector of intercepts, $N$ price variables, and real expenditure per capita, observed at time $t$. $A(L) = I + \sum_{k=1}^{l} A_k L^k$ and $B(L) = I + \sum_{k=0}^{m} B_k L^k$ are matrix polynomials in the lag operator $L$. In theory, information criteria can be used to determine the optimal lag lengths of $l$ and $m$, starting with arbitrarily high orders. In practice, demand systems are often heavily parameterized with limited number of observations in the time dimension, which makes the sequential testing of lag lengths impossible. Following Duffy (2002), we restrict ourselves to a parsimonious first order system in levels. Equation (2) then becomes

$$\Delta w_{it} = \lambda \mu_{i,t-1} + \sum_j \gamma_{ij} \Delta \ln p_{jt} + \beta_i^* \Delta \ln \frac{\tilde{z}_t}{p_t} + \varepsilon_{it} \quad (3)$$

Where $\Delta$ is the difference operator. $\mu_{i,t-1}$ is the error correction term that measures the disequilibrium for the $i$th budget share equation in the previous period, and it is the estimated residual from the $i$th STATIC-AIDS equation. $\lambda$ measures the extent to which the $i$th equation adjusts to its budget share allocation disequilibrium at time $t-1$. The adding-up condition of an AIDS model necessitates that $\lambda$ is the same for all equations. It is easy to see that Equation (3) captures both short run and long run dynamics. In the short run, where disequilibrium exists, budget share responds to changes in prices, real expenditure per capita, and disequilibrium from the previous period. In the long run, where the system reaches its steady state, all differenced terms become zero, in which case Equation (3) becomes Equation (1).

**Theoretical Restrictions and Estimation**
The AIDS models are derived from economic demand theory, and as a result a set of theoretical restrictions must be satisfied (Deaton & Muellbauer, 1980). More specifically, they are:

(i) Adding up:

\[ \sum_i \alpha_i = 1; \sum_i \beta_i = 0; \sum_i y_{ij} = 0 \text{ in Equation (1)} \]

\[ \sum_i \beta_i^* = 0; \sum_i y_{ij}^* = 0 \text{ in Equation (3)} \]

(ii) Homogeneity:

\[ \sum_j y_{ij} = 0 \text{ in Equation (1)} \]

\[ \sum_j y_{ij}^* = 0 \text{ in Equation (3)} \]

(iii) Slutsky symmetry:

\[ y_{ij} = y_{ji} \text{ in Equation (1)} \]

\[ y_{ij}^* = y_{ji}^* \text{ in Equation (3)}. \]

The adding-up condition implies that budget shares must always sum to unity. The homogeneity condition implies that a proportional change in all prices and real expenditure does not alter quantities purchased and budget allocations. The symmetry condition implies a symmetric substitution matrix and consumer preferences are consistent. The adding-up condition needs not be tested and is easily satisfied by omitting one equation from the system when estimating the model. The coefficients of the omitted equation can be calculated after using the adding-up rule if needed. Homogeneity can be tested equation-by-equation, while symmetry can only be tested for the entire system as it involves cross-equation restrictions. Both STATIC-AIDS and EC-AIDS models are typically estimated using Zellner’s (1962) seemingly unrelated regression (SUR) procedure, which accounts for contemporaneous correlations across equations and is more efficient.

**Calculation of Demand Elasticities**

Demand elasticities are computed using coefficient estimates from the AIDS model. Specifically, in a linear version of the AIDS model such as Equation (1),

\[ \text{expenditure elasticity: } \eta_i = \frac{\beta_i}{w_i} + 1 \]
where $\delta_{ij}$ is the Kronecker delta, and is equal to 1 for $i = j$, and 0 otherwise. As budget shares are observed $T$ times during the sample period, all elasticities are calculated at the sample means of the budget shares. Standard errors of the elasticities are computed based on the estimated variance covariance matrix of the AIDS model’s coefficients.

A New Price Variable

In previous applications of AIDS models to tourists’ expenditure allocation among a number of international destinations, the destination price variables usually take the relative form:

$$p_{j,t} = \frac{CPI_{j,t}/CPI_{i,t}}{EX_{j,t}/EX_{i,t}}$$

(4)

where at time $t$, $CPI_{j,t}$ and $CPI_{i,t}$ are consumer price indices as proxies of tourism prices for the destination country $j$ and the origin country $i$, respectively; $EX_{j,t}$ and $EX_{i,t}$ are exchange rates against the US dollar for the destination country and the origin country; all indexed to be 100 for a given base year (e.g., Li et al., 2004, 2006, Han et al., 2006).

However, this relative form has some limitations. Firstly, it cannot be applied to domestic tourism price in Equation (1) or Equation (3). The domestic price variable would become a constant term, and therefore it would not be possible to examine the substitution relationship between domestic and outbound tourism through elasticity analysis.

Secondly, the CPI-based price variable is only valid for time-series analysis since it captures price changes over time, but it is not suitable for cross-sectional comparisons of tourism prices in different destinations. The price and the exchange rate are indexed relative to a country’s own base-year. Therefore, one could rebase $p_{j,t}$ for every country $j$, so that they are all 100 for the same base year. This demonstrates that the price variable is not comparable across countries.

It is therefore imperative to construct a new tourism price that is suitable for both temporal and contemporaneous comparisons. This study makes the first attempt to propose a tourism price variable based on purchasing power parity (PPP), which serves both purposes and is particularly essential for the analysis of substitutability between domestic and outbound tourism within the AIDS framework.

Purchasing power parity (PPP) is defined as "the number of currency units required to buy goods equivalent to what can be bought with one unit of the currency of the base country; or with one unit of the common currency of a group of countries" (United Nations, 1992). The new price variable is based on the Penn World Table (PWT) version 7.0, which
periodically releases measures of PPP and national accounts (see Deaton & Heston, 2010, for a detailed discussion). The new price variable also takes a relative form, and takes both PPP and exchange rates into account.

The PWT contains the price level of GDP, \( P_{j,t} \), for country \( j \), which is defined as

\[
P_{j,t} = \frac{\text{PPP}_{j,t}}{\text{EX}_{j,t}} \times 100
\]

(5)

where \( \text{PPP}_{j,t} \) is defined as the ratio of country \( j \)'s GDP in its currency to country \( j \)'s GDP in USD, \( \text{EX}_{j,t} \) is the exchange rate defined as country \( j \)'s currency over USD, \( P_{j,t} \) is a unit-less measure and therefore it can be compared cross-sectionally against another country's value. However by construction the price level of GDP for the US, \( P_{US,t} \), will be 100 for all \( t \) and therefore this variable is not suitable for our study as the US is one of the key destinations for which we want to estimate price elasticities. Hence we propose the following variable that overcomes this limitation.

We label the new variable as the modified price level of GDP of country \( j \) relative to the base country \( i \), and is defined as

\[
P_{j,t,2005} = \frac{\text{PPP}_{j,t,2005}}{\text{EX}_{j,t}/\text{EX}_{i,t}} \times 100
\]

(6)

where \( \text{PPP}_{i,t} \) is the PPP over GDP for country \( i \) as used and defined in Equation (5), \( \text{EX}_{i,t} \) and \( \text{EX}_{j,t} \) are the exchange rates of countries \( i \) and \( j \) over USD respectively. \( \text{PPP}_{j,t,2005} \) is a new variable and is calculated as

\[
P_{j,t,2005} = \frac{\text{CGDP}_{j,t}}{\text{RGDP}_{j,t,2005}} \times \text{PPP}_{j,t}
\]

\[
\text{CGDP}_{j,t} = \text{CGDP}_{j,t} \times \text{PPP}_{j,t}
\]

\[
\text{RGDP}_{j,t} = \frac{\text{RGDP}_{j,t}}{\text{PPP}_{j,t}}
\]

\[
\text{PPP}_{j,t} = \frac{\text{PPP}_{j,t}}{\text{EX}_{j,t,2005}} \times 100
\]

This new price variable preserves both temporal patterns and cross-sectional patterns in price levels in different countries and therefore is an appropriate variable for our study. The use of \( \text{PPP}_{j,t,2005} \) in the numerator allows temporal variation even for the base country \( i \) which in our case is Australia. This allows the calculation of various demand elasticities for Australia in the AIDS models and enables the domestic-outbound tourism substitution analysis. In addition, by dividing the numerator and the denominator by \( \text{PPP}_{i,t} \) and \( \text{EX}_{i,t} \) respectively, we have created a price measure relative to the currency of the base country \( i \), in our case relative to the Australian dollar. Figure 2 shows yearly evolutions of the new relative price variables for the five tourist destinations in our study from year 2000 to year 2009. More detailed discussions of the relative movements of these price series will be provided in the next section.
Data Description

We measure Australian tourism demand with overnight expenditure. For domestic tourism, we use the aggregate expenditure by all purposes of travel and across all states. In terms of outbound demand, we consider the US, the UK, New Zealand, and Asia as the four main overseas destinations. For Asia we include Japan, Hong Kong, Singapore, Malaysia, Indonesia, and Thailand. The reason for combining six Asian countries into one destination region is due to the short data series available. To include these countries individually in the ADIS models would consume over 50 more degrees of freedom, and thus a simultaneous estimation of the AIDS models would be impossible. All price measures of Asia used in our AIDS model are weighted averages of the six Asian countries, and the weights are based on the tourism budget share of each country within the Asia region. We have quarterly expenditure data covering the period of 2000Q1 to 2010Q3, giving us 43 observations in the time dimension. We seasonally adjust the data prior to estimation. Both domestic and outbound data come from the National Visitors Survey managed by Tourism Research Australia (Tourism Research Australia, 2010).

Figure 3 shows the budget share for Australian domestic tourism over the sample period. It is clear that the expenditure share of domestic tourism has experienced a steady decline over the decade. From a peak of over 80% during 2000-2004 it has fallen to about 70% in year 2010.

Figure 4 shows the tourism budget shares of the overseas destinations. In contrast to domestic tourism expenditure shares of overseas destinations all experienced increases, suggesting that Australians are increasingly substituting domestic travel with overseas travel. In particular, Asia has the highest budget share amongst all four overseas destinations. This is due to a combination of factors such as its close spatial proximity, relatively lower costs, and strong cultural connections due to the presence of a large Asian migrant community in Australia.

In terms of the price variables, as PWT version 7.0 only publishes PPP data at annual frequency, the modified relative price level of GDP of Equation (6) can only be calibrated annually. In order to apply this price variable in our study, we need to convert it to quarterly frequency.

We model the modified relative price level of GDP of Equation (6) to be a function of: the domestic price level of country \( j \), the Australian price level, and exchange rate of country \( j \) denoted in AUD. Therefore we can write:
\[ p_{j,t|2005}^{yr} = \beta_0 + \beta_1 CPI_{j,t}^{yr} + \beta_2 CPI_{AUD,t}^{yr} + \beta_3 \frac{EX_{j,t}^{yr}}{EX_{AUS,t}^{yr}} + e_t \] (7)

where \( p_{j,t|2005}^{yr} \), \( CPI_{j,t}^{yr} \), \( CPI_{AUD,t}^{yr} \), and \( \frac{EX_{j,t}^{yr}}{EX_{AUS,t}^{yr}} \), are observations at the yearly frequency. Equation (7) is estimated by OLS. The R²'s for each of the regressions are respectively: 99.24%, 95.87%, 86.22%, 87.69% and 97.35%, showing satisfactory model fits.

We then project this relationship based on annual averages to a relationship based on quarterly averages,

\[ \hat{p}_{j,t|2005}^{qrt} = \hat{\beta}_0 + \hat{\beta}_1 CPI_{j,t}^{qrt} + \hat{\beta}_2 CPI_{AUD,t}^{qrt} + \hat{\beta}_3 \frac{EX_{j,t}^{qrt}}{EX_{AUS,t}^{qrt}} \] (8)

where \( \hat{\beta}_0 \), \( \hat{\beta}_1 \), \( \hat{\beta}_2 \), and \( \hat{\beta}_3 \) are the OLS estimates from Equation (7). \( \hat{p}_{j,t|2005}^{qrt} \) is the fitted quarterly value of the price variable, and \( CPI_{j,t}^{qrt} \), \( CPI_{AUD,t}^{qrt} \) and \( \frac{EX_{j,t}^{qrt}}{EX_{AUS,t}^{qrt}} \) are all observed quarterly values.

Finally, we apply the following standardization factor:

\[ \zeta_{j,t}^{qrt} = \frac{p_{j,t|2005}^{yr}}{\sum_{qrt} \hat{p}_{j,t|2005}^{qrt}/4} \] (9)

Where \( \sum_{qrt} \hat{p}_{j,t|2005}^{qrt}/4 \) results to the annual average aggregate of the quarterly fitted values within each year so that

\[ \hat{p}_{j,t|2005}^{qrt} = \hat{p}_{j,t|2005}^{qrt} \times \zeta_{j,t}^{qrt} \] (10)

is our proposed modified relative price level of GDP (as defined in Equation 6) fitted for quarterly data. Note that \( \zeta_{j,t}^{qrt} \) is merely an adjustment factor. It guarantees that the average fitted quarterly prices for any given year sum up to the observed yearly value. Since \( p_{j,t|2005}^{qrt} \) is only observed up to year 2009, quarterly prices in year 2010 are forecasted using Equation (8). Figure 4 displays the yearly \( p_{j,t|2005}^{qrt} \), the quarterly \( \hat{p}_{j,t|2005}^{qrt} \), and modified quarterly values \( \hat{p}_{j,t|2005}^{qrt} \) for the domestic price variable as an example. The \( \hat{p}_{j,t|2005}^{qrt} \) series projects the relationship in equation (7) estimated at the yearly frequency to quarterly values. \( \hat{p}_{j,t|2005}^{qrt} \) are the standardised values, so that the quarterly values within a year sum to the observed yearly value.
Figure 6 displays the quarterly modified relative price level of GDP for all the destinations considered in this study. Overall the price level of Asia remains low compared to the other destinations, although the gap has closed considerably except against domestic Australian tourism. The price level of Australia has experienced a steady increase over the years. The price level of New Zealand followed a similar trajectory to that of Australia until roughly year 2006, when its price increase slowed and started to become relatively cheaper compared to Australia. Both the US and the UK were much more expensive than the other three destinations at the beginning of the sample period, but the gap was significantly reduced over the decade. While the US, the UK, and NZ are still more expensive than Asia in general, all four destinations are now cheaper than Australia. Finally it is also clear that the domestic price series is a lot less volatile than the price series for overseas destinations. This is to be expected, as from an Australian perspective, variations in exchange rates would play no part in the price level of domestic travels.

EMPIRICAL RESULTS

To estimate the STATIC- and EC-AIDS models, we exclude New Zealand from our system estimation as it is the least interesting destination in our particular context. We test for theoretical restrictions following Wu, et al. (2011). The Wald statistics are summarized in Table 1.

None of the theoretical restrictions are satisfied for the STATIC-AIDS specification as the null hypothesis is rejected at a 1% level of significance in all three tests. The lack of short-run dynamics in the model might have been the cause of these restrictions not being satisfied. In comparison, the EC-AIDS specification passes all the restriction tests, at least at the 1% significance level. This suggests that the theoretically restricted EC-AIDS model is well specified and the calculated elasticities are accurate. Therefore the following analysis focuses on short-run elasticities only.

Since the EC-AIDS model passes the restriction tests, the homogeneity and symmetry restricted EC-AIDS model is estimated. The estimation results are presented in Table 2. In particular, we note that the EC term in the EC-AIDS is significant at the 1% level, suggesting the presence of strong short-run dynamics. Its negative value (-0.6205) is consistent with an error correction mechanism. As these coefficient estimates cannot be interpreted directly, we next look at the estimated elasticities. Only compensated price elasticities will be reported here, as they assume constant real expenditure and are more commonly used in the literature (Li et al., 2004).
Short-Run Elasticities

Table 3 summarizes the short-run expenditure elasticity estimates from the dynamic EC-AIDS model. As have been shown earlier, the EC-AIDS model satisfies both homogeneity and symmetry restrictions, thus these results are likely to be more representative of the true consumer behaviour of Australian tourists. These estimates are all significant and positive, among which the expenditure elasticity for domestic travel is less than 1, consistent with the general belief that domestic tourism is treated as a necessity. The expenditure elasticities of the three remaining overseas destinations are all greater than 1, consistent with the past literature which commonly suggests that international travel is considered a luxury good (Li et al., 2005).

The diagonal entries are own-price elasticities, all negative and significant, which are consistent with demand theory. All of the own-price elasticities values are between 0 and -1, suggesting that the demand for tourism in all these destinations are price-inelastic in the short run. In particular, the demand for Australian domestic tourism is the least price sensitive (-0.290). This is in line with demand theory which suggests that necessities tend to have more price-inelastic demand (Mankiw & Taylor, 2006). This can also be explained by the relatively high portion of Australians’ travel for visiting friends and relatives (VFR) purposes in domestic tourism compared to international travel. The demand for VFR tourism is generally less price sensitive than leisure tourism. It is also noted that the demand for tourism in Asia is less price elastic (-0.418) than that for the US (-0.852) and the UK (-0.926). There are two possible reasons for this. First, as Figure 1 shows, the price level in Asia is much lower than that in the other two long-haul destinations; second, the destination of Asia is defined as a much broader region than individual countries. According to demand theory, the broader the defined market, the less price elastic the demand, because it is easier to find close substitutes for narrowly defined products (Mankiw & Taylor, 2006).

With regard to cross-price elasticities (the off-diagonal elements of Table 4), we find that the cross-price elasticities for Australia in the first column are all positive and significant, indicating that once the tourism price decreases in the overseas destinations, the demand for Australian domestic tourism will be substituted by outbound tourism to these destinations. The substitution effect is the strongest for Asia (0.100). This is not surprising. Asia is geographically the closest to Australia and it provides many tourism products similar to those provided in Australia. For instance the beaches of Bali or Thailand are considered by many Australians as close substitutes for the beaches in the Gold Coast. This is also consistent with the patterns observed in Figures 2 and 3, where the significant decrease in
domestic tourism expenditure share is coincided most noticeably with the significant increase of Asia’s tourism expenditure share. Moreover, the sum of all the cross price elasticities in the Australian column yields 0.219, which is comparable to the own-price elasticity of Australian magnitude (0.290). Suppose the AUD was to appreciate by 10% against all overseas currencies, holding all else constant, the cost of travelling to these overseas destinations will drop by 10%. The combined effect from these three overseas destinations is an expected decrease of 2.19% of the Australian domestic share of tourism expenditure. In light of the fact that, during our sample period the AUD appreciated by 40.5% against Asia, 54.1% against US, and 59.5% against UK, this substitution effect is likely to be substantial. These price elasticity estimates clearly suggest that Australians’ tourism demand is significantly influenced by price changes, and given the significant exchange rate movements over the past decade the combined substitution effects in the long run is likely to be substantial.

In addition, the price elasticity of UK in the Asia equation and the price elasticity of Asia in the UK equation are once again negative and significant (-0.377 and -0.583, respectively), suggesting that the two destinations are likely to be complements for Australian tourists. Asia is the major connecting hub for Australians travelling to the UK (and Europe in general). It is not uncommon for Australians to plan their travel such that they spend time in both Asia (as the connecting stop-over) and the UK. Therefore, once a trip to the UK via Asia is considered, price increases in one destination is likely to lead to a reduction of spending in the other. On the other hand, the price elasticity of the UK in the US equation and that of the US in the UK equation are both positive and significant (0.474 and 0.502, respectively), suggesting that in the short run Australians treat US and UK as substitutes when deciding on an outbound travel.

CONCLUSION

This study is the first attempt to explicitly and systematically quantify the substitutability between domestic and outbound tourism. The empirical study focuses on Australia as the country of origin for domestic and outbound tourism, given its significantly widening tourism trade deficit in recent years. For the first time, the theoretical sound econometric model—EC-AIDS—is applied to the domestic-outbound tourism substitution analysis. Since the traditional CPI-based relative tourism price variable is not applicable for this analysis, a new innovative price variable based on the PPP index published by the Penn World Table is developed. Short-run demand elasticities are calculated based on the estimates of the theoretically restricted EC-AIDS, which assist a scientific investigation of the substitution relationship between domestic and outbound tourism.

The findings of this study provide confirmatory evidence on the substitutability between Australia’s domestic tourism and outbound tourism in such key destinations as Asia, the UK and the US. In addition, this study reveals that domestic tourism is regarded as a necessity by Australians, and their demand for domestic tourism is less price elastic than that for
outbound tourism. These findings confirm the validity and necessity of Australia’s tourism policies in promoting domestic tourism in recent years, such as the “See Australia” marketing initiative along with the “Domestic Tourism Initiative” (through See Australia) launched since 1999, and the “No Leave No Life” campaign launched in 2009 (OECD, 2003, Commonwealth of Australia, 2009). Meanwhile, given the widening tourism trade deficit in recent years, this study calls for further policy considerations to continue to promote domestic tourism and reduce tourism trade deficit. Effective public-private partnership between Federal, State and Territory governments and the tourism industry is crucial to drive a sustainable development of domestic tourism. Industry stakeholders all need to play an active role in the development. Greater collaboration between industry stakeholders throughout the tourism value chain and knowledge transfer through best practice sharing will contribute to further improvements of the industry’s overall performance. To maximise the benefits of the whole tourism industry, greater attention should be paid to the seasonal and regional balance of domestic tourism promotion. Discounting especially in low seasons is likely to be effective in attracting the more price-sensitive, lower-spending domestic tourists. In the present global economic recession, the downturn in inbound tourism led to excess capacities of tourism service providers. In this case lowering prices domestically is likely to attract more domestic demand to fill these excess capacities. In addition to pricing strategies, continuous product innovations may reduce the substitutability of domestic tourism by outbound travel.

Limitations and future research directions?

A limitation in our study lies in the lack of inclusion of other European countries in our EC_AIDS model. We hope that in the future sufficient amount of data on European countries will be made available by Tourism Research Australia.

We also must acknowledge that consumer behaviour is ever changing and these price elasticities are likely to shift over time. With greater data availability in the future, we would like to extend our study to a time-varying parameter framework (see Li et al 2006), which will allow us to identify temporal patterns in the estimated price elasticities for different destination regions.

References


Tourism Research Australia (2011a). Factors affecting the inbound tourism sector: The impact and implications of the Australian dollar, Tourism Australia, Canberra.

Tourism Research Australia (2011b). What is driving Australians' travel choices? Tourism Australia, Canberra.


Table 1. Wald Test Statistics for Static and Dynamic AIDS Specifications

<table>
<thead>
<tr>
<th>Null hypothesis</th>
<th>STATIC-AIDS</th>
<th>EC-AIDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homogeneity</td>
<td>62.096**</td>
<td>2.143</td>
</tr>
<tr>
<td>Symmetry conditional on Homogeneity</td>
<td>50.455**</td>
<td>15.410*</td>
</tr>
<tr>
<td>Both homogeneity and symmetry</td>
<td>128.083**</td>
<td>5.173</td>
</tr>
</tbody>
</table>

Note: * and ** denote that the null hypothesis is rejected at the (5% and 1% significance levels, respectively.)
Table 2. Estimation Results of the EC-AIDS

<table>
<thead>
<tr>
<th></th>
<th>AUS</th>
<th>ASIA</th>
<th>USA</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta \left[ \ln \left( \hat{p}<em>{AUS,t \mid 2005} \right) - \ln \left( \hat{p}</em>{NZ,t \mid 2005} \right) \right]$</td>
<td>-0.052</td>
<td>0.015</td>
<td>0.000</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>(-1.139)</td>
<td>(0.722)</td>
<td>(0.019)</td>
<td>(0.422)</td>
</tr>
<tr>
<td>$\Delta \left[ \ln \left( \hat{p}<em>{ASIA,t \mid 2005} \right) - \ln \left( \hat{p}</em>{NZ,t \mid 2005} \right) \right]$</td>
<td>0.015</td>
<td>0.041**</td>
<td>-0.021</td>
<td>-0.035**</td>
</tr>
<tr>
<td></td>
<td>(0.722)</td>
<td>(2.854)</td>
<td>(-1.908)</td>
<td>(-3.365)</td>
</tr>
<tr>
<td>$\Delta \left[ \ln \left( \hat{p}<em>{US,t \mid 2005} \right) - \ln \left( \hat{p}</em>{NZ,t \mid 2005} \right) \right]$</td>
<td>0.000</td>
<td>-0.021</td>
<td>0.007</td>
<td>0.023*</td>
</tr>
<tr>
<td></td>
<td>(0.019)</td>
<td>(-1.908)</td>
<td>(0.473)</td>
<td>(2.138)</td>
</tr>
<tr>
<td>$\Delta \left[ \ln \left( \hat{p}<em>{UK,t \mid 2005} \right) - \ln \left( \hat{p}</em>{NZ,t \mid 2005} \right) \right]$</td>
<td>0.008</td>
<td>-0.035**</td>
<td>0.023*</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.422)</td>
<td>(-3.365)</td>
<td>(2.138)</td>
<td>(0.067)</td>
</tr>
<tr>
<td>$\Delta \left[ \ln \left( \frac{x_t}{p_t} \right) \right]$</td>
<td>-0.052</td>
<td>0.018</td>
<td>0.032</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>(-0.908)</td>
<td>(0.669)</td>
<td>(1.098)</td>
<td>(0.770)</td>
</tr>
<tr>
<td>EC term (same for all equations)</td>
<td>-0.621**</td>
<td>-0.621**</td>
<td>-0.621**</td>
<td>-0.621**</td>
</tr>
</tbody>
</table>

Note: * and ** denote 5% and 1% significance levels, respectively.
Table 3. Short-Eun Expenditure Elasticity Estimates from the EC-AIDS

<table>
<thead>
<tr>
<th>Expenditure Elasticity</th>
<th>AUS</th>
<th>ASIA</th>
<th>USA</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.933**</td>
<td>1.222**</td>
<td>1.570**</td>
<td>1.299**</td>
</tr>
<tr>
<td></td>
<td>(12.595)</td>
<td>(3.683)</td>
<td>(3.027)</td>
<td>(3.351)</td>
</tr>
</tbody>
</table>

Note: ** denotes 1% significance level.
<table>
<thead>
<tr>
<th></th>
<th>AUS</th>
<th>ASIA</th>
<th>USA</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>P(AUS)</td>
<td>-0.290**</td>
<td>0.960**</td>
<td>0.784*</td>
<td>0.935*</td>
</tr>
<tr>
<td></td>
<td>(-4.969)</td>
<td>(3.782)</td>
<td>(2.095)</td>
<td>(2.491)</td>
</tr>
<tr>
<td>P(ASIA)</td>
<td>0.100**</td>
<td>-0.418*</td>
<td>-0.298</td>
<td>-0.583**</td>
</tr>
<tr>
<td></td>
<td>(3.782)</td>
<td>(-2.380)</td>
<td>(-1.501)</td>
<td>(-2.955)</td>
</tr>
<tr>
<td>P(USA)</td>
<td>0.056*</td>
<td>-0.204</td>
<td>-0.825**</td>
<td>0.502*</td>
</tr>
<tr>
<td></td>
<td>(2.095)</td>
<td>(-1.501)</td>
<td>(-3.268)</td>
<td>(2.403)</td>
</tr>
<tr>
<td>P(UK)</td>
<td>0.063*</td>
<td>-0.377**</td>
<td>0.474*</td>
<td>-0.926**</td>
</tr>
<tr>
<td></td>
<td>(2.491)</td>
<td>(-2.955)</td>
<td>(2.403)</td>
<td>(-2.814)</td>
</tr>
</tbody>
</table>

Note: * and ** denote 5% and 1% significance levels, respectively.
Figure 1. Domestic and Outbound Tourism Consumption of Australians as a Percentage of Household Final Consumption Expenditure

Figure 2. Yearly Modified Relative Price Levels of GDP for Period 2000-2009
Figure 3: Australian Domestic Tourism Budget Share over the Period 2000Q1-2010Q3
Figure 4: Budget Shares of Overseas Destinations over the Period 2000Q1-2010Q3
Figure 5. Australian Domestic Price Variables

Note: $P^{yr}$ are the observed annual values as specified in Equation (5); $\hat{P}^{qrt}$ are the estimated quarterly values as specified in Equation (7); $\tilde{P}^{qrt}$ are the modified estimated quarterly values as specified by Equation (9).
Figure 6. Quarterly Modified Relative Price Levels of GDP