



## Travelling with Dogs: Modelling Tourist Profiles through Attitudes and Behaviours

### Viajando con perros: modelización de los perfiles de los turistas a través de actitudes y comportamientos

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#### Abstract

Dogs influence holiday planning when families travel with their pets and directly impact the services they consume at destinations. This research aims to determine the relationship between the attitudes and behaviours expressed by tourists who own dogs and the sociodemographic characteristics of this type of tourists' profiles (e.g. educational level, income, age and gender). The data is based on a survey of 21 Likert questions about perceptions and thoughts regarding dog owners' tourism in Spain. An artificial neural network is developed to estimate a "tourist profile" based on inputs from the predetermined Likert scale replies to the questionnaire. This model can also assess the variations produced through the Likert scale questions in every characteristic of the tourist's profile. Key findings reveal that factors like allowing dogs to sleep in the same room, access to dog-friendly accommodations, and emotional motivations significantly shape tourist profiles. These insights can help destinations and tourism businesses better tailor their services to the needs of dog-owning travellers.

**Keywords:** Travelling with pets, multilayer perceptron, artificial neural networks, dog-friendly tourism, tourists' profiles, pets.

#### Resumen

Los perros influyen en la planificación de las vacaciones, e impactan directamente en los servicios que consumen en destino. Esta investigación tiene como objetivo determinar la relación entre actitudes y comportamientos expresados por los dueños de perros con este tipo de perfil de turista (nivel de estudios, renta, edad y género). Se emplean datos obtenidos a través de una encuesta con 21 preguntas tipo Likert sobre percepciones y pensamientos acerca del turismo de dueños de perros en España. Se desarrolla una red neuronal artificial para estimar un "perfil de turista" basado en las respuestas obtenidas de las preguntas tipo Likert. Este modelo también puede determinar las variaciones producidas a lo largo de la escala Likert para cada variable del perfil sociodemográfico. Dejar dormir a los perros en la misma habitación, alojamientos "dog-friendly" y motivaciones emocionales determinan el perfil del turista. Esto puede ayudar al destino y a las empresas turísticas a configurar mejor sus servicios a las necesidades de los dueños de perros viajeros.

**Palabras clave:** viajando con mascotas, perceptrón multicapa, red neuronal artificial, turismo dog-friendly, perfiles de turistas, mascotas.

#### 1. Introduction

The bond between humans and dogs has grown stronger, leading to an increase in family dog ownership. In Spain, approximately a quarter of households, equating to about six million families, have a dog (Diario de Sevilla, 2022), highlighting the growing role of dogs in daily human life (Carr & Cohen, 2009; Chen, Peng, & Hung, 2014; Dotson, Hyatt, & Clar, 2011). Dogs are considered pets, e.g. animals that live in human homes, are not consumed as food and are given names by their families (Zhang, 2012). The presence of pets, especially dogs, positively impacts the lives of their owners, enhancing physical and mental well-being (Dotson & Hyatt, 2008; Greenebaum, 2004; Kirillova, Lee, & Lehto, 2015). Consequently, dogs become integral family members. This relationship entails significant financial commitments, with average annual expenses of around 1,200 euros, indicating a notable economic impact on the family budget (Cavanaugh, Leonard, & Scammon, 2008).

Like children, dogs significantly influence family holiday planning, often excluding trips to secondary residences (Chen, Hung, & Peng, 2011; Kirillova *et al.*, 2015). In many cases, travel becomes a shared activity between humans and their pets (Ivanov, 2018; Ying *et al.*, 2021), with dogs partaking in various services at the destination (Hung, Chen, & Peng, 2012; Ivanov, 2018). This dynamic notably impacts accommodations, prompting numerous destinations to rebrand themselves as "pet-friendly" to attract tourists travelling with their dogs or pets (Ying *et al.*, 2021). Implementing comprehensive pet-friendly policies in hotels enhances guest satisfaction and serves as a strategic differentiator in the competitive hospitality market (Koufodontis & Melissourgou, 2024).



The growing trend of families travelling with their dogs requires businesses in these destinations to analyse the needs and behaviours of such families and their pets to decide whether to accommodate these tourists and their dogs and how to provide the best services to them (Buhalis & Chan, 2023; Carr & Cohen, 2009; Ramos-Ruiz *et al.*, 2024). These decisions, particularly regarding pet-friendly accommodations, can positively and negatively impact the destination (Han *et al.*, 2024). On the one hand, meeting the expectations of these tourists can lead to higher guest satisfaction, encouraging repeat visits and fostering positive word-of-mouth recommendations. Tourists with a high level of satisfaction are more likely to choose and recommend the destination again, thanks to their positive experience and memories (Çevrimkaya & Zengin, 2023). On the other hand, accommodating guests with dogs may lead to higher cleaning and maintenance costs, noise or other disturbances, complaints, allergy and safety concerns (Koufodontis & Melissourgou, 2024). To maximise the positive and minimise the negative impacts, destinations and service providers must know the expectations and attitudes of tourists travelling with dogs.

Although there is a growing number of studies on travelling with pets, there is still a gap in the literature, namely, if and how sociodemographic characteristics of dog owners influence their attitudes and behaviour as tourists. On the other hand, there is a scarcity of research on the "travel-with-pets" phenomenon employing advanced statistical techniques like structural equation modelling (Chen, Peng & Hung, 2013; Hung, Chen & Peng, 2016; Peng, Chen & Hung, 2014; Wu & Cheng, 2020; Ying, Tang, Wen, Ye, Zhou & Li, 2021). Artificial neural networks (ANNs) have been successfully utilised to profile gastrotourists (Moral-Cuadra, Solano-Sánchez, Menor-Campos, & López-Guzmán, 2021), attendees of flamenco shows (García-García, Solano-Sánchez, Muñoz-Fernández, & Moral-Cuadra, 2021), virtual tourism users (Martín-Martín *et al.*, 2023) and film tourists (Aguilar-Rivero *et al.*, 2024). However, no studies have applied this technique to the "travel-with-pets" context, representing a second gap this research aims to address.

Considering these gaps, this research explores the relationship between the attitudes and behaviours expressed by tourists who own dogs and their sociodemographic variables (e.g., educational background, income, gender and age). To do this, we use a dataset of dog-owning tourists' responses. A multilayer perceptron (MLP) (Rumelhart, Hinton, & Williams, 1986), which is a type of artificial neural network (ANN), was developed to estimate tourist profiles based on inputs from a pre-designed Likert-scale questionnaire. The ANN takes the respondents' answers as inputs and predicts their sociodemographic characteristics as outputs. It also helps identify how variations in their responses (based on the Likert-scale questions) relate to different aspects of their profiles.

This approach is useful in understanding how travelling with pets, namely dogs, influences tourists' attitudes and behaviours. The insights can help make destinations more pet-friendly. The model and findings presented in this study can also be valuable for professionals and businesses focused on dog-friendly tourism. By understanding potential client profiles and preferences, they can better tailor their products and services, especially since this type of information is currently lacking in the literature. To achieve the latter, this work is structured as follows: first, a literature review regarding travel with pets is made, next, the methodology followed considering survey and statistical procedures, then results, and its comparison with previous literature (discussion), and finally, the conclusions reporting aim achievement, theoretical and practical implications, limitations and futures lines of research.

## 2. Literature review

### 2.1 Travelling with pets

It is increasingly common for families to travel with their pets on their holidays. Dashper (2020) pointed out that going on a holiday with pets is similar to holidaying with another family member because of the emotions and feelings of companionship. Literature has approached the important role that animals play in families' lives, especially in moving them across countries in the decision to emigrate (Marchetti-Mercer, 2019). The growing emotional bond between families and their dogs increasingly influences travel behaviour, positioning pets as central figures in tourism decision-making (Marmolejo-Martín *et al.*, 2023). Consequently, there is a latent need to study the relevance of pets in the tourism and leisure experience (Dilek, Dilek, & Fennell, 2020). It is crucial to examine how dogs influence the consumption of certain products on these family trips and the travel planning itself (Peng, Chen, & Hung, 2014).

Many studies have analysed how pets travelling with their owners in different countries, including in Australia (Carr & Cohen, 2009), Taiwan (Chen *et al.*, 2014; Hung, Chen, & Peng, 2016; Peng *et al.*, 2014), the United Kingdom (Chen, Peng, & Hung, 2013), Canada (Taillon, MacLaurin, & Yan, 2015), China (Ying *et al.*, 2021), the United States (Dotson *et al.*, 2011; Kirillova *et al.*, 2015), and Turkey (Dilek, Dilek, & Fennell, 2020). This research shows the results of a study carried out in Spain. The scientific literature determines the need to analyse this type of travel from the perspective of supply and demand to consider the positive and negative implications of the destinations concerning this family category, made up of humans and pets. Furthermore, it is necessary to understand these non-human travellers' wishes, limitations and needs and their relationship with their human travellers (Dashper, 2020).

This leads to investigating the relationship between individuals or families who travel with their pets and their interrelationship with those who do not travel with pets. In this sense, research has been conducted to segment hotel establishments into dog-owning and non-dog-owning guests (Zhang, 2012). Likewise, research has also been carried out on the possibility of creating dog-



friendly spaces in hotel establishments (Ivanov, 2018). Along with the accommodation, it is also necessary to study the destination itself as a whole and determine what type of services are offered by restaurants, shopping centres or parks in a specific destination (Kirillova *et al.*, 2015) and determine the value, both intrinsic and extrinsic, of the destination (Bayraktaroglu & Kozak, 2022).

Although there are a large number of difficulties that constrain a trip with a dog, among which would be the evident shortage of accommodation (Taillon *et al.*, 2015), these barriers can also be presented as an opportunity for hotel accommodation because adapting their policy towards accepting pets can consequently increase their income per room (Kirillova *et al.*, 2015; Zhang, 2012). It is common to charge a supplement called a pet fee (Zhang, 2012), which contributes to the assumed higher cost of cleaning a room where a dog sleeps with their family (Zhang, 2012).

Among the characteristics that must be taken into account within the topic of travelling with pets, the following can be highlighted (Ivanov, 2018): first, pets are not participants in the decision-making of the travel; second, they do not participate in the decision of what services are consumed at the destination; third, pets do not pay for the trip; and fourth, the evaluation of satisfaction at the destination corresponds exclusively to humans and not to pets, although satisfaction will naturally be higher if the family perceives that a dog is enjoying a destination.

### **2.2 Tourist destination and accommodation**

A tourist destination is made up of the sum of different elements of attraction for the traveller. Thus, attributes are an important source of distinction in recognising a destination's brand (Truong, Lenglet, & Mothe, 2018). They significantly influence the tourist's decision-making process, affecting choices such as destination selection, length of stay, types of activities, and overall satisfaction with the experience (Abou-Shouk *et al.*, 2024). Consequently, it is necessary to identify these characteristic elements to motivate the traveller's choice of a tourist destination because these attributes justify the choice (Tsai, 2012). These characteristics are also the main elements of a memorable experience on the trip (Kim, 2014).

It is essential to distinguish between two types of destination satisfaction assessments: one that takes a general, emotionally driven approach (Correia, Kozak, & Ferradeira, 2013; Tiwari *et al.*, 2023) and another that evaluates satisfaction based on specific destination attributes (Uslu *et al.*, 2024). This last evaluation is based on tourists' expectations as consumers, which adds to the pets' consumption at the destination. The literature presents different items of a destination's assessment to define and specify those constructs that synthesise them (López-Guzmán, Uribe Lotero, Pérez-Gálvez, & Ríos Rivera, 2017). The satisfaction evaluation contributes to shaping the quality of the services and products offered to tourists and their dogs and the trip experiences, consequently modifying the patterns to establish effective strategies in a certain destination (Yoon & Uysal, 2005). Thus, if there were an increase in the tourists' satisfaction concerning these attributes, then this would imply a level of global satisfaction growth, resulting in an increment in tourists' loyalty towards that particular destination (Yoon & Uysal, 2005).

In addition to the needs of families who visit a specific place with their pets, it is essential to evaluate what activities the dogs could carry out at the destination (Carr, 2017) and how the development of these activities could affect other people, the fauna and/or the flora of the place (Bessa, Blumstein, Samia, & Geffroy, 2019; Carr, 2017). The services that the dogs must receive in a destination are evaluated by their owners, and they are mainly based on the study of the type of attractions and places of recreation for the pet and, especially, the accommodation analysis (Dashper, 2020).

In this sense, it is necessary to analyse how the companies that work in the destination adapt to this new typology of tourism, where both non-humans and humans demand different products that, in certain situations, imply a change in family consumption and consequently imply an increase in the financial outlay made by the family at the destination (Ellson, 2008). Therefore, it is essential to examine the desires, needs and limitations that dogs and their humans have in that place. Thus, those destinations that claim to be dog-friendly must adapt their restaurants, accommodation or parks to this new type of customer (Kirillova *et al.*, 2015). This implies a joint policy between private companies and public administrations to ensure that families have a positive experience with their pets (Carr, 2017) and, consequently, achieve greater satisfaction with the destination (Kirillova *et al.*, 2015).

One of the main limitations of travelling with pets is their limited accommodation and reception capacity, especially in hotels (Taillon *et al.*, 2015). However, this situation is improving (Dotson *et al.*, 2011; Ivanov, 2018), especially in dog-friendly destinations. Likewise, it is quite common for the price of a hotel room where dogs are allowed to stay to be higher than a room where they are not allowed because of the increased cost of cleaning (Ying *et al.*, 2021; Zhang, 2012), which Zhang (2012) calls a "pet-fee". Meanwhile, families who travel with their pets can show great loyalty to dog-friendly accommodations and destinations (Dotson *et al.*, 2011). This new typology of tourists would imply a rethinking of how the different hotel chains should respond worldwide (Ivanov & Ivanova, 2016).

### **2.3 Motivations**

Analysing the motivations of individuals or families to travel is essential for understanding how they plan their trips and choose destinations. Tourists may be driven by various reasons when selecting a particular place to visit (Parreira *et al.*, 2021). The



motivation to travel has a dynamic character because the user's experience, status or age defines this motivation, and consequently, their motivations change (Tseng *et al.*, 2023; Yousaf *et al.*, 2018). Nguyen and Cheung (2014) point out that experiencing new places and entertainment is one of the motivations tourists have, which is a basic motivation when travelling with pets (Matejevic, Wallrabenstein, & Ristic, 2014). Likewise, it is necessary to analyse the different services that the destination provides to tourists (Wu & Mursid, 2019).

It is also necessary to understand that the motivations for travelling and experiencing a destination are different when a pet is included. Chen *et al.* (2014) state that the analysis of this type of motivation constitutes one of the fundamental pillars in studying this type of tourism and selecting a destination. Following Tang, Ying and Ye (2022), the pet-owner relationship can boost pets' well-being through the benefits of tourism activities. Emotional attachment between families and their dogs significantly mediates travel motivations and constraints, shaping destination choices in pet-friendly tourism (Aguilar-Rivero *et al.*, 2025). Carr and Cohen (2009) point out some of the motivations that families have for travelling with their dog, as follows: first, the dog is considered to be a member of the family; second, families are entertained and have a better time at the destination if they travel with their pet (Matejevic, Wallrabenstein, & Ristic, 2015); third, they have greater satisfaction in that destination travelling with their pet; fourth, a trip together implies more joint activities for the whole family, which consequently infers more fun for the family; and fifth, although travelling with a pet may be more expensive, this increase in the cost of the trip is offset by the cost of leaving the pet at the place of origin (Lancendorfer, Atkin, & Reece, 2008), in addition to the evident emotional bonds with the pet. It is stated that the interactions between humans and animals constitute an opportunity for finding each other and building values as important as empathy (Hoarau-Heemstra & Kline, 2022). In this sense, some studies show that pet owners travel with pets for pleasure and to enhance their happiness and well-being (Ying *et al.*, 2021).

Consequently, when a family plans a trip with their pet, excluding second residences, they must carry out adequate planning of the trip. In particular, they have to pay attention to the conditions of the destination, especially the accommodation, to adapt the trip to their dog's needs.

#### **2.4 Limitations for travelling with dogs**

The limitations found in a trip with a dog range from the displacement itself to the development of tourist activity in the destination, except when using one's car and a second family residence as the destination. This implies that travelling with a dog requires greater planning for the trip and an extra expense in terms of the travel budget (Chen *et al.*, 2013) because pets require different services than humans (Dashper, 2020). According to Chen *et al.* (2014), the limitations or barriers to travelling with a dog can be divided into three groups: interpersonal, structural, and the limitations of the dogs. The interpersonal limitations that dogs have on trips are based on their attitude towards other people and/or dogs; therefore, it is necessary to consider whether or not the dog is sociable. The structural limitations of dogs are based on the obstacles a family encounters when travelling with their dog (e.g. the financial expense of travelling with the pet or if the destination can be considered dog-friendly). The limitations of dogs would be those that the pet has to travel, such as getting tired or if the dog does not like travelling.

Family displacement with the family pet is relatively easy if a private means of transport is used (fundamentally, own car) because they are often familiar with travel by this means. However, there could be problems with the trip if public transport were used, especially in the case of an aeroplane (Kirillova *et al.*, 2015). Consequently, most families who make these trips choose to travel with their vehicle. Likewise, families who travel with their pets tend to choose national trips because of the problems of crossing borders with a pet, especially due to health regulations (Kirillova *et al.*, 2015).

#### **2.5 Methods for "travelling with pets"**

There are different methods to determine the relevance of the phenomenon that constitutes travelling with pets. Most of the studies in this context are qualitative research with different frameworks, such as thematic analysis, that informed the development of an extended constraint-negotiation framework. According to Ying *et al.* (2021), the findings suggested that while some constraints can prevent travelling with pets through increased learned helplessness, negotiation can reduce that and encourage pet owners during their travels.

Wu and Chang (2021) also researched this framework through the exploratory factor analysis (EFA) to measure the relationship between the dimensions of pet attachment, experiential satisfaction and experiential loyalty in medical tourism for pets, where the results indicated several statements, as a positive effect of pet identity or a positive pet dependence. Several methods are used when travelling with pets, as previously shown. Additionally, Díaz (2019) analyses attitudes towards animals based on sociodemographic profile surveys. If it is considered the ANN method, research related to behavioural models for virtual pets on mobile phones exists (Hildmann *et al.*, 2009). Still, it is not the topic that this study discusses.

Several studies have approached travelling with pets using a methodology based on structural equations. Thus, authors such as Chen *et al.* (2013), based on an analysis of structural equations, determined the positive influence of knowledge of the perceived limitations of companion animals on the owner's participation in tourism when bringing companion animals. On the other hand,



Wu and Cheng (2020) determined the influence of satisfaction and trust when repeating future behaviours of revisiting a tourist destination with their dogs. Similarly, Ying *et al.* (2021), using the same methodology, established the perceived benefits and attachment to the dog as determinants of a willingness to adapt, which later decisively influences the intention to travel with dogs, that is, the perception of positive benefits and a high attachment to the dog makes the owner adapt to what is established to travel with dogs. In line with the above, Peng *et al.* (2014) analysed a model composed of variables such as behaviour, attitude and attachment, the study of the latter being repeated in Hung *et al.* (2016) along with other relevant variables such as pet constraints and participation. For their part, Kirillova *et al.* (2015) endorse the above through an EFA, which shows the dimensions that made the owner want to travel with dogs. In this sense, the dimensions were the perception of perceived benefits, emotional attachment and perceived limitations.

On the other hand, the use of ANN has been recently employed in a different line of research regarding the tourism sector, as in the estimation of flamenco show attendants' profiles (García-García *et al.*, 2021) or gastrotourist profiles (Moral-Cuadra *et al.*, 2021). However, no studies have been found that employ ANN in the analysis of dog-owner tourist profiles, so this research constitutes a unique form of analysis.

### 3. Methodology

#### 3.1 Data collection

The methodology used in this research is based on fieldwork that has been carried out on a significant sample of people who have a dog in Spain. We aimed to understand their opinions regarding travelling with their pet. The fieldwork was conducted through an online survey that the respondents filled in during May and June 2020. A total of 576 answers were obtained, of which 552 were valid. This way of conducting fieldwork has several advantages, such as the cost/effectiveness ratio, the ease of covering a larger population, sample selection, the rapid collection of the questionnaires, and the minimisation of errors in the tabulation process (Evans & Mathur, 2005). Additionally, this type of data collection is widely accepted in tourism research (Otoo *et al.*, 2020).

The link where the survey was located was disseminated through different social networks (such as Facebook, Instagram, Twitter, etc.) to obtain responses from different people. No stratification by any variable was carried out in the study due to the lack of studies in Spain that support this type of stratification. Finally, Cronbach's alpha test was carried out to check the scale's reliability in every group of the Likert-type questions (see Table 2 below), reaching an alpha greater than 0.7 in all cases. This value exceeds the minimum limits Nunnally and Bernstein (1994) established.

#### 3.2 Survey design

The survey was designed following previous studies (Carr & Cohen, 2009; Chen *et al.*, 2013; Hung *et al.*, 2012). Thus, previous studies by Greenebaum (2004) and Carr & Cohen (2009) have been employed related to the motivations for travelling with pets. Additionally, the previous contributions of Carr (2017) and Dashper (2020) have been followed regarding the ideal destination for a family with their pets. The draft of the survey began with an initial set of items extracted from the literature, which were subjected to a certain procedure through three steps: first, a researcher specialised in tourism analysed the proposed items; second, the questionnaire was reviewed by people who regularly travel with their pets; and third, a pre-test was carried out on 50 people who had pets and who travel with them. During the debugging phase, it was found that some questions were not easily understandable by the respondents, but these were corrected. Therefore, the final fieldwork was carried out once the questions had been evaluated and the viability of the questionnaire determined. We aimed to seek maximum clarity in the questions and the greatest adjustment of the answers to achieve the objectives set in the research and the greatest specificity possible while avoiding an excessive survey duration. Once we had followed these steps, the final version of the questionnaire was reached.

The questionnaire was anonymous and was distributed in two different parts. The first analysed three specific aspects: the family's emotional attachment to the pet, motivations for travelling with the dog and assessment of the characteristics that a certain destination must have. The questions in this section were presented using a five-point Likert scale (a value of one equals "strongly disagree" and a value of five equals "strongly agree"). The second part studied the sociodemographic profile of pet owners, where the questions were closed-ended.

#### 3.3 Data analysis

Rumelhart and McClelland (1986) define an ANN as a network composed of several processing elements or nodes with small storage capacity. These units are composed of a vector of inputs ( $x_1, x_2, \dots, x_n$ ) with synaptic weights ( $w_1, w_2, \dots, w_n$ ) that are applied to these input vectors using a propagation rule (based on the corresponding linear combination). Applying the propagation rule of an activation function provides the output results of these nodes. The nodes are grouped into input, intermediate or hidden layers (one or more) and output.



In this research, and through the SPSS Statistics v.23 software, an MLP is developed, where the input values are the replies obtained in the questionnaire (see Table 2 below), later divided into training and testing groups (see Table 4 below); and the outputs are the estimations that the model makes on the different characteristics of the sociodemographic profile of dog owners. The data were coded ahead of time to obtain numerical values as replies. During the MLP development process, different topologies and activation functions are verified. Finally, we preserved the network with a higher degree of adjustment in terms of mean absolute percentage error (MAPE).

#### 4. Results

##### 4.1 Data and variables

The respondents' sociodemographic characteristics are shown in Table 1. The sample, with 552 complete surveys, presents a majority of women in terms of gender, between 26 and 55 years old. Regarding academic training, the survey primarily consists of people with secondary education and university graduates (almost 79% of the total respondents). According to income, the survey shows that more than half of the sample has an income of 1,001€ to 2,500€ per month.

**Table 1 - The respondents' sociodemographic variables**

Variables	Percentage	Variables	Percentage
<b>Gender</b>		<b>Academic training</b>	
Male	8.70%	Primary education	3.08%
Female	91.30%	Secondary education	35.14%
<b>Age</b>		University graduate	43.66%
Less than 26 years old	9.24%	Master/PhD	18.12%
26-40 years old	53.80%	<b>Income (monthly)</b>	
41-55 years old	29.89%	Less than 700€	4.35%
More than 56 years old	7.07%	700€ to 1,000€	16.12%
		1,001€ to 1,500€	28.62%
		1,501€ to 2,500€	30.44%
		2,501€ to 3,500€	15.22%
		More than 3,500€	5.25%

Source: Authors

The set of survey questions and their descriptive statistics are presented in Table 2. All the questions follow a Likert structure where 1 means "strongly disagree" and 5 "strongly agree", with the exception of Q06, referring to the stay of the trip with the dog compared with other trips without him/her (Chen *et al.*, 2014; Hung *et al.*, 2012). The scale considered is displayed in Table 2 (The highest means are obtained in Q01, Q07, Q10, Q12, Q13 and Q15).

**Table 2 - Travel with dogs' items**

Code	Question	Mean	Std. Dev.	Min. Value	Max. Value
<b>General travelling</b>					
Q01	Dog ownership helps to improve my health	4.75	0.56	1	5
Q02	Do you travel often with your dog?	4.11	0.86		
Q03	Rural or mountain areas are the best destination for my dog	4.39	0.94		
Q04	Beach areas are the best destination for my dog	3.72	1.12		
Q05	Urban areas are the best destination for my dog	2.04	1.07		
Q06	How long is your trip when you take your dog with you? (shorter=0, same=1, longer=2)	1.02	0.51	0	2
<b>Ideal tourist destination</b>					
Q07	It has hotels that allow dogs	4.81	0.55	1	5
Q08	Unrestricted access for the dog to the monuments of the destination	4.18	1.05		
Q09	It has dog parks	4.31	1.01		
Q10	It has emergency vet services	4.75	0.58		
Q11	Existence of "dog-friendly" places in the destination	4.69	0.68		
<b>Ideal tourist accommodation</b>					
Q12	Being able to sleep with the dog in the same room	4.94	0.34	1	5
Q13	It has info about places or routes you can visit with the dog	4.78	0.51		
Q14	No noise that bothers my dog	3.91	1.14		
<b>Motivations for travelling</b>					
Q15	If the dog comes with us, we prevent him from becoming depressed or anxious	4.50	0.93	1	5
Q16	By travelling to other places, we get better socialisation with the dog	4.18	1.07		
Q17	Helps us to exercise	4.08	1.13		
Q18	It is cheaper to take it with us than to leave it at home	2.32	1.40		
<b>Travelling limitations</b>					
Q19	Taking a dog on vacation implies a significant cost	2.25	1.29	1	5
Q20	I have a hard time finding information to travel with my dog	2.83	1.38		
Q21	Certain destinations are not suitable for my dog	3.62	1.35		

Source: Authors

#### 4.2 Artificial neural network architecture

Using SPSS Statistics software, an MLP procedure with a (21, 5, 5) topology was used, with a hyperbolic tangent in the hidden layer and identity (without modification) in the output as the activation function (see Table 3). The MLP model obtained is presented graphically in Figure 1. It presents the combinations among units of different layers with synaptic weight values greater or less than zero. The subdivision of the sample in the testing and training groups is made randomly and is shown in Table 4 (training, 66.48%, and testing, 33.52%), and additionally, the errors, training time and stopping rule used. Table 5 presents an assessment of the MLP model attained. The MAPE was obtained for the different output model variables and their mean. Gender presents a distinctive lower MAPE compared with the remaining due to the high uniformity of the respondents in this regard. Age, academic training and income present similar developments.

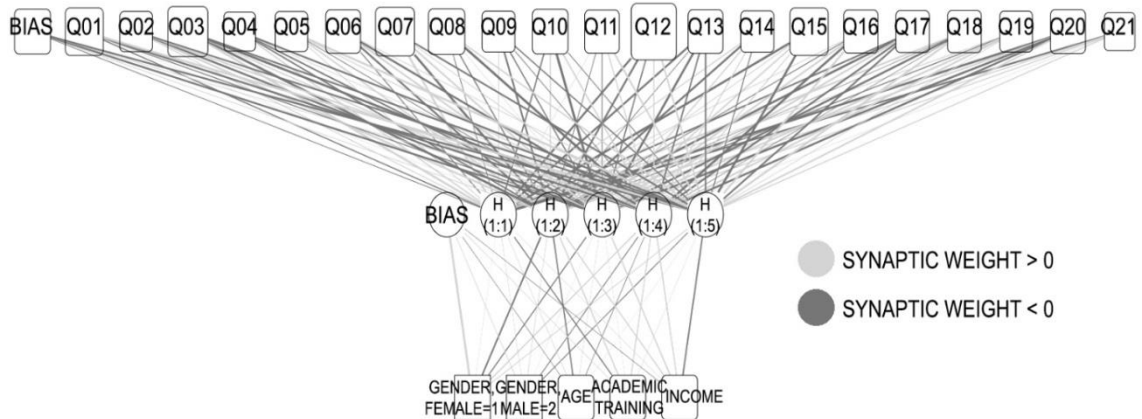


**Table 3 - Network architecture**

<b>Input Layer</b>	Bias	Value=1
	Covariates	Q01
		Q02
		Q03
		Q04
		Q05
		Q06
		Q07
		Q08
		Q09
		Q10
		Q11
		Q12
		Q13
		Q14
		Q15
		Q16
		Q17
		Q18
		Q19
		Q20
Q21		
Number of Units (excluding bias)	21	
<b>Hidden Layer</b>	Rescaling Method for Covariates	Standardised
	Number of Hidden Layers	1
	Number of Units in Hidden Layer (excluding bias)	5
	Activation Function	Hyperbolic tangent
<b>Output Layer</b>	Dependent Variables	Gender, female=1
		Gender, male=2
		Age (from 18 to 72)
		Academic Training (from 1 to 4)
	Income (from 1 to 6)	
	Number of Units	5
	Rescaling Method for Scale Dependents	Standardised
Activation Function	Identity	
Error Function	Sum of Squares	

Source: Authors.

**Figure 1 - Graphic representation of the ANN obtained**



Source: Authors.



**Table 4 - Model summary**

<b>Training (N=367; 66.48%)</b>	Sum of Squares Error		558.674
	Average Overall Relative Error		0.97
	Percent Incorrect Predictions for Categorical Dependents	Gender	7.90%
	Relative Error for Scale Dependents	Age	0.998
		Academic Training	0.954
		Income	0.941
	Stopping Rule Used		1 consecutive step(s) with no decrease in error (based on the testing sample)
Training Time		00:00.5	
<b>Testing (N=185; 33.52%)</b>	Sum of Squares Error		272.732
	Average Overall Relative Error		0.996
	Percent Incorrect Predictions for Categorical Dependents	Gender	10.30%
	Relative Error for Scale Dependents	Age	1.045
		Academic Training	0.93
		Income	0.993

Source: Authors.

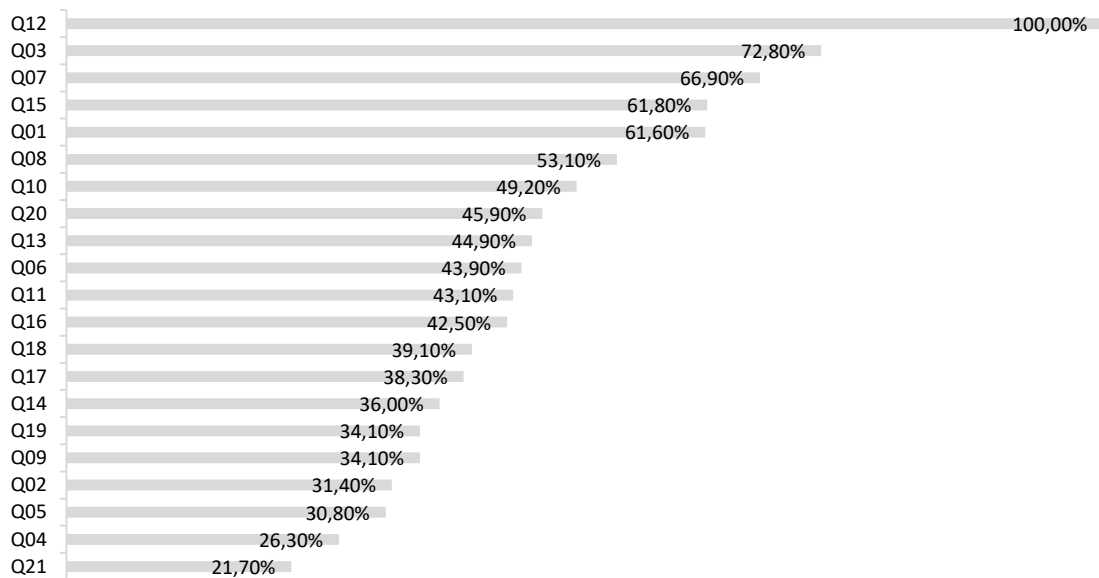
**Table 5 – Goodness of fit of the ANN obtained**

	Gender	Age	Academic training	Income	Overall
<b>MAPE</b>	4.35%	25.97%	26.56%	37.18%	23.51%

Source: Authors.

The MLP can also show the importance (in relative terms) of the exogenous variables in the model (Figure 2). Q12 (being able to sleep with the dog in the same room) presents the most significant importance as an input unit; Q7 (hotels that allow dogs) and Q15 (If the dog comes with us, we prevent him from becoming depressed or anxious) also add significant importance to the model developed. These three items had previously appeared among the most valued by the respondents (see Table 2). Q03 (Rural or mountain areas are the best destination for my dog), Q01 (dog ownership helps to improve my health), and Q08 (unrestricted access of the dog to the monuments of the destination) are also worth mentioning. The less relevant in the ANN are Q05 (urban areas are the best destination for my dog), Q04 (beach areas are the best destination for my dog) and Q21 (specific destinations are not suitable for my dog).

**Figure 2 - Relevance of input variables in the ANN model**



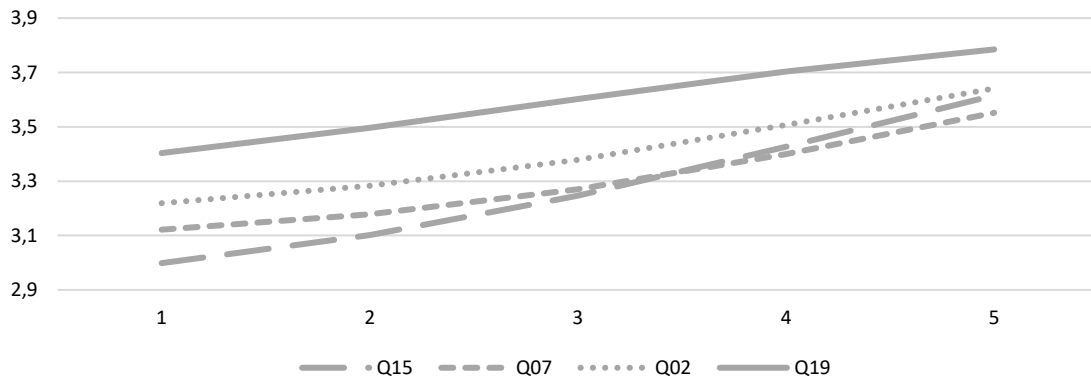
Source: Authors.



Furthermore, the MLP makes it possible to assess every question's influence on sociodemographic variables. To reach these results, the output values estimated are collected while each input unit is put into each Likert position (from lowest to highest), while other inputs are kept in their respective mean values. The outcomes attained, as shown in Figures 3 to 6, are classified by comparing the questions that show the most influence on the profile characteristics, both directly and inversely proportional. Income and academic training are the most determining factors in the tourist profile based on the previously answered questions.

The items that present the most direct relation with income are shown in Figure 3. In ordinates, the different levels of income are codified from one to six (see Table 3) and are compared to the results obtained in the questions with the high level of fluctuation presented (in abscissa). Q15 is the most influential variable regarding income (with a 10.28% increase along with the figure), followed by Q07, Q02 (*Do you travel often with your dog?*), and Q19 (*taking a dog on vacation implies a significant cost*).

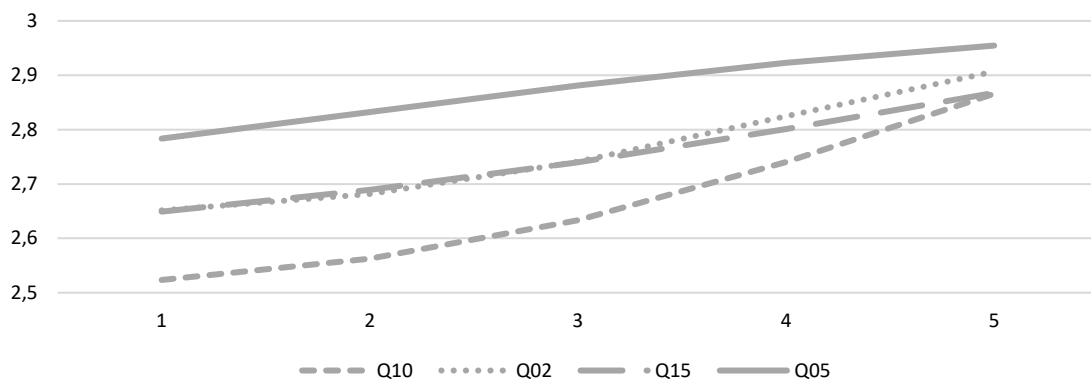
**Figure 3- Questions with the most direct influence on the profiles' income**



Source: Authors.

Following the same criteria, the input values with the most direct influence on the academic training profile are presented in Figure 4. This characteristic is codified in values from one to four (see Table 3). Thus, Q10 (*tourist destination with emergency vet services*) becomes more important as the respondent's academic training becomes higher (8.56% increase), followed by Q2, Q15, and Q05 (*urban areas are the best destination for my dog*).

**Figure 4 - Questions with the most direct influence on the profiles' academic training**

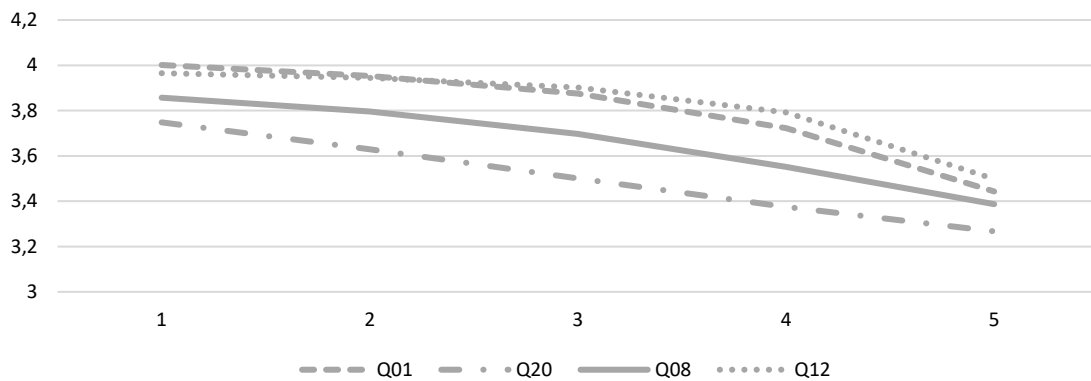


Source: Authors.

Income and academic training are the most influential sociodemographic characteristics regarding inverse influences. Figure 5 shows the inputs selected that produce the most inverse influence on income. In this regard, Q01 (*dog ownership helps to improve my health*), with a 9.30% decrease, becomes more relevant as the income of the tourist profile declines, followed by Q20 (*I have a hard time finding information to travel with my dog*), Q08 (*unrestricted access of the dog to the monuments of the destination*) and Q12 (*being able to sleep with the dog in the same room*), respectively.



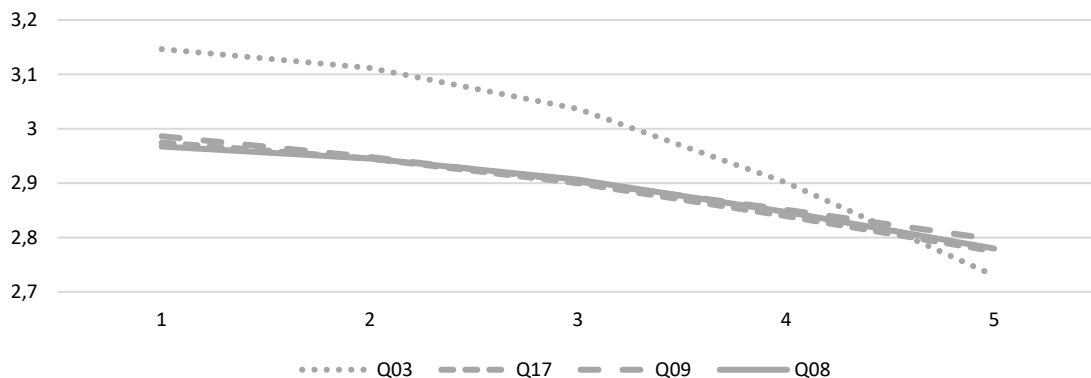
**Figure 5 - Questions with the most inverse influence on the profiles' income**



Source: Authors.

Finally, related to academic training, Figure 6 presents the inputs with the most inverse influence. Q03 (*rural or mountain areas are the best destination for my dog*) shows a 10.41% decrease along with the Likert positions regarding the academic training of the tourists' profiles. Note that a 6.31% decline in Q06 (*how long is your trip when you take your dog with you?*) is not reflected in Figure 6 due to problems of representativity (as this input is measured with a different criterion, see Table 2).

**Figure 6 - Questions with the most inverse influence on the profiles' academic training**



Source: Authors

Following these questions, Q17 (*helps us to exercise*), Q09 (*ideal tourist destination has dog parks*), and Q08 are found, presenting almost identical developments along with the figure.

## 5. Discussion

The narratives of this study verify the importance and significance of pets in the preferences of the owners' travels related to their sociodemographic profile by using artificial neural networks, through the MLP procedure. It had been shown and specified in the results of the general questions of the survey, as well as the meaning of these items in the model presented in different areas - direct and indirect- related to the pets during the trips. The present research has identified income and academic training as the variables most influenced by the Likert items related to travelling with dogs, solving the proposed aim question and thus contributing to the existing literature in this sense, since, based on the research made, no other work has used ANN to determine the relationship between sociodemographic profile and questions related to dog tourism, then approaching to fill the research gap identified.

As it is stated in this research, there are main keys to take into consideration that are explicit about the added value towards the existing literature in this field of tourism research. In Table 2, the highest mean values are related to the ideal tourist accommodation (Q12, mean of 4.94 of 5) and the ideal tourist destination (Q7, mean of 4.81 of 5). Considering ANN model input variables relevance, the highest values correspond to Q12, being able to sleep with the dog in the same room (100%), Q3, rural or



mountain areas are the best destination for my dog (72,80%) and Q7, it has hotels that allow dogs (66,90%). These facts discussed have constituted an important aspect of this research field.

This research reinforces the importance of accommodation when travelling with pets, and the demand that tourists have for their dogs to sleep in the same room. The results of this research are consistent with the findings in the scientific literature. Thus, Ramos-Ruiz *et al.* (2024) also present accommodation as a key factor in their research. On the other hand, Hoy *et al.* (2023) highlight the importance of accommodation when travelling with pets. This element is crucial even when travellers manage their trips through online accommodation platforms. Meanwhile, Buhalis and Chan (2023) recognise the significant expansion in pet-friendly hotels.

Regarding the destination, this research reinforces the importance of rural destinations, especially mountainous areas, for this type of trip. Thus, as in Bayraktaroglu and Kozak (2022), this study detected an interest in rural and beach areas to travel with dogs rather than urban areas. Additionally, and according to previous scientific literature, this study also detects the controversy about whether pets can enter the beaches (Guinness *et al.*, 2020).

On the other hand, other studies with limited perspectives exist on the needs and desires of the tourist side, including the operator's knowledge and values and the animal's abilities, included in the tourism context (Hoarau-Heemstra & Kline, 2022). To complement these studies, insights found in the present research are crucial. This research also concludes that travelling with pets helps people exercise together during vacations. This motivation was previously supported by previous literature, including research by Grenebaum (2004) and Carr and Cohen (2009).

It is also important to remember that pets are conditioned to travel by their owners, as they are subject to human whim, expectations and desire and are consequently vulnerable (Daspher, 2020). That is why it is essential to analyse the profile of tourist pet owners, detecting their preferences, attitudes or behaviours. Furthermore, Alves *et al.* (2022) point out the existence of a segment of tourists who can be identified by travelling with their pets, even Carr and Cohen (2009) define it as another member of the travelling family. These conclusions, obtained from previous scientific literature, are supported by the results of this research since certain items related to the dog's own activities (Q15, Q16 and Q17) reinforce the motivations to travel with pets. Thus, this research also concludes the importance of affection when travelling with pets, corroborating what Ying *et al.* (2021) indicated by vindicating the importance of pet attachment.

## 6. Conclusions

Pets, specifically dogs, have become important to many modern families. This has led to a significant increase in the number of people who travel with their pets. Consequently, new market niches have appeared, and many tourist destinations have been modified. In addition, many destinations are adapting to the arrival of pets (e.g. creating dog parks). However, travelling with a pet increases the expense of a holiday trip. The determination of the relations between opinions and attitudes expressed by dog owners as tourists and their sociodemographic characteristics, as the aim proposed in this research, through an ANN model of the MLP type, may help the economic agents devoted to dog-friendly tourism to customise their offer according to their clients' preferences and consequently improve their results.

### 6.1 Theoretical Implications

This study reflects the predominance of rural mountain areas as dog-friendly tourism destinations, in contrast to the beach and/or urban areas, as well as factors related to accommodation (e.g. dog allowance in hotels and the possibility of sleeping in the same room). Income and academic training are the most influential characteristics of the tourists' profile. In particular, Q15 (If the dog comes with us, we prevent him from becoming depressed or anxious) and Q2 (Do you often travel with your dog?) are directly related to income and academic training, also presenting a direct influence on academic training Q05 (urban areas preference). In line with the above, Taillon *et al.* (2015) indicated that individuals with a strong human-animal emotional bond are willing to pay an additional fee to travel with their pet than those where this bond is not as strong.

Meanwhile, Q08 (unrestricted access of the dog to the monuments of the destination) is inversely related to income and academic training. Q01 (dog ownership helps improve my health) appears to be more appreciated among people with less income. It is also worth mentioning that there is an inverse relationship between rural or mountain areas as tourist destinations with dogs and academic training. All these results reached in the present study reinforce the literature on the dog owners' tourists' profiles concerning their preferences, starting possible new lines of research using datasets reached by the employment of surveys with similar questions as presented in this work (developed in other countries, for example) to apply methods as ANN (or others) to compare results obtained.

In this sense, applying other typologies, such as structural equation models, can show dog owners' behaviour patterns in terms of motivation when making trips or evaluating dog-friendly services at the destination. All this would impact a certain level of



satisfaction on the dog owner's part and, consequently, on the patterns of repeat purchases or recommendations (Peng et al., 2014; Wu & Cheng, 2020).

### 6.2 Practical Implications

The model obtained can determine the answers that destinations must give to become dog-friendly according to their clients' profiles. Thus, these responses can be vital to creating new tourist products in the destination that are adapted to the profile of the visitors. They will also increase their pets and the family's satisfaction. It can be observed that nowadays, pets are more present than ever in the plans of owners and families, so they must be considered when planning holidays. In this sense, the adaptation of existing spaces to pets and the creation of new services adapted to them are essential since a destination that has services that treat the pet as a family member will make the family willing to make a higher financial outlay. Companies must take this into account to create new tourism products.

The main practical application of this work resides in the fact that the ANN can present a "composite sketch" of the dog-owner tourist profile based on their preferences and attitudes as input values of the model, easily customisable by the researcher. Thus, a specific set of input values will generate a particular profile. This is especially interesting for the dog-friendly hospitality industry, as it needs to adapt its offer. In this way, and following the results obtained, an advertisement is recommended to increase the business's profitability to reinforce the benefits of travelling with your dog to prevent depression or anxiety and promote dog-owner tourism to improve tourists' health. Additionally, it is recommended that rural and mountain destinations are excellent scenarios for developing dog-friendly tourism. Public and private agents may also try to find a dog-friendly tourist to usually travel with their dogs, as it is related to higher income profiles.

These improvements must not only be made from a business point of view, where companies that offer services modify their products in search of an eco-friendlier profile, but public administration must also adapt spaces for pets. This benefits not only hotels and lodging companies but also the rest of the businesses in the cities where tourist spending can be increased, derived from positive word of mouth due to the approach and development of infrastructures favourable to pets. To optimise resources and improve profitability, it is essential to know your client better. The present research relates dog-friendly tourist profiles to their preferences for using ANN. To date, based on the research made, no studies in this line were found, and consequently, the present work states a new perspective covering the gap detected.

### 6.3 Limitations and future research

This research has observed two limitations: first, the period in which the survey was developed is limited, and it would be interesting to extend our research to the whole year; second, the study was carried out during the COVID-19 epidemic in Spain, which was associated with reduced mobility. We would also recommend that future research should compare dog-friendly and non-dog-friendly destinations.

#### Credit author statement

All authors have contributed equally. All authors have read and agreed to the published version of the manuscript.

**Declaration of competing interest:** None

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