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Pragmatic and idealistic reasons: What drives electric vehicle drivers' satisfaction and continuance intention?

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ABSTRACT

The sales and use of electric vehicles (EVs) have been growing in recent times in Europe, with the hopes of mitigating CO_2 emissions and enabling more sustainable transportation. Considering the growth of the EV market, the main goal of this research is to shed light on what drives electric vehicles' satisfaction and continuance intention. We collected data from 290 EV drivers in Europe. Grounded in the task-technology fit model and expectation-confirmation theory, we explained 22 % and 40 % of the variance in EV satisfaction and continuance intention, with green self-identity as a moderator. EV satisfaction and continuance intention are primarily driven by adequate infrastructure and environmental concerns.

1. Introduction

The last greenhouse gas (GHG) bulletin from the World Meteorological Organization reported that from 2016 to 2017, we witnessed an increase in the number of molecules of gas per million (ppm) that was equal to the average growth of the last decade but lower when compared to 2015–2016 (Organization and Watch, 2018). Also, in the Paris Agreement, which was negotiated as a result of a convention on climate change, the concerns about the GHG emissions are noted (Article 2, United Nations, 2015), and countries must take measures to reduce emission levels (Article 6, United Nations, 2015). Although, according to the European Environment Agency, the total GHG emissions measured as CO_2 equivalent (in kt) decreased 27 % between 1991 (4,622,236) and 2017 (3,644,378), emissions related to transport only decreased 17 %. Moreover, in 1991, GHG emissions represented 17 % of total emissions (778,676), whereas, in 2017, they represented 26 % (934,932). Thus, transport has a substantial and increasing role in GHG emissions. As a result, reaching the European Commission's goal to achieve emission-free transportation by 2050 is vital (Biresselioglu et al., 2018). Policymakers in various countries are increasing their efforts to reduce environmental degradation in which large-scale vehicles' electrification is critical (Ensslen et al., 2020).

Between replacing old vehicles by electric vehicles (EVs) and public transport, EVs were found to have the higher impact on reducingO_2 emissions (Hofer et al., 2018), highlighting the positive impact of EVs on achieving the established GHG emissions goals. The growth of EV sales has been steady all over Europe, with an increase of over 20 % compared to the same month in the previous year (Irle, 2019). According to Statista (2020a), Portugal is one of the leading countries with the highest share of plug-in EV sales, which is

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our study's focus. Also, in terms of the number of EV charging point stations per 100 km of paved road, there are 2.5 charging points in Portugal, compared to Germany with 3.5 and Netherlands with 64, which is the leader. Considering Sheldon and Dua (2018) findings regarding the fact that EVs play a vital role in increasing the fuel efficiency of the overall fleet of vehicles, the increased number of EVs can reduce the dependency on fossil fuels.

Despite EVs' clear potential growing importance in reducing GHG emissions, most previous studies on EVs are related to adoption intention, suggesting there is a lack of knowledge about the satisfaction of EV drivers. Rezvani et al. (2015), who studied plug-In hybrid electric vehicles (PHEV) adoption intention, claim that, in many studies, there is no direct experience of the participants with the vehicles and that it is necessary to understand the gap between the intention and the experience (see also Wang et al., 2016). She et al. (2017), in their study of the public acceptance of EV, also pointed out the gap between adoption intention and actual adoption behavior as a limitation of their findings. The limitation regarding the focus on adoption intention instead of actual outcomes of behavior, such as satisfaction, among EV owners was also identified by Wang et al. (2017a) and He et al. (2018), who studied EV adoption and purchasing intention. This is, in fact, a common problem in the technology adoption literature - the fact that it is generally assumed that more adoption/use is better and leads to positive consequences – this has been shown not to be the case (Venkatesh et al., 2019). Besides, in their literature review of plug-in electric vehicles (PEV) user experience, Daramy-Williams et al. (2019) reported 75 studies of PEV user experience (between 2007 and 2017) associated with different kinds of user experience of PEV, which shows the popularity of this topic. Mainly, the coverage of topics in those studies were driving and travel behaviors, interactions with the vehicle, and subjective aspects of the user experience. The findings of those studies show that the limited electric range of the battery electric vehicles (BEV) was not debilitating as one may initially expect, as range anxiety was rarely reported; and that plug-in hybrid electric vehicles (PHEV) users greatly value the electric-only range in their vehicles to the extent that "*in many cases going out of their way to drive on electricity alone*" (Daramy-Williams et al., 2019, p. 28).

Given the potential of EVs to reduce air (through the absence of CO_2 emissions) and noise pollution, understanding the drivers of its users' satisfaction and their continuance intention is worth investigating. Thus, contrary to (the majority of) other studies, we do not focus on adoption or intention but rather on the satisfaction and continuance intention of those who have already adopted an EV. In doing so, we are addressing a gap based on the finding of Rezvani et al. (2015, p. 122) that the "*focus of published studies has been on various aspects of adoption and non-adoption behavior*" and that most of them are based on participants "*who have had no direct experience of EVs on which to base their responses*". Thus, this work aims to understand the main drivers of satisfaction with EVs and the continuance intention of those who already own this vehicle. Against this backdrop, we develop and test a research model focused on EV post-adoption, based on three well-established theories that we believe cover the most important attributes of these vehicles and have not yet been used together: task-technology fit (Goodhue and Thompson, 1995), green self-identity (Barbarossa et al., 2017), and expectation-confirmation model (Bhattacherjee, 2001). Each one covers, respectively, a key aspect of EVs: their adequacy (or lack of) to drivers' needs (tasks), the unique environmentally friendly attributes these vehicles possess, and the focus on post-adoption behavior. With this study, we expect to help policymakers and other EV stakeholders, such as car manufacturers, develop more effective policies to promote the diffusion of EVs. This is one of the first works focusing on the post-adoption stage of EV diffusion. We also draw conclusions for the technology adoption literature.

The remainder of this paper is organized as follows: Section 2 presents a literature review on the task-technology fit (TTF), green self-identity (GSI), and expectation-confirmation model (ECM) that are used in Section 3 that presents the research model of EV satisfaction and continuance intention; Section 4 discusses the methodology; Section 5 presents the results; and Section 6 concludes with the discussion, implications, and limitations of this work.

2. Theoretical background

2.1. Electric vehicles (EVs)

Electricity is largely recognized as a much cleaner fuel than fossil ones. However, despite its many environmental and performance advantages, EVs and other electricity-based technologies are still arguably not as vastly adopted as it should be. As Kapoor and Dwivedi (2020, p. 2) point out: adopting green technologies and practices implies "*newer improved systems, procedures, and techniques to minimize the emission of environment polluting substances, they can be termed as technological innovations*". Obviously, EVs are no exception, as these vehicles differ from the traditional ones in many ways. EVs belong to a broad market that includes hybrid electric vehicles (HEV) – powered by batteries and combustion engine – those vehicles can either have their batteries powered by the engine and are designated as HEV; if there is the capability of being charged connecting a plug into an electric source, they are designated as plug-in hybrid vehicles (PHEV). When the vehicles are only powered by batteries, they are classified as battery electric vehicles (BEV). In the EV context, there are also fuel cell electric vehicles (FCEV) – that run using hydrogen – and fuel cell hybrid electric vehicles (FCHEV) – that run on fuel cells having another energy storage system to support them (Wilberforce et al., 2017). In this work, we will focus on EVs, i.e., emphasizing the vehicles that require some infrastructure to charge them.

For some drivers, the main problems with EVs are related to the lack of public infrastructure (She et al., 2017) and also the driving range that Jensen, Cherchi, and Mabit (2013) found to be a critical adoption factor of EVs, which becomes even more crucial when the households rely only on one car. Even with those barriers, there are plenty of opportunities for drivers to charge their cars because there are three EV main charging modes that can make up for those insecurities: i) EV home charging – those charging points belong to the users for private use; ii) public street charging – the charging points are located in a public space; and iii) charging stations on private property with public access (San Román et al., 2011). Generally, EV drivers are faced with two different charging schemes: slow and fast. Slow charging is associated with six to eight hours of charging, mainly done at home overnight (Botsford and Szczepanek, 2009). Fast charging enables vehicles to charge for ten minutes and be driven for 100 miles (Botsford and Szczepanek, 2009). The difference between the two charging schemes is related to the connectors that each of the schemes uses because fast charging is allowed by level III connectors that enable direct charging (DC). In contrast, slow charging is associated with level I and II connectors alternating current (AC) chargers (Botsford and Szczepanek, 2009). Thus, as level III chargers allow much faster charging, it is important that the publicly available charging stations have this technology. Faster charging times, supported by level III chargers, allow more drivers to charge their vehicles without necessarily increasing charging queues and waiting times, which are a main constraint for EV use. Level III chargers should thus be the industry standard, and drivers should also be informed about its possibilities. Larson et al. (2015) noted that EV drivers are generally interested in knowing about the latest EV-related technology development.

Financial incentives and benefits play an essential role in the EV context. Graham-Rowe et al. (2012) observed in their seven-day experiment that EV drivers were concerned that cheaper refueling would not be enough to recover the high initial investment due to the concerns about the battery life and the depreciation of the cars. Caperello and Kurani (2012) also experimented with a four- to six-week period with some individuals driving a PHEV and found that drivers did not consider the payback period and the fuel costs when doing their calculations to find if PHEVs were worth it. Apart from studies that have experimented with EVs, some studies found the financial incentives and low refueling costs to be positive predictors of EV adoption. For instance, Sierzchula et al. (2014) found that financial incentives positively affect EV market share. Larson et al. (2015) did a pricing analysis regarding EVs and found the purchase price and the operating costs among the top-three factors that motivate the purchase of EVs.

Nonetheless, the high purchase price and the battery cost are also among the four top barriers to the purchase of an EV. Rezvani et al. (2015) did a similar analysis but with PHEV and found the low operational costs and financial incentives to be the most important for adoption. Bjerkan et al. (2016) extended those studies to BEV and found that financial incentives are essential for all income groups. Also, 80 % of the respondents found the exemption from purchase tax and VAT to be decisive in BEV adoption. More recently, Wang et al. (2016), in their study on HEV, reinforce the positive effect of financial benefits on the intention to purchase new energy vehicles, as defined by the authors. The most recent studies that emphasize the importance of financial incentives and savings were conducted by Biresselioglu et al. (2018). They found economic restrictions and battery cost to be the main barriers to EV adoption and the reduction of taxes, financial incentives, and the economic savings to be motivators of EV adoption. Magueta et al. (2018), for example, found that the financial incentives are a stronger driver of EV adoption than environmental aspects, such as the reduced CO_2 emissions.

Still, despite the stronger relationship with monetary incentives rather than with environmental aspects, e.g., reduced CO_2 emissions and thus less environmental degradation, there is plenty of evidence in the literature that EVs are also related to those concerns. Sovacool and Hirsh (2009) conducted an exploratory study regarding plug-in hybrid vehicles that reinforces this idea by associating that the care for the environment was a driver for early adopters to go electric. Environmental concerns are a motivator that does not work alone but are also associated as an excellent addition to the savings households get from driving EVs (Caperello and Kurani, 2012). It is also known that individuals who are concerned with the environment express a higher intention to purchase an EV (Krause et al., 2013). Some of those individuals express that if the EV relied on entirely renewable energy, it would increase their likelihood of purchasing (Larson et al., 2015). EVs are also seen as symbols that represent the drivers' values, with those values being related to pro-environmental behavior, beliefs about environmental issues (Rezvani et al., 2015), and green moral obligation (Barbarossa et al., 2015). The association with green values is transversal across all classes of vehicles in the EV market, and even HEV adoption is positively related to environmental concerns that are related to personal norms (Wang et al., 2016). The norms and moral obligations that individuals might feel associated with green self-identity are positively related to the intention to adopt EVs; also, younger individuals are more attached to ecological values (Barbarossa et al., 2017). The norms and moral obligation of society make EVs an environmental symbolic element representing one's concern regarding climate change (White and Sintov, 2017) and environmental awareness (Biresselioglu et al., 2018). Despite the evidence regarding the association between EVs and environmental concerns, green self-identity, personal values, and norms, there is room for governments to increase awareness of alternative vehicles by communicating about their benefits (Browne et al., 2012). Finally, our motivation for this work is to better understand EV satisfaction drivers, especially continuance intention. Satisfaction is defined as "users' affect with (feelings about) prior [EV] use" and the continuance intention is defined as "users' intention to continue using [EVs]" (Bhattacherjee, 2001, p. 359). Although EV's most common demand-side determinants are addressed mainly through the lenses of adoption models, this work focuses on continuance intention. To the best of our knowledge, there are no studies on EV continuance intention. Most of the target of EV studies focus on adoption (Shalender and Sharma, 2021), intention to use (Kopplin et al., 2021), and rental (Langbroek et al., 2019). In this work, we focus on continuance intention using the task-technology fit model (Goodhue and Thompson, 1995) and the expectation-confirmation model (Bhattacherjee, 2001). Each model focuses on a particular perspective. By leveraging both models, we offer valuable insights for the EV literature.

In the information systems (IS) literature, it should be noted that many theories identify the drivers of technology adoption and use. Amongst the most prominent theories, there are the technology acceptance model (Davis et al., 1989) and its two extensions (Venkatesh and Bala, 2008; Venkatesh and Davis, 2000); the diffusion of innovations (Rogers, 2003); and the unified theory of acceptance and use of technology (UTAUT) and its extended version (UTAUT 2) (Venkatesh et al., 2003; Venkatesh et al., 2012). There is some degree of overlap among these theories (e.g., UTAUT was built on eight previous adoption models, including the technology acceptance model). Other theories have been adapted from other scientific areas to explain technology adoption and use—for example, the five-factor personality traits (Sykes et al., 2011; Venkatesh et al., 2014) and the theory of basic human values (Goncalves et al., 2018). Although discussing them all is outside the scope of this work, some justification for the three models we use in this paper is essential for our effort of contextualization. As discussed, EVs have a set of characteristics that need to be considered by the theoretical lenses we will use to examine the post-adoption of EV owners. Arguably, one of the most important characteristics of EVs is the fact that they are not yet as versatile as internal combustion vehicles (ICV), essentially due to the range and need for proper charging infrastructure.

However, at the same time, they are not compatible with some drivers' needs. For this reason, the fit between the drivers' needs (tasks) with the capabilities of the vehicle (technology) plays a key role; in other words, the task-technology fit (TTF) (Goodhue and Thompson, 1995). TTF is arguably the model that best considers the specific adequacy of the technology to the tasks for which it is used. We argue that it does this better than most other models: diffusion of innovations, for example, has two constructs that partially cover TTF – relative advantage and compatibility (Rogers, 2003). We believe both fall under TTF, and TTF is more adequate to cover this important aspect of EVs. Therefore, as we believe that EVs are especially vulnerable to drivers' needs, especially because of the required infrastructure availability, TTF was chosen as the overarching theory in our conceptual model, leaving aside other prominent theories like the UTAUT or DOI. Moreover, TTF was originally developed to study post-adoption, which is precisely what we seek to do in this study.

Besides their technological advantages and limitations, EVs have a unique characteristic that distinguishes them from every other vehicle: being environmentally friendly. This is intrinsically related to one's environmental consciousness, or green self-identity (Barbarossa et al., 2017). Although other theories (or part therein) could be used to capture one's concern for environmental issues, for example, Hofstede's long-term orientation (Nagy and Konyha Molnárné, 2018), we find green self-identity as the one to be, by far, more suitable as it incorporates the intrinsic and extrinsic motivations for using an EV over an ICV. Finally, as previously mentioned, it should be kept in mind that we are specifically addressing EV post-adoption, i.e., using data from individuals who actually own an EV. Hence, we included the expectation-confirmation model (Bhattacherjee, 2001), a theoretical frame, which mainly focuses on the post-adoption phase of technology. The ECM draws on the impact of satisfaction on continuance intention, a key relationship in our study. A more detailed description of each model is presented in the following subsections and Section 3, where each hypothesis of our conceptual model is presented within the context of each theory we use.

2.2. Task-technology fit

The TTF model posits that when there is an alignment between the system (i.e., technology) and the respective task for which it is used, there are positive performance impacts (Goodhue and Thompson, 1995). TTF is an effective instrument for understanding the individual performance and has been successfully applied in different contexts, often proving its high explanatory power. Goodhue (1998) conducted an extensive test of the measurement validity of the instrument, confirming the strong discriminant validity of TTF but pointing out the lack of testing of the relationship between TTF and performance. In subsequent years, there was some interest in the relationship between TTF and performance. McGill and Klobas (2009) developed a model using TTF to measure attitudes toward learning management systems extending the application of TTF and demonstrating that TTF is a powerful model. Gebauer et al. (2008) also strengthened the predictive power of TTF by studying task characteristics and technology characteristics with an experiment where they measured TTF immediately after individuals had completed different tasks with different mobile devices, showing that TTF is a good measure for the fit between the task requirement and the technology used. Parkes (2013), in a more recent study about the interactions between individuals, tasks, and technology, also concluded that technology performance was higher when TTF was good. Another example is provided by Tam and Oliveira (2016), who found that the effect of the use on individual performance will be stronger among users with high TTF, the reverse also being true (Goodhue and Thompson, 1995). Despite the applications of TTF, which confirm its strength, the model has some limitations because focusing on fit alone is not enough because systems must be utilized before delivering performance impacts (Goodhue and Thompson, 1995).

2.3. Expectation-confirmation model

Bhattacherjee (2001) ECM is the most influential of IS continuance models. The ECM emerged from an adaptation of the expectation-confirmation theory (ECT) (Oliver, 1980). The ECM is supported by three factors that explain an individual's continuance intention: satisfaction, confirmation of expectations, and perceived usefulness. The constructs of confirmation and perceived usefulness, determined by the consumer's initial expectations, both influence user satisfaction. The satisfaction and perceived usefulness predict an individual's continuance intention of IS. ECM has been studied in different contexts, such as e-government service success (Veeramootoo et al., 2018), website usability (Pee et al., 2018), the discrepancy between gratifications obtained and gratifications sought from social networking sites (Bae, 2018), among others (see, e.g., Brown et al., 2012; Venkatesh and Goyal, 2010). However, a key gap in the application is that it has not been studied in the context of EVs.

2.4. Green self-identity

Green self-identity can be described as the perceived identification of an individual with a typical green consumer (Barbarossa et al., 2017). Binder and Blankenberg (2017) also add the sustainable/green lifestyle to the green consumer equation as the extent of the energy-saving, waste management, water conservation, and other healthy pro-environmental behaviors (PEB) for the environment. Because of the increasing environmental degradation, researchers and policymakers have drawn attention to understanding the antecedents of PEB in recent years. Alzubaidi et al. (2021), for example, focused on the antecedents of direct (e.g., replacing individual vehicles with other means of transportation) or indirect (e.g., persuading others to be more environmentally aware) PEV. They found that PEB is mainly driven by innovativeness and perceived effectiveness and constrained by materialism.

EVs have a positive impact on the reduction of CO_2 emissions, as was previously discussed, which makes these vehicles environmental-friendly. With that in mind and considering the increased awareness of the population regarding environmental issues, the green self-identity of individuals is found in recent studies to be a driver of environmentally friendly behavior. Welsch and Kühling

(2018), for example, found that only 10 % of the respondents from a multi-country European social survey show a low level of greenness. The greater values of greenness reported suggests a perceived responsibility for environmental damage that refers to the degree to which individuals believe that they are directly or indirectly responsible for causing harm to the environment (Wu and Yang, 2018), such that the individuals are more of aware of the harm their everyday actions due to the environment. When individuals take on actual environmentally friendly behaviors, there is a relationship between that and life satisfaction because Welsch and Kühling (2018) and Binder and Blankenberg (2017) found that environmentally friendly individuals are also more satisfied with their lives.

Green self-identity is a relevant trait of the identity of individuals because it has been widely applied related to EV adoption (Barbarossa et al., 2015, 2017) and is also known to play a role in consumption and transportation (Kahn, 2007; Wu and Yang, 2018). Some studies applied green self-identity to the behavior (Binder and Blankenberg, 2017) and self-image of individuals who claim to have green behaviors (Welsch and Kühling, 2018). Thus, there is evidence that it is an essential trait of the identity of the individuals that should be considered in our work on EV adoption.

3. Research model

As discussed previously, TTF is defined as the fit between the characteristics of the task at hand and the technology used. Regarding an EV, the main task is the journey from one location to another. Because there are far fewer EV chargers than gas stations, inevitably, EVs have a more limited driving range compared to internal combustion engine cars. Thus, the task for which EVs are used can be compromised if the driving distance is longer than the next available charger (Adderly et al., 2018). Hence, it seems reasonable to assume that EV drivers who can use their cars for their daily needs will be happier and want to continue using their EVs.

On the other hand, those who own an EV but cannot use it as they need, fully or without meaningful limitations, will be more prone to be frustrated with their cars (i.e., dissatisfied) and also intend to use them less in the future. In other technologies, evidence was found for this link, and we argue this relation may be even stronger for EVs than other technologies. For example, Tam and Oliveira (2016) found that TTF was positively associated with use and performance in the context of mobile banking. One may argue that because travel (by car) is more complex and demanding, the relevance of TTF for use and satisfaction is even greater than for most other tasks, e.g., checking account balances. Thus, we hypothesize:

H1a: *TTF of EV will have a positive effect on satisfaction.*

H1b*: TTF of EV will have a positive effect on continuance intention.*

Bhattacherjee (2001) showed that satisfaction is the strongest predictor of users' continuance intention. It is a key idea underlying ECM. User satisfaction, or dissatisfaction, is primarily driven by a positive or negative reaction based on prior use of technology. Moreover, when users are satisfied with using a particular technology, they will be more likely to continue using it (DeLone and McLean, 2003). Hence, including EV satisfaction in our research model is especially important. We expect drivers reporting higher levels of satisfaction with their EVs will also be more prone to report higher levels of continuance intention. Several pieces of evidence in the literature how that satisfaction is an important factor affecting a user's continuance intention (see, e.g., Albashrawi and Motiwalla, 2019; Foroughi et al., 2019; Nascimento et al., 2018).

In the context of EVs, several aspects of these can make EV drivers satisfied. For example, despite the high acquisition cost of EVs, the costs associated with charging an EV are lower than those of fuel combustion vehicles, thus likely to satisfy EV drivers. EVs also barely emit engine noise, unlike traditional vehicles that can be noisy. Moreover, one of the most appreciated characteristics of EVs is that these vehicles generate maximum torque from zero to the maximum rotations per minute (RPM) the engine supports. Internal combustion engines, on the contrary, generate high torque only at the center of their torque curve and lower in the beginning and end. This is actually the reason why EVs do not have gears, an aspect many drivers appreciate, as evidenced by the popularity of automatic transmission vehicles. These unique features, and others like the absence of engine noise (some EVs even have speakers to simulate internal combustion engine noise during throttle) and zero GHG, are likely to yield increased satisfaction/pleasure from the driving experience, as discussed previously. The more reasons users have to be satisfied with the technology, and in EVs, there are many, the more likely it is that those users will want to continue engaging in the behavior that yields satisfaction. The act of driving, let alone a vehicle with EV characteristics, is prone to satisfaction, perhaps more than typical ICVs, making the link between satisfaction and continuance intention important. Thus, we hypothesize:

H2: *Satisfaction of EV will have a positive effect on continuance intention.*

Green self-identity is reported to be positively associated with the environmental consequences of using cars, meaning that there is also a positive effect on the satisfaction and continuance intention related to EVs (Barbarossa et al., 2015). Ingeborgrud and Ryghaug (2019) found that environmental concerns are a clear driver of EVs in Norway. However, there is some evidence that green self-identity alone is not enough to explain technology adoption and use because other aspects also play an important role in that process (Barbarossa et al., 2015, 2017). We expect that people with lower levels of green self-identity overemphasize EVs' limitations, such as the relatively limited range and charging times. In contrast, we expect people with higher levels of green self-identity to underemphasize these limitations. Users' environmentally friendly behavior, i.e., green self-identity, reflects the willingness to buy green products (Khare, 2015). Environmentally friendly behavior is associated with altruism. Lalot et al. (2019) found that green self-identity drives pro-environmental actions and behavior. We believe that as one's environmental conscientiousness is tacit in nature, it works (mainly) as a catalyst for other (more explicit) drivers of EV adoption. Thus, it seems reasonable to expect EV satisfaction and continuance intention to be driven by more than a (mere) sense of environmental conscientiousness, at least in this early stage of EV diffusion, especially when EV acquisition costs are still relatively high.

For these reasons, we hypothesize that green self-identity will strengthen the effect of TTF on both satisfaction and continuance intention, as the perceived fit between EV with the tasks they are used to, combined with a positive feeling about using these vehicles,

Table 1
Questionnaire items.

Construct	Item		Adapted from
From 1 ("strongly disagree") to 7 ("strongly agree"), please indicate the degree of agreeableness with each of the following statements regarding your EV:			
Task-Technology Fit	TTF1	My EV is enough for all my trips	(Goodhue and Thompson, 1995).
	TTF2	I reach all my destinations on time with my EV	
	TTF3	My EV range is enough for my daily needs	
Green Self-Identity	GREEN1	I think of myself as someone who is concerned about environmental issues	(Sparks and Shepherd, 1992) and (Barbarossa et al., 2015)
	GREEN2	I think of myself as a "green" consumer	
	GREEN3	It is important to me how car usage may affect the environment	
	GREEN4	It is important to me how car usage may cause air pollution	
Satisfaction	SAT1	I am convinced that EVs serve my needs.	(Bhattacherjee, 2001)
	SAT2	I am convinced that I will be satisfied with EV efficiency	
	SAT3	I am convinced that I will be satisfied with EV effectiveness.	
	SAT4	I am convinced that, overall, I will be satisfied with EV.	
Continuance Intention	CI1	I intend to continue using EVs in the future.	(Bhattacherjee, 2001) and (Hoehle and Venkatesh, 2015)
	CI2	I will always try to use EV in my daily life	
	CI3	I plan to continue to use EV frequently	
Filter and Controls	Vwn	Do you own a vehicle (Yes/No) – Filter question	
	Vype	Type of vehicle owned (BEV; PHEV; HEV; FCEV; Diesel; Gas; GPL; Bi fuel)	
	MonKms	On average, how many kms you do with your vehicle per month?	
	VKms	How many kms have you done in your vehicle so far?	
	VTime	For how long you've been driving an EV?	
	Age	Age (in years)	
	Educ	Highest academic degree earned (then converted to years of education)	
	Inc	Household average monthly net income (in Euros)	
	Gen	(Male = 0; Female = 1)	

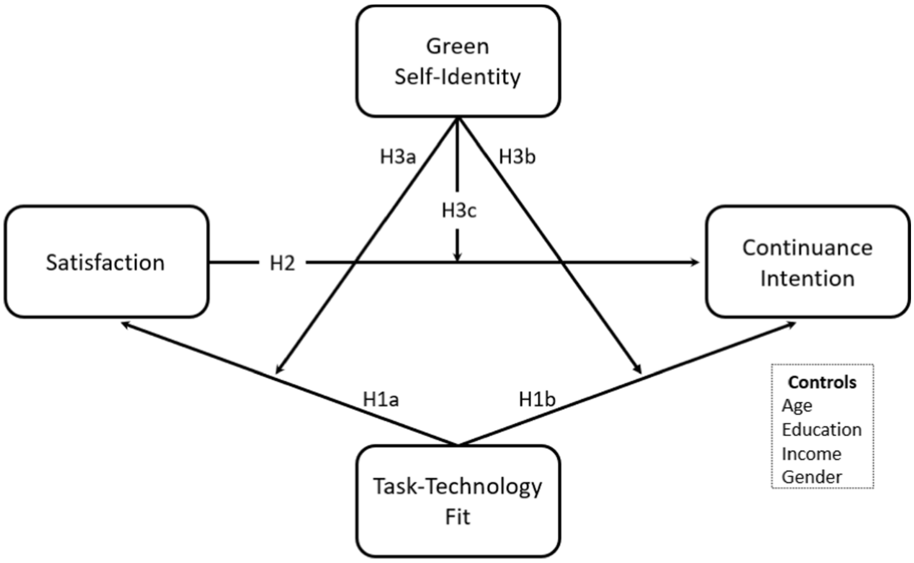

Fig. 1. Research Model.

will result in higher levels of satisfaction and continuance intention than would only one of these alone. Moreover, we argue that the effect of satisfaction on continuance intention will be stronger for those who score higher on green self-identity, as such people will be happy with more EV features (e.g., noise reduction, zero GHG) compared to those who do not score as high on green self-identity. Thus, we hypothesize:

H3a: *Green self-identity will moderate the effect of TTF on satisfaction, such that the relationship will be stronger among people with higher green self-identity.*

H3b: *Green self-identity will moderate the effect of TTF on continuance intention, such that the relationship will be stronger among people with higher green self-identity.*

H3c: *Green self-identity will moderate the effect of satisfaction on continuance intention, such that the relationship will be stronger among people with higher green self-identity.*

As is the norm in studies on consumer behavior, key sociodemographic control variables were included in the research model (please see Table 1). In particular, we controlled for age, education, gender, and income, which are amongst the most frequently used statistical controls (Bernerth and Aguinis, 2016). These variables are used as controls because they are extraneous variables, i.e., although they are not linked to the hypotheses and theories being tested, we suspect these can still influence EV continuance intention. Following the recommendation of Spector and Brannick (2011), we justify the inclusion of these controls is by our belief that men, younger, more educated, and higher income EV users are more likely to score higher on EV continuance. Therefore, as we could not hold these characteristics constant in our survey, we included them as statistical controls. Our research model can be seen in Fig. 1.

4. Methodology

We collected the data using an online survey made available through Qualtrics and shared it in forums and social media groups related to e-mobility enthusiasts and EV owners. Qualtrics is a survey tool developed for researchers with advanced surveying needs. Qualtrics was acquired by SAP in 2019. It is presently-one of the most prominent solutions in terms of Internet surveys tools, having more than 13,000 customers, including 99 of the top 100 business schools (please see www.qualtrics.com). As it would be virtually impossible to determine the sampling frame, there was no systematic sampling in the data collection process. As the instrument (i.e., survey) was administered in Portuguese, we hired a professional to translate the original questions from English to Portuguese and then another from Portuguese back to English to assess the instrument's translation equivalence. The survey started with a section explaining Evs, their types, and a glossary of related definitions (e.g., EV-related technologies and types of Evs). Respondents were first asked to answer a filter question asking if they currently own an EV. If not, the questionnaire finished immediately; if yes, it proceeded with the measurement items and, subsequently, with the sociodemographic questions.

The instrument was built to reflect our research model previously introduced, i.e., each construct presented in the previous section of the paper (e.g., TTF, satisfaction) was measured in our instrument using the original scales (questions/items) developed by their respective authors, albeit sometimes with slight adaptations to best fit the EV context. Hence, every question (item) of the questionnaire was adopted to the EV from the original theories, which have been widely used and tested separately, although in other contexts than EV. Therefore, the developed instrument has theoretical and empirical support, that has been previously validated in the literature. More specifically, the task-technology fit scale was adapted from Goodhue and Thompson (1995), and included three items; The satisfaction construct (with four items) was adapted from Bhattacherjee (2001); whereas continuance intention (three items) was adapted from Bhattacherjee (2001) and Hoehle and Venkatesh (2015); and green self-identity (with four items) from Sparks and Shepherd (1992) and Barbarossa et al. (2015). All items were measured on a seven-point scale anchored between (1) "strongly disagree" to (7) "strongly agree", as it provides interval measurement scale properties. As mentioned. some slight adjustments were made as the original items were not developed for the specific context of EV technology. The measurement items are shown in Table 1.

To test the instrument, we started by performing a pilot test with 33 EV users. With the pilot, we could assess if the respondents had difficulties in answering the questions and make an initial examination of the instrument's reliability and validity. The pilot also allowed us to refine some items and delete others that were ambiguous. Therefore, as small adaptations were made to the instrument, the answers collected during the pilot were not included in the main study.

Finally, in the main study, 843 people received the questionnaire for eight weeks between late 2019 and early 2020. The IP addresses were recorded and checked to ensure there were no duplicate responses. From the answers we gathered, 25 were from individuals who did not own an EV, making them unsuitable to participate in the study. Of the individuals who owned an EV, 468 did not answer the survey, meaning we had a 43 % response rate (considering only answers from individuals with the vehicle). We had 60 ICV drivers that were excluded, thus leaving us with a sample of 290. Finally, we employed Harman's single-factor test (Mackenzie et al., 2011) to test for common method bias. As the first factor only accounted for 37.1 % of the covariance amongst all constructs, well below the threshold of 50 %, we concluded that common method bias was not an issue (MacKenzie and Podsakoff, 2012; Podsakoff et al., 2003).

As for the respondents' sociodemographic characterization were aged between 18 and 82, with the mean age being 48. Regarding education, 83 % had completed a university degree or higher, and 77 % were employed. It is interesting to note that the weight of Evs is distributed evenly amongst families with children and single-parent/couples without children because only 54 % of respondents have three or more members in their households, meaning that Evs are not only adopted by families but also by single-parents and couples nearly in the same proportion. The sample of EV drivers were mostly men (approx. 80 %). On average, the respondent's ownership duration of an EV was 2–3 years, and those drivers, on average, drove around 31,000 km with their vehicles, which means that EV drivers, on average, drove approximately 1,000 km per month.

5. Data analysis and results

We tested our model using partial least squares (PLS), a structural equation modeling (SEM) approach (Ringle et al., 2015). SEM is an approach that combines multiple parts of the research process holistically. It is considered a second-generation analytical method that combines first-generation descriptive techniques (e.g., factor analysis) with explanatory techniques (e.g., linear regression). Therefore, it combines a psychometric component by modeling latent (unobservable) variables – constructs – such as green self-identity or satisfaction; with an econometric perspective focused on estimating the cause-effect relationships between those same constructs. These two almost independent models are known as the measurement and structural models, respectively. The main

Table 2
Loadings (values in bold) and cross-loadings.

	TTF	Green	Satisfaction	ContInt
TTF1	**0.89**	0.16	0.35	0.44
TTF2	**0.88**	0.19	0.38	0.38
TTF3	**0.87**	0.14	0.48	0.36
Green1	0.11	**0.90**	0.07	0.28
Green2	0.22	**0.86**	0.17	0.27
Green3	0.18	**0.96**	0.16	0.33
Green4	0.16	**0.94**	0.21	0.33
Sat1	0.42	0.09	**0.86**	0.23
Sat2	0.42	0.21	**0.84**	0.21
Sat3	0.44	0.16	**0.92**	0.23
Sat4	0.34	0.15	**0.90**	0.14
CI1	0.34	0.26	0.10	**0.87**
CI2	0.44	0.31	0.32	**0.83**
CI3	0.39	0.29	0.17	**0.92**

Table 3
Average (Avg), standard deviation (StDev), composite reliability (CP) and average variance extracted (AVE).

Construct	Avg	StDev	CR	AVE	TTF	Green	Satisfaction	Cont. Int.
TTF	6.40	0.94	0.91	0.77	**0.88**			
Green	5.81	1.35	0.95	0.84	0.19	**0.92**		
Satisfaction	6.48	0.72	0.93	0.78	0.46	0.17	**0.88**	
Cont. Int.	6.70	0.73	0.91	0.77	0.45	0.33	0.24	**0.88**

Notes: Composite reliability (CP), average variance extracted (AVE), the diagonal in bold is the square root of AVE, non-diagonal is correlation.

Table 4
Heterotrait-Monotrait Ratio (HTMT).

Construct	TTF	Green	Satisfaction	Cont. Int.
TTF				
Green	0.21			
Satisfaction	0.51	0.18		
Cont. Int.	0.52	0.36	0.25	

advantage of the measurement model component is that the indicators (items) used to measure each construct are subjected to measurement errors. Because each construct is measured through several items, the effects of measurement errors are reduced and controlled. This is especially important when one measures latent dimensions, as in this study. In the structural model (hypotheses testing), SEM also enables researchers to model multiple independent and dependent variables (constructs) simultaneously. SEM is arguably-one of the most popular analytic methods in social sciences for these and other reasons. There are two broad methods to conduct SEM. PLS, compared to covariance-based techniques, is recognized to have fewer assumptions, such as those related to sample sizes, the variables and the distributions of the residuals (Chin, 1998). PLS is also considered adequate whenever the sample size is more than ten times higher than the number of paths (Gefen and Straub, 2005). Hence, for these reasons, PLS was employed with SmartPLS 3.0 as the tool (Ringle et al., 2015). Following Anderson and Gerbing (1988), we divided our analysis into the assessment of the measurement and the structural model, respectively.

5.1. *Measurement model*

As our measurement model only includes reflective constructs, we evaluated the measurement model based on internal consistency, convergent validity, and discriminant validity (Hair et al., 2016). Composite reliability was assessed to verify the internal consistency, which, as suggested by (Hair et al., 2016), were all above the threshold of 0.70. Convergent validity was analyzed through indicator reliability and average variance extracted (AVE). The indicator reliability criterion was fulfilled as all the loadings were all above 0.70 and statistically significant (see Table 2). Moreover, the Fornell and Larcker (1981) criterion was also met as the AVE is above 0.50 (see Table 3), thus demonstrating convergent validity (Götz et al., 2010).

To confirm discriminant validity, three criteria were considered: the Fornell-Larcker, the cross-loadings, and the heterotrait-monotrait (HTMT) ratio. The first criterion was proposed by Fornell and Larcker (1981) and indicates that the square root of AVE should exceed the correlation between all the other constructs (see Table 3). The second criterion states that the cross-loadings should be smaller than the loadings of each indicator (Götz et al., 2010), which the results in Table 2 can confirm. Third, HTMT ratios (see Table 4) were below 0.90 (Henseler et al., 2014), thus supporting discriminant validity. Hence, we concluded that our measurement model is adequate as it presents good indicator reliability, construct reliability, convergent validity, and discriminant validity.

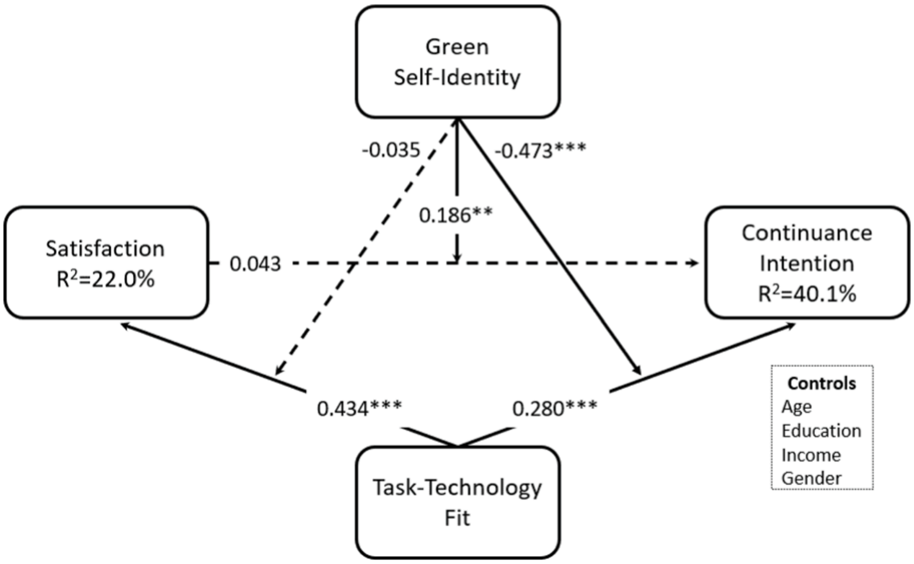

Fig. 2. Supported hypotheses and statistical significance. Note: **p* < .10; **p < .05; ***p < .01.

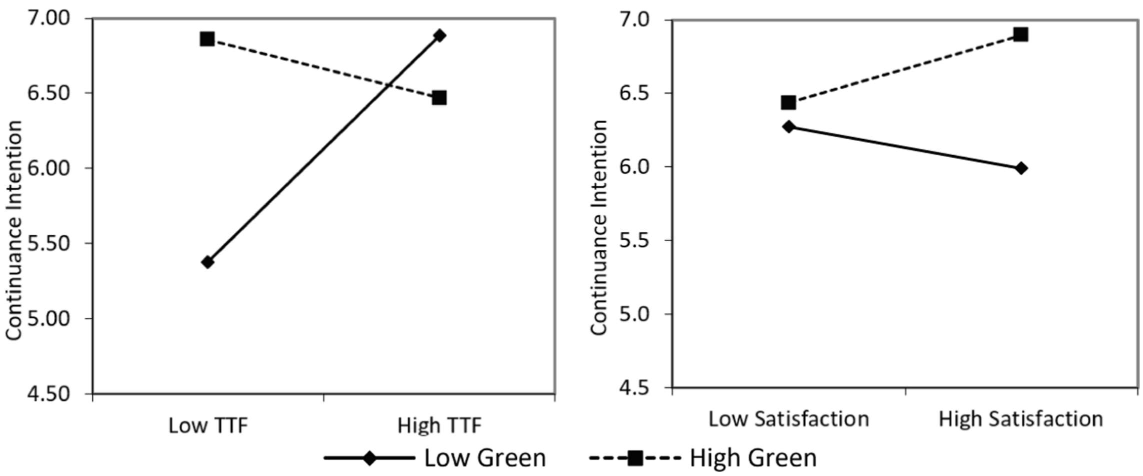

Fig. 3. Moderation effects of green Self Identity in TTF on continuance intention (H3b) and satisfaction on continuance intention (H3c).

5.2. Structural model and hypotheses

The results related to the model testing are shown in Fig. 2. Four of the six hypotheses were supported. TTF had a positive effect satisfaction (H1a; $\beta = 0.434$, $p < .001$) and continuance intention (H1b; $\beta = 0.280$, $p < .001$). The relationship between satisfaction and continuance intention (H2; $\beta = 0.043$, $p > .10$), contrary to our expectations, was not supported. Green self-identity moderated the effect between TTF on continuance intention (H3b; $\beta = -0.473$, $p < .01$), although this effect was in the opposite direction to what we hypothesized and the effect of satisfaction on continuance intention (H3c; $\beta = 0.186$, $p < .05$). Contrary to our expectations, green self-identity did not moderate the relationship between TTF on satisfaction (H3a; $\beta = -0.035$, $p > .10$) – see Fig. 3a and 3b. Our model explained about 22 % and 40 % of the variance in satisfaction continuance intention, respectively. None of the control variables had a significant effect: age ($\beta = 0.073$, $p > .10$); education ($\beta = -0.068$, $p > .10$); gender ($\beta = 0.068$, $p > .10$); and income ($\beta = 0.069$, $p > .10$).

The hypothesized moderation effects that were significant (H3b and H3c) are shown in Fig. 3. As can be seen, for those who score low on green self-identity, the effect of TTF on continuance intention (H3b) was strong and positive, whereas, for those who score high on green self-identity, it was not. As for the relationship between satisfaction and continuance intention was moderated by green self-identity (H3c). As green self-identity increased, so did the effect of EV satisfaction on continuance intention. Note that the relationship between EV satisfaction and continuance intention was nonsignificant without green self-identity's moderation effect.

6. Discussion

Our results present interesting insights regarding the diffusion of Evs There is evidence that TTF (i.e., EV owners perceived fit between their vehicles and the trips they use) had a positive effect on satisfaction and continuance intention (H1a and H1b, respectively). This result may be because EVs have a set of specificities that, to some extent, narrow their adequacy for some tasks (trips) in comparison to conventional vehicles. Thus, one might argue that TTF plays a more important role in EV owners' satisfaction and continuance intention than conventional (internal combustion) vehicles due to range anxiety that leads drivers to be extra cautious about the in-car facilities they use to save battery power and the lack of public infrastructure (Graham-Rowe et al., 2012). Adequate infrastructure is also important for reducing GHG emissions, especially for PHEVs, as it maximizes the distance these vehicles can go using electricity for fuel (Plötz et al., 2018). Note that these are not common concerns for drivers of conventional vehicles. In fact, it seems reasonable to assume that EV satisfaction and continuance intention have important antecedents that are meaningless in conventional vehicles. EV drivers, for example, need to have specific charging stations available that other drivers do not. This detail does not mean EV drivers face some important technical barriers that are non-existent to other drivers (Sovacool and Hirsh, 2009). The distance covered in each trip by an EV is a critical aspect that emphasizes its importance when individuals drive one of those vehicles (Jensen et al., 2013), as the ranges are still limited, especially in the (still often) absence of charging stations (Larson et al., 2015). This fact may yield some type of range anxiety that can vary depending on the context, e.g., urban vs countryside or driver experience (Rezvani et al., 2015), which ultimately leads to different satisfaction and continuance intention antecedents. In summary, various aspects, such as lack of proper infrastructure, trip characteristics, such as long-distance or through rural areas, or even driver experience, can strongly affect EV satisfaction and continuance intention. Thus, the more the perceived fit between task (trips) and technology (EV) is, the more likely EV drivers will be satisfied and intend to continue using their vehicles in the future.

Surprisingly, at least at first sight, satisfaction was not found to influence continuance intention (H2). It seems reasonable to assume that more satisfied EV drivers would also have a higher intention to continue using EVs in the future. Recent studies have demonstrated the influence that satisfaction can play on technology continuance intention, such as, for example, social recommender systems (Yang, 2021), cloud-based bookstores (Hung et al., 2021), chatbots (Ashfaq et al., 2020), smart city service (Salim et al., 2020), or bicycle-sharing (Shao et al., 2020). Although our findings contradict the general body of knowledge, it is still too soon to claim that, for EVs, satisfaction is independent of continuance intention. Although further research is required, we offer two possible explanations for our findings in this context: (1) the impact of satisfaction changes based on the value of the product or service, making satisfaction a weaker predictor for a high-value product; and (2) the increasing ease to discontinue the use of the technology. It should be noted that in this study, respondents are individuals who have already purchased an EV and, due to the relatively young age of these vehicles along with their relatively high acquisition costs, which is considered to be one of the main barriers toward adoption (Biresselioglu et al., 2018; Rezvani et al., 2015; She et al., 2017; Sovacool and Hirsh, 2009), are not likely to stop using them as this would imply acquiring a conventional vehicle, which would mean more expenses. Hence, as most EV drivers probably have not yet reached breakeven with their purchase, it is reasonable to expect that they will not stop using their vehicles until they do. Thus, continuance intention is independent of satisfaction for those who have already purchased and regularly use an EV. This result highlights, in our view, an essential aspect of our study: respondents are EV users and owners, and not someone that is responding "merely" based on an expectation of perceptions, i.e., with barely or no real EV experience at all.

As for green self-identity, the hypothesized moderation effect of the relationship between TTF and satisfaction (H3a) was not supported, whereas the ones between TTF and satisfaction on continuance intention were (H3b and H3c, respectively) – see Fig. 3a and 3b. For H3a, it thus seems that EV satisfaction was driven mainly by pragmatic (TTF) and not as much by subjective reasons. In contrast, as mentioned, there is evidence that green self-identity moderated the relationship between TTF and continuance intention (H3b), although with an opposite (negative) effect to what was hypothesized ($\beta = -0.473$, $p < .01$). If, in EV owners with low green self-identity, TTF is a powerful driver of EV continuance intention (noticeable by the steep ascending slope in Fig. 3a); in those with high levels of green self-identity, it is not (as depicted by the slight, nonsignificant slope in Fig. 3a). In other words, if one scores high on TTF, he/she will very likely score high on EV continuance regardless of the levels of green self-identity (high average values placed on the right of Fig. 3a). However, for those who score low on TTF (placed on the left side of Fig. 3a), only those who are high on green self-identity will likely score high on EV continuance. This may be excellent news for those who want to push EVs uptake forward. It essentially suggests that in the context of EV continuance, low levels of TTF may be compensated with high levels of green self-identity, and vice versa. Note that scoring high on both does not seem to yield any significant effect. If we look closely at Fig. 3a, this is precisely what the results suggest: only those who have low values of green self-identity and TTF simultaneously score low on EV continuance intention. Although the negative moderation effect of green self-identity is the opposite of what we originally hypothesized, it does stand to reason that pragmatic (TTF) and idealistic (green self-identity) motivations compete, instead of complementing each other, in the context of EV continuance.

Finally, even though there was no significant direct effect of satisfaction on continuance intention (H2) when moderated by green self-identity (H3c), it was significant. For those with low levels of green self-identity, satisfaction was negatively associated with EV continuance intention. Accordingly, for those with higher levels of green self-identity, satisfaction did indeed positively influence EV continuance intention. Thus, for average levels of green self-identity, satisfaction did not influence continuance intention as the effect is close to zero and, therefore, nonsignificant.

6.1. Theoretical implications

Our findings highlight the importance of both pragmatic and idealistic motivations on EV satisfaction and continuance intention, although at different levels. This finding emphasizes the importance of the (seemingly dichotomous) relationship between rational and emotional drivers in the context of technology adoption (Hughes et al., 2020). When comparing our results with the body of the literature, some studies concluded that personal utility is placed over environmental concerns (e.g., Graham-Rowe et al., 2012), and in some situations, the latter was not even considered a driver of adoption (Sierzchula et al., 2014). Our results seem to back this, but only to some extent. Some drivers might be concerned that an EV is not a 100 % clean solution, depending on the source of EV power being, or not from renewable sources (Larson et al., 2015). Thus, some consumers may lack trust in the environmental benefits of EVs (Biresselioglu et al., 2018). There is also the belief that the manufacturing process and waste after the lifetime of EV batteries might actually be worse for the environment than the reduced GHG resulting from using EVs over traditional vehicles. There is no consensus on whether this is true, although a recent study from (The International Council on Clean Transportation, 2018) argues it is not. Their report concludes that, although the EV batteries' manufacturing and recycling processes may yield different GHG emissions, EV still has a much lower environmental footprint than traditional internal combustion engines. The fact that governments also offer some incentives for EV purchases might also influence some citizens to purchase an EV not because it has low emissions, but because of the incentives, they obtain (Jenn et al., 2020; Magueta et al., 2018). It should also be noted that environmental concerns are likely mediators between the financial incentives and incentives to purchase an EV that make them play a limited role in the EV context (Wang et al., 2017b). Caperello and Kurani (2012) found that, in addition to the economic benefits, EV drivers considered the environment to be important. Even with those conclusions, there was no evaluation of which of those factors was more relevant. Even not knowing the level of importance of environmental concerns, Zhang, Wang, Hao, Fan, and Wei (2013) placed environmental awareness as part of the four constructs that positively impact the potential purchase of an EV. Environmental concern is also an incentive in the adoption, being that pro-environmental values awaken when the drivers use their vehicles (Rezvani et al., 2015; Wang et al., 2016). Hence, in the literature, evidence exists that environmental concerns positively impact use and purchase intention (He et al., 2018; Wang et al., 2017b; White and Sintov, 2017). There is also a connection between environmental concerns toward car utilization and the moral obligation of using an EV (Barbarossa et al., 2015, 2017). However, sometimes moral obligation does not mean that the drivers identify themselves as having a green self-identity.

This research sheds new light on utility and environmental motivations' importance and complementary roles in EV satisfaction and continuance intention. In this regard, perhaps our work's most important (and unexpected) finding is the negative moderation effect that green-self-identity had on the relationship between TTF and continuance intention (H3b). If, at first sight, it may seem that there is an opposite effect of pragmatism versus idealism, we argue that is not entirely true. For starters, green self-identity is only a moderator of the relationship between TTF and continuance intention because green self-identity was also associated in a positive and significant way with continuance intention. As it is noticeable by examining Fig. 3a, for those with higher values of green self-identity, TTF was nonsignificant in driving EV continuance intention (the slope of the dashed line is almost zero).

Conversely, for those who report low levels of green-self-identity, TTF is critical to EV continuance intention (the slope of the continuous line is very steep). Hence, it is natural that when both green self-identity and TTF are high, a compensation effect appears, the negative moderation of green self-identity. In any event, it should be noted that those with high levels of green self-identity (dashed line), always present relatively high levels of continuance intention, thus highlighting the positive impact of the first on the latter. This has quite an immediate implication: the answer to the question posed in the title of this study is both. As previous studies either consider one of these two drivers or both independently, our findings pertaining to the interplay between the two explain, to some extent, the contradictory findings in the literature. Thus, we believe our study bridges two separate perspectives by including environmental concerns as a moderator of the relationship between utility and continuance intention (and satisfaction).

Another theoretical contribution arises from the also surprising fact that continuance intention was independent of satisfaction (H2 was not supported). From a theoretical perspective, it is interesting to note that the ECM (main) hypothesis that satisfaction's effect on continuance intention was not supported, which may happen when individuals already own and use a new technology with relatively high initial costs. Although one might argue this might also be specific to EVs, the fact that we found no significant direct effect between satisfaction and continuance intention is contrary to the (EV) normative literature. (Rezvani et al., 2015), for example, drivers posited that they feel their pro-environmental values and symbolism when driving an EV. Consequently, we argue that the expectation-confirmation model should be augmented with moderating effects, i.e., satisfaction was actually positively associated with continuance intention only when the moderator was included (H3b). Note that this critical effect would not be revealed if only a direct effect were tested, which is what the literature actually suggests. This result highlights the importance that researchers should place in developing tailor-made research models, especially drawing on the technology under study and not merely testing existing theories.

This work also contributes to the normative literature and furthers the scope of EV diffusion, as it overcomes a common limitation of previous studies on this topic: we have addressed (current) use and satisfaction of EVs, whereas most of the previous studies have not, partially because, at the time, there were not a significant number commercially available EVs to study (Sovacool and Hirsh, 2009; Zhang et al., 2013). The present study also contributes to the state of the art because we addressed the long-term utilization of EVs and not only during an experimental period (Graham-Rowe et al., 2012). There were also limitations in prior research when participants did not have any experience with EVs (Rezvani et al., 2015; She et al., 2017) or were in the early stage of adoption (Barbarossa et al., 2015), meaning those studies were focused on the intention to adopt instead of use and consequences (He et al., 2018; She et al., 2017; Wang et al., 2016; Wang et al., 2017b). We overcame this constraint in our study because our sample, on average, had owned an EV for 2–3 years.

6.2. Implications for policymakers

We believe that our work has implications for those interested in promoting EVs as an alternative to internal combustion engine vehicles, especially policymakers at both national and local levels. Policymaking related to environmental sustainability has risen sharply in recent years (e.g., disposable plastics are being banned in many countries due to increasing awareness of climate change). In the EV context, there is substantial evidence that drivers play a critical role in reducing the environmental impacts of transportation (Fu et al., 2020) and should, therefore, be considered in the policymaking process.

Because we found strong evidence that TTF greatly drives EV satisfaction and continuance intention, policymakers need to do everything possible to make EVs a suitable choice for every-one who owns or uses a vehicle. To put it simply, EVs need to fit drivers' tasks to the same extent as ICVs. This fit may be incentivized in different ways: through direct investment in more and better-charging infrastructure; through monetary incentives, such as direct subsidization of new EVs (e.g., reducing VAT and taxes), or indirectly (e.g., offering discounts on parking spaces and tolls); or even through the implementation of EV-friendly policies (e.g., facilitating private investment on infrastructure and forbid ICV from city centers). While doing so, policymakers can also lead by example in demonstrating that EVs are an adequate choice for most individuals' tasks. In Portugal, for example, every new car bought by the central government is electric, intending to demonstrate Portugal's commitment to e-mobility and that the already existing infrastructure is adequate for anyone. In a similar move in the U.S., the Biden Administration has announced their intention to replace the approximately Federal Government's fleet of vehicles, estimated to be 650.000 with "clean electric vehicles", as a way to tackle environmental degradation and boost U.S. economic and industrial sectors. One success story in this regard is Norway, where its government aims for virtually every car sold after 2025 to be electric. Its action dates back to the 1990s, explaining why in 2019, the market share of new EV sales was above 55 % (Statista, 2020b), thus aligned with Norway's policymakers' objective of achieving zero-emission in transport (Ingeborgrud and Ryghaug, 2019). Norway's success is partially explained by measures such as VAT exemption in new EV vehicles, discounts on vehicle-related activities, and strong charging infrastructure. Note that all these increase drivers' perceptions of an EV's fit to his/her needs. (Ingeborgrud and Ryghaug, 2019) studied the main reasons behind the decision of Norwegians to buy an EV, concluding that low operation costs, being environmentally friendly, and creating free toll roads are the most important factors.

As it was also demonstrated in our study, despite its prominent influence, utilitarian reasons are not alone in promoting EV uptake. Green self-identity is also shown to influence EV continuance and satisfaction. Therefore, it is critical that the policies developed to promote EVs fit to drivers' needs and are companied measures that raise awareness towards EVs' environmental benefits compared to ICVs. In other words, policymakers should not neglect one's idealistic motivations; on the contrary, they should raise increasingly more awareness to the hazards of GHG and the great extent to which ICV contributes to it. At the same time, it should be made clear that EVs are not, by any means, more damaging to the environment than traditional vehicles are, as many (still) believe. Moreover, investing and advertising that investment in clean, electric, public transportation vehicles are also worth doing. Given the support for H3b, campaigns targeting environmentally savvy people should focus on EV benefits. Targeted ads on social media platforms could achieve this. This should be applied to both EV owners and those who do not yet have an EV, as the first satisfaction was only positively associated with continuance intention once a strong green self-identity exists. We cannot stress enough the importance of citizen engagement in awareness campaigns. As noted by Pina, Torres, and Royo (2017, p. 29), "*the most outstanding benefits of citizen participation in environmental programs are 'increased attention to climate effects of actions in various fields of life*'" – transportation clearly fits here.

Finally, for car manufacturers, as TTF is critical for EV continuance intention, they should focus on new customers (those who do not yet have EVs) as it seems that the marketing dogma that one should keep their customers satisfied does not apply or does not carry the same intensity as usual. Manufacturers should work hard on maintaining and improving the levels of quality in terms of the range of vehicles to improve the TTF for potential customers who are not yet EV drivers. It is also essential to keep EVs updated with the latest technology and design to make EVs an exciting option. It is also important to note that, besides the utilitarian and idealistic reasons behind EV adoption, evidence suggests that brand equity plays an important role (Long et al., 2019). Coincidentally, this is also an opportunity for policymakers to stimulate EV adoption, as some brands contribute strongly to a positive EV awareness and perception, as Long et al. (2019) found concerning Tesla.

6.3. Limitations and future research

Future research should consider including more dimensions of personality and not just the traits related to green consumption patterns to evaluate if there are some personality characteristics related to the use and valuation of certain aspects regarding EV benefits. Considering that green self-identity was not considered a driver for satisfaction, future research could consider studying well-being because a person might not consider himself as having a green identity but might feel good by contributing to a better world with lower GHG. Also, some more investigation regarding green self-identity toward all classes of EVs could explain that green self-identity might be more significant for vehicles that demand a higher adaptation (charging, for instance). With the increasing number of EVs being sold, it will also be relevant to investigate if the charging infrastructure is growing at the same rate. Another even more interesting angle for future research would be the status quo between different countries because governments have different investments in charging infrastructures.

Finally, we also need to acknowledge some limitations pertaining with the dataset used. First, because our data is cross-sectional, changes that EV drivers feel by driving their EVs were not accounted for in our research model. Thus, as it is plausible that the importance of pragmatism and idealism may change over time, future studies should collect longitudinal data to capture and understand these possible changes (Venkatesh et al., 2006, 2021). Second it is likely that some potentially relevant variables have not been included in the model and therefore future research should aim to further expand the variables used. One example is how many vehicles one has, as it may be the fact that some individuals may have an EV for driving around town, for shorter trips, and a gas-powered vehicle for out-of-town, longer trips.

Table A1
Collinearity Statistics - Inner VIF values.

Independent/Dependent Construct	Satisfaction	Continuance Intention
TTF	1.113	1.387
Satisfaction		1.351
Green self-identity	1.036	1.058
TTF × Green self-identity	1.081	1.648
Satisfaction × Green self-identity		1.638

7. Conclusion

Environmental awareness is gaining momentum worldwide as individuals and policymakers try to mitigate environmental degradation resulting from human activities and behavior, for which the transport sector is largely responsible. In this context, we assessed the drivers of satisfaction and continuance intention of EV drivers. We combined TTF, ECM, and green self-identity in our research model. Our substantive findings indicated that the fit between EVs with the tasks (i.e., trips) they are used for was a significant driver of both EV satisfaction and continuance intention. However, we also found that green self-identity negatively moderated this relationship. As green self-identity increased, the effect of TTF on continuance intention diminished. In other words, EV continuance intention was driven concurrently and competitively by pragmatic (TTF) and idealistic (green self-identity) reasons. Contrary to what ECM postulates, we found no significant direct association between EV satisfaction and continuance intention. However, when moderated by green self-identity, EV satisfaction was significantly associated with continuance intention, showing that green self-identity works as a catalyst in this relationship. Thus, this work's contributions are twofold. First, for practice, policymakers should disseminate the latest developments in EV technological capabilities, as these were critical to continuance intention; they should also promote environmental awareness of individuals, which was demonstrated to be an effective driver of continuance intention, especially when EV capabilities were not considered yet adequate for the tasks for which they are used. Second, for theory, we found that there is an alternate effect between pragmatic and idealist reasons for EV continuance intention; this was also not directly driven by satisfaction. This phenomenon is likely to occur in other technologies, the reason why researchers should consider the role of green self-identity as a moderator in other environment-related technologies.

CRediT authorship contribution statement

Frederico Cruz-Jesus: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Hugo Figueira-Alves:** Methodology, Formal analysis, Writing – original draft, Investigation. **Carlos Tam:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Diego Costa Pinto:** Writing – original draft, Methodology. **Tiago Oliveira:** Conceptualization, Formal analysis. **Viswanath Venkatesh:** Conceptualization, Methodology, Writing – review & editing.

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.

Appendix 1

See Table A1.

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