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What prompts tourists to become public transportation users at their destination? The case of a Mediterranean city

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Highlights

- Factors fostering tourists' use of intra-destination public transport are identified.
- How tourists travel to the destination is the most decisive determinant.
- The travel to the destination influences the impact of other variables.
- Tailor-made strategies are required to promote sustainable transportation modes.

Abstract

The multiple dimensions of mobility decisions made by visitors add additional pressure to the sustainable equilibrium of destinations that combine residents' daily activities with the arrival of tourists. Thus, the use of public transportation by tourists becomes central to improving ecoefficiency and mitigating negative externalities resulting from the massive mobility of tourists at their destinations. This research addresses the determinants of intra-destination public transportation use and departs from the hypothesis that the main impact derives from the transportation choice made during the longest trip from the traveller's origin to his or her destination. The study uses data obtained from a survey of tourists (N=939) staying overnight in Tarragona (Catalonia, Spain), a medium-sized historic Mediterranean city. Logit estimations, Chi-square Automatic Interaction Detector (CHAID) analysis and interactions in the logit estimations are used to fulfil the research objective. The results suggest that tailor-made strategies are required to foster the use of sustainable transportation modes at tourist destinations. The study therefore highlights the importance of disentangling tourist profiles in order to properly customize mobility policies.

Keywords: Public transport, sustainable mobility, tourist mobility, transport mode choice, tourism destination

1. Introduction

Transportation and tourism are co-dependent (Hall, 1999) because there would be no tourism without supporting transportation (Le-Klahn and Hall, 2015). At the same time, previous studies signalled several negative externalities that stem from these transportation activities. Researchers have extensively studied the contribution of tourism transportation to climate change because it is regarded as its most pressing negative environmental impact (Sala *et al.*, 2000; Gragl *et al.*, 2003; Thomas *et al.*, 2004; Fang *et al.,* 2018). Indeed, Peeters *et al.* (2007) concluded that climate change is to be blamed for more than half of the externalities associated with tourist transportation. Most studies have highlighted the negative impact of travelling to a destination, specifically with regard to air travel (Gössling *et al.*, 2002; Gössling *et al.*, 2005; Peters and Dubois, 2010; Rico *et al.* 2019). Nonetheless, tourism destinations are also very sensitive to the impact of intra-destination transport (Guiver and Stanford, 2014). The private car is implicated as the primary source of emissions. Regarding air quality, tourism-associated transportation's negative impact on

air quality has been well-documented (Becken, 2006; Sajjad *et al.,* 2014; Grover *et al.,* 2017). More precisely, Saenz de Miera and Rossello (2014) showed that the daily stock of tourists is a significant predictor of air pollution levels in Mallorca. Also, negative impacts related to noise (Becken, 2006), road congestion (Palmer-Tous *et al.*, 2007; Saenz de Miera and Rossello, 2012; 2013; Sundriyal *et al.,* 2018), the growth of transport infrastructure that reduces natural landscapes and wildlife habitats (Davenport and Davenport, 2006; Comer and Willems, 2011), and road safety (Wilks *et al.,* 2017; Rossello and Saenz de Miera, 2011) have been widely recognized. These deleterious effects can, not only influence residents' perceptions about tourism (Andereck and McGehee, 2008; Dickinson and Robbins, 2008), but also tourists' experiences (Alegre and Garau, 2010; Eusébio and Vieira, 2013; Iglesias-Merchan *et al.*, 2014). The correct management of mobility flows requires the analysis of tourists' mobility patterns and the identification of tourist demographics that are more likely to use sustainable modes of transportation. Accordingly, various studies have demonstrated the importance of a modal shift towards public transport (PT) so as to reduce the impact of negative externalities associated with transportation at tourist destinations (Peeters and Schouten, 2006; Guiver *et al.*, 2007; Liu *et al.*, 2017; Scuttari *et al.*, 2018). Shedding light on the factors that prompt tourists to use PT at their destinations is a central research objective for promoting destination sustainability. In spite of this, previous studies have not devoted much attention to transportation choices of tourists at their destinations (Gross and Grimm, 2018). To address the determinants of the intra-destination transportation decisions by tourists, it is particularly relevant in those destinations where the impact of those decisions is more noticeable. This is particularly the case for small and medium-sized historical cities where the size of the local community is more sensitive to the arrival of a large number of tourists (Ashworth and Tunbridge, 2000; Domènech and Gutiérrez, 2017), and there are negative consequences associated with their transportation decisions during their stay. In terms of transportation, this higher level of sensitivity associated with smaller areas has been demonstrated by Guiver and Stanford (2014), who show that within small destination areas, travellers can account for one-third of the total travel emissions, whereas Gutiérrez and Miravet (2016a) show how the demand for PT is boosted during the high travel season by the mass influx of tourists to a mid-sized coastal metropolitan area.

In this context, the aim of this research article is twofold. First, it aims to shed light on the factors that encourage tourists to use PT at their holiday destination in medium-sized historical cities. Following Gutiérrez and Miravet (2016b), the analysis departs from the main hypothesis that the mode of transportation chosen to travel to the tourists' destination is the most important factor influencing the use of PT. The second goal of this paper is to examine the validity of the previous hypothesis to determine whether and to what extent the effect of the determinants of the use of PT is sensitive to the mode of transportation chosen to travel to the holiday destination. Verifying the aforementioned hypothesis would imply the existence of divergent responses to the factors that determine the likelihood of becoming a user of the local PT network and, as a result, the need to implement segmentation strategies that foster the use of PT among tourists. The study has been performed in the city of Tarragona (Catalonia), a medium-sized Mediterranean coastal city of 130,000 inhabitants. The study was based on data obtained from a tourist survey conducted in 2014, 2015 and 2016 (N=939). The survey examined multiple characteristics of tourists that stayed overnight in Tarragona, including their socioeconomic profile and the nature of their stays. It also examined their mobility at the destination during holidays and their use of PT once at their destination.

After this introduction, a review of the relevant literature is presented. Then, a description of the data used in the research and the empirical approach implemented is provided. Finally, the results and the conclusions that can be drawn, together with the implications of this research, are presented.

2. Review of literature

Studies that have empirically addressed the determinants of tourists' use of PT during their stay at a destination have carried out their analyses by departing from a diverse set of methodological perspectives, datasets and territorial contexts. In this regard, the theoretical framework put forward by Gross and Grimm (2018) brings order to the literature on the topic. According to them, determinants can be divided in two main groups: objective and subjective. The first group can be further split in socio-demographic characteristics, travel-orientated characteristics, destination characteristics and quality of transport services. Subjective determinants include travel motivation/type of travel and time of the decision.

As stated by Dolnicar *et al.* (2010), the destination has a significant impact on the choice of transportation, even between destinations that are similar (Gutiérrez and Miravet, 2016b). In fact, a comparison of the results between studies is compromised because the works that have addressed the determinants of PT use have been carried out in very different contexts. Some of these studies are based on data from tourist surveys carried out in big cities (Munich, Germany: Le-Klähn *et al.*, 2014; Le-Klähn *et al.*, 2015), medium-size cities (Kassel, Germany: Bieland *et al.*, 2017), rural or natural areas (Ticino, Switzerland: Masiero and Zoltan, 2013; Dietlmeier 2013), Peak District (UK: Lumsdon *et al.*, 2006), coastal destinations (Costa Daurada, Spain: Gutiérrez and Miravet, 2016b; Gutiérrez *et al.*, 2019), or even on a country-wide level (Ghana: Nutsugbodo *et al.* 2018; Scotland, UK: Hough and Hassanien, 2010). On the other hand, other studies have examined surveys sent to households and, as a result, the data include respondents who have visited a diversity of destinations (Switzerland: Dolnicar *et al.*, 2010; Germany: Gross and Grimm, 2018). The effects associated with the destination can stem from both the characteristics of the area and the quality of the PT and its alternatives. Regarding the former, the type of destination and its size in terms of inhabitants (Gross and Grimm, 2018), along with its attractions (Le-Klähn *et al.*, 2015), are factors that must be taken into consideration. However, there are few works that have analysed objective characteristics associated with PT. Lumsdon *et al.* (2006) provides evidence that by offering the right combination of transport and tourism, there is potential for a modal shift among some segments of tourists.

Most of the studies in this field provide empirical evidence of the impact of socio-demographic characteristics, such as gender (Masiero and Zoltan, 2013; Nutsugbodo *et al.*, 2018), age (Bieland *et al.*, 2017; Gross and Grimm, 2018; Le-Klähn *et al.*, 2014; Masiero and Zoltan, 2013), national origin (Hough and Hassanien 2010; Masiero and Zoltan, 2013; Nutsugbodo *et al.*, 2018), education (Le-Klähn *et al.*, 2015; Hough and Hassanien 2010; Nutsugbodo *et al.* 2018), marital status (Bieland *et al.*, 2017; Gross and Grimm, 2018), household size (Gross and Grimm, 2018), income/social class (Gross and Grimm, 2018; Gutiérrez and Miravet, 2016b), occupation (Gross and Grimm, 2018; Nutsugbodo *et al.*, 2018), car/driving licence ownership (Gross and Grimm, 2018; Le-Klähn *et al.*, 2014), everyday use of PT (Bieland *et al.*, 2017) along with language capabilities and previous travel experience (Hough and Hassanien 2010). In contrast, Dietlmeier (2013) found no statistically significant relationship among any of her socioeconomic variables and the intention to use travel alternatives to a private vehicle. Regarding travel-oriented characteristics, the influence of the size of the party group (Gross and Grimm, 2018; Le-Klähn *et al.*, 2015), how the holiday has been organized (Hough and Hassanien 2010; Gross and Grimm, 2018), the length of stay (Le-Klähn *et al.*, 2014; Gutiérrez and Miravet, 2016b), repeating destination (Le-Klähn *et al.*, 2015; Masiero and Zoltan, 2013; Gutiérrez and Miravet, 2016b), type of accommodation and expenses (Gutiérrez and Miravet, 2016b) have been highlighted.

For the subjective factors, the motivation for the trip and the type of activities that the tourist is planning to undertake are central to the choice to use PT (Gross and Grimm, 2018; Le-Klähn *et al.*, 2014; Le-Klähn *et al.*, 2015; Masiero and Zoltan, 2013). Despite the fact that the theoretical framework suggested by Gross and Grimm (2018) does not include the subjective perceptions related to the quality and convenience of

PT, these are key determinants in the individuals' decision. Dietlmeier (2013) not only highlights individuals' attitudes towards sustainable modes of transport as the most important predictor of PT use during the holidays, but the perceived behavioural control is also identified. In other words, the ability to behave according to the traveller's own beliefs exerts a substantial influence. Le-Klähn *et al.* (2014) states that the tourists' perception of the existence of drive-free benefits, traffic reduction and certain advantages associated with PT triggers its use. The opposite effect is observed when the traveller perceives the existence of inconveniences and restrictions, lack of information and other disadvantages. Additional subjective elements that influence PT use among tourists are perceptions related to service quality regarding accessibility, comfort, reliability (Nutsugbodo *et al.*, 2018) and cost (Le-Klähn *et al.*, 2015).

There are two objective factors that deserve particular attention. The first is related to visits that the tourist undertakes during his or her stay. The influence of the attractions visited on the choice of the mode of transportation is a particularly sensitive issue, not only because of its effect on the decision to use PT, but also because it raises a subsequent methodological concern caused by the existence of an interdependency between both variables (Masiero and Zoltan, 2013; Le-Klähn *et al.*, 2015). In other words, the first step is to decide what to visit, and the second step is to decide how to get there, taking into consideration reciprocal interactions between each of the decisions. The choice of an estimation procedure that does not take into consideration the potential correlation structure of the random components due to the interdependency would result in biased results. To circumvent potential sources of bias, Masiero and Zoltan (2013) and Le-Klähn *et al.* (2015) applied a bivariate probit model. The statistical tests they performed support their methodological election. The second determinant relates to the mode of transportation chosen to get to the destination. Its influence has been highlighted by Dolnicar *et al.* (2010), Bieland *et al.* (2017), Gross and Grimm, (2018) and Gutiérrez and Miravet, (2016b). In particular, Gutiérrez and Miravet, (2016b) found that the selected mode of transportation becomes the most decisive variable, and analogous to the case of the visits undertaken, methodological concerns arise due to the potential endogeneity between the choice of transportation to the destination and the decision to use PT. The results of the statistical tests confirm the biasing effect caused by the correlation of the error terms. Furthermore, the evidence suggests that the unobserved heterogeneity associated with the tourists who travel by plane negatively influences the use of PT at the destination. Despite the fact that previous studies have left no doubt about the influence of transportation decisions on the posterior intra-destination use of PT, to the best of our knowledge, the literature has not yet explored whether the incidence of the determinants for the use of PT depends on the choice of transportation mode used to reach the destination from the traveller's origin.

3. Data

3.1 Study context

Tarragona is located on the shore of the Mediterranean, 100 km south of Barcelona, the capital of the north-eastern autonomous community of Spain, Catalonia (see **Figure 1**). The city and its surroundings constitute the second most important metropolitan area in Catalonia after Barcelona. The metropolitan area is inhabited by almost half a million people. Tarragona is the most populated city with 132,299 inhabitants in 2018. According to the official data from the Tourism Observatory of Catalonia, the city attracts around half a million tourists annually, which translates to 2 million overnight stays per year.

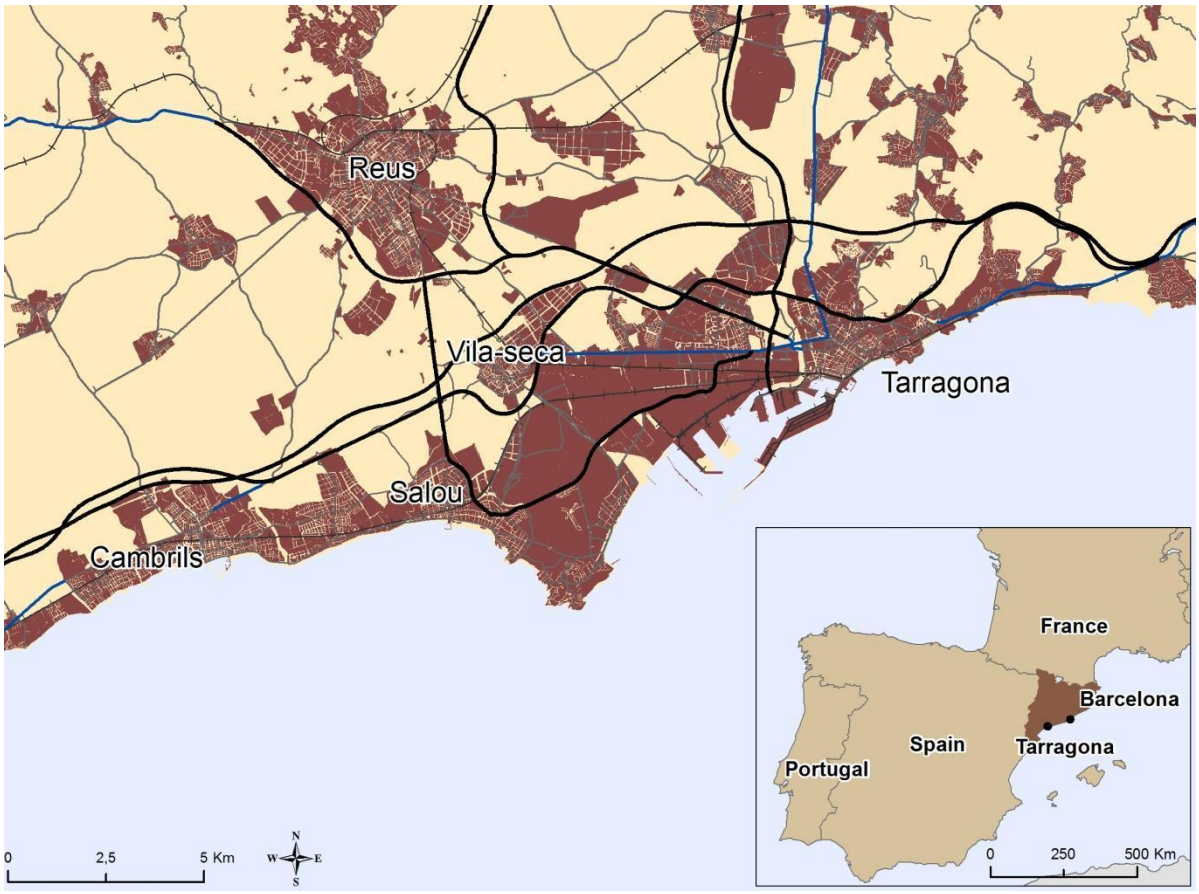

Figure 1. The metropolitan area of Tarragona and its location in the context of Catalonia, Spain and Europe.

Tourists arrive by various modes of transportation. The city is well-connected through toll motorways (Map 1). To the northeast, the AP-7 motorway connects Tarragona with Barcelona and the French border. To the southwest, it leads to Valencia and the rest of Spain's Mediterranean arc. To the west, the AP2 motorway provides connections to Madrid, Zaragoza and the River Ebro corridor. For air transport, the nearest infrastructure is Reus airport, which is 10 km from the city of Tarragona. The Barcelona-El Prat airport (100 km away) is also an important arrival location for tourists heading for Tarragona and Costa Daurada. Tarragona is connected by means of a conventional railway station and a high-speed train station located around 15 km north of the city.

Tarragona's connectivity enhances mobility between the different municipalities in its vicinity, which enables tourists to visit a wider range of tourist attractions. In fact, Tarragona is surrounded by other towns and cities that are also popular tourist destinations that can be reached in just a few minutes, such as the central Costa Daurada and Reus. The former comprises the municipalities of Salou, Cambrils and Vila-seca, which received more than 3.7 million tourists in 2018 due to their beaches. Reus, with 103,477 inhabitants in 2018, is the second most populated city in the area and attracts visitors because of its shopping venues, along with its unique heritage. It is also possible to make day visits to Barcelona from Tarragona.

3.2. Questionnaire and data collection

Data were obtained from a survey on tourist demand conducted by the Tourism Observatory of Catalonia. The sample (N=939 participants) was based on surveys conducted in 2014, 2015 and 2016 in Tarragona. People surveyed were adult tourists staying at hotels, hostels, camping sites, tourist apartments, second homes and family and friends' houses.

Questionnaires were completed during various time slots each day during the main tourist season (from June to September), in addition to weekends and on public holidays during the rest of the year. The overall distribution of surveys completed in municipality districts was defined by taking into account the number of tourists hosted in each. For this reason, key locations that attract most of the tourist influx were chosen as survey sites. The selection of individual tourists to be surveyed at each location was randomly defined.

The first part of the questionnaire collects information on the characteristics of the tourist's stay, including type of accommodation, duration of stay, travel companion(s), whether the tourist had visited Tarragona before and expenses during their stay. Data on the mode of transportation to the tourist destination from the point of origin were also gathered. The survey included information on tourist characteristics and their demographic profiles (e.g., sex, age and country of origin). Tourists were also asked about activities, mobility patterns at their destination and places visited during their stay. Finally, the questionnaire distinguished whether or not the tourists were PT users. No data on the frequency of PT usage were gathered.

4. Descriptive statistics

Table 1 presents descriptive statistics for the whole sample. All variables are dichotomous, and each sample observation can only equal 1 or 0. The mean values are interpreted as percentages of people surveyed who gave a specific answer. The sum of the means of each answer must be equal to 1 for each category, except for the set of variables relating to the attractions or places that tourists visited (or were planning to visit) during their stay in Tarragona, due to the fact that the tourists could indicate in the survey multiple destinations they visited or were planning to visit.

In the dataset, 56% of the tourists completed at least one journey outside Tarragona, whereas 20% only visited places within the city. These results indicate a considerable level of tourist mobility upon reaching Tarragona. The most commonly used transportation mode to arrive at destination from the place of origin was a private car (66%), followed by a plane (20%). Once at their destination, up to 20% of the individuals sampled used PT during their stay.

In terms of tourist demographics, Spain was the dominant nation of origin (58%), followed by France (14%). Additionally, 44% of tourists travelled with their partner or other family members who were not children, while 38% travelled with children. Over half of the tourists (52%) were accommodated in hotels, although camping (24%) and stays in second homes or apartments (20%) were also observed. Almost one-third of the tourists (62%) had a university education, and one-half of the sample were repeat visitors. Overall, a majority of the sample stayed in Tarragona for 3 days or less. Finally, regarding the level of spending at the destination, the variable has been created by implementing tertiles on the average daily spending per visitor at the destination[1].

[1] The limits of the low interval are [0.68, 21.9], [25, 40.0] for the mid interval, and [41.7, 1,000.0] for the upper interval (currency: €).

Variable	Mean (N = 939)
Transport mode to arrive at Tarragona: plane	0.20
Transport mode to arrive at Tarragona: own vehicle	0.66
Transport mode to arrive at Tarragona: public transport	0.14
Use of Public Transport once at destination	0,20
Origin: mainland Spain (excluding Balearic Islands, Canary Islands and Ceuta)	0.58
Origin: France, Andorra and Monaco (excluding Corsica)	0.14
Origin: countries located less than 2000 km from the destination	0.19
Origin: countries over 2000 km from the destination and overseas territories	0.09
Accommodation in second home or apartment	0.20
Accommodation at a camping	0.24
Accommodation in a hotel	0.52
Accommodation in other places	0.03
Up to 44 years old	0.51
From 45 to 64 years old	0.40
65 years old and older	0.09
Spending at the destination: high	0.33
Spending at the destination: medium	0.22
Spending at the destination: low	0.27
Spending at the destination: unknown	0.18
High education level (university studies)	0.62
Visit Barcelona	0.21
Visit Costa Dorada	0.26
Visit Tarragona	0.50
Visit other places	0.58
Not visiting any place	0.24
Duration of stay, 3 days or less	0.54
Duration of stay longer than 3 days	0.46
Accompanied by: friends	0.06
Accompanied by: family with children	0.38
Accompanied by: family trip or partners	0.44
Accompanied by: others (business trip, schools, etc.)	0.12
Repeater: not the first visit to Tarragona	0.50
Gender: male	0.54
Season: summer	0.59
Year 2014	0.30
Year 2015	0.38
Year 2016	0.32

Table 1. Descriptive statistics.

5. Empirical approach

The empirical strategy involves logit estimations, a chi-squared automatic interaction detection (CHAID) tree analysis, in addition to the introduction of interactions in the regressions.

5.1 Logit estimations

First, logit estimations are performed to assess the individual impact of each of the explanatory variables considered in the models. It is expected that the mode of transport chosen to reach the tourist destination

is one of the most powerful predictors of the use of public transport at destination. This variable is suspected to be endogenous, as in turn it is highly likely to be directly determined by the place of origin of the tourist (Gutiérrez & Miravet, 2016b). More specifically, our concern is due to the effect of an endogenous multinomial variable (in our case there are three possible discrete outcomes: car, plane and public transport to travel to the destination) on a dichotomous indicator variable (the use of public transport by tourists at the destination). According to Wooldridge (2014), when the estimation involves non-linear models, the use of linear IV techniques, which consist in plugging into a second stage equation the fitted values obtained in a first stage equation instead of using the original variable, leads to inconsistent results. To overcome the potential biasing impact of endogeneity as a result of the influence of a tourist's country of origin on his or her decision of transportation to reach the destination, the estimation methodology suggested by Deb & Trivedi (2006a, 2006b) is followed. This econometric technique envisages introducing latent factors both into the multinomial and outcome equations, which can follow either negative binomial, gamma or logistic distributions. Its use is justified since it suits the particular distributions of our variables and it has been proved to be superior to other econometric alternatives (Shane and Trivedi, 2012).

Thus, the choice of the mode of transportation used to reach Tarragona is expressed as a mixed-multinomial equation:

$$Pr(m_i|z_i, l_i) = \frac{exp(z_i'\propto_j+\delta_j l_{ij})}{1+\sum_{k=1}^{J} \; exp(z_i'\propto_k+\delta_j l_{ik})} \quad (1)$$

where the probability of an individual *i* using a transportation mode *j* is a function of a series of observed variables z_i and a group of unobserved variables l_{ij}, while δ_j represents the loading factor associated with each transportation mode.

The probability of using PT at the destination expressed as a endogeneity-corrected logit:

$$Pr(t_{i,}|x_i, m_i, l_i) = \frac{exp(x_i'\beta+\sum_{j=1}^{J} \; \gamma_j m_{ij}+\sum_{j=1}^{J} \; \lambda_j l_{ij})}{1+exp(x_i'\beta+\sum_{j=1}^{J} \; \gamma_j m_{ij}+\sum_{j=1}^{J} \; \lambda_j l_{ij})} \quad (2)$$

where the probability of an individual *i* using PT during his or her stay in Tarragona is a function of a series of control variables x_i, which include the characteristics and demographics of the trip and tourist, respectively, the transportation mode used to reach Tarragona m_i and the unobserved heterogeneity l_{ij} with their respective loading factors λ_j. Each λ_j reflects the impact of the unobserved heterogeneity related to the use of each transportation mode chosen to reach the destination on their probability of using PT there.

The validity of the results of the endogeneity-corrected logit model is conditioned by the result of the test put forward by Deb and Trivedi (2006b), which contrasts the null hypothesis of all λs=0, and hence λplane = λPT = 0, is tested. The rejection of the null hypothesis would imply the rejection of exogeneity, and as a result, the model suggested by Deb and Trivedi (2006a, 2006b) should be implemented.

5.2 CHAID analysis and interactions

CHAID analysis enables us to distinguish tourist profiles by means of the detection of those factors critical to the use of PT by tourists during their stay. The subsequent tree division reveals the particular factors that better account for differences in PT use for each of the tourist segments. This information is important because factors that influence different groups' choice of transportation may vary from one group to another, and, therefore, different approaches for each group are needed to successfully achieve a modal switch (Anable, 2005).

The CHAID algorithm was designed by Kass (1980) and provides a "tool that identifies [groups of] conditions under which the response distribution of the actions [of a categorized action variable] is more

homogeneous" (Van Middelkoop, *et al.,* 2003). More precisely, CHAID analysis is a non-parametric exploratory technique that allows a meaningful tree-based partition of a population into mutually exclusive exhaustive subsets (Kass, 1980). The results are presented in a tree-form diagram. The probability of an event, which, in our case, is the probability that a tourist staying overnight in Tarragona becomes a PT user, is estimated by means of a chi-square test applied to each of the potential predictor variables. The most significant predictor variable is selected in order to split the population into segments. This process is subsequently repeated down the tree for each of the segments obtained, until the predictors applied are not significant or requirements established by researchers (e.g., size of the segments) are no longer met. In our study, we have decided to impose a restriction on the node and segment sizes. The minimum node size must contain at least 100 observations, and the minimum segment size is established at 50 observations. As can be seen in **Table 2**, a total of 17 explicative/independent variables are included in the CHAID analysis, whereas the PT use by tourists at their destination is the dependent variable.

Dependent variable:				
ch_UseOfTransport:				
1= Yes				
2= No				
Explicative variables:				
ch_Gender:	*ch_Season:*	*ch_Repeater:*	*ch_Duration:*	*ch_Tertiary:*
1= Male	1= Summer	1= Repeater	1= Stay of 3 days or less	1= Tertiary studies
2= Man	2= Winter	2= First-time visitor	2= Longer than 3 days	2= Others
ch_Transport:	*ch_Accomodation:*	*ch_Origin:*	*ch_Who:*	*ch_Expenses:*
1= Airplane	1= Second home/ apartment	1= Origin Spain	1= With friends	1= Low
2= Public Transport	2= Camping	2= Origin France	2= With family and partner	2= Mid
3= Own vehicle	3= Hotel	3= Origin: countries at less than 2000 km	3= With children	3= High
4= Others	4= Others	4= Origin: countries over 2000 km	4= Others	4= Unknown
ch_VBCN:	*ch_VTGN:*	*ch_VNOT:*	*ch_VCD:*	*ch_VOTHERS:*
1= Visiting Barcelona	1= Visiting Tarragona	1= Not visiting	1= Visiting beach destinations	1= Visiting other places
2= Not visiting	2= Not visiting	2= Visiting some place	2= Not visiting	2= Not visiting
ch_Year:	*ch_Age:*			
1= 2014	1= up to 44 y.o.			
2= 2015	2= 46-64 y.o.			
3= 2016	3=65 and older			

Table 2. Variables used to develop the CHAID analysis.

Regarding the introduction of interactions in the logit estimations, it delves into the objective pursued by the CHAID analysis. In other words, this method tests whether the determinants of intra-destination PT use are sensitive to the mode of transportation chosen to travel to Tarragona. Each variable is interacted with an indicator variable that distinguishes tourists who have reached Tarragona by air travel or by PT from those who have used a private vehicle. Interactions are introduced one by one. As a result, the total number of estimated models including interactions equals the total number of explanatory variables to be interacted. As any other variable, the degree of significance of each interaction is assessed by means of the t-test. Thus, a significant coefficient associated with an interaction implies that the impact of that variable on the probability of becoming a user of public transport once at the tourist destination is sensitive to the mode of transport chosen to reach the tourist destination.

6. Results

6.1 Logit estimations

The methodology suggested by Cameron and Trivedi (2006a, 2006b) is applied to discern whether either logit estimations, or endogeneity-corrected logit estimations are preferable. First, the endogeneity corrected logit is estimated with the object of contrasting the null hypothesis of λplane = λPT = 0, following the test devised by Cameron and Trivedi (2006b). The null hypothesis is tested assuming a distribution χ^2 (q), where q is the number of parameters λ and thus, q=2. The probability of λplane = λPT = 0 is 0.18, and consequently, the null exogeneity hypothesis cannot be rejected. Moreover, as it can be noted in the results of the endogeneity-corrected logit estimation shown in the appendix, none of the Lambda coefficients associated with the plane and PT is significant, which indicates that unobserved heterogeneity does not have a significant impact on the probability of using PT once at the tourist destination. The lack of significance of the lambda coefficients is likely to be linked to a hypothetical lack of endogeneity in the model. Thus, it can be concluded that the logit estimation is preferable to the endogeneity corrected logit estimation. The results of the latter estimation are presented in the appendix, including both the logit model with the coefficients associated with the latent factors, together with the multinomial model, which includes the tourists' origin within the explanatory variables.

Estimation results of the logit models with no correction for endogeneity are shown in **Table 3**. The difference between model (1) and model (2) lies in the fact that the latter includes the origin of the tourist among the explanatory variables. Both models suggest that the transportation mode chosen to travel to Tarragona is the most determining factor that predicts the use of PT by tourists at their destination. Moreover, the impact associated with travels to Tarragona via PT in both models is higher compared to that associated with air travel. The results of model (2) indicate that the probability of using PT at a given destination is highly influenced by the point of origin of the tourists. Specifically, more distant destinations make tourists more prone to use PT. It must be highlighted that the introduction of the origin indicator variables in model (2) results in a substantial decrease in the coefficients attached to air travel. This result is consistent with the fact that tourists' origin significantly influences the transportation decision at the tourist destination, as the multinomial mixed logit estimation also makes apparent (see Appendix). Nevertheless, this relationship is not significant in the case of tourists reaching Tarragona by means of PT.

The probability of using PT considerably increases with longer stays. This result is accounted for by the fact that longer stays increase the probability of visiting a greater number of tourist attractions, not only within the city, but also in the surrounding areas (Le-Klähn *et al.*, 2014). Additionally, the longer the stay, the greater the tourist's understanding of the PT network, which also makes the tourist more likely to become a PT user. Higher levels of spending are also linked to an increased use of PT, which is consistent with Gutiérrez and Miravet (2016b).

The decisions regarding the places visited also play a key role in the use of PT. In fact, the probability of using PT at one's destination increases for those tourists who go to Barcelona or to towns belonging to the Costa Daurada during their stay. These destinations are easily accessible by means of PT, given that this mode of transportation is competitive with a private car in terms of travel times. Conversely, interior destinations grouped within the category "Visit other places" are not as easily accessible by means of PT due to the lack of frequency of the services and long travel times, which are responsible for its lack of use. Visits to attractions located within Tarragona do not have a significant impact either.

None of the coefficients associated with the rest of the explanatory variables is significant. Hence, similar to Masiero and Zoltan (2013), the results do not demonstrate a significant influence on one's accommodation. Moreover, and in accordance with Dietlmeier (2013), no evidence of a significant impact of socioeconomic characteristics has been found. Finally, coefficients associated with years 2014 and 2016

are both significant, although the impact of 2016 is much lower and only statistically significant at 10% in models (1) and (2). This result may be related to the movement of passengers in the nearest airport to the city, which influenced the number of tourists who reached Tarragona by air[2]. Aside from the absolute number of passengers, these fluctuations could affect PT use based upon the origin of the passengers.

	(1) Logit estimation		(2) Logit estimation Including tourists' origin	
	Coef.	**Std.Error**	**Coef.**	**Std.Error**
Intercept	-2.854	(0.607)***	-2.927	(0.611)***
Transport mode to arrive: own vehicle	Reference category		Reference category	
Transport mode to arrive: plane	1.639	(0.262)***	1.057	(0.337)***
Transport mode to arrive: public transport	2.258	(0.298)***	2.263	(0.310)***
Accommodation: hotel	Reference category		Reference category	
Accommodation: second residence/apartment	0.279	(0.272)	0.267	(0.274)
Accommodation: camping	-0.423	(0.416)	-0.48	(0.409)
Accommodation: other places	-0.017	(0.693)	-0.196	(0.732)
From 45 to 64 years old	Reference category		Reference category	
Up to 44 years old	-0.011	(0.215)	0.005	(0.217)
65 years old and older	0.185	(0.365)	0.124	(0.370)
Duration of stay longer than 3 days	Reference category		Reference category	
Duration of stay, 3 days or less	-1.424	(0.277)***	-1.407	(0.274)***
High education level (university studies)	0.051	(0.227)	0.003	(0.229)
Spending at the destination: medium	Reference category		Reference category	
Spending at the destination: high	0.709	(0.273)***	0.704	(0.277)***
Spending at the destination: low	0.124	(0.320)	0.167	(0.320)
Spending at the destination: unknown	0.566	(0.338)*	0.521	(0.343)
Repeater: not the first visit to Tarragona	-0.118	(0.214)	-0.028	(0.221)
Visiting Tarragona	0.159	(0.279)	0.182	(0.280)
Visiting Barcelona	0.588	(0.239)**	0.482	(0.249)**
Visiting Costa Daurada	0.612	(0.249)**	0.643	(0.250)***
Visiting other places	0.499	(0.279)*	0.455	(0.286)
Not visiting any place	0.240	(0.343)	0.241	(0.345)
Gender: male	0.068	(0.200)	0.018	(0.197)
Accompanied by: family with children	Reference category		Reference category	
Accompanied by: family trip or partners	-0.293	(0.275)	-0.305	(0.276)
Accompanied by: friends	-0.302	(0.424)	-0.387	(0.438)
Accompanied by: others	-0.288	(0.334)	-0.324	(0.340)
Season: summer	-0.154	(0.245)	-0.230	(0.251)
Year 2015	Reference category		Reference category	
Year 2014	1.092	(0.250)***	1.070	(0.249)***
Year 2016	0.523	(0.309)*	0.537	(0.308)*
Origin: Spain			Reference category	
Origin: France, Andorra and Monaco			0.104	(0.323)
Origin: countries located less than 2000 km			0.883	(0.339)***
Origin: countries over 2000 km			0.843	(0.431)**

* Significant at 10%, ** significant at 5%, *** significant at 1%. Source: authors.

Table 3. Logit estimation results (dependent variable: PT use by tourists at destination). Robust standard errors are presented in parentheses.

[2] According to the statistical registers of the public company in charge of civil aerial navigation in Spain, Aena, the number of passengers using the airport nearest the city (Reus Airport) has considerably fluctuated between 2014 and 2016. More precisely, the number of passengers in this airport in 2015 was 17% lower in comparison to 2014. In 2016, the number increased, but it did not recover the cipher registered in 2014.

6.2 CHAID analysis

The results of the CHAID analysis are shown in **Figure 2**. A total number of 13 clusters were obtained, and the key variable influencing the mode of transportation used to reach Tarragona was consistent with the empirical evidence obtained in the logit estimations. Whereas the mean use of PT for the whole sample was 19.6%, 40.1% of those who arrived in Tarragona via an airplane or PT (train or coach) used PT during their holiday (Cluster 1). In contrast, PT use for those who arrived in Tarragona in a private vehicle was reduced to 9.0% (Cluster 2).

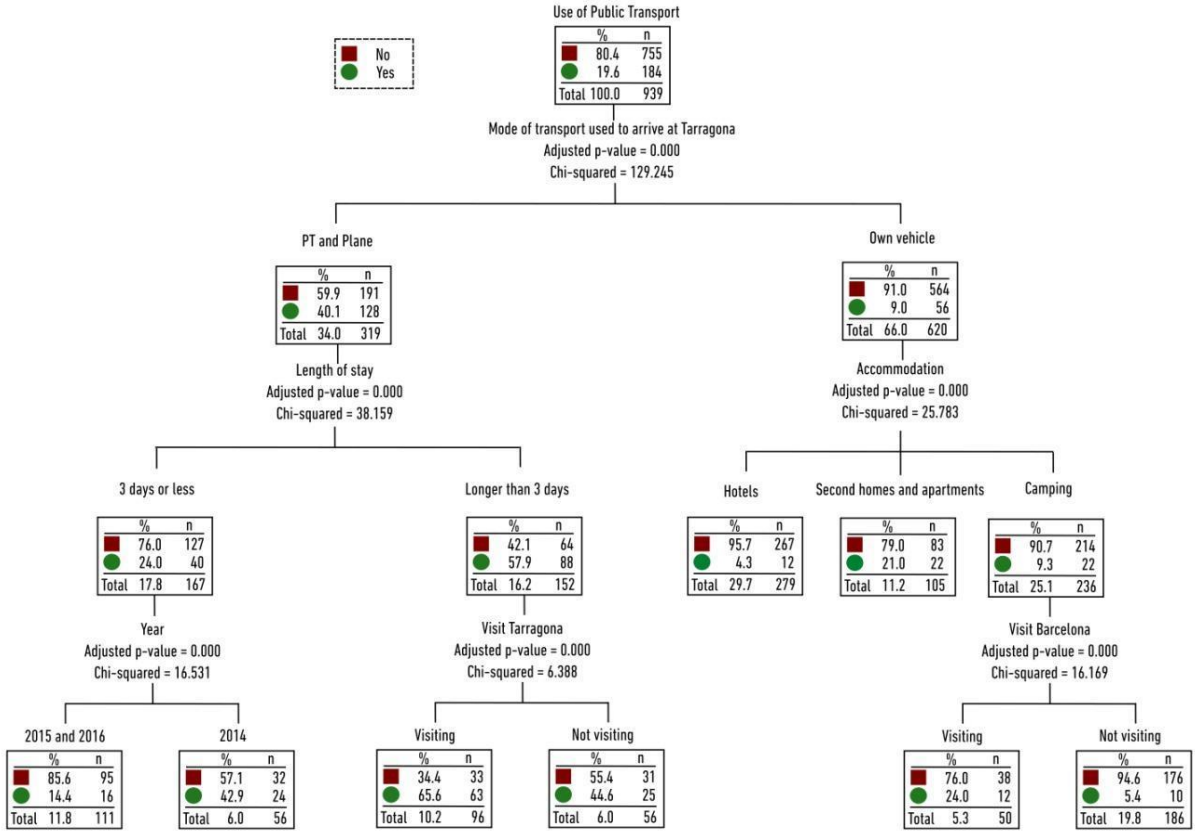

Figure 2. CHAID analysis results. Source: authors.

The conclusions derived from the CHAID analysis are overall consistent with the results obtained in the logit regressions in terms of the variables that cause the greatest impacts. The mode of transportation chosen to travel to the destination is the most determining factor for PT use at the tourist's destination. Additional predictors also play a role in the tree, including the length of stay and the visits undertaken from Tarragona. Nonetheless, the tree also shows that in contrast to the evidence provided by the regressions, the tourist's accommodation is a decisive factor for those who travelled to Tarragona by means of a private vehicle. Visiting Tarragona, which neither was significant in the regression, emerges in the third level of the tree for tourists travelling by air or PT and staying longer than 3 days. On the whole, it is striking that all the splitting variables within the first and second clusters (second and third levels) are different. In other words, the factors that make a difference for those who travelled by private vehicle to the destination are different from those that have the greatest impact for tourists who travelled to Tarragona via air or PT. This could indicate an underlying effect related to the mode of transportation chosen to travel to the destination, which might influence the effect of the rest of the determinants. In contrast with the CHAID model, these differences were not detected in the logit estimations as the sample was taken as a whole, without any partitions. Hence, coefficients only captured a mean global impact, and no distinction regarding the effect of the explanatory variables between groups was allowed. The estimation of separate samples would be an alternative to disentangle the potential divergent impacts between groups. This

option has been discarded nonetheless, as it would have made it impossible to capture the strong effect associated with each of the transportation modes used to travel to the tourist destination. Conversely, interactions allow us to distinguish the effect caused by any of the explanatory variables for each of the modes of transportation maintaining the impact derived from the latter.

6.3 Interactions

The introduction of interactions examines whether the impact of the determinants of intra-destination PT use is mediated by the transportation mode chosen to travel to the destination. **Table 4** compares the results of a model without interactions with the results of models including interactions. Only one interaction can be introduced into an equation at a time, otherwise the coefficients would be biased. For this reason, 26 models with interactions are estimated; each model interacts with one of the explanatory variables. The left column (model 1) in **Table 4** shows the results of an alternative logit regression that replicates model (2) presented in **Table 3**. The only difference is the gathering together of tourists who travelled by plane and PT to the destination, which follows the structure obtained using the CHAID analysis. The results are compared to those obtained when the interactions are considered.

	(1) Model without interactions		(2) Interactions	
	Coef.	**Std. Error**	**Coef.**	**Std. Error**
Model 1. Interaction with "Accommodation: Second residence/apartment"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	2.112	(0.32)***
Accommodation: second residence/apartment	0.342	(0.27)	0.969	(0.38)**
PT or plane x Accommodation: second residence/apartment			-0.987	(0.45)**
Model 2. Interaction with "Accommodation: Camping"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.730	(0.28)***
Accommodation: camping	-0.362	(0.41)	-0.432	(0.45)
PT or plane x Accommodation: camping			0.280	(0.68)
Model 3. Interaction with "Accommodation: Other places"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.798	(0.27)***
Accommodation: other places	-0.003	(0.68)	0.426	(0.71)
PT or plane x Accommodation: other places			-1.165	(1.38)
Model 4. Interaction with "Age: Up to 44 years old"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.441	(0.32)***
Age: Up to 44 years old	-0.005	(0.22)	-0.443	(0.32)
PT or plane x Age: Up to 44 years old			0.773	(0.42)*
Model 5. Interaction with "Age: 65 years old and older"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.910	(0.28)***
Age: 65 years old and older	0.238	(0.23)	0.895	(0.44)**
PT or plane x Age: 65 years old and older			-1.113	(0.6)*
Model 6. Interaction with "Duration of stay, 3 days or less"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.642	(0.35)***
Duration of stay, 3 days or less	-1.279	(0.27)***	-1.450	(0.42)***
PT or plane x Duration of stay, 3 days or less			0.248	(0.45)
Model 7. Interaction with "High education level (university studies)"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.542	(0.4)***
High education level (university studies)	-0.031	(0.23)	-0.201	(0.3)
PT or plane x High education level (university studies)			0.353	(0.44)
Model 8. Interaction with "Spending at the destination: high"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	2.010	(0.34)***
Spending at the destination: high	0.684	(0.27)**	1.055	(0.39)***
PT or plane x Spending at the destination: high			-0.575	(0.44)
Model 9 Interaction with "Spending at the destination: low"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.620	(0.28)***
Spending at the destination: low	0.098	(0.32)	-0.347	(0.44)
PT or plane x Spending at the destination: low			0.810	(0.53)

Model 10 Interaction with "Spending at the destination: unknown"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.895	(0.29)***
Spending at the destination: unknown	0.531	(0.35)	0.907	(0.45)**
PT or plane x Spending at the destination: unknown			-0.652	(0.51)
Model 11 Interaction with "Not the first visit to Tarragona"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.585	(0.33)***
Repeater: not the first visit to Tarragona	-0.050	(0.22)	-0.275	(0.33)
PT or plane x Not the first visit to Tarragona			0.391	(0.43)
Model 12 Interaction with "Season: Summer"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.824	(0.37)***
Season: summer	-0.189	(0.25)	-0.119	(0.4)
PT or plane x Season: Summer			-0.107	(0.46)
Model 13 Interaction with "Male"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.696	(0.36)***
Gender: male	0.006	(0.2)	-0.063	(0.29)
PT or plane x Male			0.125	(0.4)
Model 14 Interaction with "Visiting Tarragona"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.332	(0.35)***
Visiting Tarragona	0.211	(0.27)	-0.181	(0.33)
PT or plane x Visiting Tarragona			0.826	(0.44)*
Model 15 Interaction with "Visiting Barcelona"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.817	(0.29)***
Visiting Barcelona	0.480	(0.25)*	0.622	(0.36)*
PT or plane x Visiting Barcelona			-0.235	(0.46)
Model 16 Interaction with "Visiting Costa Daurada"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.789	(0.3)***
Visiting Costa Daurada	0.624	(0.25)**	0.660	(0.32)**
PT or plane x Visiting Costa Daurada			-0.078	(0.45)
Model 17 Interaction with "Visiting other places"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.644	(0.28)***
Visiting other places	0.464	(0.28)	-0.033	(0.48)
PT or plane x Visiting other places			0.895	(0.62)
Model 18 Interaction with "Not visiting any place"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.800	(0.3)***
Not visiting any place	0.270	(0.34)	0.372	(0.44)
PT or plane x Not visiting any place			-0.178	(0.52)
Model 19: Interaction with "Accompanied by: Family trip or partners"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.762	(0.35)***
Accompanied by: Family trip or partners	-0.269	(0.27)	-0.271	(0.37)
PT or plane x Accompanied by: Family trip or partners			0.003	(0.45)
Model 20: Interaction with "Accompanied by: Friends"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.720	(0.27)***
Accompanied by: friends	-0.200	(0.42)	-0.927	(1.1)
PT or plane x Accompanied by: Friends			0.912	(1.18)
Model 21: Interaction with "Accompanied by: others"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.812	(0.29)***
Accompanied by: others	-0.228	(0.34)	0.042	(0.6)
PT or plane x Accompanied by: others			-0.350	(0.66)
Model 22: Interaction with "Year 2014"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.479	(0.31)***
Year 2014	1.054	(0.25)***	0.627	(0.34)*
PT or plane x Year 2014			0.757	(0.43)*
Model 23: Interaction with "Year 2016"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	2.108	(0.32)***
Year 2016	0.565	(0.31)*	1.044	(0.38)***
PT or plane x Year 2016			-0.927	(0.44)**
Model 24: Interaction with "Origin: France. Andorra and Monaco"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.794	(0.28)***
Origin: France. Andorra and Monaco	-0.048	(0.3)	0.022	(0.34)
PT or plane x Origin: France. Andorra and Monaco			-0.415	(0.72)

Model 25: Interaction with "Origin: countries located less than 2000 km"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	2.100	(0.31)***
Origin: countries located less than 2000 km	0.264	(0.29)	1.022	(0.44)**
PT or plane x Origin: countries located less than 2000 km			-1.121	(0.51)**
Model 26: Interaction with "Origin: countries over 2000 km"				
Transport mode to arrive: PT or plane	1.764	(0.27)***	1.715	(0.28)***
Origin: countries over 2000 km	0.142	(0.38)	-12.527	(0.64)***
PT or plane x Origin: countries over 2000 km			12.746	(0.73)***

* Significant at 10%, ** significant at 5%, *** significant at 1%. Source: authors.

Table 4. Logit estimation results (dependent variable: PT use by tourists at destination). Comparison of models with and without interactions. Source: authors.

There are some variables for which their influence is not affected by the mode of transportation chosen to reach the destination. The effects exerted by the length of stay and the decision to visit Barcelona and the Costa Daurada remain pretty much unaltered, while the coefficients associated with the respective interactions are not significant. The interaction with high expenses is not significant, although the magnitude of the coefficient associated with the original variable substantially increases. Thus, it can be concluded that the impact of these variables is independent of the means of transportation used to travel to the destination. It could be argued that the non-segmented effect of these factors relates to the fact that tourists are willing to move around to visit attractions. For instance, the longer the length of stay, the more likely it is that the tourist visits further attractions, and as a result, the higher the chances that tourists need motorized transport, including PT. Thus, the strong correlations between these variables and the destinations visited indicate that the lack of information in the dataset distinguishing the mode of transportation used and the attractions visited might be a potential source of bias for their associated coefficients.

There are other variables for which the incidence is determined by the transportation choice to reach the destination. For example, staying in a second home or an apartment increases the probability of becoming a PT user for those who travelled by private vehicle. In contrast, the positive effect for those who travelled by plane or PT is eliminated. With regard to socioeconomic variables, none of which was significant in **Table 3** or model (1) in **Table 4**, changes associated with the impact of age occur with the introduction of interactions. The combined effect of having travelled either by air or PT, together with tourists being young, results in a higher probability of using PT at the destination. Conversely, the rise in the probability of using PT for the oldest group of tourists only occurs for those who reached Tarragona by private vehicle. This effect is eliminated in the oldest tourists travelling via other transportation modes. The visits to attractions within Tarragona increase the probability of using PT among tourists who travelled by plane or by PT. None of these four variables has a significant coefficient when the specification considers no interactions. Thus, the inclusion of the interactions enables the irruption of their subjacent effects, which are attached to a portion of the tourists depending on how they travelled to Tarragona. The probability of using PT among those who reach Tarragona via a private vehicle increases when travelling a distance shorter than 2,000 km (excluding Spain and France), while for the alternative modes of transportation, this impact is offset by the counter-effect yielded by the interaction. The magnitude of the impact of travel distances longer than 2,000 km must be considered cautiously given the small number of tourists who drove such a long distance. Finally, the year when the questionnaire was completed also impacted the likelihood of using PT.

To summarize, the examination of interactions has demonstrated the impact of accommodations, age and the visits to Tarragona. It has also revealed how the transportation method used to reach the destination influences the effect exerted by other factors for which the models without interactions already exhibited a

significant coefficient. Nonetheless, the magnitude of the impact of the interactions is always lower compared to the influence related to the mode of transportation for arriving in Tarragona.

7. Conclusions

The present work aimed to test whether the mode of transportation chosen to reach a tourist destination is the main determinant of PT use during one's stay. Secondly, this study assessed whether the impact of the other determinants is influenced by the previous choice in the context of a medium-sized Mediterranean city (Tarragona, Catalonia). The empirical evidence obtained undoubtedly supports the first hypothesis. In fact, the importance of the mode of transportation to the destination is not a new result and it had been previously highlighted by Dolnicar *et al.* (2010), Bieland *et al.* (2017), Gross and Grimm (2018) and Gutiérrez and Miravet, (2016b). Besides confirming the conclusions of previous studies, the results also support the second hypothesis, which represents the main novelty of our study. According to the CHAID analysis, the variables that exerted the greatest influence on the use of PT among tourists who reached Tarragona via a private vehicle are different from those that had the largest impact on tourists reaching Tarragona by an alternative means of transportation. Moreover, the introduction of interactions in the logit regressions has enabled us to identify the emergence of significant variables (relating to type of accommodation, age and visits undertaken within Tarragona) with an impact limited to just a subset of tourists, together with the influence of the decisions relating to travel to the destination on the impact exerted by other variables.

These results highlight the importance of switching tourists to more sustainable modes of transportation when travelling to the destination, since the use of alternative modes of transportation from the travel origin to the destination encourages tourists to use PT during their stay (Peeters and Schouten, 2006). Furthermore, the promotion of PT among tourists involves the implementation of tailor-made strategies to tackle the segmentation of mobility demand caused by transportation decisions on the way to the destination. Therefore, it is crucial to design customized mobility policies in order to better adapt to each tourist segment's needs and preferences. For instance, our results show that staying overnight in second homes and apartments makes tourists more likely to use PT during their stay only if they have travelled to Tarragona via a private vehicle. The impact for those tourists who have travelled by plane or PT in this particular case vanishes simply because they are likely to use the PT anyway. At the other extreme, we found that tourists who travelled to Tarragona by car and are staying at hotels, are more likely to use a private vehicle instead of PT. This type of tourist is less likely to leave their car at home during the holidays, and probably less susceptible to advertising that promotes the use of PT at the tourist destination. Dolnicar *et al.* (2010) states that the use of the car is avoided at a tourist destination if it is not required or its use is inconvenient. Thus, persuading tourists who travel by car during their holiday to leave it parked once at their destination becomes a central issue, particularly for those destinations where the number of tourists is large enough to have a negative environmental impact on the small local community. Successful strategies promoting the use of PT should involve actions that boost the destination's level of walkability and increase the attractiveness of PT compared to that of a private vehicle. The implementation of both '*pull*' and '*push*' actions should be taken into account. While the former would prompt tourists to become users of the PT network at their destination, the latter would involve actions that discourage the use of the private vehicle (Therese, 2010; Gärling *et al.*, 2002; Stradling *et al.*, 2000).

The dataset used in this study does not establish a connection between each attraction or place visited and the mode of transportation used to reach the tourist destination. This is the major limitation of this work, and the results of the variables relating to the destinations visited might therefore be biased. For this reason, future research should explore the interconnections between the decision to visit an attraction and the mode of transportation chosen to get there, as these decisions are reciprocally motivated. This advises to follow similar econometrical frameworks as those put forward by Masiero and Zoltan (2013) and Le-

Klähn *et al* (2015). Another concern is that the data used in the present study are restricted to tourists, whereas most destinations (including Tarragona) receive a substantial share of visitors travelling on day trips from areas near enough to avoid staying overnight.

In addition to including transportation choices by excursionists, future research should also take into account the influence of the potential endogeneity caused by the relationship between the transportation choice to the destination and the origin of the tourist. To the best of our knowledge, only Gutiérrez and Miravet (2016b) and the present work have econometrically considered these factors with opposite results. Future research should also take into account that while the incidence of objective determinants has been considered in all studies, the inclusion of subjective factors is much less frequent. Another topic for future research is the impact of the characteristics of the destination. Few studies have examined its effect using tourist surveys in different types of destinations (Dolnicar *et al*., 2010; Gross and Grimm, 2018). Undoubtedly, destinations are diverse, and as a result, it is highly likely that PT use is influenced by the diversity of destination characteristics. Analysing the effect of the destination's characteristics is important for examining the impact of '*push'* factors (which prompt tourists to abandon the private vehicle in favour of more sustainable alternatives) and '*pull*' factors (which involve actions that would make these alternatives more attractive) on tourists' behaviour, as well as the interactions between each.

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Appendix

	Endogeneity corrected logit estimation	
	Coef.	**Std.Error**
Intercept	-3.817	(1.897)**
Transport mode to arrive: own vehicle	Reference category	
Transport mode: plane	2.695	(1.562)*
Transport mode: public transport	3.081	(2.095)
Accommodation: hotel	Reference category	
Accommodation: second residence/apartment	0.415	(0.406)
Accommodation: camping	-0.274	(0.531)
Accommodation:other places	0.155	(0.823)
From 45 to 64 years old	Reference category	
Up to 44 years old	-0.067	(0.284)
65 years old and older	0.211	(0.466)
Duration of stay longer than 3 days	Reference category	
Duration of stay, 3 days or less	-1.639	(0.625)***
High education level (university studies)	-0.035	(0.289)
Spending at the destination: medium	Reference category	
Spending at the destination: high	0.935	(0.549)*
Spending at the destination: low	0.179	(0.431)
Spending at the destination: unknown	0.711	(0.512)
Repeater: not the first visit to Tarragona	-0.126	(0.276)
Visiting Tarragona	0.235	(0.371)
Visiting Barcelona	0.681	(0.403)*
Visiting Costa Daurada	0.829	(0.495)*
Visiting other places	0.570	(0.406)
Not visiting any place	0.321	(0.435)
Gender: male	0.032	(0.250)
Accompanied by: family with children	Reference category	
Accompanied by: family trip or partners	-0.381	(0.393)
Accompanied by: friends	-0.436	(0.621)
Accompanied by: others	-0.402	(0.464)
Season: summer	-0.218	(0.327)
Year 2015	Reference category	
Year 2014	1.295	(0.529)***
Year 2016	0.668	(0.479)
Lambda Plane	-1.321	(1.420)
Lambda PT	-0.305	(1.564)

* Significant at 10%, ** significant at 5%, *** significant at 1%. Source: authors.

Table A1. Endogeneity corrected logit estimation results. Robust standard errors are presented in parentheses. Source: authors.

	Plane vs. Own Car		Public Transport vs. Own Car	
	Coef.	**Std.Error**	**Coef.**	**Std.Error**
Intercept	-2.907	(0.771)***	-0.838	(0.536)
Origin-Spain	Reference category		Reference category	
Origin-France	0.854	(0.633)	-1.729	(0.507***
Origin-2000km	5.394	(0.445)***	0.048	(0.415)
Origin-further	6.567	(0.591)***	1.218	(0.669)*
Accommodation: hotel	Reference category		Reference category	
Accommodation: second residence/apartment	-0.698	(0.457)	0.302	(0.356)
Accommodation: camping	-3.061	(0.594)***	-4.392	(1.184)***
Accommodation:other places	-3.150	(0.908)***	-0.434	(0.657)
From 45 to 64 years old	Reference category		Reference category	
Up to 44 years old	0.420	(0.331)	0.314	(0.270)
65 years old and older	-0.551	(0.575)	0.970	(0.393)**
Duration of stay longer than 3 days	Reference category		Reference category	
Duration of stay, 3 days or less	-1.333	(0.403)***	-0.284	(0.345)
High education level (university studies)	0.697	(0.363)*	0.236	(0.253)
Spending at the destination: medium	Reference category		Reference category	
Spending at the destination: high	-0.650	(0.434)	-0.535	(0.302)*
Spending at the destination: low	0.009	(0.487)	-0.519	(0.430)
Spending at the destination: unknown	-0.448	(0.502)	-0.191	(0.418)
Repeater: not the first visit to Tarragona	0.036	(0.351)	-0.249	(0.266)
Season: summer	-0.392	(0.369)	0.088	(0.274)
Gender: male	-0.079	(0.316)	-0.337	(0.253)
Year 2015	Reference category		Reference category	
Year 2014	0.064	(0.374)	-0.205	(0.316)
Year 2016	-0.133	(0.398)	-0.206	(0.296)

Mixed multinomial logit estimation. Robust standard errors within parenthesis. * Significant at 10%, ** significant at 5%, *** significant at 1%.

Table A2. Mixed multinomial estimation. Robust standard errors are presented in parentheses. Source: authors.