MASTER THESIS

Adoption of Electric Cars in Different Neighborhoods in Amsterdam – The Role of Social Networks and Social Influences

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Abstract

Electric cars have a high potential to reduce greenhouse gas emissions, mitigate climate change and to contribute to a more sustainable transport system. Therefore, it is of great significance to identify the most influential factors which could increase the adoption rate of electric cars. Various research on how different factors influencing consumer’s adoption of electric cars have been carried out. However, empirical studies show that the role of social network influences on consumers’ electric cars adoption is still underdetected. To narrow this gap, I conducted expert interviews and a survey with a choice experiment on citizens of Amsterdam in different neighborhoods to capture the influence of car attributes and social networks on the adoption of electric cars. Results show that in the city of Amsterdam, people are more likely to choose an electric car instead of other types of cars and their baseline willingness to pay for an electric car varies under different shares of their neighbors. Besides, people’s willingness to pay also differs in different areas or neighborhoods in Amsterdam. Furthermore, government incentives such as free parking or exemption of road tax could also further motivate consumers to adopt electric cars. These findings suggest that social networks play an important role on the adoption of electric cars and its influence among different neighborhoods in a city scale should get further attention. Based on this finding, governments could slightly adjust their strategies to better target the areas that have the highest potential to further increase the adoption of electric cars.
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1. Introduction

The increasing amount of greenhouse gases (GHG) are considered as a major challenge for climate change and global warming (Bates, Kundzewicz, Wu, & Palutikof, 2008). Transportation sector contributes to a 24% of global CO2 emissions which are considered as the main composition of GHGs (IEA, 2017). The growing concerns about climate change and energy security have accelerated a global transition to a more sustainable transport system. Electric cars, representing an innovative technology with the potential to reduce greenhouse gas emissions and support the mitigation of climate change, have gained substantial interests in recent years (Sierzchula, Bakker, Maat, & Van Wee, 2014).

The development of electric cars has played a significant role in the political agenda setting in European countries. For example, The Netherlands is one of the frontrunners in Europe with more than 4% of new car sales falling into the electric cars category in 2013 (Iea et al., 2014). It is said that Dutch government had already taken the first step in banning oil-based fuel cars in the Netherlands (Oz, 2018). Furthermore, Natuur & Milieu, a Dutch environmental group, published an action plan which aims for one million electric cars by 2020 (Berg van den, Harms, Schroeders, & Sondeijker, 2009). As there is still space for increasing the uptake of electric cars in Dutch cities (Hatton et al., 2009), compared to countries like Norway where electric cars are much more common (Iea et al., 2014), it is of great significance to find out the most influential determinants of the adoption of electric cars.

In previous studies, factors that determine the adoption of electric cars often focus on personal factors such as basic sociodemographic factors, financial costs and benefits of using an electric car, personal experiences and knowledge on electric cars (Barth, Jugert, & Fritsche, 2016) and contextual factors such as government incentives, information and administration process. Consumer environmental attitudes and adoption behaviors are also studied by many researchers in the context of electric cars acceptance. Beyond the factors above, people’s attitudes and decisions can also be driven by social factors. As people often tend to define themselves as a member of groups and communities, they can always be affected by what the surrounding people or their friends do or think (Barth et al., 2016). Therefore, social norms, self-identity and network effects can also act as key players to influence consumer’s uptake of electric cars.

As there is still limited research on identifying how social networks influence the adoption of electric cars, this paper aims to explore further the role of social networks in the uptake of electric cars. In addition, as Amsterdam aims to be the first emission free city in Europe, it would be particularly interesting to choose Amsterdam as a target city and investigate into the social networks influence in different neighborhoods in Amsterdam on the adoption of electric cars. To this end, I conduct preliminary expert interviews and an online survey with a choice experiment among the residents of Amsterdam who haven’t adopted an electric car yet. I will
focus on battery electric cars rather than other types of electric cars because they produce no
GHG emissions at the tailpipe and this increases their potential to be more “green” when
compared with other type of cars.

Our study shows that in the city of Amsterdam, people are more likely to choose an electric
car compare to other types of cars and their baseline willingness to pay for an electric car varies
under different shares of their neighbors. Regarding to different neighborhoods, people who
live in the West and Zuid area are more willing to choose an electric car compare with people
who live in the Oost, Centrum or Noord area. These findings suggest that social network
influences in different neighborhoods in a city scale should get further attention. Governments
may should slightly adjust their strategies to better promote electric car adoption, such as
putting more efforts or more charging infrastructures in the West and Zuid area of Amsterdam.
Furthermore, other than network influences, I also find out that there is a substantial increase
of preferences when an electric car comes with a free parking lot and an exemption of road tax.
This in a way suggests that policies such as providing free parking lot in a certain time period
(e.g. weekends or off-peak hours at weekday) for people who drive electric cars should also be
considered.

2. Literature Review

In the following, insights from a systematic literature review are summarized. Most of the
literature on consumer adoption of electric cars consider vehicle attributes, consumer
characteristics, social norms and social networks, environmental attitudes and contextual
factors as the most relevant factors that can influence individual’s decision or intension during
their adoption of an electric car.

Vehicle attributes are significant factors for consumers to consider during their adoption
process. Rasouli and Timmermans (2016) even argue that vehicle attributes are the most
important determinants of the adoption of electric cars. The acceptance of electric cars largely
depends on the related costs and attributes (Rasouli & Timmermans, 2016). Junquera et al.
(2016) also indicates that reductions in the price of electric cars should be a priority for
manufacturers. One recommendation is that manufacturers could produce a relatively low-price
electric car model with the most basic facilities for young consumers with low incomes
(Junquera, Moreno, & Álvarez, 2016). Moreover, Egbue and Long (2012) argue that the driving
range of electric cars could also influence consumers’ adoption intention. This might due to the
so-called “range anxiety”, which indicates consumers’ concern that they might be stranded in
an electric car halfway to their destination because it has insufficient driving range. Furthermore,
Egbue and Long (2012) show that there is a large gap between personal expectations of the
driving range of an electric car and their actually daily driving distances. Degirmenci and
Breitner (2017) further discuss that driving experiences can build up consumers’ range
confidence. Hoen and Koetsse (2014) suggest that an effective way to speed up the adoption of
electric cars can be that governments implement policies specifically targeting drivers with low annual mileage. Additionally, a major potential obstacle of electric car adoption can be related to recharging. Additionally, studies (Egbue & Long, 2012) show that many respondents express that if they can recharge electric cars very quickly, they would not require the driving range to be that long.

Numerous studies also highlight the importance of social influence on individual’s behavior towards electric cars adoption. The impacts of social norms and collective efficacy on individual’s decision-making process in the early adoption stages of electric cars have been evaluated (Barth et al., 2016). It is explained by Klöckner (2014) that social norms have an influence on people’s goal intentions. Moreover, Rasouli and Timmermans (2016) expressed that individual’s social networks can either potentially encourage individuals to purchase an electric car or hinder their desires. One interesting finding that supports this argument is the influence of friends first increase with the increasing share of friends and then substantially drop when the share of friends is high (75%). Different market shares of electric cars among individuals’ family members, friends or colleagues can also pose different levels of impacts on them (Rasouli & Timmermans, 2016). Shepherd et al. (2012) found out that the uptake of electric cars could be influenced more easily by the effect of word of mouth from conventional car drivers than electric car drivers. Shepherd et al. (2012) explained that in the early years there would always be a significant majority of conventional car drivers and if they did not “spread the word” the market might fail to pick up. Additionally, suggestions for further research into the promotion of campaigns and marketing strategies on consumer awareness are provided (Shepherd, Bonsall, & Harrison, 2012). Studies also indicate that symbolic attributes such as one’s status and identify play an important role for people to accept sustainable innovations (Noppers, Keizer, Bolderdijk, & Steg, 2014). Noppers et al. (2014) point out that a higher adoption rate can be achieved when people think adopting sustainable innovations can actually have positive outcomes for their social image or social status.

With regard to personal factors, various studies have been conducted on consumer adoption of electric cars. It has been shown that consumers between their mid-twenties and mid-sixties are more willing to adopt an electric car compared to people in other age groups (Junquera et al., 2016). Sierzchula et al. (2014) points out that higher income is likely to increase the uptake of electric cars. Personal experiences with electric cars can also have an impact on individual’s willingness to purchase an electric car (Barth et al., 2016). Franke and Krems (2013) indicate that experiences with electric cars can greatly lower individual’s range anxiety. Gyimesi and Viswanathan (2011) have found that individuals who have knowledge of and experiences with electric cars are more confident with their adoption decisions and they are more willing to pay a premium for electric cars. Barth et al. (2016) have also revealed that there is a positive relationship between perceived personal knowledge about an innovation and the adoption rate.
The better individuals conceive their knowledge about electric cars, the higher their adoption rate (Barth et al., 2016).

Various studies on electric car adoption have theorized the electric cars that are considered environmentally friendly are those that have the possibility to reduce environmental problems (Egbue & Long, 2012). Engue and Long (2012) point out that the potential for electric cars to lower CO2 emissions can attract certain group of consumers (Egbue & Long, 2012). Individual’s environmental values can result in certain environmental-protecting actions (Oliver & Rosen, 2010). Kahn (2007) indicates that there is a higher potential for individuals who are environmentalists to purchase hybrid electric cars compared to non-environmentalists. Furthermore, individuals can be critical about the real environmental impacts of electric cars’ especially with regard to the energy mix for producing electricity to charge electric cars (Egbue & Long, 2012). A major barrier for high uptake of electric cars is that some people can be uncertain about the electric car battery technology and the sustainability of electricity sources (Egbue & Long, 2012). Additionally, Egbue and Long (2012) also point out that even though the environmental benefits and sustainability factors of electric cars have a major impact on electric car adoption, they are still ranked behind in factors such as costs and vehicle performance.

Additionally, previous studies have investigated the impacts of contextual factors (e.g. government subsidies or taxation, electric car information provision, etc.) on consumer’s adoption of electric cars. Surveys, such as those conducted by Hoen and Koetse (2014), showed that government incentives could substantially influence the individual’s decision-making for purchasing an electric car and thus bridge the gap in preferences for conventional cars. For instance, the exemption from the Dutch road tax for alternative fuel vehicles has the potential to increase consumer’s willingness to pay even though it is still not sufficient to overcome the negative preferences (Hoen & Koetse, 2014). Studies of Degirmenci and Breitner (2017) show the importance of government subsidies which can make it easy for consumers to afford electric cars. Sierzchula (2014) further supports this argument by pointing out that government grants and promotion of an organization’s public image can influence the purchase decision of fleet managers. However, questions have been raised about the effectiveness of government subsidy schemes as Shepherd et al. (2012) claim that subsidies may not have any significant impacts on the sales since electric cars is still in its early adoption stage. Suggestions have been provided that subsidies might be fully taken up after the technology becomes fully competitive and the plug-in hybrids enter the market (Shepherd et al., 2012). Furthermore, the need for more information about electric cars because of consumer’s limited experiences is also mentioned in literature (Degirmenci & Breitner, 2017).

3. **Research Questions**

3.1 Main research questions
This research paper aims to address the following main questions:

What are the determinants of the uptake of electric cars among citizens of Amsterdam? In particular, what is the role of social networks for the uptake of electric cars in different neighborhoods in Amsterdam?

This research investigates into the determinants of the uptake of electric cars of the residents of Amsterdam, with a focus on analyzing how individual’s social networks, especially their neighbors, can influence their decision-making process when they purchase an electric car. Different areas in Amsterdam will be studied to find out which part of Amsterdam has the most potential to promote green neighborhood, and thus increase the uptake of electric cars through the influences among neighbors. In this research, an electric car refers to a battery electric car and it is defined as a plug-in electric automobile that is powered by one or more electric motors and uses energy stored in rechargeable batteries (Singer & Singer, 2017). Furthermore, the brands and models of electric cars are considered to have a negligible influence on consumers’ adoption of electric cars.

3.2 Sub questions

From the main question, the following sub questions are derived and will be addressed in the research:

- What are the barriers and benefits faced by consumers during their adoption of electric cars?
- Based on the factor influencing the early adopters, what can I recommend to policy makers and electric car dealers to increase the uptake for electric cars?

4. Theoretical background and conceptual framework

4.1 Existing theories for the adoption of new technologies

Theory on diffusion of new technology

The process of adopting new innovations has been studied by many researchers for more than 30 years (Sahin, 2006), and one of the most popular adoption theories is called “Diffusion of Innovation” (Rogers, 1995). According to Rogers (2003), adoption is a decision of “full use of an innovation as the best course of action available” (P.177). This theory consists of four key components: innovation, communication channels, social context and time. Innovation is an idea, practice, or project which is considered as novel by an individual or other adopter (Rogers, 2003). Communication channels are formal or informal ways that play a significant role in distributing messages or information about the new innovative product, persuasion of potential customers and encouragement in behavior (Bo, Rietveld, & Knockaert, 2013). Social context
which includes social structure and system norms that may affect the adoption of a new product (Rogers, 2003). The time dimension addresses the adopter categorization, rate of adoption and decision stages (Bo et al., 2013). Bo et al. (2013) points out that time dimension plays a critical role in the process of innovation diffusion and it indicates the adoption of a new product has explicit time dynamics such as different consumers make their decisions or enter the market at different points in time. Furthermore, Roger (2003) categorizes adopters into 5 different types including innovators, early adopters, early majority, late majority, and laggards. The relationship of innovation adoption with adopter categorizations and a cumulative rate of adoption is shown in Figure 1 (Bo et al., 2013).

![Figure 1. Rate of innovation adoption with adopter categorizations and a cumulative rate of adoption (the S-shaped curve) (Bo et al., 2013).](image)

**Social networks/influences/norms**

He et al. (2014) defined social network as a group of people who are interconnected following a random or particular pattern in graph. As individuals are interdependent and usually identify themselves as members of a group, it is conceivable that social networks are relevant to the adoption of electric cars (Barth et al., 2016). On one hand, people within the same network may change their behaviors to be more consistent with the behaviors of people whom they are connected with (He, Wang, Chen, & Conzelmann, 2014). Friedkin et al. (2006) defined this process as social influence, with which people’s behavior and attitudes can be shaped through the existing links within the social networks. In the context of electric cars, consumers are often influenced by the choices of people who they connect within the network when they purchase a new vehicle (He et al., 2014). Klöckner (2014) argues that social norms can influence individual’s goal intentions in the pre-decisional stage. Social norms are defined as the customary rules that govern behavior in groups and societies (Zalta & E.N., 2014). Noppers et al.,(2014) also points out that the more people think that the adoption of electric cars will have positive outcomes for their social status, the more likely they are to adopt. Rasouli and
Timmermans (2016) also conducted a national survey in the Netherlands indicating that the influences of social networks in consumer’s adoption of electric vehicles are not as important as vehicle attributes and the influences are relatively small (Rasouli & Timmermans, 2016).

**Personal factors**

Personal factors can be linked with personal cost-benefit related factors, personal knowledge and experiences and personal environmental concerns (e.g. Rezvani et al., 2015; Barth et al., 2016). Bamberg and Möser (2007) also point out that consumer attitude, i.e., the perceived sum of positive and negative possible consequences of a decision, is a predictor of intentions. In the context of electric cars, Potoglou and Kanaroglou (2007) argued that decreased capital costs and purchase tax relieves would increase the adoption rates of alternative-fuel vehicles. Ziegler (2012) also suggested that taxation of gasoline along with subsidization measures of alternative energy sources would promote electric vehicle adoption. These findings highlight the personal cost-benefit related factors that are frequently studied in previous researches on acceptance of electric cars (Barth et al., 2016). Moreover, personal experiences and knowledge on environment impacts are also important factors which affect their attitudes and intentions in the adoption process of electric cars (Rezvani, Jansson, & Bodin, 2015). Experiences can greatly reduce range anxiety (Franke & Krems, 2013). Environmental beliefs and consumer awareness of environmental issues have been theorized to have an impact on the intentions to purchase electric cars (Lane & Potter, 2007; Carley et al., 2013; Egbue and Long, 2012; Skippon and Garwood, 2011).

**Environmental attitudes**

Many studies on consumer electric car adoption stated that environmental values and beliefs are theorized to affect individual’s adoption behavior (Rezvani et al., 2015). Consumer attitudes towards electric cars have also been studied (Egbue & Long, 2012). Caperello and Kurani (2011) argued that consumers indicated their uncertainty about the positive environmental impacts of electric cars. Moreover, Kollmuss and Agyeman (2002) explained that consumer environmental concerns will not necessarily result in pro-environmental behavior. It is argued that there is a gap between consumer environmental attitudes and behavior (Kollmuss & Agyeman, 2002).

**Contextual factors**

Caperello and Kurani (2012) found that the high upfront costs of electric cars during the administration process can be a barrier to consumer adoption. Additionally, it is argued that the lack of basic information or knowledge for calculating the real costs and payback time of electric cars can affect the adoption (Caperello & Kurani, 2011). Government financial incentives are shown to positively influence consumers’ intention to adopt electric cars in a few studies (Krupa et al., 2014). However, the effects of financial incentives to increase the adoption
of environmental-friendly products needs to be further studied in order to avoid pitfalls (Rezvani et al., 2015).

4.2 Conceptual framework

Based on the existing theories and previous literature review, I identified four categories of factors that influence the decision process of electric car adoption. Figure 2 shows the conceptual framework on the adoption of electric cars.

![Conceptual framework on the adoption on electric cars](image)

The first category is social influence factor, in which we hypothesize that social image and identity, market share of electric cars among neighbors, friends, colleagues as well as family members and relatives would have a major influence on people’s adoption of electric cars. The second category is personal factors which comprise personal environmental attitudes, personal experiences on electric cars as well as sociodemographic factors (e.g. age, gender, education, income), we assume these different factors play an important role in consumer’s decision-making process of electric car adoption. The third category is consumer’s environment attitude, including environmental concerns, reduced CO2 emissions and responsibilities for the environment. The last category is contextual factors in which we presume governmental incentives, administration processes and information can motivate or hinder the adoption decision of electric cars. Appendix I shows the detailed influencing factors in each category.

5. Methodology
In the following, I present the methodology that my research is based on. I combined an in-depth literature review with expert interviews and an online survey including a choice experiment. The insights from the literature review and the expert interviews have been used to inform the online survey and choice experiment.

5.1 Experts interviews

After conducting literature review, I conducted preliminary interview studies with EV experts in the Netherlands to enlighten the factors that the experts deemed to be the most central for adoption of electric cars. Semi-structured interviews are a good method for explorative research since questions and topics can be asked in a free and flexible way which differs from structured interviews (Fylan, 2005). Fylan (2005) points out that it is appropriate to apply semi-structured interviews when the questions that are asked are likely to vary between various participants. This makes it applicable to this project because the experts being interviewed are from various backgrounds and they share different opinions relating to electric cars. In this study, EV experts are defined as experts who are working in a field that is directly linked to EVs or EV related fields. The approach of finding experts is through literature review, social media and snowballing. Asking for the personal opinions of EV experts through interviews served the following 3 purposes: First, the interviews served to get insights on the most updated EV research, company strategies and policies suggestions. Second, perspectives of EV experts not only can be used to inform the further research direction, but also provide the researcher with certain information that related to the decision-making processes on the future development of electric cars in the Netherlands. Their opinions on electric cars are related to the strategies that are mapped out to further accelerate the diffusion of electric cars in the Netherlands. Third, a comparison of different experts’ opinions on the most influential factors on Dutch consumer adoption of electric cars with the final quantitative survey results would thus allow for an estimation of the accuracy of decision making strategies.

In April 2018, I conducted a total of 6 semi-structured interviews with academic researchers, consultants, representatives of automobile companies and car association. Those people all have rich experience in the electric vehicle field. I included one representative of an international consulting company, one representative of a global automobile company, two professors of different Dutch academic institutions, and one senior researcher of a Dutch Environmental Institute. Additionally, I had a chance to get some further insights from one representative from a Dutch car association.

I asked about their opinions on the most important factors that can affect consumer’s choice of electric cars, factors that are still underdetected, interested groups of consumers and suggestions on public policies in the context of the Netherlands. The interview questions can be seen in Appendix I. Through interviews, I aimed to identify the most possible attributes to be included in the following survey questionnaire design. I guaranteed all the interviews would
be conducted anonymously and I carried out all the interviews face to face, via telephone or through an email with questions if a personal meeting could not be arranged. Interviews which were conducted face to face were all digitally recorded and took between 20 and 60 minutes. For the interviews that were not able to be recorded, I took notes of all the answers.

In this project, as expert interview method only constituted a part of the preliminary studies, I chose to analyze the results by summarizing and categorizing the main factors and attributes according to each question instead of transcribing all the interviews verbatim. The summary of interviews results can be seen in Appendix IV. In the Final step, I counted the frequencies of different factors and categories in order to identify the most common answers (see Appendix II).

5.2 Choice experiment

An online survey with a choice experiment on the adoption of electric cars in different neighborhoods in Amsterdam was developed and used in this research to collect data from a sample of the target population of Amsterdam citizens. The choice experiment task included 4 choice cards and other questions on individual driving habit, driving history, environmental attitudes and socio-demographics. The target population are the residents of Amsterdam (postcode areas 1000-1199) who haven’t adopted an electric car yet. To increase response rate, the questionnaire was translated into Dutch considering applying this study in the Netherlands.

5.2.1 Survey design

This survey consists of 2 parts: (1) the choice experiment, including 4 choice situations for each respondent in which they can choose between 3 electric cars with different characteristics; (2) Other questions on individual driving habit, car driving history, environmental attitudes and socio-demographics.

**Part I: Choice experiment**

To design a choice experiment, the first step is to select attributes and attribute levels. According to the results of the preliminary expert interviews, 6 attributes were selected including purchasing price, driving range, charging time at the closest charging point, free public parking, exemption of road tax. Details on the selected attributes and attributes levels can be seen in Table 1.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchasing price</td>
<td>€23,000/ €28,000/ €33,000</td>
</tr>
<tr>
<td>Driving range</td>
<td>100 km/300 km/500 km</td>
</tr>
<tr>
<td>Charging time at the closest charging point</td>
<td>30 min/5 h/7 h</td>
</tr>
</tbody>
</table>
The selected attributes can be divided into vehicle attributes (purchasing price, driving range, charging time at the closest charging point), contextual attributes (free public parking, exemption of road tax) and social influence attributes (% of adopters in the neighborhood). Each attribute had different levels. I included the levels that were appropriate for the targeted city Amsterdam. Importantly, when designing the choice card, the attribute “% of adopters in your neighborhood” was used as a context condition, i.e. an attribute that was fixed across the alternatives shown per choice card. By presenting respondents different electric car options under different percentage of adopters in their neighborhood, I aimed to find out how the adoption choices of neighbors can influence individual’s decision-making process on their adoption of electric cars. Explanations of each attribute can be seen in Table 2.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchasing price</td>
<td>The price that individual pays for an electric car, including all taxes</td>
</tr>
<tr>
<td>Driving range</td>
<td>Number of km that a car can drive with a fully charged battery under normal circumstances</td>
</tr>
<tr>
<td>Charging time at closest charging point</td>
<td>Time that is necessary to charge the battery of a fully electric car at the closest charging point. Fast-charging can charge an electric car to full battery in about 30 minutes, while normal speed charging can take up to 12 hours.</td>
</tr>
<tr>
<td>Free public parking</td>
<td>Free from paying a parking fee for electric cars in the Netherlands</td>
</tr>
<tr>
<td>Exemption of road tax</td>
<td>Free from paying tax when an electric car is used on a public road</td>
</tr>
<tr>
<td>% of adopters in the neighborhood</td>
<td>The percentage of people who purchase electric cars in your neighborhood. In this survey, an electric car refers to a battery electric car.</td>
</tr>
</tbody>
</table>

The example choice card for the online survey in Amsterdam is shown in Figure 3.
Part II: Questions on driving habit, environmental attitudes and socio-demographics

The second part of the survey aimed to find out other factors that can also influence individual’s goal intensions on purchasing electric cars beyond the factors that included in the choice experiment. This part consists of 3 sections. Section 1 started the survey by asking about individual’s car purchasing history, driving habit. In this section, I introduced a filter question to divide respondents into two groups: people who currently own a car and people who do not own a car. For people who already owned one or more cars, questions on their driving habit and driving distance in the previous year were asked. While at the same time, people who currently did not have a car were asked specifically the reason why they don’t own a car. Though this procedure, we can find out additional information on the reasons why people who live in Amsterdam don’t want a car. Section 2 included questions on people’s attitudes towards the environment, the influences of friends or colleagues on their decision-making process, and the availability of charging infrastructures. A 5-point likert scale is applied to rank individual environmental attitudes. Section 3 focused on asking people about their socio-demographics such as gender, age, household size, number of children, income, level of education and their occupation. The complete survey questionnaire text can be found in Appendix III.

5.2.2 Data collection
The survey was administered via SurveyMonkey, it is an online survey software that allows me to create and run online surveys. Questionnaires was pre-tested by experts and potential respondents (both English-speaking and Dutch-speaking persons) before being sent out to obtain feedbacks and suggestions on potential mistakes or misunderstandings. After adjusting the questionnaire, I launched the final survey on 9 May, 2018 and collected data until 30 May, 2018.

With the help of the EV Rijders association, the questionnaires were posted on the association’s Facebook group which included a certain number of potential respondents. Furthermore, the link was posted on the website of the Amsterdam Smart City platform and was further spread through social media such as Linkedin and Whatsapp. At the same time, personal interviews were randomly carried out in different districts of Amsterdam in order to make sure there were sufficient respondents in every different neighborhood.

The final sample consists of 121 respondents in total. There were 111 respondents who performed the English version of the survey and 10 respondents performed the Dutch version of the survey. Compared with just by sending online questionnaire link to potential respondents, personal interview with people randomly in different areas of Amsterdam had a higher response rate. Besides, the chance for these people to complete the whole questionnaire is also higher.

After the data was collected, I started to prepare the dataset for analysis. I excluded participants who did not finished the whole survey (n=19), and this resulted in a final sample size of N=102. Furthermore, I exported the data from the SurveyMonkey software into an excel sheet for later analysis. I prepared the data by coding the string variables into numerical variables, details can be seen in Appendix V. Furthermore, new variables which were included in the choice cards need to be created manually, since the choice cards were in picture format in the survey software. Those variables include market share of neighbors, purchasing price, driving range, charging time at closest charging point, free public parking and exemption of road tax. I also categorized the living places of all the respondents into four different areas according to their first four letters of the postcodes. The four areas are West, Zuid, Oost and Centrum & Noord areas. The data was analyzed using the statistical software SPSS and NLOGIT.

6. Results

6.1 Interview results

*Important determinants of electric car adoption*
Results show that more than 80% of the experts agreed that three car attributes including purchasing price, driving range, charging time were the most influential factors that determine consumer’s choice of electric cars. The experts also believed that consumer’s driving or using experiences of electric cars can have a high influence on their decision-making of electric car adoption too. Besides, government incentives (e.g. subsidies, tax reliefs, etc.), administration process (e.g. structure of payment of purchase price) as well as consumer knowledge on electric cars were mentioned by half of the experts that can have moderate to high influence on people’s uptake of electric cars. Besides, experts considered that social norms as well as social image factors have moderate to high influence on their adoption. Importantly, experts mentioned additional factors that might have important impacts on people’s adoption of electric cars, these factors include vehicle towing capacity (e.g. tail hitch), vehicle safety, fuel price and fuel availability, level of education, battery impact as well as battery recycle ability. Additionally, from the perspectives of experts, factors such as vehicle towing capacity, political belief, gender, income and driving range are still underdetected. Experts also showed more interests on evaluating the electric car adoption of young people with relatively lower income, people who might need a larger storage space or lease car drivers.

Relevant topics for future research directions

For future research directions, promoting green neighborhoods, increasing user’s awareness on financial benefits of electric cars as well as evaluating the electric car adoption of fleet managers are 3 topics that appear on the top list of the experts’ priorities. Finally, the most effective policies that can increase consumer’s uptake of electric cars, according to the opinions of experts, are reduction or elimination of road tax, tax credit or rebate and encouraging automakers to make more of their cars available as a full electric car model. One interesting finding was that free parking seems like an attractive way to increase the adoption of electric cars due to the current expensive parking fee in Amsterdam. Other policy suggestions such as promoting other types of government incentives (e.g. prepaid card with credits for electric car charging), increasing the mix model of transportation as well as banning cars in the city center.

Discussion of results
The interview results indicate that there are various factors that can influence consumer’s decision-making process during their adoption of electric cars. Apart from cost-related factors such as price, vehicle attributes (driving range, charging time, time to reach charging stations, etc.) and government subsidies, individual driving or using experiences of electric cars, social influence factors (social norms, social networks, etc.) and other governmental incentives (free parking, exemption of road tax, etc.) can also play a significant role on the adoption of electric cars. These variables might be strongly related to the acceptance of electric cars and yet their potential is not fully identified by researchers.

It is of great significance to explore other ways to promote acceptance especially in the early adopter stage in the Netherlands. Klöckner (2014) points out that social norms can influence individuals goal intentions in their pre-decisional stage. Rasouli and Timmermans (2016) also prove that social influence factors also play a role in people's adoption process of electric vehicles. Even though the results generated from our interviews do not indicate that social networks or social norms variables are as important as other factors when it comes to electric vehicle adoption, experts do reach an agreement that promoting green neighborhoods might be an interesting way to encourage individuals adopt electric vehicles.

Therefore, I decided to investigate the relation of social influences among neighbors on the acceptance of electric cars and find out if different neighborhoods in Amsterdam have different adoption rate of electric cars under the same influence of neighbors.

In the design of the choice experiment, I intended to apply the results generated from the preliminary expert interviews to include the attributes that deemed to be the most important in the choice task, and by asking respondents their preferences of cars under different situations (different percentage of their neighbors that have adopted electric cars), I aim to find out the impacts of social influences among neighbors on consumer adoption of electric cars.

6.2 Choice experiment results

This part first presents the results of descriptive statistics of the survey sample which were generated in SPSS. Then, results for the choice experiment are shown though a series of multinomial logit and latent class logit models which were run in NLOGIT.
6.2.1 Sample characteristics

**Social-demographic characteristics**

First, descriptive statistics for socio-demographic variables were analyzed to find out the representativeness of the sample I collected. These variables included gender, age, income, education, employment and household’s information. The sample is quite representative of the Dutch population in terms of gender due to a 53% of the respondents are male and 47% of the respondents are female. The ratio is 54/48 (1.13) which is quite close to the Dutch male/female at birth (1.05) (IndexMundi, 2018). However, 81% of the respondents are between 18-34 years old and only 2% of the respondents are above 65 years old, the sample is relatively young compare with the average Dutch citizen’s age, which is 42.6 years old (IndexMundi, 2018). About 55% of the households have their net monthly income below €3000 and only 21% of the households have their net monthly income higher than €3000. Additionally, there is a clear overrepresentation of the respondents in the sample with a higher education because 88% of them have obtained at least a vocational school degree. Besides, about 60% of the respondents are employed. The average household size is 2.35, which is quite representative compared to the national level of 2.2. Among all the respondents in our sample, 42% of them live in Amsterdam Zuid area, 27% of them live in Amsterdam west area, 18% of them in Amsterdam Oost area and 13% in the Centrum and Nood area. Detailed information on social demographic characteristics can be seen in Appendix VI.

**Individual driving habit, drive experiences and access to charging stations**

In our sample, about 73% of the respondents don’t have a car in their household. However, 78% of the respondents have driving experiences with either conventional cars, hybrid cars or electric cars. Among them, 24% of respondents have driving experiences with electric cars. An interesting finding is that people who live in Amsterdam Zuid area tend to have more cars compare with people who live in other areas in Amsterdam. It also shows that people who live in Amsterdam Centrum and Noord areas owns the least number of cars. However, around 40% of the respondents don’t actually drive every day, and about 35% of them drive below 50km every day. Around half of the respondents drove less than 10,000km last year.
Among the respondents who don’t have a car, several reasons can be seen from the results of the survey. Around 35% of the respondents think that they don’t need a car because the public transportation is good. 30% of respondents believe that a car is too expensive for them. 24% of them is simply due to they don’t own a driver’s license. Interestingly, A small group of people (around 6%) don’t want to have a car because they think driving a car would cause environmental impacts. Additionally, 3% of the respondents don’t own a car because they prefer to use car sharing.

With regard to electric charging point, 60% of the respondents have access to electric charging point at their home (either in their personal garage, in a community parking garage or on the street), 30% of the respondents have access to electric charging point at work (either in a community parking garage or on the street near their working place), and 40% of the respondents have access to electric charging point at parking meters in town. Surprising, only 28% of the respondents have easy access to fast charging and 72% of them either have no easy access to fast charging or don’t know if there is access to fast charging in Amsterdam.

Environmental attitudes and social influences

Surprisingly, around 55% of the respondents neither consider that the greenness of their car is an important social symbol for them, nor want other people to know that they are environmental-friendly persons. However, 89% of all the respondents agree that global climate change is a serious threat to human beings and 80% of them believe that the global climate change is mostly caused by human activities.

Another interesting finding is that when there is a growing number of people’s friends or colleagues driving electric cars, people’s choice towards cares will greatly shift to electric cars. Among all the respondents, 41% of them show that they will consider to purchase an electric car when more and more of their friends or colleagues are driving electric cars. 38% of them indicate that maybe they will choose to purchase an electric car, but the price and vehicle attributes are still their main concern.

6.2.2 Choice experiment results
In order to find out the relationship between people’s choice towards different types of cars and the attributes included the choice experiment such as purchasing price, driving range, charging time, free parking, exemption of road tax and different neighborhoods, three different models were applied which are basic multinomial logit model (MNL) with status quo dummy, MNL model with status quo dummy interacted with other attributes (e.g. the shares of neighborhoods that have adopted an electric car, different neighborhoods, access to charging stations at work) and latent class model with stated influence of network (friends/colleagues).

**Results from the MNL model with status quo dummy (Model 1)**

The basic MNL model with status quo dummy aims to find out which option respondent are more likely to choose between the status quo and electric cars. Second, respondents’ baseline WTP for an electric car and WTP for each attribute that comes with the car can be generated.

**Coefficients of each attributes**

Table 4 presents the results of the basic multinomial logit model (MNL) model including all the attributes (purchasing price, driving range, charging time, free parking, exemption of road tax), except the “different shares among neighbors” as they are fixed across alternatives.

| Table 4. Results of basic multinomial logit model including all attributes (except different shares in neighbors) |

<table>
<thead>
<tr>
<th>CHOICE</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Z</th>
<th>Prob.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE</td>
<td>-.06972***</td>
<td>.02147</td>
<td>-3.25</td>
<td>.0012</td>
<td>-.11180 -.02763</td>
</tr>
<tr>
<td>RANGE</td>
<td>.00314***</td>
<td>.00071</td>
<td>4.42</td>
<td>.0000</td>
<td>.00175 .00453</td>
</tr>
<tr>
<td>CTIME</td>
<td>-.15861***</td>
<td>.02814</td>
<td>-5.64</td>
<td>.0000</td>
<td>-.21377 -.10345</td>
</tr>
<tr>
<td>PARKING</td>
<td>.69247***</td>
<td>.12324</td>
<td>5.62</td>
<td>.0000</td>
<td>.45093 .93401</td>
</tr>
<tr>
<td>TAX</td>
<td>.49347***</td>
<td>.12352</td>
<td>3.99</td>
<td>.0001</td>
<td>.25137 .73557</td>
</tr>
<tr>
<td>STQUO</td>
<td>-1.64279***</td>
<td>.54594</td>
<td>-3.01</td>
<td>.0026</td>
<td>-2.71261 -.57277</td>
</tr>
</tbody>
</table>

**Model summary statistics**

| Log likelihood | -518.51681 |
| Pseudo R-square| 0.0609   |
| Number of observations | 102 |

**Note**: ***, **, * ***significance at 1%, 5%, 10% level.
Results show that all the choice attribute parameters are statically significant and have the expected sign. As expected, the purchasing price and charging time have negative influences on the probability to choose an alternative, while driving range, free parking and exemption of road tax all have positive influences on choosing an alternative. All coefficients are highly reliable because the coefficients all are significant at the 1% level (all their P-values are smaller than 0.01). The negative value of the coefficient of the status quo dummy can be observed which indicates the respondents in this sample are less likely to have chosen the status quo but are more likely to choose one of the electric car options.

**Marginal Willingness to pay (MWTP)**

Respondents’ marginal willingness to pay for each of the attributes can also be calculated, a negative value of MWTP means that the feature is less preferred by the respondents than the baseline. Therefore, by dividing the coefficients of each attribute by the coefficient of price (b1), I calculated the marginal WTP for driving range (b2), charging time (b3), free parking (b4), exemption of tax (b5) and status quo (b6). The results can be seen in Table 5.

**Table 5. Results of marginal willingness to pay for each of the attributes**

<table>
<thead>
<tr>
<th>WaldFcn</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Z</th>
<th>Prob.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fncn (1)</td>
<td>.04504***</td>
<td>.01018</td>
<td>4.42</td>
<td>.0000</td>
<td>.02508</td>
</tr>
<tr>
<td>Fncn (2)</td>
<td>-2.27509***</td>
<td>.62067</td>
<td>-3.63</td>
<td>.0003</td>
<td>-3.50236</td>
</tr>
<tr>
<td>Fncn (3)</td>
<td>9.93264***</td>
<td>3.41884</td>
<td>2.91</td>
<td>.0037</td>
<td>3.23184</td>
</tr>
<tr>
<td>Fncn (4)</td>
<td>7.07621***</td>
<td>2.70219</td>
<td>2.62</td>
<td>.0088</td>
<td>1.70209</td>
</tr>
<tr>
<td>Fncn (6)</td>
<td>-23.5636***</td>
<td>3.01524</td>
<td>-7.81</td>
<td>.0000</td>
<td>-28.4736</td>
</tr>
</tbody>
</table>

*Note: ***, **, * => Significance at 1%, 5%, 10% level.*

The results for respondent’s MWTP for each of the attributes are very interesting (Interpreted in 1000 EUR as I coded the price attribute in 1000 EUR). The MWTP of status quo is -23,564 EUR, which means respondents are willing to pay 23,564 EUR to avoid choosing the status quo. This can be considered as respondents’ baseline WTP for an electric car. If the car comes with a free parking lot, respondents are willing to pay 9,933 EUR more. If the car
comes with a tax exemption, respondents are willing to pay 7,078 EUR more. For every extra hour charging time, respondents are willing to pay 2,275 EUR less, and for every extra km range, respondents are willing to pay 45 EUR more. All the coefficients are highly reliable because the coefficients are significant at 1% level.

**Results from MNL model with status quo dummy interacted with other attributes (Model 2)**

The second model with status quo interacted with other attributes aims to find out which option respondents are more likely to choose between the status quo and electric cars when other attributes are interacted. Other attributes can be shares of neighbors that have adopted electric cars, different neighborhoods in Amsterdam and people who have access to charging stations at work. After accounting the influence of each attribute that interacted with the status quo, respondents’ baseline WTP for an electric car and WTP for each attribute that comes with the car can be generated.

1. **Status quo dummy interacted with the shares of neighbors that have adopted electric cars**

When the status quo dummy is interacted with shares of neighbors that have adopted electric cars, I aim to find out the influence of shares of neighbors that have adopted electric cars on respondents’ choice between status quo and electric cars. Therefore, a same MNL model was run in which this time I interacted the shares of neighbors that has adopted an electric car with the status quo dummy. Therefore, three status quo dummies were created for each of the three shares of neighbors (50%, 30% and 5%), the results can be seen in Table 6.
Table 6. Results of MNL model with status quo dummy interacted with the shares of neighbors that have adopted an electric car

**Model 2: Multinomial logit model**  
(Status quo dummy interacted with the shares of neighbors that have adopted an electric car)

<table>
<thead>
<tr>
<th>CHOICE</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Z</th>
<th>Prob.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE</td>
<td>-0.07374***</td>
<td>0.02350</td>
<td>-3.14</td>
<td>.0017</td>
<td>-0.11981, -0.02767</td>
</tr>
<tr>
<td>RANGE</td>
<td>0.00332***</td>
<td>0.00081</td>
<td>4.08</td>
<td>.0000</td>
<td>0.00172, 0.00491</td>
</tr>
<tr>
<td>CTIME</td>
<td>-1.6447***</td>
<td>0.03029</td>
<td>-5.43</td>
<td>.0000</td>
<td>-2.2384, -1.10511</td>
</tr>
<tr>
<td>PARKING</td>
<td>0.59483***</td>
<td>0.12340</td>
<td>5.63</td>
<td>.0000</td>
<td>0.45297, 0.93669</td>
</tr>
<tr>
<td>TAX</td>
<td>4.9101***</td>
<td>0.12457</td>
<td>3.94</td>
<td>.0001</td>
<td>2.4685, 7.3517</td>
</tr>
<tr>
<td>ST50</td>
<td>-1.80964***</td>
<td>0.67594</td>
<td>-2.68</td>
<td>.0074</td>
<td>-3.13465, -0.48503</td>
</tr>
<tr>
<td>ST30</td>
<td>-1.58445***</td>
<td>0.57723</td>
<td>-2.74</td>
<td>.0061</td>
<td>-2.71580, -0.45319</td>
</tr>
<tr>
<td>ST5</td>
<td>-1.75874***</td>
<td>0.98126</td>
<td>-3.02</td>
<td>.0029</td>
<td>-2.89499, -0.61480</td>
</tr>
</tbody>
</table>

*Model summary statistics*

- Log likelihood: -518.32055
- Pseudo R-square: 0.0813
- Number of observations: 102

*Note: ***, **, * = significance at 1%, 5%, 10% level.*

**Coefficients of each attributes**

Results show that all coefficients again have the expected sign. Purchasing price and charging time have a negative influence on the probability to choose an alternative, while driving range, free parking and exemption of road tax all have a positive influence on choosing an alternative. All coefficients are highly reliable because the coefficients all are significant at the 1% level (all their P-values are smaller than 0.01). The negative values of three status quo dummies suggests that the respondents in this sample are less likely to have chosen the status quo but are more likely to choose one of the electric car options.

Another interesting thing to see in the results is that the values of the status quo dummy slightly differ for the three shares of neighbors, which suggests that there is a very small, subtle influence of the shares of neighbors on the willingness to adopt an electric car. The results become more obvious when looking at the MWTP values of each attributes.

**Marginal Willingness to pay (MWTP)**

The MWTP values are again calculated by dividing the coefficients of the attributes by the coefficient of price (b1). The only different difference is that now we have three WTP values for the baseline WTP – the three shares of neighbors that have already adopted an electric car. The results can be seen in Table 7.
Table 7. Results of Marginal willingness to pay for each of the attributes (MNL model with status quo dummy interacted with shares of neighbors that have adopted an electric car)

<table>
<thead>
<tr>
<th>WaldFcns</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Z</th>
<th>Prob.</th>
<th>95% Confidence Internal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fncn (1)</td>
<td>.04498***</td>
<td>.00964</td>
<td>4.66</td>
<td>.0000</td>
<td>.02608 - .06389</td>
</tr>
<tr>
<td>Fncn (2)</td>
<td>-2.23052***</td>
<td>.59995</td>
<td>-3.72</td>
<td>.0002</td>
<td>-3.40639 - 1.05465</td>
</tr>
<tr>
<td>Fncn (3)</td>
<td>9.42298***</td>
<td>3.33978</td>
<td>2.82</td>
<td>.0048</td>
<td>2.87713 - 15.96883</td>
</tr>
<tr>
<td>Fncn (4)</td>
<td>6.65889**</td>
<td>2.68012</td>
<td>2.48</td>
<td>.0130</td>
<td>1.40596 - 11.91182</td>
</tr>
<tr>
<td>Fncn (5)</td>
<td>-24.5442***</td>
<td>3.69109</td>
<td>-6.65</td>
<td>.0000</td>
<td>-31.7786 - -17.3098</td>
</tr>
<tr>
<td>Fncn (6)</td>
<td>-21.4876***</td>
<td>4.23506</td>
<td>-5.07</td>
<td>.0000</td>
<td>-29.7882 - -13.1879</td>
</tr>
<tr>
<td>Fncn (7)</td>
<td>-23.8105***</td>
<td>4.18847</td>
<td>-5.68</td>
<td>.0000</td>
<td>-32.0198 - -15.6013</td>
</tr>
</tbody>
</table>

Note: ***, **, * ==> Significance at 1%, 5%, 10% level.

Results indicate that the respondents are willing to pay 23,811 EUR as a baseline WTP when 5% of the neighbors have adopted electric cars. When the share increases to 30%, they are willing to pay only 21,488 EUR. When the share increases to 50%, the WTP increases again to 24,544 EUR. This suggests that the baseline WTP varies with the shares, in a U-shaped way. When the share is low, respondents are willing to pay more. This maybe because they want to show off in the neighborhood as early adopters. If the share is medium, their WTP decreases. But if the share is high, their WTP decrease again. This might be because individuals feel that since everyone around them has driven an electric car and they need an electric car as well.

Furthermore, after accounting for the role of the share of neighbors on the baseline WTP, the values for the other attributes change slightly, but not that much. If the car comes with a free parking lot, respondents are willing to pay 9,423 EUR more. If the car comes with a tax exemption, respondents are willing to pay 6,659 EUR more. For every extra hour charging time, respondents are willing to pay 2,231 EUR less, and for every extra km range, respondents are willing to pay 45 EUR more. All the coefficients are highly reliable because the coefficients are significant at 1% level.

2. Status quo dummy interacted with different neighborhoods in Amsterdam

When the status quo dummy is interacted with different neighborhoods in Amsterdam (West, Zuid, Oost, Centrum & Noord), I aim to find out the influence of living in different
neighborhoods in Amsterdam on respondents’ choice between status quo and electric cars. Therefore, I applied the same model and interacted different neighborhoods in Amsterdam with the status quo dummy. I chose the Centrum & Noord area as a base category, so 3 status quo dummies were created, for each of the three areas (West, Zuid and Oost) there is one. The results can be seen in Table 8.

Table 8. Results of MNL model with status quo dummy interacted with different neighborhoods

<table>
<thead>
<tr>
<th>CHOICE</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Z</th>
<th>Prob.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE</td>
<td>-.02748***</td>
<td>.01259</td>
<td>-2.18</td>
<td>.0291</td>
<td>-0.05217 - 0.00280</td>
</tr>
<tr>
<td>RANGE</td>
<td>.00237***</td>
<td>.00063</td>
<td>3.74</td>
<td>.0002</td>
<td>.00113 - .00381</td>
</tr>
<tr>
<td>CTIME</td>
<td>-.13171***</td>
<td>.02633</td>
<td>-5.00</td>
<td>.0000</td>
<td>-.18332 - -.08009</td>
</tr>
<tr>
<td>PARKING</td>
<td>.71448***</td>
<td>.12458</td>
<td>5.73</td>
<td>.0000</td>
<td>.47030 - .95666</td>
</tr>
<tr>
<td>TAX</td>
<td>.60908***</td>
<td>.12444</td>
<td>4.09</td>
<td>.0000</td>
<td>.26519 - .75298</td>
</tr>
<tr>
<td>SQ_WEST</td>
<td>-.79570**</td>
<td>.40208</td>
<td>-1.98</td>
<td>.0478</td>
<td>-.158376 - -.00763</td>
</tr>
<tr>
<td>SQ_ZUID</td>
<td>-.62234*</td>
<td>.35562</td>
<td>-1.75</td>
<td>.0804</td>
<td>-.131993 - .07526</td>
</tr>
<tr>
<td>SQ_OOST</td>
<td>-.10374</td>
<td>.40297</td>
<td>-.26</td>
<td>.7968</td>
<td>-.88356 - .08607</td>
</tr>
</tbody>
</table>

Model summary statistics

| Log likelihood | -520.13110 |
| Pseudo R-square| 0.0580     |
| Number of observations | 102        |

Note: *** *, ** => significance at 1%, 5%, 10% level.

Coefficients of each attributes

Expect for the coefficient for the neighborhood in the Oost, other coefficients all have the expected sign. Price and charging time have negative influences on the probability to choose an alternative. Range, free parking and exemption of tax have positive influences on choosing an alternative. Expect for the coefficient for the neighborhood in the Oost, all other coefficients are reliable because the coefficients are significant at 1%, 5% or 10% level. The negative values of the two coefficients of the two status quo dummies (SQ_West and SQ_Zuid) indicates that respondents who live in the west and zuid neighborhoods are less likely to have chosen the status quo option but are more likely to choose one of the electric car options.

Marginal Willingness to Pay (MWTP)
I calculated the WTP values by dividing the coefficients of the attributes by the coefficient of price (b1). I got two WTP values for the baseline WTP for electric cars which are significant. The results can be seen in Table 9.

Table 9. Results of marginal willingness to pay for each of the attributes (MNL model with status quo dummy interacted with different neighborhoods)

<table>
<thead>
<tr>
<th>WaldFns</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Z</th>
<th>Prob.</th>
<th>95% Confidence Internal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fcn1(1)</td>
<td>.08628**</td>
<td>.03142</td>
<td>2.75</td>
<td>.0060</td>
<td>.02469 to .14767</td>
</tr>
<tr>
<td>Fcn2(2)</td>
<td>-4.79229**</td>
<td>2.14415</td>
<td>-2.24</td>
<td>.0254</td>
<td>-8.99475 to -.58964</td>
</tr>
<tr>
<td>Fcn3(3)</td>
<td>25.9972**</td>
<td>11.89544</td>
<td>2.19</td>
<td>.0289</td>
<td>2.6826 to 49.3119</td>
</tr>
<tr>
<td>Fcn4(4)</td>
<td>18.5235**</td>
<td>8.82816</td>
<td>2.10</td>
<td>.0359</td>
<td>1.2206 to 35.8264</td>
</tr>
<tr>
<td>Fcn5(5)</td>
<td>-28.9623**</td>
<td>12.52753</td>
<td>-2.31</td>
<td>.0208</td>
<td>-53.5058 to -4.3988</td>
</tr>
<tr>
<td>Fcn6(6)</td>
<td>-22.6446**</td>
<td>9.81961</td>
<td>-2.31</td>
<td>.0211</td>
<td>-41.8906 to -3.3985</td>
</tr>
<tr>
<td>Fcn7(7)</td>
<td>-3.77474</td>
<td>13.67805</td>
<td>-28</td>
<td>.7625</td>
<td>-30.67931 to 23.02983</td>
</tr>
</tbody>
</table>

Note: **, * => Significance at 1%, 5%, 10% level.

Results show that people live in the west neighborhood have a higher willingness to pay (28,952 EUR) for electric cars than people who live in the Zuid neighborhood (22,645 EUR). Besides, there is no willingness to pay values for electric cars for people who live in the Oost, centrum and Noord neighborhood. After accounting for the role of different neighborhoods on the baseline WTP, the values of the other attributes change greatly. If the car comes with a tax exemption, respondents are willing to pay 18,524 EUR more. If the car comes with a free parking lot, respondents are willing to pay 28,952 EUR more. For every extra hour charging time, respondents are willing to pay 4792 EUR less and for every extra km range, respondents are willing to pay 86 EUR more.

Results from latent class model with stated influence of network (friend/colleague) (Model 3)

The latent class model with stated influence of network (friends/colleagues) aims to find out the influence of networks (friends/colleagues) on respondents’ choice between status quo and electric cars. In this situation, the “stated influence of networks (friends/colleagues)” means that respondents stated that they will or maybe will consider to buy an electric car when their friends or colleagues already adopted an electric car.
Coefficients of each attributes

The positive and significant coefficient of the network influence (people who answered either “yes” or “maybe”) shows that these people are more likely to be in latent class 1. In latent class 1, results show that the negative value of the status quo dummy indicates that people are more willing to choose an electric car instead of status quo when they are influenced by their friends or colleagues who have adopted an electric car. This coefficient is highly reliable because the coefficient is significant at 1% level. The results can be seen in Table 10.

Table 10. Results of latent class model with stated influence of network (friends/colleagues)

<table>
<thead>
<tr>
<th>CHOICE</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Z</th>
<th>Prob.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Utility parameters in latent class --&gt; 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRICE[1]</td>
<td>-0.07587***</td>
<td>0.02362</td>
<td>-3.21</td>
<td>.0013</td>
<td>-1.2216 -0.2958</td>
</tr>
<tr>
<td>RANGE[1]</td>
<td>0.00346***</td>
<td>0.00081</td>
<td>4.27</td>
<td>.0000</td>
<td>0.00187 0.00504</td>
</tr>
<tr>
<td>CTIME[1]</td>
<td>-1.6916***</td>
<td>0.3044</td>
<td>-5.56</td>
<td>.0000</td>
<td>-2.2282 -1.0950</td>
</tr>
<tr>
<td>PARKING[1]</td>
<td>0.68676***</td>
<td>0.12529</td>
<td>5.35</td>
<td>.0000</td>
<td>0.45120 0.94233</td>
</tr>
<tr>
<td>TAX[1]</td>
<td>0.48101***</td>
<td>0.12800</td>
<td>3.82</td>
<td>.0001</td>
<td>0.23404 0.72787</td>
</tr>
<tr>
<td>STQUO[1]</td>
<td>-2.97527***</td>
<td>0.63318</td>
<td>-4.70</td>
<td>.0000</td>
<td>-4.16228 -1.73426</td>
</tr>
<tr>
<td></td>
<td>Utility parameters in latent class --&gt; 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRICE[2]</td>
<td>-0.38813</td>
<td>0.27811</td>
<td>-1.40</td>
<td>.1628</td>
<td>-0.93323 0.15696</td>
</tr>
<tr>
<td>RANGE[2]</td>
<td>-0.07005</td>
<td>0.00700</td>
<td>1.44</td>
<td>.1505</td>
<td>-0.00365 0.02378</td>
</tr>
<tr>
<td>CTIME[2]</td>
<td>-0.32708</td>
<td>0.27334</td>
<td>-1.20</td>
<td>.2315</td>
<td>-0.86281 0.20865</td>
</tr>
<tr>
<td>PARKING[2]</td>
<td>-0.08467***</td>
<td>1.17329</td>
<td>-0.70</td>
<td>.4925</td>
<td>-2.38427 2.21494</td>
</tr>
<tr>
<td>TAX[2]</td>
<td>0.62736</td>
<td>0.99438</td>
<td>0.63</td>
<td>.5281</td>
<td>-1.32155 2.57626</td>
</tr>
<tr>
<td>STQUO[2]</td>
<td>-5.17529</td>
<td>6.26526</td>
<td>-0.83</td>
<td>.4088</td>
<td>-17.45468 7.10439</td>
</tr>
</tbody>
</table>

This is THETA (01) in class probability model.

| CONSTANT| 49.841      | .45680    | 1.07 | .2846 | -41.463 1.41136        |
| NW_MA[1]| 2.36637***  | .78848    | 3.00 | .0027 | 82101 3.91173          |

This is THETA (02) in class probability model.

| CONSTANT| 0.0      | ..... (Fixed Parameter)..... |
| NW_MA[2]| 0.0      | ..... (Fixed Parameter)..... |

Model summary statistics

Log likelihood: -462.43381
Pseudo R-square: 0.1824
Number of observations: 102

Note: ***, **, * => Significance at 1%, 5%, 10% level.
Fixed parameter ... is constrained to equal the value or had a nonpositive standard error because of an earlier problem.
Table 11. Marginal willingness to pay for each of the attributes (latent class model with stated influence of network (friends/colleagues))

<table>
<thead>
<tr>
<th>WALD procedure. Estimates and standard errors for nonlinear functions and joint test of nonlinear restrictions.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wald Statistic</td>
<td>= 93.32988</td>
</tr>
<tr>
<td>Prob. from Chi-squared [10]</td>
<td>= .00000</td>
</tr>
<tr>
<td>Functions are computed at means of variables</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>WaldFns</td>
<td>Coefficient</td>
</tr>
<tr>
<td>Fnnc (1)</td>
<td>.04556***</td>
</tr>
<tr>
<td>Fnnc (2)</td>
<td>-2.22958***</td>
</tr>
<tr>
<td>Fnnc (3)</td>
<td>9.18365***</td>
</tr>
<tr>
<td>Fnnc (4)</td>
<td>6.33987**</td>
</tr>
<tr>
<td>Fnnc (6)</td>
<td>.02592**</td>
</tr>
<tr>
<td>Fnnc (7)</td>
<td>-8.4271</td>
</tr>
<tr>
<td>Fnnc (8)</td>
<td>-21814</td>
</tr>
<tr>
<td>Fnnc (9)</td>
<td>1.61635</td>
</tr>
<tr>
<td>Fnnc (10)</td>
<td>-13.3338*</td>
</tr>
</tbody>
</table>

Note: ***, **, * ==> Significance at 1%, 5%, 10% level.

After calculating the WTP values by dividing the coefficients of the attributes by the coefficient of price (b1) in latent class 1. The baseline WTP value for electric cars were observed. Results show that when people have friends or colleagues who already adopted an electric car, they are willing to pay 39,215 EUR as a baseline WTP for electric cars. After accounting for the role of network influences on the baseline WTP, the values of other attributes change slightly. If the car comes with a tax exemption, respondents are willing to pay 6,430 EUR more. If the car comes with a free parking lot, respondents are willing to pay 9,184 EUR more. For every extra hour charging time, respondents are willing to pay 2,230 EUR less and for every extra km range, respondents are willing to pay 46 EUR more.

6. Conclusion and discussion

In this paper, I have presented the results from a survey with a choice experiment among the residents in different neighborhoods in Amsterdam. The aim of this study was to explore the influences of social networks, especially neighbors, on people’s adoption of electric cars. An important added value of this study is its focus on analyzing the relative effects of a certain group of members (neighbors) of social networks on the adoption of electric cars. Another contribution to existing literatures is the novelty that this study focuses on exploring
people’s behaviors in different areas in a Dutch city (Amsterdam). These aspects are so far still underdetected in existing studies.

Results show that, when comparing electric cars and status quo choices, people are more likely to choose electric cars and avoid status quo choices. Other features of electric cars can significantly change people’s willingness to pay. First, it indicates that a car with a free parking lot have the highest potential to increase people’s willingness to pay. Second, a road tax exemption can also have a relatively high potential to increase people’s willingness to pay, even though it’s a bit less compare with a free parking lot. Third, it seems that people are not so sensitive regarding the driving range of an electric car since their willingness to pay for an extra driving range is low. Moreover, longer charging time will substantially decrease people’s willingness to pay for an electric car.

Results also show that, people’s baseline willingness to pay for an electric car changes under different influences of their neighbors. In this study, the influences are measured by different shares of neighbors that have adopted electric cars. Their WTP presents a U-shaped curve. When the share is low (5%), people’s WTP is high. It’s been speculated that people might want to show off in the neighborhood as early adopters. If the share becomes medium (30%), their WTP decreases. But when the share is high (50%), people’s willingness to pay decrease again. This might be because individuals feel that they need an electric car as well since everyone around them has driven an electric car.

Additionally, apart from the influences from neighbors, people’s choice towards electric cars can also be influenced by other members of their networks, e.g. friends or colleagues. Results also show that people are more willing to choose an electric car when their friends or colleagues have adopted an electric car. Also, their baseline WTP for an electric car is higher compared to under the influence of neighbors.

The results furthermore show that people who live in the west and zuid area of Amsterdam are more willing to choose electric cars. Interestingly, people live in the west neighborhood have a higher willingness to pay for electric cars than people who live in the Zuid
neighborhood. The average baseline willingness to pay values for electric cars for people who live in the Oost, centrum and Noord area, instead, is not significantly different from zero.

Based on these findings, the different baseline willingness to pay under different shares of neighbors suggests that individual’s network influences on the uptake of electric cars should get further attention. Besides, adoption of electric cars in different neighborhoods in a city scale should also be further studied. Government can take advantage of these findings to slightly adjust their strategies to better promote electric car adoption, e.g. more efforts or more charging infrastructures should be put in the west and zuid area of Amsterdam as people who live in these areas have higher willingness to pay for electric cars. For car companies, they can also make their marketing strategies more flexible, e.g. organize more campaigns on promoting electric cars in the west and zuid neighborhoods to “nudge” individuals to adopt electric cars. Furthermore, the substantial preference for free parking and road tax exemption for electric cars suggest that policymakers should consider providing free parking lots for people who drive electric cars in a certain period of time, e.g. at weekends or off-peak hours at weekday, or provide road tax exemption for electric car drivers. Findings in this study also suggest that more charging stations or fast charging stations should be installed in business areas where people can charge their cars while they go to work.

One of the limitations that needed to be addressed is that the response rate is relatively low and the distribution of respondents is not even when conducting surveys randomly in different districts in Amsterdam. A small sample size might pose challenges on the statistical analysis and result in decreased predictive potential when comparing with models with more responses (Stockwell & Peterson, 2002). One suggestion for future research direction is that a door-to-door survey in different neighborhoods in Amsterdam could be conducted in the same study to increase the response rate. A certain amount of incentives or rewards could be offered when sending out the initial survey invitation mails to attract more respondents (Church, 1993). Additionally, future research should aim to increase the representativeness of the sample, this could mean to include respondents with different socio demographics and evenly live in different areas of Amsterdam. Furthermore, the current study chooses Amsterdam as a target city to analyze the social network influences in different neighborhoods on the adoption of
electric car. Replicating this method in different Dutch cities in the Netherlands would also be an important step to validate the findings.

Acknowledgements

I gratefully acknowledge all the guidance, suggestions and comments by Julia Blasch (VU university) on the first draft of the choice experiment set-up and questionnaire as well as the support on the Data analysis. Also, her efforts and comments on the first draft of this paper are greatly appreciated.
References


Charging Stations for Urban Settings the design of a product platform for electric vehicle infrastructure in Dutch cities. (2009), 1–13.


Appendix

Appendix I: Experts interview questionnaire

Experts Interview Questionnaire

“Identifying Influential Factors on Electric Cars Adoption in the Netherlands”

This interview is part of a research project of the VU University Amsterdam. The research aims to find out the most influential factors that determine consumers’ adoption of electric cars in the Netherlands. The interview will take you around 30 minutes. There are no right or wrong answers: we are only interested in your opinion. Your responses are strictly confidential and will be referred to the research project in an anonymous way.

Your opinion and time are greatly appreciated!

1. How influential are the following factors when consumers purchase an electric car in the Netherlands? Please indicate your opinions.

<table>
<thead>
<tr>
<th>Factors</th>
<th>No Influence</th>
<th>Low Influence</th>
<th>Moderate Influence</th>
<th>High Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vehicle Attributes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Battery cost</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Driving range</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Max. speed</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Charging time</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td><strong>Consumer characteristic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Gender</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Income</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Experiences</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>(*experiences of driving/using EVs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>(*knowledge of environmental impact of EVs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor Type</td>
<td>Factor Description</td>
<td>Attention Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>-----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social influence</td>
<td>Social image</td>
<td>○ ○ ○ ○ ○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(*social status increase after purchasing/using EVs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social norms</td>
<td>○ ○ ○ ○ ○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(*opinions on EVs in the decision maker’s environment (family/friends))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Collective efficacy belief</td>
<td>○ ○ ○ ○ ○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(*decision makers believe adopting EVs is most effective when large communities participate)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental impact</td>
<td>Reduced CO2 emissions</td>
<td>○ ○ ○ ○ ○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electricity mix</td>
<td>○ ○ ○ ○ ○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(*Electricity used in public charging stations)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contextual factors</td>
<td>Government incentives</td>
<td>○ ○ ○ ○ ○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(*subsidies, tax reliefs, etc.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information</td>
<td>○ ○ ○ ○ ○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(*government information provision on EVs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Process to get incentives</td>
<td>○ ○ ○ ○ ○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Administration process</td>
<td>○ ○ ○ ○ ○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(*structure of payment of purchase price)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If other, please specify:


2. Which factors do you think still haven't received much attention in research so far?


3. Is there a particular group of consumers in the Netherlands that you would recommend to focus on to study their demand for electric cars?
4. The following table are a list of possible future research directions, please choose 3 topics that you think are the most interesting and might yield important policy implications.

<table>
<thead>
<tr>
<th>Future Research Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ How to educate consumers on calculating and comparing the financial benefits and costs of EVs and ICEs (Internal combustion engine)</td>
</tr>
<tr>
<td>□ Promoting green neighborhoods to increase consumer adoption (e.g. through sustainable city planning)</td>
</tr>
<tr>
<td>□ EV’s environmental impacts in different countries</td>
</tr>
<tr>
<td>□ Exploring and comparing symbolic meanings of EVs in a diversity of cultures/countries</td>
</tr>
<tr>
<td>□ Exploring the user-friendliness of EVs through design and charging process</td>
</tr>
<tr>
<td>□ Exploring whether driving and experiencing an EV at work can potentially influence the drivers to adopt EVs as a private car</td>
</tr>
<tr>
<td>□ Exploring the adoption of EVs by fleet managers in different countries with different governmental incentives</td>
</tr>
</tbody>
</table>

If other, please specify:

5. From the list below, please indicate the top 3 public policies that you think are effective for consumers to adopt an electric car in the Netherlands.

<table>
<thead>
<tr>
<th>No.</th>
<th>Policies Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Tax credit or rebate</td>
</tr>
<tr>
<td>B</td>
<td>Free parking</td>
</tr>
<tr>
<td>C</td>
<td>Reduction or elimination of road tax</td>
</tr>
<tr>
<td>D</td>
<td>Battery Swapping scheme*</td>
</tr>
<tr>
<td>E</td>
<td>Easy installation of charging stations in apartment buildings</td>
</tr>
<tr>
<td>F</td>
<td>Information provision on electric cars</td>
</tr>
<tr>
<td>G</td>
<td>Encouraging automakers to make more of their cars available as a plug-in model</td>
</tr>
<tr>
<td>H</td>
<td>Promoting more EV adoption in business industry (e.g. Companies)</td>
</tr>
</tbody>
</table>
Choose top 3 policies that you think are effective for increasing adoption of electric cars in the Netherlands.

Top 1: __________
Top 2: __________
Top 3: __________

*Battery swapping scheme: consumers are able to exchange their discharged batteries for charged ones at battery swap stations.

If others, please specify:

Appendix II: Table of frequencies of factors and categories

<table>
<thead>
<tr>
<th>Most influential factors</th>
<th>No Influence</th>
<th>Low Influence</th>
<th>Moderate Influence</th>
<th>High Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery cost</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Driving range</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. speed</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Charging time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiences</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Social image</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social norms</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Collective efficacy belief</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Reduced CO2 emissions</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Electricity mix</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government incentives</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>2</td>
<td>2</td>
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<td></td>
</tr>
<tr>
<td>Process to get incentives</td>
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</tr>
<tr>
<td>Administration process</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other factors needed to be consider
<table>
<thead>
<tr>
<th>Factors understudied</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle towing capacity (e.g. tail hitch)</td>
<td>1</td>
</tr>
<tr>
<td>Political belief</td>
<td>1</td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
</tr>
<tr>
<td>Income</td>
<td>1</td>
</tr>
<tr>
<td>Driving range</td>
<td>1</td>
</tr>
<tr>
<td>Social norms</td>
<td>1</td>
</tr>
<tr>
<td>Collective efficacy belief</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preferred group of consumers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>“Early majority” people</td>
<td>1</td>
</tr>
<tr>
<td>Lower income people</td>
<td>1</td>
</tr>
<tr>
<td>Young people</td>
<td>1</td>
</tr>
<tr>
<td>Consumers with a need for larger space</td>
<td></td>
</tr>
<tr>
<td>Lease car drivers</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3 future research directions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Promote green neighborhood</td>
<td>4</td>
</tr>
<tr>
<td>EV environmental impacts in different countries</td>
<td>1</td>
</tr>
<tr>
<td>Symbolic meanings of EVs</td>
<td>1</td>
</tr>
<tr>
<td>User’s awareness on financial benefit of EV</td>
<td>3</td>
</tr>
<tr>
<td>User-friendliness of EV</td>
<td>1</td>
</tr>
<tr>
<td>EV adoption of fleet managers</td>
<td>3</td>
</tr>
<tr>
<td>Influence of driving and experiencing an EV on the adoption of EV</td>
<td>1</td>
</tr>
</tbody>
</table>
Appendix III. Survey questionnaire text (English version)

“Identifying Influential Factors on Electric Cars Adoption in Amsterdam”

Thank you for participating in our survey! This survey is part of a research project of the Institute for Environmental Studies (IVM) of Vrije Universiteit Amsterdam. The study addresses the adoption of electric cars in Amsterdam.

You do not have to own an electric car for taking part in this short survey. Participation is voluntary and it will take you only about 5-8 minutes to complete the questionnaire. Your responses are strictly confidential and will only be used for the purpose of this research and not be shared with third parties.

Your participation is extremely valuable for finding an effective solution to increase the uptake of electric vehicles in the city of Amsterdam. In case of questions about the study, please feel free to contact us (contact email address).

Thank you in advance for completing this questionnaire.

1. Filter questions: What are the first four numbers of your postcode? ……..

--- PAGE 1 ---

Section 1: Questions on driving habit and vehicle purchasing history

We will begin this survey by asking about your driving habit and vehicle purchasing history.
2. How many vehicles does your household currently own?

<table>
<thead>
<tr>
<th>Number of vehicles</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>□</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

--- PAGE 2 ---

3. How many kilometers do you drive every day on average?

<table>
<thead>
<tr>
<th>10 to 20</th>
<th>20 to 30</th>
<th>30 to 40</th>
<th>40 to 50</th>
<th>More than 50</th>
<th>I don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

--- PAGE 3 ---

4. How many kilometers in total did you drive last year?

<table>
<thead>
<tr>
<th>Less than 5,000</th>
<th>5,001 to 10,000</th>
<th>10,001 to 15,000</th>
<th>15,001 to 20,000</th>
<th>More than 20,000</th>
<th>I don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

--- PAGE 4 ---

5. What is the most important reason that your household don’t hold a car?

□ I don’t have a driver’s license
□ I think a car would be too expensive for me
□ I don’t need a car because the public transportation is very good
□ I prefer to use car sharing
□ There is a lack of parking spaces near my home
□ I do not want to have a car for environmental reasons
□ Other, please specify.............

--- PAGE 4 ---

Section 2: Choice card experiment(Introduction)

On the following pages, we will show you 3 comparable electric vehicles for sale, which differ in several characteristics.

These characteristics are briefly explained below (Please kindly take your time to read the explanations carefully):

1. Purchase price: The price of an electric vehicle, including all taxes.
2. Driving range: Number of km that can be driven with a fully charged battery under normal circumstances.
3. Charging time at closest charging point: Time that is necessary to charge the battery of the vehicle at the closest charging point. Fast-charging can charge an electric car to full battery in about 30 minutes, while normal speed charging can take up to 12 hours.
4. Free public parking: Whether the vehicle is exempt from parking fees.
5. Road tax exemption: Whether the vehicle is exempt from road taxes.
6. % of adopters in the neighborhood: The percentage of people in the neighborhood who already adopted an electric vehicle. In this survey, an electric vehicle refers to a battery electric vehicle (BEV).

We will show you four sets of choices between 3 vehicles in a row. In each of the four choice situations, please select the electric vehicle that you would select most likely in the specific choice situation. Consider each of the choice situations as a new choice situation and make your choice independently from the previous choices.

Before you will start making your choices, we show you the following example choice situation.

** BEGIN EXAMPLE QUESTION **

[example question here]

-- PAGE 5 --

Section 2: Choice card experiment (Q1)

Great! Now I will begin the survey. You will be asked 4 questions total in this part. You may proceed now by clicking the “next” button below.

Each option will look like this

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
<th>None</th>
</tr>
</thead>
</table>

6-9. Which option will you choose?

<table>
<thead>
<tr>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Here each random question was displayed in sequential order]

-- PAGE 6-9 --

Section 3: Questions on environment attitudes, social influences and access to charging stations

In this part, we will ask some general questions about your personal attitudes towards the environment, social experiences with electric vehicles and access to charging stations.

10. Please rate how much you agree with the following statements.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The greenness of my vehicle is an important social status symbol for me</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I want people to know that I am an environmental-friendly person</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global climate change is a serious threat to human beings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global climate change is mostly caused by human activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
11. Please select any of the vehicle types that you have ever driven, even if just for a test drive.

<table>
<thead>
<tr>
<th>Conventional</th>
<th>Hybrid</th>
<th>Plug-in Hybrid</th>
<th>Electric</th>
<th>I have never driven any of these vehicle types</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>□</td>
</tr>
</tbody>
</table>

12. If there was a growing number of people in your network (e.g. friends/colleagues) are driving electric vehicles, would you consider also buying an electric car?

- □ No, I wouldn’t consider
- □ Maybe, but the price and other vehicles attributes are still needs my main concern
- □ Yes, I will consider
- □ I don’t know

13. Do you have access to electric charging point where you could plug in a vehicle for charging? (select all that apply)

- □ At home in my personal garage
- □ At work in a community parking garage
- □ At home in a community parking garage
- □ At work on the street
- □ At home on the street
- □ At parking meters in town

14. Can you easily access fast charging stations in the city?

- □ Yes
- □ No
- □ I don’t know

--- PAGE 10 ---

Section 4: Questions on social demographics

Finally, we will ask you several questions about yourself for statistical purposes. Your responses are strictly confidential and will not be used for any other purposes.

15. What is your gender? □ Man □ Woman

16. Which age group do you belong to?

<table>
<thead>
<tr>
<th>18-24</th>
<th>25-34</th>
<th>35-44</th>
<th>45-54</th>
<th>55-64</th>
<th>65-74</th>
<th>75 or above</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

17. How many persons are in your household, including yourself?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

--- PAGE 11 ---

18. How many children younger than 18 are in your household?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19. What is the net income (after income tax) of your entire household per month?

- □ Less than €1500 net per month
- □ Between €1500 and €1999 net per month
- □ Between €2000 and €3000 net per month
- □ More than €3000 net per month

--- PAGE 12 ---
20. What is the highest level of education that you have completed?

- Primary / elementary school
- High school
- Vocational school
- College / higher education
- University
- Others, specify …………………

21. Which of the following categories characterizes you best?

- Entrepreneur / employer
- Full time / part time employee
- Jobless / searching for job
- Student
- Pensioner
- Other, specify …………………

--- PAGE 15 ---

*Note: As the Dutch version questionnaire has the same questions and the same layout as the English version questionnaire, therefore, it will not be attached here to avoid repetition.
## Appendix IV. Summary of expert interview results

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td>Consultant</td>
<td>Professor</td>
<td>Representative</td>
<td>Professor</td>
<td>Representative</td>
</tr>
<tr>
<td>Dutch University</td>
<td>Global Consulting Company</td>
<td>Dutch University</td>
<td>Global Car Company</td>
<td>Institute for Environmental Studies</td>
<td>Local Mobility Association</td>
</tr>
<tr>
<td>High influence factors</td>
<td>High influence factors</td>
<td>High influence factors</td>
<td>High influence factors</td>
<td>High influence factors</td>
<td>High influence factors</td>
</tr>
<tr>
<td>➢ Driving range</td>
<td>➢ Price</td>
<td>➢ Price</td>
<td>➢ Price</td>
<td>➢ Price</td>
<td>➢ Price</td>
</tr>
<tr>
<td>➢ Charging time</td>
<td>➢ Driving range</td>
<td>➢ Battery cost</td>
<td>➢ Driving range</td>
<td>➢ Income</td>
<td>➢ Income</td>
</tr>
<tr>
<td>➢ Experiences</td>
<td>➢ Charging time</td>
<td>➢ Driving range</td>
<td>➢ Experiences</td>
<td>➢ Knowledge</td>
<td>➢ Knowledge</td>
</tr>
<tr>
<td>➢ Reduced CO2 emissions</td>
<td>➢ Social image</td>
<td>➢ Max. Speed</td>
<td>➢ Government incentives</td>
<td>➢ Social norms</td>
<td>➢ Social norms</td>
</tr>
<tr>
<td>➢ Government incentives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate influence factors</td>
<td>Moderate influence</td>
<td>Moderate influence</td>
<td>Moderate influence</td>
<td>Moderate influence</td>
<td>Moderate influence</td>
</tr>
<tr>
<td>➢ The rest of the factors;</td>
<td>➢ Age</td>
<td>➢ Charging time</td>
<td>➢ Charging time</td>
<td>➢ Driving range</td>
<td>➢ Driving range</td>
</tr>
<tr>
<td></td>
<td>➢ Knowledge</td>
<td>➢ Age</td>
<td>➢ Charges</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>➢ Social image</td>
<td>➢ Reduced CO2 emissions</td>
<td>➢ Experiences</td>
<td>➢ Administration process</td>
<td></td>
</tr>
<tr>
<td></td>
<td>➢ Social norms</td>
<td>➢ Information</td>
<td>➢ Administration process</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>➢ Process to get incentives</td>
<td>➢ Administration process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>➢ Administration process</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other factors</td>
<td>Other factors</td>
<td>Other factors</td>
<td>Other factors</td>
<td>Other factors</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>---------------</td>
<td>---------------</td>
<td>---------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>Tail hitch, which was shown an important factor that influence consumer adoption of electric cars in her paper</td>
<td>Vehicle safety (battery combustion)</td>
<td>Net operative cost</td>
<td>Battery recycle program (manufactures should make higher standard for battery recycle program to increase consumer’s adoption)</td>
<td>Fuel price</td>
<td></td>
</tr>
<tr>
<td>Level of education</td>
<td>Battery impact</td>
<td>Distance to charging stations</td>
<td>Government program (keep track of battery, could be stored for other use)</td>
<td>Fuel availability</td>
<td></td>
</tr>
<tr>
<td>Leasing price of EV (more on the usage)</td>
<td>Reviews</td>
<td></td>
<td>Material used inside the vehicle (the material used inside the vehicle has high environmental impacts, this will affect consumer adoption)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Battery size (experts suggest that a smaller battery with a lower price</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Factors underdetected

- **Tail hitch**
- **Political belief** (perceptions of left or right-hand people)
- **Gender**
- **Income**
- **Driving range**
- **Social norms**
- **Conditional corporation** (collective efficacy belief)
- **Leasing market**

### Preferred group of consumers

- **“Early majority”**
  - Lower income people
  - Young people
- **Consumers with a need for station wagon.** (suitable for family with children, and with a need for more luggage space)
- **Lease car drivers**

### Preferred 3 future research directions

- **Promote green neighborhoods**
- **EV’s environmental impacts in different countries**
- **Symbolic meanings of EVs in a diversity of cultures/countries**
- **How to educate consumers on calculating & comparing the financial benefits and costs of EVs and ICEs**
- **User-friendliness of**
- **Users’ awareness on financial benefit of EV**
- **Promoting green neighborhoods**
- **Promote green neighborhoods to increase consumer adoption**
- **Explore whether driving and experiencing an EV at work can potentially influence the drivers to adopt EVs as a private car**
- **The adoption of fleet managers in different countries with different governmental incentives**
- **Promote green neighborhoods to increase consumer adoption**
- **How to educate consumers on calculating & comparing the financial benefits**
<table>
<thead>
<tr>
<th>Other research directions</th>
<th>EVs through design and charging process</th>
<th>Other research directions</th>
<th>and costs of EVs and ICEs</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Incentives should last longer to reach higher “early majority”</td>
<td>➢ The adoption of fleet managers in different countries with different governmental incentives</td>
<td>➢ Misinform consumers (information such as EVs are not that green, battery have environmental impacts)</td>
<td>➢ The adoption of fleet managers in different countries with different governmental incentives</td>
</tr>
<tr>
<td>➢ Car ownership</td>
<td></td>
<td></td>
<td>➢ Close the attitude-action gap</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Top 3 public policies that they think are effective for consumers to adopt an EV in the Netherlands</th>
<th>Top 3 public policies that they think are effective for consumers to adopt an EV in the Netherlands</th>
<th>Top 3 public policies that they think are effective for consumers to adopt an EV in the Netherlands</th>
<th>Top 3 public policies that they think are effective for consumers to adopt an EV in the Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Top 1: G- encouraging automakers to make more of their cars available as a full electric vehicle model</td>
<td>➢ Top 1: A-tax credit or rebate</td>
<td>➢ Top 1: H-promoting more EV adoption in business industry (e.g. companies)</td>
<td>➢ Free public parking</td>
</tr>
<tr>
<td>➢ Top 2: C-Reduction or elimination of</td>
<td>➢ Top 2: C-reduction or elimination of road tax</td>
<td>➢ Top 2: A-tax credit or rebate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>➢ Top 3: C-free parking</td>
<td>➢ Top 3: C-reduction or elimination of road tax</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>Other opinions:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Other types of government</td>
<td></td>
</tr>
<tr>
<td>Road tax</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ Top3: H-promoting more EV adoption in business industry (e.g. companies)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Others:</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Regulations on the supply side-put tax on polluters (CO2 emissions, technology)</td>
</tr>
<tr>
<td>➢ Put more advantage on full electric vehicles than hybrid vehicles</td>
</tr>
<tr>
<td>➢ It would also be good to check the consumer adoption differences after 5 years with the same attributes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>incentives</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g.: government give EV buyers a prepaid card with 1000€ credit, this amount of money can be used in charging stations etc.</td>
</tr>
<tr>
<td>➢ Battery swapping scheme should be removed, too expensive and complex, also takes a long period to realize, this plan was considered as not realistic according to some experts who has working experiences in the EV companies.</td>
</tr>
</tbody>
</table>

Opinions on why young people don’t want to own a car: |
| | |
| ➢ It depends on different area, for young people who live in the urban area, owning a car is quite expensive, they need to pay parking cost (3-5 euro/hour) + they have car sharing options which is more convenient and cheaper + whether they need a driving license; |

<table>
<thead>
<tr>
<th>Other opinions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Political issues (politicians usually don’t put too much tax on petrol cars because they will lose votes next round)</td>
</tr>
<tr>
<td>➢ Political power</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reduction or elimination of road tax</th>
</tr>
</thead>
</table>
For people who live in the rural area, owning a car is way more useful.

**Appendix V. Coding non-numerical variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID_code</td>
<td>identify code of respondents</td>
<td></td>
</tr>
<tr>
<td>start_time</td>
<td>the time when respondents starts a survey</td>
<td></td>
</tr>
<tr>
<td>end_time</td>
<td>the time when respondents finishes a survey</td>
<td></td>
</tr>
<tr>
<td>postcode</td>
<td>the first four numbers of respondent's postcode</td>
<td></td>
</tr>
<tr>
<td>area_west</td>
<td>respondents who live in Amsterdam west area</td>
<td>&quot;1&quot; for &quot;respondents who live in Amsterdam west area&quot;, &quot;0&quot; for &quot;otherwise&quot;</td>
</tr>
<tr>
<td>area_zuid</td>
<td>respondents who live in Amsterdam zuid area</td>
<td>&quot;1&quot; for &quot;respondents who live in Amsterdam zuid area&quot;, &quot;0&quot; for &quot;otherwise&quot;</td>
</tr>
<tr>
<td>area_oost</td>
<td>respondents who live in Amsterdam oost area</td>
<td>&quot;1&quot; for &quot;respondents who live in Amsterdam oost area&quot;, &quot;0&quot; for &quot;otherwise&quot;</td>
</tr>
<tr>
<td>area_cen-noord</td>
<td>respondents who live in Amsterdam centrum and noord area</td>
<td>&quot;1&quot; for &quot;respondents who live in Amsterdam centrum and noord area&quot;, &quot;0&quot; for &quot;otherwise&quot;</td>
</tr>
<tr>
<td>no._vehicles</td>
<td>number of vehicles that respondents' household currently own</td>
<td>&quot;0&quot; for &quot;household doesn't have a vehicle&quot;, &quot;1&quot; for &quot;household have 1 vehicle&quot;, &quot;2&quot; for &quot;household have 2 vehicles&quot;, &quot;3&quot; for &quot;households have 3 or more vehicles&quot;</td>
</tr>
<tr>
<td>km_day</td>
<td>distance (km) that respondents drive every day on average</td>
<td>&quot;1&quot; for &quot;10-20&quot;, &quot;2&quot; for &quot;20-30&quot;, &quot;3&quot; for &quot;30-40&quot;, &quot;4&quot; for &quot;40-50&quot;, &quot;5&quot; for &quot;more than 50&quot;, &quot;6&quot; for &quot;I don't know&quot;, &quot;7&quot; for &quot;I don't drive everyday&quot;</td>
</tr>
<tr>
<td>km_total</td>
<td>distance (km) that respondents drive in total last year</td>
<td>&quot;1&quot; for &quot;less than 5,000&quot;, &quot;2&quot; for &quot;5,001 to 10,000&quot;, &quot;3&quot; for &quot;10,001 to 15,000&quot;, &quot;4&quot; for &quot;15,001 to 20,000&quot;, &quot;5&quot; for &quot;More than 20,000&quot;, &quot;6&quot; for &quot;I don't know&quot;</td>
</tr>
</tbody>
</table>
| reason       | the most important reason that respondents' households don't have a car | "1" for "I don't have a driver’s license", "2" for "I think a car would be too expensive for me", "3" for "I don't need a car because the public transportation is very good", "4" for "I
prefer to use car sharing”, “5” for “There is a lack of parking spaces near my home”, “6” for “I do not want to have a car for environmental reasons”

<table>
<thead>
<tr>
<th>Section 2</th>
<th></th>
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<tbody>
<tr>
<td>card</td>
<td>unique identifier for choice card</td>
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<tr>
<td>alternative</td>
<td>options available in each choice questions for respondents to choose</td>
</tr>
<tr>
<td>choice</td>
<td>a certain option that respondents choose in each choice question</td>
</tr>
<tr>
<td>share</td>
<td>share of neighbors who adopted EV in percentages</td>
</tr>
<tr>
<td>price</td>
<td>purchase price of EV in 1000 EUR</td>
</tr>
<tr>
<td>range</td>
<td>driving range of EV in km</td>
</tr>
<tr>
<td>ctime</td>
<td>charging time at nearest charging station in hours</td>
</tr>
<tr>
<td>parking</td>
<td>dummy for availability of free parking</td>
</tr>
<tr>
<td>tax</td>
<td>dummy for availability of tax exemption</td>
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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>r_ssymbol</td>
<td>rank on the greenness of my vehicle is an important social status symbol for me</td>
</tr>
<tr>
<td>r_efriendly</td>
<td>rank on I want other people to know that I am an environmental-friendly person</td>
</tr>
<tr>
<td>r_cc.threat</td>
<td>rank on global climate change is a serious threat to human beings</td>
</tr>
<tr>
<td>r_cc.human</td>
<td>rank on global climate change is mostly caused by human activities</td>
</tr>
<tr>
<td>veh._con</td>
<td>vehicle that respondents have ever driven or a test drive is a conventional vehicle</td>
</tr>
<tr>
<td>veh._hyb</td>
<td>vehicle that respondents have ever driven or a test drive is a hybrid vehicle</td>
</tr>
<tr>
<td>veh._pl-hyb</td>
<td>vehicle that respondents have ever driven or a test drive is a plug-in Hybrid vehicle</td>
</tr>
<tr>
<td>veh._ev</td>
<td>vehicle that respondents have ever driven or a test drive is an electric vehicle</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>veh._none</td>
<td>respondents have never driven any of these vehicle types</td>
</tr>
<tr>
<td>choice_network</td>
<td>the choice of respondents in considering purchasing an electric vehicle. If there was a growing number of people in their network (e.g. friends/colleagues) who are driving electric vehicles</td>
</tr>
<tr>
<td>charging_home</td>
<td>access to electric charging point: at home in one's personal garage, in a community parking garage and on the street</td>
</tr>
<tr>
<td>charging_work</td>
<td>access to electric charging point: at work on the street and in a community parking garage</td>
</tr>
<tr>
<td>charging_pmeters</td>
<td>access to electric charging point: at parking meters in town</td>
</tr>
<tr>
<td>charging_fast</td>
<td>easy access to fast charging stations in the city</td>
</tr>
<tr>
<td>gender</td>
<td>gender of respondents</td>
</tr>
<tr>
<td>age</td>
<td>age group of respondents</td>
</tr>
<tr>
<td>age_18-34</td>
<td>the age of respondents is between 18-34</td>
</tr>
<tr>
<td>age_35-64</td>
<td>the age of respondents is between 35-64</td>
</tr>
<tr>
<td>age_above 65</td>
<td>the age of respondents is above 65</td>
</tr>
<tr>
<td>no._family</td>
<td>number of persons that respondents have in their household including themselves</td>
</tr>
<tr>
<td>no._child</td>
<td>number of children younger than 18 are in respondent’s household</td>
</tr>
<tr>
<td>income</td>
<td>the amount of net income (after income tax) of respondents' entire household per month</td>
</tr>
<tr>
<td>education</td>
<td>the level of education that respondents have completed</td>
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<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
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<tr>
<td>edu_lower</td>
<td>the highest level of education that respondents have completed is at a lower level, including primary school and high school</td>
</tr>
<tr>
<td>edu_higher</td>
<td>the highest level of education that respondents have completed is at a higher level, including vocational school, college and university</td>
</tr>
<tr>
<td>employment</td>
<td>the employment status of respondents</td>
</tr>
<tr>
<td>emp_employed</td>
<td>the respondent is employed, including people who is an entrepreneur/employer and full time/part time employee</td>
</tr>
<tr>
<td>emp_unemployed</td>
<td>the respondent is unemployed, including people who is jobless or searching for job, student and pensioner</td>
</tr>
<tr>
<td>emp_student</td>
<td>the respondent is a student. &quot;1&quot; for &quot;the respondent is a student&quot;, &quot;0&quot; for &quot;otherwise&quot;</td>
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Appendix VI. Sample characteristics

Table 1. Social demographic characteristics

<table>
<thead>
<tr>
<th>Statistics</th>
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<td>0</td>
<td>0</td>
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<tr>
<td>Mean</td>
<td>3.01</td>
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<td>2.94</td>
<td>2.77</td>
<td>3.07</td>
<td>2.74</td>
<td>2.84</td>
<td>2.88</td>
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<td>2.81</td>
<td>2.84</td>
<td>2.85</td>
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<tr>
<td>Std Deviation</td>
<td>2.92</td>
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<td>1.51</td>
<td>1.40</td>
<td>1.39</td>
<td>1.56</td>
<td>1.52</td>
<td>1.48</td>
<td>1.52</td>
<td>1.56</td>
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<td>Variance</td>
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<td>1.05</td>
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<td>1.16</td>
<td>1.26</td>
<td>1.18</td>
<td>1.14</td>
<td>1.11</td>
<td>1.17</td>
<td>1.20</td>
<td>1.20</td>
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Table 2. Driving habit, drive experiences and access to charging stations

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<td>0.20</td>
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Table 3. Percentage of people who have easy access to fast charging in Amsterdam

<table>
<thead>
<tr>
<th>charging_fast</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
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<tbody>
<tr>
<td>Valid</td>
<td>29</td>
<td>28.4</td>
<td>28.4</td>
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<tr>
<td>no easy access to fast charging</td>
<td>23</td>
<td>22.5</td>
<td>51.0</td>
</tr>
<tr>
<td>I don't know</td>
<td>59</td>
<td>49.0</td>
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<tr>
<td>Total</td>
<td>102</td>
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Table 4. Other environmental attributes (the following four tables)

<table>
<thead>
<tr>
<th>r_symbol</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
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<td>Valid</td>
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<td>9.0</td>
<td>9.0</td>
</tr>
<tr>
<td>disagree</td>
<td>17</td>
<td>16.7</td>
<td>26.5</td>
</tr>
<tr>
<td>neutral</td>
<td>29</td>
<td>28.4</td>
<td>54.9</td>
</tr>
<tr>
<td>agree</td>
<td>33</td>
<td>32.4</td>
<td>87.3</td>
</tr>
<tr>
<td>strongly agree</td>
<td>13</td>
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<td>100.0</td>
</tr>
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<td>Total</td>
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<td>100.0</td>
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<table>
<thead>
<tr>
<th>r_environmental</th>
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<th>Percent</th>
<th>Cumulative Percent</th>
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<tbody>
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<table>
<thead>
<tr>
<th>r_co-threat</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
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<td>1.0</td>
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<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>neutral</td>
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<tr>
<td>agree</td>
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<td>34.3</td>
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<td>56.9</td>
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<tr>
<td>Total</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>r_co-human</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
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<tr>
<td>neutral</td>
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<td>11.7</td>
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<tr>
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</tbody>
</table>

52
Table 5. People’s choice towards electric cars when there’s a growing number of people in their network who have already adopted an electric car

<table>
<thead>
<tr>
<th>choice_network</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid no, I wouldn’t consider</td>
<td>19</td>
<td>18.5</td>
<td>18.5</td>
<td>18.5</td>
</tr>
<tr>
<td>Maybe, but price and vehicle attributes are still my main concern</td>
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<td>38.2</td>
<td>38.2</td>
<td>56.9</td>
</tr>
<tr>
<td>yes, I will consider</td>
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<td>41.2</td>
<td>41.2</td>
<td>98.0</td>
</tr>
<tr>
<td>I don’t know</td>
<td>2</td>
<td>2.0</td>
<td>2.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
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<td>100.0</td>
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