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The effect of tourism taxation on tourists' budget allocation

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Abstract

Few studies have investigated the effect of taxation on micro-level tourism demand or on the composition of tourists' budgets during a trip. This study examines the intersection of these two areas to model the influence of air passenger duty (APD) on outbound UK tourists' budget allocation. The compositional data analysis (CODA) methodology is used to transform trip budget shares into three log-ratios based on staged binary sequential partitions. The seemingly unrelated regression (SUR) technique is then used to analyse the effects of APD, personal traits and trip characteristics on the log-ratios. The results demonstrate that APD modifies the budget allocation of UK outbound tourists by increasing the relative share of transportation expenditure, while correspondingly decreasing at-destination expenditures such as accommodation and food.

Keywords: Air Passenger Duty; Expenditure Composition; Compositional Data Analysis (CODA); Seemingly Unrelated Regression (SUR); Tourism Demand.

1 Introduction

The study of the economic effects of taxes is gaining momentum amongst tourism scholars, as taxes that specifically target tourists are becoming relatively popular with policy makers. Such taxes have a reputation for being exportable but have the potential to significantly distort the economy, as recognised by Forsyth et al. (2014). Gooroochurn and Sinclair (2005) identify three other rationales for fiscal policies that target tourists: they are a good source of government revenue, they are a means of correcting for externalities in production and consumption and they can be used to raise revenue earmarked for specific projects.

However, irrespective of their effects regarding the immediate target of contractionary fiscal policies, the effect often spills over to other economic groups and agents. The extent to which tourism taxes are exportable depends on the price sensitivity of consumers and producers. The effects of taxes inevitably fall on both producers and consumers regardless of which group the taxes were directly imposed on. In a market where consumers' responsiveness to changes in prices is low, consumers bear the bulk of the tax burden, but where demand is more elastic, the burden falls mostly on producers. In the case of tourism taxes, where tourism demand is price sensitive, producers must adjust prices in response to taxes to avoid losing market share.

According to the International Air Transportation Association (IATA) and the World Economic Forum, one of the main concerns about tourism taxation is its negative consequences for destination competitiveness and the excessive burdens it places on consumers and producers. It may even be argued that tourists are 'over-taxed', as they not only bear the burden of targeted taxed but also incur value-added tax and other sales taxes at both tourist destinations and their homes. Tourist taxes continue to be popular, although governments tend to regularly reform them to increase their efficiency. Authors such as Forsyth, Dwyer, Spur and Pham (2014) have written about the negative impact of tourism taxes on national economies due to their effects on employment and income generation, whereas Seetaram, Song and Page (2014) find that consumer responsiveness to the air passenger duty in the UK is marginal, leading to the conclusion that either consumers are increasing their budget to absorb the taxes or reallocating their expenditures within their

budgets to compensate for the taxes incurred.

The inelastic nature of the demand for air travel suggests that in this industry, the tax incidence falls mainly on consumers, who do not adjust their demand significantly following higher costs. Therefore, this type of fiscal policy is not able to reduce international travel. However, although it is known that producers do not share tax burdens equally, the exact proportion that is attributable to each producer is not known. In the absence of in-depth pricing knowledge for the airline industry, it is unclear how much of the tax is included in the prices and how much is absorbed by producers. In the absence of these crucial data, empirical studies on tourism taxes cannot decompose the effect of such taxation on consumers and producers. The assumption made under these circumstances – that the burden falls fully on the consumer – is not unrealistic, as the method of collecting taxes is to add it to the ticket as an extra item, as is done with other charges, such as fuel surcharges. This practice supports the argument that producers are passing the full tax amount to consumers.

Empirical studies of tourism taxes have primarily used macro-level data. Previous studies have argued that air travel's inelastic demand implies that consumers do not react to contractionary policies by cutting down on international travel; this study investigates whether they absorb the additional cost of travel by reducing their consumption of other components of their demand. To test this, micro-level data on consumer behaviour are required.

Analyses of tourism demand at the micro level focus on the spending behaviour of individuals or households, specifically their decisions about the level and composition of their expenditures. The factors influencing expenditure composition may differ from those influencing expenditure levels (Ferrer-Rosell, Coenders, Mateu-Figueras, & Pawlowsky-Glahn, 2016). As Wang and Davidson (2010) indicate, a tourism product is not a single commodity, but a combination of goods and services purchased by tourists during their trips. Both the structure and amount of these expenditures are worth examination. Tourist expenditure is typically examined in absolute terms (e.g. Engström & Kipperberg, 2015; Marksel, Tominc, & Božičnik, 2016; Zheng & Zhang, 2013), and little attention has been paid to its composition (Ferrer-Rosell, Coenders, & Martínez-Garcia, 2015).

This study contributes to the literature on tourism taxes by analysing the effect of

tourism taxes, specifically the air passenger duty, on tourist spending behaviours. It uses survey data and compositional data analysis (CODA), which is becoming increasingly popular in the analysis of consumers budget allocation due to its numerous advantages (e.g. Ferrer-Rosell et al., 2016). The CODA approach transforms the raw expenditure shares into log-ratios based on a three-step sequential binary partition process, which is consistent with a typical budget allocation procedure. A series of variables including APD, tourist attributes and trip attributes are then regressed against these log-ratios to model the determinants of expenditure composition.

2 Literature review

2.1 Tourism taxation and APD

In recent years, departure taxes, or more specifically aviation taxes imposed on air travellers, have become widespread. Examples include the aviation carbon tax in Australia and APD in the UK. As the focus of this study, APD is an excise duty levied by the government on travellers originating from a UK airport. Destinations are split into different bands based on the distance between the capital city of the destination and London, and the duty is charged accordingly. The current APD rate ranges from £13 (traveling within 2000 miles in lowest class of flight) to £468 (traveling over 2000 miles in highest class of flight) based on the travel distance and flight class. The primary purpose of APD is to encourage the UK airline industry to internalise its externalities, specifically, the soaring levels of carbon dioxide and other greenhouse gases emitted by the industry that are causing environmental problems. Another motive for imposing APD is that it is levied on those best able to pay: overseas visitors who have no votes in the UK. It is therefore a potentially effective revenue-raising mechanism for public funds.

The implementation of schemes such as APD has raised concerns about their potential consequences. In effect, APD is an export tax on international visitors who buy tourism product from the UK, and an import tax on UK residents travelling abroad who buy tourism product from other countries (e.g. Tol, 2007). It may therefore influence destination

competitiveness, tourism expenditures of both outbound and domestic tourism markets, national tax revenue and environmental protection measures. As air travel is a primary form of transport for many UK residents, the imposition of APD affects a sizeable consumer group.

Forsyth, Dwyer, Spurr and Pham (2014) propose that the effect of APD on the outbound tourism market could be a reduction in outbound numbers and expenditure, leading to an increase in domestic expenditure and flow. Tol (2007) and Seetaram et al. (2014) empirically show that the implementation of APD does in fact have a negative effect on UK outbound travel, although its strength varies across destinations. The increased cost resulting from the departure tax may deter some UK residents from travelling overseas, and such travellers are expected to spend more on home goods and services. From a purely economic perspective, policy instruments that could induce travellers to choose domestic holidays over overseas trips are perceived as highly beneficial, as consumer spending is retained within the country.

However, tourism and transport stakeholders are concerned that an export tax may make a country a less competitive tourism destination by introducing additional charges and pushing up the price of tourism (Forsyth, Dwyer, Spur, & Pham, 2014). APD has been criticised by the World Travel and Tourism Council for its potential to create huge losses for tourism and the UK economy (Forsyth, Dwyer, Spur, & Phamm, 2014). Mayor and Tol (2007) find that increased APD has led to a slight drop in the numbers of international visitors to the UK. Tourism industry representatives have claimed that the Australian carbon tax may harm the country's destination competitiveness, industry profitability and employment, for little or no gain to the global environment. This claim is further supported by Seetaram et al. (2014), who find the effectiveness of carbon emission reduction to be marginal, as travellers are generally prepared to pay more to maintain the level of demand. Mayor and Tol (2007) even find that increased APD could have the perverse effect of increasing carbon dioxide emissions, albeit only slightly, as it reduces the relative price difference between near and far holidays.

2.2 APD and tourist expenditure composition

Tourist expenditure can be analysed in absolute terms, focusing on how much tourists spend during their trips or during a period, or in relative terms, by focusing on how they distribute

their funds between different expenditure categories. Analyses of tourist expenditure composition typically focus on the latter, acknowledging the constraints and distributional nature of tourist spending during a trip.

Tourist expenditure composition is the sum of a series of interrelated spending decisions. Theoretically, tourist spending decisions can be viewed as a multi-stage process (Deaton & Muellbauer, 1980; Ferrer-Rosell et al., 2014). Tourists allocate a household budget (constrained by household income) for tourism consumption in the first stage, allocate the tourism budget to each trip/destination in the second stage and finally distribute this destination budget among specific goods and services in the third stage. These staged spending decisions form 'mental budgets' (Thaler, 1985; Sheffrin & Thaler, 1988) for each designated category. The budget allocations are binding: tourists track their expenses against their disposable resources and stop spending within a given category if the limit is reached (Heath & Soll, 1996). Functionally, this planning is mainly used as a tool for self-control to avoid overspending.

Individual decision makers are heterogeneous in their allocation of discretionary funds to alternative spending options. Factors driving tourist spending behaviour are typically assessed through tourist characteristics and their trip attributes (Ferrer-Rosell et al., 2015 2016). Sainaghi (2012) and Ferrer-Rosell et al. (2015) suggest that tourist expenditure composition could vary with the socio-demographic and economic traits of the tourist and the characteristics of the trip. The explanatory variables typically used in microeconomic tourism demand studies are income, age, gender, marital status, education, place of residence, length of stay, travel group size and composition, accommodation, main trip purpose and activities (Marcussen, 2011).

Recent research has focused on the interdependence of different expenditure components during a trip and has acknowledged that changes in a specific budget share may cause redistribution among the rest of the components. Martinez-Garcia and Raya (2008) and Ferrer-Rosell et al. (2016) find that the reduction in transportation costs brought by low-cost airlines could lead travellers to spend a higher proportion of their trip budgets at the destination. These findings echo Morley (1992) and Donicar et al. (2008), who suggest that budget allocation decisions are interdependent and that a specific part of a trip expenditure

may be affected by a surplus or deficiency in another part of the expenditure. Similarly, APD is part of the transportation cost, and thus forms a part of the total expenditure. Increased APD may increase transport spending, and thus may modify the composition of the expenditure.

2.3 Compositional data analysis (CODA) and the log-ratio approach

The variables used in the study of the composition of expenditures (relative shares of each part of the budget) may differ from those used in the study of absolute expenditures. Research on expenditure composition has focused on comparing the effects of various determinants on different spending categories in absolute terms (e.g. Wang, Rompf, Severt, & Peerapatdit, 2006). Some explanatory variables may affect all parts of a budget in the same direction, which creates difficulties in interpretation. These methods are questionable, as the same absolute amount spent on a certain category may hide changes in budget distribution (Ferrer-Rosell et al., 2016).

Expenditure composition can also be analysed by treating expenditure components as proportions or percentages of total expenditure instead of as absolute amounts. These relative expenditure components can be modelled using a series of equations. Relevant constraints are imposed on the model to ensure that the proportions sum to one. In this case, one component can increase only if other components decrease. Such compositional datasets convey information about the relative size of components and are typically non-normal and heteroscedastic. Compared with the absolute values of absolute expenditure data, compositional expenditure data occupy a constrained space, and variables may not affect all of the budget parts in the same direction. A D-term composition measured on individual i, x_{i1}, x_{i2}, $\cdots$, x_{iD} has the following constraints:

$$0 \leq x_{id} \leq 1, and \ \sum_{d=1}^{D} x_{id} = 1. \quad (1)$$

Estimating an almost ideal demand system of equations (AIDS, Deaton & Muellbauer, 1980) is a typical approach to addressing such empirical problems and has been widely used to investigate the interdependence of tourist demand within a system. At the micro level, it produces an allocation model showing how a consumer distributes his or her expenditure across different goods, with estimated price and income elasticities. It can thus be used to

model tourist expenditure allocation among alternative destinations and different categories of expenditure at a particular destination. Studies using AIDS have modelled tourists from a given origin choosing between multiple destinations (Divisekera, 2009) or tourists from multiple origins choosing a given destination, modelling, respectively, the choice between destinations (Li, Song, & Witt, 2004) or between different commodities at a destination (Wu, Li, & Song, 2011). The micro-level expenditure allocation during a trip has rarely been studied, although Fuji et al. (1995) investigate individual components of vacation travel at a resort, including six different classes of goods. However, their indicator of expenditure is per head, which they obtain by disaggregating total expenditures by the number of visitors, and thus their analysis is not fundamentally different from a macro-level analysis.

Despite its advantages for analysing compositional expenditure, the AIDS approach has constraints when applied to this study. First, in this research context, the price for each category of tourism-related goods is not available, and is almost impossible to calculate due to the large number of destinations. Second, APD cannot be included in the AIDS model. Last, although AIDS fits the compositional data, some researchers (e.g. Ferrer-Rosell et al., 2016) note that the unbounded distribution of budget share can result in a misspecification of the demand system as almost ideal, making the estimation of the expenditure shares with an unbounded error distribution unreliable. Although a set of parameter constraints is imposed on AIDS, the presence of an error term with an unbounded distribution results in a non-zero probability that the actual share may fall outside of the [0,1] interval (McLaren, Fry, & Fry, 1995).

Thus, the compositional data analysis (CODA) method is preferred for this study, as its log-ratio approach can transform compositional data to a form subject using standard and well-understood statistical techniques (Ferrer-Rosell et al., 2015; Ferrer-Rosell et al., 2016). In short, CODA uses shares that have been transformed by the logarithms of the ratios instead of the raw shares, and thus can recover the full unconstrained $-\infty$ to ∞ range. The emergent CODA approach has been applied in recent trip budget analyses (Ferrer-Rosell et al., 2015; Ferrer-Rosell et al., 2016) and has proved to be effective. However, Ferrer-Rosell et al. (2015) note that few studies of tourism expenditure composition have used CODA or any other methodology to account for the compositional constraints in compositional datasets.

3 Methodology

3.1 Log-ratio transformation based on sequential binary partitions

Following Ferrer-Rosell, Coenders and Martinez-Garcia (2015), this study applies the CODA approach with the log-ratio transformations, which is based on sequential binary partitions. These partitions begin by dividing expenditure components into two clusters, and then continue to subdivide each cluster in two until each component constitutes its own cluster.

For example, the UK outbound tourists' total budget is first divided into expenditure at the origin and expenditure not at the origin. The latter is then divided into expenditure for transportation and at destination. Last, at-destination expenditure is split into basic expenditure (accommodation and food) and discretionary expenditure (recreational and cultural activities, at-destination transportation, shopping and other items). This three-step binary partition process is an extension of the two-step binary partition process proposed by Ferrer-Rosell et al. (2014, 2015), and is best presented as a partition tree (Ferrer-Rosell, Martínez-Garcia, & Coenders, 2014; Mateu-Figueras, Pawlowsky-Glahn, & Egozcue, 2011), as shown in Figure 1. Notably, such partition of expenditure is related to the allocation of travel budget on different spending items, and has nothing to do with where the bill is paid. That is, although the transportation cost can be paid at the origin place (e.g. booking an air ticket), it is still counted as transportation cost.

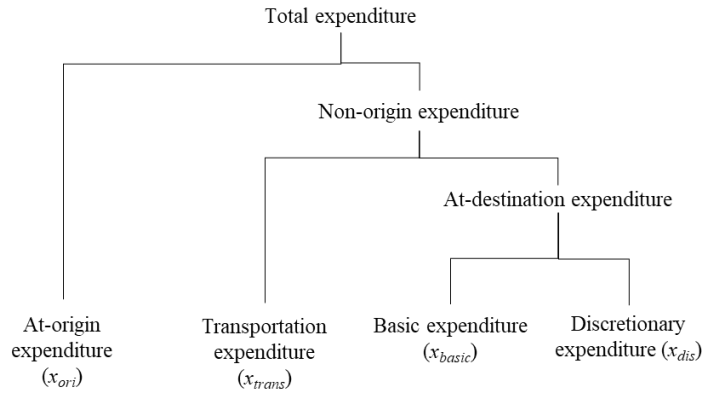

Figure 1. Sequential binary partition of the UK outbound tourist expenditure

The first log-ratio compares the at-origin expenditure with the geometric mean of three

components of the non-origin expenses (i.e. transportation expenses, basic at-destination expenses and discretionary at-destination expenses). This ratio represents the shares of the tourists' budget allocation within and outside the UK border. A positive value shows that the origin share is greater than the geometric mean of the remaining three components, and a negative value shows the opposite.

$$y_{ori\_nonori} = \ln\left(\frac{x_{ori}}{\sqrt[3]{x_{trans}x_{basic}x_{dis}}}\right) \quad (2)$$

The second log-ratio is the ratio of the transportation expenditure share over the geometric mean of the basic and discretionary at-destination expenditure shares. This ratio demonstrates the budget allocation between transportation and at-destination expenses and implies that more is allocated to transportation (between origin and destination) or at-destination spending once the origin expenditure has been paid. A positive value shows that a greater share of the budget is allocated to transportation costs, and a negative value denotes the opposite.

$$y_{trans\_des} = \ln\left(\frac{x_{trans}}{\sqrt{x_{basic}x_{dis}}}\right) \quad (3)$$

The third log-ratio is the ratio of the basic at-destination expenditure share over the discretionary expenditure share. It illustrates the budget allocation between basic and discretionary spending items at the destination. A positive value means that a greater share of the budget is allocated to basic expenditures, and a negative value shows the opposite.

$$y_{basic\_dis} = \ln\left(\frac{x_{basic}}{x_{dis}}\right) \quad (4)$$

Following Martin-Fernandez et al. (2003), $x_{id} = 0$ is replaced with a proportion of δ_{id}, which is the smallest detectable proportion of consumption component *d*, such that

$$x'_{id} = 0.65\delta_{id}. \quad (5)$$

Accordingly, the non-zero x_{id} values can be reduced to preserve the unit sum, as follows:

$$x''_{id} = x_{id}\left(1 - \sum_{x_{id}=0} x'_{id}\right) . \quad (6)$$

3.2 Seemingly unrelated regressions (SUR)

Seemingly unrelated regressions (SUR) are recommended for analysing compositional datasets that contain continuous explanatory variables (Ferrer-Rosell et al., 2014). In

econometrics, the SUR, proposed by Zellner (1962), is a generalisation of a linear regression model that consists of several regression models, each with its own dependent variable. When SUR models contain the exact same set of regressors, they can be regarded as linear regression models and thus equations can be estimated using the standard ordinary least squares (OLS) method. The SUR is commonly used to tackle multi-expenditure variable problems.

In this study, APD and several other variables representing personal and trip attributes are sequentially regressed against the three log-ratios, to examine their effects on budget allocation. Personal traits investigated include age, gender, household income level, education level and residential region, and the trip attributes include length of stay at the destination, travel party and travel distance. As income level, education level, place of residence and travel party are categorical variables, they are represented with dummy variables. Two moderating factors on the relationship between APD and the three log-ratios are also considered, i.e. distance and awareness of air travel fees and taxes. The latter is defined as the extent to which the tourists are aware of related charges. The SPSS 22.0 software package is used to estimate and test the models.

3.3 Data and variables

Data for this study were collected with a self-administered survey questionnaire distributed to outbound tourists originating from the UK. The questionnaire consisted of three parts. The first part obtained the economic and socio-demographic information of the participants, including their annual household income before tax, residence region, gender, age and education level. The tourists were then asked to recall their most recent holidays abroad, and to provide information about the destination country, date of the trip, number of nights spent at the destination, travel party, transportation mode, flight booking time and class (for those travelling by air), total expenditure amount and expenditure amount in different categories, which included spending within the UK, flight expenses, expenditures at the destination including accommodation, food, shopping, cultural and recreational activities, transportation and other items. Those purchasing a package (combined accommodation and air tickets) were identified and asked to provide the cost of the package. In the third part, the participants were

asked to indicate the extent to which they were aware of the APD charge.

The survey was conducted online from February 9 to February 28, 2016. The online survey method was selected after examining the various methods to derive a meaningful sample. The researchers hired a market research company with a track record of generating robust and reliable panel data. Using such a conduit for surveying consumers is cost-effective and can overcome low response rates from postal surveys, given the relationship that the organisation already has with the panel. Of the 2,002 participants who completed the survey, 1,063 purchased flight and accommodation packages. As distinguishing between the accommodation and transportation expenditures of these package travellers was difficult, they were excluded from the analysis. The final sample size was $N = 939$. The data were first examined for abnormal values, including outliers beyond the defined range. Outliers were detected by checking the box-plot for values that were located beyond the cut-off of three times the interquartile range (IQR). These abnormal values were deleted before the data analysis.

As the main explanatory variable, APD was calculated according to travel date, class, and distance based on the applicable rates given in 'Excise Notice 550: Air Passenger Duty' (HM Revenue and Customs, 2017). Travel distance was defined as the distance between London and the capital city of the destination country, and was abstracted from http://www.distancefromto.net/. Tables 1 and 2 present the descriptive statistics of the explanatory variables used in the regression models.

A three-step expenditure partition method was used to calculated the three log-ratios based on the absolute expenditure levels for the different categories measured in the questionnaire: origin expenditure over non-origin expenditure (y_{ori_nonori}); transportation expenditure over at-destination expenditure (y_{trans_des}); and basic at-destination expenditure over discretionary at-destination expenditure (y_{basic_dis}). The descriptive statistics of the expenditure component shares and the three log-ratios are given in Table 3.

Table 1. Descriptive statistics of categorical variables

	Count	%		Count	%
Household income (£)			Education level		
Missing	0	0	*Missing*	23	2.4

Less than 10,000	74	7.9	*GCSE or O level or equivalent*	174	18.5
10,000-20,000	231	24.6	*A or AS level or equivalent*	191	20.3
20,000-30,000	175	18.6	*Higher qualification below degree level*	108	11.5
30,000-40,000	131	14	*Undergraduate degree*	243	25.9
40,000-50,000	100	10.6	*Postgraduate degree*	144	15.3
50,000-60,000	81	8.6	*Other qualification*	41	4.4
60,000-70,000	58	6.2	*School Leavers Certificate*	15	1.6
Above 70,000	89	9.5			
Region of residence			Travel party		
Missing	20	2.1	*Missing*	7	0.7
South West	93	9.9	*Alone*	138	14.7
South East	140	14.9	*With my partner only*	306	32.6
London	149	15.9	*With my family*	317	33.8
East Anglia	66	7	*With friends*	134	14.3
West Midlands	71	7.6	*With family and friends*	37	3.9
East Midlands	63	6.7			
Yorkshire/Humbershire	67	7.1	Gender		
North West	98	10.4	*Missing*	*150*	*16*
North East	32	3.4	*Male*	*379*	*40.4*
Scotland	74	7.9	*Female*	*410*	*43.7*
Wales	50	5.3			
Northern Ireland	16	1.7			

Table 2. Descriptive statistics of continuous variables

	Min.	Max.	Mean	S.D.	Skewness	Kurtosis
APD	0.000	194.000	28.465	40.225	1.952	3.241
Distance	340.810	18.796.590	3,141.658	3,512.787	1.667	2.528
Age	18.000	83.000	47.270	16.905	0.014	-1.175
Length of stay	0.000	160.000	11.100	11.797	5.460	46.947
Awareness level	1.000	4.000	1.872	0.724	0.732	0.670

Table 3. Percentage share and log-ratio descriptive statistics

	Min.	Max.	Mean	S.D.	Skewness	Kurtosis
Origin component (x_{ori})	0.010	0.800	0.070	0.066	4.362	30.160
Transportation component (x_{trans})	0.010	0.980	0.296	0.205	0.927	0.291
Basic at-destination component (x_{basic})	-0.110	0.910	0.438	0.214	-0.155	-0.829
Discretionary at-destination component (x_{dis})	0.000	0.930	0.183	0.147	1.365	2.721
Origin/non-origin log-ratio ($y_{ori\text{-}nonori}$)	-3.500	0.740	-1.523	0.862	-0.164	-0.154
Transportation/at-destination log-ratio ($y_{trans\text{-}des}$)	-2.440	2.940	-0.049	1.103	0.337	-0.342
Basic/discretionary log-ratio ($y_{basic\text{-}dis}$)	-4.530	5.200	0.917	1.224	-0.142	0.766

4 Findings

The results of the seemingly unrelated regressions for the three log-ratios are given in Table 4. The adjusted R^2 values for the three regressions are 0.142, 0.239 and 0.063; these significant values show an average predictive power for models predicting y_{ori_nonori} and y_{trans_des} but poor prediction for the model predicting y_{basic_dis}. The Durbin-Watson values are all above 1.8, with little deviation from the critical value of 2, demonstrating that auto-correlation does not pose a serious threat to parameter estimation. The Kolmogorov-Smirnov test is insignificant for the three models, implying that normal standardised residuals can be assumed. Lastly, all of the average VIF values are below 10, demonstrating an acceptable degree of multi-collinearity. In general, the basic assumptions of the OLS estimation can be fulfilled, and thus the estimated parameters are reliable.

Table 4. Model diagnoses

	y_{ori_nonori}	y_{trans_des}	y_{basic_dis}
R^2	0.189	0.288	0.114
Adjusted R^2	0.142	0.246	0.063
d.f.	628	632	642
Sig.	0.000	0.000	0.000
Durbin-Watson	1.891	1.847	1.926
Kolmogorov-Smirnov Sig.	0.159	0.064	0.200
Average VIF	8.752	7.942	7.762

Four types of effects are examined in the models:

i. the main effect of APD;

ii. the moderating effect of travel distance and awareness level;

iii. the effects of tourist socio-demographic traits; and

iv. the trip attributes.

Table 5 presents the results of the coefficient estimation. The effects of APD on the three log-ratios are significant, implying that APD influences tourist budget allocation at all stages of decision making. Although APD is only incurred at the origin, prior to the trip, its effect extends to expenditure at the destination, implying that there are distributional effects at the global level, as expenditure at the destination is sacrificed for increased expenditure at origin. Thus, this tax can be seen as regressive, especially if the destination is a relatively lower

income country that relies on tourism expenditure to generate income. APD has a negative effect on the log-ratio of origin expenditure over non-origin expenditure (y_{ori_nonori}), where a larger value denotes a higher proportion of the budget allocated to spending within the UK. It can thus be inferred that charging a higher APD may increase the budget share allocated to non-origin spending items and decrease the share of expenditure within the UK border. This is reasonable, as the APD is a constituent of the transportation cost that is a significant proportion of the non-origin expenditure. As the expenditure within the UK border is also a source of tax revenue, the net benefit to the UK in terms of increased tax revenue generated from APD is thus partly offset by a shortfall on tax revenue generated from total tourist expenditure in the UK.

As APD increases, a tourist must allocate more of her budget to cover the increased transport cost. The absorption of the increased APD into transportation expenditure is further confirmed by the positive effect of APD on the log-ratio of the transportation share over the at-destination share (y_{trans_des}), where a higher value denotes a larger proportion of the budget allocated to transportation spending relative to at-destination expenditure. As APD increases, tourists at the second stage of budget allocation must allocate a larger part of their budget to transportation and proportionally decrease the at-destination expenditure share.

The third stage of budget allocation also produces interesting findings. Although APD is not a direct part of the at-destination expenditure, it does demonstrate a significant positive effect on the log-ratio of basic at-destination spending and discretionary at-destination spending (y_{basic_dis}). As APD increases, tourists may allocate a larger share of their at-destination spending to discretionary items such as cultural and recreational activities and shopping, while reducing the share of basic expenditure such as accommodation or food. It appears that when faced with increased transportation costs, tourists reallocate their budgets by reducing spending on other basic items, for example, they stay at a cheaper hotel, rather than making up the deficit at the expense of discretionary spending. These results indicate that demand for accommodation and food, which makes up the basic at-destination expenses, is more elastic than the demand for products described as luxuries in the literature on tourism, such as cultural and recreational activities and shopping.

Table 5. Regression model results

	y_{ori_nonori}		y_{trans_des}		y_{basic_dis}	
	Coefficient	Sig.	Coefficient	Sig.	Coefficient	Sig.
(Constant)	-2.059	***	.144	.803	.073	.917
APD	-0.013	***	0.011	***	-0.008	*
	(-0.592)		(0.381)		(-0.261)	
APD×Distance	0.000	***	-0.000	***	0.000	.368
	(0.435)		(-0.333)		(0.112)	
APD×Awar	0.002	**	0.000	.999	0.002	.224
	(0.195)		(0.000)		(0.113)	
Age	0.002	.332	-0.002	.423	0.009	***
	(0.04)		(-0.031)		(0.125)	
Gender=*Male*	-0.165	**	-0.180	**	-0.039	.692
	(-0.097)		(-0.082)		(-0.016)	
Income=						
Less than 10,000	0.673	***	0.253	.203	0.138	.569
	(0.198)		(0.060)		(0.029)	
10,000-20,000	0.601	***	0.592	***	0.033	.861
	(0.302)		(0.232)		(0.012)	
20,000-30,000	0.51	***	0.236	.146	0.114	.561
	(0.218)		(0.078)		(0.034)	
30,000-40,000	0.289	**	0.324	**	0.227	.239
	(0.124)		(0.109)		(0.069)	
40,000-50,000	0.058	.675	0.212	.209	0.051	.803
	(0.021)		(0.060)		(0.013)	
50,000-60,000	0.151	.298	0.307	*	0.224	.296
	(0.052)		(0.083)		(0.054)	
60,000-70,000	0.08	.609	0.135	.437	0.033	.888
	(0.024)		(0.032)		(0.007)	
Above 70,000						
Education level=						
GCSE or O level	0.319	.289	-0.494	.170	0.493	.239
	(0.149)		(-0.181)		(0.162)	
A or AS level	0.489	.106	-0.545	.133	0.568	.178
	(0.233)		(-0.202)		(0.191)	
Higher qualification	0.488	.115	-0.684	*	0.286	.507
	(0.184)		(-0.190)		(0.075)	
Undergraduate degree	0.48	.112	-0.692	*	0.574	.171
	(0.247)		(-0.278)		(0.208)	
Postgraduate degree	0.413	.177	-0.711	*	0.620	.146
	(0.181)		(-0.241)		(0.191)	
Other qualification	0.203	.547	-0.277	.487	0.361	.442
	(0.047)		(-0.051)		(0.060)	
School leaver certificate						

Table 5. Regression model results (continued)

	y_{ori_nonori}		y_{trans_des}		y_{basic_dis}	
	Coefficient	Sig.	Coefficient	Sig.	Coefficient	Sig.
Distance	-0.000	***	0.000	***	0.000	**
	(-0.281)		(0.462)		(-0.181)	
Length of stay	-0.003	.461	-0.009	*	-0.004	.514
	(-0.033)		(-0.079)		(-0.030)	
Travel party						
Alone	-0.016	.932	-0.034	.875	0.385	.153

	(-0.006)		(-0.011)		(0.113)	
With my partner only	-0.056	.741	-0.179	.375	0.531	**
	(-0.031)		(-0.078)		(0.208)	
With my family	-0.169	.311	-0.151	.453	0.445	*
	(-0.095)		(-0.065)		(0.175)	
With friends	-0.115	.524	-0.300	.166	0.668	**
	(-0.046)		(-0.095)		(0.190)	
With family and friends						
Residence region						
South West	0.14	.738	0.482	.289	-0.501	.371
	(0.048)		(0.130)		(-0.121)	
South East	0.373	.370	0.538	.231	-0.041	.941
	(0.155)		(0.174)		(-0.012)	
London	0.205	.620	0.336	.453	-0.422	.443
	(0.091)		(0.116)		(-0.132)	
East Anglia	0.147	.729	0.220	.631	-0.461	.414
	(0.044)		(0.033)		(-0.099)	
West Midlands	0.229	.587	0.200	.948	-0.427	.446
	(0.072)		(0.007)		(-0.097)	
East Midlands	0.346	.418	0.180	.698	-0.236	.680
	(0.101)		(0.041)		(-0.049)	
Yorkshire/Humbershire	0.059	.889	0.157	.731	-0.421	.455
	(0.018)		(0.037)		(-0.090)	
North West	0.072	.863	0.390	.388	-0.114	.838
	(0.026)		(0.108)		(-0.028)	
North East	0.064	.884	0.107	.823	-0.455	.441
	(0.014)		(0.018)		(-0.071)	
Scotland	-0.08	.849	0.399	.384	-0.518	.359
	(-0.027)		(0.104)		(-0.121)	
Wales	0.327	.442	0.157	.733	-0.551	.333
	(0.091)		(0.035)		(-0.109)	
North Ireland						

***, ** and * denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

Two moderating effects are also examined: distance and awareness level. Distance is found to inhibit the influence of APD on the first stage of budget allocation; that is, for those travelling longer distances, the negative effect of APD on y_{ori_nonori} is weakened. Long distance travel usually means a relatively larger proportion of the budget going to non-origin expenditure due to higher transportation costs; as the increase in APD results in a proportionally modest increase in expenditure, consumers' reactions to the increase are also relatively modest. That is, as the share of APD in the total expenditure is much lower for longer distance trips, its effect on the budget allocation will be weaker. The positive effect of APD on the second stage of budget allocation is again weaker for longer journeys. No significant moderating effect of distance is found between APD and the third stage of budget

allocation at the destination. The awareness level is significant only in the first stage. The positive moderating effect implies that awareness may eclipse the negative effect of APD on y_{ori_nonori}, albeit slightly; that is, those tourists who are more aware of APD and other extra charges may be more resistant to the influence of APD in terms of budget adjustment, as they may have already absorbed the cost while planning the budget.

As for the socio-demographic traits, tourist age positively influences the third stage of budget allocation between basic and discretionary at-destination expenditure. Older tourists tend to allocate a larger proportion of their at-destination budget to spending on basic items such as accommodation and food, whereas younger tourists tend to spend more on discretionary items such as cultural and recreational activities and shopping. In contrast, tourist gender has a negative effect on budget allocation at the first and second stages. Compared to female tourists, male tourists spend more outside the UK and more at the destination.

Household income also influences tourist budget allocation, although its effects are only significant at the first and second stages. Compared to tourists with higher incomes (above £70,000 per year), tourists with yearly household incomes less than £60,000 tend to allocate a larger proportion of their expenditure at the origin. Those with incomes in the £10,000 to 60,000 income brackets spend more on transportation than on at-destination expenditure items. The effect of education level is significant at the second stage of budget allocation. Those with qualifications of at least an undergraduate degree tend to allocate a larger budget share to at-destination expenditure than to transport expenditure.

Trip attributes (i.e. travel distance, length of stay and travel party composition) also have significant effects on budget allocation. Travel distance has significant effects on all three stages of the budget allocation process. It negatively influences y_{ori_nonori} and y_{basic_dis}, but positively influences y_{trans_des}, implying that tourists travelling further may allocate a larger budget share to non-origin expenditure at the first stage, to transportation expenditure in the second stage and to discretionary items in the third stage. Length of stay is found to significantly negatively influence budget allocation in the second stage, implying that those who stay longer at a destination may allocate a larger share of expenditure to the destination, which is reasonable, as a longer stay naturally leads to higher at-destination expenditure. The

effect of travel party is significant only in the third stage. Compared to those travelling with family and friends, those travelling with partners, family or friends tend to spend more on discretionary items.

5 Conclusions, implications and limitations

The influence of taxation on tourism demand is an under-researched topic in microeconomic tourism demand analysis. Previous studies have focused on the macro level and most have absorbed tourist tax into the tourism product price index, and thus the influence of tourist tax has been modelled and analysed as part of travel propensity and expenditure (e.g. Seetaram et al., 2014). Few studies have investigated how tourist taxation influences individual tourist spending behaviour. This study postulates that the effects of taxation on the allocation of trip budgets is of vital economic importance to both the origin and destination countries. Specifically, this study models the influence of APD on the composition of UK outbound tourist expenditure.

Instead of focusing on the effects on the decision to travel, this study examines the influence of taxation on the behaviour of people who have decided to travel. The results show that APD may lead to the reallocation of travel budgets in ways that have distributional effects at an international level. For example, tourists may allocate a larger share of their budgets to non-origin expenditure in the first stage, and spend more on transport in the second stage, thus reducing their expenditure at the destination. A higher APD can force tourists to pay for the increased transport costs by reducing basic at-destination spending (including accommodation and food). One inference of this finding is that the extra cost of APD has a significant negative impact on the budget share of basic expenditures at tourist destinations. Notably, the effects of APD are moderated by travel distance and tourists' awareness of the taxes. Reallocations are likely to be stronger for short-haul travellers and for those who are less aware of the charge.

These findings empirically confirm previous claims that the components of tourist expenditure are interdependent, and that changes in one component may have profound effects on expenditure composition. In an examination of low-cost airline travel, Ferrer-Rosell et al. (2015) find that a reduction in transport costs can affect the distribution of non-transportation expenditures, and that savings from the transport component can be transferred to at-destination expenditures. The findings of this study suggests that the increase in transportation costs due to levied APD may absorb part of the at-destination expenditure and

thus modify the budget allocation. More explicitly, this study indicates that increased transportation cost is absorbed by basic at-destination items including accommodation and food. The study has theoretical implications, as it further develops the understanding of the relationship between taxes and tourist budget allocation.

This study uses and further develops the CODA methodology with a log-ratio approach based on sequential binary partitions. The original two-step binary partition proposed by Ferrer-Rosell et al. (2015) is useful for analysing non-origin expenditures. This study applies a similar sequential binary partition approach to origin expenditures, developing a three-step process. The applicability of the log-ratio approach to the decision-making process throughout the whole trip is thus confirmed. This study's methodological contribution is the generalisation and validation of the application of the CODA methodology to tourist expenditure behaviour research.

Practically, this study provides a further examination of the effectiveness of APD policy. According to this study, a high APD can lead tourists to allocate a larger share of their budgets to non-origin expenditure. Although the share of at-destination expenditure also decreases, most of it goes to transport. As the effect of APD could be weakened by raising travellers' awareness of the charge, the authority should make outbound tourists aware that a large proportion of their transport cost is the duty and extra charges. Furthermore, as short-haul travellers are more sensitive to changes in APD, the appropriate authorities could alleviate APD for short-distance destinations to offset its negative consequences.

This study's limitations are primarily related to the inherent shortcomings of compositional data. Although such data are able to capture the composition and interdependence of different budget components, the absolute expenditure level is hidden. Further research could overcome this limitation by combining investigations in relative terms with those in absolute terms, enabling the effects of tax on individual tourist expenditure behaviour to be mapped more comprehensively. Second, the survey was carried out by asking for the respondents' memory, and thus the memory distortion could damage the precision of measurement, especially for the amount of spending. Third, the low R^2 is a bit low, implying flaws in its predictive power. Finally, this survey mainly targeted at holiday travellers originating from the UK; future research could include business travellers, and probably

outbound travellers in other countries (e.g. Australia),

References

Aitchison, J. (1982). The statistical analysis of compositional data. *Journal of the Royal Statistical Society. Series B (Methodological),* 44(2), 139-177.

Coenen, M., & van Eekeren, L. (2003). A study of the demand for domestic tourism by Swedish households using a two-staged budgeting model. *Scandinavian Journal of Hospitality and Tourism,* 3(2), 114-133.

Deaton, A., & Muellbauer, J. (1980). An almost ideal demand system. *The American Economic Review,* 70(3), 312-326.

Divisekera, S. (2009). Ex post demand for Australian tourism goods and services. *Tourism Economics,* 15(1), 153-180.

Dolnicar, S., Crouch, G. I., Devinney, T., Huybers, T., Louviere, J. J., & Oppewal, H. (2008). Tourism and discretionary income allocation. Heterogeneity among households. *Tourism Management,* 29(1), 44-52.

Engström, T., & Kipperberg, G. (2015). Decomposing the heterogeneous discretionary spending of international visitors to Fjord Norway. *Tourism Management,* 51, 31-141.

Ferrer-Rosell, B., Coenders, G., and Martínez-Garcia, E. (2015). Determinants in tourist expenditure composition—the role of airline types. *Tourism Economics,* 21(1), 9-32.

Ferrer-Rosell, B., Coenders, G., Mateu-Figueras, G., & Pawlowsky-Glahn, V., (2016). Understanding low-cost airline users' expenditure patterns and volume. *Tourism Economics,* 22(2), 269-291.

Ferrer-Rosell, B., Martínez-Garcia, E., & Coenders, G. (2014). Package and no-frills air carriers as moderators of length of stay. *Tourism Management,* 42, 114-122.

Hadjikakou, M., Chenoweth, J., Miller, G., Druckman, A., & Li, G. (2014). Rethinking the economic contribution of tourism: Case study from a Mediterranean island. *Journal of Travel Research,* 53(5), 610-624.

Heath, C., & Soll, J. B. (1996). Mental budgeting and consumer decisions. *Journal of Consumer Research,* 23(1), 40-52.

HM Revenue and Customs. (2017). Excise Notice 550: Air Passenger Duty. Air Passenger Duty notices and Air Passenger Duty. Last updated March 6.

https://www.gov.uk/government/publications/excise-notice-550-air-passenger-duty

Li, G., Song, H., & Witt, S. F. (2004). Modelling tourism demand: A dynamic linear AIDS approach. *Journal of Travel Research,* 42, 141-150.

Mak, J. (2006). Taxation of travel and tourism. In Dwyer, L. (Ed.), *International handbook on the economics of tourism* (pp. 251-263). Cheltenham: Edward Elgar Publishing.

Marcussen, C. H. (2011). Determinants of tourist spending in cross-sectional studies and at Danish destinations, *Tourism Economics*, 17(4), 833-855.

Marksel, M., Tominc, P., & Božičnik, S. (2017). Cruise passengers' expenditures: The case of port of Koper. *Tourism Economics*, 23(4), 890-897.

Martinez-Garcia, E., & Raya, J. M. (2008). Length of stay for low-cost tourism. *Tourism Management*, 29(6), 1064-1075.

Martinez-Garcia, E., & Raya, J. M. (2008). Length of stay for low-cost tourism. *Tourism Management,* 29(6), 1064-1075.

Mateu-Figueras, G., Pawlowsky-Glahn, V., & Egozcue, J. J. (2011). The principle of working on coordinates. In Pawlowsky-Glahn, V., & Buccianti, A. (Eds.), *Compositional data analysis: Theory and applications* (pp. 31-42). New York: John Wiley and Sons.

Mayor, K., & Tol, R. S. (2007). The impact of the UK aviation tax on carbon dioxide emissions and visitor numbers. *Transport Policy*, 14(6), 507-513.

McLaren, K. R., Fry, J. M., & Fry, T. R. (1995). A simple nested test of the almost ideal demand system. *Empirical Economics,* 20(1), 149-161.

McLaren, R. A., Puckett, J. L., & Chauhan, S. P. (1995). Estimators of birth weight in pregnant women requiring insulin: a comparison of seven sonographic models. *Obstetrics and Gynecology*, 85(4), 565-569.

Morley, C. L. (1992). A microeconomic theory of international tourism demand. *Annals of Tourism Research,* 19(2), 250-267.

Pawlowsky-Glahn, V., & Buccianti, A. (Eds.). (2011). C*ompositional data analysis: Theory and applications*. New York: John Wiley and Sons.

Sainaghi, R. (2012). Tourist expenditures: The state of the art. *An International Journal of Tourism and Hospitality Research,* 23(2), 217-233.

Seetaram, N., Song, H., & Page, S. J. (2014). Air passenger duty and outbound tourism

demand from the United Kingdom. *Journal of Travel Research,* 53(4), 476-487.

Shefrin, H. M., & Thaler, R. H. (1988). The behavioral life-cycle hypothesis. *Economic Enquiry,* 26(4), 609-643.

Thaler, R. (1985). Mental accounting and consumer choice. *Marketing Science,* 4(3), 199-214.

Tol, R. S. (2007). The impact of a carbon tax on international tourism. *Transportation Research Part D: Transport and Environment,* 12(2), 129-142.

Wang, Y., & Davidson, M. C. 2010. A review of micro-analyses of tourist expenditure. *Current Issues in Tourism,* 13(6), 507-524.

Wang, Y., Rompf, P., Severt, D., & Peerapatdit, N. (2006). Examining and identifying the determinants of travel expenditure patterns. *International Journal of Tourism Research,* 8(5), 333-346.

Wu, C., Li, G., & Song, H. (2011). Analyzing tourist consumption: A dynamic system-of-equations approach. *Journal of Travel Research,* 50(1), 46-56.

Zellner, A. (1962). An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias. *Journal of the American Statistical Association,* 57(298), 348-368.

Zheng, B., & Zhang, Y. (2013). Household expenditures for leisure tourism in the USA, 1996 and 2006. *International Journal of Tourism Research,* 15(2), 197-208.