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THE EFFECT OF TOURISM TAXATION ON TOURISTS' BUDGET ALLOCATION

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Abstract

Few studies have investigated the effects of taxation on micro-level tourism demand or the composition of tourists' budgets during a trip. This study examines the intersection of these two areas, and models the influence of the air passenger duty (APD) on the budget allocations of outbound U.K. tourists. The compositional data analysis (CODA) approach 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 analyze the effects of the APD, personal traits and trip characteristics on the log-ratios. The results demonstrate that the APD modifies the budget allocations of U.K. outbound tourists by increasing the relative share of transportation expenditure, while correspondingly decreasing the at-destination expenditures on items such as accommodation and food.

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

1 Introduction

Tourism scholars are paying increasing attention to the economic effects of taxes, as taxes that specifically target tourists are becoming relatively popular with policy makers. Although such taxes have a reputation for being exportable, they have the potential to significantly distort the economy, as recognized by Forsyth, Dwyer, Spur and Pham (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 a contractionary fiscal policy, the effects of tourism taxes often spill over to other economic groups and agents. The extent to which tourism taxes are exportable depends on the price sensitivity of consumers and producers. Moreover, the effects of taxes inevitably fall on both producers and consumers regardless of which group the taxes are directly imposed on. In a market where the consumer responsiveness to changes in prices is low, consumers bear the bulk of the tax burden, but when the demand is more elastic, the burden falls mostly on the producers. In the case of tourism taxes, when tourism demand is price sensitive, producers must adjust their prices in response to the 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 taxes but also incur value-added tax and other sales taxes at their tourist destinations and at home. Nonetheless, tourist taxes continue to be popular, although governments tend to regularly reform them to increase their efficiency. Forsyth et al. (2014) discuss the negative impact of tourism taxes on national economies due to their effects on employment and income generation. However, Seetaram, Song and Page (2014) find that the consumer responsiveness to the air passenger duty (APD) in the U.K. is marginal, leading to the conclusion that consumers are either increasing their budgets 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 burden falls mainly on the consumers, who do not adjust their demand significantly in response to higher costs. Therefore, this type of fiscal policy is unable to reduce international travel. However, although it is known that producers do not share their tax burdens equally, the exact proportion of taxes attributable to each producer is not known. Given 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 the producers. Without these crucial data, empirical studies on tourism taxes cannot decompose the effects of such taxation on consumers and producers. The assumption made under these circumstances – that the tax burden falls fully on the consumer – is not unrealistic because the taxes are added 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 on to consumers.

The empirical research on tourism taxes has primarily used macro-level data. Studies have argued that the inelastic demand for air travel implies that consumers do not react to contractionary policies by reducing their international travel. The aim of this study is to investigate whether consumers absorb the additional cost of travel by reducing their consumption of other components of their demand. To test this, micro-level data on consumer behavior are required.

Analyses of tourism demand at the micro level focus on the spending behavior of individuals or households, specifically their decisions about the level and composition of their expenditure. The factors influencing the composition of expenditure may differ from those influencing the levels of expenditure (Ferrer-Rosell, Coenders, Mateu-Figueras, & Pawlowsky-Glahn, 2016). As Wang and Davidson (2010) indicate, tourism products are not single commodities, but combinations of goods and services purchased by tourists during their trips. Both the structure and amount of these expenditures are worth examining. 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 analyzing the effects of tourism taxes, specifically the APD, on tourist spending behavior. The compositional data analysis (CODA) approach is use to analyze a sample of survey data. The CODA approach is becoming increasingly popular in the analysis of consumers' budget allocations due to its numerous advantages (e.g., Ferrer-Rosell et al., 2016). In particular, the CODA approach transforms the raw expenditure shares into log-ratios based on a three-step sequential binary partition process, which is consistent with the typical budget allocation procedures. A series of variables, including the APD, tourist attributes, and trip attributes, are then regressed against these log-ratios to model the determinants of the composition of expenditure.

2 Literature review

2.1 Tourism taxation and APD

In recent years, numerous countries have imposed departure taxes, or more specifically aviation taxes, on air travelers. Examples include the aviation carbon tax in Australia and APD in the U.K. The APD, which is the focus of this study, is an excise duty levied by the government on travelers originating from U.K. airports. Destinations are split into different bands based on the distance between the capital city of the destination and London, and the duties are charged accordingly. The current APD rate ranges from £13 (traveling within 2000 miles on the lowest class of flight) to £468 (traveling over 2000 miles on the highest class of flight) based on the travel distance and flight class. The primary purpose of the APD is to encourage the U.K. airline industry to internalize its externalities, specifically the soaring levels of carbon dioxide and other greenhouse gases emitted by the industry. Another motive for imposing the APD is that it is levied on those best able to pay, namely overseas visitors who are unable to vote in the U.K. The APD is therefore a potentially effective mechanism for raising public funds.

However, the implementation of schemes such as the APD has raised concerns about their potential consequences. In effect, the APD is an export tax on international visitors who buy tourism products from the U.K. and an import tax on U.K. residents who travel abroad and buy tourism products from other countries (e.g., Tol, 2007). The duty may therefore influence the destination competitiveness, tourism expenditures of the outbound and domestic tourism markets, national tax revenue, and environmental protection measures. Because air travel is a primary form of transport for many U.K. residents, the imposition of the APD has affected a sizeable consumer group.

Forsyth et al. (2014) propose that the APD may reduce the numbers and expenditure of outbound tourists, leading to increased domestic expenditure and flow. Tol (2007) and Seetaram et al. (2014) empirically show that the implementation of the APD has a negative effect on U.K. outbound travel, although the strength of the effect varies across destinations. The increased costs resulting from the departure tax may deter some U.K. residents from traveling overseas, and such travelers are expected to spend more on home goods and services. From a purely economic perspective, policy instruments that can induce travelers to choose domestic holidays over overseas trips are perceived to be highly beneficial, as consumer spending is retained within the country.

Tourism and transport stakeholders are concerned that export taxes may make countries less competitive as tourism destinations by introducing additional charges and increasing the price of tourism (Forsyth et al., 2014). The APD has been criticized by the World Travel and Tourism Council for its potential to create huge losses for the tourism industry and the U.K. economy (Forsyth et al., 2014). Mayor and Tol (2007) find that an increase in the APD lead to a slight drop in the numbers of international visitors to the U.K. Similarly, tourism industry representatives claim 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 that efforts to reduce carbon emissions have marginal effects because travelers are generally prepared to pay more to maintain their level of demand. Moreover, Mayor and Tol (2007) find that higher APD charges can have the reverse effect of increasing carbon dioxide emissions, albeit only slightly, because they reduce the relative price difference between near and far holidays.

2.2 APD and the composition of tourist expenditure

Tourist expenditure can be analyzed in absolute terms by 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 the composition of tourist expenditure typically focus on the relative differences, while acknowledging the constraints and distributional nature of tourist spending during a trip.

The composition of tourist expenditure 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). In this process, 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 the destination budget among specific goods and services in the third stage. These staged spending decisions form 'mental budgets' (Thaler, 1985; Shefrin & Thaler, 1988) for each designated category. The budget allocations are binding in that the 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 approach 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. The factors driving tourist spending behavior are typically assessed based on the tourist characteristics and their trip attributes (Ferrer-Rosell et al., 2015 2016). Sainaghi (2012) and Ferrer-Rosell et al. (2015) suggest that the composition of tourist expenditure may vary with the socio-demographic and economic traits of the tourists and the characteristics of their trips. The explanatory variables typically used in studies of microeconomic tourism demand 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 the rest of the components to be redistributed. Martinez-Garcia and Raya (2008) and Ferrer-Rosell et al. (2016) find that the reduction in transportation costs brought by low-cost airlines can lead travelers to spend a higher proportion of their trip budget at the destination. These findings echo Morley (1992) and Dolnicar et al. (2008), who suggest that budget allocation decisions are interdependent and that a specific part of the expenditure for a trip may be affected by a surplus or deficiency in another part of the expenditure. Similarly, the

APD is part of the transportation cost, and thus forms a part of the total expenditure. Accordingly, an increase in the APD may increase transport spending and thus modify the composition of the expenditure.

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

The variables used to analyze the composition of expenditure (relative shares of each part of the budget) may differ from those used to analyze the absolute expenditure. The research on the composition of expenditure 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 because the same absolute amount spent on a certain category may hide changes in the budget distribution (Ferrer-Rosell et al., 2016).

The composition of expenditure can also be analyzed by treating the expenditure components as proportions or percentages of the total expenditure instead of absolute amounts. These relative expenditure components can be modeled using a series of equations, with relevant constraints being imposed on the model to ensure that the proportions sum to one. In this case, a component can increase only if other components decrease. Such compositional datasets convey information about the relative size of the 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 the 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}, …, x_{iD} has the following constraints:

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

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, the AIDS approach 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 the allocation of tourist expenditure among alternative destinations and different categories of expenditure at a particular destination. Studies have used AIDS to examine how tourists from a given origin choose between multiple destinations (Divisekera, 2009) by modeling the choices between destinations (Li, Song, & Witt, 2004) and how tourists from multiple origins choose a given destination by modeling the choices between different commodities at a destination (Wu, Li, & Song, 2011). Few studies have examined the micro-level expenditure allocation during a trip. Fujii, Khaled and Mak (1995) investigate the 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 the total expenditure by the number of visitors, and thus their analysis is not fundamentally different from a macro-level study.

Despite its advantages for analyzing compositional expenditure, the AIDS approach has some constraints when applied in 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, the APD cannot be included in the AIDS model. Last, although the AIDS model fits compositional data, some researchers (e.g., Ferrer-Rosell et al., 2016) have noted that the unbounded distribution of the budget share can result in the demand system being miss-specified as almost ideal, thus 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 CODA method is preferred for this study because its log-ratio approach can transform the compositional data into a suitable form 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 proven to be effective. However, Ferrer-Rosell et al. (2015) note that few studies of the composition of tourism expenditure have used CODA or any other methodology to account for the compositional constraints in the compositional datasets.

3 Methodology

3.1 Log-ratio transformation based on sequential binary partitions

Following Ferrer-Rosell et al. (2015), this study applies the CODA approach with log-ratio transformations, which is based on sequential binary partitions. These partitions are formed by first dividing the expenditure components into two clusters and then subdividing each cluster into two until each component constitutes its own cluster.

For example, the total budget of U.K. outbound tourists is first divided into the expenditure at the origin and expenditure not at the origin. The latter partition is then divided into expenditure for transportation and at destination. Last, the 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, the partition of expenditure is related to the allocation of the travel budget to different spending items and has no relation to where the bill is paid. That is, although the transportation cost can be paid at the origin (e.g., booking an air ticket), it is still counted as a transportation cost.

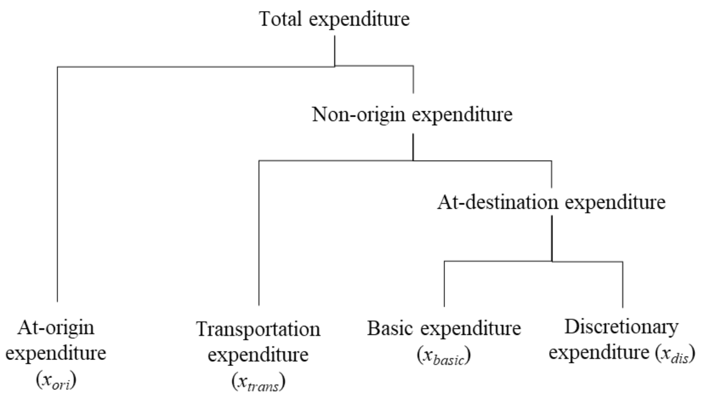

Figure 1. Sequential binary partition of the U.K. outbound tourist expenditure

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 U.K. 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.

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

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 shows the budget allocation between the 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.

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

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.

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

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

$$x'_{id} = 0.65\delta_{id}. \tag{5}$$

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

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

3.2 Seemingly unrelated regressions (SUR)

Seemingly unrelated regressions (SUR) are recommended for analyzing compositional datasets that contain continuous explanatory variables (Ferrer-Rosell et al., 2014). In econometrics, the SUR model, proposed by Zellner (1962), is a generalization 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 the equations can be estimated using the standard ordinary least squares (OLS) method. The SUR model is commonly used to tackle multi-expenditure variable problems.

In this study, the 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. The 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. Because 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 the APD and the three log-ratios are also considered, i.e. distance and the awareness of air travel fees and taxes. The latter is defined as the extent to which the tourists are aware of the related charges. The SPSS 22.0 software package is used to estimate and test the models.

3.3 Data and variables

The data for this study were collected with a self-administered survey questionnaire distributed to outbound tourists originating from the U.K. The questionnaire comprised 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 traveling by air), total expenditure amount, and expenditure amount in different categories, which included spending within the U.K., flight expenses, and 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 specify 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. After examining various methods, the online survey method was selected as the best approach to derive a meaningful sample. The researchers hired a market research company with a track record of generating robust and reliable panel data to conduct the survey. Using such a conduit to survey consumers was cost-effective and helped overcome the low response rates encountered in postal surveys. Of the 2,002 participants who completed the survey, 1,063 purchased flight and accommodation packages. As it was difficult to distinguish between the accommodation and transportation expenditures of these package travelers, these surveys 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 prior to the data analysis.

The main explanatory variable, APD, was calculated according to the travel date, class, and distance based on the applicable rates given in 'Excise Notice 550: Air Passenger Duty' (HM Revenue and Customs, 2017). The travel distance was defined as the distance between London and the capital city of the destination country, and was collected 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 calculate 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 the 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/Humberside	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 for the 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 ($y_{ori-nonori}$)	-3.500	0.740	-1.523	0.862	-0.164	-0.154
Transportation/at-destination log-ratio ($y_{trans-des}$)	-2.440	2.940	-0.049	1.103	0.337	-0.342
Basic/discretionary log-ratio ($y_{basic-dis}$)	-4.530	5.200	0.917	1.224	-0.142	0.766

4 Findings

The results of the SUR 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 indicate average predictive power for the 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 the parameter estimation. The Kolmogorov-Smirnov test is insignificant for the three models, implying that normal standardized 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 diagnosis

	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 the APD;

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

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

iv. the trip attributes.

Table 5 presents the results of the coefficient estimation. The effects of the APD on the three log-ratios are significant, implying that the APD influences the tourists' budget allocation at all stages of decision making. Although the APD is only incurred at the origin prior to the trip, its effect extends to the 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 the origin. Thus, this tax can be seen as regressive, especially when the destination is a relatively lower income country that relies on tourism expenditure to generate income. The APD also has a negative effect on the log-ratio of origin expenditure over non-origin expenditure (y_{ori_nonori}), where a larger value denotes that a higher proportion of the budget has been allocated to spending within the U.K. 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 U.K. This is reasonable because the APD is a constituent of the transportation cost, which comprises a significant proportion of the non-origin expenditure. As the expenditure within the U.K. is also a source of tax revenue, the net benefit to the U.K. in terms of the increased tax revenue generated from the APD is thus partly offset by the shortfall in the tax revenue generated from the total tourist expenditure in the U.K.

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

The third stage of the budget allocation process also produces some interesting findings. Although the 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 the 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 on accommodation or food. It appears that when faced with increased transportation costs, tourists reallocate their budgets by reducing their spending on other basic items, for example, they stay at cheaper hotels, rather than making up the deficit at the expense of their discretionary spending. These results indicate that the demand for accommodation and food, which constitute 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 (-0.095)	.311	-0.151 (-0.065)	.453	0.445 (0.175)	*
With friends	-0.115 (-0.046)	.524	-0.300 (-0.095)	.166	0.668 (0.190)	**
With family and friends						
Residence region						
South West	0.14 (0.048)	.738	0.482 (0.130)	.289	-0.501 (-0.121)	.371
South East	0.373 (0.155)	.370	0.538 (0.174)	.231	-0.041 (-0.012)	.941
London	0.205 (0.091)	.620	0.336 (0.116)	.453	-0.422 (-0.132)	.443
East Anglia	0.147 (0.044)	.729	0.220 (0.033)	.631	-0.461 (-0.099)	.414
West Midlands	0.229 (0.072)	.587	0.200 (0.007)	.948	-0.427 (-0.097)	.446
East Midlands	0.346 (0.101)	.418	0.180 (0.041)	.698	-0.236 (-0.049)	.680
Yorkshire/Humberside	0.059 (0.018)	.889	0.157 (0.037)	.731	-0.421 (-0.090)	.455
North West	0.072 (0.026)	.863	0.390 (0.108)	.388	-0.114 (-0.028)	.838
North East	0.064 (0.014)	.884	0.107 (0.018)	.823	-0.455 (-0.071)	.441
Scotland	-0.08 (-0.027)	.849	0.399 (0.104)	.384	-0.518 (-0.121)	.359
Wales	0.327 (0.091)	.442	0.157 (0.035)	.733	-0.551 (-0.109)	.333
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 the APD in the first stage of the budget allocation process; that is, for those traveling longer distances, the negative effect of APD on y_{ori_nonori} is weakened. Long distance travel usually results in a relatively larger proportion of the budget being allocated to non-origin expenditure due to the higher transportation costs. Because an increase in the APD corresponds with a proportionally modest increase in expenditure, consumers' reactions to the increase can also be considered to be relatively modest. That is, because the share of the APD in the total expenditure is much lower for longer distance trips, it has a weaker effect on the budget allocation. The positive effect of the APD in the second stage of the budget allocation process is again weaker for longer journeys. No significant moderating effect of distance is found between the APD and the third stage of the budget allocation process 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 the APD on y_{ori_nonori}, albeit slightly. That is, the tourists who are more aware of the APD and other extra charges may be more resistant to the influence of the APD in terms of budget adjustment, as they may have already absorbed the cost when planning their budget.

With regard to the tourists' socio-demographic traits, age positively influences the levels of basic and discretionary at-destination expenditure in the third stage of the budget allocation process. 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, gender has a negative effect on budget allocation in the first and second stages. Compared to female tourists, male tourists spend more outside the U.K. and more at the destination.

Household income also influences the tourists' budget allocation, although its effects are only significant in the first and second stages. Compared to tourists with higher incomes (above £70,000 per year), tourists with yearly household incomes below £60,000 tend to allocate a larger proportion of their budget to at-origin expenditure. Those with incomes in the £10,000 to 60,000 income bracket tend to spend more on transportation than at-destination expenditure items. The effect of education level is significant in the second stage of the budget allocation process. 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 who travel further may allocate a larger budget share to non-origin expenditure in the first stage, transportation expenditure in the second stage and discretionary items in the third stage. Length of stay is found to have a significantly negative influence on the second stage of the budget allocation process, 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 the travel party is significant only in the third stage. Compared to those traveling with family and friends, those traveling 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 the literature on microeconomic tourism demand. Because most studies focus on the macro level and absorb tourist taxes into the tourism product price index, the influence of tourist taxes has generally been modeled and analyzed as part of travel propensity and expenditure (e.g., Seetaram et al., 2014). Few studies have investigated how tourist taxation influences the spending behavior of individual tourists. This study postulates that the effect 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 the APD on the composition of U.K. outbound tourist expenditure.

Instead of focusing on the effects on the decision to travel, this study examines the influence of taxation on the behavior of people who have decided to travel. The results show that the APD may lead tourists to reallocate their travel budgets in ways that have distributional effects at an international level. For example, tourists may allocate a larger share of their budget 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 their basic at-destination spending (including on accommodation and food). One inference of this finding is that the extra cost of the APD has a significantly negative impact on the budget share for basic expenditures at tourist destinations. Notably, the effects of the APD are moderated by the travel distance and tourists' awareness of the taxes. Reallocations are likely to be stronger for short-haul travelers 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 the composition of expenditure. In a study on low-cost airline travel, Ferrer-Rosell et al. (2015) find that a reduction in transport costs can affect the distribution of nontransportation expenditures and that savings from the transport component can be transferred to at-destination expenditures. The findings of this study suggest that the increase in transportation costs due to the APD may absorb part of the at-destination expenditure and thus modify the budget allocation. More explicitly, this study indicates that the increased transportation cost is absorbed by the reduced spending on basic at-destination items including accommodation and food. The findings of this study have theoretical implications because they further enhance our understanding of the relationship between taxes and tourists' budget allocations.

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 analyzing non-origin expenditures. In this study, a similar sequential binary partition approach is applied to origin expenditures to develop a three-step process. The study findings confirm the applicability of the log-ratio approach to the decision-making processes of tourists throughout their journeys. This study's methodological contribution is the generalization and validation of the application of the CODA methodology to the research on tourist expenditure behavior.

Overall, this study provides further evidence of the effectiveness of the APD policy. The findings show that a high APD can lead tourists to allocate a larger share of their budget to non-origin expenditure. Although the share of at-destination expenditure also decreases, most of it goes to transport. Because the effect of the APD may be weakened if travelers become aware of the charge, the authorities should show outbound tourists that a large proportion of their transport cost is the duty and extra charges. Furthermore, as short-haul travelers are more sensitive to changes in the APD, the appropriate authorities could remove the APD for short-distance destinations to offset its negative consequences.

The limitations of the study 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 level of absolute expenditure remains hidden. This limitation could be overcome by combining investigations in relative terms with those in absolute terms, which would enable the effects of tax on the expenditure behavior of individual tourists to be mapped more comprehensively. Second, because the survey asked the respondents to recall their journeys, memory distortions may have undermined the precision of the measurement, especially for the amount of spending. Third, the low R^2 values suggest there are flaws in its predictive power. Finally, the survey mainly targeted holiday travelers originating from the U.K., future studies could include business travelers and outbound travelers in other countries (e.g., Australia),

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