MOTIVATIONS FOR PURCHASING ELECTRIC CARS IN SWITZERLAND: A MARKET RESEARCH STUDY COMPARING SWITCHERS AND NON-SWITCHERS

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ABSTRACT

This study examines the factors that motivate people in Switzerland to switch to electric cars compared to those who continue to own a gasoline-powered vehicle while also purchasing an electric car. The objective is to identify key demographic traits, attitudes, and perceptions that differentiate these two groups. A survey was conducted, and factor analysis with regression analysis was performed. The results showed three significant variables: cost of ownership, performance and features, and social influences. However, social influences did not significantly impact the intention to purchase an electric car. The study also found no significant differences between the two groups, switchers and non-switchers. It was also discovered that males and females made no difference in terms of their intention to purchase an electric car. These findings have implications for understanding the factors that influence the adoption of electric cars and can inform marketing and communication strategies to promote electric car adoption in Switzerland.

Keywords: Electric Vehicles, Electric Car Adoption, Non-switchers, Cost of Ownership, Performance and Features, Environmental Concerns, Charging Infrastructure, Marketing Strategies, Communication Strategies, Intention to Purchase, Demographic Characteristics, Psychographic Characteristics, Switzerland, Sustainability, Green Transportation

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CHAPTER 1
INTRODUCTION

The global climate crisis has necessitated the shift towards emission-cutting transportation technologies. Since the transportation industry is a significant contributor to greenhouse gas emissions, electric vehicles (EVs) have gained prominence worldwide. In Switzerland, a country heavily reliant on imported fossil energy, promoting EV adoption is a policy priority to reduce carbon emissions and improve energy security. However, Swiss consumers' exhibit mixed views and adoption patterns towards EVs, with some fully embracing them and others continuing to use both EVs and internal combustion engine vehicles. It is essential to understand the motivations and preferences of these consumer groups for effective policymaking, marketing strategies, and infrastructure planning. By exploring the factors that influence EV adoption, this research aims to provide valuable insights to promote sustainable and greener mobility in Switzerland.

1.1 Background and Context of the Study

The transportation industry is the single most significant greenhouse gas (GHG) emitter, accounting for 37% of carbon dioxide emissions in 2021 (International Energy Agency, 2022). Statistics by the International Energy Agency (IEA) further indicate a rebounding in carbon dioxide emissions, increasing by 8% after lifting the Covid-19 movement restrictions. Achieving a Net Zero emission by 2030 will require a 20% reduction in emissions within the industry, dropping from the current 7.7 gigatons to below 6 gigatons (International Energy Agency, 2022). This goal can be achieved by rapidly adopting electric vehicles (EVs). EV adoption has increased considerably in recent years. According to Muratori, et al. (2021), the increased adoption stems from the maturity of e-vehicle technology, a significant reduction in e-vehicle battery costs, increased awareness and preference for clean transportation, and greater availability of EV charging infrastructure. Favorable regulations in the developed world have also contributed to EV adoption. For example, the US introduced EV tax credits in its Inflation Reduction Act (IRA).

In contrast, California and European countries have introduced regulations banning the sale of vehicles dependent on fossil fuels from 2035 onwards (Carey, 2023).

Today, 11% of new cars are fully electric (Carey, 2023). The sale of EVs has accelerated to record highs. For instance, only 120,000 electric cars were sold globally in 2012. In comparison, the same numbers of cars were sold in just one week in 2021, regardless of the supply chain disruptions occasioned by the pandemic. As a result, the number of PHEVs (plug-in hybrid electric vehicles) and BEVs (battery electric vehicles) on the roads exceeded 16.5 million (International Energy Agency, 2022). Most of the sales occurred in Europe and China, with the two regions making up 85% of the sales. Automotive manufacturers increased their investment in electric vehicles and related infrastructure. At least $140 billion has been dedicated towards transportation electrification, with about 130 new EV models expected to hit the market in 2023 (Muratori, et al., 2021).

Switzerland depends highly on imported fossil energy, which constitutes 56% of its primary energy use. Domestic sources, primarily hydroelectric power, only comprise 19% of its primary use. The high dependence on fossil energy imports makes the country vulnerable to external market shocks that affect oil prices. In addition, fossil energy contributes significantly to GHG emissions, with the transport sector contributing a third of the emissions. Between 1990 and 2007, carbon dioxide emissions increased by 14.3%. Of this, road transportation contributes 44%, with private cars contributing 72% of the road emissions (Alpiq Group, 2010). Thus, EV adoption has been a policy imperative for the country. As of January 2023, about 76,650 Evs had been sold in the country (Statista, 2023) of these; BEVs were 50,330, while PHEVs were 26,320. Tesla models dominate the market at 11.8%, followed by Volkswagen 9.8%, BMW 9.1%, and Volvo 9.0%. Other notable players include Audi 6.4%, Mercedes-Benz 6.4%, Renault 5.5%, and Skoda 5.4%. Evs are expected to more than double to 166,830 by 2027. In terms of EV infrastructure, there are about 11,620 charging stations throughout Switzerland.

Nevertheless, Swiss consumers have expressed mixed views regarding EVs. Some have fully embraced electric cars, opting to abandon the traditional internal combustion engine vehicles (ICEVs). Others are still reluctant to adopt EVs, with some choosing to own both an EV and an ICEV. Few studies have examined this

dichotomy. For instance, Brückmann and Bernauer (2020) examined the factors driving public support for EV policies in Switzerland. A sample of 5325 car holders participated in the survey. From the findings, the primary factor is the availability of more charging infrastructure (i.e., 58% for 10 chargers for every 1000 parking spaces and 59% for 100 chargers/1000 parking spaces). The rating remained high even among respondents who did not use EVs. The respondents perceived EVs favorably if adequate information such as fuel consumption, energy efficiency, and carbon dioxide emissions were provided through energy labels and sales brochures. Consumers tend to evaluate EVs the same way they assess other consumer goods. Such evaluations include comparing prices, quality, and product capabilities, which in this case involves comparing the effectiveness and efficiency of EVs with fossil fuel vehicles. Therefore, they will assess prices, speed, comfort, convenience, energy use, and emission risks. From these findings, EV adoption in Switzerland is driven by the availability of information and supportive EV infrastructure.

The reduced environmental footprint of EVs is also a significant motivation for adoption, given the growing ecological consciousness worldwide. For instance, the emission of a standard electric car does not exceed 7 grams of carbon dioxide per kilometer during electricity generation and up to 23 grams per kilometer during electricity consumption based on the high quality of Swiss electricity (Alpiq Group, 2010). The study further shows that the use of electricity as an alternative fuel in the sector would drastically reduce local air pollutants, such as small particulate matter, in the cities. Switching entirely to EVs fueled by renewable energy or zero-carbon electricity can prevent approximately 170,000 premature deaths and related damages of about $1.5 trillion by 2050 (Carey, 2023). A combined report by California University, Berkeley, and Energy Innovation made similar findings by estimating the number of voided deaths at 150,000 and the savings in health and environmental costs at $1.3 trillion by 2050, especially among frontline populations living near major roads (California University Berkeley, 2021). The report estimates the economic savings for consumers at $2.7 trillion during the same duration. This means that each household would save about $1000 annually for the next three decades. In addition, the savings would support introducing more than 2 million jobs in 2035. Thus, EVs offer numerous benefits compared to internal combustion engine vehicles (ICEVs).

These benefits include no tailpipe emissions, non-dependence on petroleum (i.e., greater fuel diversity), lower maintenance, and better fuel economy – all of which can help reduce carbon emissions (Muratori, et al., 2021). They also offer a better driving experience, including improved acceleration, convenient charging (e.g., home stations), and noise reduction. Reduced car emissions also mean a lower risk for respiratory and cardiovascular diseases that were caused or aggravated by tailpipe and exhaust emissions.

But despite these reasons and benefits, a section of consumers is skeptical about the viability of electric vehicles. Even among the environmentally conscious, this skepticism prevails (Brückmann & Bernauer, 2020). Factors such as inadequacies in the EV infrastructure could be responsible. According to De Wit (2018), Switzerland has 1 charging unit per 22 EVs. However, these charging points are provided and maintained by different energy providers. The lack of a universal charging infrastructure creates interconnectivity problems, forcing drivers to search for specific charging stations that match their car specifications. This can not only be hectic and time-consuming considering the heavy traffic on peak hours but also inconvenience drivers who may be forced to drive long distances to recharge their units. For this reason, many consumers may decide not to adopt EVs until such a time when related infrastructure is widely available. For others, however, owning an electric car alongside the typical fossil-fueled vehicles is a safer option, enabling them to try out the new EV models without grossly suffering the inconvenience and costs associated with their current use. Therefore, there is a need to decompose the motivations behind the purchase decisions of consumers. For full adopters, the knowledge of their reasons can help automotive manufacturers identify, accentuate, and customize the car features that are most attractive to consumers. This would ensure they retain this customer base. This knowledge would also benefit policy makers. Knowing the reasons for product adoption can assist the government in making the most effective policies to support its objectives.

1.2 Problem Statement

EV adoption and purchase is proliferating worldwide, including in Switzerland, driven by factors such as environmental concerns, technological advancements, and government incentives. However, there is a considerable lack of understanding of the motivations and intentions behind individuals who switch to EVs compared to those who purchase an electric car (henceforth, EC) while still owning a gasoline one in Switzerland. This information is critical for automakers, policymakers, and other stakeholders to develop effective strategies to promote ECs and reduce greenhouse gas emissions. This market research project aims to fill this gap by investigating the intentions and preferences of these two groups in Switzerland and identifying the factors that differentiate them. The results of this research will provide valuable insights into the Swiss market for ECs and inform strategies to increase their adoption and reduce carbon emissions.

1.3 Research Objective and Questions

1.3.1 Research Objectives

The research objective of the proposed study endeavors to better understand the factors influencing the decision or intention to buy or adopt e-vehicles in Switzerland. It specifically seeks:

1) To investigate the motivations, attitudes, and preferences of individuals who switch to ECs compared to those who purchase an EC while still owning a gasoline one in Switzerland

2) To identify the variables that influences the purchase of ECs in Switzerland.

The overall goal is to provide valuable insights into the Swiss market for ECs and to inform strategies to increase their purchase and reduce carbon emissions.

1.3.2 Research Questions (RQs)

The study's main RQ is: *What are the main intentions for purchasing ECs in Switzerland?* In answering this RQ, the study will particularly seek to answer the following Sub-RQs:

1) What are the motivations and preferences of individuals who switch to ECs compared to those who purchase an electric car while still owning a gasoline-powered car in Switzerland?

2) How do attitudes and perceptions towards ECs contribute to the intention to purchase an electric car in Switzerland?

3) What are the most effective marketing and communication strategies for promoting the adoption of ECs in Switzerland, and how do these strategies differ between the two groups?

4) What are the key demographic characteristics of individuals who switch to ECs compared to those who purchase an EC while still owning an ICE car in Switzerland?

1.4 Research Scope

This study is focused on Switzerland and specifically examines individuals who intend to purchase an electric car (EC). It investigates the motivations, preferences, attitudes, and perceptions of individuals who are considering switching to ECs or who have already made the switch, as compared to those who continue to own a gasoline-powered car alongside an EC. The research delves into demographic and psychographic characteristics, as well as the influence of various factors such as cost of ownership, performance and features, social influences, and availability of charging infrastructure. By narrowing the scope to Switzerland and individuals with an intention to buy an EC, this research aims to provide valuable insights into the factors driving EC adoption in the country.

1.5 Significance and Importance of the Study

Besides contributing to the mounting literature on the motivations and barriers to EV adoption in the face of a changing climate, there are two main reasons for carrying out the present study. Firstly, EV is a relatively new and rapidly evolving innovation, which, as noted in such studies as Dutta and Hwang (2021), is a worthwhile issue to explore in the light of as well as from the perspective of environment and climate-related challenges. Therefore, exploring the motivations (or lack thereof) of consumers' intention to switch to EVs can be useful for the Swiss

government and firms from the perspective of addressing CO_2 escalation in the environment. Secondly, studies have extensively examined EV adoption, but such research remains wanting in the context of Switzerland. Research indicates that different countries face different challenges in terms of adopting and using new products and technologies. This, according to Dutta and Hwang (2021), is because every country is different socio-economically, culturally, politically, and demographically. Therefore, examining these factors from a country-specific perspective is warranted.

From an academic perspective, this study, as indicated above, contributes to the growing scientific literature on EV adoption and consumer purchase behaviors, providing an in-depth understanding of consumers' decision-making processes when deciding to switch to EVs. Moreover, the study sheds light on the role of various extraneous factors like environmental concern, peer influence, and social norms in shaping consumers' decisions to acquire EVs. Practically, the research provides a critical understanding of the drivers and barriers to EV adoption in the context of Switzerland. This insight can be used by policymakers and car manufacturers in developing effective EV promotion campaigns, especially with regard to potential incentives, subsidies, tax credits, and consumer preferences and needs.

1.6 Definition of Main Terms

Electric Vehicles (EVs): Vehicles powered – partially or fully – by electricity

Battery electric vehicle (BEV): EVs variant powered solely by electricity

Internal Combustion Engine (ICE): Cars powered by conventional fuels such as fossil-based fuels, e.g., gasoline or diesel

Plug-in Hybrid Electric Vehicle (PHEV): Vehicles running on both rechargeable – electricity powered batteries and ICE

Consumer: Used herein to refer to a user, purchaser, or driver of an EV

Switchers: Persons using a new product

Non-switchers: Individuals not using the new product

Drivers: Factors encouraging or motivating people into taking a particular action, in this case, adopting EVs

Barriers: Obstacles or challenges preventing people from taking a certain action, in this case, switching to EVs

Decision-making process: The processes that an individual goes through cognitively as well as emotionally when making a decision, which in the present case when deciding whether (or not) to adopt or switch to EVs.

1.7 Outline of the Paper

The study is generally structuralized into six, and the subsequent sections proceed as follows. The next chapter covers the study's literature review component, and it presents in more detail the various variables used in the research in addition to other studies conducted on similar topics. This chapter also provides an overview of the conceptual framework and theoretical background supporting the research. It presents models related to identity, technology adoption, as well as rational choices. Also included are consumer-decision marking processes and planned behavior theory. Following this chapter is the methodology section. The section presents the study's methodological approach not only in terms of research design, data collection, and analysis but also with regard to the justification and rationale for the approach. Research limitations and ethical considerations are also presented. Next is the result section. The findings are presented thematically based on the study's objectives and RQs. In the discussion section, an analysis of the study's findings in relation to the set objectives and implications for policymakers will be presented. Finally, is the conclusion that summarizes the study and outlines its major contributions, significance, and recommendations.

CHAPTER 2
LITERATURE REVIEW

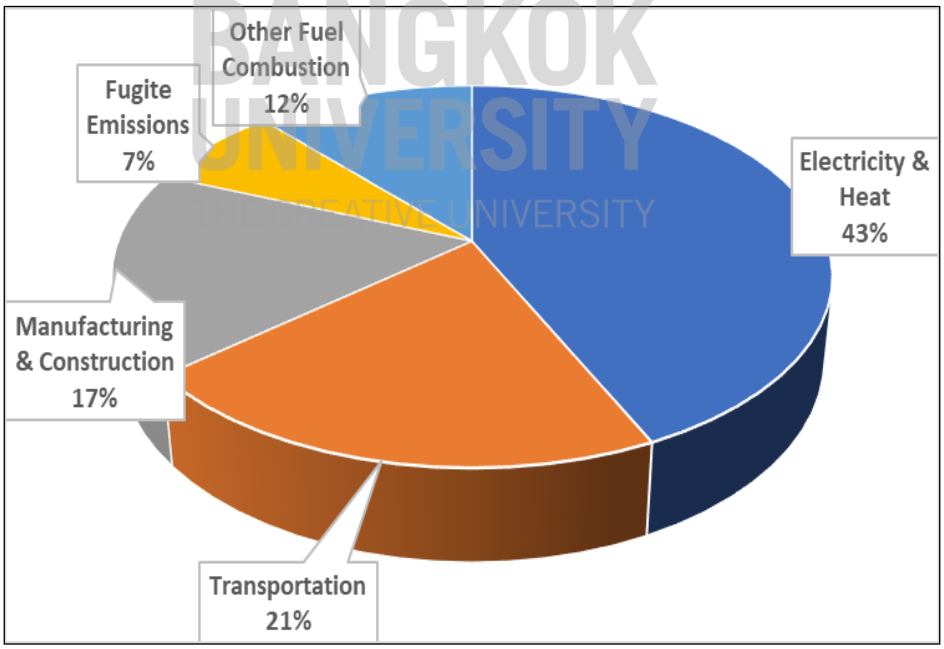
This chapter presents a comprehensive review of the literature on electric vehicle (EV) adoption, with a specific focus on Switzerland and individuals' intentions to purchase an EV. It begins by highlighting the global climate crisis and the significant contribution of the transportation sector to greenhouse gas emissions, emphasizing the need for widespread EV adoption. The chapter explores the motivations and preferences that drive consumers to switch to EVs, including environmental consciousness, cost savings, government incentives, and technological advancements. It also examines the influence of perceived performance and features of EVs, social factors, and the unique characteristics of Switzerland's energy landscape, transportation sector, and policy framework on EV adoption. The literature review identifies gaps in current knowledge, particularly in understanding the motivations of individuals who own both EVs and traditional internal combustion engine vehicles (ICEVs) in the Swiss context. By addressing these gaps, this study aims to contribute valuable insights to the existing literature and inform marketing strategies, policy recommendations, and infrastructure planning to promote EV adoption in Switzerland and advance sustainable transportation options.

2.1 Overview of the Industry

Electric mobility (e-mobility) has a significant role to play in facilitating the transition to a cleaner and more sustainable transportation system. Paoli, Dasgupta & McBain (2022) noted that e-vehicles present a crucial technology for decarbonizing road transportation, a sector that is estimated to account for 15-16% of global emissions (Figure 2.1). Recent years have experienced exponential growth in the sale of e-vehicles. This has been accompanied by an improved transportation range, increased vehicular performance, and broader model availability. With passenger cars rising in popularity, about 13% (Table 2.1) of all new cars estimated to have been sold in 2022 were electric, and if the growth witnessed in the past two years is maintained, vehicular CO_2 emissions are projected to be on the path to attain Net Zero emissions by 2050 scenario (Paoli, et al., 2022). However, in order to reach this target, 60% of

all vehicles sold worldwide must be e-powered by 2030 and 100% by 2035 (“Why electric mobility is good for me and the planet”, 2023). The adoption of e-vehicles is still relatively low. There is also the issue of policy initiatives to contend with: are policymakers and consumers, in general, sufficiently equipped to make the required decisions, including legislative directives for sustainable outcomes on e-vehicles? This question is at the core of the present analysis, which seeks to investigate the enablers and impediments of e-vehicle purchases in Switzerland. This section reviews and discusses the pertinent literature concerning the motivation (or lack thereof) for purchasing e-mobility. It provides an overview of the conceptual framework and theoretical background supporting the research and also presents models related to identity, technology adoption, as well as rational choices. Also included is consumer-decision marking processes and planned behavior theory.

Figure 2.1: Global Emissions by Sector



Source: Center for Climate and Energy Solutions. (2018). *Global emissions*. Retrieved from https://www.c2es.org/content/international-emissions/.

The graph depicts global GHG emissions by economic activities that cause their production. Globally, the primary sources of GHG are electricity & heat production followed by transportation.

2.2 Electric Vehicles: Overview

Before examining the determinants affecting the adoption (or lack thereof) of e-passenger cars, it is critical to provide its definition and other related terms. According to Anastasiadou and Gavanas (2022), e-mobility describes clean and efficient means of transportation, using electric-powered vehicles fueled either by rechargeable batteries or hydrogen fuel cells. Presently, there are four primary e-vehicles that are electrically rechargeable, namely:

1) Battery Electric Vehicles (BEVs): These vehicles are wholly driven by an electric motor using an on-board fitted battery that is chargeable through the power grid;

2) Plug-in Hybrid Vehicles (PHEVs): These vehicles use a battery-powered electric motor. Besides the rechargeable battery through the main power grid, these vehicles are also supported/driven by an internal combustion engine (ICE).

3) Fuel Cell Electric Vehicles (FCEV): These vehicles use a fuel cell-powered electric motor rather than a battery. Some are also powered by a battery-super capacitor combination.

4) Range Extender Electric Vehicles (REEV): These vehicles are equipped with an on-board liquid fuel converter to generate electrical energy as well as extend the vehicle's mileage.

In addition, there are hybrid electric vehicles (HEVs). These vehicles are not electrically chargeable. They are, however, powered by an ICE and an electric motor that derives power from a battery that is recharged via the car's braking system (Anastasiadou & Gavanas, 2022).

2.2.1 Global Market Size and Adoption Trends

Table 2.1: Global E-vehicle Sales

	EV Volumes (‘000s)	EV Market Share (%)
2013	206	0.20%
2014	320	0.40%
2015	543	0.60%
2016	791	0.90%
2017	1,262	1.30%
2018	2,082	2.20%
2019	2,276	2.50%
2020	3,244	4.20%
2021	6,768	8.30%
2022	10,522	13.00%

Source: Irle, R. (2022). *EV-volumes - The electric vehicle world sales database*. Retrieved from https://www.ev-volumes.com/.

Table 2.1 shows the trends in e-vehicle adoption worldwide, covering the period between 2013 and 2022. E-sale volumes have increased, rising from about 206,000 in 2013 to over 10.5 million in 2022. Similarly, the share of e-vehicles, as a proportion of the total number of cars sold worldwide, increased from 0.2% in 2013 to 13% in 2022.

2.3 Market Size and Adoption Trends in Switzerland

The number of new e-vehicles sold in Switzerland continues to increase – even faster than most conservative estimates, including projections made by Touring Club Switzerland (TCS) car association. According to recent estimates, the sale of alternative fuel vehicles climbed steeply in 2021 to account for nearly 50% of all new cars sold in. For the period between September and November 2021, fully electric cars accounted for 18.3% of the country’s new vehicle registrations, and plug-in cars

(electric and plug-in hybrids) registered a new record of 28%, according to TCS (Bradley & Turuban, 2022). The year ended with BEVs accounting for 13% of all car sales ad PHEVs representing 9% (Table 2.2).

Table 2.2: Sales/Adoption of Alternative Fuel Vehicles in Switzerland (2015-2021)

Vehicle Type	2015	2016	2017	2018	2019	2020	2021
BEVs	1%	1%	2%	2%	4%	8%	13%
PHEVs	1%	1%	1%	2%	1%	6%	9%
Other Hybrid Models	2%	2%	3%	4%	7%	14%	22%
Gas	0%	0%	0%	0%	0%	0%	0%

Source: Bradley, S., & Turuban, P. (2022). *Electric car sales pass "tipping point" in Switzerland*. Retrieved from https://www.swissinfo.ch/eng/sci-tech/electric-cars-pass--tipping-point--in-switzerland/47260170.

Table 2.2 depicts trends in the sale of e-vehicles in Switzerland from 2015 to 2021. The overall finding is that e-vehicles sales have been increasing. In 2015, for instance, BEVs accounted for only 1% of all Swiss car sales. By 2021, this figure had risen to around 13%. Similar trends are also observed with regard to the sales of PHEVs and other hybrid car models that surged from 1% and 2% to 9% and 22%, respectively.

The increasing adoption of e-vehicles in Switzerland has been described as a threshold milestone, with these car variants nearly going beyond the "tipping point" and moving into the mainstream. A number of factors have directly contributed to this growth – increased social acceptance, ongoing advancements in the technological front, and increasing choice of e-vehicle models. Collectively, these factors have made the development of electromobility progress faster than projected, and the 50% mark for full e-vehicles, which was expected only around 2030, is on track to be attained significantly faster (Bradley & Turuban, 2022).

Overall, vehicle sales in Switzerland were significantly dulled in 2021 due to various external factors such as COVID-19, supply chain disruptions, and computer

chip shortages that ensued. This was despite many Swiss consumers demanding new cars. Annual sales of 2021 were down slightly compared to 2020 but almost a quarter lower than the 2019 sales numbers (Figure 2.2).

Figure 2.2: New Car Sales in Switzerland

Source: Bradley, S., & Turuban, P. (2022). *Electric car sales pass "tipping point" in Switzerland*. Retrieved from https://www.swissinfo.ch/eng/sci-tech/electric-cars-pass--tipping-point--in-switzerland/47260170.

The graph shows the sales volume of new passenger cars in Switzerland in December. The new car sales peaked in 2016, with 35,325 being sold. In pre-COVID-19 2019, a total of 34,825 cars were sold. This dropped to 24,523 in sales (2015-2021).

Of all the supply chain disruptions that affected e-vehicles production during and the ensuing period after the pandemic, the computer chip shortage was arguably one of the most significant, also affecting e-car sales. Since the onset of the computer chip supply problem, automakers and car importers are reported to have systematically prioritized e-vehicle production and delivery plans, indicating the trend of fitting the valuable semiconductors in new e-vehicles rather than in ICE models. Looking ahead, studies, including Bradley and Turuban's (2022) findings, suggest

that this trend is poised to persist over the coming years. In fact, the report estimated that collectively, alternative fuel vehicles exceeded the 50% sales threshold by last year's end, with all e-vehicles accounting for 18-19%. Progress is still being made, and although the growth of e-powered vehicles remains uneven worldwide, Switzerland continues to feature at the summit of the global ranking. Meanwhile, Norway continues to outdo other nations. In 2021, pure e-vehicles made up close to two-thirds of Norway's new car sales as it pursues its objective of becoming the first nation to end the sale of ICE cars (Bradley & Turuban, 2022). Despite being an oil-producing economy, Norway continues to encourage and support the switch to zero-emission vehicles with reduced taxes on e-vehicles and the provision of a range of incentives and exceptions to beguile car buyers. This is an area where Switzerland is performing poorly, especially in comparison to countries like Norway, Iceland, and Sweden (Figure 2.2). In Switzerland, incentives advanced for plug-in e-vehicles are not coordinated. They also vary between cantons.

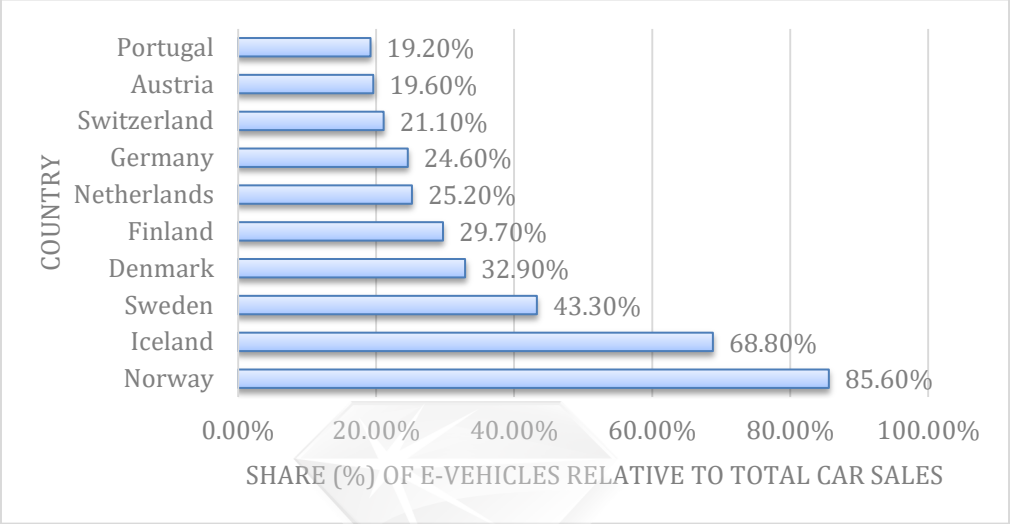
2.4 Theoretical Framework

As depicted in Tables 2.1 and 2.2, e-vehicles are gaining significant popularity among consumers in Switzerland and elsewhere. A number of theoretical frameworks have been advanced to help understand the consumers' perception of e-vehicles and their likelihood (or lack thereof) of using e-mobility. This study's overall aim is to establish e-vehicles as a feasible, sustainable, and long-term solution for the technology's future in the transportation sector, which can help decrease the dependency on fossil fuels as well as decrease GHG emissions. As an integral aspect of long-term benefits, the continued adoption of and subsequent transition to e-vehicles gives environmentally friendly and clean innovation to society. But despite positive environmental reasons and implications, the number of e-vehicles in usage remains inadequate. One of the underlying causes of this insubstantial acceptance (and ultimate adoption) of e-vehicles is mostly dependent on the consumers' perception regarding e-vehicles (Adnan, Nordin, Rahman, Vasant & Noor, 2016). However, the present study provides an inclusive outline of some of the common hurdles impeding consumer e-vehicle purchasing behavior, in addition to contemplating consumers' intention in e-vehicle direction. For instance, Wicki,

Brückmann and Bernauer (2022) examined how the uptake of electric cars could be accelerated. In the choice experiment, a sample of 1021 participants from Zurich, Switzerland, were asked to compare two sets of proposals on BEVs and decide their preference. The proposals encompassed ten properties of BEVs that could be affected by policymaking or car manufacturers. The ten attributes were also the most relevant mentioned in current literature – purchase price, energy costs, P.T. day pass, car exchange, government subsidy, maintenance costs, charging time, warranty duration, driving range, and charging guarantee.

In Wicki, et al. (2022) seminal analysis, Switzerland was selected for four main reasons. First, it has one of the worst performers in vehicular emissions in Europe. Second, the country has a high vehicular density and substantial external costs. Third, the country has comparatively low BEV adoption rates (in relation to its peers) (Figure 2.3) despite the income levels being high (i.e., the cost is not a hindrance to adoption). Fourth, the country has a superb public transport network that can permit the substitution of private cars with long-distance trains, yet this is not so. Thus, the examination of the drivers and barriers to BEV adoption from the consumer's perspective was necessary. From the findings, the main obstacles to adoption were mainly technical and economic in nature. Cost factors such as buying price and warranty and technical factors such as the range of the vehicles and the charging time affected their decisions. This means that introducing supply-side measures such as prohibiting the use of fossil-fuel vehicles can accelerate BEV adoption. Attractive leasing policies can also reduce the financial barriers and fears surrounding technology risks, such as strong depreciation linked to the fast-paced innovation in car batteries.

Figure 2.3: E-vehicle Adoption among Selected Countries



Source: Bradley, S., & Turuban, P. (2022). Electric car sales pass "tipping point" in Switzerland. Retrieved from https://www.swissinfo.ch/eng/sci-tech/electric-cars-pass--tipping-point--in-switzerland/47260170.

The graph shows the proportion of e-vehicles relative to total car sales (2021) among select countries. Norway leads with e-vehicles making up 85.6% of its total car sales in 2021. Switzerland ranks far behind with e-vehicles sales, accounting for 21.1% of its total car sales.

In another study, Abbasi, et al. (2021) used the Unified Theory of Acceptance and Technology (UTAUT) to assess the motivation of consumers toward EV adoption in developing countries. In the study, a random sample of 199 participants from Malaysia took part in the questionnaire assessment. From the findings, motivational factors such as technophilia and perceived environmental knowledge and concerns affected the intentions of customers to buy EVs. These concerns stem from the scientifically proven fact that the transportation sector is a major contributor to GHG, and electric vehicles offer a promising solution for reducing emissions and promoting sustainable transportation. By understanding the motivations and barriers to electric vehicle adoption and dual ownership, researchers can identify ways to encourage more people to adopt electric vehicles and reduce their carbon footprint. On the other

hand, effort expectancy (i.e., the expectation that EVs will require less effort to operate and save on fuel and time) also had a positive impact on consumer motivation. Social influence also had a significant positive relationship with consumer motivation. This is because Malaysia is a collectivist nation, meaning that individuals have strong ties to their extended families. Through these relationships, therefore, their EV adoption decisions can be influenced. As such, consumer awareness and knowledge about the ecological benefits of EVs can influence consumer perception and purchase of EVs.

Likewise, Brückmann and Bernauer (2020) examined the factors that drive public support for policies encouraging EV adoption. In the choice experiment, a sample of 5325 car holders from four cantons in Switzerland (i.e., Zurich, Zug, Schwyz, and Aargau) participated in the survey. The study assessed two things. First, it sought to determine whether revealing the cost implications of EV funding policies negatively affects public support. Second, to determine the extent of public support for EVs among both EV holders and non-holders. The findings showed strong support for EV policies in both groups, with EV holders showing more robust support for policies encouraging EV adoption. These sentiments remain stable even if the policy funding implications are revealed.

Anastasiadou and Gavanas (2022) undertook a near-similar study and investigated the key factors influencing EV adoption regarding private passenger cars. In the systematic review, 61 recent international studies published between 2020 and 2022 were assessed to identify the barriers and motivators. These factors were then grouped based on the PESTLE model (i.e., political, economic, social, technological, legal, and environmental dimensions). Political factors included purchase subsidies, tax reductions, electricity tariff reductions, information awareness, policies related to public charging infrastructure, green certification policies, and policies bundling EVs with renewable energy. Economic factors included vehicle buying cost, maintenance cost, fuel economy, and the depreciation costs of EVs. Social factors included social status, family/peer pressure, personal attitudes, EV driving experience, daily transport patterns, travel distance, and demographic features such as gender and age. Technological factors included vehicle-to-grid connectivity, smart vehicle technology, EV range, availability of skilled technical support personnel, charging speed, and the

availability of charging infrastructure. Legal factors included the restrictions placed on car ownership and use and the coverage of less privileged consumers. Lastly, the environmental factors included the recycling of Lithium=ion batteries and the level of vehicular emission. Overall, the availability of charging infrastructure and the seed of charging were the strongest determinants. For this reason, the study recommended investment in such infrastructure as well as stepping up consumer awareness of EV benefits, especially regarding their environmental impact and lower operational/maintenance cost.

Also, Bryła, et al. (2023) conducted a systematic review of EV adoption. A sample of 57 articles published within the 2015-2022 duration was evaluated. From the findings, the factors that influence EV adoption include socioeconomic factors, sustainability, lower operation cost, usage satisfaction, and financial incentives. The barriers included limited battery range and charging infrastructure and unclear EV policies by the government. Drawing insights from the above studies as well as Adnan et al. (2016) analysis of the same, it is apparent that most of the existing literature on e-vehicle adoption has tried to examine the issues mostly from the perspective of e-vehicle diffusion. In comparison, this research articulates consumer perception and attitudes, which provides a broad but in-depth perspective on consumer attitudes and the decision-making process regarding e-vehicle adoption. As such, the aim is to expand this line of inquiry in order to understand better the consumers' psychology – emotions, attitudes, behavior – and, ultimately, the decision to adopt (or not) e-vehicles. Table 2.3 summarizes selected empirical and theoretical studies on e-vehicles in regard to their findings with enablers and impediments perceived by consumers.

Table 2.3: Summary of Factors Influencing E-vehicle Purchases and Relevant Theories

Study	Sample Size	Country/Study Area	Methodological Approach/Study Design	Theories Adopted	Factors Influencing e-vehicle purchase
Krause, Lane, Carley & Graham (2016)	961	United States	Quantitative	Consumer Culture Theory (CCT)	-Cost of purchase/initial acquisition -Possible cost-savings on fuel
Barbarossa, Beckmann, De Pelsmacker, Moons & Gwozdz (2015)	2,005	Denmark, Belgium, and Italy	Quantitative; Online Survey	Theory of Planned Behavior (TPB)	-Environmental concern -Green moral duty
Wang, et al. (2014)	433	China	Quantitative	TPB	-Cost reduction -Environmental concern -Personal moral norm
Noppers, Keizer, Bolderdijk & Steg. (2014)	105	Netherlands	Quantitative; Survey	Self-congruency, Costly Signaling Theory (CST)	-Fuel cost -Symbols and social status

(Continued)

Table 2.3 (Continued): Summary of Factors Influencing E-vehicle Purchases and Relevant Theories

Study	Sample Size	Country/Study Area	Methodological Approach/Study Design	Theories Adopted	Factors Influencing e-vehicle purchase
Peters and Dütschke, et al. (2014	969	Germany	Quantitative Survey	Innovation & Diffusion	-Purchase cost -Fuel cost -Compatibility with own personal values, needs, and experience -Subjective social norms -E-vehicle trial-ability and experience
Schuitema, Anable, Skippon & Kinnear (2013)	2,700	United Kingdom	Qualitative, semi-structured interview	Grounded Theory	-Cost of purchase -Hedonic attributes (e.g., driving for pleasure and eagerness to enjoy new technology) -Pro-environmental identity -Symbolic attributes (e.g., lifestyle fit and feeling proud/embarrassed of e-vehicles

(Continued)

Table 2.3 (Continued): Summary of Factors Influencing E-vehicle Purchases and Relevant Theories

Study	Sample Size	Country/Study Area	Methodological Approach/Study Design	Theories Adopted	Factors Influencing e-vehicle purchase
Hong, Soh, Khan, Abdullah, & Teh (2013)	107	Malaysia	Quantitative; Online Survey	Decomposed TPB	-To reduce fuel cost -Subjective social norm -Perceived behavioral control

The table summarizes selected studies done on factors influencing consumer perception, attitudes, and subsequent adoption of e-vehicles. They represent a sample of studies across countries and highlight, in regard to their findings, the reasons (drivers and barriers) advanced by consumers for adopting (or not) e-vehicles alongside the relevant theoretical framework.

2.5 Analysis and Synthesis of the Literature

This section offers an analysis and synthesis of the existing literature on the factors that influence the intention to purchase electric vehicles (EVs) in Switzerland. By critically examining and integrating the findings from previous studies, the aim is to identify the key variables and trends that shape the decision-making process of individuals considering EV adoption. This analysis provides a strong foundation for the empirical investigation, enabling the development of hypotheses, research questions, and a conceptual framework that align with the unique context of the Swiss market. Through this analysis and synthesis, a comprehensive understanding of the motivations, preferences, and attitudes of individuals with an intention to buy an EV in Switzerland can be gained.

2.5.1 Categorization of Key Determinants

From the preliminary findings of the literature presented thus, the consumers' decision to purchase e-vehicles can be presented using various theoretical models that capture customers' perceived value of e-vehicles. In our case, however, and in order to systematically and comprehensively analyze the various aspects that affect the purchase of e-vehicles in Switzerland, an approach for the classification of major key determinants is proposed. This categorization is also used in Stockkamp, Schäfer, Millemann and Heidenreich (2021) and is based on the implementation of PESTLE framework analysis. This comprehensive framework is a consequence of (and emanates from) the synthetic overview of existing literature reviews and critical analyses of case studies and industry reports. More specifically, Kumar and Alok (2020), in their insightful research, grouped the main factors associated with consumer adoption of e-vehicles into five:

1) Technical and Product Features – e.g., cost of ownership (acquisition or purchase and maintenance), vehicle performance (e.g., mileage), product perception, and perceived and actual environmental benefits. Regarding the cost of ownership, e-vehicles offer several economic benefits, including lower fuel and maintenance costs than gasoline cars. They also come with attractive governmental incentives such as tax credits. By studying the factors that influence the adoption of electric vehicles and dual ownership, researchers can identify ways to help people save money and improve their financial well-being. Another critical issue is the performance and features of e-vehicles, such as acceleration, range, and driving experience, which can be essential factors in the decision to switch to ECs.

2) Government Policy – such as incentives and subsidies and availability of charging infrastructure. On the latter, the availability of public and private charging infrastructure is critical for adopting ECs, as it reduces range anxiety and enables drivers to recharge their vehicles conveniently.

3) Socio-demographic Factors – such as level of income and socioeconomic status (SECs), level of educational attainment, age, and gender

4) Social Influence – such as persuasive marketing and product advertisement campaigns as well as opinions and behaviors of family, friends, and colleagues, can play a role in switching to e-vehicles.

5) Consumer Behavior – such as environmental consciousness and awareness and lifestyle factors. Lifestyle factors, such as commuting distance, driving habits, and access to public transportation, can influence the decision to switch to e-vehicles based on practical considerations.

Anastasiadou and Gavanas (2022) implemented this categorization and argued that one of the principal factors for “clean” vehicle deployment is to cut costs and improve productivity while supporting innovation and enhancing awareness. Meanwhile, other studies (e.g., Schlosser, Maitra, Seidel, & Sempf, 2022) have identified, as primary factors for consumer readiness to adopt e-vehicles, the (1) economic factors (e.g., personal purchase/acquisition and maintenance costs), (2) technical factors (e.g., availability of vehicle charging infrastructure), (3) prevailing socio-economic atmosphere, and (4) personal perceptions. In other studies (e.g., Ruoso & Ribeiro, 2022), various categories; (1) socio-economic, (2) environmental,

(3) political, and (4) technical, are assessed to determine the customers' likelihood of adopting electromobility. Based on insights gleaned from the studies presented thus far, the classification adopted in such newer research as Anastasiadou and Gavanas (2022), and more so, the need to provide an in-depth understanding of the various factors influencing e-vehicle purchases in the context of Switzerland, the categorization of factors used in the present study consists of the following six major groups of the PESTEL framework for key e-vehicle adoption:

1) Political
2) Economic
3) Social or socio-demographic
4) Technical or technological
5) Legal
6) Environmental

E-vehicles are gaining significant acceptance. A number of theoretical frameworks have been advanced to help understand the consumers' perception of e-vehicles and their likelihood (or lack thereof) of purchasing e-mobility. This study's overall aim is to establish e-vehicles as a feasible, sustainable, and long-term solution for the technology's future in the transportation sector, which can help decrease the dependency on fossil fuels as well as decrease GHG emissions. As an integral aspect of long-term benefits, the continued adoption of and subsequent transition to e-vehicles gives environmentally friendly and clean innovation to society. But despite positive environmental reasons and implications, the number of e-vehicles in usage remains inadequate. One of the underlying causes of this insubstantial acceptance (and ultimate adoption) of e-vehicles is mostly dependent on the consumers' perception regarding e-vehicles (Adnan, et al., 2016).

However, the present study provides an inclusive outline of some of the common hurdles impeding consumer e-vehicle adoption behavior, in addition to contemplating consumers' intention in e-vehicle direction. For instance, Wicki, et al. (2022) examined how the uptake of electric cars could be accelerated. In the choice experiment, a sample of 1021 participants from Zurich, Switzerland, were asked to compare two sets of proposals on BEVs and decide their preference. The proposals encompassed ten properties of BEVs that could be affected by policymaking or car

manufacturers. The ten attributes were also the most relevant mentioned in current literature – purchase price, energy costs, P.T. day pass, car exchange, government subsidy, maintenance costs, charging time, warranty duration, driving range, and charging guarantee. As mentioned above Wicki, et al. (2022) seminal analysis, Switzerland was selected for four main reasons. Being the worst performers in vehicular emissions in Europe. Having a high vehicular density and substantial external costs. Having comparatively low BEV adoption rates (in relation to its peers) (Figure 3) despite the income levels being high (i.e., the cost is not a hindrance to adoption). Also having an advanced public transport system across the country.

Thus, the examination of the drivers and barriers to BEV adoption from the consumer's perspective was necessary. From the findings, the main obstacles to adoption were mainly technical and economic in nature. Cost factors such as buying price and warranty and technical factors such as the range of the vehicles and the charging time affected their decisions. This means that introducing supply-side measures such as prohibiting the use of fossil-fuel vehicles can accelerate BEV adoption. Attractive leasing policies can also reduce the financial barriers and fears surrounding technology risks, such as strong depreciation linked to the fast-paced innovation in car batteries.

2.6 Identification of Gaps or Limitations in the Existing Research

As mentioned previously there is still very little research on the motivations of purchasing electric cars in Switzerland, and even fewer differentiating people who switch and those who buy an electric car while still owning a gasoline one. Most existing research has geographical limitations, meaning they are conducted in their own specific geographic areas outside of Switzerland. Therefore, we cannot assume that the results will be the same in Switzerland as there are many differences to consider between different countries. There also seem to be an inconsistent in measurement as different studies decided to test different factors that could influence the motivation behind the purchase of electric cars. In order to get more information on this topic in Switzerland a few variables were selected to test for in this study. These variables are believed to be some of the most important ones based on existing research related to electric vehicles. A total of six independent variables were taken to

test against one dependent variable. These variables were tested using a mix of questions based on existing scales and some constructed specifically for this study. The variables are as follows:

2.6.1 Dependent variable

Decision or intention to purchase ECs, either by switching entirely to an EC or purchasing an EC while keeping a gasoline one.

2.6.2 Independent Variables

1) Environmental Concerns: The transportation sector is a major contributor to greenhouse gas emissions, and electric vehicles offer a promising solution for reducing emissions and promoting sustainable transportation. By understanding the motivations and barriers to electric vehicle adoption and dual ownership, researchers can identify ways to encourage more people to adopt electric vehicles and reduce their carbon footprint. The questions chosen to test this variable is a mix between the New Ecological Paradigm (NEP) scales developed by Dunlap, Van Liere, Mertig & Jones (1978), and original questions.

2) Cost of Ownership: Electric vehicles offer several economic benefits, including lower fuel and maintenance costs than gasoline cars. They also come with attractive governmental incentives such as tax credits. By studying the factors that influence the adoption of electric vehicles and dual ownership, researchers can identify ways to help people save money and improve their financial well-being. The questions to test this variable was also using a mixed of original questions and from Maqsood, et al. (2021) who looked into Willingness-to-Pay more for ECs.

3) Lifestyle Factors: Lifestyle factors, such as commuting distance, driving habits, and access to public transportation, can influence the decision to switch to ECs based on practical considerations. This variable had mostly specific questions created for this study, and a few based on the research by Choo and Mokhtarian (2004).

4) Social Influence: Social influence, such as the opinions and behaviors of family, friends, and colleagues, can play a role in switching to ECs. This variable has come up in several studies involving the behaviors of family and friends affecting an individual's decision. The Theory of Planned Behaviour (TPB) questionnaire was slightly modified and used by studies such as Wang, Wang, Yang,

Li and Song (2020). Some questions from this scale was used to try and test for the variable social influence.

5) Availability of charging infrastructure: The availability of public and private charging infrastructure is critical for adopting ECs, as it reduces range anxiety and enables drivers to recharge their vehicles conveniently. In order to measure this variable questions were created to investigate how much people knew about the charging infrastructures around them. These questions were based on the research by Funke, et al. (2019) talking about the necessity of amount of charging infrastructure for ECs.

6) Performance and Features: The performance and features of ECs, such as acceleration, range, and driving experience, can be important factors in the decision to switch to ECs. This variable has already been investigated involving vehicles in past studies, existing questions applicable to this study were found in the research by Vrkljan and Anaby (2011).

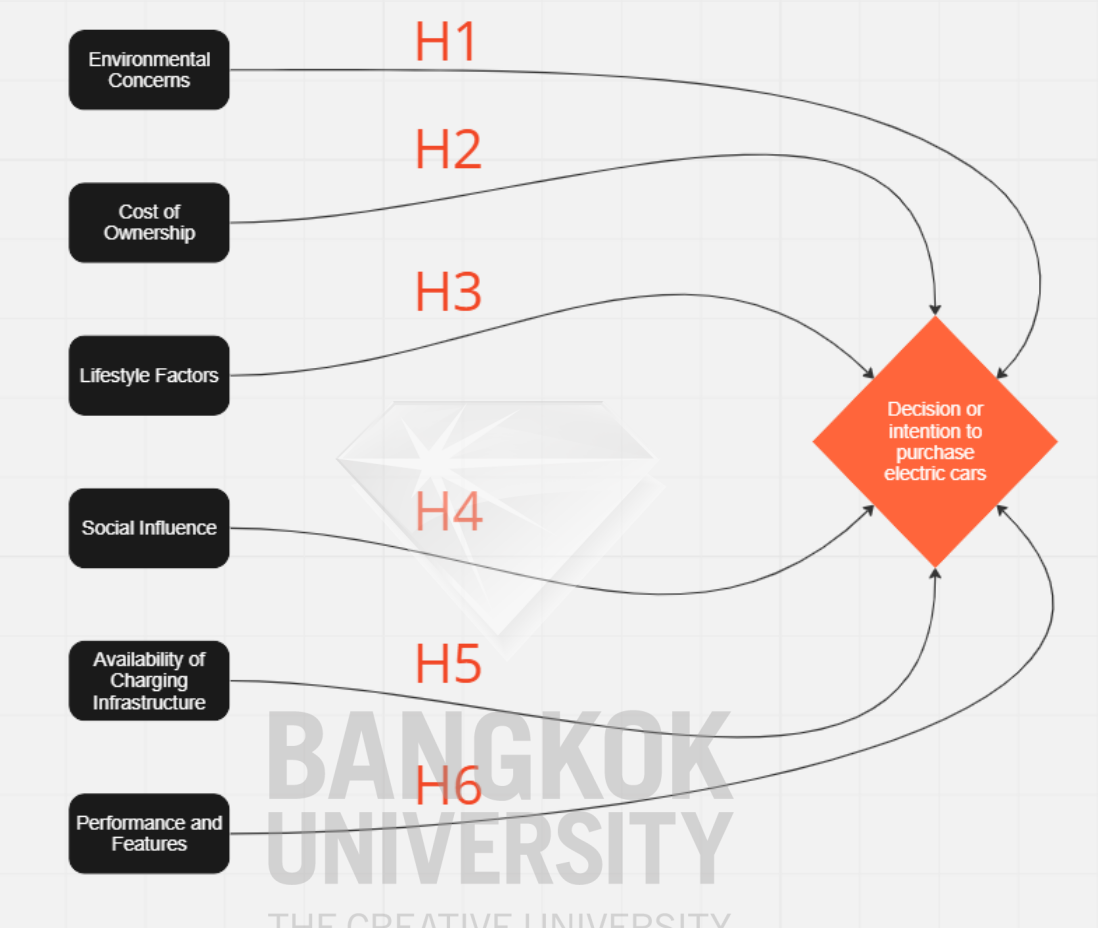
CHAPTER 3
METHODOLOGY

This chapter describes the methodology used in this study to examine the motivations, preferences, and attitudes of individuals who intend to purchase electric vehicles (EVs) in Switzerland. It provides a summary of the research approach, data collection methods, sample selection, and data analysis procedures. By utilizing a rigorous methodology, this study aims to produce reliable and valid insights into the factors that influence EV adoption in Switzerland. The chapter serves as a guide to ensure the transparency and credibility of the research process, leading to meaningful findings that contribute to the existing knowledge on EV adoption.

3.1 Description of the Research Methods Used to Answer the Research Question or Objective

This study will try to determine and investigate the different motivations behind people's intentions to buy an EV in Switzerland. In order to achieve this total of seven different variables were selected to focus on. The variables are separated into two different groups, independent variables, and a single dependent variable. For the independent variables I have chosen "environmental concerns", "cost of ownership", "Lifestyle factors", "social influence", "availability of charging infrastructure", and "performance and features". On the other hand, the dependent variable involves the intention to buy EVs in Switzerland. As shown in my conceptual framework I believe there is a positive relationship between the independent variables and the dependent variable (Figure 3.1). The study will also try to see if there are differences in the factors that affect the motivations of purchasing electric cars between the two groups, switchers and non-switchers. This could be useful if only one group wants to be targeted for future studies or projects.

Figure 3.1: Conceptual Framework



The figure shows the independent variables in black and the dependent variable in orange, and the relation between the two groups.

3.1.1 Hypotheses:

H1: The higher the level of environmental concern, the greater the likelihood of intention to buy an e-vehicle.

H2: The lower the cost of ownership, the greater the likelihood of intention to buy an e-vehicle.

H3: The more important e-vehicles fit with an individual's lifestyle, the greater the likelihood of intention to buy an e-vehicle.

H4: The greater the influence of social networks on an individual's decision-making, the greater the likelihood of intention to buy an e-vehicle.

H5: The higher the availability of charging infrastructure, the greater the likelihood of intention to buy an e-vehicle.

H6: The higher the perceived performance and features of an e-vehicle, the greater the likelihood of intention to buy an e-vehicle.

3.2 Justification for the Choice of Methods

This research paper used a survey research design to collect data from individuals living in Switzerland. These individuals had to own or be interested to own electric cars in the future. The survey was conducted using the help of a professional site, “Monkey Survey”, which sent out a questionnaire to a random sample of people in Switzerland who met the specified criteria. The criteria were people above the age of 18 living in Switzerland who also had an interest in electric cars. People under the age of 18 are not targeted as 18 is the legal age to obtain a driving license in Switzerland. The survey was made up of different questions meant to investigate the motivations and attitudes of people interested in buying electric cars in Switzerland. The survey also sought to identify factors that differentiate individuals that switch to electric cars and those who bought electric cars while still owning a gasoline car. The questionnaire was divided into four main parts the “screening questions”, which allowed for the filtering of participants to make sure we only got the responses of the people fitting the criteria of the study. Participants that did not fit into the criteria were redirected to the end of the questionnaire and asked about their demographics. The next section was the “general questions” which served the purpose of asking simple questions to generate interest in the participants. Then we move on to the “specific questions” which involve harder questions that will measure the construct. The last of the specific questions is the intention to buy question. Finally, we will have the “demographic questions” which collect some background information about participants such as their age and gender. The answers were on a four-point Likert scale, which does not involve a neutral option as it is necessary to know if a participant intends, or not, to purchase an electric car.

3.3 Explanation of the Data Collection and Analysis Process

For the analysis section of the paper, several things were done using the help of statistical software called Jamovi (The Jamovi Project, 2022; R Core Team, 2021). As the question in the questionnaire were created and not based on existing scales a factor analysis had to be run. Factor analysis, with Varimax, was used to reduce the data into more manageable groups of variables that represented underlying constructs relating to the intention behind purchasing electric cars in Switzerland. The factors were found by eliminating cross-loading in the data, by removing the questions with the highest uniqueness values first until a desired outcome was achieved. Once these factors are identified they could be used in subsequent analysis to observe the relationship between these factors and other variables like attitudes toward the environment and demographic characteristics. The next step started only when the desired results were achieved while keeping the cumulative percentage above 50%. A simple linear regression analysis was also performed to identify the factors that greatly influence the intention to buy electric cars among individuals living in Switzerland. The simple regression analysis is what will examine the relationship between the dependent variable, being the intention to buy electric cars in Switzerland, and the independent variables mentioned above. The factors identified in this step is used to find the average of each variable to carry out a regression analysis.

When running a regression analysis, it is also important to take into account the reliability and validity of the test. When talking about reliability we look into how consistent and stable the data is over time. To test for the reliability of the variables being tested Cronbach alpha was used. In most cases to determine if the analysis was reliable a Cronbach alpha of around 0.7 is needed. R square (R^2) was also required to have a value of close to 0.3 to be considered as satisfactory. The final adjusted R^2 of this study is 0.154 being a little low but still acceptable. The P value also had to be less than 0.05 with VIF less than 2.5 which was achieved by the study.

For the validity of the survey, before being sent out it was reviewed by a few people who would fit the target of the questionnaire to see if they agreed that the questions would measure what was intended to measure. A pilot test of the questionnaire was also sent to a group of 20 individuals in order to see if all the

questions were clear and if meaningful answers could be collected. In this case, the pilot test was successful in measuring what was trying to be studied.

Using Jamovi's T-test function, it was possible to investigate significant differences between two independent groups by looking at the means. This was done in order to find interesting information related to aspects like age or gender in comparison to the motivation to purchase an electric car. If the P value result of the T-test falls below 0.05, it shows a significant difference in the two groups being tested. If the value is above 0.05 then there are no significant differences. A look at both groups' means can help confirm the results, if the means are similar it means there are no significant differences, and vice versa.

The proportion test was also very useful to see interesting trends between people and allowed the grouping of different people together based on their answers. This function was used to look at the gender and level education of people that did not fit the criteria of the questionnaire.

The whole study was carried out while considering the ethical issues involved. The survey itself was created to be fully anonymous, and participant's names were not collected, therefore they cannot be directly connected to the responses. The main objective of this study was to look into the motivations and factors that influence the decision to buy electric vehicles in Switzerland. Which is not considered to be a sensitive topic for people in general. The questionnaire itself contained no offensive content, and the questions were straightforward and meant to be quickly understood by the participants. To ensure that participants knew the goal of the questionnaire it was clearly stated in the introduction, while also assuring them that answers were anonymous and would not be used for other purposes.

It was also clear that the survey was voluntary and that participants were free to end the survey at any time they wanted. The survey was sent out using the website "Monkey Survey" and no direct contact was made with the participants. Overall, the study followed ethical standards and tried to minimize any harm or offense to participants.

CHAPTER 4
RESULTS

This chapter presents the findings of the study, offering a comprehensive analysis of the data collected from the survey conducted among individuals interested in purchasing EVs in Switzerland. It examines the key factors related to EV adoption, such as demographic characteristics, cost of ownership, performance and features, social influence, and availability of charging infrastructure. By utilizing various data analysis techniques, such as descriptive statistics, regression analysis, and factor analysis, the results provide valuable insights into prospective EV buyers' motivations, preferences, and attitudes. These findings contribute to a better understanding of the factors that influence EV adoption and offer practical implications for policymakers and industry stakeholders seeking to promote sustainable transportation and encourage the widespread adoption of EVs in Switzerland.

4.1 Presentation and Analysis of the Data Collected

Once all the data was collected it then had to get processed to be able to use what was discovered in relation to the stated research questions and objectives. The results would also try to prove, or disprove, the previously mentioned hypothesis.

The survey ended up being distributed to a sample of 155 individuals of these, only 5 individuals did not complete the questionnaire fully giving a completion rate of 97%. The number of responses was very balanced when looking at the overall demographics of participants. There was a good amount of both females and males, at 49% females and 51% males. As my sampling group was random, the results can be generalized and utilized for the population of Switzerland.

In the screening questions of the survey, two questions were asked regarding the popularity of different electric car models. One of these questions asked people who had already driven an electric car in the past and which model it was. While the other question targeted people who have not yet driven one and which model would they hope to drive one day. Below are the figures that represent the answers to these two questions involving the most popular models of electric cars of the 150

participants who completed the survey, 69 people have never owned or driven an electric car and 81 have. Of the 69 people who have never driven or owned an electric car only 48 said they would consider purchasing an electric car in the future. Therefore, the remaining 21, who had no interest in purchasing an electric car, were directed to the end of the questionnaire as they did not fit into the targeted audience. Some more details on the people who did not meet the survey criteria will be explained later in this paper.

Figure 4.1: Electric Car Models People have Driven Before

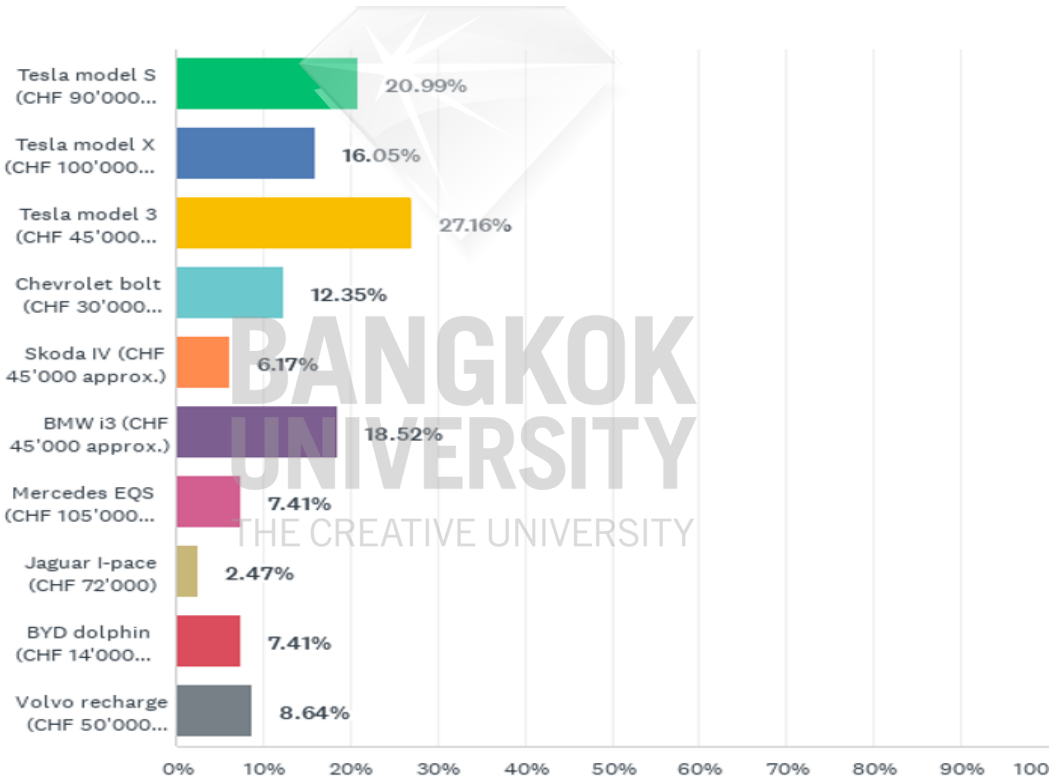
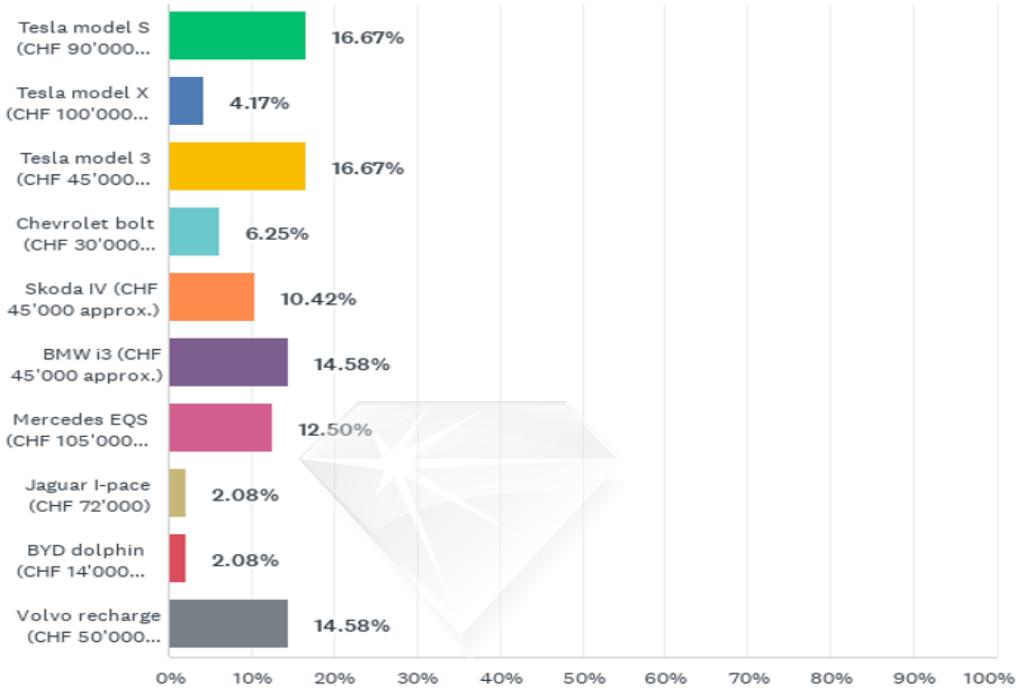


Figure 4.2: Electric Car Models' People would like to Drive in the Future



From both Figures 4.1 and 4.2, we see that most people have driven a Tesla or would like to drive one. Followed by European brands like the BMW or the Volvo. This data confirms the research found in the beginning of the paper. Saying that the dominating brand of electric car in Switzerland was Tesla followed by European brands. Clearly the British and Chinese electric cars have not been very popular among the Swiss population.

4.2 Factor Analysis

A factor analysis was conducted, Table 4.1, to identify underlying variables from the original set of survey questions. The method used was Varimax and the number of components was determined based on Eigenvalues greater than 1. Prior to the factor analysis, assumption checks were conducted, including Barletts test of sphericity and KMO measure of sampling adequacy. The factor loadings were sorted by size and any loadings below 0.4 were hidden to improve the accuracy of the analysis. Additional outputs such as component summary, initial eigenvalues, and scree plot were also examined.

Table 4.1: Principal Component Analysis (Component Loadings)

	Component			
	1	2	3	Uniqueness
Social influence 1	0.818			0.316
Social influence 3	0.773			0.352
Social influence 2	0.715			0.342
Social influence 4	0.567			0.522
Cost of ownership 2		0.787		0.353
Environmental Concern 1		0.722		0.445
Cost of ownership 3		0.653		0.473
Lifestyle factor 2			0.814	0.308
Cost of ownership 1			0.646	0.519
Performance and feature 1			0.564	0.523

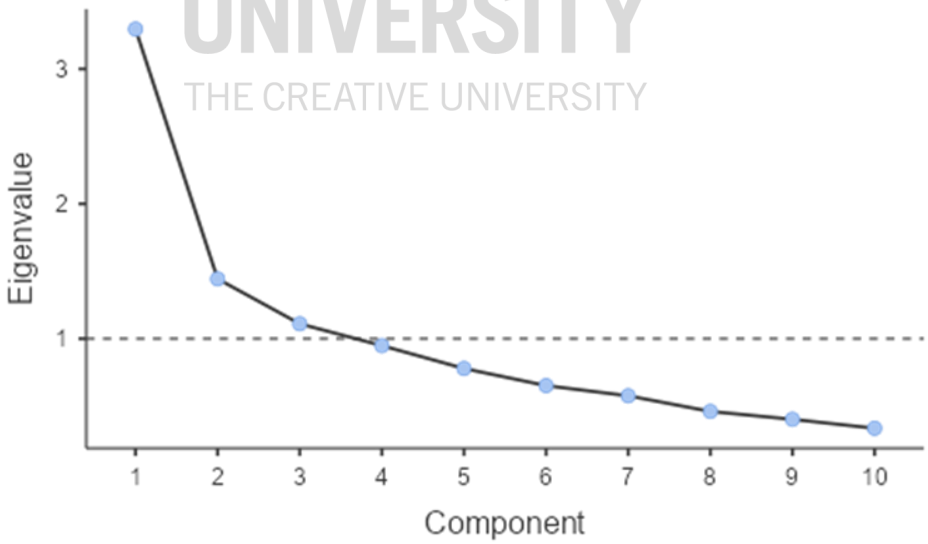
Note. 'varimax' rotation was used

After the analysis, all cross-loadings with high uniqueness were removed, leaving us with three useful variables: "Social Influences," "Cost of Ownership," and "Vehicle Features." The Variable “Social Influences” was made up of four different questions, “The opinions of my friends are important when making a vehicle purchase decision.”, “Social media has influences on my vehicle purchase decisions.”, “I am likely to choose an electric car because of the perceived social status associated with driving one.”, and “The opinions of my family are important when making a vehicle purchase decision.”. The variable “Cost of Ownership” includes three questions, “I am willing to pay a higher upfront cost for an electric car if it would result in lower long-term operating costs.”, “I am concerned about environmental issues related to transportation”, and “I am likely to choose an electric car because of its potential cost savings over time.” Finally, the variable “Vehicle Features” uses the three questions “The range of the vehicle (i.e., how far it can travel on a single charge) is important when choosing a vehicle.”, “The cost of ownership is important when choosing a vehicle.”, and “I am likely to choose an electric car because of its performance.” In Table 5 can see that the Eigenvalues reveal a good cumulative percentage of 68.0% on the component 4 line. The scree plot in Figure 4.3 also shows a clear separation between the 3rd and 4th component indicating three valid factors.

Table 4.2: Initial Eigenvalues

Component	Eigenvalue	% of Variance	Cumulative %
1	3.295	32.95	32.9
2	1.443	14.43	47.4
3	1.110	11.10	58.5
4	0.948	9.48	68.0
5	0.779	7.79	75.7
6	0.652	6.52	82.3
7	0.576	5.76	88.0
8	0.460	4.60	92.6
9	0.402	4.02	96.6
10	0.336	3.36	100.0

Figure 4.3: Scree Plot



4.3 Reliability Analysis

Following the factor analysis, a reliability analysis was performed on the three new variables. The results in Table 6 show that "Social Influences" had a Cronbach's alpha of 0.752, "Cost of Ownership" had a Cronbach's alpha of 0.636, and "Vehicle Features" had a Cronbach's alpha of 0.545. These values indicate acceptable levels of internal consistency for each variable.

Table 4.3: Reliability Analysis of variables from previous Factor Analysis

New Variables	Cronbach's α
Social Influences	0.752
Cost of Ownership	0.636
Vehicle Features	0.545

4.4 Linear Regression

To test the relationship between the three selected variables and the dependent variable, a simple linear regression was conducted. The R square value was found to be 0.177, indicating that the model explains only 17.7% of the variation in the dependent variable. The adjusted R-square was 0.158. However, the overall model test had a p-value less than 0.001, indicating that the model is statistically significant.

Further analysis of the model coefficients revealed that only two of the three variables were significant predictors of the dependent variable. "Cost of Ownership" had a significant p-value of less than 0.01, and "Vehicle Features" had a significant P-value of 0.024. However, "Social Influences" was found to be an insignificant predictor of the dependent variable with a p-value of 0.211, as can be seen in Table 4.4.

To address this issue, the "Social Influences" variable was removed, and a new linear regression was performed with only the remaining two variables, shown in Table 4.4. The adjusted R-square values did not change significantly, and the two variables left remained significant predictors with p-values less than 0.05. The collinearity statistic assumption test also showed that all three variables had VIF

values below 2.5, indicating that multicollinearity was not a concern. Nevertheless, the adjusted R-square value remains low under the 0.3 mark.

Overall, these results suggest that "Cost of Ownership" and "Vehicle Features" are significant predictors of the dependent variable, while "Social Influences" has no significant relationship with the dependent variable.

Table 4.4: Results of Simple Linear Regression with 3 new Variables

Model Fit Measures

				Overall Model Test			
Model	R	R^2	Adjusted R^2	F	df1	df2	p
1	0.421	0.177	0.158	8.98	3	125	< .001

Model Coefficients - DV

Predictor	Estimate	SE	t	p	Stand. Estimate
Intercept	0.646	0.2451	2.64	0.009	
FA Comp. 1 Mean	−0.109	0.0866	−1.26	0.211	−0.113
FA Comp. 2 Mean	0.394	0.1070	3.69	< .001	0.339
FA Comp. 3 Mean	0.249	0.1086	2.29	0.024	0.205

Table 4.5: Result of Simple Linear Regression Removing Variable “Social Influences”

Model Fit Measures

				Overall Model Test			
Model	R	R^2	Adjusted R^2	F	df1	df2	p
1	0.409	0.167	0.154	12.6	2	126	< .001

Model Coefficients - DV

Predictor	Estimate	SE	t	p
Intercept	0.530	0.228	2.33	0.021
FA Comp. 2 Mean	0.353	0.102	3.46	< .001
FA Comp. 3 Mean	0.221	0.107	2.08	0.040

Assumption Checks

Collinearity Statistics

	VIF	Tolerance
FA Comp. 2 Mean	1.16	0.859
FA Comp. 3 Mean	1.16	0.859

4.5 T-tests

To determine whether there are significant differences between the two groups of electric car buyers, namely switchers and non-switchers, an independent sample T-test was conducted. The switchers group included individuals who would like to trade their gasoline car to use an electric one instead, while the non-switchers group included individuals who would keep a gasoline car while owning another electric one. The T-test was conducted on the multiple-choice questions "I would buy an electric car as a replacement for my gasoline/diesel car.", or “I would buy an electric car as an additional car to have with my gasoline/diesel car.”, in relation to the Dependent Variable question.

The result of the T-test in Table 4.6 showed no significant differences between switchers and non-switchers as the p-value was 0.316, which is above the 0.05 threshold to have a significant difference. A look at the group descriptive further

confirmed this, as the two groups' means were very close, with the DV at 1.59 and the other at 1.72. The medians were also both at 2.00. These results are shown in the figure below.

Table 4.6: Independent Samples T-Test between Switchers and Non-switchers towards their Intention to Buy an EV.

Independent Samples T-Test

		Statistic	df	p	Mean difference	SE difference
DV	Student's t	−1.01	127	0.316	−0.131	0.130

Note. $H_a\ \mu_1 \neq \mu_2$

Group Descriptives

	Group	N	Mean	Median	SD	SE
DV	1	93	1.59	2.00	0.612	0.0635
	2	36	1.72	2.00	0.779	0.130

Another interesting point to look into is to see whether gender has an effect on the motivation to buy an electric car in Switzerland. Therefore, another T-test was done in order to investigate this relationship. The gender choices in the survey were, "Male", "Female", or "Other". As mentioned previously the participants were very evenly divided between females and males, with no respondents answering "Other" in this question. This makes the T-test possible and simple. The result of this T-Test shown in Table 4.7 also confirm that there is no significant difference between the two genders when it comes to the motivation to get an electric car. The p-value is 0.327, still above the 0.05 mark. Again, it was backed up by the means of the two groups being very close, at females being 1.69 and males being 1.57. With both medians again at 2.00.

Table 4.7: Independent Samples T-Test between Genders towards their intention to buy an EV

Independent Samples T-Test

		Statistic	df	p	Mean difference	SE difference
DV	Student's t	0.985	127	0.327	0.115	0.117

Note. $H_a\ \mu_1 \neq \mu_2$

Group Descriptives

	Group	N	Mean	Median	SD	SE
DV	1	61	1.69	2.00	0.765	0.0979
	2	68	1.57	2.00	0.555	0.0673

It was mentioned in the beginning of this chapter that participants who did not fit the criteria of the survey would be directed to the demographic questions. In most instances research papers will not gather data from these participants as it has not purpose towards their end goal. However, this paper still wants to briefly investigate people not suited to the study and whether there is a trend. Table 4.8 below shows the relationship between people not interested in buying an electric car and their demographics. Only the results deemed interesting were picked to be shown. The demographic questions revealing interesting data for participants who do not fit the criteria were, gender and level of education. It showed that most people not interested in ECs are mostly females or have a lower level of education.

Table 4.8: Proportion test Gender/Education Level of People not interested in ECs

Proportion Test (2 Outcomes)

Binomial Test

	Level	Count	Total	Proportion	p
Would you consider getting an electric car in the future?	Not interested in buying an EC	21	21	1.000	< .001
What is your gender?	Female	15	21	0.714	0.078
	Male	6	21	0.286	0.078
What is the highest level of education you have completed?	Did not attend school	1	21	0.048	< .001
	HS diploma or less	17	21	0.810	0.007
	Bachelor's degree	3	21	0.143	0.001

Note. H_a is proportion ≠ 0.5

4.6 Discussion of the Findings Concerning the Research Question or Objective

The purpose of this research was to examine the factors that affect people's decision to purchase electric cars in Switzerland. By conducting factor analysis and regression analysis, the study was able to gain a better understanding of how these factors are related to people's intention to switch to electric cars. It would help look into the main research question, “What are the intentions for purchasing ECs in Switzerland?”. The subsequent discussion focuses on the main findings of the study and their significance.

As many items were removed during the factor analysis process, due to high cross-loadings and low uniqueness. These items made up a couple of variables that ended up being left out as a result. Unfortunately, the variables “environmental concerns”, “lifestyle factors”, and “availability of charging infrastructure” did not appear in the factor analysis as the specific items or questions related to those variables did not load significantly onto any of the identified factors. In other words, they did not contribute to the underlying factors extracted from the analysis.

After the factor analysis, it was discovered that three variables - "cost of ownership," "vehicle features," and "social influence" - had an impact on the decision to purchase electric cars. However, "social influence" was found to be unrelated to the other factors and was therefore eliminated from further analysis.

The remaining factors, "cost of ownership" and "vehicle features," were found to have a significant correlation with the intention to switch to electric cars. The

study suggests that people in Switzerland who prioritize lower ownership costs and appreciate the performance and features of electric cars are more inclined towards adopting this alternative mode of transportation. This would allow us to see the motivation/preferences and attitude/perception of the people who would buy an EC and how it contributes to their intentions to purchase one. This is what the first and second sub RQ looked into.

The results suggest that individuals in Switzerland prioritize the economic aspects, such as ownership costs, and the performance and features of electric cars when considering a switch from conventional vehicles. These findings align with previous research highlighting the importance of cost savings, technological advancements, and driving experience in shaping consumer preferences for electric cars. More importantly allows us to identify the most effective marketing and communication strategies to promote the adoption of ECs. Which was the third RQ of this study.

It is worth noting that the exclusion of the "social influence" factor raises questions about its relative importance in the context of electric car adoption in Switzerland. Further research could explore other social and contextual factors that may influence individuals' decisions, such as peer influence, social norms, and government incentives.

People in Switzerland place greater importance on the economic aspects, such as ownership costs, and the performance and features of electric cars when contemplating a shift from traditional vehicles. These results are consistent with prior studies that emphasize the significance of cost savings, technological advancements, and driving experience in shaping consumer preferences for electric cars. Which could also help answer the fourth sub RQ on the demographic characteristics of switchers compared to non-switchers.

It is important to note that the omission of the "social influence" factor raises questions about its relevance in the Swiss context of electric car adoption. Future research could investigate other social and contextual factors that may impact people's decisions, such as peer influence, social norms, and government incentives.

CHAPTER 5
CONCLUSION

5.1 Summary of the Key Findings

This paper tried to investigate several aspects involving the influencing factors behind the purchasing of ECs. All while trying to separate participants into two groups, those who switch from a gasoline car to an electric one and those who buy an additional electric car while keeping a gasoline one. The paper has highlighted a few interesting findings in regards to this topic.

Firstly, from the data collected from the survey, we confirm that the leading EC brand in Switzerland is Tesla. It is the car most people have already driven and the one people want to drive. Following Tesla we have a lot of big European brands, such as BMW and Volvo that are also popular. This agrees with the data provided by Statista (2023). It is normal that Switzerland has higher numbers of European ECs rather than Chinese ones, as Switzerland neighbors these countries. This makes shipping a lot easier and cheaper. Switzerland is also a rather small country therefore, it has easily achieved to put charging stations across different cities. The Swiss government has also introduced a lot of incentives for people who decide to purchase an EC (Morris, 2021). Tesla on the other hand could be leading simply because it was the first company to sell electric cars on a large scale successfully, which allowed the Swiss population to get used to them before any other brands and this built brand recognition.

Secondly, it was found that the two most significant and influential variables in the purchase of ECs in Switzerland were “Cost of Ownership” and “Vehicle Features”. Which is intriguing as it means that people look at things like vehicle size and safety when deciding on buying an EC. Which also further explains why Tesla and European brands like Volvo are popular. The Tesla model Y has outshined all its competition regarding safety ratings in 2023. It has scored an almost perfect safety rating for adult and child occupants and road users. This is greatly due to its many safety assistance technology, which is innovating the whole industry (Bleakley, 2023). Then we have Volvo which is known to be the leaders in vehicle safety and is always fighting to innovate with new safety features. They were also the creators of

the 3 point seat belt that has saved numerous lives for decades (Volvo, 2023). Every popular car brand chosen by the participants also offers a wide range of different car sizes and types that will suit anyone. We also see that if people feel like an EC will save them money over time they would be willing to pay more upfront.

Having seen that there were no significant differences between switchers and non-switchers when it comes to purchasing an EC, we can say that they are motivated by the same variables. Coupled with that we also see no significant differences between males and females. This is useful to know as it means that overall marketing and communication strategies for promoting the adoption of ECs in Switzerland can be relatively consistent across different groups.

Unfortunately, as seen in Table 8 in the result section of this paper, the adjusted R-square value of the final regression analysis was 0.154. This is a relatively low number as the target was a value of 0.3, meaning the predictive power of the regression model is not very strong. This was a surprise as the survey questions were based on a mix of existing questions and specifically made questions that were supposed to be accurate in testing what this paper wanted to investigate. Furthermore, the pilot survey meant to identify weaknesses in the questions came back with positive feedback. This could be because Switzerland is a small country divided into 3 main parts that all speak different languages, influenced by their bordering countries. The biggest part is German speakers, followed by French speakers, and finally Italian speakers. Therefore, these different parts could have different views on the topic of electric cars. This theory was recently proven by a study done in Switzerland by the famous news company “Le Matin”. According to this study, 71% of Swiss citizens do not want anything to do with electric cars. It highlighted people’s different negative views towards ECs depending on which part of Switzerland they were from. The study showed that German speakers understood that the batteries in ECs were more harmful to the environment than the use of a gasoline car. While the Italian and French speakers were more bothered with the expensive price tags of ECs compared to traditional cars and did not think it was worth the price difference (Talos, 2023). This would explain why there would be a lot of inconsistencies in the survey answers depending on which part of Switzerland the participants were from, and why the predictive power of the regression model was not great.

Another interesting thing shown by this study involves people who are not at all interested in owning an EC. This was not the main intention of the research; however, this is also useful as it could further help understand the barriers to EV adoption in Switzerland. What was discovered was that there were similarities between the participants who do not care about ECs. These similarities were based on their gender and level of education. As mentioned previously, most people not fitting the criteria of this study were mostly female. This could be linked simply because females are usually less interested in cars than males. A study by Kutz (2023) has shown that a reason why women may be less interested in ECs is a lack of understanding surrounding ECs. The research pointed out that in 2021 less than 30% of ECs were bought by women. When questioned, most women stated a lack of familiarity with ECs. Some even said they did not know how to plug in an EC, while others said they did not feel safe waiting long periods at charging stations with no guards. It was also discovered that men generally purchased more cars than women, seeing cars more as toys while women as practical tools.

Looking at the education level of people unlikely to purchase an electric car we see an interesting result. A majority of these people (81%) only obtained a high school or less. Therefore, there could be a reason behind this that would be worth exploring further. According to research done in Sweden, it was proven that education level significantly affected the purchase rates of ECs. As with higher levels of education come a higher awareness of environmental impacts and more willingness to drive ECs to help with climate change (Malmhagen, 2018).

5.2 Implications of the Study

The research done by this paper offers useful insight for policymakers and industry stakeholders in Switzerland to create effective strategies to promote the purchasing of ECs. It is now known that both switchers and non-switchers focus on the same variables when looking to buy an EC. Therefore, they can both be targeted using similar strategies. The same thing applies to gender as there are no significant differences between Males and Females when it comes to buying an EC. This also helps marketing professionals in the automotive industry to create personal marketing and communication strategies. As we saw that “Cost of Ownership” and “Vehicle

Features" play an important role in purchasing an EC, these will be considered for marketing and communication strategies.

This study highlights the importance of environmental issues and the potential of EC in the fight to minimize carbon emissions. Knowing that "Environmental Concerns" did not push the Swiss public to purchase an EC, the government can now use other methods to try and sell more ECs. This would bring Switzerland one step closer to alleviating the consequences of climate changes altogether.

This paper also emphasises the necessity for educating consumers and creating awareness campaigns to correct misunderstandings and improve knowledge of ECs. By providing information about things like environmental benefits and cost savings efforts can be made to increase consumer knowledge and confidence in buying ECs.

5.3 Limitations and Future Directions for Research

There can be some limitations regarding this study. One is that the sample size of 150 participants may be too little to represent the entire population of people interested in electric cars in Switzerland. Additionally, since the questionnaire was given out randomly it may not have reached certain subgroups that have different opinions and attitudes which results in a different way of looking at electric cars. As the survey was distributed through the use of a professional website, there is some risk of sampling bias, this could limit the representativeness of the sample group. This study uses a cross-sectional design, meaning it only captures data at a specific given point in time. As a majority of the questions in the survey were made specifically for this research, there could be a limitation in measurement. Extra steps taken to ensure the validation of the survey instruments would strengthen the study's results.

Having mentioned all this, a couple of recommendations can be made for future research to further understand the adoption of electric cars and sustainable transportation. Future research can be conducted with a more extensive and diverse sample group. This would allow the findings to be more generalized and applicable to the population. It would also offer a broader perspective on the influential factors behind the purchase of electric cars. Conducting a Longitudinal Research would

provide insights into adoption dynamics and how factors may evolve over different stages of individuals' engagement with electric vehicles instead of just a frozen moment in time. A more extensive comparison study could also investigate the differences behind the intention to buy an electric car between regions and areas with other cultures. The study could also be narrowed to look at different speaking parts within Switzerland. Another alternative would be a qualitative approach to gathering data through interviews; the answers would be much more personal. This qualitative data could provide a rich understanding of adopters' subjective experiences and perspectives. There is still much more research to be done in this domain to fully understand the complex relationships between the variables and their potential implications in the innovative Electric car business.

5.4 Concluding Remarks

Initially from the conceptual framework, we started with 6 hypotheses. However, after the factor analysis cut out the independent variables related to the hypotheses H1, H3 and H5, and H4 they were removed to run the regression test. At the end we were only left with two hypotheses being supported which are H2 and H6. H2. The lower the cost of ownership, the greater the likelihood of intention to buy an e-vehicle.

According to the results of this study H1 regarding cost of ownership was supported. A significant positive relationship was found between the cost of ownership and the intention to buy an EV. This suggests that individuals who perceive a lower long-term cost of owning an EV are more likely to express an intention to purchase them.

H6. The higher the perceived performance and features of an e-vehicle, the greater the likelihood of intention to buy an e-vehicle.

This study also provided support for the hypothesis involving the perceived performance and features of EVs. A positive significant relationship was found between perceived performance, features, and intention to buy EVs. This suggests that people who see EVs as having more features and performance than traditional cars express an intention to buy one.

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