A Study of the determining factors in the adoption of electric vehicles by consumers

Miguel Francisco Pimenta Gonçalves nº a32776

Trabalho realizado sob a orientação da Professora Doutora Maria Clara Rodrigues bento Vaz Fernandes

Mestrado de Engenharia Mecânica

2025

A Study of the determining factors in the adoption of electric vehicles by consumers

Miguel Francisco Pimenta Gonçalves nº a32776

2025

Declaro que o trabalho descrito nesta tese é da minha autoria e é da minha vontade que o mesmo seja submetido para avaliação.

____

Miguel Gonçalves nº a32776

Dedicatória

À minha família, à Joana e à Professora Clara Vaz, esta conquista é também vossa.

Agradecimentos

Como forma de agradecimento, este trabalho é dedicado aos meus pais, pela base e apoio incondicional, à minha noiva, Joana Sena, pela presença constante e encorajamento ao longo deste percurso, e à minha orientadora, Professora Doutora Clara Vaz, pela orientação, disponibilidade e confiança depositada em mim.

Resumo

A crescente preocupação ambiental e o rápido avanço da tecnologia têm impulsionado significativamente a adoção de veículos elétricos (VEs) e híbridos plug-in, marcando um momento de transformação no setor dos transportes. Esta dissertação visa identificar os principais fatores que influenciam as decisões dos consumidores na adoção de veículos elétricos. O estudo baseia-se numa amostra de 297 inquiridos residentes em Portugal e recorre a uma abordagem quantitativa para analisar as suas percepções e comportamentos.

Os resultados demonstram que a adoção de VEs é fortemente influenciada por factores financeiros, nomeadamente o elevado custo inicial de aquisição e a importância de incentivos governamentais, como subsídios e isenções fiscais. O acesso à infraestrutura de carregamento revelou-se igualmente um fator crítico, moldando a confiança dos consumidores na utilização destes veículos. Adicionalmente, características demográficas, como níveis de rendimento mais elevados e a residência em áreas urbanas, demonstraram ter um impacto significativo na probabilidade de adoção. Curiosamente, embora os benefícios ambientais dos VEs sejam amplamente reconhecidos, a sua influência nas decisões de compra revelou-se inferior à dos fatores financeiros e infraestruturais.

Este estudo sublinha a necessidade de políticas públicas direcionadas e de investimentos estratégicos para ultrapassar as barreiras financeiras e logísticas enfrentadas pelos potenciais utilizadores de veículos elétricos. Ao melhorar a infraestrutura e oferecer incentivos bem estruturados, será possível acelerar a transição para um sistema de mobilidade mais sustentável e ambientalmente responsável.

Palavras-chave: Veículos elétricos, Comportamento do consumidor, Adoção de VEs, Sustentabilidade, Incentivos, Infraestruturas, Portugal

Abstract

The growing environmental awareness and the rapid advancement of technology have significantly driven the adoption of electric vehicles (EV) and plug-in hybrids, marking a transformative moment in the transportation sector. This dissertation aims to identify the key factors influencing consumer decisions regarding the adoption of electric vehicles. The study is based on a sample of 297 respondents residing in Portugal and uses a Logistic regression model to analyze their perceptions and behaviors.

The results show that EV adoption is strongly influenced by financial factors, namely the high initial purchase cost and the importance of government incentives such as subsidies and tax exemptions. Access to charging infrastructure also proved to be a critical factor, shaping consumer confidence in using these vehicles. Additionally, demographic characteristics such as higher income levels and residence in urban areas showed a significant impact on the likelihood of adoption. Interestingly, although the environmental benefits of EVs are widely recognized, their influence on purchasing decisions was found to be lower than that of financial and infrastructural factors.

This study highlights the need for targeted public policies and strategic investments to overcome the financial and logistical barriers faced by potential EV users. By improving infrastructure and providing well-structured incentives, it will be possible to accelerate the transition to a more sustainable and environmentally responsible mobility system.

Keywords: Electric vehicles, Consumer behavior, Ev adoption, Sustainability, Incentives, Infrastructure, Portugal.

Index

Table List

Figure List

ABBREVIATIONS

AC: Alternate Current

DC: Direct Current

EAFO: European Alternative Fuels Observatory

EV: Electric Vehicle

GHG: Greenhouse Gas

GPL: Gás de Petróleo Liquefeito

HEV: Hybrid Electric Vehicle

ICE: Internal Combustion Engine

IPB: Instituto Politécnico de Bragança

ISV: Imposto Sobre Veiculos

NEV: New Energy Vehicle

OR: Odds Rations

PEV: Plug-in Electric Vehicle

PHEV: Plug-in Hybrid Electric Vehicle

EU: European Union

VAT: Value Added Tax

VIF: Variance Inflation Factor

Chapter 1

Introduction

1.1 Framework

The adoption and advancement of electric vehicles (EV) and Plug-in hybrid electric vehicle (PHEV) are crucial in addressing the urgent need for sustainable transportation, especially due to rising Greenhouse Gas (GHG) emissions from the transportation sector. This study focuses on understanding the key factors that influence consumer adoption of EVs and aims to highlight the drivers behind their decision-making process.

Transportation contributes significantly to GHG emissions, with passenger cars and trucks accounting for approximately 10.8% of global energy-related CO^2 emissions (IEA ,2022; Javid & Nejat, 2017). Effective policies are essential to mitigate these emissions and address climate change through sustainable transportation practices. Javid & Nejat (2017) emphasize the importance of sustainable transportation policies in reducing GHG emissions. Global strategies are classified into three groups: reduce, avoid, and replace, which aim to reduce emissions per passenger kilometer, avoid unnecessary energy consumption, and replace fossil fuels with low-emission alternatives (Javid & Nejat, 2017).

Widespread adoption of Plug-in Electric Vehicles (PEV), including both fully electric and plug-in hybrid models, is a key strategy for improving sustainability in road transportation (Tal et al., 2014). These vehicles offer advantages such as reduced operating costs, decreased fossil fuel reliance, and notably lower GHG emissions. Understanding the factors influencing EV adoption is crucial for assessing their environmental and economic impacts (Tamor et al., 2013, 2015).

This research provides an overview of the electric vehicle market and its challenges, focusing on factors influencing consumer adoption, such as age, education, income, location, charging infrastructure, technology, and safety considerations. The study seeks insights into consumer preferences and motivations when choosing between traditional and electric vehicles.

The global electric vehicle markets exponential growth highlights its significance in shaping transportation's future. EVs are expected to play a crucial role in reducing carbon emissions, improving air quality, and fostering a sustainable transportation ecosystem (Y. Zhang et al., 2020). Investments in charging infrastructure are vital to unlocking EVs potential. Collaborative efforts among policymakers, industry stakeholders, and consumers are necessary to develop a robust charging network (IEA, 2021). Technological advancements, such as improved battery performance and charging speed, will further enhance EVs convenience and attractiveness (IEA, 2021).

By drawing on existing literature and considering the broader EV market context, this research aims to provide valuable insights into the key determinants of EV adoption. The findings can assist industry stakeholders, policymakers, and researchers in promoting sustainable transportation and facilitating widespread EV adoption by understanding and addressing factors influencing consumer decision-making.

1.2 Background and Motivation

This section provides the background and context for the *Study of Determining Factors in Consumer Adoption of Electric Vehicles*. The transportation sector is a well-known contributor to greenhouse gas GHG emissions, with passenger cars and trucks accounting for an estimated 10.8% of global energy-related CO^2 emissions (IEA, 2022). These emissions play a significant role in exacerbating climate change and deteriorating air quality. As a response, electric vehicles EVs have gained considerable attention due to their potential to address these environmental challenges.

By offering reduced operating costs, decreased reliance on fossil fuels, and significantly lower emissions compared to traditional vehicles, EVs present a promising solution for creating a more sustainable transportation future (Bradley & Quinn, 2010; Javid & Nejat, 2017). However, their widespread adoption is not straightforward, as it requires a thorough understanding of the factors that influence consumer choices.

Although the benefits of EVs, particularly their environmental advantages and technological advancements, are widely acknowledged, the decision-making process behind adopting these vehicles is complex. As highlighted by Javid & Nejat (2017) key factors such as cost, driving range, charging infrastructure, and performance play crucial roles in shaping consumer behavior. Additionally, understanding how these factors intersect with specific consumer preferences and regional contexts is essential for developing effective policies and strategies to accelerate adoption.

These include demographic variables such as age, education, and household income; geographic location; the availability of charging infrastructure; technological features; and perceptions of safety. By examining these dimensions, the research intends to uncover the motivations, preferences, and barriers faced by portuguese consumers considering EV ownership.

The driving motivation behind this research is to provide a deeper understanding of how portuguese consumers perceive and approach EV adoption. Insights gained from this study can help policymakers, industry leaders, and researchers design targeted interventions to overcome existing barriers and promote more widespread adoption. Furthermore, by focusing on Portugal, this research contributes to the growing body of literature on EV adoption by shedding light on the unique cultural, economic, and infrastructural dynamics of the country.

By exploring aspects such as demographics, infrastructure, technology, and safety concerns, the research seeks to provide actionable insights that can inform policy development, guide industry practices, and support the transition to a more sustainable and low-emission transportation system. At its core, this research is driven by a desire to better understand portuguese consumer behavior and contribute to the country's ongoing journey toward a greener future.

1.3 Research Design and Consumer Analysis

It is essential to study consumer opinions regarding electric vehicles to better understand their needs and what they value most. As argued by Plötz et al. (2018) successful market strategies and policies depend on understanding the characteristics and needs of adopters. Most studies on electric vehicles analyze factors such as consumer satisfaction related to environmental awareness. For example, Syamnur et al. (2019) found that awareness levels are not directly related to satisfaction after purchase. Bjerkan et al. (2016) concluded that cost reductions influenced by tax exemptions are significant incentives for purchasing an electric vehicle.

However, it remains to be seen whether user satisfaction is more closely related to available incentives or to product improvements.

The objective of this study is to describe the profile of potential users of electric vehicles in terms of their demographic characteristics, driving habits, and vehicle ownership. Additionally, it aims to identify the most relevant factors that led them to adopt electric mobility. Finally, the study will identify the factors that are most important to consumers when considering the purchase of an electric vehicle. These questions were addressed by surveying a sample of 297 drivers who own a vehicle in Portugal.

1.4 Structure of the Work

This dissertation is structured into six chapters, each of which plays a critical role in addressing the research questions and achieving the study's objectives. The following overview provides a brief description of the content and purpose of each chapter:

The first chapter sets the stage for the research by introducing the broader context of electric vehicle adoption. It outlines the significance of the study, focusing on the factors influencing consumer behavior towards EVs. This chapter also presents the key research objectives and explains the rationale for conducting the study, along with a brief overview of the methodology employed.

The second chapter offers a comprehensive review of the existing literature related to electric vehicles. It begins by exploring the technological advancements in the EV sector, such as battery improvements and charging infrastructure development. The chapter then delves into consumer adoption factors, including cost, environmental awareness, and policy incentives. Furthermore, it critically evaluates previous research on the barriers to EV adoption, drawing on studies from various geographic regions to highlight gaps in knowledge that this dissertation aims to address. The review sets the foundation for the empirical analysis by identifying the key variables and theoretical frameworks relevant to the study.

The third chapter outlines the research design and methodology used in the study. It provides a detailed explanation of the quantitative approach employed to gather and analyze data on consumer attitudes towards EVs. The chapter describes the construction of the questionnaire instrument, the sampling method used to select participants, and the data collection process. Additionally, the statistical techniques employed for data analysis, including descriptive statistics, correlation analysis, and logistic regression, are thoroughly described. This chapter justifies the methodological choices, linking them to the study's research objectives and hypotheses.

In the fourth chapter, the data collected through the questionnaire is analyzed to identify patterns and relationships between key variables. The chapter presents the descriptive statistics, followed by the results of hypothesis testing and logistics regression analysis. Each section of the chapter is structured to address the research questions posed in the study. The findings are discussed in relation to the consumer characteristics that influence EV adoption. The chapter concludes by summarizing the key insights derived from the analysis.

The final chapter summarizes the main findings of the research and draws conclusions based on the evidence presented in the earlier chapters. It offers practical recommendations for key stakeholders, including policymakers and industry leaders, on how to enhance EV adoption through targeted strategies such as improving charging infrastructure and offering financial incentives. The chapter also outlines the contributions of the study to the existing literature and discusses areas for future research, highlighting gaps that remain in the understanding of consumer behavior towards EVs. The study's limitations are acknowledged, ensuring transparency and providing a basis for future investigations.

Chapter 2

Literature Review

2.1 Electric vehicles

The landscape of electric vehicles EVs in this moment in time exhibits an unprecedented surge in growth and adoption, as highlighted by the IEA (2021), in their *Global Electric Vehicle Outlook 2021: Accelerated Transition*. Despite representing a modest fraction of total vehicle sales in 2021, the increasing market share of EVs is attributed to a maturing market and advancements in technology.

Technological advancements, particularly in battery technology, have played a pivotal role in shaping the state of EVs. Graham-Rowe et al. (2012) discuss recent improvements in battery technology that have led to significant enhancements in the performance and cost-effectiveness of EVs. These advancements include the development of more advanced and longer-lasting batteries, as well as the establishment of faster and more convenient charging infrastructure. These breakthroughs have increased the accessibility and attractiveness of EVs to a broader range of consumers, while also reducing the key barriers to widespread adoption.

Despite the impressive growth and technological advancements, several challenges persist in the EV market. Thomas (2009) highlight the need for a comprehensive charging infrastructure that is universally accessible and convenient. Meeting this challenge requires significant investments in infrastructure and technology, as well as collaboration among governments, industry stakeholders, and other relevant parties. Developing a robust charging infrastructure capable of meeting the needs of an expanding population of EV owners is essential for sustaining the growth and development of the EV market.

In context with the literature, the state of the art of electric vehicles in 2023, as analysed based on IEA (2023), Thomas (2009) showcases a landscape of rapid growth and exciting opportunities on a global scale. The potential benefits of EVs, including reduced dependence on fossil fuels, decreased emissions, and improved energy security, position them as crucial elements in the future of sustainable mobility, not only in developed countries but also in developing nations. As the market continues to evolve and technology advances further, electric vehicles are expected to play an increasingly significant role in shaping the future of transportation worldwide.

2.2 Advantages of Electric Vehicles

Electric vehicles EVs offer numerous advantages compared to internal combustion engine vehicles. One of the primary benefits is regenerative braking, which helps recharge the battery while the car is in use. Furthermore, EVs produce no CO^2 emissions during operation, leading to zero pollution and significantly reducing greenhouse gas emissions (IEA, 2024).

The maintenance of electric vehicles is also significantly lower, as they do not require oil and filter changes, and typically only specific components need to be checked. Additionally, the daily operating costs of EVs are much lower. According to Higueras-Castillo et al. (2020), driving 100 km in an electric vehicle can cost as little as €1.50 in electricity.

Another notable advantage is the convenience of charging. EVs can be charged at various public locations such as shopping malls, supermarkets, or at home, providing flexibility and ease for users (Salari & Javid, 2016) .This combination of environmental benefits, reduced maintenance, and cost savings makes electric vehicles a compelling choice for the future of transportation.

2.3 Disadvantages of Electric Vehicle

Despite their numerous advantages, electric vehicles EVs also have some disadvantages. One of the primary limitations is their range, which is generally lower than that of internal combustion engine vehicles. This can be problematic for longer trips, as it requires more frequent stops to recharge the battery (Higueras-Castillo et al., 2021) .

Additionally, the acquisition cost of an electric vehicle is still significantly higher compared to conventional vehicles, which can be a barrier for many consumers (IEA, 2024). Another factor is the charging time, which can cause inconvenience, especially for frequent users. Using a standard 220V outlet, a full charge for an EV typically takes 6 to 8 hours, substantially longer than the few minutes needed to refuel a petrol or diesel car (Higueras-Castillo et al., 2021). Although fast charging options are available, they are not always accessible and can be more expensive.

This combination of limited range, high acquisition costs, and long charging times presents challenges for the widespread adoption of electric vehicles.

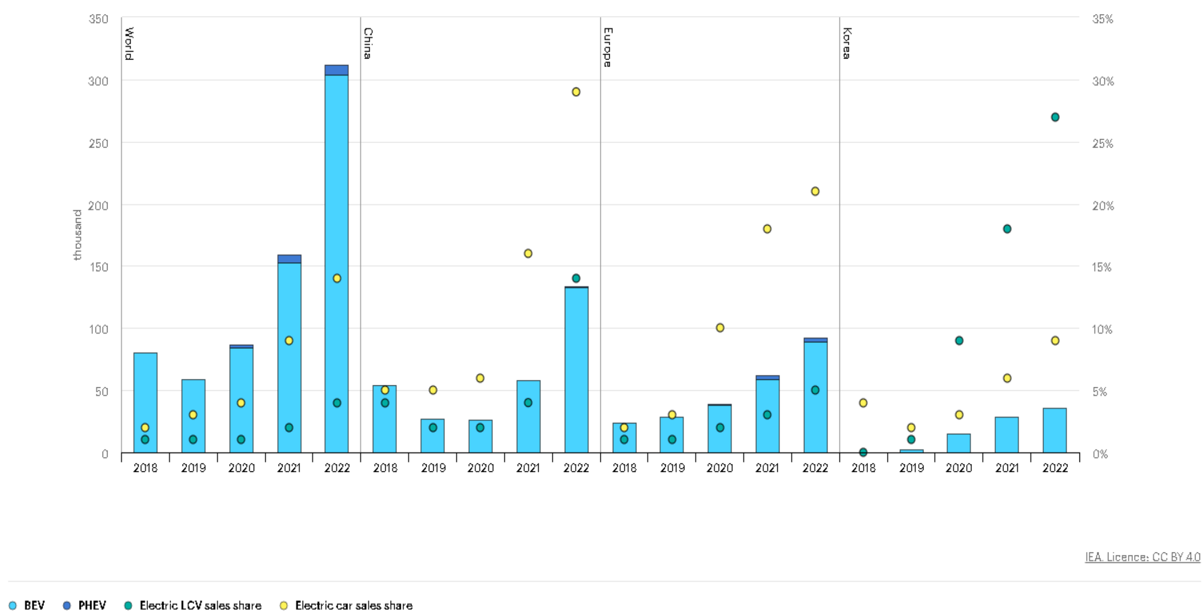
2.4 Electric Reality

In recent years, the electric vehicle market has experienced rapid growth, driven by technological advancements, increasing environmental awareness, and government incentives aimed at accelerating the shift towards sustainable transportation. However, despite these gains, the market has recently begun to face significant challenges. While earlier years saw unprecedented sales growth, more recent data suggests a slowdown, with unsold inventories of EVs accumulating in certain regions due to shifting consumer preferences, affordability concerns, and infrastructure limitations. This chapter explores the dynamics of the EV market over the past three years, highlighting both the positive trends and the emerging obstacles. Key factors such as the current oversupply of EVs, regional disparities in adoption, supply chain disruptions, and evolving consumer sentiment will be analyzed to provide a nuanced understanding of the state of electric mobility and its potential future trajectory.

Global Sales Trends

The IEA (2024) estimates that approximately 14 million electric cars were sold worldwide in 2023, accounting for nearly one in every five new vehicles. This marks a continuation of the rapid growth observed over the past few years. Cumulatively, this growth has resulted in a global fleet of around 40 million electric vehicles by the end of 2023, in line with projections made in the Global EV Outlook (IEA, 2024) .

Figura 1 *Electric light commercial vehicle (LCV) sales and sales shares, 2016-2022*

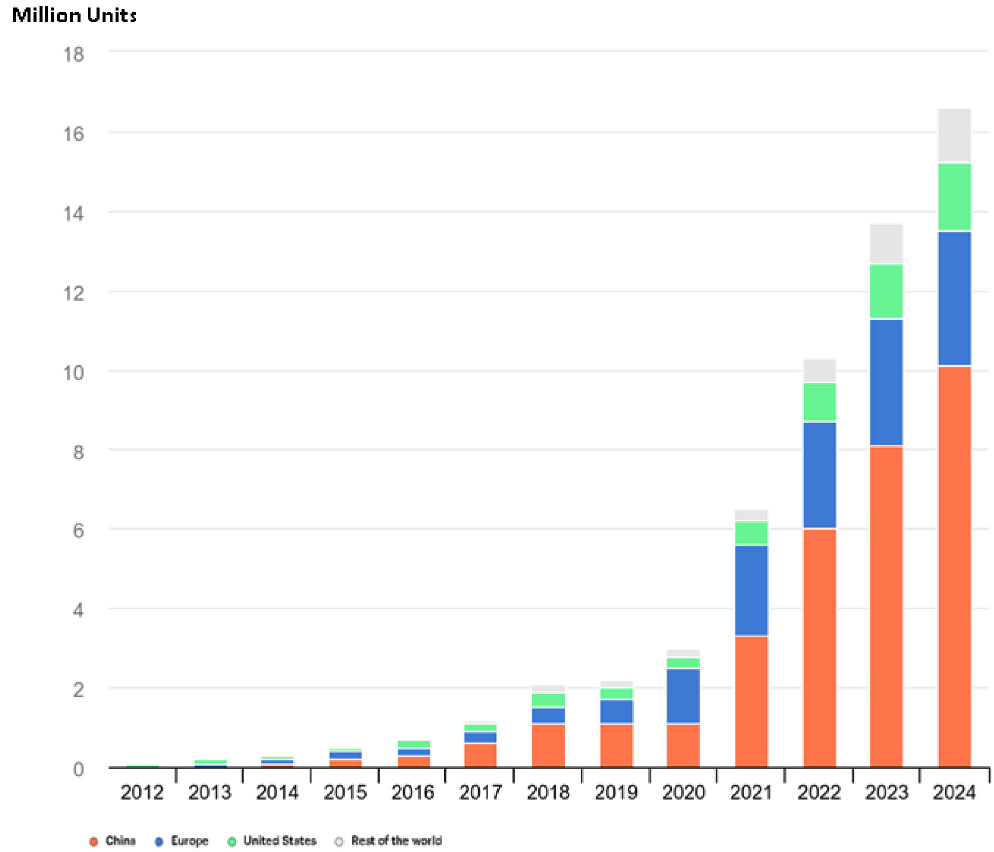


The consistent growth is evidenced by a 35% year-on-year increase in 2022, which is more than six times higher than in 2018. Notably, in 2022, there were over 250,000 new electric car registrations per week, surpassing the annual total from a decade earlier.

Regional Analysis

The concentration of electric vehicle sales is notably high in a few major markets. In 2023, China, Europe, and the United States accounted for 95% of global electric car sales. Specifically, China led the way with just under 60% of new electric car registrations, followed by Europe with nearly 25%, and the United States with 10%. This concentration underscores the significant regional disparities in electric vehicle adoption.

Figura 2 *Regional Sales analysis of EV market*



The Chinese market continued to dominate, with 8.1 million new electric car registrations in 2023, marking a 35% increase from 2022. This growth was driven by the maturity of China's New Energy Vehicle industry, which operated without national subsidies for EV purchases in 2023. Despite the withdrawal of subsidies, tax exemptions and non-financial support continued to bolster the market. China also became the largest auto exporter globally, with over 4 million car exports in 2023, of which 1.2 million were electric (IEA, 2024). In the United States, new electric car registrations totaled 1.4 million in 2023, reflecting a 40% increase compared to 2022. The growth was supported by the Clean Vehicle Tax Credit and price reductions in popular EV models. However, new guidelines in 2024 reduced the number of eligible models for tax credits, potentially impacting future growth (Plötz et al., 2018) .

Europe saw nearly 3.2 million new electric car registrations in 2023, with the European Union contributing 2.4 million of these sales. Despite the phase-out of purchase subsidies in some countries, overall sales remained robust. Countries like Germany, France, United Kingdom, Netherlands, and Sweden saw significant sales shares, with Norway leading Europe with almost 95% of new car sales being electric (IEA, 2024) .

Market Dynamics

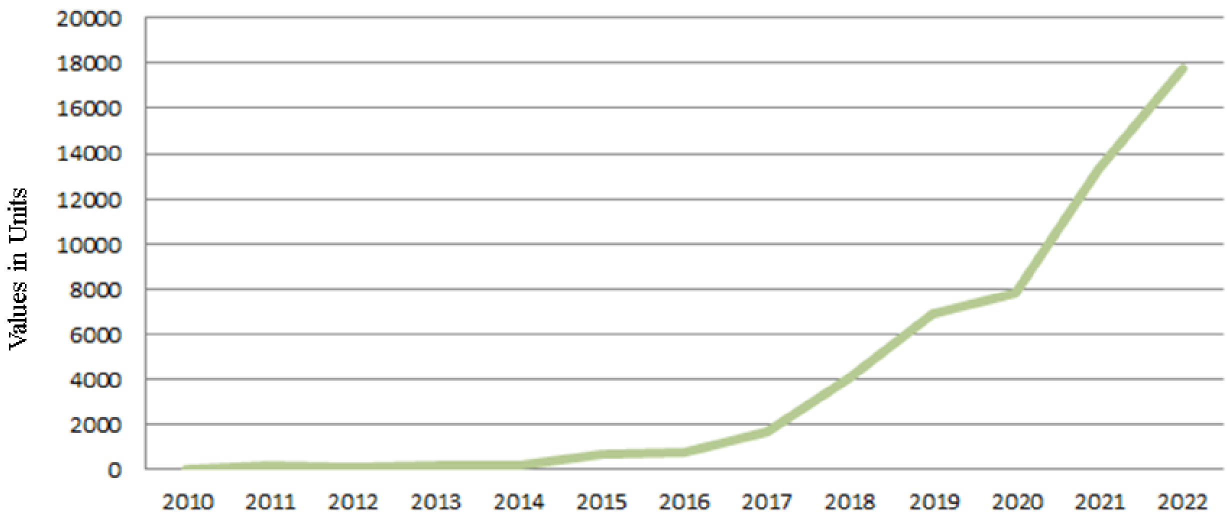
The market dynamics in these regions reveal the interplay of policy support, consumer preferences, and economic conditions in driving electric vehicle adoption. The increased price competition and market consolidation in China, the strategic use of tax credits in the United States, and the varying impacts of subsidy phase-outs in Europe illustrate the diverse approaches to fostering electric mobility.

The reality of electric vehicle sales over the past three years highlights a period of rapid growth and significant regional disparities. The trends observed in major markets like China, the United States, and Europe provide valuable insights into the factors driving the adoption of electric vehicles. Understanding these dynamics is essential for policymakers, manufacturers, and stakeholders as they navigate the evolving landscape of electric mobility.

Portugal's Context

Portugal has shown significant growth in electric car sales in recent years, reflecting global trends in the electrification of the automotive sector. In the period of 2010-2022, for example, electric car sales in Portugal reached approximately 18,000 units, representing an increase over the approximate 4,000 units compared to the previous year. This growth is aligned with the trend observed in other European markets, where electric car sales have also been increasing (IEA, 2024).

Figura 3 *Portuguese values over time*



The data are shown in absolute values in units.
Battery Electric Vehicles (BEV)+ Fuel Cell (FCEV) are 100% considered.
Source: ACEA

The portuguese government has played an active role in supporting the transition to electric mobility, implementing tax incentives and subsidy programs for the purchase of electric vehicles. Additionally, the development of charging infrastructure across the country has contributed to making the adoption of electric cars more accessible and convenient for consumers (IEA, 2024).

The market share of electric cars in Portugal has been steadily increasing, with estimates suggesting it reached approximately 8% of all new car sales in 2025 (IEA, 2024). However, official figures on the exact market share may vary depending on data sources and reports. This growth represents a significant milestone in the transition to electric mobility in Portugal and reflects the growing interest of consumers in electric vehicles (IEA, 2024) .

Furthermore, Portugal has been a regional leader in the development of charging infrastructure, with a growing number of fast and ultra-fast charging stations across the country more than 4,450 publicly accessible charging stations (AICEP, 2024). This has helped alleviate concerns about the range of electric vehicles and has strengthened consumer confidence in the viability of electric cars as a practical transportation option (IEA, 2024)

Based on the observed trends, it is estimated that electric car sales in Portugal will continue to grow in 2025, reaching approximately 40,000 units. This projection reflects the ongoing adoption and acceptance of electric vehicles by portuguese consumers, as well as the country's commitment to reducing greenhouse gas emissions and promoting sustainability in the transportation sector (IEA, 2024).

Portugal is making significant efforts to align with the European Union's (EU) standards and expectations for the transition to electric mobility. While the country has demonstrated progress in expanding its electric vehicle market and developing the necessary infrastructure, meeting the ambitious targets set by the EU will require continued government support and investment. As such, Portugal is well-positioned to contribute to the broader european efforts towards sustainability, though the path forward will likely involve overcoming several challenges to fully meet these expectations (IEA, 2024).

2.5 Barriers to the Adoption of Electric Vehicles

In Portugal, a variety of policies and financial incentives have been implemented to encourage the adoption of electric vehicles EVs, including both tax benefits and government subsidies. Financial incentives are critical in reducing the overall cost of EV ownership, which is a key factor in accelerating the shift towards electric mobility.

These policies are part of the 2019-2023 government program, which emphasizes the importance of creating favorable conditions for the growth of electric mobility (República Portuguesa, 2019-2023)

In Portugal, EVs are fully exempt from Vehicle Tax (ISV), and EVs receive up to a 75% reduction, provided they meet specific emission and range thresholds, namely under 50g of CO^2/km and a minimum of 50 km electric range. Hybrid Electric Vehicles (HEVs) enjoy a 40% tax reduction under similar emission criteria

For company cars, VAT deductions are available since companies can deduct 100% of VAT on EVs priced up to €62,500, and for EVs, up to €50,000. In addition to tax benefits, the government provides a €3,000 subsidy for individuals purchasing a new EV, with a price cap of €62,500. This subsidy is limited to one vehicle per person.

Portugal has made significant advancements in improving its EV charging infrastructure. According to the European Alternative Fuels Observatory (EAFO) analysis of 2024 trends, the country has 9071 publicly accessible charging points, of which 5,996 are normal-speed AC chargers and the remaining are DC fast chargers. This infrastructure growth is crucial for supporting the increasing number of electric vehicles on the road, and municipalities have further incentivized EV adoption by offering reduced charging rates and free parking for electric vehicle users.

These developments have been crucial in making EV adoption more convenient. Additionally, local incentives include support for the installation of charging stations, with financial assistance covering 80% of installation costs for public and private entities. These efforts aim to address infrastructure limitations, which are often cited as barriers to wider EV adoption.

The combination of tax incentives, government subsidies, and the expansion of charging infrastructure has been essential in driving EV adoption in Portugal

Chapter 3

Methodology

3.1 Investigation & Sampling

This work aims to explore the main motivations and barriers that influence the adoption of EVs by consumers. Understanding these factors is crucial, as they can either encourage or hinder the diffusion of EVs in society, making the transition slower than desirable. Considering that EVs are crucial for reducing pollution caused by the transport sector, this delay implies a negative impact on environmental protection and on the reduction of greenhouse gas GHG emissions, consequently contributing to global (Graham-Rowe et al., 2012) .

To achieve these objectives, the methodology of this dissertation involved conducting a questionnaire, developed based on previous studies on electric mobility (Salari & Javid, 2016). The questionnaire was adapted to the Portuguese context to obtain an accurate view of the experiences and perceptions of local consumers. The target population consisted of individuals residing in Portugal, aged over 18, and holding a driver's license.

The questionnaire was disseminated through social media and email, including groups focused on electric mobility. It was also spread through the email platform at “Instituto Politécnico de Bragança” (IPB). This method allowed for the collection of a diverse sample, though with the limitation of potential bias in participant (Bell et al., 2022) .

To ensure the clarity and effectiveness of the questionnaire, a "pilot survey" was conducted with 97 participants, whose responses helped to adjust eventual questions. Data collection took place between April 10, 2023, and March 6, 2024, resulting in 297 valid responses after excluding respondents not residing in Portugal as well as other invalid responses.

Subsequently, the data were statistically analyzed to identify correlations between variables and to test the defined research hypotheses further in the methodology.

3.2 Sampling size and Population sample

The study was based on a questionnaire conducted with a sample of 297 respondents. The target population consisted of individuals residing in Portugal who were over 18 years old and held a valid driver's license. These criteria ensured that the participants were representative of potential or current vehicle owners, aligning with the research objective of understanding the factors influencing electric vehicle adoption.

The sample was selected using a convenience sampling method, with the questionnaire distributed through online platforms, including social media and the email system at the IPB. Although this approach facilitated data collection, it introduced potential selection bias, as participation was voluntary and dependent on accessibility to digital platforms. Despite these limitations, the sample provided valuable insights into the target group of portuguese drivers considering electric vehicle adoption.

Outliers in the data were reviewed and excluded to ensure the validity and reliability of the analysis. The majority of respondents reported household incomes between €1,501 and €2,500, which aligns with income distributions in Portugal as reported by Pordata (2024).

3.3 Data collection and Methods

The data for this study was collected through a structured questionnaire, developed to examine the factors influencing the adoption of EVs in Portugal. Drawing on methodologies from prior research, such as Higueras-Castillo et al. (2020, 2021) ,the questionnaire was tailored to the Portuguese context, capturing insights into consumer perceptions, attitudes, and key decision-making factors. This approach was chosen for its effectiveness in generating robust quantitative data, facilitating the identification of relationships between variables, and enabling the testing of research questions.

The questionnaire was designed to address three core areas: sociodemographic characteristics, perceptions of EVs, and adoption intentions. Sociodemographic questions explored variables such as age, gender, education, income, and geographic location, given their established relevance in shaping mobility behavior. Questions regarding EV perceptions focused on prior knowledge, attitudes, barriers like cost and infrastructure, and motivations such as financial incentives and environmental benefits. Finally, the questionnaire assessed participants likelihood of adopting EVs, along with the factors they considered most influential in this decision. To ensure clarity and consistency, the questionnaire employed a *Likert scale* (1-5), enabling respondents to express degrees of agreement or importance across multiple dimensions.

The distribution of the questionnaire was conducted online, leveraging social media platforms and the institutional email system of the IPB. This digital approach ensured broad reach and efficiency while minimizing logistical costs. Data collection spanned (approximately during 9 months), resulting in 297 valid responses from participants who met the inclusion criteria: residency in Portugal, being 18 years or older, and holding a valid driver's license. These criteria were essential for targeting a population directly relevant to the study's objectives, current or potential drivers likely to consider EV adoption.

While the online format facilitated data collection, it also introduced limitations, including potential selection bias, as participation depended on internet access and digital literacy. Additionally, the use of convenience sampling limits the generalizability of the findings to the wider portuguese population. Nonetheless, the collected data offers meaningful insights into the perceptions and behaviors of portuguese drivers regarding EVs, making it highly relevant for the scope of this research.

To ensure reliability and clarity, the questionnaire underwent pilot testing with a sample of about 97 individuals prior to distribution. Feedback from this testing phase informed minor adjustments to the phrasing and structure of questions, optimizing the instrument for the target population.

3.4 Scales Used

The scales used in this study were adapted from well-established research on EV adoption, drawing inspiration from studies such as (Higueras-Castillo et al., 2020, 2021) and others in the field of sustainable mobility. Below, we detail the scales employed to measure each construct and their relevance to the research objectives.

Sociodemographic Variables

1. Age: measured on a six-category ordinal scale ranging from "Under 20" to *"60 and above"* (Li et al., 2022);
2. Education: captured using five levels: basic education, secondary education, bachelor's degree, master's degree, and doctorate/PhD (Bjerkan et al., 2016);
3. Household Income: a five-point scale from "0–500€" to "Above €5,000/month", adapted from (Salari & Javid, 2016).

Perceptions and Barriers

4. Prior Experience with EVs: categorical variable derived from question 2.1: "Have you ever driven or tested an EV?" (Yes/No);
5. Barriers to Adoption: evaluated using a five-point *Likert scale* from 1 = Not Important to 4 = Very Important, with 5 = Don't Know.

Adoption Intentions

6. EV Purchase Intention: measured via question 5.1 on a three-point categorical scale: yes, no, or don't know;
7. Purchase Decision Factors: government incentives, environmental benefits, and infrastructure were rated on a five-point *Likert scale* from 1 = Not Important to 4 = Very Important, with 5 = Don't Know.

Driving Habits and Vehicle Ownership

8. Daily Driving Duration: measured using a seven-category scale from "less than 15 minutes" to "more than 2 hours";
9. Vehicle Ownership: type of vehicles owned, recorded based on the available option, which for this study are: GPL vehicle, diesel vehicle, petrol vehicle, electric vehicle, hybrid vehicle, motorcycle and bicycle.

Satisfaction and Improvement Priorities

10. Satisfaction with Current Vehicle: five-point *Likert scale* ranging from 1 = Completely Dissatisfied to 4 = Completely Satisfied, with 5 = Don't Know;
11. Perceived Enablers for EV Adoption: five-point *Likert scale* ranging from 1 = Completely Dissatisfied to 4 = Completely Satisfied, with 5 = Don't Know.

3.5 Statistical Procedures

The statistical analysis for this study was conducted using *IBM SPSS Statistics 27*. The approach aimed to analyze the data collected through the structured questionnaire, providing insights into the factors influencing the adoption of electric vehicles EVs in Portugal. Below, the main statistical procedures used in this study are described.

Descriptive Statistics

Descriptive statistics were used to summarize and characterize the data. For continuous variables, the analysis focused on calculating means (M) and standard deviations (SD), while for nominal and ordinal variables, absolute frequencies (n) and percentages (%) were presented. This step allowed for an initial understanding of the sample's sociodemographic profile and other key variables, such as income distribution and awareness of EVs.

Reliability Analysis

To ensure the internal consistency of the scale items used in this study, a reliability analysis was conducted using *SPSS*. The result yielded a Cronbach's alpha value of 0.785, which indicates a respectable level of internal consistency (Aljandali, 2017; Pallant, 2020) . According to accepted guidelines, values above 0.70 are considered acceptable, particularly in exploratory research contexts.

Furthermore, corrected item-total correlations were reviewed for each item, and most values met or exceeded the minimum acceptable threshold of 0.30, suggesting that the items contribute meaningfully to the overall construct (Liu & Zhang, 2024) .These results support the reliability of the measurement instrument and justify its use in subsequent statistical analyses.

Logistic Regression Analysis

The choice of logistic regression was based on its suitability for analyzing binary outcomes, such as the intention to adopt electric vehicles EVs. This method allows for the inclusion of multiple independent variables and offers robust insights into the relative importance of each factor. Given that the dependent variable was coded as 1 for adoption intent and 0 otherwise, logistic regression was appropriate for testing each hypothesis. It also enables the simultaneous analysis of multiple explanatory variables. In this context, descriptive statistics complemented the model by providing an overview of the sample and its characteristics. The logistics regression model is represented in the equation (Alves et al., 2021; Pallant, 2020), in which all relevant independent variables are categorical.

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x^1 + \beta_2 x^2 + \beta_3 x^3 + \beta_4 x^4 + \cdots + \beta_y x \quad (1)$$

The estimated coefficients (β) were interpreted using the exponential function, yielding odds ratios (OR). Thus, for each independent variable, the ratio between the chances of adopting EV and the chances of not adopting EV is calculated. A value of OR greater than 1, implies an increase in chances if the quantitative variable varies by 1 unit. For categorical variables, each OR expresses the chances of EV adoption for a given category relative to the reference group. An odds ratio greater than 1 denotes an increased chance of adoption compared to the reference group, whereas an odds ratio below 1 indicates a reduced chance. For example, if the OR for urban residents relative to rural residents is 2.0, this suggests that individuals residing in urban areas are twice as likely (in terms of odds) to adopt an EV, considering all other variables constant.

This interpretative framework facilitates a clearer understanding of the relative influence of each independent variable on the probability of EV adoption.

Data Preparation and Validity Checks

Before running statistical analyses, the data underwent rigorous cleaning and validation. Outliers and missing values were reviewed, and appropriate handling methods were applied to minimize their impact on the results. Given that the dataset consisted predominantly of categorical and ordinal variables, assumptions of normality were not required for the majority of predictors.

Regarding multicollinearity, although it was not possible to compute Variance Inflation Factor (VIF) values directly due to the string format of the variables in SPSS, care was taken during model construction to minimize multicollinearity by pre-screening variables using *Pearson's Chi-square tests* and avoiding redundant predictors, selecting the relevant ones. Additionally, Spearman's rank correlation was used to explore potential associations between ordinal predictors. These procedures helped ensure the internal consistency and reliability of the logistic regression model.

3.6 Research Question proposal

This study is guided by seven research questions derived from a comprehensive review of the literature and adapted to the Portuguese context of electric vehicle (EV) adoption. These questions aim to explore the economic, infrastructural, demographic, and motivational factors that influence consumer behavior. As emphasized by Higueras-Castillo et al. (2021) and Salari & Javid (2016) understanding these dimensions is essential for the design of effective mobility policies and consumer engagement strategies.

The research questions are as follows:

H1. How do financial factors, such as acquisition costs and government incentives, impact EV adoption?

H2. What role does charging infrastructure play in shaping consumer decisions regarding EV adoption?

H3. Which demographic characteristics are associated with a higher likelihood of adopting EVs?

H4. How do consumers perceive the environmental benefits of EVs, and do these perceptions influence their decision?

H5. Does prior experience with EVs increase the intent to adopt them?

H6. What are the main barriers still preventing broader EV adoption in Portugal?

H7. To what extent do motivational factors, such as sustainability concerns, perceived cost savings, and technological familiarity, affect adoption decisions?

These questions were addressed based on the questionnaire inspired by previous research from Higueras-Castillo et al. (2021) and Salari & Javid (2016) . The collected data was then analyzed using SPSS to identify key patterns and test the research hypotheses. The results will be presented in Chapter 4.

Chapter 4

Data Analysis and Results

4.1 Descriptive Statistics

The sample for this study consists of 297 respondents, all residing in Portugal, aged 18 or older, and holding a valid driver's license. The data collected aims to identify the key factors influencing the adoption of electric vehicles EVs, including perceptions, barriers, and motivations. Below is a detailed description of the sample, complemented by interpretations and conclusions drawn from the results. The descriptive statistics provide valuable insights into the demographic profile of potential EV adopters by examining variables such as age distribution, gender representation, educational attainment, household composition, income levels, and geographic location.

Demographic Profile

Age Distribution

The majority of participants fall within the 45–55 age group, representing 33% of the sample. Notably, the highest percentage of EV adoption intent was recorded among respondents aged 45–55. This suggests that the group most engaged with the idea of EV adoption is economically active and more likely to embrace new technologies. The alignment of this trend with income stability further reinforces the assumption that this group has the means to afford an EV.

Gender Distribution

This section begins with an analysis of the gender distribution within the sample. Understanding the gender composition of respondents is essential, as it may influence attitudes towards electric vehicle adoption. Table 1 presents the gender breakdown of the participants.

Tabela 1 *Gender distribution*

Gender	Frequency	Percentage
Female	113	38.0%
Male	184	62.0%
Total	**297**	**100.0%**

The results indicate that most respondents (62.0%) are male and (38.0%) female.

Education Level

Although Table 2 displays the general distribution of educational attainment, the percentage of EV adoption intent within each education level can be confirmed in Appendix A, where cross-tabulations provide detailed insight.

Tabela 2 *Education Level*

Level	Official Qualification (Summary Description)	Frequency	Percentage
1	2nd Cycle of Basic Education	0	0%
2	3rd Cycle of Basic Education (completed up to 9th grade)	6	2,0%
3	3rd Cycle of Secondary Education (completed up to 12th grade)	84	28,3%
5	(Post-secondary non-tertiary qualification with credits for continuation to higher education)	7	2,3%
6	(Bachelor's Degree)	114	38,8%
7	(Master's Degree)	48	16,2%
8	(Doctorate)	38	12,8%
	Total	**297**	**100,0%**

The results suggest that EV adoption is more prevalent among individuals with at least higher levels of educations. The group that saw the highest percentage of potential EV adoption, is the Bachelor's Degree bracket, with a 38,8%. These results reinforce that respondent with higher education levels, particularly, demonstrated greater intent to adopt electric vehicles. This supports existing research indicating that consumers with greater access to information and resources are more inclined to explore alternative options like EVs.

Income Level

Household income is a key demographic variable when analyzing electric vehicle adoption, as purchasing power directly influences the ability to acquire higher-cost technologies such as EVs. The following table summarizes the monthly income distribution among the respondents.

Tabela 3 *Income Level*

Monthly Household Income	Frequency	Percentage
0€ - 500€	4	1.3%
501€ - 1500€	51	17.2%
1501€ - 2500€	87	29.3%
2501€ - 3500€	61	20.5%
3501€ - 5000€	33	11.1%
Above 5000€	20	6.7%
Prefer not to answer	38	12.8%
Total	**297**	**100.0%**

While Table 3 presents the general income distribution, results indicate that the highest percentage of EV adoption intent was reported among respondents in the 1501€ - 2500€ income bracket, hitting the majority at 26,3%. This suggests that middle to upper-middle income groups are more inclined to consider EV ownership.

Further details on EV adoption by income group are presented in Appendix confirming that respondents in the 1501€ - 2500€ bracket exhibited the highest intent to adopt electric vehicles.

Driving Habits & Vehicle Ownership

The average daily driving distance for most respondents (24.3%) falls between 21–50 km, a range well within the capabilities of modern electric vehicles EVs, making them a feasible option for daily commuters. Respondents who drive over two hours per day (approximately 4%) expressed greater concerns about charging infrastructure availability. In terms of vehicle ownership, 46.1% of respondents reported owning a diesel vehicle, 18.8% a gasoline vehicle, and 14.1% already own an EV. This distribution suggests that the EV market could benefit from targeted strategies aimed at consumers who currently own ICE vehicles but are considering transitioning to EVs.

Geographic Location (NUTS Classification)

To ensure consistency with official classifications, the geographical distribution of respondents was structured according to the NUTS 2024 classification system:

Tabela 4 *Geographic Location*

NUTS I	NUTS II	NUTS III	Frequency
Continente	Norte	Alto Tâmega e Barroso	100
Continente	Norte	Área Metropolitana do Porto	31
Continente	Grande Lisboa	Grande Lisboa	78
Continente	Centro	Região de Aveiro	5
Continente	Centro	Região de Coimbra	6
Continente	Alentejo	Alentejo Central	14
Continente	Algarve	Algarve	2
R. Autónoma	Madeira	Região Autónoma da Madeira	1

Table 4 summarizes the distribution by region, the Lisbon district seems to be the one with the highest percentage of EV adoption according to the questionnaire, at 20,8%. Additional data are required to determine which regional areas exhibit the highest intent to adopt EVs. This dimension could be further explored in future studies focusing on regional differences in adoption behavior.

4.2 Logistic Regression

Results and Interpretation

To identify the predictors, or, independent variables, that were most relevant on EV adoption stated in the equation (1), the Test *Pearson's Chisquare* was applied, crossing each question in the questionnaire with the EV adoption question concerning the dichotomic variable," 5.1 – Based on your current level of knowledge, would you consider purchasing an electric vehicle EV? "

Based on these results, the most relevant independent variables were identified by using the *Pearson's Chisquare,* considering a significance level (α) equal to 0,05,(Aljandali, 2017; Pallant, 2020) in which the null hypothesis (Ho) for *Pearson's Chisquare* test states that the two variables are independent.

This step was particularly important considering that the dataset is composed entirely of categorical variables. As such, identifying the most relevant independent variables provided a clearer foundation for modelling and avoided the inclusion of variables with low explanatory potential.

Thus, the following independent variables (j) were selected based on the *Pearson's Chi-square* tests.

Tabela 5 *Pearson's Chi-square tests*

Variable	p-value at *Pearson's Chi-square* tests
Age	0,283
Gender	0.003
District	1,000
Had the Opportunity to drive an EV?	0,000
Daily transportation mode	0.003
Acquisition cost	0,999
Battery Longevity	0,840
While traveling time acceptable to charge	0,013
Air Quality	0,109
Maintenance Cost reduction	0,025
Vehicle acquisition cost	,999
Fear of running out of charge	0.036

The variables included in the model were selected based on their statistical relevance in the Chi-square tests, using a threshold of p value< 0.05. As shown in Table 5, only variables meeting this criterion such as Gender, Opportunity to drive an EV, and Daily transportation mode were retained. Although some others (e.g., *Maintenance cost reduction*, p = 0.025) fell slightly outside this threshold, they were included due to strong theoretical relevance and interpretative value.

4.2.1 Model Fit & Results

To examine the factors influencing Portuguese consumers' intention to adopt electric vehicles EVs, a binary logistic regression model was estimated using 297 valid cases. As mentioned earlier, the dependent variable was dichotomous (1 = intention to adopt; 0 = no intention), and predictors included sociodemographic characteristics (age, gender, district of residence), prior EV driving experience, daily transport habits, perceptions of charging infrastructure, environmental motivations, battery durability concerns, and psychological barriers.

The independent variables included in the model were selected based on their statistical relevance in the Chi-square tests , as summarized in the preceding table. The independent variables included in the model were selected based on their statistical relevance in the Chi-square tests (p value < 0.05), as summarized in the preceding table. An exception was made for the variable *age* (Question 1.1), which, despite not reaching the threshold (p = 0.283), was included due to its established relevance in EV adoption literature and its potential contextual impact in the Portuguese setting.

Categorical predictors were entered into the logistic regression model (1) as dummy variables, using the first category of each variable as the reference group, in line with SPSS contrast settings. This standard approach allows for clearer interpretation of odds ratios (OR), by comparing the effect of each category relative to its baseline (Field, 2013).

The model (1) was statistically significant, as indicated by the *Omnibus Test of Model Coefficients* ($\chi^2 = 236.58, df = 93, p = 0.001$), and showed good fit based on the *Hosmer and Lemeshow* Test ($\chi^2 = 11.36, df = 8, p = 0.182$). These results confirm that the set of predictors contributes meaningfully to the explanation of EV adoption intent.

The model ran with a –2 Log Likelihood of 174.88, a Nagelkerke R^2 of 0.732, and a classification accuracy of 85.2%. This indicates that the model correctly predicts EV adoption in over 85% of cases, reflecting robust explanatory power and predictive capability (Pallant, 2020).

Interpretation of the regression coefficients was based on odds ratios (OR), which estimate the likelihood of EV adoption relative to each variable's reference category. Table 5 presents the most representative categories for each variable, selected based on Wald's Test.

In summary, the model demonstrated strong fit and predictive ability, confirming that both experience-based and perception-based factors contribute substantially to EV adoption decisions among Portuguese consumers.

Tabela 6 *Results of Logistics Regression*

Variable	Category	S.E.	df	Sig.	Exp(B)
Age (reference: 18-34)	**18-34**		4	,222	
	35-44	,836	1	,803	,812
	45-55	,867	1	,283	2,538
	56-65	,808	1	,460	1,817
	>66	,849	1	,848	1,176
Gender (reference: female)	**female**	0,371	1	0,003	2,989
Had the Opportunity to drive an EV? (reference: yes)	**yes**	0,345	1	0,000	3,619
Daily transportation mode (reference: diesel)	**diesel**		3	,021	
	petrol	0,916	1	0,003	15,733
	electric	1,207	1	,990	,985
	hybrid	1,802	1	,410	,226
Vehicle acquisition cost (reference: 1-Not important)	**1-Not important**		4	,989	
	2-Slightly important	22785,890	1	,999	3.698 E+11
	3-Important	22785,890	1	,999	7.791 E+11
	4-Very important	22785,890	1	,999	6.455 E+ 11
	5-I don't know	48424,290	1	,999	1.792E+29
When traveling, what is the maximum charging time (hours) or (minutes) that you consider acceptable in an Electric Vehicle (EV)? (reference: 30 min)	30min		4	,141	
	1h	1,273	1	,665	1,736
	2h	,477	1	,395	,667
	3h or more	,657	1	,700	,776
	don't know	,881	1	,013	,112
Air Quality (reference: 1-Not important)	**1-Not important**		4	,086	
	2-Slightly important	1,595	1	,855	1,338
	3-Important	1,404	1	,351	3,703
	4-Very important	1,394	1	,109	9,332
	I don't know	13689,449	1	,999	284805089,556
Battery Life Concerns (reference: 1-Not important)	**1-Not important**		4	,701	
	2-Slightly important	4,198	1	,998	1,010
	3-Important	4,120	1	,926	,681

	4-Very important	4,156	1	,850	,455
	I don't know	4,520	1	,599	,093
Fear of running out of charge (reference: 1-Not important)	**1-Not important**		4	,031	
	2-Slightly important	1,267	1	,139	6,533
	3-Important	1,002	1	,946	1,070
	4-Very important	,973	1	,488	,509
	I don't know	2,835	1	,633	,258
Constant		33351,467	1	,998	,000

4.3 Research Questions analysis

H1. How do financial factors, such as acquisition costs and government incentives, impact EV adoption?

In Section 4.1 of the questionnaire, many participants expressed concern over the high acquisition cost of EVs. However, in the logistic regression, this variable (2.5 – Vehicle acquisition cost) did not show statistical significance ($p > 0.99$ across all levels, see Table 6), nor a consistent trend, possibly due to data irregularities or limited variation in responses. This suggests that while cost concerns are real, their statistical weight may be influenced by other interacting factors. This may reflect that although financial incentives are available, their impact is limited by low public awareness or visibility. This supports (IEA, 2023) which emphasizes that visibility is as important as the incentive itself.

H2. What impact does charging infrastructure have on consumer decisions regarding EV adoption?

Charging-related concerns were central in both the questionnaire (especially in 2.7 and 4.1) and the regression. Respondents who indicated they didn’t knew were significantly less likely to adopt EVs. This suggests that the inconvenience associated with long charging periods, particularly compared to the speed of refueling conventional vehicles, may deter potential users. For these individuals, limited patience or time availability may act as a barrier to adoption. This reinforces findings from (Higueras-Castillo et al., 2020) and supports the need for improved infrastructure access, particularly outside urban areas.

H3. Which demographic characteristics impact EV adoption?

The questionnaire collected detailed sociodemographic data (age, gender, income, education, location). From these, only gender emerged as statistically significant in the regression, with men more likely to adopt. Age showed a positive trend, but it wasn't conclusive. Income and education were explored descriptively but were not included in the final regression, because they were not statistically significative in this study.

H4. How do consumers perceive environmental benefits, and does this influence their decision?

Section 3.2specifically Air Quality, of the questionnaire showed that a strong majority recognized the environmental benefits of EVs. However, this variable did not show statistical significance in the regression, suggesting that while people value sustainability, their decisions are more strongly shaped by practical considerations. This supports Higueras-Castillo et al. (2020), who identified a similar disconnect.

H5. Does prior experience with EVs increase adoption intent?

Yes, decisively. Participants who had driven or tested an EV (Section 2.1) were much more open to adoption. This was strongly confirmed by the regression model, reinforcing the importance of direct exposure, as discussed in Graham-Rowe et al. (2012).

H6. What barriers still prevent broader EV adoption in Portugal?

Across the questionnaire, particularly in Sections 2.5, 2.7, and 4.1, respondents highlighted concerns with battery durability, charging time, and purchase price. The logistic regression identified charging time as a statistically significant barrier to EV adoption ($p = 0.013$), as shown in Table 6 under the variable "maximum acceptable charging time while traveling". Respondents who responded that they didn't knew, were significantly less likely to intend to adopt EVs. Battery concerns, although frequently mentioned in the survey, did not reach statistical significance in the model. The suggestions provided by respondents, such as expanding public charging infrastructure and clarifying available incentives align with strategic recommendations in prior literature, including (IEA, 2024; Javid & Nejat, 2017; Salari & Javid, 2016).

H7. Do motivational factors like sustainability, cost savings, and prior experience influence adoption?

Yes, but not all equally. While most respondents in Section 3.3 acknowledged motivations like emissions reduction and noise reduction, only *prior experience* (2.1 – Had the opportunity to drive an EV?) and *operational cost perceptions* (2.6 – Maintenance cost reduction) emerged as statistically significant predictors in the regression ($p = 0.000$ and $p = 0.025$, respectively, see Table 6). This suggests that hands-on familiarity and perceived savings matter more than abstract environmental values.

Chapter 5

Conclusions

An extensive review of the literature (Chapter 2) established that while electric vehicles EVs offer substantial environmental and economic potential, several critical barriers still constrain their widespread adoption. Studies such as Hawkins et al. (2013) and (Javid & Nejat, 2017) explored lifecycle emissions and battery disposal, revealing divergent views on the sustainability of EVs. These concerns were reflected in this study's results (Chapter 4), where participants expressed skepticism about the overall ecological impact of EVs, particularly with regard to production emissions and battery-related limitations.

The questionnaire-based methodology used in this study (Chapter 3), informed by established frameworks in the EV adoption literature (Higueras-Castillo et al., 2020, 2021; Javid & Nejat, 2017), enabled the collection of meaningful primary data from a diverse sample of Portuguese respondents. The questionnaire was designed to measure knowledge, perceptions, and behavioral intentions, incorporating elements related to infrastructure, incentives, environmental concerns, and personal experience. While informative, limitations related to sample representativeness and self-reported responses should be acknowledged when generalizing findings.

The regression analysis highlighted multiple statistically significant factors influencing EV adoption intent. Notably, prior experience driving an EV, age, and gender emerged as consistent predictors, with more exposure and familiarity correlating with higher willingness to adopt. These findings confirm the importance of experiential familiarity and demographic characteristics, aligning with the behavioral insights reported in Pallant (2020) and Unwin (2013).

While financial incentives such as tax exemptions and subsidies were viewed positively, they did not demonstrate strong statistical significance in the model. This suggests potential disconnects between available policies and consumer awareness or perceived relevance, diverging somewhat from findings in Sierzchula et al. (2014) and T. Zhang et al. (2011), who argue that direct financial support plays a key role in EV uptake. This also reflects the Portuguese context, where incentive visibility may still be limited.

Although limited access to charging infrastructure was frequently mentioned by participants, particularly outside urban centers this variable did not emerge as statistically significant in the logistic regression model. This discrepancy may reflect limitations in sample representativeness or multicollinearity with related variables, such as charging time tolerance. Nonetheless, these concerns remain relevant in the literature IEA (2023) and Kester et al. (2020), and were clearly perceived as adoption barriers by respondents in the descriptive data.

Interestingly, environmental motivations, such as reducing emissions and pollution, were not statistically significant predictors of EV adoption. This contrasts with international findings (IEA, 2022), which often place sustainability at the core of consumer motivation. This inconsistency could point to contextual or cultural differences within Portugal, and possibly a lack of effective environmental communication strategies.

Lastly, although EVs offer lower long-term operational costs, the high upfront purchase cost continues to deter potential adopters. This is consistent with international evidence by Javid & Nejat (2017), emphasizing the importance of financing mechanisms to bridge this affordability gap.

5.1Implications to the field

This study provides several practical and academic implications for advancing electric vehicle (EV) adoption in emerging markets like Portugal. By integrating questionnaire insights and logistic regression analysis, the findings clarify how infrastructure, consumer experience, and economic perceptions jointly shape adoption behavior.

For policymakers, the results highlight the critical role of charging infrastructure and the limited visibility of existing incentives. Although financial support exists, prior research suggests that many potential adopters remain unaware of it, indicating that policy effectiveness may depend not only on availability but also on public communication and perceived accessibility. These insights reinforce calls for tailored, locally grounded strategies that combine infrastructure investment with awareness campaigns (Sierzchula et al., 2014; van Bree et al., 2010).

Expanding public charging networks, particularly in rural or underserved regions, should be a national priority. This directly addresses range anxiety and reinforces consumer trust in the viability of EVs, two factors confirmed as significant barriers in this (IEA (2021).

For the automotive industry, the strong influence of prior EV experience suggests that increasing access to test drives and real-life exposure could substantially improve adoption rates. Product development should continue focusing on battery performance, cost efficiency, and perceived reliability, especially for first-time buyers (Hawkins et al., 2013; Javid & Nejat, 2017).

Academically, this research contributes to EV literature by offering evidence from a transitional ecosystem where adoption is growing but not yet mature. The dataset captures early adopter behavior in a Portuguese context, adding geographic diversity to predominantly Northern European and North American studies (Higueras-Castillo et al., 2020, 2021). Future studies could build on this by employing longitudinal or mixed-methods approaches to track evolving perceptions over time and to explore underrepresented demographic groups.

In sum, this study confirms that EV adoption is influenced by a combination of practical and psychological factors, some of which can be addressed through targeted, collaborative strategies. Supporting this transition will require not only technical advancements, but also policy clarity, infrastructure access, and consumer engagement. Together, these measures can help accelerate Portugal's shift toward a more "sustainable" mobility.

References

AICEP. (2024). *Portuguese Trade & Investment Agency (AICEP) (April 2024) Portugal leads the way with interoperable EV charging network. Portugal Global.* https://www.portugalglobal.pt/en/news/2024/april/portugal-leads-the-way-with-interoperable-ev-charging-network/

Aljandali, A. (2017). *Multivariate Methods and Forecasting with IBM® SPSS® Statistics*. Springer International Publishing. https://doi.org/10.1007/978-3-319-56481-4

Alves, J. M. A., Vaz, C. B., & Martins, C. A. (2021). Brand Affiliation: Portrait of Hotel Establishments in Portugal. *2021 16th Iberian Conference on Information Systems and Technologies (CISTI)*, 1–6. https://doi.org/10.23919/CISTI52073.2021.9476471

Bell, E., Bryman, A., & Harley, B. (2022). *Business Research Methods*. Oxford University Press. https://doi.org/10.1093/hebz/9780198869443.001.0001

Bjerkan, K. Y., Nørbech, T. E., & Nordtømme, M. E. (2016). Incentives for promoting Battery Electric Vehicle (BEV) adoption in Norway. *Transportation Research Part D: Transport and Environment*, *43*, 169–180. https://doi.org/10.1016/j.trd.2015.12.002

Bradley, T. H., & Quinn, C. W. (2010). Analysis of plug-in hybrid electric vehicle utility factors. *Journal of Power Sources*, *195*(16), 5399–5408. https://doi.org/10.1016/j.jpowsour.2010.02.082

Graham-Rowe, E., Gardner, B., Abraham, C., Skippon, S., Dittmar, H., Hutchins, R., & Stannard, J. (2012). Mainstream consumers driving plug-in battery-electric and plug-in hybrid electric cars: A qualitative analysis of responses and evaluations. *Transportation Research Part A: Policy and Practice*, *46*(1), 140–153. https://doi.org/10.1016/j.tra.2011.09.008

Hawkins, T. R., Singh, B., Majeau-Bettez, G., & Strømman, A. H. (2013). Comparative Environmental Life Cycle Assessment of Conventional and Electric Vehicles. *Journal of Industrial Ecology*, *17*(1), 53–64. https://doi.org/10.1111/j.1530-9290.2012.00532.x

Higueras-Castillo, E., Herrera, L.-J., & Liébana-Cabanillas, F. (2021). Adoption of electric vehicles: Which factors are really important? *International Journal of Sustainable Transportation*, *15*(10), 799–813. https://doi.org/10.1080/15568318.2020.1818330

Higueras-Castillo, E., Kalinic, Z., Marinkovic, V., & Liébana-Cabanillas, F. J. (2020). A mixed analysis of perceptions of electric and hybrid vehicles. *Energy Policy*, *136*, 111076. https://doi.org/10.1016/j.enpol.2019.111076

IEA. (2021). *Global EV Outlook 2021*. https://www.iea.org/reports/global-ev-outlook-2021

IEA. (2022). *Global EV Outlook 2022*. https://www.iea.org/reports/global-ev-outlook-2022

IEA. (2023). *Global EV Outlook 2023*. https://www.iea.org/reports/global-ev-outlook-2023

IEA. (2024). *Global EV Outlook 2024*. https://www.iea.org/reports/global-ev-outlook-2024

IEA (2021), Global EV Outlook 2021, IEA, Paris https://www.iea.org/reports/global-ev-outlook-2021, Licence: CC BY 4.0. (n.d.).

Javid, R. J., & Nejat, A. (2017). A comprehensive model of regional electric vehicle adoption and penetration. *Transport Policy*, *54*, 30–42. https://doi.org/10.1016/j.tranpol.2016.11.003

Kester, J., Sovacool, B. K., Zarazua de Rubens, G., & Noel, L. (2020). Novel or normal? Electric vehicles and the dialectic transition of Nordic automobility. *Energy Research & Social Science*, *69*, 101642. https://doi.org/10.1016/j.erss.2020.101642

Li, L., Wang, Z., Gong, Y., & Liu, S. (2022). Self-image motives for electric vehicle adoption: Evidence from China. *Transportation Research Part D: Transport and Environment*, *109*, 103383. https://doi.org/10.1016/J.TRD.2022.103383

Liu, Y., & Zhang, H. (2024). Gray correlation analysis of strategic human resource management and corporate performance. *Applied Mathematics and Nonlinear Sciences*, *9*(1). https://doi.org/10.2478/amns-2024-0980

Pallant, J. (2020). *SPSS Survival Manual*. Routledge. https://doi.org/10.4324/9781003117452

Plötz, P., Funke, S. Á., & Jochem, P. (2018). The impact of daily and annual driving on fuel economy and CO2 emissions of plug-in hybrid electric vehicles. *Transportation Research Part A: Policy and Practice*, *118*, 331–340. https://doi.org/10.1016/J.TRA.2018.09.018

Pordata. (2024). *Rendimento disponível bruto das famílias*. https://www.pordata.pt/pt/estatisticas/economia/rendimento-e-poupanca/rendimento-disponivel-bruto-das-familias

República Portuguesa. (2019). *Programa do XXII Governo Constitucional 2019-2023*.

Salari, M., & Javid, R. J. (2016). Residential energy demand in the United States: Analysis using static and dynamic approaches. *Energy Policy*, *98*, 637–649. https://doi.org/10.1016/j.enpol.2016.09.041

Sierzchula, W., Bakker, S., Maat, K., & Van Wee, B. (2014). The influence of financial incentives and other socio-economic factors on electric vehicle adoption. *Energy Policy*, *68*, 183–194. https://doi.org/10.1016/J.ENPOL.2014.01.043

Syamnur, F. H., Pambudi, N. A., Biddinika, M. K., & Wardani, N. S. (2019). Barriers to the adoption, acceptance and public perceptions of Electric Vehicles (EV) in Indonesia: Case studies in the city of Surakarta. *Journal of Physics: Conference Series*, *1402*(4), 044061. https://doi.org/10.1088/1742-6596/1402/4/044061

Tal, G., Nicholas, M. A., Davies, J., & Woodjack, J. (2014). Charging Behavior Impacts on Electric Vehicle Miles Traveled. *Transportation Research Record: Journal of the Transportation Research Board*, *2454*(1), 53–60. https://doi.org/10.3141/2454-07

Tamor, M. A., Gearhart, C., & Soto, C. (2013). A statistical approach to estimating acceptance of electric vehicles and electrification of personal transportation. *Transportation Research Part C: Emerging Technologies*, *26*, 125–134. https://doi.org/10.1016/J.TRC.2012.07.007

Tamor, M. A., Moraal, P. E., Reprogle, B., & Milačić, M. (2015). Rapid estimation of electric vehicle acceptance using a general description of driving patterns. *Transportation*

Research Part C: Emerging Technologies, *51*, 136–148. https://doi.org/10.1016/j.trc.2014.10.010

Thomas, C. E. (2009). Fuel cell and battery electric vehicles compared. *International Journal of Hydrogen Energy*, *34*(15), 6005–6020. https://doi.org/10.1016/J.IJHYDENE.2009.06.003

Unwin, A. (2013). Discovering Statistics Using R by Andy Field, Jeremy Miles, Zoë Field. *International Statistical Review*, *81*(1), 169–170. https://doi.org/10.1111/insr.12011_21

van Bree, B., Verbong, G. P. J., & Kramer, G. J. (2010). A multi-level perspective on the introduction of hydrogen and battery-electric vehicles. *Technological Forecasting and Social Change*, *77*(4), 529–540. https://doi.org/10.1016/j.techfore.2009.12.005

Zhang, T., Gensler, S., & Garcia, R. (2011). A Study of the Diffusion of Alternative Fuel Vehicles: An Agent-Based Modeling Approach *. *Journal of Product Innovation Management*, *28*(2), 152–168. https://doi.org/10.1111/j.1540-5885.2011.00789.x

Zhang, Y., Li, Y., Tao, Y., Ye, J., Pan, A., Li, X., Liao, Q., & Wang, Z. (2020). Performance assessment of retired EV battery modules for echelon use. *Energy*, *193*, 116555. https://doi.org/10.1016/J.ENERGY.2019.116555

Chapter 7

Appendix

Note: Due to file size limitations, the original SPSS (.sav) files used in this research are not embedded in this document. However, all extracted data tables used in the analysis have been exported to Excel format and are available through the following links:

(A) Descriptive statistics

https://1drv.ms/x/c/3a3d8bc5a3f2efa3/EbzCNxpONjVNrGSuEbNOVrQBsM9xW9YHrZdEVszEg2bR0g

(B) Chi-Squared

https://1drv.ms/x/c/3a3d8bc5a3f2efa3/ESMyD8bYrHBLhtTsRIWwPMEBBRnYeE5TcMdk0pzOs9QO2g

(C) Reliability Analysis

https://1drv.ms/x/c/3a3d8bc5a3f2efa3/ET-OTVdrbrlKrxU0_IH2fa8B6M17V6fi3ZsQxzgyvqWTvg

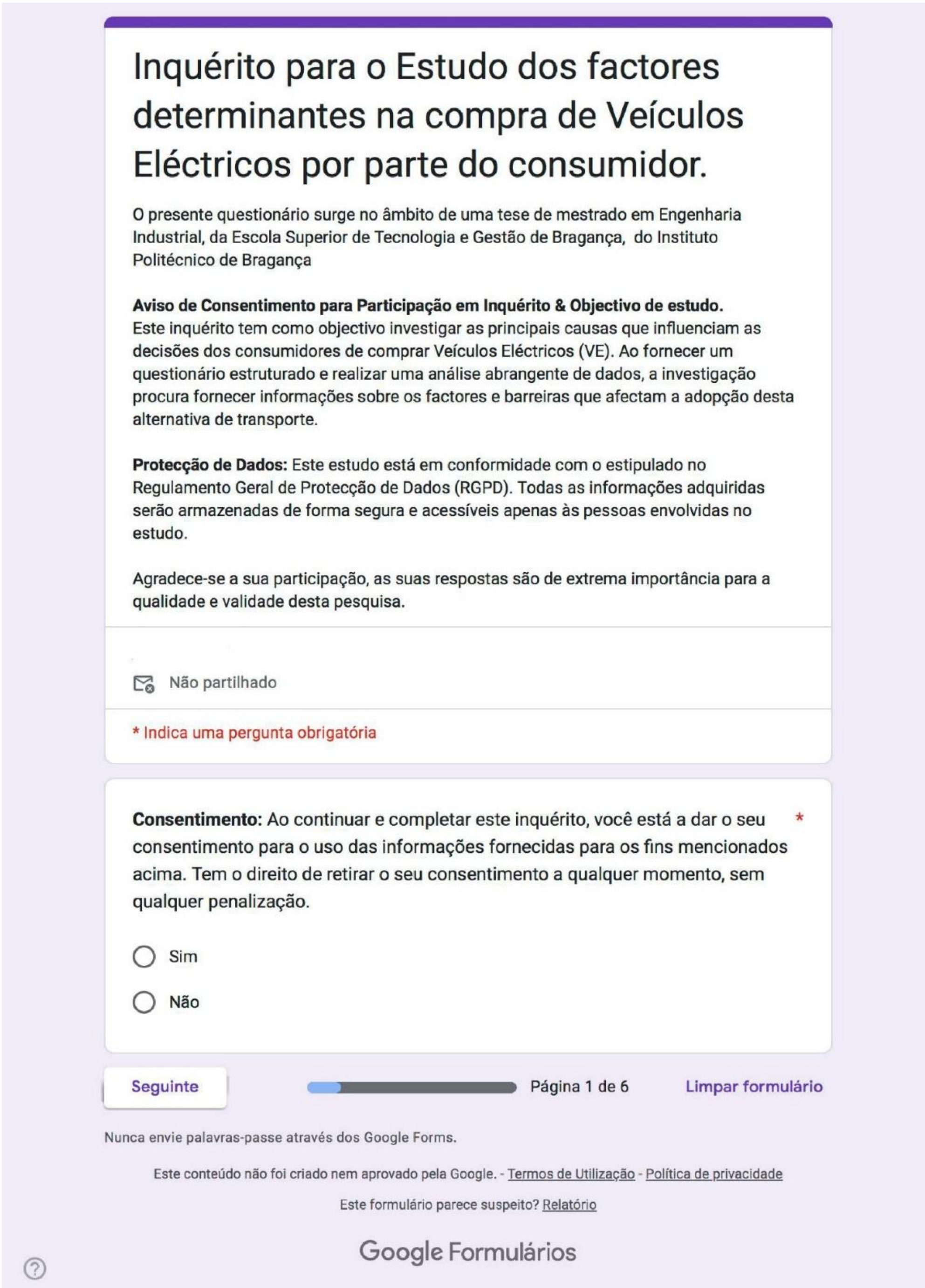
(D) Logistic Regression.

https://1drv.ms/x/c/3a3d8bc5a3f2efa3/EfE1xkn0OeBJii4V60kYuVQBAiHR47v9margrxGQM5QbWA

These files contain all relevant variables, coding structures, and case-level data used for statistical processing and validation. For full access or verification purposes, the original SPSS

(E) Questionnaire

Figura 4 *Questionnaire (page 1)*



Inquérito para o Estudo dos factores determinantes na compra de Veículos Eléctricos por parte do consumidor.

O presente questionário surge no âmbito de uma tese de mestrado em Engenharia Industrial, da Escola Superior de Tecnologia e Gestão de Bragança, do Instituto Politécnico de Bragança

Aviso de Consentimento para Participação em Inquérito & Objectivo de estudo.
Este inquérito tem como objectivo investigar as principais causas que influenciam as decisões dos consumidores de comprar Veículos Eléctricos (VE). Ao fornecer um questionário estruturado e realizar uma análise abrangente de dados, a investigação procura fornecer informações sobre os factores e barreiras que afectam a adopção desta alternativa de transporte.

Protecção de Dados: Este estudo está em conformidade com o estipulado no Regulamento Geral de Protecção de Dados (RGPD). Todas as informações adquiridas serão armazenadas de forma segura e acessíveis apenas às pessoas envolvidas no estudo.

Agradece-se a sua participação, as suas respostas são de extrema importância para a qualidade e validade desta pesquisa.

Não partilhado

* Indica uma pergunta obrigatória

Consentimento: Ao continuar e completar este inquérito, você está a dar o seu consentimento para o uso das informações fornecidas para os fins mencionados acima. Tem o direito de retirar o seu consentimento a qualquer momento, sem qualquer penalização. *

- Sim
- Não

Seguinte | Página 1 de 6 | Limpar formulário

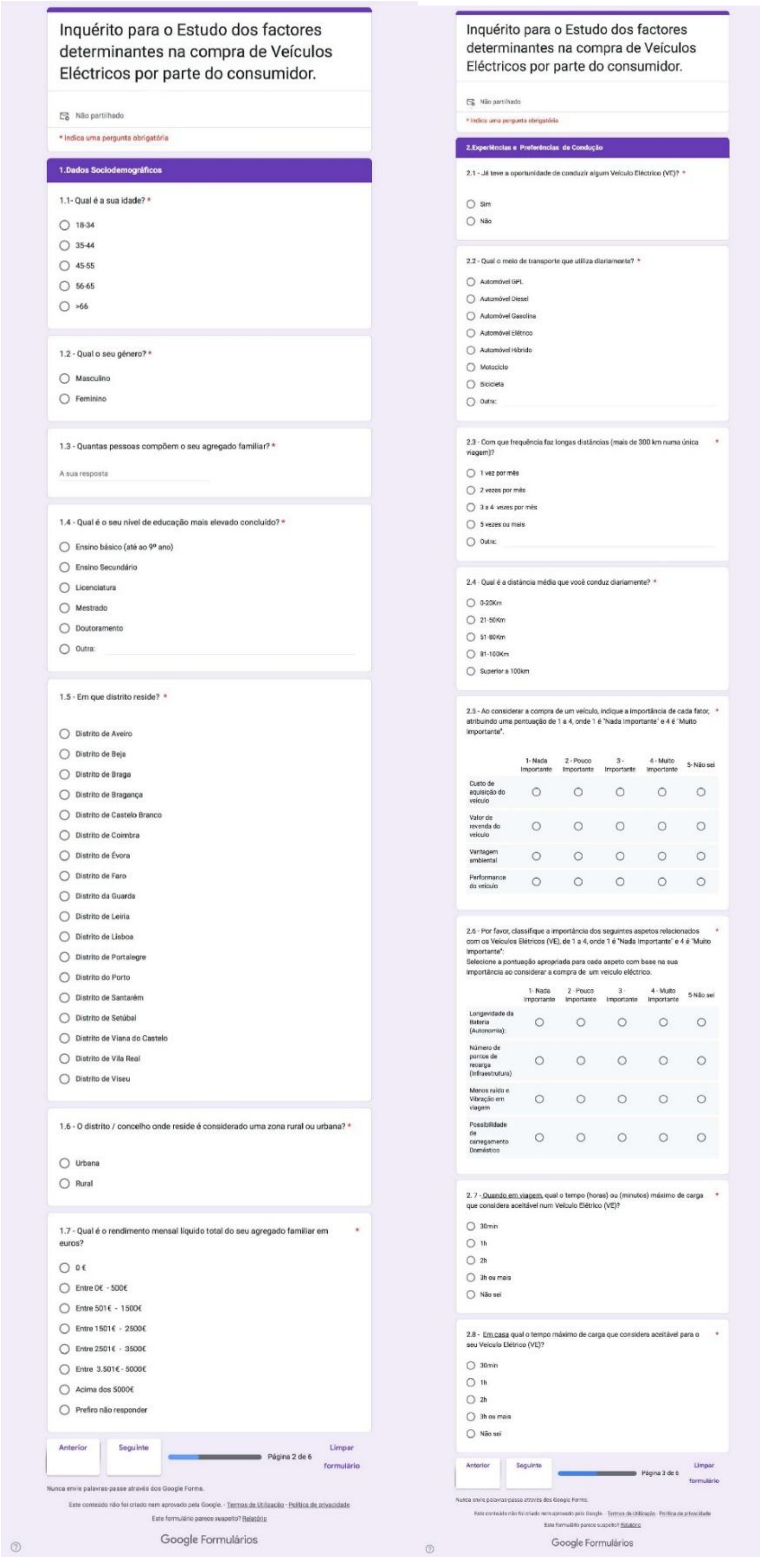
Nunca envie palavras-passe através dos Google Forms.

Este conteúdo não foi criado nem aprovado pela Google. - Termos de Utilização - Política de privacidade

Este formulário parece suspeito? Relatório

Google Formulários

Figura 5 *Questionnaire (page 2 and 3)*



Inquérito para o Estudo dos factores determinantes na compra de Veículos Eléctricos por parte do consumidor.

Não partilhado

* Indica uma pergunta obrigatória

1.Dados Sociodemográficos

1.1- Qual é a sua idade? *

- 18-34
- 35-44
- 45-55
- 56-65
- >66

1.2 - Qual o seu género? *

- Masculino
- Feminino

1.3 - Quantas pessoas compõem o seu agregado familiar? *

A sua resposta

1.4 - Qual é o seu nível de educação mais elevado concluído? *

- Ensino básico (até ao 9º ano)
- Ensino Secundário
- Licenciatura
- Mestrado
- Doutoramento
- Outra:

1.5 - Em que distrito reside? *

- Distrito de Aveiro
- Distrito de Beja
- Distrito de Braga
- Distrito de Bragança
- Distrito de Castelo Branco
- Distrito de Coimbra
- Distrito de Évora
- Distrito de Faro
- Distrito da Guarda
- Distrito de Leiria
- Distrito de Lisboa
- Distrito de Portalegre
- Distrito do Porto
- Distrito de Santarém
- Distrito de Setúbal
- Distrito de Viana do Castelo
- Distrito de Vila Real
- Distrito de Viseu

1.6 - O distrito / concelho onde reside é considerado uma zona rural ou urbana? *

- Urbana
- Rural

1.7 - Qual é o rendimento mensal líquido total do seu agregado familiar em euros? *

- 0 €
- Entre 0€ - 500€
- Entre 501€ - 1500€
- Entre 1501€ - 2500€
- Entre 2501€ - 3500€
- Entre 3.501€ - 5000€
- Acima dos 5000€
- Prefiro não responder

Anterior Seguinte Página 2 de 6 Limpar formulário

Nunca envie palavras-passe através dos Google Forms.

Este conteúdo não foi criado nem aprovado pela Google. - Termos de Utilização - Política de privacidade

Este formulário parece suspeito? Relatório

Google Formulários

Inquérito para o Estudo dos factores determinantes na compra de Veículos Eléctricos por parte do consumidor.

Não partilhado

* Indica uma pergunta obrigatória

2.Experiências e Preferências de Condução

2.1 - Já teve a oportunidade de conduzir algum Veículo Eléctrico (VE)? *

- Sim
- Não

2.2 - Qual o meio de transporte que utiliza diariamente? *

- Automóvel GPL
- Automóvel Diesel
- Automóvel Gasolina
- Automóvel Elétrico
- Automóvel Híbrido
- Motociclo
- Bicicleta
- Outra:

2.3 - Com que frequência faz longas distâncias (mais de 300 km numa única viagem)? *

- 1 vez por mês
- 2 vezes por mês
- 3 a 4 vezes por mês
- 5 vezes ou mais
- Outra:

2.4 - Qual é a distância média que você conduz diariamente? *

- 0-20Km
- 21-50Km
- 51-80Km
- 81-100Km
- Superior a 100km

2.5 - Ao considerar a compra de um veículo, indique a importância de cada fator, atribuindo uma pontuação de 1 a 4, onde 1 é "Nada Importante" e 4 é "Muito Importante". *

	1- Nada Importante	2 - Pouco Importante	3 - Importante	4 - Muito Importante	5- Não sei
Custo de aquisição do veículo	○	○	○	○	○
Valor de revenda do veículo	○	○	○	○	○
Vantagem ambiental	○	○	○	○	○
Performance do veículo	○	○	○	○	○

2.6 - Por favor, classifique a importância dos seguintes aspetos relacionados com os Veículos Elétricos (VE), de 1 a 4, onde 1 é "Nada Importante" e 4 é "Muito Importante": *
Selecione a pontuação apropriada para cada aspeto com base na sua importância ao considerar a compra de um veículo eléctrico.

	1- Nada Importante	2 - Pouco Importante	3 - Importante	4 - Muito Importante	5-Não sei
Longevidade da Bateria (Autonomia):	○	○	○	○	○
Número de pontos de recarga (Infraestrutura)	○	○	○	○	○
Menos ruído e Vibração em viagem	○	○	○	○	○
Possibilidade de carregamento Doméstico	○	○	○	○	○

2. 7 - Quando em viagem, qual o tempo (horas) ou (minutos) máximo de carga que considera aceitável num Veículo Elétrico (VE)? *

- 30min
- 1h
- 2h
- 3h ou mais
- Não sei

2.8 - Em casa qual o tempo máximo de carga que considera aceitável para o seu Veículo Elétrico (VE)? *

- 30min
- 1h
- 2h
- 3h ou mais
- Não sei

Anterior Seguinte Página 3 de 6 Limpar formulário

Nunca envie palavras-passe através dos Google Forms.

Este conteúdo não foi criado nem aprovado pela Google. - Termos de Utilização - Política de privacidade

Este formulário parece suspeito? Relatório

Google Formulários

Figura 6 *Questionnaire (page 4 and 5)*

Inquérito para o Estudo dos factores determinantes na compra de Veículos Eléctricos por parte do consumidor.

Não partilhado

* Indica uma pergunta obrigatória

3: Motivações para comprar Veículos Elétricos (EV)

3.1 - Indique os incentivos que considera relevantes para a compra de um Veículo Elétrico (EV). *
Classificando a importância de 1 a 4, sendo 1 'Nada Importante' e 4 'Muito Importante'.
Atribua uma pontuação para cada incentivo com base em sua importância ao considerar a compra de um Veículo Elétrico(VE).

	1 - Nada Importante	2 - Pouco Importante	3 - Importante	4 - Muito Importante	5 - Não sei
Benefícios na compra (Isenção de IUC, ISV)	○	○	○	○	○
Subsídios governamentais (podem ser obtidos 3000€ para pessoas singulares e 2250€ para pessoas colectivas) de acordo com o Despacho n.º 5126/2023, de 3 de maio	○	○	○	○	○
Estacionamentos gratuito para veículos elétricos nos centros urbanos (parquímetros)	○	○	○	○	○
Benefícios de consumo	○	○	○	○	○
Possibilidade de carregamento em áreas comerciais	○	○	○	○	○
Ecofriendly (amigo do ambiente)	○	○	○	○	○

3. 2 - Ao considerar a compra de um Veículo Elétrico (VE), avalie a importância dos seguintes fatores usando uma escala de 1 a 4, onde 1 significa "Nada Importante" e 4 significa "Muito Importante": *

	1 - Nada Importante	2 - Pouco Importante	3 - Importante	4 - Muito Importante	5 - Não Sei
Redução de Emissões de Gases de Efeito Estufa:	○	○	○	○	○
Conservação dos Recursos Naturais (ex.: redução do consumo de recursos não renováveis)	○	○	○	○	○
Impacto na Qualidade do Ar:	○	○	○	○	○
Contribuição para a Redução da Poluição Sonora	○	○	○	○	○
Travagem Regenerativa	○	○	○	○	○
Menos ruídos e vibrações em viagem	○	○	○	○	○
Desempenho e aceleração	○	○	○	○	○
Estatuto social	○	○	○	○	○

3.3 - Quais dos seguintes fatores influenciariam a sua decisão de comprar um Veículo Elétrico (VE)? *
Marque todas as opções aplicáveis e atribua a importância de cada uma, numa escala de 1 a 4, onde 1 significa "Nada Importante" e 4 significa "Muito Importante":

	1 - Nada Importante	2 - Pouco Importante	3 - Importante	4 - Muito Importante	5 - Não Sei
Redução de custos operacionais (ex.: menor custo de combustível, manutenção)	○	○	○	○	○
Contribuição para a redução das emissões de carbono	○	○	○	○	○
Incentivos fiscais ou financeiros	○	○	○	○	○
Melhor performance e aceleração	○	○	○	○	○
Disponibilidade de pontos de carregamento	○	○	○	○	○

Anterior Seguinte Página 4 de 6 Limpar formulário

Nunca envie palavras-passe através dos Google Forms.

Este conteúdo não foi criado nem aprovado pela Google. - Termos de Utilização - Política de privacidade

Este formulário parece suspeito? Relatório

Google Formulários

Inquérito para o Estudo dos factores determinantes na compra de Veículos Eléctricos por parte do consumidor.

Não partilhado

* Indica uma pergunta obrigatória

4: Barreiras para a compra de Veículos Elétricos (EV)

4.1 - Avalie a importância das seguintes barreiras para a aquisição de Veículos Elétricos (VE) usando uma escala de 1 a 4, onde 1 significa "Nada Importante" e 4 significa "Muito Importante": *

	1 - Nada Importante	2 - Pouco Importante	3 - Importante	4 - Muito Importante	5 - Não sei
Preço Inicial Mais Elevado dos Veículos Elétricos:	○	○	○	○	○
Incerteza na Autonomia da Bateria:	○	○	○	○	○
Indisponibilidade de Infraestrutura de Recarga:	○	○	○	○	○
Elevados custos de Manutenção e Reparo:	○	○	○	○	○
Preocupações com a Vida Útil da Bateria:	○	○	○	○	○

4.2 - Quais dos seguintes fatores o impediriam de comprar um VE? *
Numa escala de 1 a 4, onde 1 significa "Nada Importante" e 4 significa "Muito Importante"
(Marque todas as opções aplicáveis)

	1 - Nada Importante	2 - Pouco Importante	3 - Importante	4 - Muito importante	5 - Não sei
Preço inicial mais elevado	○	○	○	○	○
Receio de ficar sem carga	○	○	○	○	○
Falta de pontos de carregamento acessíveis	○	○	○	○	○
Falta de conhecimento sobre VE	○	○	○	○	○
Preferência por veículos tradicionais a combustão interna	○	○	○	○	○
Autonomia limitada	○	○	○	○	○
Preocupação com Manutenção específica	○	○	○	○	○

4.3 - Na eventualidade de considerar pertinentes outras barreiras de impedimento (para além das já indicadas), por favor, indique-as

A sua resposta

Anterior Seguinte Página 5 de 6 Limpar formulário

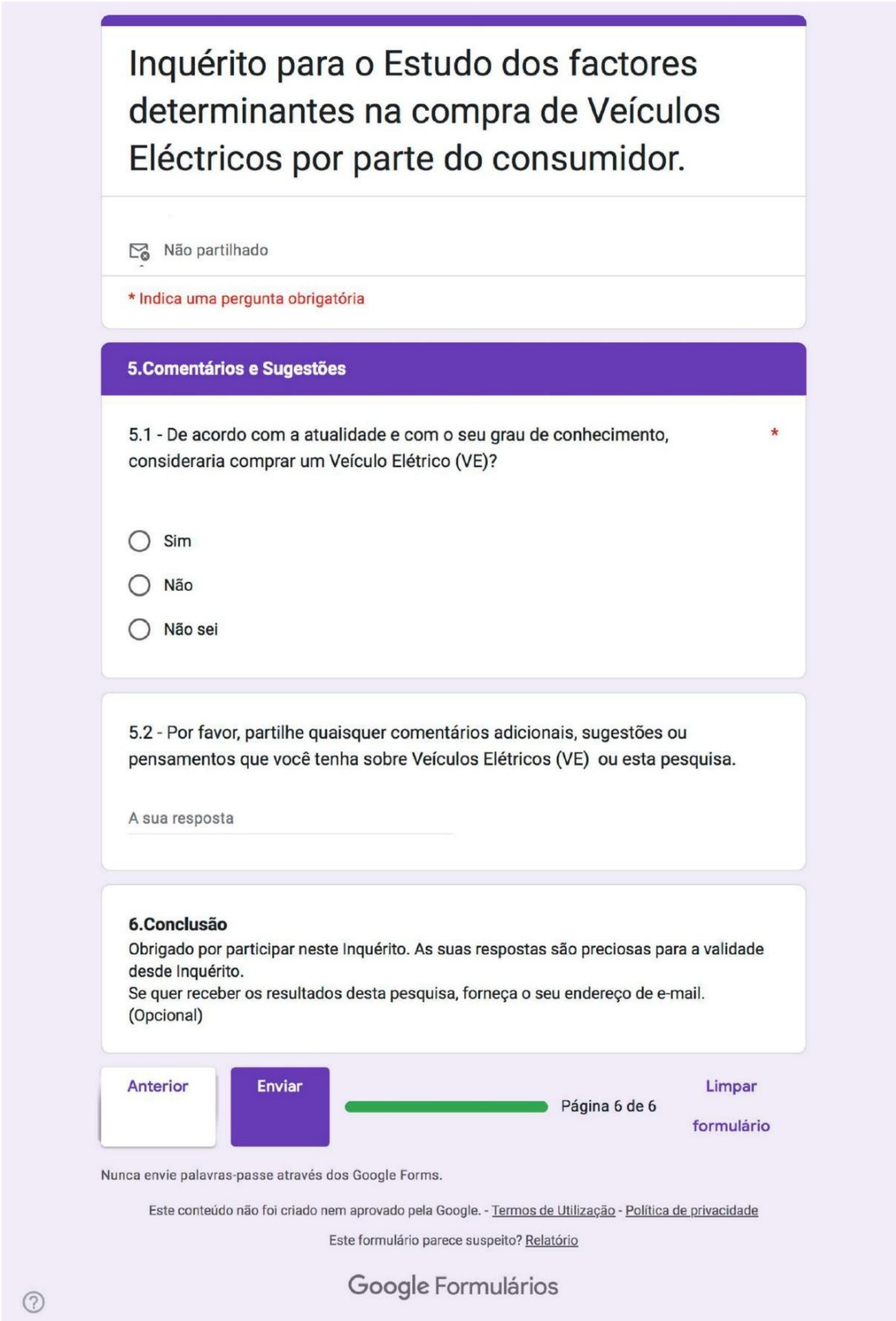
Nunca envie palavras-passe através dos Google Forms.

Este conteúdo não foi criado nem aprovado pela Google. - Termos de Utilização - Política de privacidade

Este formulário parece suspeito? Relatório

Google Formulários

Figura 7 *Questionnaire (page 6)*



Inquérito para o Estudo dos factores determinantes na compra de Veículos Eléctricos por parte do consumidor.

Não partilhado

* Indica uma pergunta obrigatória

5.Comentários e Sugestões

5.1 - De acordo com a atualidade e com o seu grau de conhecimento, consideraria comprar um Veículo Elétrico (VE)? *

- Sim
- Não
- Não sei

5.2 - Por favor, partilhe quaisquer comentários adicionais, sugestões ou pensamentos que você tenha sobre Veículos Elétricos (VE) ou esta pesquisa.

A sua resposta

6.Conclusão

Obrigado por participar neste Inquérito. As suas respostas são preciosas para a validade desde Inquérito.
Se quer receber os resultados desta pesquisa, forneça o seu endereço de e-mail. (Opcional)

Anterior | Enviar | Página 6 de 6 | Limpar formulário

Nunca envie palavras-passe através dos Google Forms.

Este conteúdo não foi criado nem aprovado pela Google. - Termos de Utilização - Política de privacidade

Este formulário parece suspeito? Relatório

Google Formulários