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Economic crisis and tourism expenditure cutback decision

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ABSTRACT

Tourists from different European regions have reacted heterogeneously during the Global Economic Crisis. Such variability is due to different preferences and willingness to pay for tourism. This paper explores the underpinnings behind such heterogeneity. Regional variables and household socioeconomic variables are gathered to understand tourists' expenditure cutback decision. Since the cutback decision is not independent of the destination choice, a Simultaneous Semi-Ordered Bivariate Probit model is specified, which deals with the simultaneous estimation of both decisions and endogeneity. Post-estimation results are based on GIS, contours and non-parametric analysis. They prove that during an economic crisis, tourists' cutback decisions on tourism expenditure depend on climate conditions of the place of origin, GDP and GDP growth.

Introduction

In 2009, the world economy has faced the deepest economic crisis of the last decades. According to World Bank Development Indicators, World Gross Domestic Product (GDP) per capita has decreased by 3.39% in 2009, whereas for European Union-27 (EU-27) countries and United States it has declined by 4.74% and 4.37%, respectively. Figure 1 shows growth time series since 1960. It shows the relevance of this crisis as compared to other relevant crises such as the oil crisis. According to economic theory, in situations of macroeconomic stability and certainty, household consumption mainly depends on disposable income. However, if instability and uncertainty are present in the economy at certain degree, consumption depends on current disposable income and expected changes on such disposable

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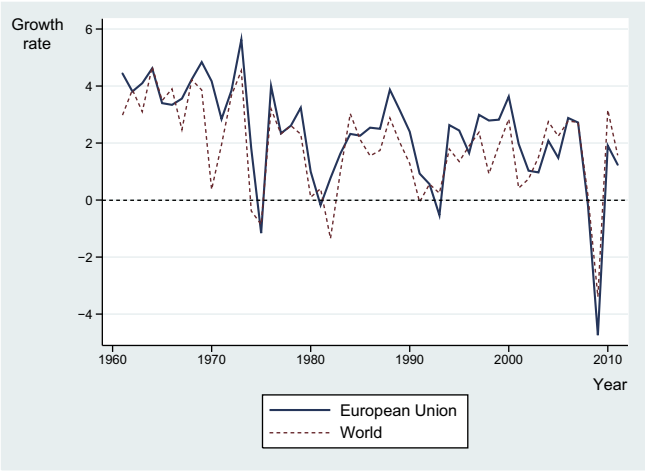

Figure 1. World and EU GDP per capita.

income. Thus, it seems that expectations are key elements to understand consumption behavior during an economic crisis. On average, it is expected that during an economic crisis, the decrease in households' disposable income will also imply a decrease in consumption. Thus, luxury goods and services, such as traveling and tourism expenditure, are expected to be more sensitive during economic crises. Indeed, during 2009, World arrivals decreased by 3.8%, whereas in Europe and United States they declined by 4.9% and 5.01%, respectively (United Nations World Tourism Organization, 2011).

In order to analyze the economic impacts or implications of these figures on destinations, it is necessary to consider arrivals and receipts altogether because a destination may react to a decrease in arrivals with a decrease in tourism prices. In 2009, World tourism receipts decreased by 9.36%, whereas in Europe and United States the decline reached 13.05% and 14.7%, respectively (United Nations World Tourism Organization, 2011). Such marked differences between percentage variations in arrivals and expenditure are due to a new equilibrium between tourism demand and supply. Decreases in GDP imply a downward demand shift. It is expected that the travel and hospitality sectors will anticipate the shift and reduce prices. At the same time, some tourists cut back on tourism expenditure in different ways, such as traveling to closer destinations, reducing the length of stay, or staying in cheaper accommodation. The way tourists react during the economic crisis is not homogeneous. Despite the crisis, some people are still keen on traveling, whereas other people are reluctant to do so and prefer to save money cutting back on tourism expenditure. Such heterogeneous sensitivity responds to different preferences and willingness to pay for expending on traveling (Nicolau & Masiero, 2013), especially for traveling abroad. The attractiveness of the place of residence can make a difference on such preferences and the need for traveling. For instance, bad climate in origin may be a push factor for traveling abroad (Eugenio-Martin & Campos-Soria, 2010). On top of that, individuals' preferences may be determined by socioeconomic characteristics, such as age, gender, occupation or education.

A natural variable to be used as endogenous is household expenditure (see for instance, Melenberg & Van Soest, 1996). However, a household or individual may vary their yearly expenditure for several reasons, not all related with the economic crisis. For instance, during a certain year the individual may wish to travel to a far destination that implies high expenditure. Nevertheless, the following year the individual may seek another kind of destination which is located much closer. Such change in destination choice may be associated with disposable income or not at all. They may respond to different causes, some of them may be economic, but some other causes may be due to employment (Alegre, Mateo, & Pou, 2013), family issues or varying preferences. Econometric models may interpret such expenditure variations wrongly, causing biased results. Instead, it is possible to be more specific with

this issue asking individuals if they have had to cut back on tourism expenditure during the last year. The expenditure cutback decision does not confuse the researcher, because the direction of the change is clearly stated by the interviewee. Comparing the suitability of the cutback decision with respect to household expenditure, there are pros and cons. On the one hand, cutback decision variable provides additional accuracy on measuring tourists' behavior because it permits to identify with no doubt who is really affected by the economic crisis. On the other hand, the intensity of the cutback is not captured. The analysis of the cutback decision in order to understand the effects of an economic crisis does not mean to replace the analysis of the household expenditure, but it represents an interesting alternative or complement to it, especially during economic crises.

Most research papers measures the impacts of any kind of crisis by changes in arrivals and receipts from a macroeconomic perspective. Two main reasons explain this approach. On the one hand, data limitations constrain the scope of the analysis and on the other hand, forecasting is very relevant for policy making. Nevertheless, the decision of cutting back on tourism expenditure should take into account household microdata. It allows for controlling on socioeconomic characteristics and the attributes of the place of residence, which explain part of the heterogeneous preferences and it improves the results significantly. Moreover, the economic crisis is measured on macroeconomic terms, such as GDP changes, so that, ideally, microdata and macrodata should be combined in the analysis. This approach may be of interest for tourism and hospitality decision-makers who need to understand and anticipate the linkage between GDP and tourists' behavior. Literature supports the need for further knowledge from a microeconomic perspective. Sheldon and Dwyer (2010, p. 4) state that "our lack of knowledge about possible consumer responses to the crisis places great impediments in the way of forecasting its effects on the industry". Moreover, Bronner and de Hoog (2012, p.1049) argues that "because people lived for such a long time in a situation of rising incomes, little is known about the reaction of consumers in general to a global economic crisis". Smeral (2009, p.3) points out the need for understanding the tourism expenditure cutback substitution pattern: "Consumer cutbacks in response to the all-prevailing crisis will disproportionately affect luxury goods in general as well as tourism services in particular". It is interesting to consider such tourism expenditure cutback decisions. However, as far as we know, tourism literature on this issue does not exist.

This paper focuses on the underpinnings of the households' tourism expenditure cutback decisions during the global economic crisis in 2009. In particular, this study tests if during the global economic crisis, cutback decisions on tourism expenditure depend on climate conditions of the place of origin, GDP and GDP growth, among other well-known determinants. For that purpose, an econometric model is built, employing a survey carried out at the European regional level (NUTS 2 regions of EU-27). It should be noted that cutback decisions are not independent of destination choice, and for that reason the model requires the estimation of both decisions simultaneously. On the one hand, the cutback decision is binary. On the other hand, destination choice can be ordered according to the distance, so that the model that fulfills the required specifications is a Seemingly Unrelated Semi-Ordered Bivariate Probit (SU S-OBP) model (Greene & Hensher, 2009) or Simultaneous Semi-Ordered Bivariate Probit (S S-OBP) model (Sajaia, 2008), as it is explained below.

Literature review

Tourism Crises

One common issue shared by all the crises is that they affect tourism demand. Generally speaking tourism crises imply shocks to the usual flow of tourists from a region of origin and the destinations. Thus tourism crises may affect inbound tourism demand, outbound tourism demand or both. On the one hand, inbound tourism flow towards destinations has faced many different kinds of crises in the last decades. They differ in the nature of the causes and its consequences and they may be temporary or permanent. Permanent crises may be related with destination competitiveness and destination life cycle, whereas temporary crises may be triggered by a wide range of causes. Most common causes faced so far are due to natural disasters, such as tsunami (Carlsen & Hughes, 2008; Ichinosawa, 2006) or volcanic eruption (Murphy & Bayley, 1989); diseases, such as foot and mouth disease in

UK (Blake, Sinclair, & Sugiyarto, 2003; Eugenio-Martin, Sinclair, & Yeoman, 2005) or SARS in some Asian countries (Kuo, Chen, Tseng, Ju, & Huang, 2008; Mao, Ding, & Lee, 2010; McKercher & Chon, 2004); shocks to safety, such as terrorism attacks on September 11th in US (Araña & León, 2008; Blake & Sinclair, 2003), Bali bombings (Hitchcock & Putra, 2005; Pambudi, McCaughey, & Smyth, 2009) or attacks in Middle East (Fleischer & Buccola, 2002). It is interesting to note that economic crises in the destinations have not proved to deter tourist arrivals significantly, see for instance the case of Asian financial crisis in 1997 (Prideaux, 1999). On the other hand, outbound tourism demand crises are associated with economic crises or shocks to global safety such as September 11th (Araña & León, 2008).

Literature has dealt with how much tourism demand is affected by certain crises. Tourism demand can be approached from a macroeconomic or microeconomic perspective depending on the purpose of the study. The macroeconomic approach is based on national or regional time series datasets. The endogenous variables are usually arrivals, receipts and or expenditure (Song & Witt, 2000). The microeconomic approach is based on individuals or households. The endogenous variables may be participation, expenditure or any other experimental observation of tourists' behavior (Araña & León, 2008; Bronner & de Hoog, 2012). Once tourism demand impact is estimated, crisis evaluation may proceed with further economic impacts on earnings or employment. Final impacts will depend on how the crisis has been managed (Ritchie, 2004). Its management depends on the nature of the crisis. For instance, economic impact of foot and mouth disease crisis in Scotland was managed improving knowledge and understanding of a complex and multifaceted crisis, minimizing the economic effect using a crisis responses model (Page, Yeoman, Munro, Connell, & Walk, 2006), in which coherence and coordination between businesses and public organizations were crucial. One way of evaluating the economic impacts is employing computable general equilibrium models as considered by Blake and Sinclair (2003), who identify the spread of the impacts on the economy by economic sectors, allowing for flexible prices and wages. Such flexibility is very relevant to take into account in a crisis evaluation, especially to anticipate alternative scenarios and set optimum prices.

Global Economic Crisis

This paper focuses on the global economic crisis that affected most countries of the world between 2008 and 2009, although for some countries it was extended much longer. This crisis is characterized by a credit constraint that throttles liquidity and reduces consumption. Thus aggregate demand and GDP are also reduced, increasing unemployment and decreasing disposable income. Consequently, outbound tourism from affected countries is reduced. It has an impact on the number of arrivals in tourism destinations, as estimated by different authors (Page, Song, & Wu, 2012; Papatheodorou, Rosselló, & Xiao, 2010). Destinations may anticipate the demand shift, so that prices are usually reduced to keep up with the number of arrivals, thus decreasing expenditure at the destination (Ritchie, Molinar, & Frechtling, 2010; Smeral, 2010).

Understanding how different income elasticities are, is necessary to anticipate the impact of the crisis appropriately. The accuracy depends on the spatial resolution of the analysis. Due to dataset limitations, national aggregate figures of arrivals and expenditure are usually employed with time series analysis (Song & Li, 2008). Several authors have pointed out that for the study of the impact of a crisis these approaches are not exempt of critical inconveniences. The most relevant issues are related with the way of identifying the effect of the crisis and the right model to estimate it. Song, Lin, Witt, and Zhang (2011) argue that forecasting models lack of explanatory variables that are necessary to understand its dynamics and that econometric approaches to estimate forecasting models are preferred. Eugenio-Martin et al. (2005) proposed comparing current data with the expected forecast if the crisis never happened, so that the difference should reveal the impact of the crisis. Nevertheless, such analysis is later to the event and ideally, the model should be useful to anticipate the effects. Hence for that purpose, the model needs to rely on current trend and estimate the parameters associated with that. Unfortunately, it comes along with two main problems. On the one hand, the length of the series is critical to the stability of the parameter. Sheldon and Dwyer (2010) argue that this kind of estimations is based on long-term upward-trended data that may not be valid for long and deep recessions. Li,

Song, and Witt (2006) suggest employing time-varying parameter models for that purpose. Despite such parameter adaptation, Smeral (2010) argues that:

> The forecasts made assume that tourism demand elasticities are symmetrical, that is, that the elasticities in up-and downturns have a similar magnitude. But it is important to bear in mind that income elasticities do not remain stable across the business cycle: the relative fall in tourism demand during a severe economic downturn—reflecting, as it does, the greater threat to a person's financial situation and job security—will be steeper than the relative increase in demand during an economic upturn of a similar magnitude (2010, p.37).

On the other hand, it is problematic to identify the intensity and the length of the crisis over time. Some studies control a crisis by including one-off dummy variables in the model (Kulendran & Witt, 2001), however, it ignores both the intensity and the length and it assumes that it is the same during the period. For instance, the global economic crisis may be captured by a dummy variable in 2008 and 2009 but its estimated value cannot be inferred for future forecasts because 2008 dummy is conditioned to the length of the crisis within that year, i.e. it may happen that only four out of twelve months in 2008 were really affected by the crisis. Moreover, the intensity of the effect within 2009 may not be the same than those in 2008. Hence, the model may be appropriate for studying the past but not the future. An additional problem of identification with this kind of models happens with the confluence of several events over time (Hall, 2010; Page et al., 2012).

Heterogeneous Behavior During Economic Crises

Tourists under an economic crisis show heterogeneous behavior. Households or individuals who live in certain regions or countries react differently during an economic crisis. Such distinction is relevant for the tourism management of the crisis. The determinants of tourism demand are usually decomposed between economic and non-economic factors (Goh, 2012). Given the same depth of economic crisis, the reaction will be different depending on the current level of household income. However, non-economic factors play also a relevant role in tourism demand. Cho (2010) argues that different origins have different cultural and nationalistic backgrounds that explain part of the heterogeneous behavior of the households. Thus, preferences and willingness to pay of the tourists differ, especially in relation to a geographical pattern. In this sense, the place of residence works as a benchmark tourism destination alternative to compare the rest of destinations with. Usually traveling is more expensive than staying at home enjoying recreational one day visits or activities. The utility obtained from traveling needs to compensate sufficiently the additional money spent on it, otherwise, staying at home will be preferred. Hence, the attractiveness of the place of residence is key to understand the willingness to pay for traveling. Eugenio-Martin and Campos-Soria (2011) show that under income increases the willingness to travel abroad differs between UK and Germany with respect to France and Italy. The former countries increase their probability of traveling abroad with income increases, whereas the latter countries keep preferring traveling domestically under the same income variation. The attractiveness of the place of residence works as a 'pull' factor to stay at home and practice domestic tourism. At the same time, lack of attractiveness of the place of residence works as a 'push' factor to travel abroad.

The identification of regional factors associated with the attractiveness of the place of residence is similar to those factors associated with the attractiveness of any other tourism destination. However, it is true for destinations where the marginal utility of a repeat visit does not decrease much. Some of the attributes that define the attractiveness of the place of residence are climate; natural resources; cultural resources; ease of language and social communication; and safety and low uncertainty. Moreover, the existence of transport infrastructure such as airports is expected to facilitate traveling.

Climate As A 'Push' Factor In Outbound Tourism Demand

Climate in the place of residence is one of the most relevant 'push' factors for traveling abroad. According to Agnew and Palutikof (2006):

> Climate is viewed as one element in the decision making process that can act either as a 'pull' factor encouraging the home-grown tourist to holiday in the UK, or as a 'push' factor encouraging the UK resident to holiday abroad (2006, p. 110).

The climate in the place of residence explains part of the asymmetries found in the willingness to travel abroad between different regions and countries. Maddison (2001) argues that:

> A major factor in both choice of destination and time of departure is surely climate. Tourists might be construed as making a decision to go abroad in order to gain some short-term climatic advantage. In America retired people in particular can be observed heading south to Mexico for the winter whilst in Australia they travel north to the 'Gold Coast' resorts of Queensland (2001, p. 193).

Maddison's idea suggests taking into account climate differences between the place of origin and potential destinations. However, tourism demand literature does not usually take into account the climate in origin or destination, but it focuses on economic factors (Lise & Tol, 2002). The role of climate in the destination has received more attention recently (Bigano, Hamilton, & Tol, 2006; Goh, 2012; Lise & Tol, 2002), especially due to the study of climate change (Becken, 2013). However, Rosselló-Nadal, Riera-Font, and Cárdenas, (2011) state that "previous studies have considered the influence of climate in the destination, neglecting the influence of the weather conditions in the origin country on outbound tourism flows". Indeed there are few exemptions that have considered climate in origin. For instance, Eugenio-Martin and Campos-Soria (2010) take into account climate in the place of origin to explain the substitution pattern between traveling domestically and or abroad. Moreover, for the case of winter tourism, Falk (2013) finds out different sensitivities between domestic tourism and international tourists in relation to weather conditions. It is interesting to discuss how tourists anticipate bad weather conditions in origin. In this sense, Agnew and Palutikof (2006) state that:

> International tourism is generally less spontaneous than domestic tourism with bookings made well in advance of the time of travel. It is therefore not surprising that the association is stronger with the climate of the year previous to travel than that of the current year (2006, p. 119).

For certain origins, good or bad weather is expected with no doubts for certain months. Maddison (2001) identifies this kind of cases with the perfect information assumption. However, for other origins or certain months, expected weather is much more uncertain. Rosselló-Nadal et al. (2011) explores the length in advance of tourists' traveling decision making. They consider weather variables such as temperature, sunshine days, air frost and heat waves, to understand the short term dynamics of UK outbound flows. Similarly, Saverimuttu and Varua (2013) show that during extreme weather conditions, such as El Niño (warm phase) and La Niña (cold phase) phenomenon in US, outbound tourism increased to Philippines significantly.

Hence, long term climate conditions of the place of origin may work as a 'push' factor for traveling abroad and they may make a difference in the willingness to pay for traveling. Such heterogeneity in willingness to pay is explained by spatial clusters because not all the tourists are equally sensitive to income and price adjustments. Some tourists may be less reluctant than others to give up on traveling during their holidays. Unfortunately, regional data on tourism is not usually provided. One way of dealing with this issue is combining macro and microdata, so that the effects of macro variables such as GDP or growth can be estimated along with regional variables such as climate and individual variables such as age or traveling motivations, for instance. This is the approach considered in this paper and it is explained further in the next section.

Methodology

Theoretical Model

During an economic crisis, individuals may reduce their consumption. They may keep the consumption of certain goods and services and reduce it of others. However, such decision is not homogeneous because it depends on how different individuals' preferences are and how tight the new

budget constraint is. For instance, a 10 per cent decrease in income may affect low income households differently than high income ones. Moreover, individuals' consumption do not vary smoothly over time, because each individual foresee the future differently. Some individuals behave as short-sighted consumers, so that, if their income is altered, consumption is also adapted in a similar way. This is known as Keynesian Consumption function (Keynes, 1936). However, Keynes assumed that average propensity to consume should decrease under a GDP increase, which could not be refuted empirically (Kuznets, 1942).

Modigliani and Brumberg (1954) emphasize the role of intertemporal consumption over the life cycle of the individuals. They suggest that individuals' expectations of future income are taken into account when deciding on current consumption. Friedman (1957) developed a similar idea. He suggested that individuals assess their income and realize the existence of a permanent income. However, over time, income may be higher or lower than such permanent income. When income is higher than the permanent income, individuals save so that they can keep their expenditure level when income is lower than the permanent income. Hence, according to the permanent income hypothesis, individuals consume according to their permanent income. Further details of this approach are shown in Appendix A.

However, individuals behave heterogeneously. Some individuals behave myopic and some other behave foreseeing the future. For that reason, this paper follows Campbell and Mankiw (1989), Campbell and Mankiw (1991), who suggest combining both kinds of consumers within a more general model. The proportion of consumers who behave myopic is denoted by λ_i, which names the model.

$$C_{it} = \lambda_i Y_{it} + (1 - \lambda_i) YP_{it} \tag{1}$$

where YP_{it} denotes permanent income by individual i in period t, Y_{it} denotes total income, which is defined as:

$$Y_{it} = rW_{it} + YL_{it} \tag{2}$$

so that, r denotes interest rate, W_{it} denotes current wealth, and YL_{it} denotes labor income. In other words, income received by individual i in period t comes from capital and labor rents. During an economic crisis, the research inquiry relies on the sensitivity of the consumption under GDP shocks. According to this model (see Appendix A), change in consumption is:

$$\Delta C_{it} = \lambda_i (r\Delta W_{it} + \Delta YL_{it}) + (1 - \lambda_i)\varepsilon_{it} \tag{3}$$

The main purpose of the paper is to understand tourists' behavior during an economic crisis. In particular, the interest is focused on tourism expenditure cutback decisions. Household consumption may be disentangled so that, total consumption (C_{it}) is composed by household tourism expenditure (TE_{it}) and consumption of other goods and services (OC_{it}). It is shown in Eq. (4).

$$C_{it} = TE_{it} + OC_{it} \tag{4}$$

However, since the interest is focused on tourism expenditure cutback decisions, Eqs. (5) and (6) are developed to take into account such consumption changes.

$$\Delta C_{it} = \Delta TE_{it} + \Delta OC_{it} \tag{5}$$

$$\Delta C_{it} = \theta_{it} \Delta C_{it} + (1 - \theta_{it}) \Delta C_{it} \tag{6}$$

Parameter θ_{it} represents the share of the redistribution of consumption between tourism and other goods and services. Thus, the larger theta parameter is, the more relevant changes in tourism expenditure are with respect to changes in total consumption. Eqs. (7) and (8) are developed from previous equations but introducing θ_{it} parameter.

$$\Delta TE_{it} = \theta_{it} \Delta C_{it} \tag{7}$$

$$\Delta OC_{it} = (1 - \theta_{it}) \Delta C_{it} \tag{8}$$

Eq. (9) shows the definition of θ_{it} parameter as the ratio between both changes. Thus θ_{it} may be interpreted as the sensitivity of changes in tourism expenditure under changes in total consumption. It is interesting to think of alternative values for θ_{it}. For instance, under an economic crisis, on the one hand, if $\theta_{it} = 0$, it means that the household is keen on tourism expenditure, so that despite a consumption reduction, there is no tourism expenditure cutback. On the other hand, if $\theta_{it} = 1$, it means that all the consumption reduction is attributed to tourism expenditure cutback.

$$\theta_{it} = \Delta TE_{it} / \Delta C_{it} \tag{9}$$

Finally, Eq. (10) is obtained substituting Eq. (3) into Eq. (7). It shows that tourism expenditure changes depend on income variations and the sensitivity of the tourism expenditure of the household under total consumption variations.

$$\Delta TE_{it} = \theta_{it}[\lambda_i(r\Delta W_{it} + \Delta YL_{it}) + (1 - \lambda_i)\varepsilon_{it}] \tag{10}$$

Since θ_{it} depends on individuals' preferences, it may be modeled by a function of socioeconomic and regional variables (see Eq. (11)).

$$\theta_{it} = f(S_{it}, R_{it}) \tag{11}$$

where, S_{it} represents a set of socioeconomic variables and R_{it} a set of regional variables.

Econometric modeling

Household tourism expenditure varies over time. Modeling the impact of a crisis with tourism expenditure variations is problematic because such variation does not only depend on income changes, but on many other personal circumstances. In particular, part of the tourism expenditure variation depends on household decisions concerning destination choice. Again, such decision may be due to a new budget constraint, but it may also be due to a 'random' choice. Since far destinations are expected to increase household tourism expenditure, then there may be a *random destination choice* bias when analyzing household tourism expenditure variations. This problem happens only when analyzing households, because at the aggregate level it disappears during the aggregation process. In order to avoid such bias, the cutback decisions on tourism expenditure may be analyzed directly. This way, random destination choice bias is avoided, because the direction of the change is clearly stated by the interviewee.

Hence, this paper works on a discretized version of Eq. (10), so that tourism expenditure cutback is the endogenous variable. However, it should be noted that the cutback decision is not independent of the destination choice, so that a simultaneous estimation of both equations is necessary. Greene and Hensher (2009) deal with a similar case where one equation is binary and the other one is ordered. They show that such estimation is a particular case of the bivariate ordered probit model, known as Semi-Ordered Bivariate Probit. Additionally, destination choice may also be constrained by the cutback decision. In order to consider such endogeneity issue more explicitly, the methodology employed in this paper follows Sajaia (2008), which allows for including the cutback decision as an additional variable of the destination choice model. Hence, the following methodology is an adaptation from Sajaia (2008) model for the case of a simultaneous binary and ordered probits that deals with endogeneity, and taking into account Greene and Hensher (2009) Semi-Ordered approach.

Cutback decision is denoted by $y_{1,i}$, so that it takes unitary value if the household has incurred in any kind of tourism expenditure cutback during 2009 (i.e. $\Delta TE_{it} < 0$). Destination choice is an ordered discrete variable denoted by $y_{2,i}$, which takes values between one and four depending on how far the household is taking their holidays, that is at home, domestically, abroad but within EU-27 countries and abroad outside EU-27. Let $y^*_{1,i}$ be the latent variable of cutback decision and $y^*_{2,i}$ the latent variable of the destination choice, which depend on exogenous variables $x_{1,i}$ and $x_{2,i}$, respectively. Endogeneity of cutback is considered in the destination choice equation employing parameter γ. It helps weighting its relevance within the destination choice equation and testing its significance. The simultaneous system of equations is the following:

$$y^*_{1,i} = x'_{1,i}\beta_1 + \varepsilon_{1,i}$$
$$y^*_{2,i} = x'_{2,i}\beta_2 + \gamma y^*_{1,i} + \varepsilon_{2,i}$$

where β_1 and β_2 are vectors of unknown parameters, and $\varepsilon_{1,i}$ and $\varepsilon_{2,i}$ are the error terms.

The probability of taking certain discrete values depends on the cutoff points estimated. For the cutback decision, there is only one cutoff point $c_{1,1}$, whereas for the destination choice there are three cutoff points: $c_{2,1}$, $c_{2,2}$, $c_{2,3}$.

$$y_{1,i} = \begin{cases} 0 & if \quad y^*_{1,i} \leqslant c_{1,1} \\ 1 & \text{otherwise} \end{cases}$$

$$y_{2,i} = \begin{cases} 1 & if \quad y^*_{2,i} \leqslant c_{2,1} \\ 2 & if \quad c_{2,1} < y^*_{2,i} \leqslant c_{2,2} \\ 3 & if \quad c_{2,2} < y^*_{2,i} \leqslant c_{2,3} \\ 4 & if \quad c_{2,3} < y^*_{2,i} \end{cases}$$

Since both decisions are not independent, the joint probability of both of them is required to be estimated for each pair of possible decisions. For instance, the case of a household that does not cut back on tourism expenditure and travel domestically can be represented by the following joint probability:

$$\Pr(y_{1,i}=0, y_{2,i}=2) = \Pr(y^*_{1,i} \leqslant c_{1,1}, c_{2,1} < y^*_{2,i} \leqslant c_{2,2}) = \Pr(y^*_{1,i} \leqslant c_{1,1}, y^*_{2,i} \leqslant c_{2,2}) - \Pr(y^*_{1,i} \leqslant c_{1,1}, y^*_{2,i} \leqslant c_{2,1})$$

If errors are distributed as bivariate standard normal with correlation ρ, the individual contribution to the likelihood function is expressed as follows:

$$\Pr(y_{1,i}=0, y_{2,i}=2) = \Phi_2(c_{1,1} - x'_{1,i}\beta_1, (c_{2,2} - \gamma x'_{1,i}\beta_1 - x'_{2,i}\beta_2)\zeta, \tilde{\rho}) - \Phi_2(c_{1,1} - x'_{1,i}\beta_1, (c_{2,1} - \gamma x'_{1,i}\beta_1 - x'_{2,i}\beta_2)\zeta, \tilde{\rho})$$

where Φ_2 is a bivariate standard normal cumulative distribution function, $\zeta = \frac{1}{\sqrt{1+2\gamma\rho+\gamma^2}}$ and $\tilde{\rho} = \zeta(\gamma + \rho)$. We refer to this specification as Simultaneous Semi-Ordered Bivariate Probit model, as adapted from Greene and Hensher (2009) and Sajaia (2008). If $\gamma = 0$, the model simplifies so that $\zeta = 1$ and $\tilde{\rho} = \rho$. This is known as Seemingly Unrelated Semi-Ordered Bivariate Probit specification (as shown by Greene & Hensher, 2009). It should be noted that the only way to identify the system of equations is by imposing an exclusion restriction on the vectors of exogenous variables, so that at least one variable of $x_{1,i}$ should not be included in $x_{2,i}$ (Sajaia, 2008).

Application

Cutback model specification

The application estimates a discretized and linearized version of Eq. (10). This equation shows that cutback decision depends on households' preferences for tourism under consumption changes and income variations. In order to clarify the exposition, the specification is splitted up into two parts:

On the one hand, preferences are modeled according to parameter θ_{it} which depends on socioeconomic variables and regional variables.

(a) Socioeconomic variables (S_{it})

The set of socioeconomic variables considered are age, gender, education and employment, which together with per capita GDP in PPS terms are used as a proxy for personal income. Gender is a dummy variable that takes value one for male. Education is a continuous variable that takes the value of the age at which the individual stopped full time education. Employment can be one of the following: Farmer, forester or fisherman; Owner of a shop or craftsman; Professional such as lawyer, medical practitioner, accountant, or architect; Manager of a company; Professional such as employed doctor, lawyer, accountant or architect; General manager, director or top management; Middle management; Civil servant; Office clerk; Employees such as salesman, or nurse; Supervisor (foreman), or team man-

ager; Manual worker; Unskilled manual worker; Looking after the home; Student (full time); Retired; Unemployed; and sets of Other occupations within different professional categories.

(b) Regional variables (R_{it})

Given a cutback on consumption, tourism expenditure cutback will depend on socioeconomic variables as commented above, but also on the preferences for tourism with respect to other goods or services. Such preferences are conditioned by the spatial location of the dwelling of the individual. In particular, one key determinant that may make a difference in regional preferences is the possibility of recreating at home with good climate. In other words, given two identical individuals with the same income and the same cutback on consumption, the final tourism expenditure cutback is likely to be higher in the case of individuals who can recreate and enjoy a good climate at their footstep than those who can not.

Climate is considered in the model as an index. It takes into account temperature, rainfall and days with rainfall according to Mieczkowski (1985) thresholds on tourism climatic comfort. Complementarity of climate variables and non-linear relationships that avoid overriding properties are dealt with a double hurdle index, as suggested by Eugenio-Martin and Campos-Soria, (2010). Further details on the elaboration of the index are shown in Appendix B.

On the other hand, income variation, is shown in Eq. (10) as ($r\Delta W_{it} + \Delta YL_{it}$). It represents variations in capital gains and labor income. It should be reminded that measuring GDP with the income approach is based on the aggregation of income obtained from both factors of production. Hence, at the aggregate level, such variations in capital gains and labor income are equivalent to GDP variations, i.e. GDP growth.

Destination choice model specification

As stated in the methodology, cutback decision is not independent of the destination choice. Households that travel abroad may be more sensitive to the crisis than those who travel domestically.

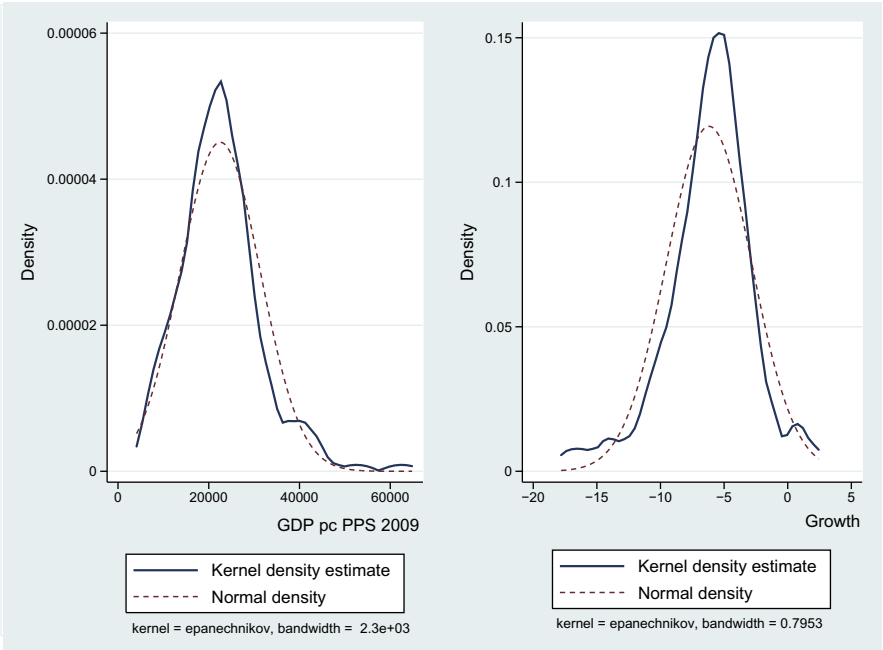

Figure 2. Kernel distribution of regional GDP and growth, 2009.

In order to avoid such bias, destination choice needs to be included in the model as a simultaneous endogenous variable. Nevertheless, the main purpose of the paper is to model the cutback decision, but taking into account destination choice simultaneously. Hence, the priority in terms of model specification does not target the destination choice model but the cutback model. In other words, it is necessary to specify a destination choice model that is sensible and that it can be estimated simultaneously with the cutback decision.

Again, there are two sets of determinants. On the one hand, the model takes into account individual socioeconomic determinants such as age and education. Additionally, individuals choose their destination depending on their main motivations when traveling. The motivations considered in the model are Service quality; Budget; Cultural attractiveness; Social considerations (e.g. labor conditions, respect for the host community); and Safety and security. On the other hand, there are spatial or regional variables that influence destination choice. One key variable is the size of the community which can take one of three possible values: Metropolitan zone; Town or urban centre; and Rural zone. It is expected that individuals who live in metropolitan areas will have easier and closer access to the transport infrastructure, which may make a difference in destination choice. Moreover, regional per capita GDP is also considered as a key determinant for traveling further. Finally, geographic determinants such as good climate or living on the coast may be determinants for staying at home (Eugenio-Martin & Campos-Soria, 2010).

Dataset and descriptive analysis

The application focuses on outbound tourism demand of EU-27 regions in 2009. The analysis comprises a joint dataset composed by microdata provided by households and macrodata at the origin region. Microdata employed belong to the survey – Attitudes of Europeans Towards Tourism, which corresponds to Flash Eurobarometer 281, conducted by European Union in September 2009. Full report of the descriptive analysis and details of data collection of this survey was published by European Commission (2010). The survey collected information on socioeconomic characteristics of 23,606 households and their decisions on tourism activities, such as destination and cutback decisions in 2009. Macrodata considered in this study was collected for 165 regions of EU-27 countries. The source of GDP in Purchasing Power Standard is Eurostat and data on climate was obtained from World Meteorological Organization.

In the sample, 46.32% of the interviewees reveal that they had to cut back on tourism expenditure. It should be noted that 95.7% of the regions had a negative GDP growth in 2009. Average growth rate

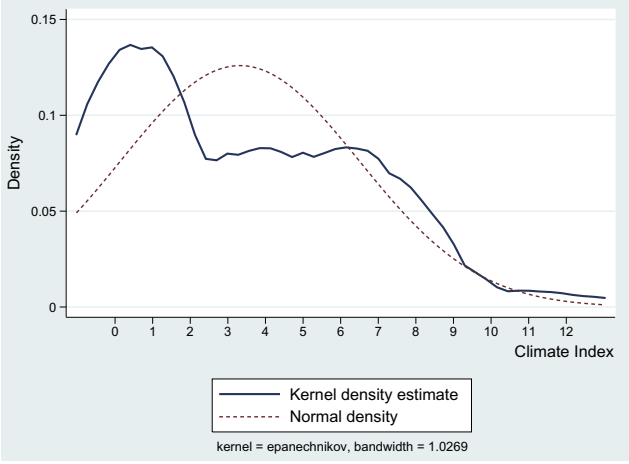

Figure 3. Kernel distribution of climate index.

Table 1
The determinants of the cutback decision and destination choice.

Variable	SU S-OBP[a]		S S-OBP[b]	
	Coefficient	Stand. E.	Coefficient	Stand. E.
CUTBACK DECISION				
GDP pc (PPS)	−0.00002***	0.00000	−0.00002***	0.00000
Growth	−0.02458***	0.00264	−0.00614***	0.00220
Preferences for tourism $\theta_{it} = f(S_{it}, R_{it})$				
Socioeconomic variables (S_{it})				
Age	0.02669***	0.00376	0.02512***	0.00341
Age squared	−0.00033***	0.00004	−0.00032***	0.00004
Gender (male = 1)	−0.09264***	0.01991	−0.06842***	0.01522
Education	−0.00871***	0.00160	−0.00729***	0.00158
Employment				
Farmer, Forester, Fisherman	−0.50730***	0.11174	−0.27362***	0.08595
Owner of a shop	−0.39110***	0.07649	−0.42690***	0.05912
Professional self employee	−0.40099***	0.07505	−0.50951***	0.05796
Manager	−0.50901***	0.08573	−0.57902***	0.06651
Other self employed	−0.35625***	0.07736	−0.43579***	0.05906
Professional employee	−0.37482***	0.06197	−0.48254***	0.04832
General manager	−0.50513***	0.08949	−0.67845***	0.06907
Middle manager	−0.48274***	0.06718	−0.56010***	0.05347
Civil servant	−0.50326***	0.06067	−0.51370***	0.04962
Office clerk	−0.36346***	0.06189	−0.40077***	0.04824
Salesman, nurse	−0.31841***	0.05804	−0.35556***	0.04491
Other employee	−0.43268***	0.06432	−0.44754***	0.05086
Supervisor	−0.13892	0.11315	−0.33847***	0.08369
Manual worker	−0.10803*	0.06402	−0.11978**	0.04767
Unskilled manual worker	−0.10100	0.11248	−0.09750	0.08360
Other manual worker	−0.33560***	0.12791	−0.28913***	0.09600
Looking after home	−0.22019***	0.06297	−0.22678***	0.04793
Student	−0.41525***	0.06373	−0.50145***	0.05028
Retired	−0.33388***	0.05954	−0.36607***	0.04612
Other not working	−0.30245***	0.08345	−0.23532***	0.06323
Regional variables (R_{it})				
Climate index	0.04851***	0.00305	0.04303***	0.00291
DESTINATION CHOICE				
GDP pc (PPS)	0.00002***	0.00000	3.26e−06**	0.00000
Socioeconomic variables				
Age	0.00890***	0.00254	0.02650***	0.00285
Age squared	−0.00013***	0.00003	−0.00034***	0.00003
Education	0.04206***	0.00403	0.02372***	0.00373
Education squared	−0.00058***	0.00007	−0.00042***	0.00006
Size of the community				
Town or urban centre	−0.03564*	0.02177	−0.03079*	0.01756
Rural zone	−0.10309***	0.02269	−0.07736***	0.01856
Motivations for traveling				
Service quality	0.79489***	0.02111	0.63066***	0.02741
Budget	0.72425***	0.01976	0.58474***	0.02553
Cultural attractiveness	0.96134***	0.02017	0.75873***	0.03095
Social considerations	0.64649***	0.02735	0.50058***	0.02850
Safety and security	0.78605***	0.02652	0.63061***	0.03039
Regional variables				
Coast and climate	−0.03809***	0.00269	−0.00714**	0.00296
athrho	−0.11573***	0.01063	0.69764***	0.05639
γ			−0.69034***	0.03287
c11	−0.11449	0.10464	−0.29553	0.09155
c21	0.86195	0.07880	0.81573	0.07683
c22	2.03959	0.07977	1.77187	0.09117

Table 1 (*continued*)

Variable	SU S-OBP[a]		S S-OBP[b]	
	Coefficient	Stand. E.	Coefficient	Stand. E.
c23	3.00740	0.08059	2.55650	0.10873
ρ	−0.11522	0.01049	0.60287	0.03589
$\tilde{\rho}$			−0.12006	
Log likelihood	−33534.254		−33413.421	
Wald chi2 (27)	1175.11		1154.24	
Prob > chi2	0.00000		0.00000	
Number of observations	18494		18494	

Notes: Omitted dummies variables are: "Seeking a job" and "Metropolitan zone".
*** Level of significance 1%.
** Level of significance 5%.
* Level of significance 10%.
[a] Seemingly Unrelated Semi-Ordered Bivariate Probit.
[b] Simultaneous Semi-Ordered Bivariate Probit.

was −6.18%, with a maximum growth rate of 1.64% (Polnocny, Poland) and a minimum growth rate of −17.01% (Groningen, The Netherlands). Figure 2 shows regional distribution of GDP in Purchasing Power Standard and its growth. It shows that the economic crisis impact was pretty symmetric. The distribution of the climate index is shown in Figure 3. By regions, average climate index is 3.32 with a standard deviation of 3.16.

Results

Estimation

Table 1 shows the results of the estimation of the Seemingly Unrelated Semi-Ordered Bivariate Probit (SU S-OBP) and Simultaneous Semi-Ordered Bivariate Probit (S S-OBP) models. Key parameters to look at are γ and ρ. Seemingly Unrelated Semi-Ordered Bivariate Probit model estimates ρ significantly. Its value is about −0.115 which shows a negative correlation between the probability of cutting back and how far the holidays are taking place. Its significance proves the need for a joint estimation of both equations. This estimation allows for error correlation between the two equations, however, it may be necessary to include the cutback decision as an additional explicative variable in the destination choice equation. Such model needs to take into account the endogeneity and simultaneity issues, which it is the purpose of the Simultaneous Semi-Ordered Bivariate Probit. The key parameter to look at is γ. If γ is significantly different from zero it means that the later model may be appropriate. Table 1 shows that this is the case because γ is significant and equal to −0.690. Its negative sign reinforces the idea that those households that are cutting back on tourism expenditure are more likely to spend their holidays closer to home. New ρ parameter ($\tilde{\rho}$) is slightly affected, since its value is −0.120. Likelihood ratio test comparing the likelihood of both models proves that the later model is preferred.

Destination choice model is defined as how far the holidays are taking place from home. Hence, positive parameters imply higher probabilities of traveling further from home. The relationship with GDP is positive, which implies that those regions with higher income are more likely to travel abroad. This result follows up forecasting models where GDP represents a key variable of international tourism demand. Both education level and age have a diminishing positive relationship with traveling abroad, as already shown in the literature (Eymann & Ronning, 1997). Destination choice also depends on tourists' motivations (Mansfeld, 1992). Table 1 shows that all the parameters associated with these motivation dummies are positive. Since there is not any constant in the model, they represent different shifts from origin depending on their motivations for traveling. Highest dummy value corresponds to households interested in cultural differences. Similar results have also been shown by Kozak (2002) or Nicolau and Más (2005) in relation to variables such as 'to increase knowledge of new places', 'to visit historical and cultural places' and 'to meet local people'. The lowest dummy value represents

motivations on social considerations such as respect for the host community. Additionally, the results show that the size of the community makes a difference on destination choice. Households located on small towns and rural areas are less likely to travel further than those who live in metropolitan areas, as expected. This result could be explained because large cities have more transportation facilities and/or because people who live in densely populated cities have a greater need to escape for relaxation (Eymann & Ronning, 1997). Good climate in the region of origin has proved to be a deterrent for traveling abroad (Eugenio-Martin & Campos-Soria, 2010), but only for those regions located on the coast, as shown by the dummy that relates coast with climate index.

Simultaneous regression with the destination choice equation helps to estimate the true determinants of the cutback decision more appropriately. Current GDP and GDP growth are key determinants of the cutback decision on tourism expenditure. The model shows that both are negatively related with such decision. This paper shows young individuals are more likely to cut back than older ones and that men are also less likely to cut back than women. In the model, the relationship between age and cutback decision is non-linear. Tourists with higher education levels are less likely to cut back. Individual occupations play an expected role. For instance, individuals occupied with high responsibility jobs, such as managers are less likely to cut back. On the contrary, people who are working at home or involved with manual jobs with lower responsibility level are more likely to reduce their tourism expenditure. It is interesting to note that regions with bad climate are less likely to cut back than those

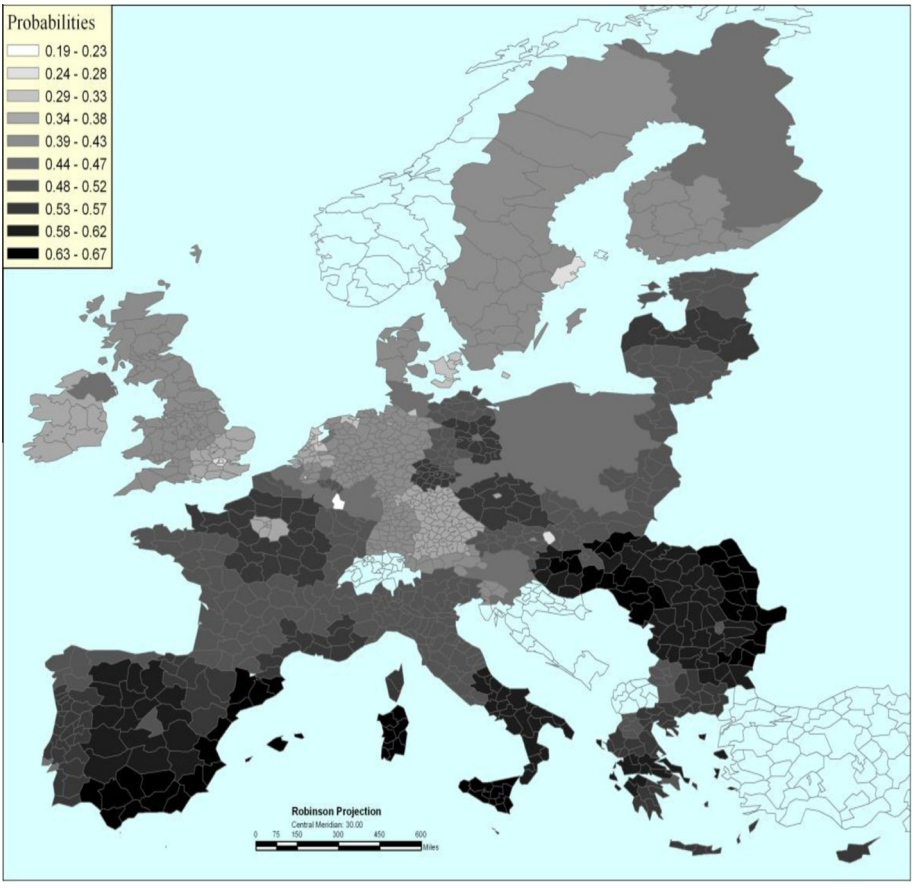

Figure 4. GIS of the probability of cutback decision.

households located in regions with good climate. It may be related with heterogeneous needs and preferences on tourism expenditure. Thus, tourism as a luxury good or service is relative to your needs, and climate in your place of residence is one key determinant for such preference.

Analysis of probabilities

Post-estimation analysis focuses on the probabilities of cutback on tourism expenditure. The paper analyzes the regional differences of these probabilities and their variations are analyzed along with some key determinants. Figure 4 shows a Geographical Information System of these probabilities for each European region. Two clear conclusions may be obtained from this Figure. On the one hand, there are marked differences between North-European and Mediterranean regions. On the other hand, households located in certain cities are very reluctant to cut back, for instance, this is the case of Luxembourg, London or Paris. These two results may respond to climate and GDP differences. Indeed, Table 1 showed that, GDP and climate play a key role on cutback decision. More precisely, Table 2 highlights the regions with the highest and lowest probabilities of cutting back on tourism expenditure. It also shows GDP and climate index, so that it can help to preview the link between the probabilities and these determinants. In order to explore this relationship further, non-parametric analysis of moving median probabilities in relation to these key determinants is shown in Figure 5.

Figure 5 shows how the post-estimation probabilities of cutting back and traveling abroad vary with GDP and climate index. It should be reminded that this non-parametric analysis does not prove any kind of causality among them, but it shows how the median probability varies for each moving band of GDP or climate. They show a clear relationship. On the one hand, the probability of cutting back decreases smoothly with GDP. Regions with GDP per capita lower than 10,000 euros, have a median probability around 60%, which decreases to 18% for regions with GDP per capita higher than 60,000 euros. This result corroborates the idea that tourism generally behaves as a luxury good with a positive income elasticity, increasing its consumption as income increases (Davis & Mangan 1992; Eugenio-Martin & Campos-Soria, 2011). On the other hand, the probability of cutting back grows smoothly with climate. It varies from a median probability of approximately 38% for regions with bad climate up to 66% for regions with good climate. The probability of traveling abroad is also represented in Figure 5 to show how the counterpart equation of the model is also working with respect to the key determi-

Table 2
Ranking of the probability of cutback on tourism expenditure in 2009 by region.

Ranking	Region	Country	Cutback Probability (%)	GDP pc (PPS)	Climate index
1	Canary Islands	Spain	66.6	20,500	12
2	Andalusia	Spain	66.0	18,900	12
3	North East	Romania	64.9	6,900	7
4	South East	Romania	63.8	8,900	7
5	Del-Alfold	Hungary	63.5	10,100	7
6	Sardinia and Sicily	Italy	63.0	16,700	10
7	Vest	Romania	62.5	12,100	7
8	East Coast and Balearic Is.	Spain	62.4	25,500	12
9	Severoiztochen	Bulgary	62.3	8,400	6
10	North	Hungary	62.2	9,300	6
.....					
156	Hovedstaden	Denmark	31.9	34,900	0
157	North Holland	The Netherlands	31.6	35,400	0
158	Groningen	The Netherlands	31.3	40,000	0
159	Utrecht	The Netherlands	30.9	36,900	0
160	Hamburg	Germany	28.5	44,100	1
161	Bratislawský Kraj	Slovakia	26.8	41,800	0
162	Stockholm	Sweden	26.7	40,400	0
163	London	United Kingdom	26.6	44,400	0
164	Brabant Wallon	Belgium	26.2	52,500	3
165	Luxembourg	Luxembourg	18.5	62,500	0

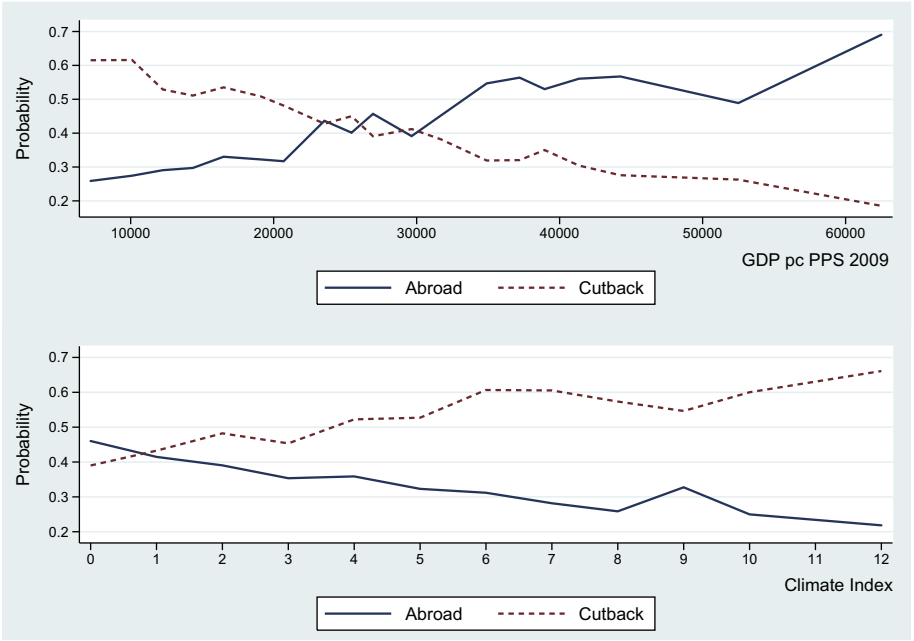

Figure 5. Moving median of the probabilities.

nants. The probability of traveling abroad is the result of summing up the probability of traveling within European Union and outside European Union. Its behavior is pretty much expected. It grows with GDP and it decreases with good climate.

Figure 5 uses moving median to show the relationship, however, it misses out the degree of heterogeneity. Contour analysis of Figure 6 complements the picture showing the variability level of this relationship. More precisely, contour figures represent the bivariate density distribution between GDP or climate and the probability of cutting back. The darker the area, the higher the joint probability is. The darkest area represents the bivariate mode of the distribution. In the case of GDP, Figure 6 shows a negative relationship with moderate heterogeneity in the probability of cutback. The case

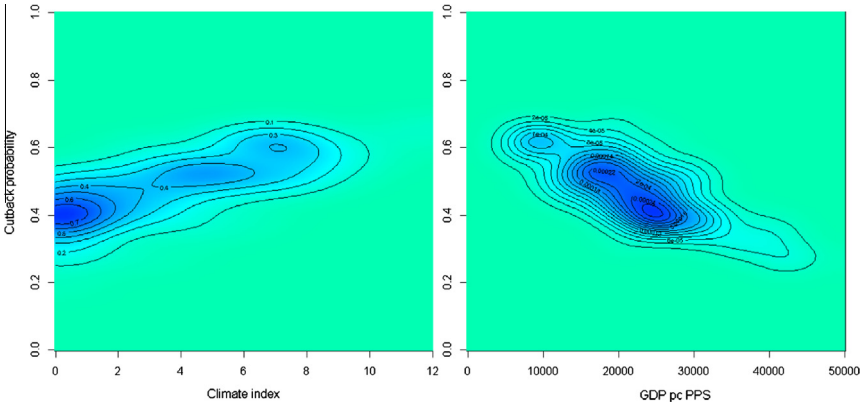

Figure 6. Contour of the probability of cutback, GDP and climate.

of climate index is more homogeneous than GDP with a positive relationship with the probability of cutting back.

Conclusion

Public and private agents need to understand and anticipate how tourists react during economic crises. It is relevant because origin markets decrease their demand heterogeneously. Such heterogeneity is due to different preferences and needs among origins. Hence, public policy-makers demand information on the sensitivity of different origin markets in order to decide which markets require to be strengthened. At the same time, private firms such as hotels need to anticipate the demand shift and set a new optimum price scheme. Hence, they need accessible indicators of the economic situation. One key indicator is GDP and its growth. The research inquiry concerns how GDP changes will affect tourism expenditure. However, since tourism, especially international outbound tourism, is appreciated differently by different European regions and households, then it is ideal to manage a comprehensive dataset that combine household microdata, regional attributes and macrodata. Thus, if the econometric model takes into account all these variables simultaneously, then the linkage between GDP and tourists' behavior is enriched and it may be estimated more accurately. Household tourism expenditure is a candidate for endogenous variable, however, despite macroeconomic data on tourism expenditure is usually stable, household data on tourism expenditure may be very volatile because their destination choices may vary yearly independently of their income constraint. Participation models are a possible solution, so that they may capture how sensitive participation in tourism is due to GDP changes. However, a more informative approach to the dilemma between 'participate' and 'not participate' is provided by the tourism expenditure cutback decision. People may still participate in tourism but spending less money due to their cutback decision.

As far as we know, this paper is the first study that models the cutback decision. Modeling such decision is a challenge because it is not independent of the destination choice. For instance, households that travel domestically may not be as sensitive to the crisis as those who travel abroad. Moreover, the decision of having traveled to a certain place is conditioned by the need to cut back. For this purpose, the econometric model employed is a simultaneous system of cutback decision and destination choice. More precisely, Simultaneous Semi-Ordered Bivariate Probit has proved to be the most useful econometric model for the estimation because it deals with the simultaneity of the cutback and destination choice decisions as well as the endogeneity.

This paper explores how households from 165 regions of EU-27 countries react during the crisis. More precisely, this paper has proved that during an economic crisis, such as the 2009 global economic crisis, households react cutting back their tourism expenditure depending on GDP, GDP growth, and climate in their place of origin. Other well-known determinants also play an expected role. Tourism as a luxury good is relative to your needs, and climate in your place of residence is one key determinant for such preferences, so that regional heterogeneity responds to climate and GDP differences. In that sense, there are marked differences between North-European and Mediterranean regions. It is interesting to note that regions with bad climate are less likely to cut back than those households located in regions with good climate. It is obvious that the global economic crisis implies a shrink of international tourism, but depending on the country it may bring new opportunities for domestic tourism because it may improve its relative competitiveness with respect to international destinations due to new budget constraints. It may help the economy in production and employment terms, reducing the leakages that may occur during the crisis (Sheldon & Dwyer, 2010). However, such switch in tourism destination is not homogeneous for all regions. This paper has proved that regions with good climate are more likely to switch between international and domestic tourism, but it is not the case of regions with bad climate.

The methodology proposed in this paper represents a new way of analyzing the impacts of an economic crisis. Two levels of analysis can be considered. On the one hand, macroeconomic data of tourism expenditure is usually explored. On the other hand, the microeconomic analysis of the household may be carried out. Microeconomic datasets allow for taking into account socioeconomic characteristics of the households and regional variables of their environment that may enrich the analysis. How-

ever, tourism expenditure variations of any household may be due to a budget shrink or to a random expenditure variation. Such issue is not problematic when using macroeconomic datasets because of the averaging properties, but it may cause biased results with microeconomic datasets. In order to avoid random expenditure variations, the methodology proposed in this paper considers stated cutback decisions instead. The cutback decision statement works well under crises because there is no doubt in the direction of the change. However, the intensity of the cutback is not captured. Future research on methodologies that can deal with the intensity of the cutback decision is likely to improve the results obtained in this paper. Moreover, further knowledge on other issues is necessary. Extending this model for understanding how tourists cut back their tourism expenditure may provide additional information on their behavior, so that policy making can anticipate and formulate their strategies more appropriately. Information on length of stay, transportation mode, service quality or the frequency of traveling are also key variables that tourists may change during the crisis. Additionally, as suggested by Sheldon and Dwyer (2010) it is interesting to understand budget redistribution at household level, i.e. shifting to other leisure products, or saving money.

Appendix A:. Permanent income hypothesis

A representative consumer (i) is assumed to maximize her utility. The utility depends on current and expected future consumption. Preferences for current consumption with respect to future consumption is discounted according to the subjective rate of discount of consumer δ_i. If δ_i = 0, it means that current consumption is equally weighed with future consumption. In Eq. (1), U_i represents a utility function of consumer i, E_{it} represents consumer's expectations conditional on available information at period t, and C_{it} denotes current consumption.

$$\max U_i = E_{it}\sum_{t=1}^{\infty}\left(1/(1+\delta_i)^{t-1}\right)u(C_{it}) \quad U' > 0, \quad U'' < 0 \tag{1}$$

Eqs. (2) and (3) show that utility maximization is subject to two constraints. On the one hand, current consumption can be achieved in three ways: (a) with wealth depletion, (b) with current labor income (YL_{it}), and (c) with capital rents from current wealth (W_{it}), where r denotes interest rate. It should be noted that wealth may be negative, such that this expression is also compatible with indebtedness. On the other hand, the second constraint imposes wealth depletion within an overlapping generations model.

$$C_{it} = (W_{it} - W_{it+1}) + YL_{it} + rW_{it} \tag{2}$$

$$\lim_{t\to\infty} E_{it} = (W_{it}/(1+r)^t) = 0 \tag{3}$$

Eqs. (2) and (3) together imply that the budget constraint can be written as:

$$E_{it}C_{it} = E_{it}YL_{it} + (1+r)W_{it} + \sum_{t=1}^{\infty}(1/(1+r)^t)\,(E_{it}YL_{it+1} - E_{it}C_{it+1}) \tag{4}$$

The Euler equation of this intertemporal optimization problem for any pair of periods is:

$$U_i'(C_{it})/U_i'(C_{it+1}) = (1+r)/(1+\delta_i) \tag{5}$$

Hall (1978) and Flavin (1981) test the permanent income hypothesis. From their studies, it may be concluded that if $r = \delta_i$ and the marginal utility is linear, then current consumption is the optimal forecast of consumption tomorrow:

$$E_{it}C_{it+1} = C_{it} \tag{6}$$

Hence the change in consumption is a random walk.

$$\Delta C_{it} = \Delta YP_{it} = \varepsilon_{it} \tag{7}$$

Appendix B: Climate index

The tourism climate index is defined as follows:
AT_{rm}: Average temperature of region r during month m
R_{rm}: Days of rainfall in region r during month m
TR_{rm}: Total rainfall in region r during month m

$$DT_{rm} = \begin{cases} 1 & \text{if } 15 \leqslant AT_{rm} \\ 0 & \text{otherwise} \end{cases}$$

$$\left.\begin{aligned} DDR_{rm} &= \begin{cases} 1 & \text{if } R_{rm} \leqslant 10 \\ 0 & \text{if } R_{rm} \leqslant 10 \end{cases} \\ DTR_{rm} &= \begin{cases} 1 & \text{if } TR_{rm} \leqslant 60 \\ 0 & \text{if } TR_{rm} \leqslant 60 \end{cases} \end{aligned}\right\} DR_{rm} = DDR_{rm} \cdot DTR_{rm} \left.\right\} W_{rm} = DT_{rm} \cdot DR_{rm}$$

A set of dummy variables are created such that if they take value 1 they are considered to be within the range popularly known as 'good weather', such that during month m, region r is known to have a good weather if W_{rm} = 1. This happens if there is an appropriate combination of temperature (between 15 and 35 °C), total rainfall (<60 mm) and number of days with rainfall (<10 days) during the month. Data were obtained from the World Meteorological Organization. Yearly measures of weather consist of adding up each monthly dummy variable, such that:

$$W_r = \sum_{m=1}^{12} W_{rm}$$

Hence, the tourism climate index (W_r) ranges from 0 to 12 depending on the number of months per year with "good weather".

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