Analyzing Tourist Consumption: An Dynamic System-of-Equations Approach[1]

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ABSTRACT

The dynamic system-of-equations approach has been employed to analyze the demand for outbound tourism among a number of destinations. However, this approach has not been applied to the context of the tourist consumption of different products in a given destination. Given the importance of understanding tourists' consumption behavior to destination management, this study seeks to gain new insights into Hong Kong inbound tourist expenditure patterns using a dynamic system-of-equations approach: the almost ideal demand system (AIDS) model. Based on the estimation of a complete demand system, we investigate the interactions amongst the demand for different tourism products (i.e., shopping, hotel accommodation, meals outside hotels, and others) and the impacts of price changes on demand. Tourists from different source markets are examined separately, and the results show that their consumption behavior differs significantly.

KEYWORDS: tourism demand; almost ideal demand system; dynamics; elasticity analysis

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INTRODUCTION

The almost ideal demand system (AIDS) model, a system-of-equations approach, was originally developed in static form to reflect the long-run equilibrium of an economic system. Examples of the use of the static model in tourism demand studies include the work of Divisekera (2003), Han, Durbarry, and Sinclair (2006), and White (1985). However, in reality, a tourism demand system tends to deviate from the equilibrium state, and the static AIDS model is unable to capture such dynamics. Over the past two decades, econometricians have sought ways to capture the dynamic behavior of consumers. Deaton and Muellbauer (1980) suggested that dynamic AIDS models could be realized by estimating the system in the first-difference form. Later, Balcombe and Davis (1996) included lagged independent variables in the system to embody the dynamic characteristics of consumer behavior. More recently, in the tourism demand context, researchers such as Durbarry and Sinclair (2003), Li, Song, and Witt (2004, 2006), and Li, Wong, Song, and Witt (2006) incorporated error correction (EC) mechanisms into AIDS specifications (known as the EC-AIDS model) to capture the dynamics of a tourism system. Nevertheless, applications of the AIDS model to tourism demand research have so far been limited to the expenditure of tourists from a particular origin on traveling to a number of destinations. These studies have explored the competing or complementary relationships amongst destinations as far as a particular country of origin is concerned and tourism demand sensitivity in response to price changes in the destinations under consideration. However, little attention has been paid to the budget allocations of tourists from a particular origin to different categories of tourism goods and services in a particular destination. The studies of Divisekera (2009) and Fujii, Khaled, and Mak (1985) are the only exceptions, in which the demand systems were considered in terms of a group of tourism goods and services in one destination. However, the authors used the static AIDS model in their empirical studies. To the best of our knowledge, no published study has used the dynamic AIDS models to analyze tourist expenditure on tourism products at the destination level. The aim of the current study is thus to bridge this gap.

Separability is always an issue in system modeling research. In practice, there are many goods and services available to a tourist. It is impossible to analyze a complete demand system that consists of an infinite number of equations, each of which represents a single good or service available to the tourist. The usual solution to this problem is to assume an *a priori* weak separability between goods and services, which implies that all goods and services can be categorized into broader groups and that a change of price in a single category will affect the demand for all of the goods and services in another category in the same manner (Edgerton et al. 1996). This assumption is made in this study. Tourists are assumed to allocate their budgets in a three-stage process. A resident of a particular source market will first determine the amount of money available to spend on tourism and non-tourism goods and services. In the second budgeting stage, the tourist will divide his or her tourism budget amongst the various tourism products available in a specific destination (Hong Kong in this study) and those available in other selected destinations. In the third stage, the tourist will then allocate his or her expenditure to a group of tourism goods and services in a specific destination. This three-stage budgeting process is illustrated in Figure 1.

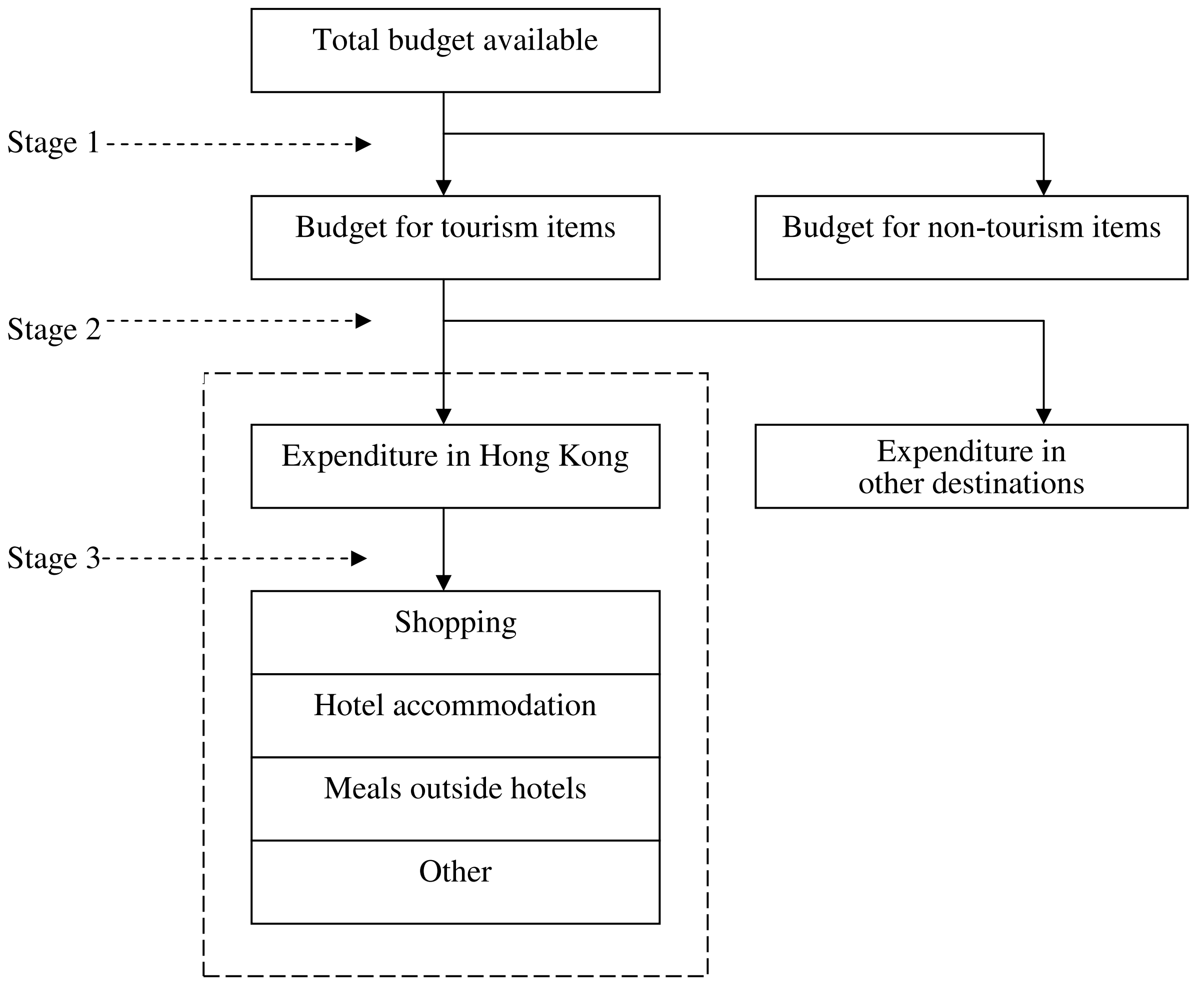

Figure 1 Tourism consumption budgeting stages

This study focuses on the third stage of the budget allocation process. It does not examine the issue of how tourists split their budgets between tourism- and non-tourism consumption or how they choose a tourism destination.

Turning to methodology, while single-equation models dominate the tourism demand modeling and forecasting literature, the AIDS model has a number of advantages over the single-equation models. The AIDS model is explicitly derived from economic theory and has a strong theoretical underpinning, whereas the single-equation models are often criticized for lacking a strong theoretical foundation and independent variables are generally included in these models on an *ad hoc* basis (Durbarry and Sinclair 2003). Furthermore, single-equation models cannot analyze a complete system, which means that the demand for different tourism goods and services and their interactions cannot be explored. The AIDS model overcomes these limitations by capturing the interactions in a system of equations in which each equation represents one expenditure allocation. As these equations are estimated simultaneously, the cross-price elasticities between different tourism goods and services can be computed and analyzed.

In addition, in contrast to the single-equation approach, the AIDS model also allows for the basic assumptions of economic demand theory to be tested, including tests for homogeneity and symmetry restrictions. Previous empirical studies that utilized AIDS models tested these two restrictions with mixed results. In the context of tourism demand, Divisekera (2003) concluded from his empirical analysis that neither of the two restrictions can be rejected when the static AIDS model is used, and Li, Song, and Witt (2004) came to the same conclusion for the dynamic AIDS models. In contrast, White (1985) rejected the symmetry assumption for the static form of AIDS models. As there is no cross-equation restriction for homogeneity, it is easy to test this restriction equation by equation (Deaton and Muellbauer 1980), whereas the symmetry restriction can be tested either on the basis of the assumption of homogeneity or jointly with homogeneity. Here, the restriction is tested in both situations.

METHODOLOGY

The two-step modeling procedure of Engle and Granger (1987) is adopted to specify the EC-AIDS model. According to this procedure, when several variables in a model are non-stationary, traditional diagnostic tests for the residuals of the regression model are unreliable, and the estimation of the model may lead to the problem known as spurious regression. If these non-stationary variables are all integrated into the same order and the residuals of the model resulting from these variables are stationary, then the variables are said to be cointegrated. This cointegration relationship reflects the long-run equilibrium of the system under study. Once the cointegration relationship has been detected in the first step of the modeling process, a flexible dynamic version of the cointegration model can be specified. The error correction term measured by the lagged residuals of the long-run equilibrium model is included as an explanatory variable in the dynamic model in which both the dependent and independent variables are of the first difference. The error correction model permits a gradual adjustment towards a new equilibrium state in the long run, and thus effectively captures the short-run dynamic consumption behavior of tourists.

The remainder of this section focuses on the specification of the dynamic EC-AIDS model, the construction of the aggregate price index to be used in the estimation of the model, and the restriction tests of the demand theory for the model.

Specification of the dynamic EC-AIDS model

The static AIDS model was first advanced by Deaton and Muellbauer (1980) as

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log \frac{x}{P} + \sum_k \varphi_{ik} dum_k + \varepsilon_i , \qquad (1)$$

where w_i is the budget share of the ith tourism good or service (i=1,…,4 indicating shopping, hotel accommodation, meals outside hotels, and other, respectively), p_j is the price of the jth good or service, x is the total expenditure on all goods and services in the system, P is the Tornqvist aggregate price index, x/P is the real total expenditure per capita, dum_k is the kth dummy variable that captures the effect of a one-off event, a_i , b_i , φ_{ik} and γ_{ij} are the parameters to be estimated, and ε_i is a disturbance term. As the long-run cointegration relationship is identified among the variables in the static system, the dynamic EC-AIDS model is then specified as

$$\Delta w_i = \alpha_i^* + \lambda_i \mu_{i,t-1} + \sum\nolimits_j \lambda_{ij}^* \Delta \log p_j + \beta_i^* \Delta \log \frac{x}{p} + \sum\nolimits_k \varphi_{ik}^* dum_k + \varepsilon_i^* \qquad (2)$$

where $\mu_{j,t-1}$ is the error correction term that measures the adjustment of the decision errors made in the previous period, which is the estimated residual term from the long-run static AIDS model in Equation (1), and Δ is the difference operator. The coefficient λ_i represents the adjustment of equation *i* in response to the disequilibrium of the budget allocation related to tourism good or service *i* at time *t*-1. The adding-up condition requires λ to be equal in each equation in the system (Edgerton et al. 1996, p.197). α_i^* , γ_{ij}^* , β_i^* and φ_{ik}^* are parameters to be estimated.

Tornqvist price index

In estimating Equations (1) and (2), an aggregate price index *P* must be created to linearize the demand system (Deaton and Muellbauer 1980). In this study, the Tornqvist price index (Tornqvist 1936) is used and takes the form

$$\ln P = \sum_{i=1}^{N} w_i \ln\left(p_{it} / p_{i0}\right) \qquad (3a)$$

or

$$P = \prod_{i=1}^{N} \left(p_{it} / p_{i0}\right)^{w_i} , \qquad (3b)$$

where 0 represents the base period and *t* represents period *t*. The weight w_i is defined as $w_i = \left(w_{i1} + w_{i0}\right)/2$, and w_i s are positive and add up to 1.

The Stone (1954) price index is the most commonly used proxy for an aggregate price index in the AIDS models used in existing empirical studies. Deaton and Muellbauer (1980) also used this index to linearize the AIDS model. Other aggregate price indices, such as the Laspeyres price index and the Paasche price index, have also been used in previous studies (see, for example, Buse and Chan 2000; Moschini 1995). However, the Tornqvist price index has attracted most attention due to its superior properties. The Tornqvist price index belongs to the class of superlative indices identified by Diewert (1976) that share the property of being exact for linearly homogeneous functions, which are second-order approximations of utility functions and are thus less likely to be subject to substitution bias.

Balk and Diewert (2001) further demonstrate that the Tornqvist price index is linearly homogeneous in comparison-period prices, that is, the price index is λ times higher if the comparison-period prices were λ times as high as they currently are. Furthermore, the Tornqvist price index satisfies the time reversal test, which means that the price index for period 1 relative to period 0 and the price index for period 0 relative to period 1 are reciprocal.

Through a Monte Carlo experiment, Buse and Chan (2000) showed that the Laspeyres and Tornqvist indices are distinctly superior to the Stone and Paasche indices in generating unbiased expenditure and price elasticities with the AIDS model. Furthermore, when the sample size increases, only the Tornqvist index shows a statistically significant reduction in bias. Given the theoretical and experimental advantages of the Tornqvist index, it is employed here to linearize the demand system. Fujii, Khaled, and Mak (1985) also employed the Tornqvist index to represent the aggregate price index in their static AIDS model.

Tests for theoretical restrictions

As AIDS models are explicitly derived from economic theory, they must meet the basic assumptions of demand theory. These restrictions on AIDS models are termed the adding-up, homogeneity, and symmetry restrictions.

The adding-up restriction implies that budget shares should add up to unity, which requires that $\sum_i \alpha_i = 1$, $\sum_i \gamma_{ij} = 0$ and $\sum_i \beta_i = 0$ in Equation (1) (also $\sum_i \alpha_i^* = 1$, $\sum_i \gamma_{ij}^* = 0$ and $\sum_i \beta_i^* = 0$ in Equation 2). This assumption can be realized by omitting one equation from the system when the model is estimated. The coefficients in the omitted equation can then be calculated based on the adding-up rule.

The homogeneity restriction means that a proportional change in all prices and real expenditure will not affect the quantities purchased, and thus $\sum_j \gamma_{ij} = 0$ in Equation (1) and $\sum_j \gamma_{ij}^* = 0$ in Equation (2). Homogeneity can be tested equation by equation.

The symmetry restriction requires that $\gamma_{ij} = \gamma_{ji}$ in Equation (1) and $\gamma_{ij}^* = \gamma_{ji}^*$ in Equation (2), which indicates that the substitution matrix is symmetric and thus that the choices of consumers are consistent. In the AIDS framework, symmetry implies cross-equation restrictions on the parameters.

Conventional methods used for testing the homogeneity restriction or the symmetry and homogeneity joint restriction include the Wald test, the likelihood ratio test, and the Lagrange multiplier test. However, these tests may lead to a considerable bias towards the rejection of the null hypothesis, especially where large demand systems with relatively few observations are concerned (Bera, Byron, and Jarque 1981; Balcombe and Davis 1996; Laitinen 1978; Li, Song, and Witt 2004; Meinser 1979). Given the limited number of observations available, this study adopts the sample size corrected statistic developed by Court (1968) and Deaton (1974) to test the homogeneity restriction, the symmetry restriction, and the symmetry and homogeneity joint restriction. This statistic is calculated as

$$T = \frac{tr\left(\Omega^R\right)^{-1}\left(\Omega^R - \Omega^U\right)/q}{tr\left(\Omega^R\right)^{-1}\Omega^U/(n-1)(N-k)}, \tag{4}$$

where Ω^R and Ω^U denote the estimated residual covariance matrices with and without restrictions imposed, respectively, N is the number of observations, n is the number of equations in the system, k is the number of estimated parameters in each equation, and q is the number of restrictions. T is approximately distributed as $F(q, N-k)$. This statistic has been used in several AIDS studies in the literature (see, for example, Baldwin, Hadid, and Phillips 1983; Chambers 1990; Li, Song, and Witt 2004).

DATA DESCRIPTION

Annual data from 1984 to 2006 are used to analyze tourist expenditure in Hong Kong by residents of eight major source markets. They include the five short-haul markets of mainland China, Japan, South Korea, Singapore, and Taiwan, and the three long-haul markets of

Australia, the United Kingdom, and the United States. Consequently, eight EC-AIDS models are specified. In each system, four categories of tourist consumption are examined, including expenditure on shopping, hotel accommodation, meals outside hotels, and other items. All expenditure data are transformed into the *per capita* form for the model estimation as suggested by Deaton and Muellbauer (1980). The Hong Kong Tourism Board (HKTB) releases annual *per capita* expenditure data on the following categories of goods and services: shopping, hotel accommodation, meals outside hotels, entertainment, tours, and other. However, as price indices for entertainment and tours are not available, these two categories are incorporated into the ‘other’ group.

With regard to the price variables, the price indices for shopping and meals outside hotels are collected from publications of the Hong Kong Census and Statistics Department. Although these price indices mainly relate to Hong Kong residents, an earlier study by Martin and Witt (1987) suggested that in the absence of price indices for tourists, domestic price indices can be used as an approximation. The price index for hotels is obtained from publications of the HKTB. The price index for other items is the consumer price index (CPI) in Hong Kong. As discussed earlier, the Tornqvist price index is generated to approximate the aggregate price index P.

The scope of this study is confined to the third stage of the tourist budget allocation process as described in Figure 1. In this stage, exchange rates between the origin and destination have no influence on the demand system as the tourist has already set a given budget for visiting a destination. For this reason, exchange rates are not included in the system modeling process. However, exchange rates do have an impact on the choice made from amongst a group of destinations, which means that when the system is based on stage 2 of the budgeting process, exchange rates must be included in the estimation. For example, Divisekera (2003), Durbarry and Sinclair (2003), and Li, Song, and Witt (2004) took exchange rates into consideration in adjusting the price variables in the system models used in their analyses of tourist expenditure allocations in different destinations.

In addition to shopping, hotel accommodation, and meals outside hotels, the fourth category of ‘other’ must be included to form a complete system in accordance with the requirements of the AIDS specification. However, this study does not pay particular attention to this category, because it covers a variety of heterogeneous goods and services and thus contributes little to theoretical explanations or practical implications. The econometric software EViews 6.0 is utilized to estimate the AIDS models proposed.

EMPIRICAL RESULTS

Before the EC-AIDS models are estimated, the long-run static AIDS models are first produced for the eight source markets under study. In each static AIDS model, because three equations are estimated simultaneously, three residual series are produced. Augmented Dickey-Fuller unit root tests are carried out, the results indicating that the residual series of the hotel accommodation equation in the U.S. model is stationary at the 10% significance level, the residual series of the hotel accommodation equation in the Australian model is stationary at the 5% significance level, and the remaining 22 residual series are all stationary at the 1% significance level.[2] These results demonstrate that the dynamics of these systems can be presented in the error correction version of the AIDS model.

When the EC-AIDS models are established, the estimation of each system starts with the unrestricted EC-AIDS model. The model is then re-estimated with the homogeneity restriction imposed, and then under both the homogeneity and symmetry restrictions. By comparing the residual covariance matrices with and without restrictions, three tests are carried out for each system, including the homogeneity test, the symmetry test based on the homogeneity assumption, and the joint test for homogeneity and symmetry. The results are provided in Table 1. In the dynamic EC-AIDS models, homogeneity cannot be rejected at the 1% significance level, but is rejected in the models for the United States and mainland China at the 5% significance level. Symmetry based on homogeneity is accepted in most cases, with only one exception at the 5% significance level (Singapore) and one at the 1% level (the United States). Similarly, most models pass the symmetry and homogeneity joint test, with the exceptions of Singapore and mainland China at the 1% significance level and the United States at the 5% level. Theoretically, the assumption of homogeneity and symmetry should be satisfied, but this does not always hold in empirical studies. This may be due to the fact that the data used to estimate the system models do not accurately reflect tourist behavior, or may be caused by sampling bias when the number of observations for the variables is small. Another possible reason for the rejection of this restriction is irrational behavior by tourists in allocating their expenditure to overseas travel as a result of information asymmetry. As the homogeneity and symmetry restrictions cannot be rejected in the majority of the cases here, both restrictions are imposed on each of the systems in estimating the models and discussing the findings.

Table 1 Homogeneity and symmetry restriction tests

	Australia	U.K.	U.S.A.	Mainland China	Japan	South Korea	Singapore	Taiwan
Homogeneity	1.973	2.369	3.584*	3.762*	n.a.	0.571	n.a.	0.149
Symmetry based on homogeneity	1.341	1.350	4.236*	2.116	2.349	0.774	7.509**	1.564
Homogeneity and symmetry	1.453	1.949	5.183**	4.200*	0.586	1.051	3.384*	0.801

Note: * and ** denote significance at the 5% and 1% levels, respectively; n.a. refers to non-positive statistics.

Table 2 summarizes the estimation results for the eight system models, all of which are subject to the homogeneity and symmetry restrictions. One dummy variable is included in the mainland China model to account for the effect of SARS in 2003, but this variable is deleted from the other systems due to its statistical insignificance. The results show that the EC terms in all eight of the systems are statistically significant at the 1% level and have the correct signs. Some of the other variables are statistically insignificant, but are retained in the final models in accordance with the requirements of the AIDS specification.

[2] Due to space constraints, the test statistics are not reported, but are available from the authors upon request.

Table 2 Estimates of the homogeneity and symmetry restricted EC-AIDS models

	Australia	U.K.	U.S.A	Mainland China	Japan	South Korea	Singapore	Taiwan
Equation one: shopping								
Constant	0.001 (0.109)	0.001 (0.209)	-0.005 (0.895)	0.003 (0.868)	-0.003 (-0.639)	-0.001 (-0.233)	-0.006 (-1.548)	-0.006 (-1.310)
Ln(p_shopping)-ln(p_other)	0.148 (1.346)	0.037 (0.435)	0.150 (1.720)	-0.303** (-3.116)	-0.028 (-0.313)	-0.199 (-1.748)	-0.150* (-2.049)	-0.285* (-2.646)
Ln(p_hotels)-ln(p_other)	0.029 (0.815)	-0.015 (-0.454)	-0.108** (-3.072)	0.001 (0.025)	-0.002 (-0.071)	0.194** (4.347)	0.034 (1.495)	-0.015 (-0.467)
Ln(p_meals)-ln(p_other)	-0.130* (-2.424)	-0.134 (-1.952)	-0.107 (-1.659)	-0.069 (-1.564)	-0.035 (-0.807)	-0.099 (-1.320)	0.060 (0.997)	0.074 (1.383)
Ln(exp/P)	0.192** (4.104)	0.092 (1.520)	0.197** (3.449)	-0.084* (-2.390)	0.199** (5.292)	0.149* (2.526)	0.053 (1.906)	0.084 (1.958)
EC term	-0.511** (-4.598)	-1.191** (-8.775)	-0.633** (-4.949)	-0.821** (-8.641)	-0.810** (-7.616)	-1.020** (-8.651)	-1.037** (-9.531)	-1.067** (-8.031)
Dummy2003				0.090** (6.786)				
Equation two: hotel accommodation								
Constant	0.001 (0.124)	-0.002 (-0.274)	0.002 (0.46)	-0.005 (-1.386)	0.001 (0.451)	0.000 (-0.016)	0.003 (0.493)	-0.002 (-0.662)
Ln(p_shopping)-ln(p_other)	0.029 (0.815)	-0.015 (-0.454)	-0.108** (-3.072)	0.001 (0.025)	-0.002 (-0.071)	0.194** (4.347)	0.034 (1.495)	-0.015 (-0.467)
Ln(p_hotels)-ln(p_other)	0.007 (0.178)	0.063 (1.555)	0.127** (3.734)	0.019 (1.047)	0.053** (2.731)	-0.137** (-3.619)	0.015 (0.475)	0.047 (1.961)
Ln(p_meals)-ln(p_other)	-0.031* (-2.328)	-0.022 (-1.348)	0.011 (0.626)	0.025* (2.419)	-0.007 (-0.665)	-0.055** (-2.860)	-0.027 (-1.738)	-0.011 (-0.741)
Ln(exp/P)	-0.150** (-2.976)	-0.097 (-1.283)	-0.168** (-2.980)	0.068 (2.007)	-0.154** (-6.013)	-0.126* (-2.503)	-0.057 (-1.438)	-0.069* (-2.051)
EC term	-0.511** (-4.598)	-1.191** (-8.775)	-0.633** (-4.949)	-0.821** (-8.641)	-0.810** (-7.616)	-1.020** (-8.651)	-1.037** (-9.531)	-1.067** (-8.031)
Dummy2003				-0.041** (-3.115)				
Equation three: meals outside hotels								
Constant	-0.002 (-0.865)	-0.002 (-0.840)	0.001 (0.186)	-0.002 (-1.113)	0.001 (0.560)	0.000 (0.040)	0.001 (0.415)	0.003 (1.420)
Ln(p_shopping)-ln(p_other)	-0.130* (-2.424)	-0.134 (-1.952)	-0.107 (-1.659)	-0.069 (-1.564)	-0.035 (-0.807)	-0.099 (-1.320)	0.060 (0.997)	0.074 (1.383)
Ln(p_hotels)-ln(p_other)	-0.031* (-2.328)	-0.022 (-1.348)	0.011 (0.626)	0.025* (2.419)	-0.007 (-0.665)	-0.055** (-2.860)	-0.027 (-1.738)	-0.011 (-0.741)
Ln(p_meals)-ln(p_other)	0.132 (1.580)	0.038 (0.310)	-0.017 (-0.209)	0.380** (3.971)	0.214** (3.243)	-0.269* (-2.611)	0.201* (2.035)	0.034 (0.536)
Ln(exp/P)	-0.049** (-2.814)	-0.080** (-2.736)	-0.041 (-1.400)	-0.003 (-0.169)	-0.005 (-0.368)	-0.044 (-1.715)	0.013 (0.671)	-0.003 (-0.151)
EC term	-0.511** (-4.598)	-1.191** (-8.775)	-0.633** (-4.949)	-0.821** (-8.641)	-0.810** (-7.616)	-1.020** (-8.651)	-1.037** (-9.531)	-1.067** (-8.031)
Dummy2003				-0.031** (-4.626)				

Note: * and ** denote significance at the 5 % and 1% levels, respectively; the figures in parentheses are *t*-statistics.

Based on the estimations of the eight system models, the expenditure elasticities and price elasticities are calculated to evaluate the demand responses to changes in expenditure budgets and prices. In the AIDS model, expenditure elasticity reflects the responsiveness of demand to changes in the spending budget and is calculated as $\varepsilon_{ix} = \frac{\beta_i}{x_i} - 1$. According to demand theory, if expenditure elasticity is greater than 1, then the good or service in question can be considered a luxury, whereas a value between 0 and 1 indicates a necessity.

Price elasticity is another important indicator that measures the sensitivity of demand in response to price changes. Both uncompensated and compensated price elasticity can be calculated within the AIDS framework. The former holds under the assumption that total expenditure and the prices of other goods and services remain constant, whereas the latter assumes that real expenditure is constant. This study reports compensated price elasticities (see Table 4) because they reflect the effects of price changes better than uncompensated price elasticities. To ensure we provide rigorous findings, attention is paid only to statistically significant results in the discussion that follows.

The long-haul markets–Australia, the United Kingdom, and the United States

According to the expenditure data from 2007, Australia, the United Kingdom, and the United States are the three leading non-Asian source markets for Hong Kong tourism. The expenditure of tourists from these three markets reached HK$2.91 billion, HK$2.86 billion, and HK$5.36 billion, respectively, in that year, accounting for 3.3%, 3.3%, and 6.1% of total tourist expenditure in Hong Kong. Figure 2 shows the composition of tourist expenditure on different categories of goods and services by tourists from these three countries. For tourists from the United Kingdom and the United States, the greatest expenditure item is hotel accommodation, which accounts for about 46.3% and 52.5%, respectively, of total expenditure, followed by expenditure on shopping, which accounts for about 23.8% and 21.1% of the total, respectively. Australian tourists spent about equal amounts on shopping and hotel accommodation (38.4% and 38.1%). Expenditure on meals outside hotels by tourists from all three countries was relatively low, representing about 13.0%, 17.3%, and 16.1% of total expenditure, respectively.

The expenditure elasticities reported in Table 3 suggest that retail products purchased by tourists from these three long-haul markets are consistently regarded as luxuries (the expenditure elasticity of shopping is greater than 1), whereas hotel accommodation and meals outside hotels are commonly perceived as necessities (the expenditure elasticities for these categories are less than 1). For example, the expenditure elasticity of shopping in the U.S. market is 1.578. This means that a 10% increase (or decrease) in the tourism budgets of U.S. tourists in Hong Kong would lead to a 15.78% increase (or decrease) in their spending on shopping. Conversely, a 10% increase (or decrease) in these budgets would result in a 6.27% and 6.57% increase (or decrease) in their spending on hotel accommodation and meals outside hotels, respectively.

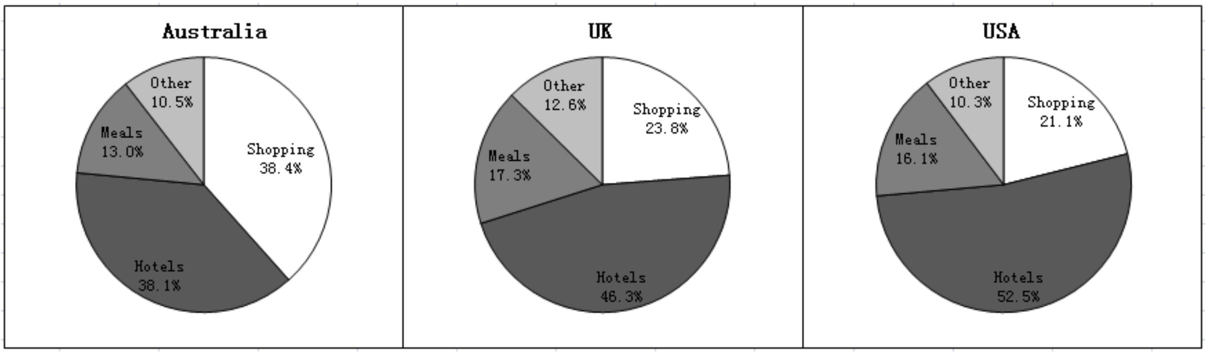

Figure 2 Tourist expenditure distributions for Australia, the United Kingdom, and the United States in 2007

The diagonals in Table 4 refer to compensated own-price elasticities. All of the significant own-price elasticities are negative, which is consistent with the demand theory notion whereby relative expenditure decreases as prices increase.

With respect to cross-price elasticities (the off-diagonal figures in Table 4), all of the significant values are positive. This indicates the presence of substitution relationships between the three consumption categories. However, the degree of this substitution effect differs between each pair of consumption categories concerned. For instance, the demand for shopping amongst U.K. tourists is more sensitive to price changes in hotel accommodation than is their demand for hotel accommodation in response to price changes in shopping, with cross-price elasticities of 0.392 and 0.245, respectively. This means that if the average tariff for hotel rooms increases by 10%, then U.K. tourists are likely to spend 3.92% more on shopping, but if the average price of shopping increases by 10%, they will only spend 2.45% more on their accommodation. In the case of Australia, the degree of substitution between shopping and hotel accommodation in both directions varies less distinctly, with related cross-price elasticities of 0.451 and 0.487, respectively. For both the United Kingdom and the United States, the demand for meals outside hotels is much more sensitive to price changes in hotel accommodation than is the demand for hotel accommodation in response to price changes in meals outside hotels. The relevant cross-price elasticities are 0.301 and 0.100 for the United Kingdom and 0.544 and 0.146 for the United States.

Table 3 Expenditure elasticities

	Australia	U.K.	U.S.A.	Mainland China	Japan	South Korea	Singapore	Taiwan
Shopping	1.467**	1.330 **	1.578**	0.867**	1.386 **	1.340**	1.141**	1.140 **
Hotels	0.606 **	0.784 **	0.627**	1.444**	0.433 **	0.579 **	0.842 **	0.645 **
Meals	0.570 **	0.464*	0.657 *	0.977**	0.955**	0.680 **	1.083 **	0.971**

Note: * and ** denote significance at the 5% and 1% levels, respectively.

Table 4 Compensated price elasticities

	Australia			U.K.			U.S.A.			Mainland China		
	Shopping	Hotels	Meals	Shopping	Hotels	Meals	Shopping	Hotels	Meals	Shopping	Hotels	Meals
Shopping	-0.229	0.451**	-0.202	-0.588	0.392**	-0.332	-0.220	0.133	-0.195	-0.850**	0.155**	0.016
Hotels	0.487**	-0.603**	0.033	0.245**	-0.413**	0.100*	0.101	-0.267**	0.146**	0.634**	-0.721**	0.285**
Meals	-0.729	0.110	0.273	-0.623	0.301*	-0.593	-0.550	0.544**	-1.02	0.082	0.349**	2.150*

	Japan			South Korea			Singapore			Taiwan		
	Shopping	Hotels	Meals	Shopping	Hotels	Meals	Shopping	Hotels	Meals	Shopping	Hotels	Meals
Shopping	-0.536**	0.267**	0.044	-1.016**	0.741**	-0.090	-1.023**	0.450**	0.310	-0.876**	0.169**	0.239
Hotels	0.509**	-0.532**	0.086*	1.086**	-1.162**	-0.048	0.472**	-0.599**	0.077	0.521**	-0.565**	0.060*
Meals	0.205	0.210*	1.032	-0.286	-0.105	-2.820**	0.772	0.183	0.479	1.240*	0.101	-0.593

Note: * and ** denote significance at the 5% and 1% levels, respectively.

The short-haul markets–Japan, South Korea, Singapore, and Taiwan

Japan, South Korea, Singapore, and Taiwan are the main short-haul origins of tourists in Hong Kong. In 2007, their expenditure in Hong Kong varied from HK$2.61 billion to HK$3.56 billion, with market shares ranging from 2.97% to 4.05%. However, unlike long-haul tourists, these short-haul tourists spend more on shopping than on hotel accommodation (see Figure 3).

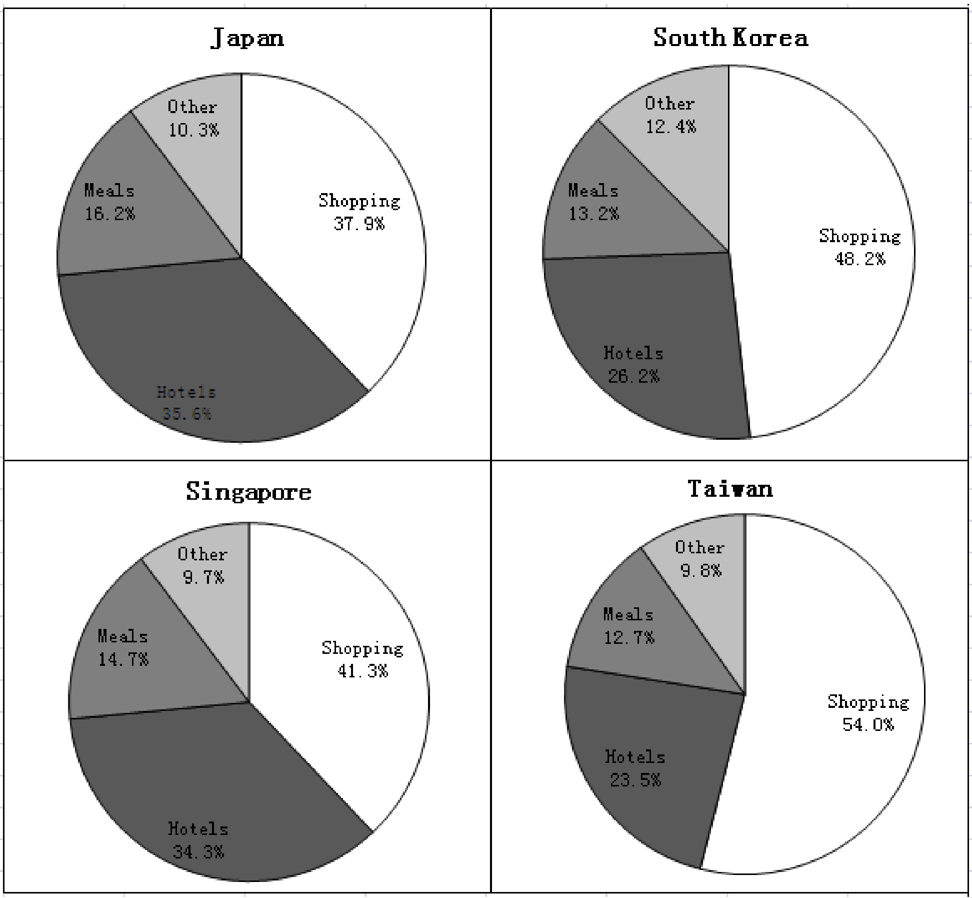

Figure 3 Tourist expenditure distributions for Japan, South Korea, Singapore, and Taiwan in 2007

As Table 3 suggests, these four short-haul markets share some similar spending patterns to their long-haul counterparts. The expenditure elasticities are all positive, which indicates that these tourists tend to spend more (or less) on each of the three consumption categories as their total budget increases (or decreases). Again, the products that they purchase (i.e., those in the shopping category) are generally regarded as luxuries, whereas hotel accommodation and meals outside hotels are regarded as necessities, with only one inconclusive case (meals outside hotels consumed by Singaporean tourists). The cross-price elasticities calculated suggest some significant substitution effects. For example, the demand for hotel accommodation among short-haul tourists is more sensitive to price changes in the shopping category than is their demand for shopping in response to price changes in hotel accommodation.

Furthermore, the demand for shopping is more expenditure-elastic amongst Japanese and Korean tourists than it is amongst Taiwanese and Singaporean tourists (see Table 3). In terms of meals outside hotels, the expenditure elasticities for the short-haul markets are consistently higher than those for the long-haul markets. This means that meals outside hotels are regarded more as necessities for non-Asian tourists, whereas the demand amongst Asian tourists for meals outside hotels is more sensitive to changes in their total expenditure budget.

The own-price elasticities for the shopping category are higher for Korean, Singaporean, and Taiwanese tourists than for Japanese tourists. The relatively low sensitivity of Japanese tourists' demand for shopping to retail price changes can be explained by their relatively high income level. In contrast, pricing strategies in the retail sector are likely to be more effective in attracting greater spending by Korean, Taiwanese, and Singaporean tourists. In terms of hotel accommodation, the own-price elasticity amongst Korean tourists is distinctly higher than that for the other three short-haul markets. Thus, hotels that specifically target the Korean market should consider appropriate promotional campaigns (perhaps in collaboration with Korean tour operators or travel agencies) to boost their revenues.

Mainland China

Although mainland China is also a short-haul tourist origin, it is analyzed separately due to its special role in Hong Kong tourism. Since the United Kingdom handed over Hong Kong to China in 1997, Hong Kong has attracted increasing numbers of Chinese tourists. The Chinese government launched an outbound travel policy in 2003 called the individual visit scheme (IVS) that allows mainland Chinese citizens from certain cities and regions to visit Hong Kong and Macau independently of tour groups. Before this policy was brought in, mainland Chinese citizens could only visit Hong Kong as part of tours organized by authorized Chinese travel agencies. The IVS resulted in an immediate surge in the number of mainland Chinese visitors to Hong Kong, and by 2007 tourist arrivals from mainland China had reached 9.09 million, accounting for 53% of total arrivals in Hong Kong. Mainland Chinese tourists generated HK$47.22 billion in revenue in 2007, equivalent to 53.7% of total tourist expenditure in Hong Kong in that year. By 2008, the IVS had been extended to 49 mainland Chinese cities, and the market continues to grow. Considering the significant contribution made by mainland Chinese visitors to Hong Kong's tourism industry, it is appropriate to seek particular insights into this market to enhance the understanding of the distinct consumption behavior of this group of tourists.

Figure 4 shows the distribution of the spending of mainland Chinese tourists in Hong Kong. Unlike tourists from the long-haul and other short-haul markets, mainland Chinese tourists spend a considerably higher proportion of their budget on shopping (72.6%) and a relatively small proportion on hotel accommodation (7.2%).

The demand elasticities calculated also differentiate the mainland Chinese market from the other markets analyzed here. Using shopping as an example, mainland Chinese tourists have the lowest expenditure elasticity (0.867) of all the markets assessed, with the remaining markets all having expenditure elasticities above 1. This implies that mainland Chinese tourists generally regard the products they purchase in Hong Kong as necessities, rather than luxuries. This is likely to be explained by the fact that most Chinese tourists who can afford to travel to Hong Kong are wealthy, middle-class people for whom shopping is a major motivation for their visit (for example, they may intend to shop for gold items or designer clothes and handbags). Given this inelastic feature of their demand for shopping, Hong Kong enjoys a competitive advantage as a shopping destination for mainland Chinese visitors. Thus, to attract more spending by mainland Chinese tourists, it is important for Hong Kong's retail industry to maintain the high quality of its products and customer services.

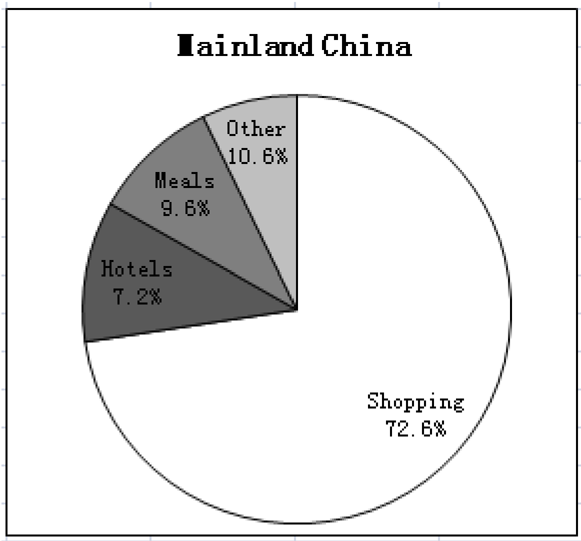

Figure 4 Tourist expenditure distribution for mainland China in 2007

Compared with the other source markets, mainland Chinese tourists display different patterns of spending on hotel accommodation, with a considerably higher expenditure elasticity of 1.444. This elastic feature implies that hotel accommodation in Hong Kong is regarded as a luxury by mainland Chinese tourists, rather than the necessity it is perceived as by the other markets. With regard to meals outside hotels, the expenditure elasticity of mainland Chinese tourists (0.977) is at a similar level to that of the Japanese, Singaporean and Taiwanese markets, but is higher than that of the long-haul markets.

Table 4 shows that mainland Chinese and Taiwanese tourists exhibit the same level of sensitivity to price changes in shopping, with own-price elasticities of -0.850 and -0.876, respectively. Mainland Chinese tourists are also highly sensitive to price changes in hotel accommodation, with an own-price elasticity of -0.721, the second highest amongst the markets under study. Overall, mainland Chinese tourists behave differently from tourists from other source markets for reasons that may be derived from the special relationship between mainland China and Hong Kong. From a geographical perspective, travelling to Hong Kong carries the lowest transportation cost of all the other international destinations under consideration. From a political perspective, since the handover of Hong Kong to China in 1997, the Chinese government has been encouraging mainland Chinese citizens to visit Hong Kong to enhance its economic competitiveness. Finally, from a cultural perspective, mainland China and Hong Kong share the same cultural roots. Together, these aspects may explain the distinct consumption behavior of mainland Chinese tourists in Hong Kong.

CONCLUDING REMARKS

This study employs the dynamic AIDS model to analyze Hong Kong inbound tourism demand. The EC-AIDS model, which integrates the EC mechanism into the modeling process, reflects the economic system more accurately than the static AIDS model, because although a system is always self-adjusting to an equilibrium state, it rarely attains that state in practice. In a departure from most previous work, this study employs the Tornqvist price index to produce the aggregate price index.

Eight demand systems for Hong Kong inbound tourism (representing the markets of Australia, the United Kingdom, the United States, Japan, South Korea, Singapore, Taiwan, and mainland China) are established over four tourism goods and services categories: shopping, hotel accommodation, meals outside hotels, and other. This study bridges a gap in the literature by employing the EC-AIDS model to analyze tourism expenditure on a group of tourism products at the destination level. It provides insights into the patterns of tourist consumption of different tourism goods and services in response to changes in expenditure budgets and price changes in the demand system.

The empirical results reveal different types of consumption behavior amongst the eight source markets. For example, demand for meals outside hotels is more expenditure-elastic in the short-haul markets than in the long-haul markets. Mainland Chinese tourists display markedly distinct consumption characteristics. For example, in contrast to tourists from the other markets, mainland Chinese tourists regard shopping in Hong Kong as a necessity, but view hotel accommodation as a luxury. In contrast, tourists from all the other markets under study perceive shopping in Hong Kong as a luxury, and the expenditure elasticity of shopping is much higher than that of other product categories as far as these markets are concerned. There are a number of reasons for the different types of consumption behavior observed, such as differences in cultural background, income level, perceived images of Hong Kong as a tourist destination, and geographic distance between the source market and Hong Kong.

Understanding the different types of tourist consumption behavior and patterns for the key source markets has important implications for the tourist sector in Hong Kong in terms of strategic issues such as pricing, market segmentation, and service quality. In particular, the distinctive consumption behavior of mainland Chinese tourists and their significant contribution to the Hong Kong tourism industry presents tourism practitioners with the challenge of sustaining the continuous growth of the mainland Chinese market while maintaining a healthy balance with the other key source markets. Moreover, faced with increasingly fierce competition from neighboring countries, the Hong Kong tourism industry must enhance its competitive advantage. The empirical results reported here provide useful information that can be utilized by public agencies in Hong Kong in formulating and evaluating the effectiveness of tourism policies such as those relating to taxation. Moreover, the uniformly high expenditure elasticity (above one) of shopping for all source markets other than China indicates that during times of global economic weakness such as the present, retail is likely to be the sector in Hong Kong that is hit most severely given the tightened tourism expenditure budgets of most international tourists. Retail shops need to consider innovative marketing and promotional campaigns, though price cuts are unlikely to be effective as this study shows that most tourists perceive retail products as price-inelastic. Total revenue is unlikely to be boosted through a discounting strategy. On the other hand, during an economic boom, the retail sector is likely to benefit the most from increased spending among tourists.

Due to data availability restrictions, this study examines tourist consumption behavior solely on the basis of annual data. However, researchers and practitioners commonly observe that tourism demand systems have strong seasonal characteristics and that expenditure elasticities and price elasticities are thus likely to display seasonal variations. Where seasonal data are available, future research should employ the EC-AIDS model to examine the seasonal patterns of tourist budget allocations to various consumption categories.

A further limitation of this study is that it focuses purely on stage 3 of the budgeting process depicted in Figure 1. Where richer data are available, a multi-stage budgeting system should be considered within the AIDS framework. Multi-stage budgeting systems have been applied in other fields of study, such as in the work of Decoster and Vermeulen (1998), but not yet in the tourism context.

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