ECONOMIC ANALYSIS OF TOURISM CONSUMPTION

DYNAMICS:

A Time-varying Parameter Demand System Approach

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ABSTRACT

This study considers the dynamics of the consumption behaviour of tourists from an economic perspective. The evolution of various demand elasticities is explored using a time-varying parameter almost ideal demand system model. The top four source markets for tourism in Hong Kong are examined, and three major tourist expenditure categories, including shopping, hotel accommodation and meals outside hotels, are investigated for each market. Elasticity analysis reveals different consumption trends and patterns across the source markets. The findings will serve as a useful reference for Hong Kong tourism-related industries and the government in their efforts to enhance the competitiveness of Hong Kong as an international tourism destination.

Keywords: tourism consumption, time-varying parameter, almost ideal demand system, demand elasticity, evolution, Hong Kong.

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INTRODUCTION

International tourism plays an increasingly significant role in national and global economies. Tourist expenditure on shopping, hotel accommodation, food services, transport, visitor attractions, entertainment and so forth contributes substantially to developing and developed economies by generating gross domestic product (GDP), creating employment and providing socio-economic development opportunities. In 2008, more than 80 countries earned over US\$1 billion from international tourism, with worldwide receipts reaching \$944 billion (UNWTO, 2009). Given the importance of tourism consumption to a destination's economy and its direct link to the performance of tourism-related businesses, tourism demand analysis has attracted increased attention from both academics and practitioners. It is of great importance to study the consumption behaviour of tourists from an economic perspective. The economic study of tourism is set within a well-established academic discipline, with a firm theoretical foundation and well-tested methodologies (Stabler, Papatheodorou & Sinclair, 2010). In this discipline, the modelling of tourism demand "is one of the most developed and rigorous areas of the economic analysis of tourism" (Stabler et al., 2010, p. 425).

In particular, demand elasticity analysis can be used to assess tourists' consumption behaviour scientifically and to generate useful managerial implications for tourism-related industries and tourist destinations. Various demand elasticities, such as income elasticity, own-price elasticity and cross-price elasticity, can be calculated based on an estimated demand model to determine the sensitivity of tourist demand for tourism goods and services to changes in a tourist's disposable income, the price of tourism products and the price of alternative consumption products. Such analyses can help tourism organisations to manage and promote a destination effectively in a competitive environment, and can guide tourism service providers in setting appropriate pricing strategies (Cortés-Jiménez, Durbarry & Pulina, 2009).

This study aims to provide new insights into the dynamics of Hong Kong inbound tourists' consumption behaviour regarding a group of tourism goods and services and to evaluate the competitiveness of Hong Kong as an international tourist destination. The remainder of the paper is organised as follows. In the next section, a brief review of the relevant literature on tourism consumption is provided, with a particular focus on past empirical studies using the almost ideal demand system (AIDS) model. Section 3 includes the discussion of various versions of the AIDS model, followed by an introduction to the empirical research design and data collection. The results of the empirical study are presented and discussed in detail in Section 4. The concluding remarks and managerial implications of the study's findings are presented in Section 5.

RELEVANT LITERATURE

A variety of modern econometric approaches have been employed to model the relationship between tourism demand and its economic determinants. These include the autoregressive distributed lag model, error-correction model, vector autoregressive model and system-of-equations approach (see Li, Song & Witt, 2005, and Song & Li, 2008, for comprehensive reviews of the application of these methods in tourism demand analysis). The system-of-equations approach in particular has several advantages over its single-equation counterparts. By including a number of tourism goods and services, such as restaurant dining and hotel accommodation, in the system and estimating them simultaneously, a system-of-equations model allows the researcher to investigate how a tourist chooses a bundle of goods and services to maximize his or her utility within certain budget constraints. It also allows the interrelationships amongst alternative tourism goods and services in a demand system – the substitution or complementary effects – to be evaluated effectively (Li, Song & Witt, 2004).

Tourism Consumption Analysis Using the Almost Ideal Demand System

Within the family of complete systems of demand equations, the AIDS model has attracted the most attention in consumer demand studies, including those related to tourism demand. This is due to its superiority over other methods such as the linear expenditure system, the indirect addilog model, the Rotterdam model and the double logarithmic system (Thomas, 1993). The AIDS model is explicitly derived from economic theory, and has a strong theoretical underpinning. It is capable of analysing the demand for different tourism goods and services and their interactions, and allows the cross-price elasticities amongst various tourism goods and services to be estimated directly. The basic assumptions of economic demand theory – homogeneity and symmetry – can also be considered in the system (Wu, Li & Song, 2011). Because of its strong theoretical underpinning, the AIDS model provides more accurate results for demand elasticity compared to single-equation demand models.

The AIDS model has been applied with various model specifications and estimation methods to tourism consumption analysis in two ways. The first, which has a greater number of empirical applications, concerns the analysis of the demand for outbound tourism across several destinations. Each destination under study is regarded as a tourism product within the demand system, and the nature of the destinations (i.e., luxury or necessity) and their relationships (i.e., substitution or complementarity) are identified through demand elasticity analysis. Such analyses generate useful findings on destination marketing and management. For example, White (1985) employs the AIDS model to estimate the budget allocations of US tourists amongst western European countries, identifying the luxury destinations and the complementary or substitution relationships between destinations.

In the recent tourism literature, an error-correction version of the AIDS model (EC-AIDS) has been introduced to analyse the short-run dynamics of demand for various tourist destinations. For instance, Durbarry and Sinclair (2003) develop an EC-AIDS model to analyse the demand for tourism to Italy, Spain and the United Kingdom by French residents. Italy and the United Kingdom are identified as luxury destinations, and Spain is found to be a substitute destination for Italy and the United Kingdom as far as French tourists are concerned. Li et al. (2004) employ an EC-AIDS model to examine UK residents' outbound tourism demand for several countries in western Europe, and show that travelling to most destinations in this region appears to be a luxury for UK tourists in the long run, and that the substitution or complementary effects vary across destinations. Cortés-Jiménez et al. (2009) use an EC-AIDS model to analyse the outbound Italian tourism demand for four European countries: France, Germany, Spain and the United Kingdom. They find that France and Germany are substitute destinations in the short run for Italian tourists.

The second category of AIDS applications in tourism is the examination of tourists' budget allocation amongst several tourism product categories, including accommodation, food, transport, shopping and entertainment. Such studies are very few, mainly because of the difficulty of obtaining tourist expenditure and price data at the product category level. Fujii, Khaled and Mak (1985), the first to explore this application, employ a basic AIDS model to analyse tourist demand for food and drink, lodging, recreation and entertainment, local transport, clothing and other items in Hawaii. Divisekera (2009) analyses the demand for accommodation, food, transport, shopping and entertainment amongst ten tourism source markets for Australia, and identifies the complementary relationships of the demand for these expenditure categories by calculating the cross-price elasticities. These two studies are based on the static AIDS model, which focuses solely on long-run demand elasticities. Wu et al. (2011) employ an EC-AIDS model to analyse the short-run dynamics of the demand for shopping, hotel accommodation, meals outside hotels and other tourism goods and services in Hong Kong. They consider eight major source markets, and find substitution relationships amongst the expenditure categories in most cases. All of these studies calculate the average long-run or short-run demand elasticities over the sample period, but do not consider the evolution of tourists' consumption behaviour over time.

Evolution of Tourism Consumption: The Time-varying Parameter Approach

The estimation methods used in the econometric analysis of tourism demand can be categorised into two types: constant parameter and time-varying parameter (TVP) approaches. In constant parameter demand models, the coefficients of the explanatory variables remain unchanged for the entire estimation period. Thus, once the models have been estimated, the average impact of determinants on tourism demand over the sample period can be evaluated. The majority of empirical studies adopt the constant parameter approach to estimate tourism demand models. However, in practice, the relationship between tourism demand and its determinants may vary in response to technological developments, preference shifts amongst tourists and improvements in

living standards. The TVP approach, which is based on a recursive estimation of the parameters in a model, is capable of capturing these dynamics and the evolution of the demand system, because the coefficients are allowed to vary over the sample period. In other words, constant parameter models can estimate only the average impact of determinants on tourism demand over the sample period, whereas their TVP counterparts can trace the evolution of tourist behaviour over time. Due to this advantage of TVP models over their constant parameter counterparts, this study applies the TVP approach to examine the historical evolution of tourists' consumption behaviour in relation to different tourism products.

Despite the development of the TVP technique in econometrics and its advantages for consumer demand analysis (Harvey, 1989), its application in tourism research is still limited. Song and Wong (2003) employ a TVP model to examine the demand for Hong Kong tourism by residents of 16 major tourism origin countries. Riddington (1999) compares the forecasting performance of TVP models with that of their constant parameter counterparts, and provides empirical evidence of the greater accuracy of the former. Song, Witt and Jensen (2003) employ international tourism data to compare the forecasting performance of a TVP model with seven other econometric and time-series approaches, and find that the TVP model provides the most accurate one-year-ahead forecasts. Li, Wong, Song and Witt (2006) combine the TVP technique with an error correction model (ECM), and show the superior forecasting performance of the TVP-ECM compared to other econometric and time-series models.

All of the aforementioned applications of the TVP technique are in the context of single-equation demand models. Thus far, only one study in the tourism literature has applied the TVP approach to AIDS models. Li, Song and Witt (2006) introduce the TVP technique into both the static and error-correction versions of the AIDS model (TVP-AIDS and TVP-EC-AIDS, respectively) to examine the long-run and short-run evolution of British tourists' consumption behaviour in relation to a group of European destinations. However, due to sample size constraints, the equations in the developed TVP-AIDS and TVP-EC-AIDS models are estimated separately, rather than simultaneously. This means that the cross-equation symmetry restriction is not tested, and consequently fully restricted (homogeneous and symmetric) TVP-AIDS and TVP-EC-AID models are not considered.

To the best of our knowledge, no research has applied the TVP model to analyse the evolution of tourism consumption with regard to different tourism goods and services and their interactions in a tourist destination. The present study aims to bridge this gap in the literature by combining the advanced TVP estimation technique with a theoretically sound system-of-equations demand model – the AIDS – to analyse how tourists allocate their expenditure to various tourism goods and services in the context of Hong Kong as an international tourist destination. This study builds upon previous research applying the AIDS in this way (e.g., Wu et al., 2011) by incorporating the

TVP technique to examine the evolution of tourism consumption behaviour. It also extends the work of Li, Song and Witt (2006), as the equations in the demand system are estimated simultaneously rather than equation by equation. All of the theoretical restrictions are verified, including homogeneity, symmetry and the joint assumption of both. The resulting homogeneity and symmetry restricted TVP-EC-AIDS model is estimated and used for the evaluation of short-run demand elasticities and the evolution of tourists' consumption behaviour.

METHODOLOGY

Given the advantages of both the TVP technique and the AIDS model, as discussed, a TVP-EC-AIDS model is proposed in this study to examine the dynamics and evolution of tourists' consumption behaviour in relation to several tourism expenditure categories. This section introduces the basic AIDS model proposed by Deaton and Muellbauer (1980), and discusses the dynamic version of the model. The TVP-EC-AIDS model is then introduced, which forms the basis for the empirical analysis in this study.

Basic AIDS Model

Deaton and Muellbauer (1980) first proposed the basic AIDS model to analyse the demand for a number of goods and services simultaneously. The model specification is shown as follows.

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

where w_i ($i = 1, \dots, n$) is the budget share of the i th category of tourism goods and services (here, n categories of tourism goods and services constitute a complete demand system), p_j is the price of the j th tourism product, x is the total expenditure on all tourism goods and services in the system, P is an aggregate price index, x/P is the real total expenditure *per capita*, dum_k is the k th dummy variable that captures the effect of a one-off event, α_i , γ_{ij} , β_i and φ_{ik} are parameters to be estimated and ε_i is a disturbance term. The Tornqvist price index (Tornqvist, 1936) is used as the proxy for the aggregate price index in Equation 1 due to its advantages over other aggregate price indices (see Wu et al., 2011).

As a complete system is studied, the 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. To avoid the singularity problem in the residual variance-covariance matrix when setting the dependent variables (budget shares) to add up to unity, one equation is normally omitted from the system in the estimation, and its coefficients are then calculated later based on the adding-up rule (Deaton & Muellbauer, 1980). At the same time, two basic restrictions – homogeneity and symmetry – are imposed on the parameters according to the theoretical properties of demand theory within the AIDS framework. These restrictions are also imposed in other versions of the AIDS model discussed below.

EC-AIDS Model

The dynamic version of the AIDS (i.e., EC-AIDS), rather than the basic AIDS model, is employed here to model tourists' consumption behaviour because the EC-AIDS is capable of reflecting continuous adjustments in such behaviour in relation to new equilibriums of the demand system (see Wu et al., 2011). The EC-AIDS model is specified as

$$\Delta w_{i,t} = \alpha_i + \lambda \mu_{i,t-1} + \sum_j \gamma_{ij} \Delta \log p_{j,t} + \beta_i \Delta \log \frac{x_t}{P_t} + \sum_k \phi_{ik} dum_k + \varepsilon_{i,t}, \quad (2)$$

where Δ is the difference operator, and $\mu_{i,t-1}$, the estimated residual term from the basic AIDS model (i.e., Equation 1), is the error-correction term that measures the adjustment of the decision errors made in the previous period. The unit root test suggests that all of the variables included in Equation 1 are integrated of order one, and that a cointegration relationship exists amongst them, which supports the adoption of the EC-AIDS model. This result is in line with previous studies adopting the AIDS, such as those of Cortés-Jiménez et al. (2009) and Li et al. (2004).

TVP-EC-AIDS Model

To incorporate the TVP technique into the EC-AIDS model, the system is specified in a state space form that includes two types of equations. The first is the signal equation, which describes the relationship between tourism demand and its determinants (see Equation 3, which is identical to Equation 2 apart from the subscripts of the parameters). The other is the state equation, which controls the variation in the coefficients in the signal equation over time (see Equations 4-7).

$$\Delta w_{i,t} = \alpha_{i,t} + \lambda_t \mu_{i,t-1} + \sum_j \gamma_{ij,t} \Delta \log p_{j,t} + \beta_{i,t} \Delta \log \frac{x_t}{P_t} + \sum_k \phi_{ik} dum_k + \varepsilon_{i,t}, \quad (3)$$

$$\alpha_{i,t} = \alpha_{i,t-1} + \vartheta_t, \quad (4)$$

$$\lambda_t = \lambda_{t-1} + \theta_t, \quad (5)$$

$$\gamma_{ij,t} = \gamma_{ij,t-1} + \rho_t, \quad (6)$$

$$\beta_{i,t} = \beta_{i,t-1} + \tau_t, \quad (7)$$

where ϑ_t , θ_t , ρ_t and τ_t are disturbance terms. An efficient recursive algorithm named the Kalman filter (Kalman, 1960) is used to estimate this state space model. Details of the Kalman filter algorithm are discussed in Durbin and Koopman (2001) and Harvey (1989).

Demand Elasticities

As the parameters in the TVP-EC-AIDS model are specified to change over time, the calculated demand elasticities also vary across the sample period. The expenditure

elasticity of demand is calculated as $\varepsilon_{ix,t} = \frac{\beta_{i,t}}{w_{i,t}} + 1$. The calculation of the compensated own-price and cross-price elasticities is also based on these formulae; that is, $\varepsilon_{ii,t} = \frac{\gamma_{ii,t}}{w_{i,t}} + w_{i,t} - 1$ and $\varepsilon_{ij,t} = \frac{\gamma_{ij,t}}{w_{i,t}} + w_{j,t}$, respectively. As the subscripts of these formulae suggest, in the TVP-EC-AIDS model, the estimated coefficients (β_i , γ_{ii} and γ_{ij}) have different values at different points in time. In addition, distinct from the constant parameter AIDS models, in which the average of $w_{i,t}$ (i.e., $\bar{w}_i$) is used for the elasticity calculation, in the TVP-EC-AIDS model, the entire time series of $w_{i,t}$ is employed to generate time-varying demand elasticities. Thus, the calculated demand elasticities vary over the sample span, and the evolution of tourists' consumption behaviour can be analysed over time. For instance, based on the calculated demand elasticities, tourists' responses to changes in the total expenditure budget or the prices of different categories of tourism goods and services can be evaluated. Furthermore, the evolution of consumption patterns across different tourism source markets can be identified and compared.

Data for the Empirical Study

This study employs Hong Kong inbound tourism data to demonstrate the estimation of the TVP-EC-AIDS model empirically. The four largest source markets for Hong Kong tourism – mainland China, Japan, Taiwan and the United States – are investigated. Mainland China has been the leading source market for Hong Kong's inbound tourism since 1997. According to the Hong Kong Tourism Board (2009), total tourist expenditure in Hong Kong was US\$12.1 billion (HK\$94.2 billion) in 2008, and over half of that figure (56.5%) was contributed by mainland Chinese tourists. Visitor arrivals from mainland China reached about 16.9 million in the same year, accounting for 57.1% of total arrivals in Hong Kong. The rapid increase in personal disposable income and the appreciation of the Chinese currency (the renminbi) in recent years has fuelled the growth of tourism demand from mainland China. The country now makes a vast contribution to Hong Kong inbound tourism, and a study of the consumption behaviour of mainland Chinese tourists is thus of great practical importance. Japan, Taiwan and the United States accounted for 5.3%, 3.7% and 3.5%, respectively, of the overall tourist expenditure in Hong Kong in 2008. It should be noted that the present study focuses on the budget allocation of tourists in Hong Kong after they have paid for their transportation between their home country and Hong Kong. This is because the relevant data on international transport expenses are unavailable. Thus, the impact of transport mode choice and related expenses on total tourism consumption, and the related cross-price elasticity analysis, is beyond

the scope of the current study.

The Hong Kong Tourism Board (HKTB) releases annual tourism expenditure data on the following categories of goods and services by source market: shopping, hotel accommodation, meals outside hotels, entertainment, tours and other expenditure. These data are obtained from visitor surveys regularly conducted by the HKTB. However, as the price indices on entertainment and tours are unavailable, these two categories are merged into the “other expenditure” category. Thus, for each source market, a tourism demand system that contains four tourism expenditure categories, including shopping, hotel accommodation, meals outside hotels and other expenditure, is established. In each demand system, tourists allocate their expenditure budget amongst the four product categories with the aim of maximising their utility given their total budget constraint. Particular attention is paid in the empirical analysis to the consumption behaviour related to the first three product categories, and the findings of the “other expenditure” category are excluded from the discussion as they do not have specific practical implications. Annual data from 1984 to 2008 (from 1993 to 2008 for mainland China due to data availability) are employed for the model estimation.

The price index for hotel accommodation is constructed using the weighted average of room rates across different hotel types in Hong Kong – high tariff A hotels, high tariff B hotels, medium tariff hotels and tourist guesthouses – as reported by the Hong Kong Hotels Association. The price index for shopping is constructed using the weighted average of the prices of the main tourism products purchased by inbound tourists: clothing and footwear, jewellery, watches, cameras and optical products, cosmetics and personal care products and other retail items. Their expenditure shares are reported by the HKTB. The price index for other retail items is approximated using the retail price index. The price index for meals outside hotels by tourists is approximated by the price index for meals outside hotels by Hong Kong residents. The consumer price index in Hong Kong is used as a proxy for the price indices for the other types of expenditure. All prices employed to derive the price indices of shopping and meals outside hotels are obtained from the publications of the Hong Kong Census and Statistics Department. Using these data, four demand systems are estimated – each of which relates to one of the four key source markets – and the evolution of the demand elasticities (the expenditure, own-price and cross-price elasticities) is examined accordingly.

EMPIRICAL RESULTS

Descriptive Analysis

Figure 1 shows the tourist expenditure shares of the various tourism goods and services for each source market under consideration over the sample period. Various trends in spending behaviour can be observed. For tourists from the three Asian markets – Japan, Taiwan and mainland China – expenditure on shopping has

historically dominated the spending budget. However, for US tourists, who are long-haul travellers making a relatively long stay in Hong Kong, the highest spending since 1989 has been on hotel accommodation. Likely because of their similar cultural roots, mainland Chinese and Taiwanese tourists display the most similar consumption behaviour, spending a much higher proportion of their travel budgets on shopping and a much lower proportion on hotel accommodation and meals.

From a dynamic perspective, the share of expenditure on shopping has been increasing over time amongst mainland Chinese tourists, whereas the opposite trend is seen in the other markets. The expenditure gap between shopping and hotel accommodation has been narrowing since the 1980s amongst Japanese tourists but widening in the mainland Chinese market since the 1990s. Meals outside hotels account for the smallest share of tourism expenditure across all four markets (with the exception of only a couple of years in the mainland China case). This category of spending also shows the most stable trend over time, although US and Japanese tourists have spent slightly more on it in recent years.

Figure 1. Share of tourist expenditure on different categories of goods and services.

Table 1 Final state estimates of the TVP-EC-AIDS models

	Mainland China	USA	Japan	Taiwan
<i><u>Shopping equation</u></i>				
Constant	0.021 (1.203)	0.007 (0.436)	0.000 (-0.007)	-0.006 (-1.275)
ln(p_shopping)-ln(p_other)	-0.159 (-1.502)	0.021 (0.033)	0.054 (0.441)	-0.301* (-2.480)
ln(p_hotels)-ln(p_other)	0.038 (1.829)	-0.123** (-3.079)	-0.023 (-0.251)	0.000 (0.001)
ln(p_meals)-ln(p_other)	0.022 (0.313)	-0.052 (-0.875)	0.019 (0.538)	-0.108 (-0.645)
ln(x/P)	-0.092* (-2.427)	0.186** (2.821)	0.193** (5.181)	0.092* (2.234)
Error-correction term (t-1)	-0.729** (-6.409)	-0.348 (-0.528)	-0.380 (-0.720)	-0.902** (-5.830)
<i><u>Hotel accommodation equation</u></i>				
Constant	-0.007 (-0.384)	0.006 (0.804)	0.000 (0.011)	0.001 (0.354)
ln(p_shopping)-ln(p_other)	0.038 (1.829)	-0.123** (-3.079)	-0.023 (-0.251)	0.000 (0.001)
ln(p_hotels)-ln(p_other)	-0.013 (-0.550)	0.061 (1.429)	0.024 (1.117)	0.040* (1.811)
ln(p_meals)-ln(p_other)	0.022 (1.315)	0.016 (1.112)	0.096* (2.310)	0.053 (0.046)
ln(x/P)	0.081* (1.991)	-0.184* (-1.539)	-0.178** (-5.883)	-0.056* (-1.697)
Error-correction term (t-1)	-0.729** (-6.409)	-0.348 (-0.528)	-0.380 (-0.720)	-0.902** (-5.830)
<i><u>Meals outside hotels equation</u></i>				
Constant	-0.002 (-0.683)	0.000 (0.071)	-0.006 (-1.366)	-0.001 (-0.229)
ln(p_shopping)-ln(p_other)	0.022 (0.313)	-0.052 (-0.875)	0.019 (0.538)	-0.108 (-0.645)
ln(p_hotels)-ln(p_other)	0.022 (1.315)	0.016 (1.112)	0.096* (2.310)	0.053 (0.046)
ln(p_meals)-ln(p_other)	0.151 (0.880)	0.216 (1.918)	0.502** (6.562)	0.013 (0.109)
ln(x/P)	-0.004 (-0.153)	-0.072 (-1.389)	0.025* (2.439)	-0.042 (-0.891)
Error-correction term (t-1)	-0.729** (-6.409)	-0.348 (-0.528)	-0.380 (-0.720)	-0.902** (-5.830)
<i><u>Entire system</u></i>				
Log likelihood	-1.208	54.648	76.604	38.956
AIC	2.694	-3.221	-5.050	-1.913

Note: * and ** denote significance at the 5% and 1% levels, respectively. The figures in parentheses are z-statistics. The one-tailed test applies to the estimates of the ln(x/P) variable, and the two-tailed test applies to the remainder.

Model Estimation

Following the descriptive analysis, econometric analysis is conducted based on the TVP-EC-AIDS model. Several unrestricted and theoretically restricted versions of the model are estimated, and the homogeneity and symmetry restrictions are tested

separately and jointly using a sample size-corrected statistic developed by Court (1968) and Deaton (1974). The results for the homogeneity, symmetry based on homogeneity, and symmetry and homogeneity joint tests show that both homogeneity and symmetry restrictions cannot be rejected at the 1% significance level, with two exceptions only. The small sample size is likely a reason for these exceptions, as discussed in Wu et al. (2011). To be consistent across all cases and in line with demand theory, both restrictions are imposed on all models for estimation, following previous studies (e.g., Cortés-Jiménez et al., 2009; Wu et al., 2011). Thus, the calculation of the demand elasticities and the subsequent analysis are based on the homogeneity and symmetry restricted TVP-EC-AIDS model. Table 1 shows the final state estimates of the TVP-EC-AIDS model for the four source markets. All four models yield satisfactory results. In particular, all of the estimates of the error correction terms fall between -1 and 0, which is in line with the requirement for an error correction model, and over half of them are statistically significant. Based on these estimates, various demand elasticities are calculated and their evolution is analysed. To increase the robustness of the findings, only statistically significant elasticities are discussed (De Mello, Pack & Thea, 2002).

Expenditure Elasticities

Figure 2 demonstrates the evolution of the expenditure elasticities for shopping, hotel accommodation and meals outside hotels in the four source markets. A clear difference is observed between the shopping behaviour of mainland Chinese tourists and that of tourists from the other three markets. For the former, the expenditure elasticity of demand for shopping remains highly inelastic (falling between 0 and 1) over the sample period, suggesting that mainland Chinese tourists consistently treat shopping in Hong Kong as a necessity. In contrast, the other tourists regard shopping as a luxury, as the expenditure elasticities of these three markets are all greater than 1. It is thus concluded that Hong Kong has a comparative advantage as a shopping destination for mainland Chinese tourists.

With regard to the evolution of expenditure elasticities, a common trend observed across all of the markets is that the demand for shopping has become increasingly sensitive to changes in the expenditure budgets of tourists. The calculated correlation coefficients between these elasticity series are as high as 0.93. This trend is most evident in the US market, for which the elasticity value rises from 1.20 in 1996 to 1.88 in 2008, with an annual growth rate of 3.79%. This suggests that US tourists increasingly perceive shopping in Hong Kong as a luxury, with the most recent expenditure elasticity value being the highest amongst all of the source markets under consideration. The growth of the expenditure elasticity of demand for shopping is the steadiest in the mainland Chinese market and the least stable in the US market. These findings suggest that during economic downturns, such as the one that has lasted for the past three years, all of the key source markets for Hong Kong inbound tourism tend to cut their spending on shopping. The Hong Kong retail sector is likely to suffer most from the reduced expenditure of the US market and least from that of the

mainland Chinese market. The corollary of this is that during boom periods, the Hong Kong retail sector should particularly target the US market.

Figure 2. Evolution of expenditure elasticities.

With respect to the expenditure elasticities of demand for hotel accommodation, the calculated results are statistically non-significant in the first few years of the sample for the US and Japanese markets, and thus are omitted from the analysis. Figure 2 shows that mainland Chinese tourists always treat hotel accommodation in Hong Kong as a luxury (i.e., the elasticity value is greater than 1), whereas the other three markets view it as a necessity (i.e., the elasticity value is less than 1). In terms of the evolution of the expenditure elasticities, opposite trends can be observed between the pair of mainland China and Taiwan on the one hand, and the pair of Japan and the United States on the other hand. The trend of the former pair of markets is a general decrease in expenditure elasticities, whereas that of the latter pair shows a gradual increase. The expenditure elasticities in the mainland Chinese market decrease from 2.40 in 2002 to 1.70 in 2008, equivalent to an annual decline of 5.55%, which indicates that hotel accommodation is viewed less and less as a luxury by mainland Chinese tourists. This can be explained by the rapid growth in personal disposable income of residents of mainland China and the concomitant appreciation of the renminbi in recent years. This trend is likely to continue, and a similar level of expenditure elasticity of demand for hotel accommodation (i.e., close to but less than 1) may emerge amongst all four markets in the future.

As for meals outside hotels, the results are statistically significant only for the mainland

Chinese and Japanese markets. Despite the rapid growth of the Chinese economy and increase in personal income levels, mainland Chinese tourists still regard meals outside hotels as a luxury, although less so since 2007. This is probably because food prices in mainland China are still low compared with those in Hong Kong. However, inflation has been relatively high in recent years and the price gap is narrowing; thus, mainland Chinese tourists do not perceive dining out in Hong Kong to be as much of a luxury as they did before. The elasticity values decreased by 2.79% annually between 2004 and 2008. For tourists from Japan, a mature market, the expenditure elasticity of demand for meals outside hotels is very stable across the sample period, with an average annual decline of only 0.58%, and the values are above, although close to, 1.

Own-Price Elasticities

The significant own-price elasticities of demand for the three product categories in the four source markets are plotted in Figure 3. It can be observed that the own-price elasticities of demand for shopping in Hong Kong have remained very stable over time for mainland Chinese and Japanese tourists in recent years, with an average growth of only 1.26% and 0.73%, respectively, indicating that the consumption behaviour of these tourists has not changed much in response to price changes in the retail sector in Hong Kong. Taiwanese tourists appear to be much more sensitive to retail price changes compared with mainland Chinese and Japanese tourists. The own-price elasticities for shopping are -1.01 and -0.51 for Taiwan and mainland China, respectively, in 2008 and -0.52 for Japan in 2007.

Figure 3. Evolution of own-price elasticities.

The own-price elasticities of demand for hotel accommodation are relatively stable, decreasing slightly (in terms of absolute value, with an annual decline between 2.09%

and 1.20%) over time across all source markets. This means that the demand for hotel accommodation in these markets is decreasingly sensitive to the variation in hotel prices in Hong Kong. The demand for accommodation of US tourists is the most price inelastic (with an elasticity value of -0.37 in 2008) compared with that of the three short-haul markets. Japanese and Taiwanese tourists display very similar consumption behaviour towards hotel accommodation, with similar elasticity evolution patterns and consistent levels of price sensitivity (with elasticity values in 2008 of -0.57 and -0.60, respectively). In comparison, mainland Chinese tourists are more sensitive to price changes in accommodation in Hong Kong, and their demand for accommodation is price elastic, with values ranging between -1.00 and -1.07 over the period from 2002 to 2008, equivalent to an average annual decline of 1.20% in terms of absolute values.

Positive own-price elasticities of the demand for meals outside hotels are identified in the Japanese market, but the value decreases sharply over the study period, declining by 3.64% per year on average. The positive own-price elasticities can be explained by the fact that Japanese tourists are more interested in Hong Kong cuisine, evidenced by the relatively high proportion of their expenditure on this category of goods/services (16.0% in 2008) compared to that of the other Asian markets, and this expenditure share has continued to increase over recent years. Heung, Qu and Chu (2001) also provide empirical evidence that Japanese tourists rate food as the second most important motive among 25 for visiting Hong Kong. In addition, meals in Hong Kong are relatively cheap compared to those in Japan. Thus, despite the increase in the price of such meals, Japanese tourists spent more on food in Hong Kong. The own-price elasticities of meals outside hotels for the other three source markets are not discussed due to their statistical non-significance.

Cross-Price Elasticities

As shown in Figure 4, three pairs of substitution relationships are identified based on the calculated positive cross-price elasticities: shopping and hotel accommodation in the mainland Chinese market, accommodation and meals outside hotels in the US market and shopping and accommodation in the Taiwanese market. It is noted that the substitution effects between the two product categories concerned differ in each pair. For example, the demand of mainland Chinese tourists for hotel accommodation is much more sensitive to price variations in the shopping category than the other way round (with cross-price elasticities of 1.04 and 0.17, respectively, in 2008). In other words, hotel accommodation is more substitutable for shopping than shopping is for hotel accommodation amongst these tourists. This finding further confirms the importance of shopping for mainland Chinese tourists. The evolution of the cross-price elasticities in Figure 4 indicates that this consumption behaviour has remained relatively stable in recent years. The average annual growth rates are lower than one percent over the sample period in most cases.

Figure 4. Evolution of cross-price elasticities.

CONCLUSION

Traditional constant parameter models can reveal average consumption patterns over the time span under consideration but cannot capture changes in consumption patterns over a specific period. To overcome this limitation, the present study combines the TVP estimation technique with a system-of-equations demand model to examine the evolution of tourists' consumption behaviour patterns over time. This study enriches the literature by employing the TVP-EC-AIDS model for the first time to analyse how tourists allocate their budget amongst different tourism consumption categories. Based on the estimation results generated by the developed model, the expenditure, own-price and cross-price elasticities of the demand for shopping, hotel accommodation and meals outside hotels in Hong Kong are examined from a dynamic perspective. The empirical results show diverse expenditure patterns amongst tourists from four source markets: mainland China, Japan, Taiwan, and the United States. The findings provide new insights into the understanding of the dynamics of tourists' consumption behaviour, and have some useful implications that may assist the relevant stakeholders in both the public and private sectors in Hong Kong to make

strategic decisions regarding tourism planning and management.

This study finds that the demand for shopping by mainland Chinese tourists is insensitive to their expenditure budget (or personal income), but has become relatively more sensitive in recent years. As Hong Kong is perceived to be a shopping paradise by mainland Chinese tourists, the retail sector has benefited greatly from this source market in recent years. It is thus important that both the business sector and the government make an active effort to sustain the attractiveness of Hong Kong's retail businesses. For retail shops that target mainland Chinese tourists as their main customers, the delivery of high-quality goods and services is vital. Investment to improve the shopping environment and establish a fair and trusting relationship between customers and retail shops would further boost the demand for retail products by mainland Chinese tourists.

Retailers are likely to be greatly affected by economic crises, as retail sales from tourism are closely related to the economic conditions in source markets. Thus, during economic downturns, it is important for the retail industry to adopt proper marketing and promotional strategies to attract tourists, particularly those from markets with low expenditure elasticity values. For example, long-haul markets for Hong Kong tourism, such as the United States, have suffered greatly from the recent economic recession, which has negatively affected the expenditure of inbound tourists from such markets. Tourist arrivals from mainland China, however, have continued to grow over the past two years. It is thus crucial for the retail sector in Hong Kong to target mainland Chinese tourists in their promotional and marketing efforts. The Hong Kong government has already played a part by launching several successful initiatives over the past two years to encourage shopping tourism from mainland China, such as the extension of the individual visit scheme to non-Guangdong residents who live in Shenzhen.

Hotel accommodation is viewed by mainland Chinese tourists as a luxury, although less so in recent years. This may be due to gradual increases in personal income and the appreciation of the Chinese renminbi. According to the price elasticity estimates of the hotel industry, pricing strategies are more effective in attracting tourists from mainland China than those from the other three source markets under consideration. However, the implementation of price discrimination should be applied with caution, as applying different prices to different source markets can be perceived negatively. A better strategy would be to improve service quality with a view to increasing the level of tourist satisfaction, which tends to be more effective than pricing strategies in attracting tourists. This study also finds that meals outside hotels in Hong Kong are still perceived by mainland Chinese tourists to be quite expensive compared with meal prices in mainland China.

To maintain the competitive advantages of Hong Kong as a popular international tourist destination, the government needs to formulate a broader range of effective

tourism policies and continue to invest in public facilities for tourists. Given the sharp increase in the number of tourists from mainland China, new immigration ports for mainland Chinese tourists should be introduced. Additional efforts should also be made to simplify the entry procedure and to further extend the individual visit scheme to other cities in China. Distinct from tourists from other source markets, who usually visit Hong Kong by air, a large proportion of mainland Chinese tourists travel to Hong Kong by train and bus. The Hong Kong government should thus make further investments in land transportation to diversify the means of transport, shorten the travel time and reduce the transportation costs of mainland Chinese tourists.

The findings indicate that US tourists increasingly view shopping in Hong Kong as a luxury. This implies that the competitive advantage of the retail sector in Hong Kong has weakened with respect to the US market. Clearly, the decrease in the disposable income of US tourists because of the recent financial crisis has led to a reduction in their expenditure on shopping in Hong Kong. The findings further reveal that Taiwanese tourists also view shopping more as a luxury than they did before. The expenditure elasticity in the Taiwanese hotel model declines over the sample period, whereas that of the Japanese market increases.

Overall, the findings of this study suggest that different source markets for Hong Kong tourism display different types of consumption behaviour and different evolution patterns. This study provides empirical confirmation of the argument in the literature that tourism consumption is socially influenced and culturally framed (Sharpley, 1999). Tourism practitioners in Hong Kong need to closely monitor the dynamics of the consumption behaviour of tourists from different markets, and adopt flexible, market-oriented promotional plans and pricing strategies. It is also important that they review business strategies regularly and make the necessary adjustments in response to the dynamic nature of tourists' consumption behaviour.

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