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Determinants of collective transport mode choice and its impacts on trip satisfaction in urban tourism

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ABSTRACT

The continuous growth of tourism has important environmental impacts and transports account for a large proportion of the CO_2 emissions generated by tourists. Understanding the motivations and characteristics of collective transport users in contemporary cities may contribute to promote more sustainable forms of tourism. Based on an extensive questionnaire to international tourists in Barcelona, this study employs a multinomial logistic regression to explore the links among visitors' characteristics, motivations, and means of transportation, while an ordinal logistic regression is applied to investigate whether the preference for collective transport has an impact on the satisfaction with the trip. The novelty of our approach is testing the hypothesis that the choice of collective transports is more related to trip motivations (professional, leisure, or personal) than to socio-demographic or personal characteristics of tourists. The results show that professional travelers are more oriented to the use of private cars, but they prefer collective transports when the length of stay is higher and combined with other trip motivations. Also, using collective transports is linked to high satisfaction with the visit for the tourists using this form of transportation. This study puts forward policy implications and suggestions for future research directions, in particular regarding the utilization of non-motorized forms of transportation cities.

1. Introduction

The continuous growth of travel and tourism observed over the last decades is also linked to increasing levels of CO_2 emissions. According to the estimates of the World Tourism Organization (UNWTO) (2008), tourism was responsible for 5% of the global emissions in 2005. Since then, international arrivals increased from 770 million to 1.2 billion in 2016 (1.8 billion expected for 2030), while domestic arrivals reached 8 billion in 2016 (4 billion in 2005), with an estimation of 15.6 billion for 2030 (World Tourism Organization and International Transport Forum, 2019). This report estimates that 1600 million tons of CO_2 were related to the transportation of tourists in 2016, representing 5% of the global emissions related to the consumption of energy. Transports represent 75% of the tourism-related emissions, with the plane (40%) and car (32%) being responsible for the largest shares. These means of transportation also generate higher emissions per passenger per kilometer (0.1135 Kg for car and 0.1042 for air travels), when compared to the bus (0.03 Kg) or train (0.0205 Kg). As Gössling et al. (2013) observed, the achievement of the expected levels of tourism growth estimated by international institutions is hardly compatible with the discourses about green growth or sustainable development. Thus, promoting the utilization of public (or collective) means of transportation appears as a crucial factor in order to mitigate the negative environmental impacts of tourism in contemporary societies, as proposed by Le-Klähn et al. (2014).

Significant differences regarding the utilization of public transports in rural or urban destinations have been identified in the literature (Dickinson and Dickinson, 2006). Despite the expected higher environmental concerns of tourists visiting rural areas or remote natural landscapes, the low population density of these places is normally related to lower levels of supply of public transports, thus implying the utilization of private cars (Dickinson and Robbins, 2008; Xiao et al., 2012). On the other hand, despite the higher availability of public transports in urban areas, that is not always the main choice of tourists. Considering that cities generate 70% of the greenhouse gases currently emitted at the global level (OECD, 2019), and the cumulative impacts of the mobility of tourists and residents in a context of the rising importance of urban tourism, the promotion of the utilization of collective (or

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public) transport by tourists may contribute to reducing pollution levels and traffic congestion. Moreover, by contributing to address these problems, an efficient network of public transports may promote urban attractiveness for tourists (Prideaux, 2000), potentially increasing the satisfaction with the destination (Thompson and Schofield, 2007). It is also noteworthy that the utilization of public transports by tourists may generate revenues potentially reinvested in the improvement of these services (Albalate and Bel, 2010), thus contributing to local economic development and improvements in the living conditions of residents.

Although the preference of urban tourists for the utilization of public transports has been addressed in several recent studies, the lack of data related to foreign tourists is still an obstacle for the study of this question, as noted by Hall et al. (2017). The results and conclusions seem very sensitive to the characteristics of the places, existing transport systems, and types of visitors. However, the reasons for not choosing public transport seem more consensual, as observed by Le-Klähn et al. (2014): inconvenience and restrictions of the network, lack of information, disadvantages related to comfort or quality of service, and personal preferences. For the case of Munich, these authors identify several characteristics as predictors of the preference for public transports: longer duration of the visits, holiday as the main purpose of the trip, and frequency of use of public transport when at the place of residence. Socio-demographic aspects, trip characteristics, destination features, and travel motivations are among the aspects taken into account. For the particular case of travel motivations, which are not identified among the main factors contributing to the choice of public transports, the authors identify, however, that business travelers are more represented in the group of non-users (18%) than in the group of users (10%). To a certain extent, our analysis aims at confirming these results, while adding new elements regarding the characteristics of the tourists, a more detailed analysis of the motivations of their trips, and establishing a clear link to the satisfaction achieved with the destination as a whole.

With broader perspectives, other types of studies have contributed to a better understanding of the transport choices in tourism destinations. Lew and McKercher (2006) identify three major factors: the size and expenditure of tourist "time-budgets" (a concept formulated by Pearce (1988), defining the availability of time for the visit to a destination); personal motivations, interests, and travel group composition; the tourist knowledge of the destination concerned. Different authors adopted similar approaches, by linking movement patterns and transport choices (Masiero and Zoltan, 2013). In the detailed summary presented by Le-Klähn and Hall (2015), it is observed that private modes seem preferable for visitors with more complex itineraries while having multiple purposes in a destination is suitable for public transport choice when the attractions and activities are relatively close and well connected (taking into account "pull factors" like comfort, congestion or the number of transfers). On the other hand, professional travelers tend to give more importance to time constraints and quick connections.

Taking the insights from these previous studies into account, our analysis aims at testing the hypothesis that the motivation for travel (professional, leisure, or personal) can be a better predictor for the preference for public transports by urban tourists than their personal, socio-cultural or demographic characteristics. As observed in the detailed and informed literature review presented by Le-Klähn (2015), travel motivations have not been identified among the main factors contributing to the preference of public transports in previous studies. This analysis is possible once we can consider a double layer for the analysis of motivations, by considering a primary and (when existing) a secondary motivation for the visit. With this information, collected in the extensive surveys implemented by the city of Barcelona, we can identify which are the preferred modes of transportation used by tourists according to their travel motivation. More importantly, we can also infer how these preferences change if there is a second motive for the trip. As will be seen, we can perceive that professional tourists are those who mainly use private motorized transports in the city. However, this preference reduces if and when professional is the main motive but there is a second motivation. Moreover, the extent of this reduction is much larger in the case when the professional is a secondary motivation for the trip. We conclude the analysis by investigating whether the preference for collective forms of transportation reduces the overall satisfaction with the trip and we observe the contrary: in fact, this choice exerts a positive impact on trip satisfaction.

By looking at the mobility of tourists in Barcelona, a mature urban tourism destination, served by a very advanced network of public transportation (significantly developed after the Olympic Games in 1992, which was also a major milestone for the international tourism promotion of the city), our work offers a detailed analysis of the determinants of transport mode choice for the mobility inside the city. By using multinomial and ordinal logistic regression models (Nutsugbodo et al., 2018) described in detail in the next Section, socio-cultural and demographic aspects are combined with trip characteristics and a double layered-analysis of trip motivations, with a particular focus on the factors influencing the utilization of collective transports. In the second step, a link to the satisfaction with the visit to the destination is established by using the ordinal logistic regression. This innovative and comprehensive analysis takes into account the undergoing strategies to reduce CO_2 emissions in European cities, as recently defined by the European Commission (2019) (estimating in 71% the share of road transport within transport-related greenhouse emissions in European urban areas).

Although the motivation for this analysis corresponds to a broad concern with the ecological impacts of urban tourism globally identified, this question is also especially relevant in the city of Barcelona, even though the contribution of intra-urban transport represents a small share (0,7%, corresponding to 63,862 CO_2 equivalents per year) of the tourism-related CO_2 emissions in the city (Rico et al., 2019). However, the significant increase in the total number of visitors (multiplied by 5 between 1990 and 2017) and in particular in the number of international tourists (multiplied by 10 in the same period) is a reason for concern with environmental impacts (City of Barcelona, 2019). Barcelona received more than 56 million visitors (tourists and excursionists) in 2017 (more than 150.000 per day, on average), with a significant concentration of the movements around the main touristic attractions (City of Barcelona, 2019). According to the strategic plan for tourism mobility each of these visitors makes almost 4 movements per day (600,000 in total and more than 40% using public transports), representing 10% to 15% of the displacements inside the city (City of Barcelona, 2018). As most of the tourists use the same tickets used by local residents (only 15% of the tourists use the tourist-oriented ticket), this also generates a relevant source of revenue for the local transport service, which is financed in very similar shares by public subsidies and revenues from ticket sales (Autoritat del Transport Metropolità, 2017). Finally, the promotion of the use of collective forms of transportation is also a central aspect of the strategic plan for urban mobility, which aims at reducing the utilization of private cars from 26% to 20% in the internal displacements (Metropolitan Area of Barcelona, 2019).

2. Material and methods

2.1. Sample

The study is based on data collected in a survey conducted by the Barcelona City Council in 2016 (Barcelona City Council, 2017). The survey aims to understand various aspects related to tourism in the city. Our study explores transportation mode choices, combining traveler characteristics (including personal information and travel information), travel motivations, means of transportation, and destination satisfaction. Finally, a total of 6032 questionnaires were employed in this study.

Table 1 lists the demographic information of the respondents. There were more males (62.10%) than females (37.90%). The majority (34.70%) were aged between 25 and 34. Combining with the groups

Table 1
Profile of travelers ($n = 6032$).

Variable	Category	Frequency	Percent
Sex	Male	3777	62.60%
	Female	2255	37.40%
Age	≤ 24	965	16.00%
	25–34	2096	34.70%
	35–44	1401	23.20%
	45–54	923	15.30%
	55–64	446	7.40%
	≥ 65	201	3.30%
Travel companion	Colleague/Friend/child	2072	34.40%
	Couple	2254	37.40%
	Individual travelers	1706	28.30%
Length of stay	Short trips (≤ 4 days)	2072	37.22%
	Medium trips (5–6 days)	2254	32.21%
	Long trips (≥ 7 days)	1706	30.57%
Repeat visit	New visitors	2850	47.20%
	Repeat visitors	3182	52.80%
Accommodation	Conventional accommodation	4172	69.20%
	Touristic apartments	1022	16.90%
	Houses of friends/family/others	838	13.90%

from 35 to 44 (23.20%) and 45 to 54 (15.30%), we had about 3/4 of the sample. The youngest group (less or equal to 24 years old) represented 16%, while the oldest groups had much lower representation (7.40% were aged between 55 and 64, and only 3.30% were aged older than or equal to 65). The travel companion is well distributed, with 34.40% traveling with children, friends, colleagues. 37.40% of traveling were couples, while 28.30% were traveling alone. Regarding the length of stay, the distribution is also well balanced, with 37.22% staying for a relatively short time (≤4 days), while 32.21% were middle time visitors (5–6 days) and 30.57% were staying for a relatively long time (≥7 days). As for visiting experience (repeaters), nearly half of the visitors (47.20%) were visiting Barcelona for the first time, while 52.80% of visitors reported that they have been to Barcelona before. Regarding their accommodation, 69.20% preferred conventional accommodation (hotels, hostels, or youth hostels), while 16.90% used touristic apartments and 13.90% were hosted by friends, family, or other acquaintances. Additionally, we found that 20.37% of the visitors came from English-speaking countries, 26.61% from Latin language-speaking countries, and the rest (53.02%) were from other countries.

Following the structure of the survey, this study considers three motivations for visiting Barcelona: professional motivation, leisure motivation, and personal motivation. Professional motivation includes participation in fairs, congresses, professional meetings, and other jobs, business, or travel incentives. As for leisure motivation, it covers sports events (to compete or as a spectator), cultural events, boarding or departing on a cruise ship, holidays or tourism. Personal motivation contains personal matters such as visiting family and friends, shopping, healthcare, medical treatment, and learning. In the survey, respondents chose a major motivation but they also stated whether they carried out a second activity. The results suggest that travelers often have more than one motivation to visit Barcelona.

This characteristic of the travelers was explored in our analysis as a new approach, by identifying how meaningful it would be to explore (and to model) the link between the main motivation and the second activity, in order to explore the implications on transportation choices and behaviors. Thus, we obtained nine different combinations of primary and secondary motivations (percentage of respondents chose in each combination): professional-only (9.90%) (The main motivation is professional, and the second activity is also professional, or they do not have a second activity); professional-leisure (12.48%) (First a professional motivation and leisure as a second activity), professional-personal (2.44%), leisure-professional (0.80%), leisure-only (54.38%), leisure-personal (11.07%), personal-professional (0.17%), personal-leisure (6.12%), and personal-only (2.65%) (Following the same logic).

Collective transports, private transports, and soft modes of mobility (non-motorized) are the three means of transportation travelers used in the city we are currently analyzing. About 2/3 of the travelers (66.71%) selected collective forms of transportation as their priority mode, while 28.10% of travelers preferred private transportation, and 5.19% were oriented to soft modes of transportation. Collective transportation refers to subways (used as a priority means of transportation by 53.56% of the travelers), trains, trams, funiculars, car cables, regular buses, touristic buses, or long-distance buses. Private transportation mainly involves taxis (grabbed by 25.03% of the travelers as a priority), auto caravans, private/rental cars, or car-sharing/pooling. Soft modes of transportation indicate private, rental, or shared bicycles (0.66% of travelers rent bicycles), private or rental motorcycles, or electric scooters. Regarding collective transportation, 38.69% of travelers are between 25 and 34 years old, followed by 35 to 44 years old (21.07%), less than 24 years old (19.16%), 45 to 54 years old (12.77%), 55 to 64 years old (5.67%), and over 65 years old (2.63%). Concerning private transportation, 29.68% of travelers are between 35 and 44 years old, followed by 25 to 34 years old (25.07%), 45 to 54 years old (21.53%), 55 to 64 years old (11.62%), less than 24 years old (6.78%), and over 65 years old (5.31%). As for soft transportation, 36.42% of travelers are between 25 and 34 years old, followed by less than 24 years old (25.24%), 35 to 44 years old (15.97%),45 to 54 years old (14.06%), 55 to 64 years old (6.71%), and over 65 years old (1.60%).

3. Theory and calculation

3.1. Conceptual framework

Our analysis aims at identifying the main determinants of collective transport choice in urban destinations, leading to a discussion and generalization of policy implications for urban planning and management. The analysis is focused on the "push" factors of transport choice (related to the characteristics of users), rather than "pull" factors (linked to the characteristics of transport services and infrastructures, which tend to be much more place-specific), as observed by Dann (1999). Also, we assume that the behavior of tourists does not necessarily reflect their values and choices for daily life actions, once the destination is normally perceived as a "non-ordinary place and time for the tourists", as defined by Jafari (1987) when reflecting on the differences of personal behaviors when at the place of residence or when doing the traveling. A similar observation is proposed by Hibbert et al. (2013), with a more specific focus on transportation issues.

Focusing on the personal attitudes, preferences, and behaviors of travelers, different studies have identified groups or segments of tourists regarding transport choices at the destination. Focusing on the choice between public transports and private cars, Anable (2005) identifies "malcontented motorists", "complacent car addicts", "die-hard drivers", "aspiring environmentalists", "carless crusaders", and "reluctant riders". More focused on the options between the train and private car, Dallen (2007) distinguishes "Road regulars", "Public Transport Reliants", "Train Enjoyers", "Train Tempted", "Anti Rail Riders", or "Content Car Drivers". In a more recent study, Barr and Prillwitz (2012) identity "addicted car users", "aspiring green travelers", "reluctant public transport users" and "committed green travelers". However, these authors (Prillwitz and Barr, 2011) also claim that segmentation analyses are not sufficient in order to achieve significant behavioral changes towards sustainable mobility.

Despite their limitations, these analyses contributed to understanding the importance of using different communication strategies and channels to address different types of tourists to implement strategies for the promotion of public (collective) means of transportation at the destination. As observed by Gronau and Kagermeier (2007), key factors for such a long-term strategy include improvements in the transparency and quality of the public transport service, restrictions to the use of private cars, and new ways of marketing. These authors also observe that an effective policy towards the utilization of public transports is

only possible when the potential users already reveal a disposition for this type of transportation. Le-Klähn et al. (2014) add to these concerns the importance of using social marketing techniques both before and after the arrival to tourist destinations. Le-Klähn and Hall (2015) also claim that, in general, terms, European cities have more developed public transport systems, thus being in a better position to promote the use of public transports among tourists. For these authors, the correct identification of target visitors is a crucial aspect for the implementation of successful communication strategies.

The main contribution of our work is to test a new hypothesis, according to which travel motivations (assuming professional, leisure, and personal as the 3 main motives and considering a primary and a secondary motivation) are better predictors than personal characteristics regarding the choice of public or collective means of transportation. This identification may constitute relevant information for urban tourism planners and managers in order to target adequate market segments when promoting the use of collective transports. For the purposes of our analysis - focused on the mobility within a destination - trains, trams, or buses are considered as collective means of transportation (including touristic buses, which are not exactly "public"), while cars are considered as individual means of transportation (including shared cars or taxis, which are not exactly "private"). Non-motorized modes (walking, bicycles, or electric scooter) are also considered. This classification takes into account the similar CO_2 emissions observed for each group of vehicles.

3.2. Calculation

Based on the aforementioned discussion, the research model is displayed in Fig. 1. For traveler characteristics, it includes personal information (sex, age, travel companion) and travel information (length of stay, visited Barcelona before, accommodation). There are three main types of motivations and three types of second activities, which together constitute 9 different types of travel motivations. 8 of 9 motivations were compared with the reference category: personal-only. Three means of transportation are discussed in this study: collective transportation and soft transportation compared with private transportation. Traveler characteristics, motivations, means of transportation are categorical variables. Satisfaction is an ordinal variable, which is rated on a five-point Likert scale from (1) strongly disagree to (5) strongly agree.

The associations between tourists' characteristics, motivation, and means of transportation were investigated by the multinomial logistic regression using SPSS Statistics 23.0 (IBM, New York, NY, USA). Additionally, means of transportation are linked to satisfaction, assessed by considering the general valuation of the city and also taking into consideration other aspects influencing the satisfaction with the destination. The links were analyzed with the ordinal logistic regression using SPSS Statistics 23.0 (IBM, New York, NY, USA).

4. Results

4.1. Multinomial logistic regression: the links between characteristics, motivations, and means of transportation

In this study, characteristics, motivations, and means of transportations are categorical variables, that is, independent variables and outcome variables are classified. Hence, this study applied multinomial logistic regression to predict the membership of categorical variables on dependent variables (Field, 2013; Starkweather and Moske, 2011). Hosmer et al. (2013) suggested that 10 samples per parameter would be suitable for the model. The conditions have been satisfactory since 6032 cases were analyzed in the current study. Additionally, the group whose motivation is personal-professional was relatively small and exclusively composed of males younger than 65, who did not travel as a couple or select touristic apartments/soft transportation. Except for the standard errors associated with these variables, all standard errors are less than 2.0 (Field, 2013).

Table 2 presents regression coefficients that predict motivations and means of transportation for each independent variable. Standard errors and significance levels are also included. Since multinomial logistic regression is a combination of binary regression, a certain reference is needed (Field, 2013). In the case of motivations, personal-only motivation was set as the reference, and for means of transportation, private transportation was selected.

The associations between characteristics, nine combinations of motivations, and means of transportation were verified. First, regarding gender, the odds ratio indicated that as gender changes from male to female, the change in the odds of the professional-only motivation compared to personal-only was 2.611. In other words, men who visited Barcelona are more likely to visit Barcelona for professional-only motivation than women, followed by motivations of professional-personal (2.512), professional-leisure (2.137), leisure-only (1.797).

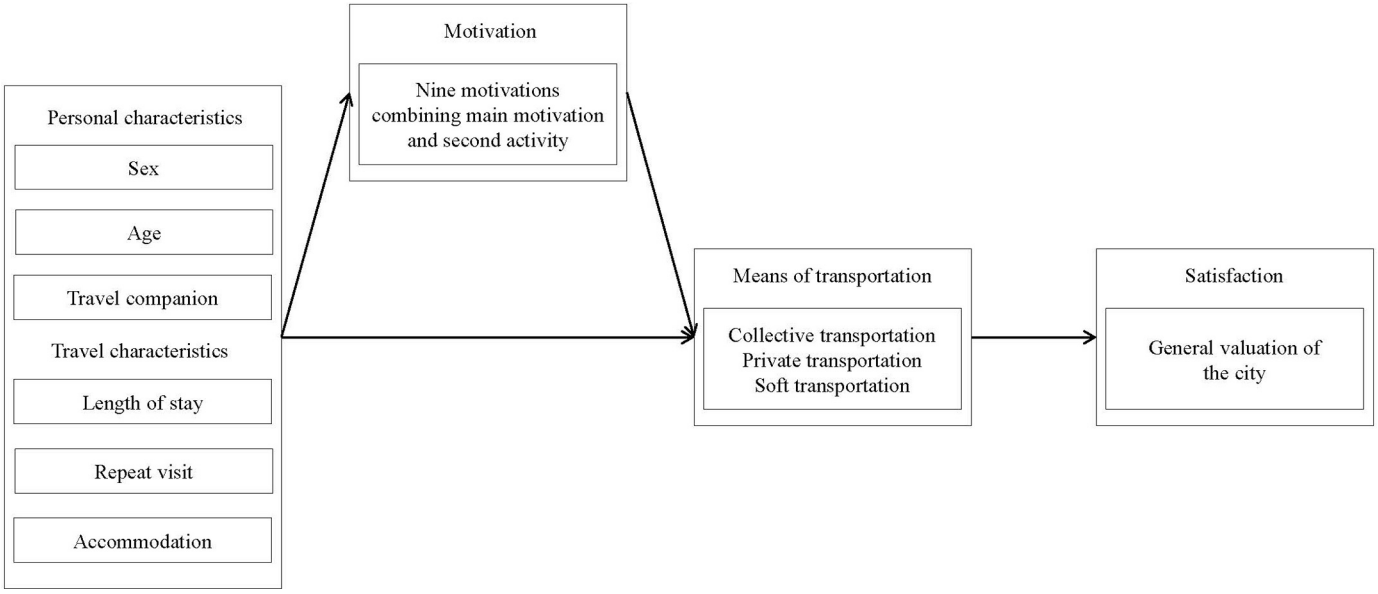

Fig. 1. The proposed research model of travel transportation.

Table 2
Results for characteristics and motivations associated with means of transportation.[a, c]

Variables	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Marginal Effects	Coefficient	Coefficient	Marginal Effects
	Professional-only	Professional-leisure	Professional-personal	Leisure-professional	Leisure -only	Leisure-personal	Personal-professional	Personal–Leisure	Motivations (Personal-only)	Collective transportation	Soft transportation	Transportation (Private)
Male	0.960**(0.198)	0.759** (0.188)	0.921**(0.252)	0.443(0.345)	0.586**(0.173)	0.104(0.182)	-[d]	−0.005(0.193)	−0.0116**	−0.193**(0.065)	−0.008(0.133)	0.0322**
Female	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	-[d]	0[b]	-[d]	0[b]	0[b]	-[d]
≤24	−1.891**(0.715)	−1.304* (0.637)	−1.929*(0.806)	−2.663*(0.1.288)	−0.009(0.560)	0.251(0.595)	-[d]	−0.453(0.600)	0.0094	1.767**(0.182)	2.529**(0.487)	−0.3256**
25–34	0.449(0.651)	0.541(0.609)	−0.214(0.719)	−0.063(0.833)	0.447(0.550)	0.481(0.584)	-[d]	−0.503(0.590)	−0.0048	1.132**(0.160)	1.527**(0.475)	−0.2357**
35–44	0.731(0.653)	0.547(0.612)	−0.154(0.720)	−0.804(0.865)	−0.206(0.554)	−0.096(0.591)	-[d]	−1.182(0.604)	0.0052	0.481**(0.160)	0.614(0.486)	−0.1093**
45–54	1.266(0.684)	0.803(0.646)	−0.188(0.764)	0.316(0.866)	0.127(0.590)	0.012(0.630)	-[d]	−0.161(0.633)	−0.0052	0.340*(0.165)	0.825(0.489)	−0.0842*
55–64	0.496(0.703)	0.480(0.661)	−0.376(0.791)	−0.657(0.966)	−0.349(0.602)	−0.396(0.647)	-[d]	−1.255(0.676)	0.0099	0.063(0.179)	0.652(0.515)	−0.0237
≥65	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	-[d]	0[b]	-[d]	0[b]	0[b]	-[d]
Colleague/Friend/child	0.492*(0.237)	0.819**(0.234)	0.651*(0.282)	0.064(0.496)	1.347**(0.225)	0.859**(0.236)	−0.171(0.843)	0.353(0.251)	−0.0227**	−0.303**(0.079)	−0.631**(0.160)	0.0630**
Couple	−2.818**(0.375)	−0.880**(0.260)	−1.366**(0.411)	0.902*(0.411)	1.878**(0.234)	1.001**(0.246)	- [d]	0.304(0.266)	−0.0228**	0.328**(0.082)	−0.071(0.161)	−0.0507**
Individual travelers	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	-[d]	0[b]	0[b]	-[d]
Short trips	0.366(0.221)	−0.497*(0.212)	0.025(0.275)	−0.907*(0.427)	−0.120(0.194)	−0.537**(0.205)	−2.487*(1.084)	−0.216(0.218)	0.0059	−0.384**(0.076)	0.395*(0.164)	0.0607**
Medium trips	0.467(0.272)	0.517*(0.255)	0.519(0.326)	0.285(0.408)	0.473(0.242)	0.125(0.251)	−1.358(1.094)	0.365(0.265)	−0.0078	−0.057(0.080)	0.430*(0.176)	0.0049
Long trips	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	-[d]	0[b]	0[b]	-[d]
New visitors	−0.334(0.236)	0.565*(0.220)	−0.762*(0.327)	1.237**(0.362)	1.274** (0.208)	0.928**(0.217)	1.152(0.732)	0.633** (0.231)	−0.0187**	0.448**(0.064)	0.163(0.131)	−0.0773**
Repeat visitors	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	-[d]	0[b]	0[b]	-[d]
Conventional accommodation	3.210**(0.269)	3.271**(0.267)	1.525**(0.283)	1.987** (0.534)	2.108**(0.202)	0.479*(0.208)	0.538(0.735)	−0.280(0.224)	−0.0592**	−0.731**(0.106)	−0.640**(0.189)	0.1242**
Touristic apartments	2.090** (0.412)	2.761**(0.379)	0.950*(0.475)	1.137(0.755)	2.304**(0.321)	0.364(0.337)	-[d]	0.138(0.354)	−0.0571**	−0.051(0.134)	−0.171(0.242)	0.0087
Houses of friends/family/others	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	-[d]	0[b]	0[b]	-[d]

[a] The reference category: personal-only and private transportation.
[b] This parameter is set to zero because it is redundant.
[c] Standard errors are in parentheses.
** $p < .01$.
* $p < .05$.
[d] The response variable does not contain this category.

Regarding transportations, as gender changes from male to female, the change in the odds of selecting collective transportation compared to private transportation is 0.824. That is, males are less likely than females to use collective transportation.

Young travelers (age $\leq$ 24) are less likely than old travelers (age $\geq$ 65) to visit Barcelona motivated by professional reasons. As age changes from young travelers to old travelers, the change in the odds of the leisure-professional motivation compared to personal-only was 0.070. In other words, old travelers are more likely than young travelers to visit Barcelona for leisure-professional (1/0.070 = 14.286), followed by professional-personal (1/0.145 = 6.897), professional-only (1/0.151 = 6.623), and professional-leisure (1/0.271 = 3.690) compared to personal-only motivation. Considering transportation, young and middle-aged travelers (age $\leq$ 54) are more likely than old travelers (age $\geq$ 65) to use collective transportation. Additionally, the young generation ($\leq$34 years old) is more likely to try soft transportation (walking, bicycles, or electric scooter).

Compared with individual travelers, travelers companioned by colleagues, friends, or children who visited Barcelona are more likely for leisure-oriented main motivations (leisure-only (3.845) and leisure-personal (2.362)) and professional-oriented main motivations (professional-leisure (2.269), professional-personal (1.918), and professional-only (1.635)). Couples are also more likely for leisure-oriented main motivations (leisure-only: 6.539, leisure-personal: 2.720, and leisure-professional: 2.465) than individuals, while couples are less likely for professional-oriented main reasons (professional-only: 0.060, professional-personal: 0.255, and professional-leisure: 0.415). Regarding transportations, travelers with colleagues, friends, or children are less likely than individuals to select collective transportation (0.739) or soft transportation (0.532). However, couples are more likely to use collective transportation (1.388).

When the length of stay changes from short trips to long trips, the change in the odds of personal-professional motivation compared to personal-only was 0.083. In brief, short trip travelers who visited Barcelona are less likely than long trip travelers for personal-professional (0.083), followed by leisure-professional (0.404), leisure-personal (0.585), and professional-leisure (0.609). The only significant relationship between the middle trip and travel motivation can be found for professional-leisure motivation (1.677). Short trip travelers (0.681) become less likely than long trip travelers to select collective transportation. However, both short trip (1.485) and middle trip (1.537) travelers may choose soft transportation.

Visit experience has diverse relations with motivations and means of transportation. As visit experience changes from new visitors to repeat visitors, the change in the odds of leisure-only motivation compared to personal-only was 3.573. New visitors are more likely for leisure-involved motivation than repeat visitors, followed by motivations of leisure-professional (3.446), leisure-personal (2.530), personal-leisure (1.883), and professional-leisure (1.759). They are less likely than repeat visitors to visit Barcelona for professional-personal motivation (0.467). Surprisingly, new visitors reveal higher preferences for collective transportation (1.566) than those who already are repeat visitors.

Finally, this study looked at possible links between accommodations and motivations. Conventional accommodation is more preferred by professional-leisure travelers (26.348) than acquaintance residential (friends, families, or others), followed by motivations of professional-only (24.778), leisure-only (8.233), leisure-professional (7.293), professional-personal (4.593), and leisure-personal (1.615). Touristic apartment is also more likely than acquaintance residential to be selected by professional-leisure travelers (15.823), leisure-only travelers (10.017), professional-only travelers (8.083), and professional-personal travelers (2.585). Travelers who stayed at conventional accommodations are less likely to take collective transportation (0.481) or soft transportation (0.528).

Professional-oriented travelers are more likely not to choose collective transportation (professional-only: 0.284, professional-personal: 0.406, and professional-leisure: 0.527). However, the odds ratios of leisure (personal-leisure: 2.048 and leisure-only: 1.785) indicate that leisure-involved travelers are more likely to use collective transportation than personal-only travelers. Similar to collective transportation, soft transportation is less likely to be selected for professional-oriented travelers as well (professional-personal: 0.085, professional-only: 0.194, and professional-leisure: 0.354). The findings indicated that professional-oriented visitors enjoy private transportation, may because private transportation saves time on professional matters (such as attending meetings or conferences). When people's purpose is leisure, they usually visit many places, hoping to effectively and economically reach various tourist spots. Collective transportation makes it easy for travelers to explore destinations on an optimistic budget.

As indicated by Greene (2003), calculating marginal effects can help to better understand the research model, by clarifying the associations between variables. In general terms, the marginal effects calculated (using the packages nnet, margins, MASS, and mfx for R) revealed relatively low scores for the variables relating to characteristics of tourists with travel motivation or transport choice (Table 2). For the links between characteristics and means of transportation, the only case where the marginal effects are above 10% refer to the relations between private transport choice and preference for a conventional tourism accommodation (12.42%) and, with a negative sign, regarding the age of tourists (−32.56% for the visitors below 25 years old and −23.57% for the tourists between 25 and 34 years old). It is noteworthy that both characteristics (utilization of conventional forms of accommodation and age) are related to the professional motive, as also shown in Table 2.

The scores obtained for the marginal effects of the variables defining the relationships between travel motivations and choice of transport mode clearly confirm our main hypothesis, stating that travel motivations are a better predictor for the preference for collective transports than characteristics of tourists. In a first observation, it is visible in Table 3 that a significant positive sign for the marginal effects is only found when the professional motive is present, which constitutes the first confirmation of our hypothesis. Moreover, the preference for private transports is still very high (but it decreases significantly) when comparing the score for the marginal effect of professional as the only motivation to travel (30.88%) with the scores obtained when professional is the primary motive but it is combined with personal motivations (23.63%) or leisure (15.61%). Finally, if the professional is a

Table 3
Results for motivations associated with means of transportation.[a, c]

Variables	Coefficient	Coefficient	Marginal Effects
	Collective transportation	Soft transportation	Transportation (Private)
Professional-only	−1.258**(0.198)	−1.641**(0.379)	0.3088**
Professional-leisure	−0.640**(0.193)	−1.038**(0.352)	0.1561**
Professional-personal	−0.901**(0.244)	−2.461**(0.779)	0.2363**
Leisure-professional	−0.051(0.361)	−0.825(0.812)	0.0250
Leisure-only	0.580**(0.184)	−0.157(0.317)	−0.0930*
Leisure-personal	0.261(0.200)	−0.197(0.352)	−0.0420
Personal-professional	0.071(0.713)	-[d]	0.0125
Personal-leisure	0.717**(0.227)	0.496(0.376)	−0.1195**
Personal-only (reference category)	0[b]	0[b]	-[d]

[a] The reference category: private transportation.
[b] This parameter is set to zero because it is redundant.
[c] Standard errors are in parentheses.
** $p < .01$.
* $p < .05$.
[d] The response variable does not contain this category.

secondary motivation, these marginal effects are even smaller (and not significant), although they keep a positive sign (2.50% when leisure is the main motivation and 1.25% when personal reasons are the main motive). This positive sign is not found when the combinations of motivations do not include the professional motive. In fact, significant negative signs (suggesting a preference for collective transports) are found for the travelers exclusively motivated by leisure or combining leisure with personal reasons for the trip.

From this set of results, it is possible to infer that, not only the professional motive has a clear and very significant impact on the preference for private transport, as its combination with other motives reduces this impact. Thus, although there are personal and trip characteristics which also appear as a strong predictor of preference for private transport - age of tourists, travel companion, or type of accommodation - these characteristics are related to the professional motive, both when this is an exclusive trip motivation and also when it is combined with other motives (couples or the youngest travelers do not visit Barcelona for professional reasons). From this, we can also infer that: the main reason to justify the transport choices is the professional motive; the importance given by professional travelers to these forms of transportation reduces when other motives are involved, suggesting that private transports are used for professional movements, while other forms of transport are used for the mobility-related to other motives.

4.2. Ordinal logistic regression: the links between means of transportation, satisfaction with different aspects of the city, and overall trip satisfaction

After identifying the main determinants for the choice of collective transports, we test whether this preference has an impact on the satisfaction with the trip. In particular, we test if the utilization of collective transports (eventually less comfortable, flexible, and fast) implies a reduction in satisfaction with the visit to the city of Barcelona. However, we assume that the assessment of the determinants of trip satisfaction is a complex problem requiring the consideration of a wide range of factors, as testified by Pizam et al. (1978) in their early assessment. Other complex models establish a link to the concept of loyalty (Yoon and Uysal, 2005) or focus on specific aspects, like destination image (Chi and Qu, 2008) or cultural heritage (Romão et al., 2015). In this case, we focus exclusively on the potential particular impacts of transport choice on the satisfaction with the trip, as revealed by the tourists, by using a relatively simple ordinal logistic regression.

In this study, the assessment of different aspects of the city contributing to trip satisfaction was answered on a five-point Likert scale, ranging from (1) strongly agree to (5) strongly disagree (which is defined as the reference category). Since satisfaction is evaluated on an ordinal scale (Wu and Leung, 2017), this study employed the ordinal logistic regression (Ashby et al., 1989) to explore the links between means of transportation, satisfaction with different aspects of the city, and overall trip satisfaction. The prediction model indicates goodness of fit to the observed data ($p < .001$). The non-significant results of Deviance and Pearson chi-square tests also show that the model fits the data well (Field, 2013; Petrucci, 2009). The assumption has been satisfied because the test of parallel lines is not significant ($p = .268$). In this study, 38.89% of travelers are satisfied with the city, and 59.67% are strongly satisfied. Overall, they were happy with the trip to Barcelona. The results of ordinal logistic regression are shown in Table 4, also including the estimation of the direct impact of collective transport choice on the overall trip satisfaction.

First, the results of ordinal logistic regression confirmed the effects of means of transportation on urban satisfaction. Compared with private

Table 4
Results for means of transportation and other aspects associated with trip satisfaction.[a]

Variables	Coefficient	SE	OR	Variables	Coefficient	SE	OR
Collective transportation	0.471**	0.070	1.602	Soft transportation	0.090	0.145	1.094
Entertainment = 1	0.935	0.840	2.547	Kindness = 1	2.881**	0.642	17.826
Entertainment = 2	0.634	0.840	1.886	Kindness = 2	2.156**	0.641	8.638
Entertainment = 3	0.272	0.853	1.312	Kindness = 3	1.487*	0.647	4.423
Entertainment = 4	0.156	1.095	1.168	Kindness = 4	0.319	0.733	1.376
Hotels/Accommodations = 1	0.768*	0.371	2.156	Collective transport = 1	1.052*	0.482	2.862
Hotels/Accommodations = 2	0.293	0.370	1.341	Collective transport = 2	0.708	0.482	2.029
Hotels/Accommodations = 3	0.162	0.380	1.175	Collective transport = 3	0.421	0.498	1.523
Hotels/Accommodations = 4	−0.189	0.461	0.828	Collective transport = 4	0.169	0.602	1.184
Catering = 1	1.635**	0.558	5.127	Citizen security = 1	0.609	0.436	1.839
Catering = 2	0.945	0.558	2.574	Citizen security = 2	0.432	0.436	1.541
Catering = 3	0.540	0.568	1.717	Citizen security = 3	0.287	0.447	1.332
Catering = 4	−0.015	0.671	0.985	Citizen security = 4	0.487	0.513	1.627
Shops = 1	0.342	0.966	1.408	Noise = 1	0.473	0.242	1.604
Shops = 2	0.066	0.964	1.068	Noise = 2	0.282	0.229	1.325
Shops = 3	0.049	0.970	1.050	Noise = 3	0.091	0.231	1.095
Shops = 4	0.065	1.149	1.068	Noise = 4	−0.154	0.255	0.858
Business hours = 1	−0.443	0.546	0.642	Air quality = 1	0.808*	0.357	2.242
Business hours = 2	−0.493	0.546	0.611	Air quality = 2	0.539	0.352	1.714
Business hours = 3	−0.682	0.555	0.506	Air quality = 3	0.409	0.355	1.505
Business hours = 4	−0.760	0.648	0.467	Air quality = 4	0.338	0.391	1.402
Signage/access =1	0.978*	0.394	2.660	General cleaning = 1	0.989*	0.499	2.689
Signage/access =2	0.625	0.393	1.868	General cleaning = 2	0.769	0.496	2.158
Signage/access =3	0.405	0.401	1.500	General cleaning = 3	0.295	0.500	1.343
Signage/access =4	0.243	0.468	1.276	General cleaning = 4	−0.669	0.564	0.512
Beaches of Barcelona = 1	0.712	0.475	2.038	Information/tourist offices = 1	−1.875	0.997	0.153
Beaches of Barcelona = 2	0.766	0.477	2.151	Information/tourist offices = 2	−1.884	0.998	0.152
Beaches of Barcelona = 3	0.870	0.486	2.386	Information/tourist offices = 3	−1.845	1.007	0.158
Beaches of Barcelona = 4	0.326	0.546	1.386	Information/tourist offices = 4	−2.997**	1.076	0.050
Transport infrastructures = 1	−0.116	0.702	0.890	Accessible for people with limited mobility =1	0.066	0.407	1.068
Transport infrastructures = 2	−0.500	0.702	0.606	Accessible for people with limited mobility =2	0.211	0.408	1.235
Transport infrastructures = 3	−0.479	0.710	0.620	Accessible for people with limited mobility =3	0.097	0.415	1.102
Transport infrastructures = 4	−0.254	0.816	0.775	Accessible for people with limited mobility =4	−0.032	0.468	0.969

Link function: Logit.
[a] SE: standard error, OR: odds ratio.
** $p < .01$.
* $p < .05$.

transportation (assumed as the reference category in our regression), collective transportation has a stronger positive and significant prediction for urban satisfaction (0.471), indicating that most travelers enjoyed collective transportation. Specifically, the relation shows that visitors using collective transportation are more likely to be satisfied with the city. Because of the positive association of satisfaction with collective transportation, it would be necessary to try to enhance travelers' satisfaction by considering the collective transport situation in Barcelona. Improving the collective transport situation involves understanding the elements of transport quality, such as transport policies (Pérez et al., 2017). Thus, our analysis allows us to perceive that the choice for collective transports, not only does not exert a negative impact on satisfaction, as it is perceived as a factor positively contributing to the satisfaction achieved with the visit to the city of Barcelona. It is also noteworthy that the impact of the preferring soft modes of transportation is also positive (0.090), although it is not statistically significant.

Second, the results indicated that the higher the collective transport satisfaction, the higher the trip satisfaction it can lead. When collective transport is strongly satisfied, the odds ratio is highest (2.862). As the satisfaction degree continues to decrease, the odds ratio also decreases, which indicates that the probability of improving trip satisfaction decreases. Additionally, we can also observe that the significant positive impact of collective transport on the overall trip satisfaction is more important than aspects like entertainment or shopping environment, which do not exert a statistically significant impact.

5. Discussion and conclusion

By taking into account socio-demographic features of travelers, characteristics of the trips undertaken and a combination of primary and secondary motivations to visit the city of Barcelona, we developed a model to identify the determinants of the preference for the utilization of collective means of transportation, along with its implications on the satisfaction achieved with the visit to the destination. The detailed analysis of the travel motivations (with a primary and a secondary reason) and the links between transport choices, personal and travel characteristics, and trip satisfaction constitute the original contributions of this analysis. The focus on the specific determinants on the users of collective transports is possible due to the large share of tourists (almost 2/3) preferring this mode of transportation (in this case, mostly the subway).

It would be also interesting to proceed to a similar analysis of the users oriented to soft transport modes, but the concerning share is relatively low (5%), implying that only a very small sample could be observed. However, it is possible to observe that younger visitors (under or equal to 24 years old) with leisure motivations are those with higher motivation for this type of mobility, mostly when the duration of travels is short or medium (eventually related to budgetary restrictions of young travelers). This is a matter for further research, considering the environmental benefits of these transport modes in the urban context (Pérez et al., 2017).

It was clearly identified that traveling for professional purposes is directly related to the preference for individual means of transportation (mostly taxis), which constitute the priority choice for almost 30% of the tourists visiting Barcelona. This result suggests that, although this segment of the touristic market is generally perceived among those generating higher economic benefits for the destinations, it also corresponds to the highest contributions for road congestion and CO_2 emissions through transports. Once this is an important market segment, not only for the tourism sector itself but also for the rest of the local economies, policy and managerial focus on the collective transport systems and related information channels oriented for these travelers appears as a crucial aspect in terms of urban transport policies. It was also found that male travelers tend to prefer private means of transportation in comparison with female visitors, but this appears to be related to the higher proportion of men within the group of tourists with professional motivations for the trip.

Moreover, it was also found that a longer duration of the visit to Barcelona contributes to increasing the priority preference for collective transports, even when referring to tourists combining the professional motive with other motivations (personal or leisure). This result suggests that the preference for an individual means of transportation is related to the scarce time (low time-budget) available at the destination, rather than the personal characteristics of the professional travelers. Travelers with similar characteristics and combining the professional motive with other types of motivation tend to reveal different behaviors (more oriented to the utilization of collective means of transportation) when the duration of their visit is longer.

This analysis is only possible by considering the combinations of primary and secondary motivations for travel assumed in our model and the clear differences in the results obtained when professional is the only motivation for traveling, when is the primary motive but it is combined with other, or when it is a secondary motive. Once there are no significant differences in personal characteristics with impacts on transport choice among the members of these different groups, the results clearly suggest a shift in the transport choice when the movements of tourists relate to professional reasons or when mobility has other motives. Although our results are clear in this aspect (in particular when looking at the marginal effects presented in Table 3), a more detailed observation of transport choices in different moments of the trips and with different motives may constitute an interesting aspect for further research, mostly if it is possible to consider information based on GPS tracking systems.

It was also observed that new visitors are mostly motivated by leisure activities (often combined with professional and personal motives, though) and they tend to prefer collective forms of transportation, thus suggesting that the existing collective transport networks and information channels are effective, even for persons who do not know the city. The results are consistent with previous research (Garcia-Sierra et al., 2018) that good public transport connections make travelers more willing to use public transport. It was also observed that the youngest and mid-aged tourists are more oriented to the utilization of collective means of transportation than older travelers. Moreover, the youngest visitors are also those with higher motivation for the utilization of non-motorized forms of transportation, which may suggest a significant change in urban tourism mobility in the near future.

The findings of this research provide new insights into the role of collective transport in improving traveler satisfaction of the city. So far, there is limited awareness of collective transportation as a predictor of travelers' attitudes towards cities. Our results clearly show that the preference for collective transports, not only does not imply a reduction in trip satisfaction, as it contributes to increasing it. This interesting result also shows that new models for a comprehensive assessment of trip satisfaction should include aspects related to the choice and utilization of different means of transportation, which is clearly a further development of this work. Advocating collective transportation also brings health and environmental advantages by increasing physical exercise, reducing pollution and traffic congestion, and creating employment opportunities (Mindell, 2014; Pérez et al., 2017).

High levels of satisfaction with the experience at the destination are achieved when visitors give priority to the use of collective forms of transportation. This study found that the utilization of collective transports has a higher contribution to trip satisfaction than entertainment or shopping environments. Thus, it seems clear that adequate collective transport infrastructures and services, supported by appropriate information provided by effective channels may ensure the mobility of urban tourists while contributing to a highly satisfactory visit. Consequently, the challenge for urban tourism transport policies seems to be to enlarge the attractiveness of collective transports for professional travelers, by ensuring that mobility can be done within the time restrictions of these travelers.

It should be noted, however, that the city of Barcelona has a highly developed network of collective transports, comprising an extensive subway line, complemented by buses and funiculars, with appropriate intermodal connections, also with suburban or regional networks (including trains). Additionally, communication in several languages has been developed in different channels (mostly after the organization of the Olympic Games in 1992), along with flexible solutions for ticketing (like packages of 10 tickets for any kind of route with very low cost). Thus, the results obtained in this particular case are not necessarily the same as those obtained in other cities. However, the lack of prior knowledge of the city and the expectations of highly satisfied visits are perfectly compatible with the use of collective means of transportation. It is also possible to point out that the presence of large numbers of tourists in local collective transport networks may have negative implications on the congestion of these services and infrastructures, thus implying negative implications on the daily mobility of local residents. In this sense, the promotion of non-motorized forms of mobility appears as another crucial aspect of tourism transport policies, which requires further research.

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Author statement

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Conflicts of interest

The authors declare no conflict of interest.

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