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Consumers' preferences for electric vehicles: The role of status and reputation

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ABSTRACT

This paper provides insight into motivational reasons for consumers' preferences for Electric Vehicles (EVs) assuming equal and different prices between EVs and traditional vehicles. Referring to consumer behavior, it shows that reputation-driven consumers prefer EVs only when the purchase price is more expensive than that of other vehicles, thus suggesting that true environmental concern is attenuated by reputation motives; and that the desirability of EVs as sustainable products only increases if prices are more expensive. It provides insights into the influence of sociodemographic variables, car attributes and external environmental factors. The study offers an empirical approach with a sample set of more than 2.000 responses. Different logit models are estimated to explore the factors influencing the preference for an EV. It is found that age, being male, having children, education, living in urban areas, and previous experience positively influence EV adoption. Better infrastructure and information availability help to promote EVs.

1. Introduction

Climate change with its anthropogenic consequences is widely-debated by the public, and considered proven within the scientific community (Jochem et al., 2015). EVs are defined as a possible solution to overcome environmental concerns; however, the transport sector is responsible for 24% of direct CO_2 emissions from fuel combustion (IAE, 2020). Although greenhouse gas emissions (GHG) from the EU transport sector decreased in 2020, this decrease refers to the decrease in activity due to the Covid-19 pandemic, and road transport remains the main GHG contributor of all transport emissions (EEA, 2021). According to some sources, road transport emissions have even increased despite slow but steady progress in electrification (IAE, 2020). Air pollution in cities and the growing environmental concerns of consumers have led to an increased demand for responsible action on the part of both businesses and consumers. Many governments around the world are trying to promote EVs to increase their market diffusion. In recent years, Plug-in Hybrid Electric Vehicles (PHEVs) and Battery Electric Vehicles (BEVs) have become more prominent in the field of sustainable transportation. However, despite the growing demand, the market share of EVs is still limited, counting for only 2.7% for BEV and 4.9% for PHEVs of all cars registered in Spain in 2021 (MSI Iberia, 2022).

In order to increase the market share of EVs, it is crucial to analyze and understand consumer perception and behavior. Consumer behavior is shaped by social, economic, and environmental concerns that lead to new consumer demands and therefore require

Abbreviations: AFCVs, Alternative Fuel Vehicles; BEVs, Battery Electric Vehicles; CO_2, Carbon dioxide; EFA, Exploratory Factor Analysis; EU, European Union; EVs, Electric Vehicles; GHG, Greenhouse Gases; HEVs, Hybrid Electric Vehicles; ICE, Internal Combustion Engine; ICEVs, Internal Combustion Engine Vehicles; PHEVs, Plug-in Hybrid Electric Vehicles.

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different strategies for companies (Hofenk et al., 2019). More and more attention is being paid to sustainable consumer research; however, it is still underrepresented, and more research is needed. Based on these arguments, in this manuscript the authors analyze consumer behavior towards EVs as a sustainable innovation and analyze consumer preferences if all cars cost the same.

In detail, this paper addresses the following research questions:

1. In line with previous literature, what are the factors that influence the preference and adoption of EVs? By answering this question, the research is able to answer the following:
   a. What does a Spanish consumer of EVs look like (sociodemographic variables)?
   b. What effect do experience, governmental incentives, information availability, and other car attributes have on EV preference?

In this case, the dependent variable focuses on a variable that includes whether a consumer prefers to buy an electric or others, more traditional cars (1 = Yes, EV; 0 = No EV). This research question adds further evidence to the existing literature on potential consumers in Spain, a Southern European country where such profiling is lacking. Moreover, it compares previous results and fulfills future research recommendations for the "experience" variable.

2. In order to shed light on the importance of consumer behavior, are consumers' status, reputation, and image driven when adopting EVs?
   a. With respect to the different technologies of a car, if all types of car technology cost the same, would a consumer prefer to buy an electric or gasoline/diesel car?
   b. Are consumers rather driven by reputation when purchasing an EV?

In this case, the dependent variable focuses on consumer preferences if EVs cost the same as other cars, that is to say, if all cars have the same purchase price, regardless of technological differences. This research question helps to obtain results on the importance of status and reputation.

The present study contributes to the literature by gaining insights into consumer behavior for EVs, especially by analyzing consumers' behavior and preferences with equal and different prices for EV compared to Internal Combustion Engine Vehicles (ICEV). Consistent with previous literature, it also identifies the sociodemographic characteristics of EV consumers, focusing on experience while applying a structured and comprehensive approach to include environmental aspects and car attributes.

The explanatory research is based on a solid theoretical foundation related to consumer behavior. Based on the theoretical framework and the empirical study, car attributes and external attributes, environmental settings that could influence the preference for EVs are discussed. Current literature has analyzed the factors of EV adoption and their motivators and barriers; however, this paper provides a holistic overview of different factors for EV adoption and a better understanding of consumer behavior and car preferences if EVs cost the same as other cars. The results show clear policy implications, indicating the importance of the availability of information on EVs, a better infrastructure to charge EVs, and governmental incentives to promote EVs.

To accomplish the aforementioned objectives, the rest of the paper is organized as follows. First, in Section 2 a review of the literature is presented, then the conceptual model guiding this research is presented, followed by the hypotheses. Section 3 explains the variables extracted from the survey and Section 4 shows the empirical results of both research questions. In this section, special emphasis is placed on consumer behavior in relation to status- and reputation-driven factors. Finally, Section 5 shows the main conclusions as well as the limitations of the current research and future lines of research.

2. Literature review, conceptual model, and hypotheses

2.1. Different types of EVs

In order to develop a search related to the topic of interest, it is necessary to explain that "EV" is a general term for electric vehicles and includes different types of electric technologies. Table 8 in the appendix explains the different types of EVs so that we can specify the coverage of the present research. This study focuses on EVs in general.

2.2. Past Research, theoretical framework, and respective hypothesis

In order to identify relevant studies that help to accomplish the objectives of this research, a literature review was conducted (see Table 9). The search for research studies published in peer-reviewed journals included keyword combinations such as Electric Vehicles, preference, adoption, consumer behavior, and consumer attitudes. It is important to note that this paper aims to analyze consumer behavior for EV preferences from a Marketing and managerial perspective, thus excluding engineering papers and other areas irrelevant to this research.

An increasing amount of research on consumers' purchase intentions and preferences is found as well as the role of self-image when purchasing green products (e.g., Hahnel et al., 2014; Ozaki, 2011; Lane and Potter, 2007; Hur et al., 2013; Herberz et al., 2020; Griskevicius et al., 2010; Hafner et al., 2017). According to previous literature, consumer behavior plays an important role in the adoption of new technologies, such as EVs, which are considered a sustainable solution. In this research, it is of interest to investigate consumers' motivations and preferences for sustainable behavior.

The paper distinguishes itself from other papers in its approach of systematically applying a comprehensive analysis of EV consumers with respect to three subcategories (consumers' demographic variables, car attributes, environmental settings) and then by comparing the model to a second model with another dependent variable representing the impact of consumer preferences if EVs cost the same as other cars. Our results highlight the importance of symbolic attributes, such as status, reputation and image, in opting for EVs.

Based on the literature review, we have identified three pillars that aggregate different variables that influence the preference for EVs: (1) the consumer, (2) car attributes, and (3) environmental settings. By doing so, we aim to answer the research questions stated above via a holistic approach. Li et al. (2017a, 2017b) applied a systematic structured approach and divided their systematic literature review also into three types: (1) demographic, (2) situational, and (3) psychological factors. Likewise, Lane and Potter (2007) illustrated the factors for the adoption of EV with situational and psychological factors, whereby situational factors include environmental settings, such as regulations or infrastructure, and psychological factors include attitudes, symbols, influences, etc.

2.2.1. Consumers' variables & behavior

In general, the literature has shown contradictory results for demographic variables of EV consumers. Previous studies have provided evidence that females are more environmentally concerned than men are and thus more willing to buy green products (Johansson-Stenman and Martinsson, 2006; Knez et al., 2014; Prakash et al., 2014; Jansson et al., 2017; Simsekoglu and Nayum, 2018; Yang et al. 2019). Sovacool et al. (2019) explained, based on "gendering of (electric) mobility" references going back to 1880, that the gender discussion was already prevalent in the earliest discussions about automobiles when EVs were more common and had a larger market share. Plötz et al. (2014)found that it is rather men who are the first buyers of EVs.

H1: Females are more likely to prefer EVs than men.

Regarding the variable age, the results of the current literature are inconsistent. On the one hand, the existing literature shows evidence that green consumers are rather young (Hackbarth and Madlener, 2016; Hidrue et al., 2011; Knez et al., 2014; Laroche et al. 2001; Mukherjee and Ryan, 2020; Sanitthangkul et al., 2012). In contrast, other authors have found that older consumers are willing to purchase an EV (Jansson et al., 2017; Zhang et al., 2011). Plötz et al. (2014) and Peters and Dütschke (2014) found that middle-aged men are the most likely group of private EV buyers. Johansson-Stenman and Martinsson (2006) concluded that age had a positive influence, claiming that older people buy this type of green product.

H2: The younger the consumer, the higher the likelihood of preferring an EV over an ICEV.

There is evidence in the literature that individuals with higher education are more environmentally concerned and thus more willing to purchase an EV (Hidrue et al., 2011; Jansson et al., 2017; Mukherjee and Ryan, 2020; Sanitthangkul et al., 2012; Olson, 2013). Nayum and Klöckner (2014) found that higher education had a positive impact on the purchase of more fuel-efficient cars. However, there are also research studies that show a negative influence of education on EV adoption, meaning that less educated consumers are more likely to purchase EVs (Hackbarth and Madlener, 2016; Johansson-Stenman and Martinsson, 2006; Zhang et al., 2011).

H3: Higher education leads to an increased probability of preferring an EV over an ICEV.

For the variable income, different effects have been found in different studies. Bjerkan et al. (2016) concluded that income levels matter only when consumers compare the usage costs of BEVs and ICEVs. When the purchase cost of a BEV and ICEV is similar, people with lower incomes favor the option with lower usage costs. In line with this, Plötz et al (2016; 2017); Junquera et al. (2016), and Erdem et al. (2010) found that consumers with higher incomes were more likely to adopt an EV. In contrast, Nayum and Klöckner (2014) found that household income had a negative effect on purchasing a fuel-efficient vehicle. In accordance with this, Gleim and Lawson (2014) found through cluster analysis that the group with the highest average income did not have the highest purchase intention toward green products. Sanitthangkul et al. (2012) found no significant influence of income in determining the attitude toward eco-cars, which is in line with the studies by Egbue and Long (2012), Knez et al. (2014), Hidrue et al. (2011).

H4: Higher income leads to an increased probability of preferring an EV.

With reference to the living area of consumers, Mukherjee and Ryan (2020) showed that BEV owners tended to live in urban centers with very high population densities. In contrast, Plötz et al. (2014) found that the most likely group of EV buyers lived in rural or suburban areas. However, as is later stated in the limitations section, it is important to consider whether more educated people rather live in urban areas and less educated people in rural areas, which could also affect whether or not they own an EV. In addition, there are more cities that limit access to the city center to cars with reduced or no CO_2 emissions, which could also affect the decision concerning which car technology to buy.

H5: Living in urban areas leads to an increased probability of preferring an EV.

It is also of interest whether having children, that is to say a family with more family members, increases the preference for an EV (Zhang et al., 2011; Nayum and Klöckner, 2014).

H6: Having children leads to an increased probability of preferring an EV.

Furthermore, car ownership seems to positively influence the purchase intention toward EVs. Zhang et al. (2011) showed that the number of vehicles owned by a family increased the willingness to purchase an EV. Nayum and Klöckner (2014) showed that a higher number of cars in the household positively impacted the purchase of more fuel-efficient cars. Hidrue et al. (2011) investigated the fact of owning multiple cars and found that it decreased the probability of being in the groups supporting EVs. It is also important to consider that nowadays the younger generation tends not to purchase a car of their own. This fact could influence the later results of the research as younger people do not necessarily own cars anymore.

H7: Possessing a car (independent of model) leads to an increased probability of preferring an EV.

Another important factor to consider is the impact of experience on EV uptake. As Liu et al. (2020) summarized, there are several studies analyzing the impact of experience on the adoption of BEVs but without general consensus. There are several studies that have investigated the role of direct BEV experience for its adoption or purchase intention (Günther et al., 2019; Liu et al., 2020; Nayum et al., 2016; Schmalfuβ et al., 2014; Schmalfuβ et al. 2017; Peters and Dütschke, 2014; Jensen et al., 2013). Individuals with BEV experience accepted higher purchase prices and showed a higher willingness to pay more for a BEV compared to individuals who had no experience (Larson et al., 2014; Peters and Dütschke, 2014). Hahnel et al. (2014) summarized from other authors that previous experience positively influenced the willingness to drive an EV. Herberz et al. (2020) concluded that first-hand experience with an unfamiliar technology helps to incentivize the purchase of sustainable products. The study by Xu et al. (2020) showed that consumers' EV driving experience had a significantly positive effect on consumers' intention to adopt EVs. Skippon et al. (2016) analyzed the influence of having had experience with a BEV and found that willingness to consider a BEV declined after experiencing this type of car in a controlled trial. Bühler et al (2014) found a positive significant effect of experience on the general perceptions on EVs but not on purchase intentions for EVs. Rauh et al. (2020) showed that practical driving experience, together with range-related knowledge, reduced so-called range anxiety or stress, resulting in experience as a means to overcome range anxiety as a barrier.

H8: Having had previous experience leads to an increased probability of preferring an EV.

As previously mentioned, consumer behavior and attitudes toward sustainable behavior are gaining more attention, and studies highlight the importance of self-image when purchasing green products. Hahnel et al. (2014) explained that consumers use products to define and express their self-image and match it with the "value-expressive attributes of the products." (p. 318) Johansson-Stenman and Martinsson (2006) explained that individuals often want others to have a good impression of them with social approval and esteem, in other words, to use products to make people believe that they are more environmentally friendly and socially responsible than they really are. Individuals focus more on positive self-image than they care to admit, as "being motivated largely by status concerns is perceived to be an unfavorable character trait." (Johansson-Stenman and Martinsson, 2006, p.131). The authors defined this behavior as self-deception and explained that pretending to be very concerned about the environment can lead to a better self-image, as others value the fact of "being" environmentally friendly. Rahmani and Loureiro (2019) showed that consumers buy EVs more for reputational issues rather than for environmental reasons. Ozaki (2011) has given evidence that people focus on their identity, image, values, and norms when adopting green technology, which is consistent with the study by Laroche et al. (2001). Moreover, Lane and Potter (2007) highlighted the importance and role of a car as a status symbol, and found evidence that consumers want others to know about their green vehicle, which should positively affect their image. Hur et al. (2013) explained that green products can represent the consumeŕs image or socially responsible values, and their use can show to which consumer group they belong. Hahnel et al. (2014) showed that the activation of pro-environmental values leads to lower price sensitivity to higher purchase prices of EVs. However, as Herberz et al. (2020) mentioned, it is important to keep in mind that "changing consumer behavior can be difficult, especially in conservative, slow-changing sectors such as the transportation domain" (p.102). Interestingly, Griskevicius et al. (2010) showed the interrelations of environmental behavior and status and found that "(…) a desire for status can spur self-sacrifice [that] also presents a powerful tool for motivating prosocial and proenvironmental action." (Griskevicius et al. 2010, p.402).

H9: Reputation- and status-driven consumers are more likely to prefer EVs.

2.2.2. *Car attributes*

There is a common understanding that a high purchase price is one of the main reasons why consumers hesitate to adopt EVs. The initial purchase price of EVs is usually higher than that of conventional cars, and the market share and diffusion of EVs may not increase if the purchase price does not decrease (Bjerkan et al., 2016; Cecere et al., 2018; Egbue and Long, 2012; Knez et al., 2014; Lane and Potter, 2007; Lieven et al., 2011; Ozaki, 2011). Ozaki (2011) has explained that individuals see green alternatives as too expensive, and Lieven et al. (2011) confirmed that "price is the top priority for both conventional and the electric vehicles (…)" (p. 139). Bjerkan et al. (2016) concluded that purchase cost reduction is the strongest incentive to promote BEV adoption.

H10 A higher list price for EV lowers the preference for EVs.

At the same time, lower consumption and lower maintenance costs can offset a higher purchase price (Egbue and Long, 2012; Gallagher and Muehlegger, 2011; Lane and Potter, 2007).

H11 Lower consumption and lower maintenance costs compensate for the higher purchase price of EVs and leads to an increased probability of preferring an EV.

In terms of car attributes, it has been shown that a higher range leads to higher acceptance of EVs and that a limited range has a negative impact on EV adoption, distribution, acceptance and usage (Barkenbus, 2020; Cecere et al., 2018; Egbue and Long, 2012; Günther et al., 2019; Hackbarth and Madlener, 2016; Hidrue et al. 2011; Hoen and Koetse, 2014; Lieven et al., 2011; Schneidereit et al. 2015). Hereby, range refers to the distance an EVs can travel before the battery needs to be recharged. Cecere et al. (2018) have suggested that manufacturers improve the quality of EVs' batteries to increase driving range in order to achieve greater diffusion of EVs. Franke and Krems (2013) has shown that, in particular, experienced EV drivers seek average and maximum range, while inexperienced drivers show weak affect towards range needs. Range anxiety is associated with higher range preferences, according to the trial study conducted by Franke and Krems (2013). Hereby, range anxiety refers to the fear of running out of battery before reaching a charging station.

H12 A higher range of EVs, leads to an increased probability of preferring an EV.

2.2.3. *Environmental settings*

Several authors have shown the importance of the development of charging infrastructures in order to promote EVs and have concluded that the availability of a functioning charging infrastructure is significantly related to BEV markets (Barkenbus, 2020; Hardman et al., 2018; Li et al., 2017a; Sierzchula et al., 2014). Oliveira et al. (2019) also pointed out the importance of including charging/ fueling infrastructure in future research for EV. Martínez-Lao et al. (2016) illustrated the need for "structured

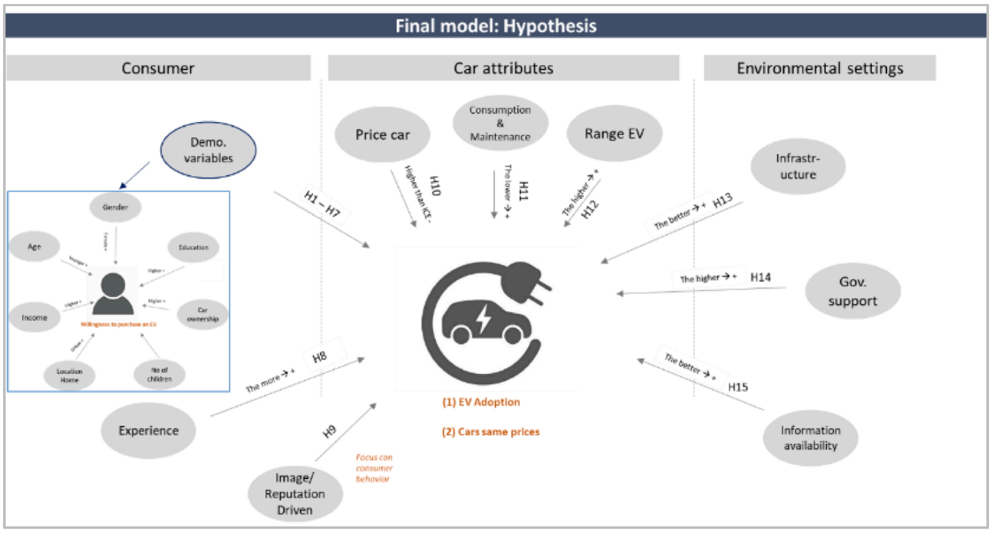

Fig. 1. Final model Overview.

implementation strategies" (p. 970) with public charging stations to enhance electric mobility. Hoen and Koetse (2014) demonstrated that charging potential and recharge time are limiting factors for preference choices for Alternative Fuel Vehicles (AFVs). Harrison and Thiel (2016) concluded that minimal infrastructural objectives could be advantageous; however, in their scenarios, the provision of charging points appeared to be weaker than other vehicles subsidies.

H13 Better infrastructure (charging stations, wallbox installations) the context shows leads to an increased probability of preferring an EV.

There are several studies showing the importance of governmental supports to further promote EV (Cordera et al., 2019; Gallagher and Muehlegger, 2011; Hardman et al., 2017; Li et al., 2019; Turcksin et al., 2013). Wang et al. (2017) divided policy measures into three categories, such as financial incentives, information provision, and convenience policy measure and displayed that all three catalogs are significantly related to EV adoption intention. Hackbarth and Madlener (2016) found that governmental purchase price subsidies were not sufficiently valued by consumers, although non-monetary government incentives and vehicle tax exemptions could increase the likelihood of choosing an AFV. Similarly, Mukherjee and Ryan (2020) has shown that financial incentives can especially encourage younger consumers with lower savings and also showed the positive impact of exclusive bus lanes or free parking while recharging. Zhang et al. (2011) found a negative influence of government policies on EV adoption.

H14 Governmental support for EVs leads to an increased probability of preferring an EV.

In order to overcome other barriers for EV adoption, it is necessary to improve the availability and diffusion of information about low emission cars. Some authors have shown that consumers are often resistant to new technologies because of their novelty, unfamiliarity, and uncertainty (Hidrue et al, 2011; Ozaki, 2011; Egbue and Long, 2012; Turcksin et al., 2013). Rezvani et al. (2015) showed that so-called "engaged green" consumers pursued a more technology-oriented lifestyle and were open to change. Rahmani and Loureiro (2019) found mistrust and misconceptions about this technology to be other reasons for a lack of interest.

H15 More available information combined with the know-how of dealers, leads to an increased probability of preferring an EV.

This literature review provides a comprehensive overview of existing studies that analyze the variables that motivate or hinder EV adoption. As stated by Nayum and Klöckner (2014), it is important not only to include sociodemographic factors but also psychological factors to avoid misguidance for industry and policy decisions.

2.3. Hypotheses and model

Following the literature review, our hypotheses refer to the following categories: (1) demographic factors including individual variables and experience, and consumer behavior; (2) car attributes, such as range, price, etc.; and (3) situational factors, such as environmental settings. Table 9 in the appendix shows the hypotheses with the respective study references.

2.3.1. Final model

Fig. 1 shows the final model, which is a logit regression, for this research in a visual approach. This study differs from previous studies by not only offering a complete overview of demographic variables of consumers but also by taking into consideration car attributes and environmental settings in the same model, with the objective of analyzing the factors that influence consumer intention to adopt EVs. Additionally, and more importantly, it analyzes the impact on consumer behavior if EVs cost the same as other cars, namely if EVs are not more expensive than traditional vehicles.

The model is built on the following:

Table 1
Overview Variables.

Variable	Question	Definition	Descriptive
Yes_EV_1_0	Based on the variable Future_EV: Would you rather buy an electric or Diesel/Gasoline car as your next future car? (Dummy variable)	0–50% = 0 –> No EV 51%-100% = 1 –> Yes EV	0 = 64%/ 1 = 36% Std deviation: 30.23524 Min: 0 Max: 100
Car_sameprice	With regard to the different technologies of a car, if all types of cars cost the same, would you rather buy an electric or Diesel/ Gasoline car?	1 = Electric vehicle, 0 = Traditional vehicle (Diesel or Gasoline. ICE - internal combustion engine)	1 = 82%, 0 = 18%
Driver_License	Do you possess a driver's license?	1 = Si/Yes, 0 = No	90% Yes/ 10% No
Age	How old are you?	indication of age	Min: 18/ Max. 87 Average 31 Std deviation: 13.00326
Gender	What is your gender?	0 = female, 1 = male	0 = 54% 1 = 46%
Own_Car	Do you have a car (independently if it is a leasing, financed, property)?	0 = No, 1 = Yes, Petrol car, 2 = Yes, Diesel Car, 3 = Others	0 = 26%/ 1 = 36%/ 2 = 30% 3 = 8%
Type_car	What type of car would you like to buy as your next one?	1 = Gasoline/Gasolina, 2 = Diesel, 3 = Battery Electric car/ Vehículo eléctrico de batería (BEV), 4 = Plug in Hybrid/Vehículo hibrido enchufable (PHEV), 5 = Others	1 = 21%/ 2 = 13%/ 3 = 17%/ 4 = 21%/ 5 = 28%
Future_EV	How likely (in %) is it that you buy an electric vehicle (EV) as your next vehicle (0% not likely at all, 100% certain)?	Indication in %	mean = 46%
Area	What area do you live in?	1 = City Center (urban area) / 2 = suburban area/ 3 = rural area	1 = 56%/ 2 = 31%/ 3 = 13%
Edu	What is your highest level of education?	2 = High school (Abitur), 3 = Bachelor Degree, 4 = Master Degree, 5 = Doctor and above	2 = 18%/ 3 = 38%/ 4 = 27%/ 5 = 17%
Salary	What is your annual salary? (gross income)	1 = <20.000€, 2 = 20.000€-34.999€, 3 = 35.000€-49.999€, 4 = 50.000€-64.999€, 5 = 65.000€ or more	1 = 61%/ 2 = 14%/ 3 = 9%/ 4 = 6%/ 5 = 10%
Children	How many children do you have?	0 = none; 1 = 1; 2 = 2; 3 = 3; 4 = 4; 5 = 5 or more	0 = 79%/ 1 = 7%/ 2 = 11%/ 3 = 3%/ 4 = 0,14/ 5 = 0,05
PrevExp2	Have you had previous experience with electric vehicles (EVs)? Response	0 = No. No experience at all./ 1 = Yes	0 = 78%/ 1 = 22%

- Dependent variables: "EV Adoption" and "Cars same price".
- Independent variables: Demographic variables, car attributes, environmental settings

$$EV = b_0 + b_1 \text{Age} + b_2 \text{Educ} + b_3 \text{ Gender} + b_4 \text{ Income} + b_5 \text{ Owncar} + b_6 \text{ Area} + b_7 \text{ Children} + b_8 \text{ Exper} + b_9 \text{ Image} + b_{10} \text{ Pricecar} + b_{11} \text{ Consump} + b_{12} \text{ Range} + b_{13} \text{ Infrastructure} + b_{14} \text{ Govsupport} + b_{15} \text{ Infoavail} + e$$

3. Empirical analysis

In this section, we focus on the data set with which we worked and the analyses performed. The main techniques are: (i) factor analysis, which helps to reduce variables, and (ii) logit to determine the relevance of the factors for increasing the probability of considering purchasing an EV.

3.1. Data Collection: The survey

Data were collected via a web-based survey (Survey Monkey Platform, Premium member) through an online questionnaire. Distribution of the survey and participation were completely anonymous and without any remunerative aspects. Before issuing the final survey, an intense check-control process was carried out. The survey was sent to six experts from the automotive industry and four other persons, who were invited to comment. This improved the quality of the survey. The common method of online invitations sent via email was applied. The study was sent out from Barcelona, Spain and was conducted online during the months of March until May 2021. After passing several evaluation committees at the University of Autonoma de Barcelona, the survey was finally approved to be sent in both English and Spanish to the UAB́s data set. This data set consists of students, professors, and administrative employees.

The survey was not distributed through a paid-based platform due to lack of funding. Throughout the entire process, the utmost attention was paid to a careful sample design with a focus on controlling sampling errors and avoiding biases that could be introduced unconsciously. Subsequently, sample validation was also conducted to ensure that the sample was representative of the population, as explained in the following.

Regarding the sampling method, a quota sampling approach was developed for contacting people from the University Autonoma of Barcelona with the goal of obtaining a "quota" of each stratum of the population, according to gender and age (sampling people

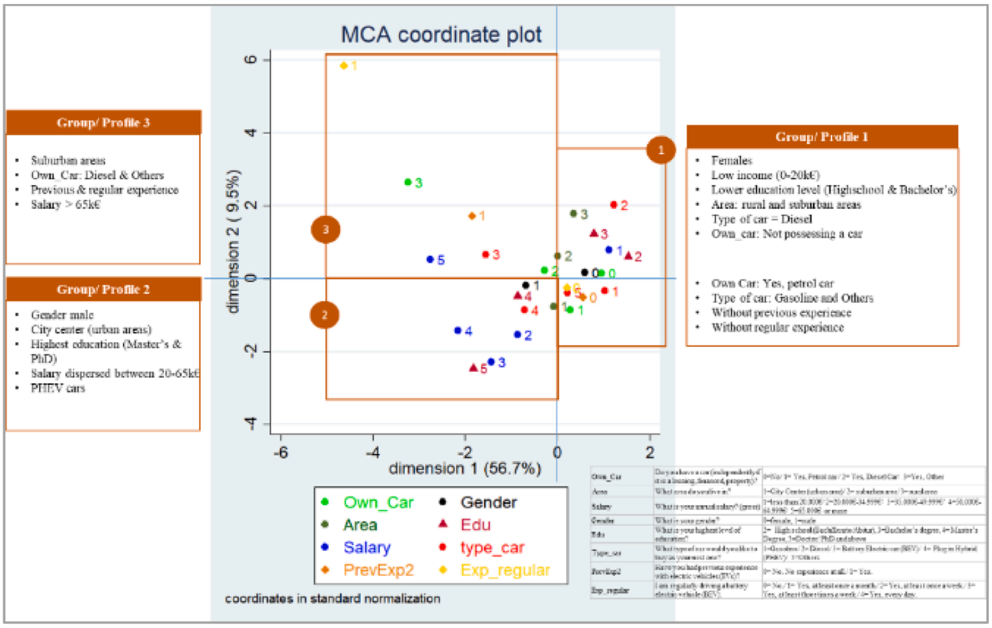

Fig. 2. Results MCA Analysis.

between 18 and 87 years old), in order to be more representative of the population of interest (Barcelona, Spain). Based on official sources from the National Institute of Statistics (INE, 2022) and focusing on the gender and age of the population for Barcelona from 18 years until 87 years with a sample of 4.46 million habitants, 48.4% were male and 51.6% were female. In order to determine the sample size, we considered an infinite population, a confidence level of 95%, with p = q = 0.5 and a sampling error of + 2%, which supposed a theoretical sample size of 2,400 observations.

The questionnaire consisted of two parts: the first part gave information on the profile of the respondents, including gender, age, education, income, and residential location, and the second part contained measurement items of additional variables of experience, preferences in cars, etc. In total, 2,198 answers were collected. In order to ensure the quality of the sample, 50 answers were excluded due to missing values for variables that will be used later to perform the two different factor analyses to be applied, resulting in a total sample of 2,148 responses.

The overall sample ranged in age from 18 to 87, with an average age of 31 years, which is a fairly young sample. When tabulating the sample by gender and age, we obtained 45.67% males and 54.32% females on the basis of 2,115 valid answers. The majority had an income of less than 20,000€ and up to 35,000€. Referring to official sites of population distribution in Spain (INE, 2022), the majority lived in urban areas, with 56% living in urban areas/ city areas and 31% in sub-urban areas, for a total of 87%. Comparing this figure to the Spanish Urban population (INE, 2022) an 80% of the population lives in urban areas in 2020. The difference with respect to the proportions in the population is + 2.7%. This sampling error is slightly above the theoretical one, so we consider that the sample obtained is an acceptable representation of the population of interest.

3.2. Data and Description of variables

In order to achieve the objectives of this work, the variables as found in Table 1 were defined.

The dependent variable "EV" asked about the preference for an EV or "other" and was changed into a binary variable for the sake of simplicity, with 1 as opting for an EV as a future car, and 0 for opting for "other". Interestingly, 64% would rather buy an "other" vehicle than an EV. If all vehicles cost the same, 82% would opt for an EV (variable "car_sameprice"). Ninety percent of respondents possessed a driver's license, and 26% did not possess their own vehicle.

4. Empirical results

4.1. Most important factors when buying a new car

When analyzing the direct question "What are the most important factors when buying a new car? Indicate on a scale from "1 = not important at all" to "10 = most important," the factors price, driving range, and consumption (refers to fuel consumption) showed the highest importance. Interestingly, social acceptance had the lowest importance. This is an important finding for the following analysis when prices are assumed to be the same for all vehicles.

Table 2
Categories new variable "Profile".

New variable "Profile"		Description	
Category 1 Females with low income, low education level living in suburban and rural areas	profile = 1 if d1 > 0	• Females • Low income (0–20 k€) • Low education level (Highschool and Bachelorś Degree) • Area: rural and suburban areas • Type_car = Diesel • Own_car: Not possessing a car • Own Car: Yes, gasoline car • Type_car: Gasoline + Others • Without previous experience • Without regular experience	Frequency 1.244 58%
Category 2 Males with high education in city center and higher income	profile = 2 if d1 < 0 and d2 < 0	• Males • City center • Highest education (Masters and PhD) • Income dispersed between 20 and 65 k€ • PHEV cars	Frequency: 583 27%
Category 3 Male with highest income living in suburban areas with experience	profile = 3 if d1 < 0 and d2 > 0	• Suburban areas • Own_Car: Diesel and Others • Previous and regular experience • Income > 65 k€	Frequency: 323 15%

4.2. Exploratory Factor analysis

Due to the relationships among the explanatory quantitative variables, and with the purpose of avoiding future problems of collinearity in the explanatory analysis, we first conducted an Exploratory Factor Analysis (EFA) with all quantitative predictor variables (33 variables in total). These included those that loaded on factors listed in Table 10 in the appendix, with a total of nine car-factor importance items (measured on a 10-point Likert scale in response to the question, "What are the most important aspects when buying a new car?") and another 22 EV opinion items (measured on a 5-point Likert scale of agreement/disagreement). Additionally, the quantitative variables "age" and "children" were included in the EFA. Principal component factor analysis with varimax rotation was implemented. We considered only factors with an eigenvalue > 1 (number# of factors was 10). With 10 factors, we captured 60.31% of the total information contained in the original variables (kMO value: 0.753 and Bartlett's test for sphericity Chi-squared = 16470.16***, df = 528). In Table 12 and 13 in the appendix, we show the rotated factor loadings, eigenvalues, and the percentage of variance explained by each factor obtained through factor analysis.

4.3. Multiple correspondence analysis (MCA)

Due to possible relationships between the qualitative variables and in order to avoid future problems of collinearity in the explanatory analysis, we performed a Multiple Correspondence Analysis (MCA) for the qualitative variables (see Fig. 2). We worked with two dimensions because graphing is more intuitive. Furthermore, the principal inertia of dimension 1 was 0.024, and the principal inertia of dimension 2 was 0.004. The percentages of original information captured by these two dimensions were, respectively, 56.74% and 9.53%, with the cumulative percentage being 66.27%. For the MCA all qualitative variables were selected to check the possible dimensions and to provide a first interpretation.

In the upper right in Fig. 2 as "Group/Profile 1," we find the gender "female" and the income category 0–20 k€, combined with a lower education level (2) with High School (Bachillerato) and Bachelor. These individuals live in rural and suburban areas and do not own a car. In the same dimension of the coordinate plot < 0 are grouped individuals who own a gasoline car and would choose gasoline or others as future cars and who do not have any EV experience yet. On the left-hand side dimension, we find individuals who can be grouped into "Profile 2," that is, males living in the city center with the highest education level (master's and PhD) and a dispersed income level of 20 k€ − 65 k€. Individuals who are grouped into "Profile 3" are those living in suburban areas, owning diesel cars & others, with previous and regular EV experience and the highest salary at > 65 k€. Although MCA helps to detect and represent underlying structures of categorical variables in order to define groups of individuals with a similar profile, it is possible that the groups included individuals who did not fit 100% into the profile definition.

In summary, MCA helped to reduce qualitative variables in only one variable "profile" with three subcategories (see Table 2). Later, in the regression analysis, the categories represented the initial variables.

4.4. Relationship between profiles and factors

As the factors were quantitative variables and profile was a qualitative variable with three categories, through one-way ANOVA, we tested whether the population means of the new quantitative variables (which were the factors obtained) were equal for the categories

Table 3
Oneway factors.

oneway (factorX) ANOVA profile, tab	F	Prob > F (p-value)	Variances homogeneity Prob > chi2
Factor 1: Reputation-Driven	6.32	0.0018	0.528
Factor 2: Fitting necessities	10.26	0.0000	0.137
Factor 3: Social status	6.29	0.0019	0.279
Factor 4: Performance	0.70	0.4946	0.068
Factor 5: Price compensation	0.75	0.4702	0.147
Factor 6: Life Stage	283.048(a)	0.0000	0.0000
Factor 7: Lack of knowledge	21.98	0.0000	0.578
Factor 8: Missing infrastructure	2.305 (a)	0.1002	0.024
Factor 9: Price of EV	19.19	0.0000	0.564
Factor 10: Range Anxiety	4.10	0.0167	0.301

(a)F value of applying fstar option. Based on the fact that variances homogeneity is not given for the factor “Life Stage” and “Missing infrastructure”, the F-value represents the one obtained through fstar command in Stata.

Table 4
Logit regression Model 1 Option 1.

Model 1 Option 1: Dependent Variable EV					
Definition Factor	Coef	Std. Err.	P>|z|	Lower limit ci 95%	Upper limit ci 95%
Factor 1: Reputation-Driven	0.0844426	0.0540744	0.118	−0,0215	0.1904
Factor 2: Fitting necessities	1.012105	0.0661058	0.000	0.8825	1.1416
Factor 3: Social status	0.1690223	0.0535709	0.002	0.0640	0.2740
Factor 4: Performance	0.4864028	0.0588977	0.000	0.3709	0.6018
Factor 5: Price compensation	0.4599024	0.056502	0.000	0.3491	0.5706
Factor 6: Life Stage	0.2579496	0.0519183	0.000	0.1561	0.3597
Factor 7: Lack of knowledge	-0.0025247	0.0543732	0.963	−0.1090	0.1040
Factor 8: Missing infrastructure	-0.0412599	0.0535949	0.441	−0.1436	0.0637
Factor 9: Price of EV	-0.1288551	0.0556772	0.021	−0.2379	−0.0197
Factor 10: Range Anxiety	0.0311045	0.0531473	0.558	−0.0730	0.1352
_cons	-0.7759184	0.0560567	0.000	−0.8857	−0.6660

Log likelihood: −1073.1354.
Number of observ: 1985.
LR chi2(10): 448.26.
Prob > chi2: 0.0000.
Pseudo R2: 0.1728.

of the variable “profile” (see Table 3).

All factors except “performance,” “price compensation,” and “missing infrastructure” showed a statistically significant difference in the means corresponding the three categories of “profiles.” Therefore, only these factors, each unrelated to the variable “profile,” were selected for the logit regression that included the profile variable to avoid potential collinearity. The close relationship between the profiles and factor 6 (life stage) probably arises because both represent socio-demographic differences.

4.5. *Estimation of the explanatory model: Analysis*

After defining the factors and the new categorical variable “profile,” we checked their relations with the other variables before estimating the model. In order to overcome multicollinearity, we tested the variables for possible correlation problems between them. We related and hypothesized the factors obtained through EFA that did not show any multicollinearity with the variable “profile” and the preference for EV in the future. The analysis of this study includes robustness assessments, factor analysis, and multivariate logit analyses of the individuals’ attitudinal and behavioral opinion towards EV.

In order to determine how the obtained factors and the profiles impacted on the dependent variable, attending to the nature of this variable, logit regression was implemented. There were two different approaches due to the relationship identified between “factors” and “profile”: (1) used only the factors as explanatory variables (see 4.5.1) and, (2) worked with “profile” and factors not related to profile as explanatory variables (see 4.5.2). Option (2) helped us to verify and strengthen the results of option (1,) at least for the factors which were not related to profile. It is noteworthy to highlight that the survey asked about preferences and beliefs, so the interpretations were limited to the relationship between opinions and preferences.

4.5.1. *Option 1: Logit regression only with factors*

In a first assessment, a logit regression was performed only with the factors defined above. The Pseudo R-squared shown in the following tables refers to McFaddeńs $R^{\hat{}2}$ and is a measure of goodness of fit. The overall fit of the model was significant and the correctly classified observations were 72.80% (66.17% “yes” and 75.28% “no”). All factors except the factors “reputation-driven”,

Table 5
Logit Regression Model 1 Option 2 (with "profile").

Model 1 Option 2					
Yes_EV_1_0	Coef	Std. Err.	P>|z|	Lower limit ci 95%	Upper limit ci 95%
_Iprofile_2 (Male city center)	. 8,744,242	0.112426	0.000	0.6540	1.0947
_Iprofile_3 (Male highest salary)	. 8,970,386	0.1370168	0.000	0.6284	1.1655
Factor 4:Performance	. 3,974,305	0.053762	0.000	0.2920	0.5028
Factor 5: Price compensation	. 3,600,625	0.0513426	0.000	0.2594	0.4606
Factor 8: Missing infrastructure	-0.0329299	0.0496488	0.507	−0.1302	0.0643
_cons	−1.011134	0.0683952	0.000	−1.1451	−0.8770

Log likelihood: −1199.7339.
Number of obs = 1985.
LR chi2(5) = 195.06.
Prob > chi2 = 0.0000.
Pseudo R2 = 0.0752.

Table 6
Logit Regression Model 2 Option 1 ("Car_sameprice").

Model 2: Dependent Variable: Car_sameprice					
Car_sameprice2	Coef	Std. Err.	p-value	Lower limit ci 95%	Upper limit ci 95%
Factor 1: Reputation-Driven	-0.4422998	0.0741533	0.000	−0,5876	−0.2969
Factor 2: Fitting necessities	1.369866	0.0856904	0.000	1.2019	1.5378
Factor 3: Social status	0.4801909	0.0733781	0.000	0.3363	0.6240
Factor 4: Performance	0.3579716	0.06851	0.000	0.2236	0.4922
Factor 5: Price compensation	0.4091105	0.0711792	0.000	0.2696	0.5486
Factor 6: Life Stage	0.0783293	0.070079	0.264	−0.0590	0.2156
Factor 7: Lack of knowledge	0.2137138	0.0676224	0.002	0.0811	0.3462
Factor 8: Missing infrastructure	-0.2510928	0.0717101	0.000	−0.3916	−0.1105
Factor 10: Range Anxiety	-0.2778786	0.0743539	0.000	−0.4236	−0.1321
_cons	2.152514	0.0894543	0.000	1.9771	2.3278

Log likelihood: −656.81695.
Number of observ: 1981.
LR chi2(9) = 546.18.
Prob > chi2 = 0.0000.
Pseudo R2 = 0.2937.
Info: Factor 9 not included in this model (Price).

"lack of knowledge," "missing infrastructure" and "range anxiety" showed a significant effect (see Table 4). The more the EV fit the personal and professional "necessities," the higher the probability of preferring an EV as their next car. If consumers perceived that an EV could fit their professional and personal necessities, the higher the probability of purchasing one. "Social status" represented the understanding that an EV improves social status and image in society. The greater the attention paid to social status, the higher the probability of preferring an EV over a gasoline/ diesel vehicle as the next future car. Thus, status-driven consumers were more akin with one another in preferring and purchasing EVs compared to non status-driven consumers. The "performance" factor included car attributes, such as range, performance, consumption and emissions, and the better these data were for the vehicle, the higher the probability of preferring an EV. The factor "price compensation" showed a positive coefficient and included variables that defined that lower consumption and lower maintenance compensated the higher purchase price of the EV. Consumers were more willing to purchase EVs if they perceived that the lower maintenance and consumption compensated for the initial purchase price. The "life stage" factor included the consumer's age and number of children, and the positive coefficient indicated that the older and the more children the consumer had, the higher the preference for an EV. The "price" factor included aspects related to the higher price for EVs and showed a negative coefficient, which means that the higher the price for EV, the lower the probability of purchasing an EV as their next car.

4.5.2. Option 2: Logit regression with "Profile" and not related factors

The global fit of the model considering the factors and profile was significant, and the correctly classified observations were 67.51% (58.75% "yes" and 69.72% "no"). As for the newly introduced variable "profile," we can see that belonging to profile 2 or 3, instead of profile 1, increased the preference for an EV as the next car compared to an ICEV (see Table 5). As explained above, profile 1 was made up of females with lower education levels and lower income, while profile 2 and 3 were made up of men with higher salaries and who owned cars. We can see that all categories were statistically significant, which means that profile 2 and 3 individuals were more likely to prefer an EV than the group of individuals assigned to profile 1.

In order to analyze the impact on the dependent variable, only the factors not related to profile were introduced: "performance," "price," and "missing infrastructure" (see Table 5). Two of these three factors were statistically significant. "Performance" showed statistical significance with a positive coefficient, so the better the technical data of an EV, the higher the preference for this type of technology. This coincided with the positive, significant results of the factor “price compensation”.

4.6. Consumer behavior when assuming equal prices

In order to deepen the analysis of consumer attitudes, the hypothetical situation that EVs cost the same as other cars was introduced. Therefore, a new dependent variable “car_sameprice” was introduced, which refers to the question that if EVs cost the same as other cars, which car would the consumer prefer. As previously explained, the variable “price” has a statistical significance impact on the purchase intention of EV and is therefore important to analyze. This approach helped to provide evidence on consumer behavior and to shed further light on the importance of reputation and image when adopting an EV. As previously explained, two different approaches to explanatory variables were used: (1) used only factors (see 4.6.1) and; (2) used “profile” and not related factors (see 4.6.2).

4.6.1. Option 1: Logit regression only with factors

First, a logit regression was conducted (see Table 6). The global fit of the model considering nine factors (factor price was excluded) was significant and the correctly classified observations were 85.71% (87.67% “yes” and 68.02% “no”). The factor “price” was excluded from this model as the dependent variable itself supposed that EVs cost the same as other cars. Factors “fitting necessities,” “social status,” “performance,” “price compensation,” and “lack of knowledge” showed statistical significance with positive signs. The factors “reputation-driven”, “missing infrastructure” and “range anxiety” were statistically significant with negative coefficients. The factor “life stage” was not statistically significant in this model.

The factor “reputation driven,” which had not shown a significant effect on the preference for EV in the first model, was significant in the second model with a negative coefficient, meaning the more consumers were driven by reputation (based on the vehicle’s brand, design, social acceptance, and reputation), the less they opted for an EV in the situation that EVs cost the same. This is in line with the significance level of the factor “social status” in the first model. Considering the situation that all cars cost the same and the significance level of this factor, it showed that reputation-driven consumers were influenced by the higher price of an EV. Thus, reputation-driven consumers seemed to prefer higher-priced EVs to increase their status and reputation. As previously shown, this is in line with the study by Griskevicius et al. (2010), explaining that status motives increased the desirability of green products when they cost more than non green products.

The factors “fitting necessities,” “social status,” “performance,” and “price compensation” can be interpreted in the same way as in Model 1. The factor “life stage”, representing age and having children, showed a positive effect on the preference for an EV, without statistical significance if we assumed that car prices were the same. “Lack of knowledge,” which had no significant effect on the probability of increasing one’s preference for EVs according the first model, now became positive and significant. Therefore, if EVs cost the same as other cars, and the more information and knowledge about EVs was provided, it seems that consumers had a higher probability of preferring EVs over other cars. Factor “missing infrastructure” now showed a negative coefficient, which was interpreted as if infrastructure was lacking, consumers showed a decreasing probability of preferring EVs, assuming that the car prices were the same. The same happened for “range anxiety,” which showed no significant effect on the probability of preferring EVs according to the first model, but when the assumption about the same price for all cars was introduced, “range anxiety” showed a negative coefficient, which led to the assumption that the worse the range, the lower the probability of preferring an EV. In summary, the results of the first option of the second model give additional information on factors that were not statistically relevant in the first model.

4.6.2. Option 2: Logit regression with “Profile” and not related factors

In line with the previous approach in Model 1 Option 2, the new dependent variable was also compared with the created variable “profile” and the factors “performance,” “price compensation,” and “missing infrastructure,” which were factors not related to profile (see Table 7). The overall fit of the model considering the three factors and “profile” was significant, and the correctly classified observations was 82.23% (82.28% “yes” and 66.67% “no”). Category 2 of the newly created variable “profile” showed statistical relevance, meaning that male consumers living in the city center showed a higher probability of buying an EV compared to female

Table 7
Logit Regression Model 2 Option 2 “Car_sameprice” (with “profile”).

Car_sameprice	Coef	Std. Err.	P>|z|	Lower limit ci 95%	Upper limit ci 95%
_Iprofile_2 (Male city center)	0.3754224	0.1471205	0.011	0.0870	0.6637
_Iprofile_3 (Male highest salary)	0.1087161	0.1722673	0.528	−0.2289	0.4463
Factor 4: Performance	0.2885597	0.0565134	0.000	0.1777	0.3993
Factor 5: Price Compensation	0.3249849	0.0583146	0.000	0.2106	0.4392
Factor 8: Missing infrastructure	-0.2060537	0.0620898	0.001	−0.3277	−0.0843
_cons	1.488456	0.0775327	0.000	1.3364	1.6404

Log likelihood: −892.87321.
Number of obs = 1981.
LR chi2(5) = 74,07.
Prob > chi2 = 0.0000.
Pseudo R2 = 0.0398.

consumers with lower income and education, living in suburban and rural areas. However, category 3 of the variable “profile,” which referred to male consumers with the highest salary living in suburban areas and having had previous experience with EV, showed no statistical significance; thus, the coefficients tended to suggest that for this consumer group there was no influence on the preference for EV if these type of cars cost the same as the others.

In contrast to Model 1, “missing infrastructure” now showed statistical significance with a negative coefficient in both logit options, assuming that consumers’ preferences for EVs were lower with a missing infrastructure for recharging. “Price compensation” was interpreted to mean that lower consumption and lower maintenance costs can compensate for the higher purchase price for EVs. “Performance” referred to technical data, such as range and performance, and the better these data were, the higher the preference for an EV.

In summary, when comparing all four models, the price comparable models showed slightly better prediction accuracy, which strengthens the present approach of conducting a second model with the control variable of prices. In the following, the pseudo R2 and accuracy of the four models are summarized.

- Model 1 Option 1: pseudoR2 = 0.17, accuracy (correctly classified preferences) = 72.80%
- Model 1 Option 2: pseudoR2 = 0.08, accuracy (correctly classified preferences) = 67.51%
- Model 2 Option 1: pseudoR2 = 0.29, accuracy (correctly classified preferences) = 85.71%
- Model 2 Option 1: pseudoR2 = 0.04, accuracy (correctly classified preferences) = 82.23%

4.7. Results of hypotheses for both models

In comparison to the first model (assuming different prices), the second model (assuming equal prices) provided further statistical relevance. It is noteworthy that reputation-driven consumers showed negative statistical relevance in the second model based on Factor 1 “reputation-driven,” meaning that if prices were the same for all vehicles, the probability of preferring an EV over an ICE vehicle would decrease. Griskevicius et al. (2010) also found that status motives increased the preference for green products, especially when these products cost more than non green products. Griskevicius et al. (2010) and Hafner et al. (2017) have suggested that people might not agree that image matters when adopting EV when asked directly. Therefore, the role of image and reputation is highly complex, and consequently consumeŕs responses regarding those variables might not reflect the real attitude. This is an important finding for further research on consumer behavior. For five of our hypotheses, we found statistical evidence in only one of the two models, which raises the possibility that the positive tests may have been “false positives” due to the increased probability of getting a positive result when conducting multiple hypothesis tests. In order to overcome this issue, we applied the Bonferroni test as the technique when conducting multiple analyses on the same dependent variable with the chance of increasing error rate, and thus increasing the probability of incorrectly rejecting the true null hypothesis by coming about a significant result by chance. However, we found no concerning impact. Table 11 in the appendix shows the hypotheses’ results.

4.7.1. Consumer hypotheses

Regarding Hypothesis 1, “Females are more likely to prefer EVs than men,” this assumption can be rejected in both models, as profiles 2 and 3, which included male consumers, showed a positive sign compared to group 1 in which women were prevalent; thus, in this sample men seemed more likely to prefer EVs. As previously explained, it is important to consider that not each individual who responded to the survey fit 100% the definition of the different groups created from MCA. If this result is accepted with some caution, Hypothesis 1 is to be rejected, and this outcome is in line with Plötz et al. (2014). As for the variable age, our result suggests rejecting Hypothesis 2 based on Model 1, as the factor “life stage,” which included the variable “age,” showed a positive sign, meaning that the older the consumers were, the higher the probability of preferring an EV. This result supports the findings by Johansson-Stenman and Martinsson (2006), Zhang et al. (2011), Plötz et al. (2014), Peters and Dütschke, (2014) and Jansson et al. (2017). As previously explained, this hypothesis was rejected in the first model, and statically was not significant in the second model. Hypothesis 3 can be accepted with the different profile categories created through MCA that showed a positive impact of belonging to profile 2 or 3 (higher education) compared to profile 1 (lower education). Thus, a higher level of education led to a higher probability of preferring an EV, which is in line with the current literature (Hidrue et al., 2011; Sanitthangkul et al., 2012; Olson, 2013; Jansson et al., 2017; Mukherjee & Ryan, 2020; Nayum and Klöckner, 2014). The same applies for Hypothesis 4, according to which a higher income leads to a higher probability of preferring an EV, in accordance with Bjerkan et al. (2016), Plötz et al. (2016), Plötz et al. (2017), Junquera et al. (2016), Erdem et al. (2010). Hypothesis 5 is to be accepted based on the different profile categories, which showed that people living in urban areas (profile 2) were more likely to purchase an EV than those living in rural areas (profile 1). This result is in line with Mukherjee and Ryan (2020)) and adds further evidence concerning this variable. Hypothesis 6 states that consumers who have children (more household members) are more likely to buy an EV, as the results of Zhang et al. (2011), Nayum and Klöckner (2014), Plötz et al. (2014) showed. This was confirmed in both models, based on the positive significance of factor 6. Also, the fact of owning a car, as Hypothesis 7 assumes, can be accepted in both models and provides further evidence for what Zhang et al. (2011) and Nayum and Klöckner (2014) found. As for Hypothesis 8, having had previous experience seemed to increase the preference for EVs and therefore, Hypothesis 8 can be accepted based on the result of the previously defined profiles. The positive impact of having had previous experience confirms former findings found for this variable, among others by Xu et al. (2020), Liu et al. (2020) and Schmalfuβ et al. (2017) and Jensen et al.

(2013). Hypothesis 9 deals with the question of whether reputation- and status-driven people have a higher probability of preferring an EV, aiming to provide further contribution to the literature especially based on the research by Hahnel et al. (2014), Johansson-Stenman & Martinsson (2006), Rahmani and Loureiro (2019), Ozaki (2011), Laroche et al. (2001), Lane and Potter (2007), and Hur et al. (2013). This can be accepted based on the significant level of the factor “social status” in Model 1 Option 1. Consumers believe that an EV improves their image, reputation, and social status. The result regarding the impact of status was reinforced in Model 2 Option 1, where “social status” again showed a positive statistical significance. More interestingly, the factor “reputation-driven” now in Model 2 Option 1 showed a statistical significance with a negative coefficient, leaving room for interpretation that reputation-driven consumers only prefer EVs if these types of vehicles are more expensive. Once EVs cost the same as other vehicles, they seemed not to be a preferred option for this consumer group. This is an interesting result and can serve as useful evidence for future research.

4.7.2. *Car attributes hypotheses*

Hypothesis 10 states that a higher purchase price for EV decreases the preference for EVs, and this is to be accepted based on Model 1 due to the statistical significance of the factor “price of EV.” This outcome strengthens the results of Egbue and Long (2012), Knez et al. (2014), Lane and Potter (2007), Bjerkan et al. (2016), Ozaki (2011), Lieven et al. (2011), and Cecere et al. (2018). As mentioned above, the factor “price” was not included in Model 2, based on the model’s assumption that all cars cost the same. Hypothesis 11, stating that lower consumption and lower maintenance of an EV can compensate for the higher purchase price, represented by the factor “price compensation” was validated in both models. This evidence is in line with the research conducted by Lane and Potter (2007), Gallagher and Muehlegger (2011), Egbue and Long (2012). Hypothesis 12 concerns whether a higher driving range, in the form ofthe distance the vehicle can drive before recharging, increases the preference for an EV. Several authors (see e.g. Hidrue et al. 2011, Lieven et al., 2011; Egbue and Long, 2012; Hackbarth and Madlener, 2016; Barkenbus, 2020) have supported this assumption with their research results. In our analysis, the driving range was represented by both the factors “performance” and “range anxiety,” and based on the statistical significance of the factor “performance,” Hypothesis 12 is to be accepted in both models. Although the factor “range anxiety” did not show statistical significance in Model 1, it still can be confirmed by the factor “performance” in Model 1. In Model 2, both “range anxiety” and “performance” showed statistical significance. All in all, the hypotheses about the different car attributes helped to better understand consumer behavior and the factors that influence their preferences for EVs.

4.7.3. *Environmental settings hypotheses*

Hypothesis 13 analyzes the impact of an EV charging infrastructure, which was represented by the factor “missing infrastructure.” Several authors found a significant, positive impact of a good infrastructure for charging on the preference for EVs (Sierzchula et al., 2014; Hoen and Koetse, 2014; Li et al., 2017a; Martínez-Lao et al. (2016); Hardman et al., 2018; Oliveira et al., 2019; Barkenbus, 2020). Our results for this variable showed no statistical significance in Model 1 but a statistical significance with a negative coefficient in Model 2 in both logit options. Therefore, Hypothesis 13 is to be accepted based on Model 2. Hypothesis 14 concerns whether governmental supports increase the preference for an EV, which had been investigated in several research studies with positive affirmation (Gallagher and Muehlegger, 2011; Turcksin et al., 2013; Hardman et al., 2017; Wang et al., 2017; Cordera et al., 2019; Li et al., 2019). We showed (Section 4.5.1, Table 4) that people who consider EV prices important (factor 9) are less likely to intend to buy an EV. The ’subventions’ variable (“The purchase of an electric vehicle should be incentivized by financial advantages”) has a rotated factor loading of 0.490 on factor 9, as shown in Table 12 in the appendix (“Scale_subv-s” for Factor 9). This indicates that the two are associated and, hence, that that price-conscious car buyers may also tend to support subventions for EVs. This is consistent with the hypothesis that governmental supports would increase the preference for an EV through their tendency to reduce the initial purchase price. Since the factor “price of EV” showed statistical significance in Model 1, Hypothesis 14 can be accepted, according to which government support contributes to increasing the preference for an EV. Hypothesis 15 analyzed the impact of information availability reflected in the factor “lack of knowledge,” in order to support the positive relationship between information availability and EV preference, as found by Hidrue et al. (2011), Ozaki (2011), Egbue and Long (2012), Turcksin et al. (2013), Rahmani and Loureiro (2019). In Model 1, the factor was not significant; however, it was statistically significant in Model 2 and therefore can be confirmed based on the Model 2.

Comparing both models proved the robustness of the first model and yielded good performance. The second model provided additional validity and improved interpretation and understanding of consumer behavior, showing that reputation-driven consumers are interested in EV as a sustainable product only when prices are more expensive compared to other vehicles. The model revealed that reputation-driven consumers prefer EVs due to their higher purchase price, as they apparently provide some kind of exclusivity. This fact is of great interest and is explained in more detail in our conclusions, Section 5, below. The approach of running two models with two different dependent variables is acceptable in order to provide greater interpretation and a deeper understanding of consumers of EVs when assuming the same price for all vehicles. However, and as stated as a limitation in the last section, future research should focus on different prices within hypothetical choice experiments.

5. Discussion, conclusion and policy implications

In conclusion, this paper presents, in a comprehensive and systematic way, the impact of different variables influencing the preference for EVs with a strong emphasis on consumer behavior. It includes (1) consumers’ sociodemographic variables with an additional focus on experience and consumer behavior, (2) car attributes, and (3) environmental settings, such as governmental support schemes and infrastructure development on the preference for EV, additional to the findings of how consumer preferences would change if purchase prices were the same for both BEV and ICE vehicles. Based on this structural approach, the findings and recommendations help validate the present research literature to improve the utility of future studies. This study explores the role of reputation, status, and image as factors related to whether an individual will prefer an EV over other vehicles. By highlighting the importance of reputation, it gives valuable information about consumers' behavior. Regarding socioeconomic factors, there are contradictory results in the current literature. At the same time, there is a common understanding that sociodemographic variables exert significant influence. In summary, we could show that a higher education and higher salary, as well as having children and living in urban areas, rather than rural areas and owning a vehicle are positively reflected in the preference for an EV.

At the outset, we asked, "What effect does EV experience have on potential EV adoption?" Previous research has shown that experiences can encourage EV adoption (Liu et al., 2020; Xu et al., 2020; Rauh et al., 2020; Schmalfuβ et al., 2017; Hahnel et al, 2014; Schmalfuβ et al., 2014; Jensen et al., 2013). We found that experience was more common in a particular socio-demographic group: men with higher salaries who live in suburban areas tended to have EV experience. Compared to a reference group of women with less education, lower income, and living in rural or suburban areas, these men in our sample set had more intention to purchase EVs but did not show a clear difference in EV preference (at equal prices with other vehicles). This could be interpreted as showing that lower-income groups tend not to have experimented with EVs (perhaps due to price barriers) but may share preferences for EVs with those who have. However, given those previous research findings that indicate the encouraging effect of EV experiences it may also be the case that intervening to provide EV experiences to individuals who tend to be women with less education and income might encourage EV adoption in this group, particularly as prices of EVs and non-EVs begin to equalize.

Furthermore, our study suggest that the more consumers are driven by reputation, the less they opt for an EV in the situation that EVs cost the same, which is an interesting finding. It is worth considering whether "reputation drive" does not capture the socially desirable aspects of cars other than EVs once "social desirability" is controlled statistically within the model and "purchase price" is removed from the equation (since high-status cars are usually more expensive). A possible follow-up is a moderated multiple regression approach allowing the two variables reputation and price to together explain more, or less, variance than they might do each individually.

Analysis of the heterogeneity of a driver's willingness to purchase an EV is important and useful for public decision-makers, such as governments, to implement correct measures by understanding the market and consumers. Although the study sample is representative of the population of Barcelona with respect to age and gender, it is still useful to take the results into account for policy and decision-making. As other studies have shown (e.g. Gallagher and Muehlegger, 2011; Hardman et al., 2017; Wang et al., 2017; Li et al., 2019), the adoption of EVs is likely to be limited without significant governmental incentives. The potential impact of governmental incentives was validated in both models of this study. Given the low market penetration of EVs, incentives are believed to be a prerequisite to eventually change consumers' environmental behavior. As for the Spanish market, the government put in place the new "MOVES III" support in 2021, which is an aid program to encourage the purchase of electric, plug-in hybrid and fuel cell vehicles; however, it needs certain improvements, on which automotive associations are working. Governments should encourage the availability of information on EVs to clarify misunderstandings about their performance. Additionally, a good infrastructure system should be promoted and implemented.

Overall, the study addresses environmental and sustainability research by focusing on consumer behavior. The hypotheses are tested with two different dependent variables. In doing so, the present study is one of the first to investigate the consumeŕs behavior and preference for EVs using different dependent variables while contrasting previous results concerning sociodemographic variables. The second model highlights the importance of reputation for consumers, when adopting an EV. Being reputation-driven positively influences the preference for EVs only if these cars are more expensive. This result leads to the interpretation that inexpensive sustainable products might undermine a consumers' ability to signal their wealth and purchasing power, and therefore green products are only preferred if they are more expensive. This research can lead to the conclusion that people tend to care more about reputation and social acceptance than about environmental issues. In summary, this study adds value and insights for EV adoption from a consumer perspective and confirms earlier findings while applying new empirical approaches. The research provides a comprehensive analysis of consumers' demographic variables when adopting EVs, car attributes, and external environmental settings, and applies an additional model to analyze consumer behavior by assuming the same prices for all vehicles.

6. Limitations

Although this research shows interesting findings and consequently applicable measures for higher EV adoption, some limitations must be taken into account when interpreting the results. Overall, it should be taken into consideration that it is a study of the relationships between different questionnaire answering patterns and not a study of cause and effect, such as an experiment trial. For future studies, an experiment trial could be applied. Regarding environmental concern, this study included statements to be answered on a Likert Scale, such as "It is important to care for the environment," "For the purchase of an EV, I am motivated by lower contamination compared to an ICEV," etc.; however, future research should focus more on environmental measurements and use as reference the items of the NEP Scale by Dunlap and Van Liere published in 1978. In relation to consumer attitudes and behavior, further research on the connection between EVs and environmental concerns is essential.

The study focuses on EV in general, which also includes HEV and PHEV, where psychological barriers to adaptation are easier to overcome than in the case of pure BEVs, which only run on electricity and have clearer technological differences. It might be treacherous to generalize results from AFVs to BEVs. Therefore, in order to enrich the literature and focus on the most innovative technologies, future studies should mainly focus on BEVs. In line with the study by Noppers et al. (2016), it is critical to keep in mind that people do not necessarily highlight and recognize the importance of symbolic self-attributes, such as the impact on self-identity and social status, when asked directly about important factors for the adoption of sustainable innovations, such as an EV. Consistent with Herberz et al. (2020) and Gleim and Lawson (2014), consumers may admit the importance of a sustainable approach to green products, but they do not always translate this attitude into actual behavior. Future research should further analyze the psychology of consumers to review whether consumers underestimate the importance of symbolic attributes. The present paper applied factor analysis (EFA) and MCA, which implied data reduction in order to create and label different factors and dimensions. This approach helps to reduce correlation between variables; however, it has to be acknowledged that original hypotheses cannot be evinced unambiguously.

Also, it is important to consider that consumer behavior may change over time and it would be interesting to know how status- and image-focused behavior will change once EVs become more accessible to all consumers (see for further information Adnan et al. 2017). It is vital to deal with consumers' attitudes and preferences to be more successful in adopting sustainable means, such as green vehicles. At the same time, it is important to conduct a cross-country comparison to generalize the results. Southern European Countries, such as Spain or Italy, suffer a shortfall of research in this field. Regarding sociodemographic variables, future research should take into consideration the change in transportation patterns in society, e.g., decreasing car ownership and increasing car-sharing options, especially for younger generations (see Efthymiou et al., 2013). At the same time, it is interesting to analyze the relationship between vehicle ownership and household relocations, such as moving to suburban geographies (see Schouten, 2022).

Future research could also analyze in depth the role of the different automotive brands. In the present study, the variable "brand" is included in the factor analyses, but it would be of interest to know whether consumers prefer EVs of a specific brand when adopting luxury brands that might convey social status (is consumer's behavior different when adopting luxury brands, such as Porsche, Mercedes, Audi compared to VW, Renault, KIA, etc.). Despite these limitations, our study does point out a path toward fruitful future research that can be built up from this paper's outcome.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A

See Tables 8-13

Table 8
Definition EVs.

Vehicle type	Short name	Description*
Battery Electric Vehicle	BEV	BEVs run entirely by an electric motor which works solely with batteries, and consequently are without any combustion gasoline engine. The batteries are usually larger than the ones for PHEVs and are rechargeable, so that the vehicle can be plugged into an external source of electricity. BEVs can also, like all electric vehicles, recharge their batteries through regenerative braking for which its kinetic energy is converted into electricity when slowing the car down. Such cars are zero emission vehicles.
Plug-in Hybrid Electric Vehicles	PHEV	PHEVs consist of an electric or battery motor in combination with an internal combustionengine; while the battery-powered electric motor is the main power source. The battery is often smaller than the one in pure BEVs. Both HEVs and PHEVs combine the internal combustion engine with the battery and electric motor, but the PHEVs can be recharged from external sources, such as plugging them in at home, regenerative braking, or by gas engine.
Hybrid electric vehicles	HEV	HEV is a hybrid vehicle, and is mainly powered by an internal gasoline combustion engine. The electric motor is only used to complement this combustion engine. Such cars use the electric motor at low speeds and then change into gasoline power, in contrast to PHEVs. Thus, the main power source is still gasoline. In doing so, such cars combine benefits of both kinds of power sources and are considered a combination of low emission and conventional cars.
Fuel-cell electric vehicles	FCEV	FCEVs uses electricity which is created by using a fuel cell powered by hydrogen from an on-board tank that is combined with atmospheric oxygen. These vehicles do not produce tailpipe emissions.
Range-extended electric vehicle	REEV	REEV is powered by an electric motor and an auxiliary power which is a small petrol engine as electric generator to supply the electric motor. The auxiliary combustion engine is used only to supplement battery charging and consequently to increase the vehiclés range.

Source: U.S.Department of Transportation (2022); (Tran et al., 2021).
* Further types are existing, but are not explained in more detail here, e.g. hydrogen fuel cell vehicles, natural gas vehicles NGV.

Table 9
References Literature Review.

Category		Hypothesis	Authors (Literature Review)	In contrast
Consumer	H1	Females are more likely to prefer EVs than men.	Johansson-Stenman & Martinsson, 2006; Knez et al., 2014; Prakash et al., 2014; Jansson et al., 2017; Simsekoglu & Nayum, 2018; Yang et al. 2019; Sovacool et al., 2019	Plötz et al., 2014
	H2	The younger the consumer, the higher the likelihood of preferring an EV over an ICE vehicle.	Laroche et al. 2001; Hidrue et al., 2011; Sanitthangkul et al., 2012; Knez et al., 2014; Hackbarth & Madlener, 2016; Mukherjee & Ryan, 2020	Johansson-Stenman and Martinsson, 2006; Zhang et al. 2011; Plötz et al., 2014; Peters & Dütschke, 2014; Jansson et al., 2017 *no signficance:* Egbue and Long, 2012
	H3	Higher education leads to an increased probability of preferring an EV over an ICE vehicle.	Hidrue et al., 2011; Sanitthangkul et al., 2012; Olson, 2013; Jansson et al., 2017; Mukherjee & Ryan, 2020; Nayum and Klöckner, 2014	Johansson-Stenman and Martinsson, 2006; Zhang et al., 2011; Hackbarth & Madlener, 2016.
	H4	Higher income leads to an increased probability of preferring an EV.	Bjerkan et al., 2016; Plötz et al., 2016; Plötz et al., 2017; Junquera et al. (2016); Erdem et al., 2010	Nayum and Klöckner, 2014; *no significance*: Sanitthangkul et al., 2012; Egbue and Long, 2012; Knez et al., 2014; Hidrue et al., 2011. Green products: Gleim and Lawson (2014)
	H5	Living in urban areas leads to an increased probability of preferring an EV.	Mukherjee and Ryan, 2020	Plötz et al., 2014
	H6	Having children leads to an increased probability of preferring an EV.	Zhang et al., 2011; Nayum and Klöckner, 2014; Plötz et al., 2014. *household size*	–
	H7	Possessing a car (independent of model) leads to an increased probability of preferring an EV.	Zhang et al., 2011; Nayum and Klöckner, 2014: *number of cars*	Hidrue et al., 2011
	H8	Having had previous experience leads to an increased probability of preferring an EV.	Jensen et al., 2013; Schmalfuβ et al., 2014; Peters & Dütschke, 2014; Hahnel et al., 2014; Larson et al., 2014; Peters & Dütschke, 2014; Nayum et al., 2016; Schmalfuβ et al. 2017; Günther et al., 2019; Rauh et al., 2020; Herberz et al., 2020;Xu et al., 2020; Liu et al. (2020)	Skippon et al., 2016; Bühler et al., 2014
	H9	Reputation- and status-driven consumers are more likely to prefer EVs.	Hahnel et al., 2014;Johansson-Stenman & Martinsson, 2006; Rahmani and Loureiro, 2019; Ozaki, 2011; Laroche et al., 2001; Lane & Potter, 2007; Hur et al., 2013	–
Car attributes	H10	A higher list price for EV lowers the preference for EVs.	Egbue and Long, 2012; Knez et al., 2014; Lane and Potter, 2007; Bjerkan et al., 2016; Ozaki 2011; Lieven et al., 2011; Cecere et al, 2018	–
	H11	Lower consumption and lower maintenance costs compensate for the higher purchase price of EVs and leads to an increased probability of preferring an EV	Lane and Potter, 2007; Gallagher and Muehlegger, 2011; Egbue and Long, 2012	–
	H12	A higher range of EVs, leads to an increased probability of preferring an EV.	Hidrue et al. 2011, Lieven et al., 2011; Egbue & Long, 2012; Hoen & Koetse, 2014; Schneidereit et al. 2015; Hackbarth & Madlener, 2016; Cecere et al., 2018; Günther et al., 2019; Barkenbus, 2020	For unexperienced drivers: Franke & Krems, 2013
Environ-mental settings	H13	Better infrastructure (charging stations, wallbox installations) the context shows leads to an increased probability of preferring an EV.	Sierzchula et al., 2014; Hoen & Koetse, 2014; Li et al., 2017a; Martínez-Lao et al. (2016); Hardman et al., 2018; Oliveira et al., 2019; Barkenbus, 2020	Weaker than other incentives: Harrison and Thiel, 2016
	H14	Governmental support for EVs leads to an increased probability of preferring an EV.	Gallagher and Muehlegger, 2011; Turcksin et al., 2013; Hardman et al., 2017; Wang et al., 2017; Cordera et al., 2019; Li et al., 2019	Zhang et al., 2011; Hackbarth & Madlener, 2016; For younger consumers: Mukherjee and Ryan, 2020
	H15	More available information combined with the know-how of dealers, leads to an increased probability of preferring an EV.	Hidrue et al, 2011; Ozaki, 2011; Egbue and Long, 2012; Turcksin et al., 2013; Rahmani & Loureiro, 2019	–

Table 10
10 Factors defined through factor analysis.

Factor	Variables	Definition Variables	Question Survey	Definition Factor
Factor 1	Factor_Brand Factor_Design Factor_SocAccept Factor_Reput	Brand Design Social Acceptance Reputation	What are the most important factors when buying a new car? Please indicate on a scale from “1 = not important at all” to “10 = most important”.	Reputation driven
Factor 2	Scale_personalnecess	An electric vehicle fits my personal necessities.	Please indicate on a scale from 1 (completely disagree) to 5 (completely agree) with the following. (EV = electric vehicle. ICE = internal combustion engine; traditional vehicle)	Fitting necessities
	Scale_professionalnecess	An electric vehicle fits my professional necessities.		
	Scale_lessemiss	For the purchase of an EV, I am motivated by a lower contamination of an EV (compared to an ICE).		
Factor 3	Scale_image_socialstatus	Driving an electric vehicle would improve my image and social status.	Please indicate on a scale from 1 (completely disagree) to 5 (completely agree) with the following. (EV = electric vehicle. ICE = internal combustion engine; traditional vehicle)	Social Status
	Scale_ecofriendlyimage	For the purchase of an EV, I am motivated by an eco-friendly image towards others (others will think that I care about the environment).		
	Scale_statussociety	Individuals who purchase an EV have a better status in society.		
Factor 4	Factor_Drive	Driving Range (distance your car can drive before recharging/refueling)	What are the most important factors when buying a new car? Please indicate on a scale from “1 = not important at all” to “10 = most important”.	Performance
	Factor_Consum Factor_Perf Factor_Emiss	Consumption Performance (HP, kwH) Emissions		
Factor 5	Scale_lowerconsumhigherprice	The lower consumption (cost) of an electric vehicle can compensate for a higher initial price of EVs vs traditional cars.	Please indicate on a scale from 1 (completely disagree) to 5 (completely agree) with the following. (EV = electric vehicle. ICE = internal combustion engine; traditional vehicle)	Price compensation
	Scale_lowrunningcosts	The lower running costs for workshop, parts, maintenance etc. can compensate for the higher initial price of electric vehicles vs traditional cars.		
Factor 6	Age Children	quantitative variable	How old are you How many children do you have?	Life Stage
Factor 7	Evless_lessinfo	… the little information provided about electric vehicles.	Electric vehicles are not sold more often due to….	Lack of knowledge
	Evless_knowledgeDealer	…the lack of knowledge about electric vehicles of sales advisors in dealerships	Please indicate from a scale from 1 (completely disagree) to 5 (completely agree) for the following assumptions of why electric vehicles are not sold more often.	
Factor 8	Evless_wallbox	… the fact of not having a private parking space to install chargers (Wallbox).	Electric vehicles are not sold more often due to….	Missing infrastructure
	Evless_infrastr	…the lack of public chargers.		
	Evless_installprivatecharger	…the effort (approval by community) to install a private charger in a shared parking space.	Please indicate from a scale from 1 (completely disagree) to 5 (completely agree) for the following assumptions of why electric vehicles are not sold more often.	
Factor 9	Factor_Price	Price, cost of car	What are the most important factors when buying a new car? Please indicate on a scale from “1 = not important at all” to “10 = most important”.	Price/ Financial aspects
	Evless_price	Electric vehicles are not sold more often due to……the high purchase price.	Electric vehicles are not sold more often due to…. Please indicate from a scale from 1 (completely disagree) to 5 (completely agree) for the following assumptions of why electric vehicles are not sold more often.	
Factor 10	Evless_perfor Evless_range	…the performance of the electric vehicle. …the limited range of electric vehicles.	Electric vehicles are not sold more often due to…. Please indicate from a scale from 1 (completely disagree) to 5 (completely agree) for the following assumptions of why electric vehicles are not sold more often.	Range Anxiety

Table 11
Hypothesis Results Model 1(assuming different prices) vs Model 2 (assuming equal prices).

Category		Hypothesis	Results Model 1 (assuming different prices)	Results Model 2 (assuming equal prices)
Consumer	H1	Females are more likely to prefer EVs than men.	Rejected (Profile category 2 and 3 are males)	Rejected (Profile category 2 are males)
	H2	The younger the consumer, the higher the likelihood of preferring an EV over an ICE vehicle.	Rejected (Factor 6)	not significant (Factor 6)
	H3	Higher education leads to an increased probability of preferring an EV over an ICE vehicle.	Accepted (Profile)	Accepted (Profile)
	H4	Higher income leads to an increased probability of preferring an EV.	Accepted (Profile)	Accepted (Profile)
	H5	Living in urban areas leads to an increased probability of preferring an EV.	Accepted (Profile)	Accepted (Profile)
	H6	Having children leads to an increased probability of preferring an EV.	Accepted (Factor 6)	Accepted (Factor 6)
	H7	Possessing a car (independent of model) leads to an increased probability of preferring an EV.	Accepted (Profile)	Accepted (Profile)
	H8	Having had previous experience leads to an increased probability of preferring an EV.	Accepted (Profile)	Accepted (Profile)
	H9	Reputation- and status-driven consumers are more likely to prefer EVs.	Accepted (Factor 3) Not significant (Factor 1)	Accepted (Factor 3 and Factor 1)
Car attributes	H10	A higher list price for EV lowers the preference for EVs.	Accepted (Factor 9)	Not included
	H11	Lower consumption and lower maintenance costs compensate for the higher purchase price of EVs and leads to an increased probability of preferring an EV	Accepted (Factor 5)	Accepted (Factor 5)
	H12	A higher range of EVs, leads to an increased probability of preferring an EV.	Accepted (Factor 4) Not significant (Factor 10)	Accepted (Factor 4) Accepted (Factor 10)
Environ-mental settings	H13	Better infrastructure (charging stations, wallbox installations) the context shows leads to an increased probability of preferring an EV.	not significant (Factor 8)	Accepted (Factor 10)
	H14	Governmental support for EVs leads to an increased probability of preferring an EV.	Accepted (Factor 9)	(Factor 9 not included)
	H15	More available information combined with the know-how of dealers, leads to an increased probability of preferring an EV.	not significant (Factor 7)	Accepted (Factor 7)

Table 12
Rotated factor loadings and unique variances −1 Rotated factor loadings (pattern matrix) and unique variances.

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8	Factor9	Factor10	Uniqueness
Age	0.0540	−0.0121	−0.0372	0.0485	−0.0436	0.8996	−0.0352	0.0177	−0.0408	0.0605	0.1751
Children	0.0352	−0.0240	0.0151	0.0146	−0.0043	0.8876	−0.0060	−0.0233	0.0132	−0.0012	0.2091
Factor_Brand	0.7488	0.0588	−0.0611	−0.0262	0.0252	0.1090	−0.0331	0.0603	0.0578	0.0384	0.4093
Factor_Price	−0.0235	−0.0537	0.0156	0.2934	−0.0119	−0.3606	0.0296	−0.0126	0.5471	−0.0673	0.4752
Factor_Drive	0.1126	0.0469	0.0148	0.6471	−0.0196	0.0939	−0.1025	0.0676	−0.0042	0.1613	0.5159
Factor_Des ~ n	0.7421	0.1075	−0.0416	0.0766	−0.0057	−0.0917	−0.0366	0.0550	−0.0145	0.1111	0.4048
Factor_Con ~ m	−0.0402	−0.0480	0.0051	0.7516	0.0084	−0.0843	0.1457	0.0417	0.2500	−0.0312	0.3376
Factor_Perf	0.3840	−0.0666	−0.1686	0.5283	−0.0561	−0.0393	0.1236	0.0450	0.0251	0.0768	0.5121
Factor_Emiss	−0.0798	0.2625	0.0605	0.7006	0.0991	0.1781	0.1319	−0.0322	−0.1415	0.0280	0.3493
Factor_Soc ~ t	0.6976	−0.0112	0.3546	−0.0598	0.0194	0.1019	0.0687	−0.0207	−0.1133	0.0035	0.3551
Factor_Reput	0.7403	−0.0607	0.2133	0.0174	0.0439	0.0652	0.0333	−0.0279	−0.0590	−0.0324	0.3899
Scale_pers ~ c	0.0377	0.7966	0.0608	0.0528	0.0920	−0.0480	0.0737	−0.0438	0.0623	−0.1328	0.3179
Scale_prof ~ c	0.0991	0.7910	0.0475	−0.0108	0.0341	−0.0015	−0.0167	−0.0001	0.0469	−0.0606	0.3548
Scale_imag ~ s	0.1032	0.1959	0.7537	0.0041	0.0987	−0.0607	−0.0464	0.0273	0.0336	−0.0442	0.3635
Scale_life ~ e	−0.0237	0.4820	0.4605	0.0775	0.1378	−0.0805	0.1897	−0.0557	0.0503	−0.0254	0.4813
Scale_envi ~ n	−0.2265	0.3992	0.0632	0.3035	0.0902	−0.1022	−0.0068	0.1270	−0.1119	0.0658	0.6415
Scale_less ~ s	−0.0909	0.5215	0.2923	0.1964	0.2238	0.0687	0.1559	0.0074	0.1463	0.0225	0.4947
Scale_ecof ~ e	0.2181	0.0147	0.7174	−0.0547	0.0609	0.0575	0.1274	−0.0444	0.0019	0.0388	0.4079
Scale_stat ~ y	0.0093	0.0375	0.7932	0.0397	0.0717	−0.0220	−0.0587	0.0627	−0.0001	0.0226	0.3543
Scale_pena ~ y	−0.0269	0.2695	0.1975	0.1123	0.3799	0.1953	0.1019	−0.0257	−0.1848	0.0102	0.6473
Scale_subv ~ s	−0.0512	0.3892	0.2175	0.0376	0.1067	0.0572	0.1435	0.1061	0.4901	0.1027	0.5000
Scale_will ~ e	−0.1083	0.2741	0.1176	0.2998	0.4755	0.0999	−0.0429	0.0197	−0.3449	0.0440	0.4503
Scale_lowe ~ e	0.0290	0.0902	0.0730	0.0270	0.8823	−0.0457	0.0081	0.0271	−0.0095	−0.0272	0.2027
Scale_lowr ~ s	0.0351	0.0288	0.0636	−0.0296	0.8667	−0.0316	0.1010	0.0253	0.0723	−0.0175	0.2245
Evless_price	−0.0792	0.1553	−0.0080	0.0223	0.0199	0.0391	−0.0070	0.1449	0.7313	0.0441	0.4093
Evless_wal ~ x	0.0103	−0.0455	0.0189	0.0551	0.0397	0.0006	0.0225	0.8026	0.1053	−0.0385	0.3356
Evless_les ~ o	−0.0092	0.0993	−0.0121	0.1113	0.0662	−0.0564	0.8031	0.1279	0.0541	0.0130	0.3056
Evless_kno ~ r	0.0270	0.0544	0.0437	0.0560	0.0818	0.0203	0.8041	0.0970	−0.0132	0.0311	0.3270
Evless_inf ~ r	0.0104	0.0647	−0.0088	0.0216	0.0366	0.0396	0.1400	0.7536	0.0712	0.0711	0.3947
Evless_cos ~ y	0.0462	−0.1440	−0.0261	0.0608	−0.1104	−0.1804	0.3946	0.2061	0.0245	0.3040	0.6368
Evless_per ~ r	0.0555	−0.0629	−0.0012	0.0479	−0.0299	−0.0218	0.2816	−0.0956	0.0198	0.7715	0.3053
Evless_range	0.0434	−0.1065	0.0145	0.0487	−0.0149	0.1382	−0.2107	0.2052	0.0140	0.7535	0.3104
Evless_ins ~ r	0.0729	−0.0712	0.0547	−0.0247	−0.0030	−0.0833	0.2403	0.6296	−0.0665	0.1488	0.4983

Table 13
Rotated factor loadings and unique variances −2 Rotated factor loadings (pattern matrix) and unique variances.

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8	Factor9	Factor10	Uniqueness
Age						0.8996					0.1751
Children						0.8876					0.2091
Factor_Brand	0.7488										0.4093
Factor_Price									0.5471		0.4752
Factor_Drive				0.6471							0.5159
Factor_Des ~ n											0.4048
Factor_Con ~ m				0.7516							0.3376
Factor_Perf				0.5283							0.5121
Factor_Emiss				0.7006							0.3493
Factor_Soc ~ t	0.6976										0.3551
Factor_Reput	0.7403										0.3899
Scale_pers ~ c		0.7966									0.3179
Scale_prof ~ c		0.7910									0.3548
Scale_imag ~ s			0.7537								0.3635
Scale_life ~ e											0.4813
Scale_envi ~ n											0.6415
Scale_less ~ s		0.5215									0.4947
Scale_ecof ~ e			0.7174								0.4079
Scale_stat ~ y			0.7932								0.3543
Scale_pena ~ y											0.6473
Scale_subv ~ s											0.5000
Scale_will ~ e											0.4503
Scale_lowe ~ e					0.8823						0.2027
Scale_lowr ~ s					0.8667						0.2245
Evless_price									0.7313		0.4093
Evless_wal ~ x								0.8026			0.3356
Evless_les ~ o							0.8031				0.3056
Evless_kno ~ r							0.8041				0.3270
Evless_inf ~ r								0.7536			0.3947
Evless_cos ~ y											0.6368
Evless_per ~ r										0.7715	0.3053
Evless_range										0.7535	0.3104
Evless_ins ~ r								0.6296			0.4983

(blanks represents abs(loading) $<$ 0.5).

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