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Predicting Consumer Intention to Adopt Battery Electric Vehicles: Extending the Theory of Planned Behavior

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Abstract: Societies worldwide are under increasing pressure to reduce carbon footprints, combat air pollution, and address climate change. Battery electric vehicles (BEVs) represent a sustainable transportation solution to mitigate environmental issues. Despite growing consumer demand, BEV adoption rates remain relatively low. This study extends the theory of planned behavior to analyze factors influencing consumer adoption intentions for BEVs in Spain. The research incorporates the constructs Attitude, Perceived Behavioral Control, Subjective Norm, Moral Norm, Environmental Concern, and a unique consumer 'profile' dimension comprising experience, education, and gender, alongside the moderating variable of 'price sensitivity'. This study comprises 1816 responses collected through an online survey, and it utilized the partial least squares structural equation model. The empirical findings indicate that Attitude, Perceived Behavioral Control, Subjective Norm, and Moral Norm significantly impact consumer adoption intention. Attitude emerges as the strongest influencer, emphasizing the significance of personal beliefs. Environmental Concern suggests environmentally conscious consumers may lean toward BEV adoption due to positive attitudes. The 'profile' dimension does not affect the relationship toward adoption intention. Price sensitivity moderates these relationships, indicating pricing strategies and incentives could significantly influence BEV adoption decisions. These findings offer practical guidance for governments and manufacturers aiming to promote sustainable, eco-friendly transportation methods in the face of global environmental challenges.

Keywords: sustainability; battery electric vehicles; extended theory of planned behavior; environmental concern

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1. Introduction

Climate change with its anthropogenic consequences is widely debated by the public and considered a proven phenomenon within the scientific community [1]. Air pollution in cities and the growing environmental concerns of consumers have led to an increased demand for responsible action on behalf of both businesses and consumers, signaling the societal commitment to environmentally friendly alternatives. Electric vehicles (EVs) are regarded as a solution to address environmental concerns, and they play a key role in reducing greenhouse gas (GHG) emissions within the transport sector [2]. This sector remains a major contributor to GHG emissions in the European Union (EU), accounting for 25.9% of total GHG emissions [3]. While the automotive sector has significantly reduced emissions, the demand for cleaner transportation options remains unabated. The European Green Deal underscores the objective of a 90% reduction in GHG emissions from the transport sector by 2050 to achieve climate neutrality [4]. The EU set a fleet-wide target of 95 g CO_2/km for the years 2020–2024 measured in the New European Diving Cycle (NEDC); Spain shows an average CO_2 emission level of 121.6 g/km for new passenger cars registered in 2022, under the Worldwide Harmonized Light Vehicles Test Procedure (WLTP) [4]. Concurrently, Spain has committed to reducing CO_2 emissions of new cars by 12% in 2023 [5]. In recent years, plug-in hybrid electric vehicles (PHEVs) and battery

electric vehicles (BEVs) as types of EVs have gained prominence in the field of sustainable transportation. Yet, their market share remains limited, accounting for 3.8% for BEVs and 5.9% for PHEVs of all new passenger cars registered in Spain in 2022 [6]. To promote EV adoption, understanding consumer behavior is crucial. Consumer preferences are influenced by social, economic, and environmental factors, necessitating tailored strategies for businesses [7]. There are a variety of explanatory theories about consumer behavior under the lenses of psychology, sociology, or economics, among others, which have derived from social sciences [8]. Sustainable consumer research is gaining attention but requires further investigation. Hereby, the theory of planned behavior (TPB) allows for the investigation of constructs as attitudes, subjective norms, and perceived behavioral control by consumers to adopt environmentally friendly products.

In this research study, consumer behavior towards BEVs as a sustainable innovation in the transportation sector is analyzed. The TPB model was employed to explore consumer attitudes, subjective norms, and perceived behavioral control regarding environmentally friendly products. A questionnaire survey was conducted to investigate the intention of consumers to adopt BEVs and to examine the factors influencing their adoption. Building upon TPB and the traditional TRA model, 'Attitude (ATT)', 'Subjective Norm (SN)', and 'Perceived Behavioral Control (PBC)' are analyzed, extended with 'Moral Norm (MN)' and 'Environmental Concern (EC)'. Both the direct and indirect impacts of EC on the intention to adopt BEVs are assessed. Furthermore, a newly created 'profile' variable is introduced, which incorporates gender, education, and experience. 'Price sensitivity' and its impact on the relationships among these constructs and adoption intention (AI) is also considered. Structural equation modeling (SEM) using SmartPLS4 is applied. This study combines literature insights with the extended TPB model to investigate consumer purchase behavior for BEVs in the Spanish context. The main research questions aiming to clarify BEV adoption decisions are as follows:

1. What impact do the extended TPB constructs ATT, PBC, SN, MN, and EC have on consumers' intention to adopt BEVs based on a Spanish sample set? What behavioral patterns can be concluded?
2. What role do experience, gender, education, and price sensitivity play in the TPB model?

By addressing these questions, this study contributes valuable insights into the factors driving BEV adoption in Spain, which can guide strategies for promoting sustainable transportation and reducing carbon emissions. In addition, this study addresses a literature gap in sustainable, environmentally friendly research by focusing solely on BEVs, a technology that necessitates distinct consumer adoption behaviors compared to traditional combustion or PHEVs. The focus on BEVs responds to a call for differentiation between BEVs and PHEVs in previous research [9]. BEV adoption is still limited, justifying the use of TPB's intention-focused approach with a broader sample [10]. This study distinguishes itself by (1) concentrating on BEVs, (2) analyzing EC's impact as both a direct and indirect construct, (3) introducing the 'profile' variable, encompassing gender, experience, and education in addition to 'price sensitivity', and (4) employing a Spanish sample.

To accomplish the stated objectives and address the research questions, this study is organized as follows: in the next section, a review of the literature related to the extended TPB is presented. Based on this review, the hypotheses and the conceptual model guiding this research are proposed. The 'Research Methodology' section focuses on the survey design, research methods, and measures of SEM. Section 4 contains explanations about the data analysis, empirical results, and validity of the SEM based on Smart PLS4. Section 5 focuses on the discussion, and Section 6 shows the main conclusions with practical implications, as well as limitations and future lines of research. The result of this study confirms the appropriateness of the extended TPB model and verifies its good explanatory power in predicting consumers' intention to adopt BEVs.

2. Literature Review and Hypotheses

2.1. Theory of Planned Behavior (TPB)

The TPB, originally proposed by Ajzen in 1991 [10], evolved from the theory of reasoned action (TRA) of 1980. Its primary purpose is to predict an individual's intention to engage in a specific behavior, particularly when the individual has control over the behavior. The TPB is widely applied in studying intentions related to sustainable actions, and scholars increasingly use it to explore environmentally friendly consumer behaviors [11]. The TPB is defined as '*probably the most frequently and successfully applied behavioral theory for predicting pro-environmentally transport choices*' [12] (p. 2). The traditional TPB consists of three key variables that collectively determine the strength of one's intention to perform a behavior when the opportunity arises. This intention is considered a proxy for the actual behavior, and it is influenced by (1) behavioral attitude, (2) subjective norms, and (3) perceived behavioral control [10]. According to the theory, if an individual perceives a specific behavior as a social norm, she/he is more likely to adopt it. Essentially, actual behavior is shaped by behavioral intention, which, in turn, is composed of attitude toward the behavior, subjective norms, and perceived behavioral control [10]. While both behavioral intention and actual behavior share the same determinants, behavioral intention is generally a stronger predictor [13]. Behavioral intention is regarded as the immediate determinant of actual behavior, offering the most accurate prediction [10]. To comprehensively understand the factors influencing intentions and decisions as concerns EV adoption, it is essential to consider psychological factors. These psychological factors are integrated into various constructs that can directly impact adoption intentions. In the context of Spain, where BEVs are still relatively new, measuring adoption intention rather than actual adoption aligns with the TPB model [10].

2.2. Determinants of (Extended) TPB

Table 1 provides a comprehensive overview of 29 TPB research studies, along with their associated (extended) TPB constructs. This compilation serves a dual purpose: firstly, it offers insights into the diverse range of constructs employed in the existing literature for TPB, and secondly, it provides an initial glimpse into the findings of other researchers. While extensive research has been conducted on EV adoption, this table is specifically centered on the TPB. A recent research study investigated a total of 92 articles that focus on the analysis of road transportation adoption with different theories applied, serving as a reference to enhance the completeness of this body of knowledge [14].

Table 1. Literature review: research studies and their constructs.

Authors	Year	Context	Veh. Type	Sample #	Constructs TPB Traditional	Extended or Modified	Impact/Results
Deka et al. [15]	2023	India	EVs	317	ATT, SN, PBC	Cost, herd behavior, personal norms	SN and PBC: positive (+) direct impact. Attitude: negative (−) impact/cost, herd behavior, personal norms mediate TPB variables (no influence alone).
Buranelli de Oliveira et al. [16]	2022	Brazil	EVs	488	ATT, SN, PBC	Emotions and additional items complexity, relative advantage, compatibility, mass media, peers, self-efficacy, facilitators, constraints	ATT and influence of emotions: positive effect on intention to use.
Yegin and Ikram [17]	2022	Turkey	EVs	626	SN, ATT, PBC	Environmental concern (EC) and green trust (GT)	ATT, PBC, EC, and GT: positively correlated with EV purchase intentions (+). Direct impact of EC. SN: negative effect (−).
Shakeel [18]	2022	Pakistan	EVs	511	ATT, SN, PBC	Cognitive states (CS), product perception (PP), non-monetary incentive policy (NMIP), monetary policy (MIP) on purchase intention	ATT, SN, PBC, PP, NMIP, and MIP: positive impact on consumer purchase intention.
Hasan [19]	2021	Norway	EVs	278	SN, ATT, Perceived functional barriers	Overall satisfaction (cost aspect, range and recharge, policy measures, environmental attributes, symbolic attributes, availability) on repurchase intention (RI)	ATT, SN, and PFB: impact on RI. Unable to find significant direct effect of overall satisfaction on RI.
Jayasingh et al. [20]	2021	India	Electric two-wheelers	182	ATT	Environmental concern (EC), perceived economic benefit (PEB), social influence (SI), charging infrastructure (CI), gender	EC, PEB, SI and CI significantly affect consumer ATT, which in turn affects intention to purchase.

Table 1. *Cont.*

Authors	Year	Context	Veh. Type	Sample #	Constructs TPB Traditional	Extended or Modified	Impact/Results
Shalender and Sharma [21]	2020	India	EVs	326	ATT, SN, PBC	Moral norms, environmental concern	ATT, SN, PBC, MN and EC: positive relation with AI (+). Direct impact of EC.
Bhutto et al. [22]	2020	Pakistan	HVs	266	ATT, SN, PBC	Price sensitivity (PS)	ATT, SN, PBC, and PS: direct positive impact on AI (+) PS as moderator: no statistical significance.
Dong et al. [23]	2020	China	BEVs	1.021	SN, PBC	Feelings and emotions + norm activation model: Awareness of consequences, personal norms, ascription of responsibility + cost factors	SN, feelings and emotions, personal norms, PBC: positive impact (+).
Liu et al. [24]	2020	China	BEV	347	ATT, SN, PBC	Driving experience attitudes: charging convenience, cruising range, economic benefit, battery life, low emission, low noise	SN, PBC, ATT, and the adoption of willingness in experienced consumers are higher (+) than in unexperienced consumers. Adoption willingness (+) through direct and indirect paths.
Yan et al. [25]	2019	China	EVs	537	ATT, SN, PBC	Positive attributes; negative attributes	Positive attributes: positive impact (+). Negative attributes: negative impact (−).
Eneizan [26]	2019	Jordan	EVs	250	ATT, SN, PBC	-	ATT, SN, PBC: positive impact (+).
Higueras-Castillo et al. [27]	2019	Spain	Electric and hybrid	404	-	Building on the theories of perceived value and reasoned action: attitude with antecedents: quality, emotional, price, social, acceleration, low noise	Emotional issues, price, acceleration, low noise: positive impact on attitude (+). Quality, social value: no statistical significance.
Shankar and Kumari [28]	2019	India	EVs	278	ATT, SN, PBC	Environmental concern, perceived CSR obligation	ATT, SN, PBC, EC, and CSR: positive impact (+). Direct impact of EC.
Simsekoglu and Nayum [29]	2019	Norway	BEV	205	-	Perceived accident risk, knowledge about BEVs, instrumental attributes, environmental attributes	Environmental–economic attributes, SN, PBC: positive impact (+). Being male: negative (−). Perceived accident risk and knowledge: no direct impact, but indirect through perceived attributes.
Tu and Yang [30]	2019	China	EVs	300	ATT, SN	Self-control ability with self-efficacy, facilitating conditions, PBC. Items for attitude: perceived usefulness, perceived ease of use, compatibility, personal innovativeness. Items for subjective norm: interpersonal and external influence	ATT: perceived usefulness, perceived ease of use, compatibility: positive attitude (+). SN: interpersonal influence: no significance; external influence: positive (+).
Xu et al. [31]	2019	China	BEVs	382	ATT, SN, PBC	Environmental performance, price value, non-monetary incentive policy, monetary incentive policy (MIP)	ATT, PBC, SN, Environmental performance, and MIP: positive (+). Direct impact of E-performance.
Mohamed et al. [9]	2018	Canada	EVs	15,392	ATT, SN, PBC	Environmental concern (impact on constructs), personal moral norms	ATT and PBC: strongest impact (+). EC, ATT, and personal MNs: (+).
Haustein and Jensen [12]	2018	Denmark and Sweden	BEV and CV (conventional)	2467	PBC, SN, Attitude: symbolic Attitude: affective	Busy lifestyle (PMN), personal norms (PNs), other control variables (experience)	Comparing BEV users and conventional car users: BEV users perceive less functional barriers towards BEVs and have more positive attitude and norms. Symbolic attitudes most important factor.
Adnan et al. [32]	2018	Malaysia	PHEVs	403	ATT, SN, PBC	Environmental concern, personal moral norms, hyperbolic discounting on actual adoption	ATT, SN, MN, and PBC: indirect positive impact (+); constructs are significantly predetermined by EC.
Zhang et al. [33]	2018	China (Beijing)	EVs	124	ATT, SN, PBC	Policy supporting	PBC and SN: positive impact (+). ATT: insignificant. Policy support: positive effects on ATT and SN.
Du et al. [34]	2018	China (Tianjing)	NEVs new energy vehicles	811	ATT, SN, PBC	Personal norms, low-carbon awareness and policy, social demography, government policy	SN, ATT, personal norms, and PBC: positive impact (+). Government policy: (+). Low-carbon awareness: (−).
Wang et al. [35]	2017	China	EVs	324	-	Financial incentive policy measures, information provision policy measures, convenience policy measures, environmental concern	All policy measures: (+). EC plays moderating role between financial incentive and convenience policy measures.
Adnan et al. [36]	2017	Malaysia	EVs	391	ATT, SN, PBC	Personal moral norms, environmental concern. Impact on attitude: Interaction, knowledge sharing, response of vehicle owners	Dimensions of ATT: (+) impact on attitude. EC: indirect positive impact on ATT, SN, PBC, and personal norm. EC and AI not directly proportional.
Degirmenci and Breitner [37]	2017	Germany	EVs	40 interviews, 167 test drives	ATT	Environmental performance, price value, range confidence, control variables (gender, age, profession, experience)	E-performance is stronger predictor of attitude, and thus AI, than price value and range confidence.
Mohamed et al. [38]	2016	Canada	EVs	3505	ATT, SN, PBC	Environmental concern, personal moral norms; control variables	ATT, SN, PBC, and personal MN: (+) impact. EC: indirect (+) impact. Age, employment: (+).
Wang et al. [11]	2016	China	HEVs	433	ATT, SN, PBC	Personal moral norms, environmental concern	ATT, SN, PBC, and personal MN: mediate effect of EC towards AI. EC: indirect (+) impact on AI.
Kaplan et al. [39]	2016	Austria, Denmark, and Germany	ECVs	1443	Positive ATT, Subjective norms favorable to ECVs	Perceived operational ease of using ECVs; perceived familiarity with ECVS. Fleet manager socio-economic characteristics, firm characteristics, and industrial sector, vehicle fleet characteristics and use patterns, country context	Focus on fleet: positive attitudes and subjective norms (+), familiarity (+), perceived operational ease (+).
Sang and Bekhet [40]	2015	Malaysia	EVs	750	-	EV acceptance model: usage intentions, performance attributes, social influences, financial benefits, demographic, infrastructure readiness, government intervention, EC	Social influences, performance attributes, financial benefits, environmental concerns, demographics, infrastructure readiness, government interventions (+).

2.3. Research Hypotheses and Conceptual Framework

This study incorporates the fundamental TPB components—ATT toward the behavior, SN, and PBC—while it also includes MN and EC as supplementary constructs to elucidate the intention to adopt BEVs. Specifically, MN is integrated into the model on the same footing as the three traditional constructs, exerting a direct impact on AI. Meanwhile, EC plays a dual role, impacting AI directly and indirectly through its mediation by the other constructs. Additionally, the TPB is extended with a newly created (moderator) variable 'profile' that includes education, gender, and experience. In addition, the relationship of 'price sensitivity' among EC and the other constructs is analyzed. The BEV AI is the dependent variable and is defined in the TPB model as the willingness to try to adopt a specific behavior [10]. The AI is a direct predictor of behavior and a result of the traditional TPB constructs ATT, PBC, and SN.

The first of the three traditional independent determinants of intention is attitude, defined as 'the attitude toward the behavior and refers to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question' [10] (p. 188). Essentially, attitude reflects whether an individual positively or negatively assesses her/his adoption behavior [11]. It gauges the extent to which the performance of a behavior is valued. Attitude is highlighted as an indispensable concept in social psychology [41]. The significant influence of perception and attitude on individual buying behavior has been highlighted in previous research [10]. In this context, a specific attitude is a potent predictor of a specific behavior, such as purchasing green products, whereas a general attitude represents a broader predisposition towards a behavior [42]. Consumers have specific feelings regarding eco-friendly products, thus supporting environmental well-being [43]. Psychological determinants, including attitudes and norms, show substantial influence on the adoption of green cars [44]. A positive consumer impact was noted for the adoption of EVs when consumers believed that this technology was more beneficial on an individual level or when they perceived its use as easier and more convenient, which positively impacted their attitude towards EVs [30]. Building on prior research and recognizing the significance of ATT this study investigates EV adoption intention in the following manner:

H1. *Consumers' attitude (ATT) toward BEVs has a significant direct and positive impact on the intention to adopt BEVs.*

The second predictor of the traditional TPB Model is the 'subjective or social norm' that refers to the social pressure individuals perceive whether to perform a particular behavior based on the acceptance of such social pressure; hence, it refers to a person's social context [10]. Depending on the situation, social pressure can be more influential than one's own attitude towards the behavior [42]. People in society tend to comply with others' motivations to achieve recognition and acceptance. A '*subjective norm controls that behavior that is instigated by the desire to act as others think you should act*' [8] (p. 444). There is greater impact on behavioral intention when a SN is strongly influenced [30]. Therefore, a SN can be a mental representation of what the consumer believes to be expected from her/himself by others. Studies show that the higher the SN, the higher the intention to adopt EVs [15]. A SN has a strong impact on the adoption intention of EVs and consequently, there is a '*need to activate social networks for sharing information and knowledge of EVs among society, and it is necessary to have a strategy to reduce misunderstanding and dually increase knowledge of EVs by transmitting relevant information using interpersonal media*' [45] (p. 98). This study analyses the impact of the SN in the following hypothesis:

H2. *Consumers' subjective norm (SN) has a significant direct and positive impact on the intention to adopt BEVs.*

The third independent determinant within the traditional TPB model is the perceived behavioral control. This element centers around an individual's perception of the challenges

and obstacles associated with carrying out a specific behavior, drawing from her/his past experiences [10]. From a psychological standpoint, the perception of behavioral control is of greater significance than the actual degree of control [10]. It is important to recognize that PBC can vary across different situations and behaviors. The level of PBC '*refers to the perceived ease or difficulty of performing the behavior and is assumed to reflect past experience as well as anticipated impediments and obstacles*' [10] (p. 188). In summary, the stronger an individual's ATT and SN are impacted, and the higher the PBC she/he possesses, the more robust her/his intention to engage in a particular behavior is. In alignment with the existing literature, the following hypothesis is proposed:

H3. *Consumers' perceived behavioral control (PBC) has a significant direct and positive impact on the intention to adopt BEVs.*

The MN is the fourth determinant in the extended TPB model and stands for the obligation that an individual feels to perform a certain kind of action [46]. Individuals are influenced by their moral norms in certain decision-making contexts [46]. This integrated personal norm encapsulates an individual's feeling of moral duty to act in a particular manner, rooted in her/his personal value system [10]. The concept of MN draws from Schwartz's Norm Activation Model (1977). The importance of incorporating feelings of moral responsibility or norms into the TPB's explanatory framework is emphasized in previous research [46]. Consumers showed a willingness to allocate a substantial sum of money to adopt green vehicles in alignment with their own MN and sense of responsibility [47]. It is essential to distinguish between MNs and SNs. While MNs pertain to the internalized rules or values held by an individual, SNs are associated with the external pressure individuals feel [11,36]. In this research, we extended the TPB by including the MN at the same level as the three other traditional components, leading to the following assumption:

H4. *Consumers' moral norm (MN) has a significant direct and positive impact on the intention to adopt BEVs.*

Furthermore, the construct EC is introduced into the traditional TPB model as a psychological factor. Consumers who are environmentally conscious are more inclined to engage in environmentally conscious behavior [48]. '*Environmental concern influences specific behavior indirectly via its impact on the generation and evaluation of situation-specific beliefs in the context of the decision to acquire information about green electricity products and the local providers of these products.*' [48] (p. 23). Activating environmental values increases consumers' willingness to accept and pay a higher purchase price for EVs, underscoring the influence of consumers' pro-environmental motivations, which are contingent on their own assessments and perceptions, influenced by the availability of information about EVs [49]. Numerous authors have incorporated EC into their TPB models to assess its impact on EV adoption [9,11,17,21,28,31,35,38,50,51]. Consumers with a higher level of EC exhibited a greater intention to purchase environmentally friendly products [8], indicating that EC positively influences the preference for and adoption of EVs [52,53]. Environmental–economic attributes of BEVs, SN, and PBC are positively related to AI [29]. ATT, SN, PBC, EC, and perceived corporate social responsibility obligations all had a direct and significantly positive impact on the intention to adopt EVs [28]. When including 'Environmental Performance' in conjunction with the constructs of Price Value and Range Confidence concerning ATT toward EVs, it was possible to conclude that Environmental Performance emerged as the strongest predictor of attitude, which, in turn, positively affected AI [37]. It is crucial to highlight that, in these studies, the construct EC was treated at the same level as the other constructs, rather than being considered an antecedent construct for other TPB elements, as is the approach taken in this study. Based on the results obtained in previous studies, we formulate the following hypothesis:

H5. *Environmental Concern (EC) has a significant direct and positive impact on the intention to adopt BEVs.*

Other studies showed that EC as a general attitude is not a direct but rather an indirect determinant of a specific behavior, in this case AI, with a positive impact of EC on the TPB constructs ATT, SN, PBC, and personal moral norms, which, in turn, positively influences AI [9,11,32,38,48]. In this study, the construct EC was also introduced as a moderating variable in the relationship between consumers' behavioral intentions and their adoption of EVs, affirming that intention to adopt EVs is positively and indirectly affected by EC [36]. Given the acknowledged significance of EC, especially its indirect impact on EV adoption intention, we consider the other TPB constructs as mediating variables when assessing the influence of EC on the relationship to adoption intention. Consequently, we propose that EC exerts an indirect positive effect on the intention to adopt BEVs through consumers' attitude, SN, MN, and PBC.

H6. *Environmental Concern (EC) has an indirect positive effect on the intention to adopt BEVs through consumers' Attitude (ATT).*

H7. *Environmental Concern (EC) has an indirect positive effect on the intention to adopt BEVs through consumers' Subjective Norm (SN).*

H8. *Environmental Concern (EC) has an indirect positive effect on the intention to adopt BEVs through consumers' Perceived Behavioral Control (PBC).*

H9. *Environmental Concern (EC) has an indirect positive effect on the intention to adopt BEVs through consumers' Moral Norm (MN).*

Moderating Variables: Profile and Price Sensitivity

In the theoretical framework, the newly created variable 'profile' was introduced, comprising experience, gender, and education, selected based on their demonstrated importance in prior research. Several authors have analyzed the importance of demographic variables on EV adoption intention [29,54–57]. Concerning the effects of gender, studies have yielded varying results regarding the inclination of females or males towards adopting EVs. Previous research on the TPB, incorporating gender as a moderator variable in the relationships between EC and other factors towards ATT, indicates that gender does not act as a moderator for this specific relationship [20]. With respect to the level of education, the extant literature provides evidence supporting a positive association between educational attainment and the adoption of EVs [58–62]. The inclusion of the 'experience' variable aims to investigate how an individual's previous driving experience with BEVs influences their AI. Previous studies have utilized vehicle trials to explore whether attitudes and preferences toward EVs change after first-hand experience. They have found evidence indicating that preferences significantly shift after individuals have direct experience with EVs [52,63]. The importance of experience is paramount in shaping realistic attitudes toward EVs as a novel product [12]. Specific attitudes toward BEVs can vary depending on the level of experience [64], while ATT, SN, PBC, and adoption willingness are more favorable among experienced consumers than among inexperienced ones [24]. Experienced BEV drivers showed a higher increase in purchase intention and willingness to pay for BEVs [65]. We anticipated that individuals with BEV experience would have a more positive ATT compared to those without such experience. The variable 'profile' was included as a moderating factor using a multigroup SEM. The moderating effect occurs when the moderator (in this case, 'profile') alters the strength of relationships between other constructs in the model [66]. Therefore, we hypothesize that the established relationships among EC, ATT, SN, MN, and PBC in relation to AI will be influenced by consumers' 'profile'.

H10. *The 'profile' of the consumer, considering experience, gender, and education, will moderate the relationships among EC and all constructs of the extended TPB, as well as the intention to adopt.*

There is widespread recognition of the fact that the relatively high purchase price of EVs constitutes a significant barrier to EV adoption. EVs typically incur higher initial costs compared to traditional vehicles, and the broader acceptance and proliferation of EVs may be hindered unless these costs decrease [16,55,67–71]. Purchase cost reduction is identified as the most potent incentive for promoting BEV adoption [51,67]. Many individuals perceive green alternatives as too expensive [72] and '*price is the top priority for both conventional and electric vehicles…*' [71] (p. 139). In summary, the purchase price plays a pivotal role in a consumer deciding whether to buy a BEV or not [31]. The variable 'Price sensitivity' assesses individuals' perceptions of prices and the role that such prices play in their purchasing decisions [22], while sensitivity is akin to willingness-to-pay. Price sensitivity has a significant positive impact on consumers' purchase intentions [22]. Additionally, individuals with BEV experience are more accepting of higher purchase prices and demonstrate greater willingness to pay more for a BEV compared to those without such experience [65,73]. In a similar vein, activating pro-environmental values diminishes price sensitivity toward higher EV purchase prices [49]. To further investigate consumer attitudes, we introduced a hypothetical scenario in which EVs cost the same as other cars. Consequently, we created a moderating variable, 'car_sameprice', which is related to the question of consumer preference if EVs and traditional cars were priced equally. This approach provides valuable insights into consumer behavior and highlights the pivotal role of price in EV adoption.

H11. *Price sensitivity will moderate the relationships among EC and the constructs of the extended TPB and the intention to adopt.*

Figure 1 visualizes the model as well as the hypotheses to be tested.

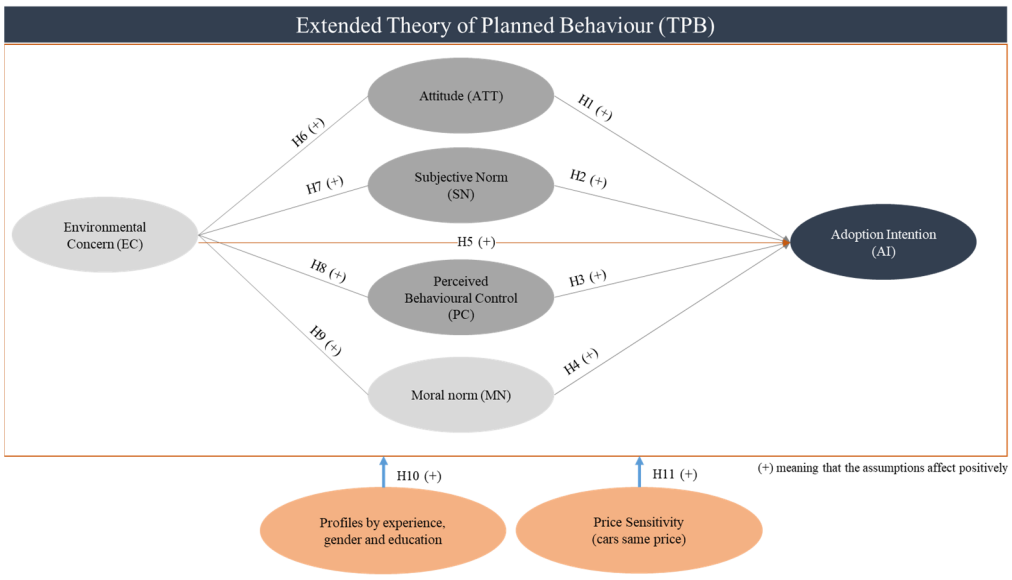

Figure 1. Overview of the model with hypotheses.

3. Research Methodology

3.1. Survey Design and Data Collection

Data were gathered through an anonymous web-based survey using the Survey Monkey Platform (Premium member) for an online questionnaire. Distribution and participation were entirely anonymous and voluntary, without any financial incentives. The survey questionnaire was distributed online via the university's data set. The survey was

conducted between 14 March and 17 May 2021, originating from Barcelona, Spain. The questionnaire consisted of two parts: the first part provided information on the profile of the respondents, including gender, age, education, income, and residential location, and the second part contained measurement items for the TPB constructs. A rigorous check–control process was executed before the final survey issuance, involving feedback from six automotive industry experts and four other individuals to enhance its quality. The survey results represent the population of interest without being a convenience sample set. The overall sample ranged in age from 18 to 87, with an average age of 31 years, indicating a relatively young sample. When tabulating the sample by gender and age, we obtained 45.67% males and 54.32% females (see Table 2). The difference, reflected as a sampling error with respect to different proportions in the population, is +2.7%. While this sampling error is slightly above the theoretical one, we consider the obtained sample an acceptable representation of the population of interest.

Table 2. Variables used to generate consumer profiles and measure price sensitivity.

Variable	Question	Definition	Descriptive
Gender	What is your gender?	0 = female, 1 = male	0 = 54%; 1 = 46%
Age	How old are you?	Indication of age	Min: 18/ Max. 87 Average 31 Std deviation: 13.00326
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's degree, 4 = Master's degree, 5 = Doctorate and above	2 = 18%/ 3 = 38%/ 4 = 27%/ 5 = 17%
PrevExp2	Have you had previous experience with electric vehicles (EVs)?	0 = No. No experience at all./ 1 = Yes	0 = 78%/ 1 = 22%
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%

The constructs SN, EC, and AI were measured by a 5-point Likert Scale from 'strongly disagree' to 'strongly agree', and the other constructs were measured with 5-point semantic differential scale items, such as 'For me, adopting a BEV is . . .' with the answers unfavorable/favorable, negative/positive, and false/definitely true (see Table 3). EC was measured with five indicators. Despite the limitations of online surveys, such as the potential for self-selection bias and a restricted ability to probe for deeper insights, the advantages of efficiency, cost-effectiveness, and broad accessibility made it a pragmatic choice for this research aimed at a large sample size. Sample data are available upon request.

Table 3. Questionnaire construct measurements.

Construct	Measurement Variables	Scale 5-Point Likert Scale	Loads with Final Items Free of CMB
Attitude SEM_ATT (Cronbach's alpha = 0.822; CR = 0.893; AVE = 0.735)	I consider the adoption (purchase) of a battery electric vehicle (BEV) as:	(unfavorable 1–favorable 5)	0.859
	I consider the adoption (purchase) of a battery electric vehicle (BEV) as:	(negative 1–positive 5)	0.860
	I consider the adoption (purchase) of battery electric vehicle (BEV) as:	(undesirable 1–desirable 5)	0.854
	It is environmentally friendly to buy battery electric vehicles (BEVs):	(strongly disagree 1 to strongly agree 5)	Deleted due to CMB

Table 3. *Cont.*

Construct	Measurement Variables	Scale 5-Point Likert Scale	Loads with Final Items Free of CMB
Perceived Behavioral Control SEM_PBC (Cronbach's alpha = 0.633; CR = 0.792; AVE = 0.562)	I can buy a BEV if I wanted to.	false (1) to definitely true (5).	0.826
	The price of a BEV is important to me if I decided to adopt one.		Deleted due to CMB
	I can find where to buy a BEV if I wanted to.		0.773
	It is mostly up to me to buy or not to buy a BEV.		0.637
Subjective Norm SEM_SN (Cronbach's alpha = 0.863; CR = 0.908; AVE = 0.713)	Most people who are important to me think I should adopt a BEV when adopting a vehicle in the near future.	(strongly disagree) to 5 (strongly agree)	0.875
	I think that many people who are important to me expect that I buy an environmentally friendly car such as a BEV.		0.889
	People whose opinion I value would prefer that I adopt a BEV when adopting a vehicle in the near future.		0.890
	While adopting a new vehicle, I consider the wishes of other people who are important to me.		Deleted due to CMB
	If I buy a BEV, then most people who are important to me would also buy a BEV.		0.711
Moral Norm SEM_MN (Cronbach's alpha = 0.799; CR = 0.869; AVE = 0.626)	I believe it is my moral responsibility to reduce environmental pollution and greenhouse gases emissions.	false (1) to definitely true (5).	0.760
	If I buy a vehicle, I feel morally obliged to buy a BEV, regardless of what other people do.		0.718
	I take environment consequences into account when I adopt a vehicle.		0.830
	I feel obliged to take the environmental consequences of vehicle use into account when making adoption choices.		0.849
Environmental Concerns SEM_EC (Cronbach's alpha = 0.830; CR = 0.877; AVE = 0.589)	I think we as individuals have the responsibility to protect the environment.	1 (strongly disagree) to 5 (strongly agree)	0.761
	I am very concerned about the environment.		0.838
	I think environmental issues have become more serious in recent years.		0.690
	I think we should live in harmony with the environment by achieving sustainable development.		0.773
	I take environmental consequences into account when I adopt a vehicle.		0.766
Intention to adopt a BEV SEM_BEV_ AI (Cronbach's alpha = 0.829; CR = 0.921; AVE = 0.854)	I am willing to adopt a BEV when adopting a vehicle in the near future.	1 (strongly disagree) to 5 (strongly agree)	0.928
	I intend to adopt a BEV when adopting a vehicle in the near future.		Deleted due to CMB
	I plan to adopt a BEV when adopting a vehicle in the near future.		0.920

3.2. Measures

The constructs and measures for the extended TPB model were adapted from previous studies [11,17,21,25,33,38] and are outlined in Table 3. All constructs adhere to the reflective nature identified in previous research.

3.3. Structural Equation Model (SEM)

The partial least squares method, a type of SEM, was utilized to validate the hypotheses and assess the overall fit of the survey data. This method is widely used in social sciences [74], particularly for identifying key success factors related to constructs such as customer satisfaction, loyalty, behavioral intentions, and consumer behavior. SEM is a preferred approach in green energy research because it can accommodate complex model scenarios and incorporate latent variables that cannot be directly measured by observable

ones [17]. PLS-SEM is particularly useful when dealing with models that contain numerous constructs and variables, as it facilitates model simplification. PLS-SEM allows a causal–predictive paradigm to validate the predictive power of a model developed with theory and logic [74]. Furthermore, we used this technique due to the non-normal distribution of most indicators (80%), considering the results of the Shapiro–Francia normality test [75]. PLS-SEM results can be evaluated in two stages to address the reflective measurement model, and, if applicable, the formative measurement model/s [74].

4. Data Analysis and Results

4.1. Convergent Validity and Reliability

Before presenting the estimated coefficients of the structural model, the item AI2 was removed from the AI construct to prevent and to confirm that the model was free of common method bias (CMB). First, we applied the unmeasured latent method [76]. The unrotated solution, which includes all the items of the measured variables, is fulfilled with 32.7% of the variance. CMB is present if this value is higher than 50% [76]; therefore, a sample with 32.7% is not affected by CMB based on Harman's test. We also analyzed the significance and values of the loadings, the composite reliability (CR), and the average variance explained. Based on this analysis, the items Att4, PBC2, and SN4 had to be deleted. Table 3 includes the final items with their loads, Cronbach's alpha, composite reliability rho_a and rho_c, and average variance extracted for measuring the constructs.

4.2. Discriminant Validity

Regarding discriminant validity, we examined the heterotrait–monotrait ratio (HTMT). Discriminant validity is observed if an HTMT value is above 0.90 or above 0.85 when the constructs in the path model are conceptually distinct. As Table 4 shows, all constructs in the model exhibit discriminant validity based on the HTMT method. Additionally, the Fornell–Larcker criterion can be applied to assess a model's discriminant validity [66]. This approach verifies if the square root of the average variance extracted (AVE) values exceeds their highest correlation with any other construct. In the present model, this additional test of discriminant validity was successfully met, as confirmed in Table 4.

Table 4. Discriminant validity: Heterotrait–monotrait ratio (HTMT) matrix and Fornell-Larcker criterion (FLC).

	SEM_ATT		**SEM_BEV_Adopt**		**SEM_EC**		**SEM_MN**		**SEM_PBC**		**SEM_SN**	
	HTMT	**FLC**	**HTMT**	**FLC**	**HTMT**	**FLC**	**HTMT**	**FLC**	**HTMT**	**FLC**	**HTMT**	**FLC**
SEM_ATT		0.857										
SEM_BEV_Adopt	0.718	0.602		0.924								
SEM_EC	0.381	0.327	0.400	0.360		0.767						
SEM_MN	0.516	0.417	0.613	0.495	0.842	0.729		0.791				
SEM_PBC	0.149	0.117	0.228	0.178	0.118	0.095	0.155	0.121		0.750		
SEM_SN	0.416	0.356	0.554	0.469	0.206	0.204	0.477	0.392	0.220	0.174		0.844

4.3. Structural Model (Path Coefficients)

The five constructs ATT, PBC, SN, MN, and EC explain 48% of the variance of the endogenous construct AI (R^2 = 0.481; R^2 adjusted = 0.479). As for the goodness-of-fit of the model, the Chi-square is 4547.253 in the saturated model, and 4503.210 in the estimated model. The standardized root mean square residual (SRMR) is 0.113, suggesting a potential issue with the fit of the model. A value less than 0.10 or 0.08—a more conservative threshold—is generally considered indicative of a good fit [77]. We scrutinized the residuals, as they may indicate misspecification, a possibility we dismissed. Furthermore, we verified the reliability and validity of the indicators as measures of their respective latent constructs. Based on these comprehensive assessments, we continued to employ the model. Regarding the estimated coefficients among the constructs, we employed a bootstrapping estimation

method. The bootstrapping results (see Table 5) indicate that path coefficients for the following relations ATT → AI, PBC → AI, SN → AI, and MN → AI were statistically significant; therefore, H1, H2, H3, and H4 were not rejected. However, the path relation of EC → AI was not significant. Consequently, H5 was rejected due to its missing statistical significance level. There is no evidence of a direct relationship between EC and AI.

Table 5. Bootstrapping path coefficient matrix.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	*p* Values
	0.422	0.423	0.021	20.360	0.000
SEM_EC → SEM_ATT	0.327	0.327	0.024	13.548	0.000
SEM_EC → SEM_BEV_Adopt	0.015	0.015	0.025	0.609	0.543
SEM_EC → SEM_MN	0.729	0.729	0.011	65.172	0.000
SEM_EC → SEM_PBC	0.095	0.097	0.027	3.476	0.001
SEM_EC → SEM_SN	0.204	0.205	0.023	8.874	0.000
SEM_MN → SEM_BEV_Adopt	0.214	0.214	0.029	7.479	0.000
SEM_PBC → SEM_BEV_Adopt	0.063	0.064	0.020	3.121	0.002
SEM_SN → SEM_BEV_Adopt	0.221	0.220	0.020	11.004	0.000

4.3.1. Indirect Effects of the SEM

Referring to the results of the indirect effects of the SEM, the estimated coefficients for the following relationships (EC → ATT, EC → MN, EC → PBC, and EC → SN) were significantly different than 0. Furthermore, when we analyzed the specific indirect effects of EC on AI, the results indicate that all relationships were statistically significant (see Table 6).

Table 6. Indirect effects of the SEM.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	*p* Values
SEM_EC → SEM_SN → SEM_BEV_Adopt	0.045	0.045	0.007	6.843	0.000
SEM_EC → SEM_ATT → SEM_BEV_Adopt	0.138	0.138	0.012	11.418	0.000
SEM_EC → SEM_PBC → SEM_BEV_Adopt	0.006	0.006	0.003	2.305	0.021
SEM_EC → SEM_MN → SEM_BEV_Adopt	0.156	0.156	0.021	7.283	0.000

4.3.2. Multigroup

To test H10 and H11, a multigroup analysis was implemented. In Figure 2, different dimensions (d) are visually presented. On the right hand-side, d > 0, there are predominantly female consumers with no or less education (no, high-school, bachelor's) and without previous experience with BEVs. Conversely, on the left hand-side, d < 0, the group is mainly formed by men with the higher education levels of master's and PhD and previous BEV experience.

For the variable 'profile' (H10), no significant differences were found in the estimated coefficients among model constructs in different groups (see Table 7, 2-tailed *p*-value). 'Profile' did not moderate the established relationships among EC and the other constructs of the TPB nor the intention to adopt. Analyzing the path coefficient *p*-values from the bootstrapping multigroup analysis, the effect of PBC → AI was not significant in the group of experienced men (coefficient 0.030, *p*-value = 0.306). However, in the group of inexperienced women, the effect of PBC on AI was significantly different from 0 (coefficient 0.067, *p*-value = 0.014).

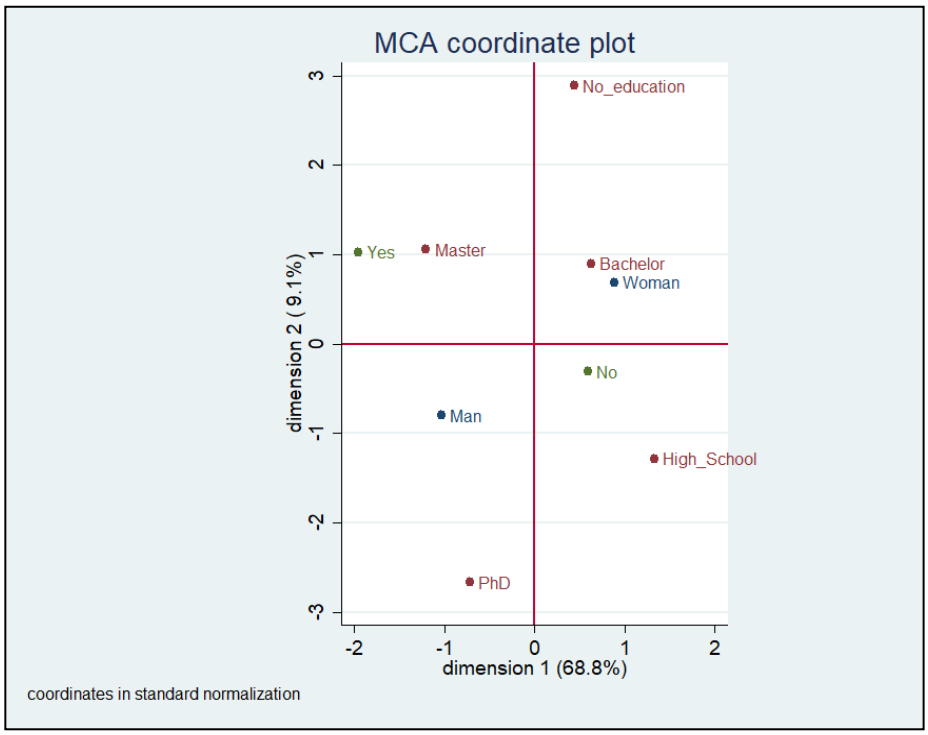

Figure 2. MCA coordinate plot.

Table 7. Bootstrapping multigroup analysis—profile.

	Original Profile 1	*p* Value Profile 1	Original Profile 2	*p* Value Profile 2	Difference Profile 1–Profile 2	1-Tailed Profile 1 vs. Profile 2 *p* Value	2-Tailed Profile 1 vs. Profile 2 *p* Value
SEM_ATT '→ SEM_BEV_Adopt	0.458	0.000	0.402	0.000	0.056	0.095	0.190
SEM_EC '→ SEM_ATT	0.344	0.000	0.316	0.000	0.028	0.286	0.572
SEM_EC '→ SEM_BEV_Adopt	0.041	0.277	0.002	0.948	0.039	0.221	0.443
SEM_EC '→ SEM_MN	0.733	0.000	0.726	0.000	0.007	0.379	0.758
SEM_EC '→ SEM_PBC	0.115	0.015	0.087	0.017	0.028	0.322	0.645
SEM_EC '→ SEM_SN	0.214	0.000	0.197	0.000	0.017	0.357	0.715
SEM_MN '→ SEM_BEV_Adopt	0.184	0.000	0.232	0.000	−0.047	0.790	0.420
SEM_PBC '→ SEM_BEV_Adopt	0.030	0.306	0.067	0.014	−0.037	0.821	0.357
SEM_SN '→ SEM_BEV_Adopt	0.217	0.000	0.217	0.000	0.000	0.504	0.992

Profile 1: Man, with experience, higher education; Profile 2: Woman, no experience, less education.

Testing H11 involved using the groups determined by the variable 'price sensitivity' to investigate preferences for different vehicle technologies under the assumption of equal costs for all vehicle types. Respondents were asked to choose between an electric or traditional (diesel/gasoline) car. The results indicated that 82% preferred an electric vehicle, while 18% opted for a traditional one. Convergent and discriminant validity were confirmed in all the groups considered, with reliability and validity details available upon request. MICOM analysis, encompassing configural invariance, compositional invariance, and equality of composite mean values and variances, was performed. Partial measurement invariance was observed for groups based on the variables profile and price sensitivity. Configural invariance for price sensitivity (Step 1) was satisfied, while compositional invariance (Step 2) showed a permutation *p*-value for SEM_MN below 0.05, indicating slight deviation but globally acceptable compositional invariance. When focusing on price sensitivity, data indicate significant differences in the estimated coefficients among the constructs 'SEM_EC → SEM_SN' and 'SEM_PBC → SEM-BEV_Adopt' of the model in the two groups considered (see Table 8). Consequently, the impacts of EC on social norms and

perceived control on AI are higher for those who, assuming equal prices, would buy an EV compared to those who, under the assumption of equal prices, would choose traditional vehicles. The effects of the constructs cannot be considered the same regardless of price sensitivity; thus, a statistical difference exists between the groups, and price sensitivity moderates the relations (H11). In addition, the impact of EC on AI is not significant for both groups, while the effect of EC on SN is not significant only for the group comprised of individuals who would choose a traditional car in the case of equal prices. In summary, all preceding statistical results provide insights into the moderating impact of price sensitivity on adoption intention.

Table 8. Bootstrapping multigroup analysis—price sensitivity.

	Equal Price Buy Traditional (0)	*p* Values	Equal Price Buy BEV (1)	*p* Values	Difference (Group_0–Group_1)	1-Tailed (Group_0 vs. Group_1) *p* Value	2-Tailed (Group_0 vs. Group_1) *p* Value
SEM_ATT → SEM_BEV Adopt	0.409	0.000	0.343	0.000	0.066	0.105	0.210
SEM_EC → SEM_ATT	0.214	0.001	0.270	0.000	−0.056	0.787	0.426
SEM_EC → SEM_BEV_Adopt	−0.061	0.398	0.018	0.527	−0.079	0.845	0.309
SEM_EC → SEM_MN	0.725	0.000	0.724	0.000	0.001	0.470	0.941
SEM_EC → SEM_PBC	0.157	0.038	0.114	0.000	0.043	0.260	0.521
SEM_EC → SEM_SN	0.046	0.441	0.192	0.000	−0.146	0.990	0.020
SEM_MN → SEM_BEV_Adopt	0.278	0.003	0.196	0.000	0.082	0.206	0.411
SEM_PBC → SEM_BEV_Adopt	−0.112	0.047	0.171	0.000	−0.284	1.000	0.001
SEM_SN → SEM_BEV_Adopt	0.243	0.000	0.218	0.000	0.025	0.328	0.656

5. Discussion

The purpose of this research was to investigate the factors influencing the intention to adopt BEVs in the Spanish market, focusing on behavioral constructs within the TPB. The traditional TPB posits that consumers' behavior (in this research, the intention to adopt BEVs) is influenced by ATT, SN, and PBC. The TPB model was extended by incorporating the constructs of EC and MN, while including an additional dimension of consumer groups based on education, gender, and experience, in addition to 'price sensitivity'. Spain, as a Southern European country, still accounts for fewer BEV adoptions than other Northern European countries. Therefore, it is of interest to shed light on the consumer behavior of potential BEV consumers in Spain. Regarding the model's validity and reliability analysis, the results of Cronbach's alpha and CFA findings confirmed that the SEM model can be utilized to investigate consumers' intentions to adopt BEVs based on this Spanish sample.

Table 9 summarizes the results of the hypotheses tested in this model. In conclusion, all hypotheses, except for H5 (EC has a direct and positive significant impact on the intention to adopt BEVs) and H10 (The 'profile' of the consumer, considering experience, gender, and education, will moderate the relationships among EC and all constructs of the extended TPB, as well as the intention to adopt) were accepted. The different constructs (ATT, SN, PBC, and MN) had a positive direct impact on the intention to adopt BEVs. Based on the results of the indirect relations of EC, we can confirm that the constructs served as mediating variables for EC, with a positive impact of the indirect effect of EC on AI.

H1 suggested that consumers' attitude towards BEVs is positively related to the AI regarding BEVs. This assumption can be accepted with a confidence level of 99% based on its *p*-value of 0.000 and with our second highest path coefficient of 0.422, meaning that consumers' own attitudes towards BEVs do play a significant role when purchasing BEVs. Creating more favorable value perceptions is essential to improve the attitude towards the adoption of electric vehicles [78]. This result should be taken into consideration for further promotion of the positive benefits consumers would receive by adopting a BEV.

H2 stated that consumers' social norm is also positively related to the intention to adopt BEVs. This relationship can be accepted with a confidence level of 99% and a path-coefficient of 0.221. Social pressure plays an important role and reflects its impact on the H2 result. The adoption of BEVs appears to depend significantly on social norms, based on this Spanish sample.

Table 9. Results of the hypotheses.

	Hypotheses	**(The Theoretical Hypothesis Is. . .)**
H1	Consumers' Attitude (ATT) toward BEVs has a significant direct and positive impact on the intention to adopt BEVs.	Accepted
H2	Consumers' Subjective Norm (SN) has a significant direct and positive impact on the intention to adopt BEVs.	Accepted
H3	Consumers' Perceived Behavioral Control (PBC) has a significant direct and positive impact on the intention to adopt BEVs.	Accepted
H4	Consumers' Moral Norm (MN) has a significant direct and positive impact on the intention to adopt BEVs.	Accepted
H5	Environmental Concern (EC) has a significant direct and positive impact on the intention to adopt BEVs.	Rejected
H6	Environmental Concern (EC) has an indirect positive effect on the intention to adopt BEVs through consumers' Attitude (ATT).	Accepted
H7	Environmental Concern (EC) has an indirect positive effect on the intention to adopt BEVs through consumers' Subjective Norm (SN).	Accepted
H8	Environmental Concern (EC) has an indirect positive effect on the intention to adopt BEVs through consumers' Perceived Behavioral Control (PBC).	Accepted
H9	Environmental Concern (EC) has an indirect positive effect on the intention to adopt BEVs through consumers' Moral Norm (MN).	Accepted
H10	The 'profile' of the consumer, considering experience, gender, and education, will moderate the relationships among EC and all constructs of the extended TPB, as well as the intention to adopt.	Rejected
H11	Price sensitivity will moderate the relationships among EC and the constructs of the extended TPB and the intention to adopt.	Accepted

H3 suggested that the consumers' perceived behavioral control is positively related to the intention to adopt BEV, which can be confirmed with a 98% confidence level with a *p*-value of 0.002 and a path-coefficient of 0.063. Based on this result, in our study, we observed that PBC has the lowest direct impact on AI regarding BEVs, which contrasts with other studies that found this construct to be the most important factor influencing the willingness to purchase a BEV [31,33], with the second strongest impact on AI [11]. Nevertheless, the positive coefficient sign of PBC in our study confirmed that consumers' intention to adopt BEVs increases if they perceive BEVs to be accessible. To increase the perception of BEVs, it is essential to analyze consumers' perceived ease and the obstacles they perceive they face when adopting BEVs. In addition, the context's infrastructure readiness is also an important factor to consider, given the ongoing concern about charging infrastructure, time, and autonomy [16].

Ultimately, as for the direct impacts tested in this research model, H4 can be accepted. H4 claimed that consumers' moral norms are positively related to the intention to adopt BEVs. In our model, moral and social norms showed almost the same impact strength with a path coefficient of 0.214 and 0.221, respectively. When considering the purchase decision of a BEV, consumers seem to rely significantly on their own moral norms to adopt a BEV or not. The positive effect of the moral norm is aligned with other previous studies [9,11,21,32,34,36,38].

H5 analyzed the direct impact of EC on AI regarding BEVs. As previously explained, EC has an important impact on the adoption of green products. Therefore, we included the EC construct both with a direct and indirect relation to AI. As for H5, we suggested that EC has a direct positive impact on the intention to adopt BEVs. However, this assumption cannot be validated, based on an insignificant *p*-value of 0.545 and, hence, needs to be rejected. This result is in line with other authors who did not find a direct and statistically

significant level of the impact of EC on AI but suggested an indirect impact of EC on AI via the mediating constructs ATT, SN, PBC, and MN [11,38].

H5–H9 reflected the indirect effects of EC on AI via the previously introduced constructs that served as mediating variables. For H5–H9, the following conclusions can be drawn: The constructs ATT, SN, PBC, and MN all showed a positive *p*-value and, therefore, play a positive mediating role in EC being a factor in AI regarding BEVs. The indirect, significant effect of EC on AI via the mediating constructs confirmed previous studies that also analyzed the indirect impact of EC [9,11,32,36,38]. The path coefficient of SN and PBC in our model are 0.204 and 0.095, respectively. The relationships of EC → ATT → AI, EC → SN → AI, and EC → MN → AI can be accepted with a significant *p*-value of 0.000, and the relationship of EC → PBC → AI can be accepted with a *p*-value of 0.001. Particularly noteworthy is the strong impact of the path coefficients of EC on MN (0.729) and of EC on ATT (0.327). These results emphasize the importance and power of moral beliefs influencing the intention to adopt BEVs, as indicated by the result of MN.

Regarding H10, no statistical difference existed between the groups, as analyzed with multigroup analysis. The variable 'profile' with gender, education, and experience did not moderate the relationships among EC and the other constructs. Therefore, H10 is to be rejected. Considering the impact of the constructs per group, PBC was not statistically significant for the male group. All other constructs exerted the same impact for both groups.

Concerning H11, a statistical difference existed between those who would buy EVs when the price of these vehicles is equal to traditional ones in comparison to those who would still prefer traditional vehicles. As previously elaborated in the literature review, price sensitivity moderates the relations analyzed.

In summary, among all constructs with a direct impact on AI, the impact of ATT on AI is the strongest, with a path coefficient of 0.422. This aligns with previous studies that identified ATT and PBC as having the strongest effect on AI [9]. Moreover, the five constructs in our model explained 48% of the variance of the endogenous constructs concerning AI (R^2 = 0.480). Among the indirect impacts, the strongest one posits MN as the mediating variable of EC in AI regarding BEVs. Therefore, it is crucial to highlight the impact consumers' MN and beliefs have on AI regarding BEVs. Referring to the created control variable 'profile', we can conclude that there is no significant difference between the two different groups created (the profile of men with experience and higher education; and the profile of women without experience and with less education). However, confirming results from the previous literature, price sensitivity moderates the relations being studied. This result is particularly important for defining strategies in a price-sensitive market such as Spain. Consumers' price sensitivity plays a vital role in translating ATT, SN, PBC, MN, and EC into AI. The validated factors of the constructs ATT, SN, PBC, MN, and EC provide good reliability in predicting AI. The findings of the relationships between the constructs towards adoption intention helped to validate our hypotheses and were largely consistent with the current literature.

6. Conclusions

In this research, we applied the TPB, which is a valid theory to explain consumers' behavioral intentions to adopt BEVs. The original TPB was extended by MN and EC to conduct a comprehensive analysis of a consumer's intention to adopt a BEV. EC was investigated for both its direct and indirect impact on AI. Additional constructs such as profile and price sensitivity were included. PLS structural equation analysis was applied to analyze the data with 1816 participants and to test the research model. The results of this research confirmed the appropriateness of the extended TPB. During the validity check, some items were found to be incompatible with the model's requirement and were deleted (Att4, PBC2, SN4, AI2).

The findings of this research provide valuable insights to further focus on consumer behavior in actual BEV adoption. As highlighted by the scholar Ajzen in 1991, '*explaining human behavior in all its complexity is a difficult task*' [10] (p. 179) and should be approached

with the utmost seriousness by researchers. Given the heterogeneity of consumer behavior, it is essential to recognize that consumers are not homogenous. The results also offer guidance for governments and industries to refine campaigns promoting full BEV adoption, increase awareness, and emphasize environmental benefits. Reducing perceived risks associated with BEVs by highlighting their environmental benefits is crucial. Consumers' EC positively impacts constructs such as ATT, PBC, SN, and MN. In this model, ATT and MN exerted a stronger influence on consumers' AI for BEVs. Governments should aim to strengthen individual moral responsibility to protect the environment, and politicians and marketers can contribute by promoting a positive image of BEVs through vehicle shows, demonstration test drives, and marketing campaigns.

6.1. Future Research

As previously explained, the construct ATT exerted the strongest direct impact on AI regarding BEVs. Therefore, research should emphasize the importance and the influential power of consumers' attitudes towards specific pro-environmental behaviors. Additionally, investigations into the behavioral attitudes of consumers could delve deeper into the impacts of feelings and emotions. The TPB model might be extended by incorporating the norm activation model and introducing 'feelings and emotions' as additional constructs influencing purchase intentions for EVs [23]. Furthermore, integrating values such as the Schwartz values system into the TPB model can enhance its capability to comprehend environmental behavior [79]. There is limited empirical research that includes the impact of personal values on consumer-decision making. Future studies could enrich the existing literature by examining the influence of such personal values and norms in conjunction with the concept of green moral obligation [80]. Additionally, it is of interest to carry out a cross-country study to highlight the differences between cultural perceptions [20,80]. Research aimed at comparing diverse cultural settings could offer valuable insights into the interplay of cultural factors shaping consumer behavior regarding the adoption of sustainable technologies. Moreover, research should extend beyond solely examining EV adoption to encompass the impact and challenges associated with EV charging stations [81]. Recognizing that the availability and functionality of charging infrastructure are crucial components in the successful integration of EVs adds another layer of complexity to the discussion. In addition, as other studies have shown [35,82–84], the adoption of EVs is likely to be limited without significant governmental incentives. Therefore, it is essential to investigate both fiscal and non-fiscal measures for governments to promote EV adoption [2]. However, it is important to mention that the elevation of EV adoption is not free of criticism; prior research exists analyzing the negative impact that the use and production of EVs might have on the environment, as well as the harms of EV electricity consumption [85]. Based on the literature review, future research should include critical analysis and a closer interrogation of the resources, emissions, and energy claims for EVs [81]. Accordingly, it is crucial to address these concerns to ensure the sustainable development and adoption of EV technology.

6.2. Limitations

There are limitations of this study that need to be pointed out. Primarily, it is important to note that this study considers adoption intention rather than actual adoption. However, the adoption intention can be considered an immediate determinant for actual behavior [10], thus validating the results of this study. Nonetheless, the empirical evidence could be enriched by focusing on the actual adoption of BEVs, which will be easier in the future as consumers adopt BEVs on a more scalable level.

Moreover, this study is centered on a Spanish sample to contribute insights to the literature within this specific cultural context. However, this geographical specificity simultaneously imposes limitations on the generalizability of and global discourse on sustainability. To address this, it is imperative to conduct a thorough exploration of cultural variations across diverse contexts. Analyzing cultural dimensions using Hofstede's

framework, as done in studies in contexts such as Spain and India [53], can provide valuable insights. Country-specific knowledge regarding consumer adopters of EVs is essential for informed marketing strategies and effective policy formulation [20,80].

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