Determinants of the Interest in Electric Vehicles

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For the collaborative research project, we will work on adoption of electric vehicles in the UK, focusing on identifying the potential buyers which hopefully helps the UK government to differentiate EV promoting strategies by target groups. This document presents detailed proposal for our project.

1 Background

As a part of the efforts to cope with the climate change, countries have been trying to reduce greenhouse gas (GHG) emissions. Considering the fact that the large portion of GHG emission is attributed to road traffic (European Comission 2015), reducing the emission from vehicles is an important issue for many industrialized countries.

Several types of low emission vehicles have been invented and released into the world as listed below (US Department of Energy 2014).

- Hybrid electric vehicles (HEVs), which use both a conventional inner combustion engine (e.g. gasoline engine) and an electric motor, are the early generation of the low emission vehicles. HEVs store electric powers in a battery from braking and the inner combustion engine, which are normally lost in conventional vehicles. Thus, HEVs have better fuel efficiency and less emission compared to the conventional vehicles.
- Plug-in hybrid electric vehicles (PHEVs) are the improved version of HEVs. PHEVs have a smaller inner combustion engine and more powerful batteries that can be charged by plugging into charging infrastructures, as well as the energy captured from braking and the inner combustion engine. Thus, PHEVs have further better fuel efficiency and less emission compared to HEVs.
- Battery Electric Vehicles (BEVs) are the most recent generation of the low emission vehicles, which powered only by an electric motor. The batteries that drive the motors are charged by plugging into charging infrastructures. Because EVs do not use inner combustion engines at all, they make no emission when they drive.

From the environmental point of view, PHEVs and BEVs are the ideal type of vehicles because they use electric powers from plugs, instead of fossil fuels. In this project, we will collectively refer to them as electric vehicles (EVs). In reality, however, because of many reasons, the adoption rates of EVs are not as high as the desirable level. One of the biggest reasons is the costs. Although some articles report that EVs are cheaper than conventional vehicles in long-term thanks to no fuel costs (e.g. Herron 2015a), people tend to refrain from buying EVs because of the high purchase prices. Also, current technical standards such as battery capacities (maximum driving distance with one-time charging) are pointed out to be an obstacle to the widespread EV adoption (Lieven et al. 2011). Availability of charging stations matters as well (Herron 2015b).

Aiming to promote EVs and other types of low emission vehicles, governments have been taking various kinds of means such as financial incentives to owners, R&D grants, installation of charging infrastructures. In order to maximize the performance of those governments' efforts, and thus to accelerate low emission vehicle adoption, it is crucial to **identify the characteristics of the potential EV buyers**, and **reasons that makes those potential buyers to choose EVs over conventional vehicles**.

This study will focus on EVs, which is the most recent generation of low emission vehicles and thus not many researches have made so far compared to other types of sustainable vehicles.

2 Literature Review

Previous studies have examined various factors that are related to consumers' choice.

At the macro level, the relationship between demographic characteristics and EV adoption has been analyzed. For instance, Sierzchula et al. (2014) identify financial incentives, the prevalence of charging stations, and the presence of a local EV manufacturer as the relevant factors, using data on 30 countries. Interestingly, however, they do not find socio-economic variables to be good predictors of a country's EV adoption level. Another macro-level study divides Finland into grids with different socio-economic characteristics and finds that "the income and education level, the amount of families with children and the average size of the residences" (p. 459) are related to the region-level or neighborhood-level adoption rate of EVs (Saarenpää, Kolehmainen, and Niska 2013).

At the micro level, motivations and individual characteristics that affect individual choice are studied. Egbue and Long (2012) explores characteristics of potential EV buyers through a survey targeting current conventional vehicle owners, which asked their opinions, perceptions, and attitudes towards EVs, besides socio-economic attributes. Using 481 observations gained from the web-based survey, the authors performs chi-square analyses and find out that different groups of people have different stances towards EVs. For instance, likelihood to purchase an EV differs by gender, education level, age, and income of respondents. In addition, based on the survey questions regarding the respondents' concerns, the authors reveal that more than a quarter of them were unsure about the safety of EVs. Therefore, they concludes that people with better knowledge about EVs are more likely to purchase one.

There are not many studies that observed people who actually bought an EV, possibly resulting from the small adoption rate. However, a similar study for another type of low emission vehicle may be helpful to think about the motivations that push people to purchase one. Ozaki and Sevastyanova (2011) analyze consumers' motivations to purchase an HEV. Based on a survey data of HEV owners, the authors discovers that people bought an HEV motivated by environmental benefits, as well as personal economic benefits. As a policy implication, advertisements to the public are suggested along with financial incentives to the owners.

In addition, possible policy options to promote low emission vehicle adoption are also covered in several articles. For an example of PHEVs, Skerlos and Winebrake (2010) discuss an effective way to allocate government's financial resources. Currently, the U.S. federal government provides uniform tax credits to all PHEV owners aiming to expand share of PHEVs in the car market. Considering the social benefits of PHEVs including reduced GHG emission, air pollution abatement, increased energy security, the authors argue that the tax credits could have worked better if the government differentiated the incentives depending on consumers' purchasing power and geographical locations. As for the purchasing power, more credits to lower income individuals and fewer to higher income ones may have increased PHEV adoption, considering that current level of financial incentives may not be enough for low income people, while high income people would have bought one anyways with less or no financial incentives. As for the environmental benefit, PHEV owners in highly populated areas should have received larger credits because one unit reduction of pollution delivers larger benefits (i.e. affects more people). It would also be ideal to promote PHEVs in the areas where the electric powers are generated from alternative sources rather than thermal powers that use fossil fuels.

Since policies of financial incentives are the most common one, Gallagher and Muehlegger (2011) compare a number of policies to promote EV in different US states. Mainly focusing on the efficacy of sales tax waivers and income tax credits, they find that the former is "associated with ten-fold increase in hybrid sales" (p.1) and that tax incentives are generally more effective than non-tax incentives. Thus, both to identifying the characteristics of potential buyers and to design government interventions targeting those individuals are the essential strategies to promote low emission vehicles.

Regarding EV adoption, more detailed researches that focus on EVs are needed. In particular, not many studies have been done on the relationship between EV adoption and individual-level motivations/characteristics, partly due to a lack of survey data on people's attitudes towards EVs that covers both those who buy (or are willing to buy) and those who do not. In this study, we will examine the micro-level relationship using a recent data set from the UK.

3 Data Gathering and Methodology

This analysis is based on survey data in the UK called "Opinions and Lifestyle Survey, Electric Vehicles Module, February 2014 and February 2015" (Office for National Statistics. Social Survey Division 2015). Note that registration is required to download the data set from the UK Data Service website above. After logging in and agreeing with the terms of conditions, the data sets are available for download in STATA or other format. The registration process may take a few days. However, other documents (e.g. questionnaire, brief summary) are available at the link above without registration. This module comes with two data sets: survey results from 2014 and 2015. For our study, we use both survey years by combining both data sets together.

We are interested in the potentially different attitudes and priorities of different groups and in identifying potential buyers of EVs as well as obstacles preventing EV consumption. In the survey, the questionnaire asks the respondent's attitudes towards buying an EV. The answer choices ranges from "I already have one" to "I don't drive". The answers are recoded into a binary dummy variable whether the person is interested in buying an EV ("I already have one," "I am thinking about buying one," "I thought about buying one") or not. The explanatory variables will be each person's demographic characteristics such as age, gender, education level, etc. In order to take the regional differences in policies to promote EVs into account, if there are, we will also include government administrative regions within the U.K. as a control.

As our dependent variable is a binary dummy, **logistic regression** expressed in the equation below will be adopted:

$$\ln \frac{p}{1-p} = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_k x_{ki}$$

Where p is the probability that the dependent variable equals to 1 (i.e. being interested in buying an EV). By exponentiating the coefficients (e^{β_i}), we will obtain the odds ratio for different group of people.

Further, by converting the log odds ($\ln \frac{p}{1-p}$) into p as shown in the equation below, we will obtain the predicted probability for the ith person depending on his/her personal characteristics.

$$p = \frac{1}{1 + exp\{-(\beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_k x_{ki})\}}$$

Thus, we are expecting to see different predicted probabilities of being interested in buying an EV for different demographic groups, which will provide some useful information for the policy makers to create efficient means to promote EVs.

4 Analysis

4.1 Descriptive Analysis

4.1.1 Variables

The list of variables are shown in the table below.

Table 1: List of Variables

Names	Types	Descriptions
EVinterest	dummy	Whether the respondent is interested in EVs or not
RAGE	continuous	Respondent's age
Male	dummy	Respondent's sex

Names	Types	Descriptions
inccat	categorical	Respondent's income in 4 categories (low, low-mid, high-mid, high)
degree	dummy	Whether the respondent is a college graduate or not
licence	dummy	Whether the respondent has a valid drivers licence or not
NumCar	continuous	Number of cars in the respondent's household
DVHsize	continuous	Respondent's household size
havechildren	dummy	Whether the Respondent has children or not
Scotland	dummy	Whether the Respondent lives in Scotland or not

4.1.2 Summary statistics

The original data set contains 962 observations from Feburary 2014 and 1,034 from Feburary 2015. After combining the two samples and liminating all the observations with missing values in any of the key variable listed above, a subset of 1,710 observations is obtained for this study. Each of the variables are summarized as follows:

- **EVinterest**: 18.48 % of respondents have interests in EVs
- **RAGE**: Mean=52.03, Standard deviation=17.92. The distribution of age is shown in figure 1 below.
- **Male**: 46.84 % of respondents are male
- **inccat**: distribution is shown in table 2 and figure 2 below. The thresholds of each category are based on 25, 50, 75 percentile gross income from Survey of Personal Incomes 2012-13 in the UK(Office for National Statistics. HM Revenue and Customs (2015)).

Table 2: Distribution of Income

Income	Range	Percentage
Low	Below £14,559	50.53
Low-Mid	£14,560~£20,799	15.09
High-Mid	£20,800~£25,999	8.95
High	£26,000 and Above	25.44

- **degree**: 24.39 % of respondents have college degree
- **licence**: 76.55 % of respondents have valid drivers licence
- **NumCar**: Mean=1.14, Standard deviation=0.86. The distribution of the number of cars in respondent's household is shown in figure 3 below.
- **DVHsize**: Mean=2.28, Standard deviation=1.24. The distribution of household size is shown in figure 4 below.
- **havechildren**: 28.07 % of respondents have children
- **Scotland**: 8.71 % of respondents lives in Scotland

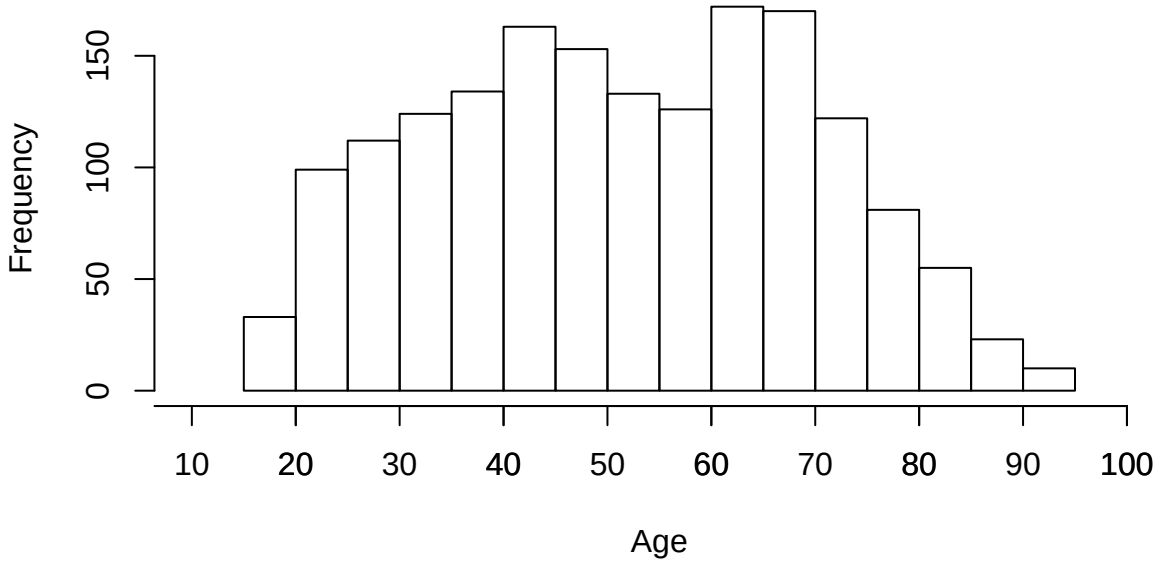

Figure 1: Distribution of respondent's age

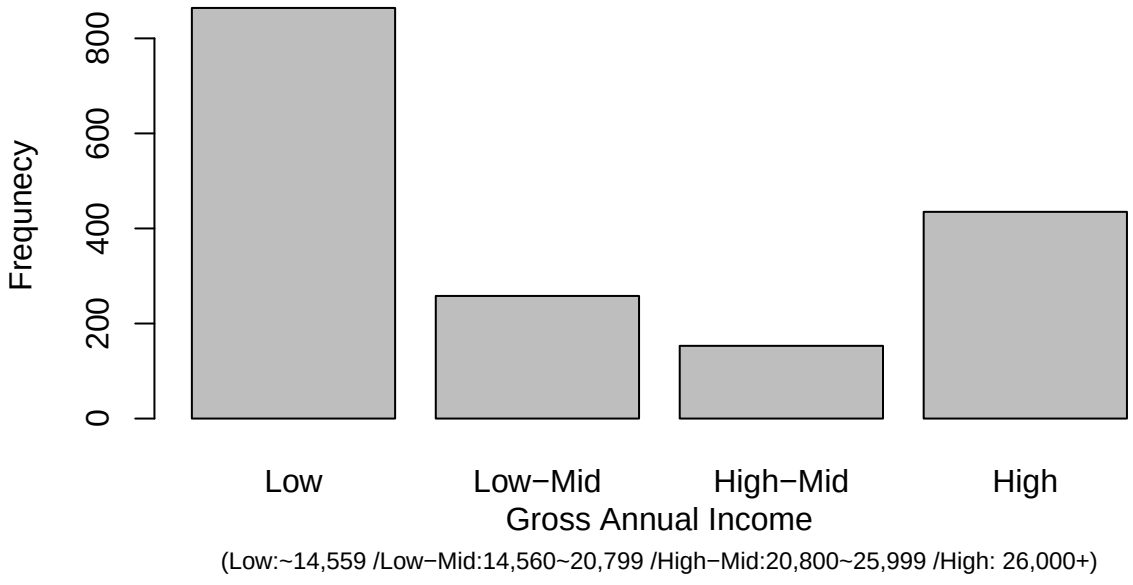

Figure 2: Distribution of respondent's income

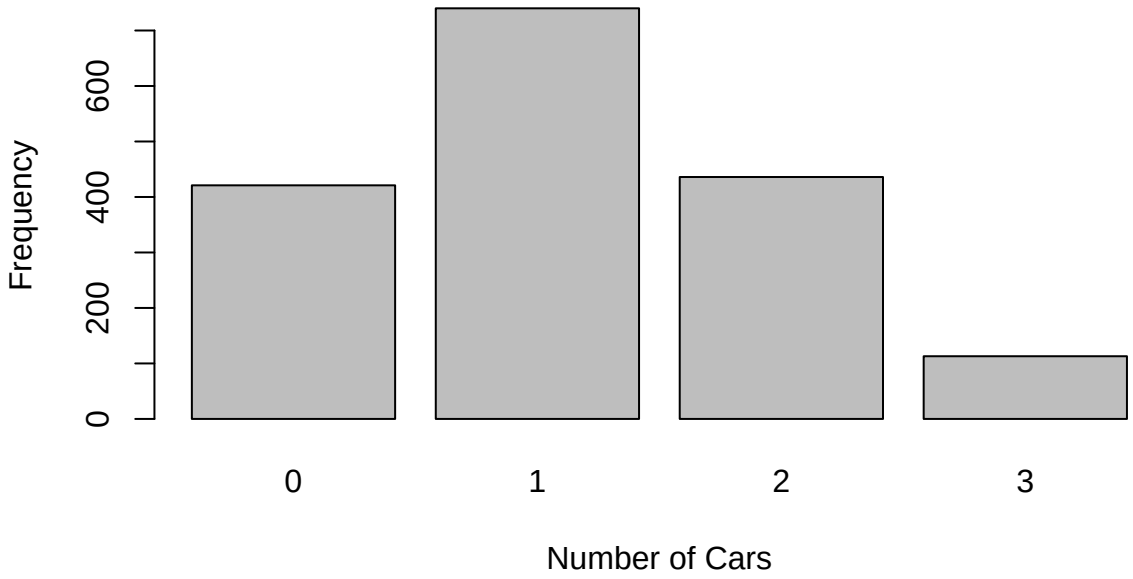

Figure 3: Distribution of number of cars

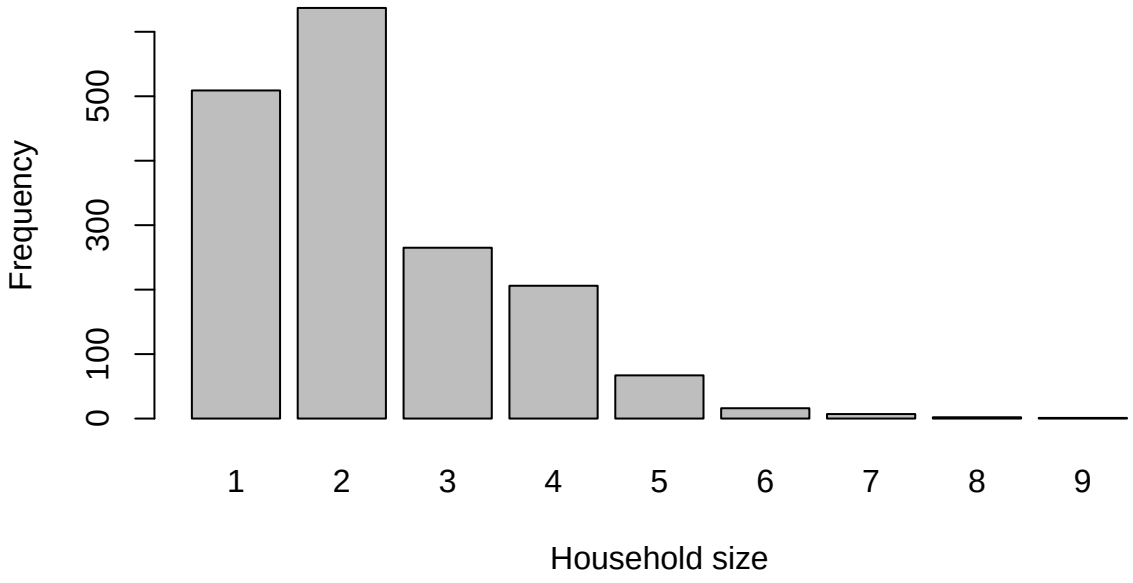

Figure 4: Distribution of household size

4.2 Logistic Regression

4.2.1 Modelling

This section presents our efforts to answer the question, "Who are more/less likely to be interested in EVs". Since the dependent variable is a binary variable, i.e. respondents having an interest in EVs or not, we adopt logistic regression models here.

Nine independent variables are categorized into four groups. Socio-economic variables include age, sex, gross annual income level, and education level. The second group includes having driver's license or not, and the number of cars available to the household, which to some extent describe the respondents' potential to buy a new car. The third one is household-level variables, including household size and whether or not having dependent children. The last one is region. (The UK has 11 regions in total. However, our preliminary analysis suggests that, using London as the baseline, only Scotland is significantly different. Therefore, we only include "Scotland" in the regression.)

We only include socio-economic variables in our base model (regression 1) and add in a new group of independent variables each time. As the results in table 3 show, all models are significant at 99% level. Except for the two variables, size of household and having dependent children or not, all other variables are statistically significant as well. The fact that household-related variables are effective predictors at macro level, but not at micro level, may suggest a neighborhood effect, but it is beyond the scope of this paper.

Table 3: Step-wise Modelling

	Dependent variable:			
	EVinterest			
	(1)	(2)	(3)	(4)
Age	-0.01^{*}	-0.01^{*}	-0.01^{*}	-0.01^{*}
	(0.004)	(0.004)	(0.004)	(0.004)
Male	0.49^{***}	0.46^{***}	0.46^{***}	0.47^{***}
	(0.14)	(0.14)	(0.14)	(0.14)
Income: low-middle	0.07	-0.09	-0.09	-0.10
	(0.20)	(0.21)	(0.21)	(0.21)
Income: high-middle	0.27	0.05	0.05	0.03
	(0.23)	(0.24)	(0.24)	(0.24)
Income: high	0.57^{***}	0.31^{*}	0.30^{*}	0.29^{*}
	(0.17)	(0.17)	(0.17)	(0.17)
College degree	0.69^{***}	0.65^{***}	0.65^{***}	0.65^{***}
	(0.15)	(0.15)	(0.15)	(0.15)
Drivers licence		0.92^{***}	0.92^{***}	0.90^{***}
		(0.24)	(0.24)	(0.24)
Number of cars		0.18^{**}	0.19^{**}	0.19^{**}
		(0.08)	(0.09)	(0.09)
Size of household			-0.02	-0.03
			(0.08)	(0.08)
Having dependent children			0.04	0.02
			(0.21)	(0.21)
Scotland				-0.70^{**}
				(0.29)
(Intercept)	-1.79^{***}	-2.63^{***}	-2.59^{***}	-2.49^{***}
	(0.23)	(0.29)	(0.36)	(0.36)
Observations	1,710	1,710	1,710	1,710
R^2	0.08	0.11	0.11	0.12
χ^2	90.15^{***} (df = 6)	124.56^{***} (df = 8)	124.64^{***} (df = 10)	131.59^{***} (df = 11)
Note:				*p<0.1; **p<0.05; ***p<0.01

Based on this analysis, we leave out the two household-related variables and use the following formula.

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 Age + \beta_2 Male + \beta_3 Lowmid + \beta_4 Highmid + \beta_5 High + \beta_6 College + \beta_7 license + \beta_8 NumCar + \beta_9 Scotland$$

Where p is the probability of being interested in EVs. The estimated model is shown in table 4.

Table 4: Interests in EVs

	Dependent variable:
	EVinterest
Age	-0.01^{*}
	(0.004)
Male	0.47^{***}
	(0.14)
Income: low-middle	-0.10
	(0.21)
Income: high-middle	0.03
	(0.24)
Income: high	0.29^{*}
	(0.17)
College degree	0.65^{***}
	(0.15)
Drivers licence	0.91^{***}
	(0.24)
Number of cars	0.18^{**}
	(0.09)
Scotland	-0.70^{**}
	(0.29)
(Intercept)	-2.56^{***}
	(0.29)
Observations	1,710
R^2	0.12
χ^2	131.47^{***} (df = 9)
Note:	*p<0.1; **p<0.05; ***p<0.01

$$\ln\left(\frac{p}{1-p}\right) = \underset{(.29)}{-2.56} - \underset{(.004)}{.01}Age + \underset{(.14)}{.47}Male - \underset{(.21)}{.10}Lowmid + \underset{(.24)}{.03}Highmid + \underset{(.17)}{.29}High + \underset{(.15)}{.65}College + \underset{(.24)}{.91}license + \underset{(.09)}{.18}NumCar - \underset{(.29)}{.70}Scotland$$

The model is statistically significant at 99% level and five out of the seven variables are significant at 95% level. On average, males are more likely to be interested in EVs: the odds of being interested in EVs are 60% higher ($e^{0.47} = 1.60$) for male than female, holding other variables constant [z=3.36, p<0.001]. Having a college degree or driver's license also increases the likelihood of being interested: the odds of having interested in EVs are 92% higher ($e^{0.65} = 1.92$) for people with college degree compared to people without [z=4.38, p<0.001], the odds are 148% higher ($e^{0.91} = 2.48$) for those who have drivers licence compared to those who don't [z=3.83, p<0.001]. The number of cars is positively relative to the likelihood, suggesting that people who already have the "basics" are more likely to consider EVs: each additional car in a household increases the odds of being interested in EVs by 20% ($e^{0.18} = 1.20$), holding other variables constant [z=2.12, p=0.034]. However, being in Scotland reduces this likelihood: people who live in Scotland have 50% lower ($e^{-0.7} = 0.50$) odds of being interested in EVs compared to people who live in other regions of the UK [z=-2.44, p<0.015].

The less significant variables are age and income level. Age is negatively relative to the likelihood of being interested, meaning that younger people are more likely to have an interest in EVs: each one year increase in the respondent's age is associated with 1% decrease ($e^{-0.01} = 0.99$) in the odds of having interests in EVs [z=-8.73, p<0.001]. Interestingly, income level seems not to matter much. Using the lowest quartile group as the baseline, only the highest quartile group is significantly different: high income people have 34% higher ($e^{0.29} = 1.34$) odds of being interested in EVs compared to low income people [z=1.70, p<0.089]. Nevertheless, results from regression 1 shows that income level (at least when comparing the highest quartile to the lowest quartile) is statistically significant at 99% level. The decrease in significance is due to the correlation between income level, and having driver's license and number of cars available.

4.2.2 Predicted Probabilities of Interest in EVs by Group

In addition to the odds ratio provided in the regression output, we want to be more specific with the size of effects of the seven independent variables. Therefore, the ranges of probability based on the variation of different variables are provided as following.

$$Pr(Interested) = \frac{1}{1 + e^{\boldsymbol{\beta_k} \cdot \boldsymbol{x_i}}}$$

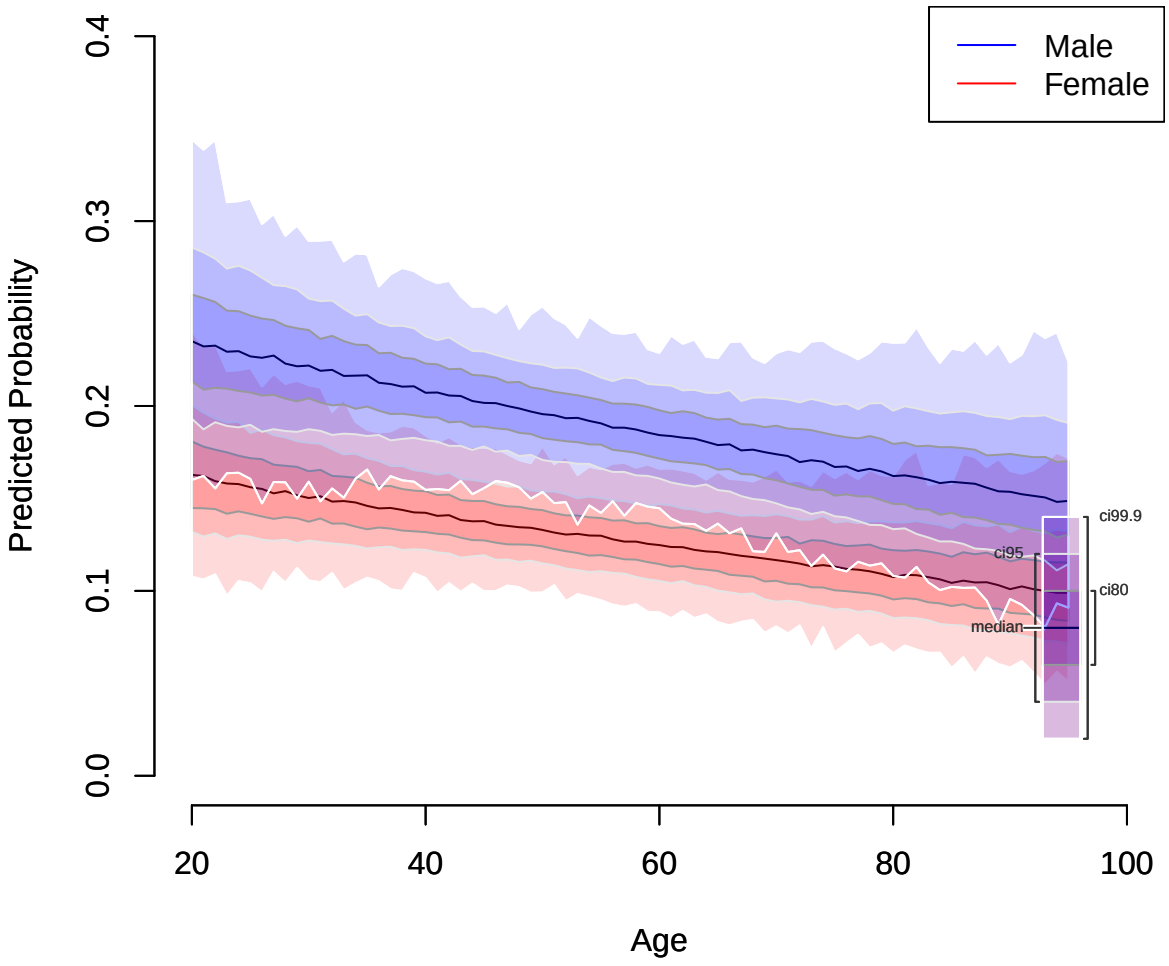

Figure 5: Predicted Probability of Having an Interest in EVs by Age and Sex

Figure 5 shows the predicted probability of having an interest in EVs by age and sex. Regardless of age, males show a greater interest than females. Even though the variation among males is larger too, the difference in probability is on average about 5 percentage points. The linear relationship between age and this probability is clearly demonstrated here as well. Younger people are more likely to be interested than older people.

Table 5-9 summarize predicted probabilities of having an interest in EVs of different groups and allow us to know the differences between groups.

- By Income Level & Sex: predicted for those people with mean age, valid licence, college degree, a car, and who doesn't live in Scotland.

Table 5: Probability by Income Level & Sex

Income Level	Male	Female
Lowest quartile	32.06	22.86
Second lowest quartile	30.02	21.22
Second highest quartile	32.72	23.4
Highest quartile	38.79	28.47

- By Education Level & Sex: predicted for those people with mean age, lower-middle income, valid licence, a car, and who doesn't live in Scotland.

Table 6: Probability by Education Level & Sex

Education Level	Male	Female
At least have a college degree	30.02	21.22
Do not have a college degree	18.35	12.37

- By License Status & Sex: predicted for those people with mean age, lower-middle income, college degree, a car, and who doesn't live in Scotland.

Table 7: Probabilities by Driver's License Status & Sex

License Status	Male	Female
At least have a college degree	30.02	21.22
Do not have a college degree	14.74	9.8

- By Number of Cars & Sex: predicted for those people with mean age, lower-middle income, college degree, valid licence, and who doesn't live in Scotland.

Table 8: Probabilities by Number of Cars & Sex

Number of Cars	Male	Female
0	26.36	18.35
1	30.02	21.22
2	33.95	24.40
3	38.12	27.89

- By Region & Sex: predicted for those people with mean age, lower-middle income, college degree, valid licence, and a car.

Table 9: Probabilities by Region & Sex

Region	Male	Female
In Scotland	17.56	11.8
In other regions	30.02	21.22

Among all respondents, only 18.48% are interested. This, on the other hand, suggests the need to better understand the factors related to the interest in EVs, and this is what motivated our research too.

Above analysis shows that the variations among different groups are quite large. For instance, people having a college degree, on average, have a probability of 30.7% to be interested in EVs, while people without a degree only have a probability of 14.5%. This kind of variation (especially the one related to education level) is actually a good sign, suggesting that interest in EVs could be potentially increased. Promotion of EVs should give more attention to the needs and consumption patterns of low-interest groups.

4.3 Factors Putting Off/Encouraging Buying EVs

In order to investigate what would turn existing interest in EVs into actual consumption of EVs, we look at questions regarding factors that will put off or encourage buying EVs and summarize the results here.

4.3.1 General factors

The graph below shows the major obstacles to buying an EV. The most popular issue is the recharging of the EVs, as 34.68% of respondents answered that they are concerned about it. The second largest issue is the capacity of the batteries, which is crucial to the travel distance. 30.82% of respondents are concerned about it, followed by the high costs of EVs (25.73%).

Now we turn to the factors that may encourage EV consumption. The choices provided in the survey and their relative importance in the respondents' minds are shown in the figure xxx.

Among the nine choices, the top four choices are: "Cost" with 30.12% respondents choosing it, "Battery: distance travelled on charge" with 15.67%, "Convenience of recharging" with 13.63%, and "Environmentally friendly" with 12.22%.

The facts above potentially reveal a public interest in EVs. If there were no interest at all, people would not have bothered to learn about EVs' battery capacity and recharging condition. In the section of policy recommendations, we will provide suggestions on how to take advantage of this interest.

4.3.2 Cost-related factors

The survey also asks what aspects of the costs people are concerned about. As shown in the graph below, 22.87% of respondents think that the purchasing costs would put them off buying an EV. The other major concerns are the maintenance costs (11.23%) and the fuel/recharging costs including fuel tax (10.29%).

As for encouraging cost-related factors, the top three choices are the same, only with a different order. While the top choice is still the purchase cost (21.23%), the second is fuel/recharging cost (16.49%) and the third is maintenance cost (11.64%).

Admittedly, this question is rather vague, because it only gives us the information regarding what kind of cost matters most to consumers, but not how they think of the costs at current levels. However, the results

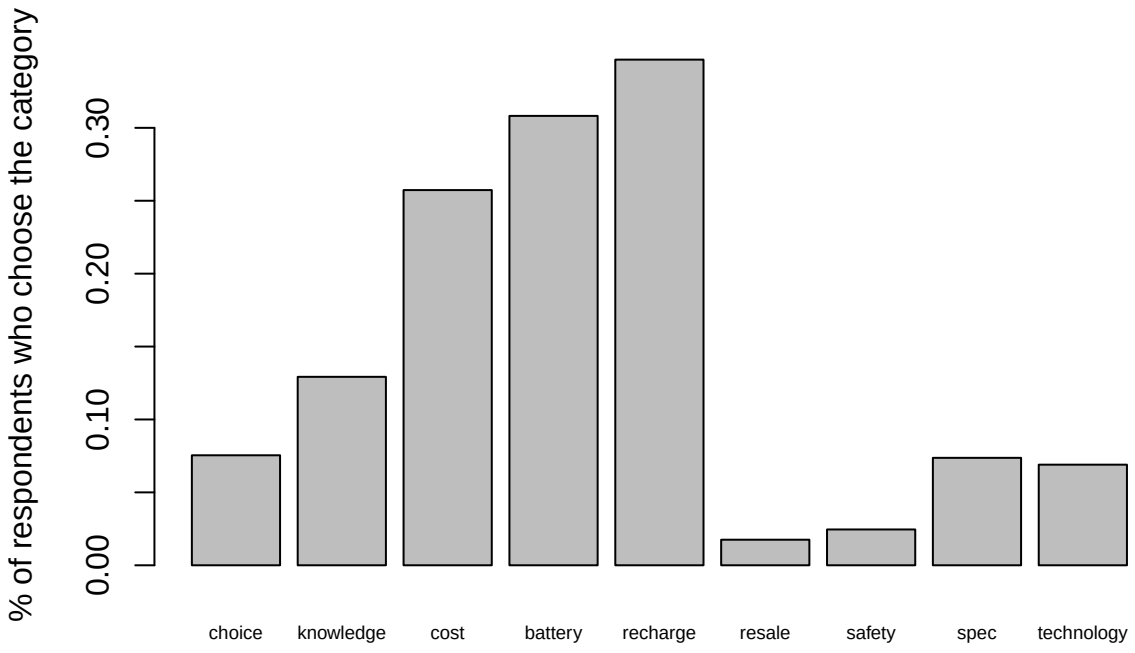

Figure 6: Factors putting off buying EVs

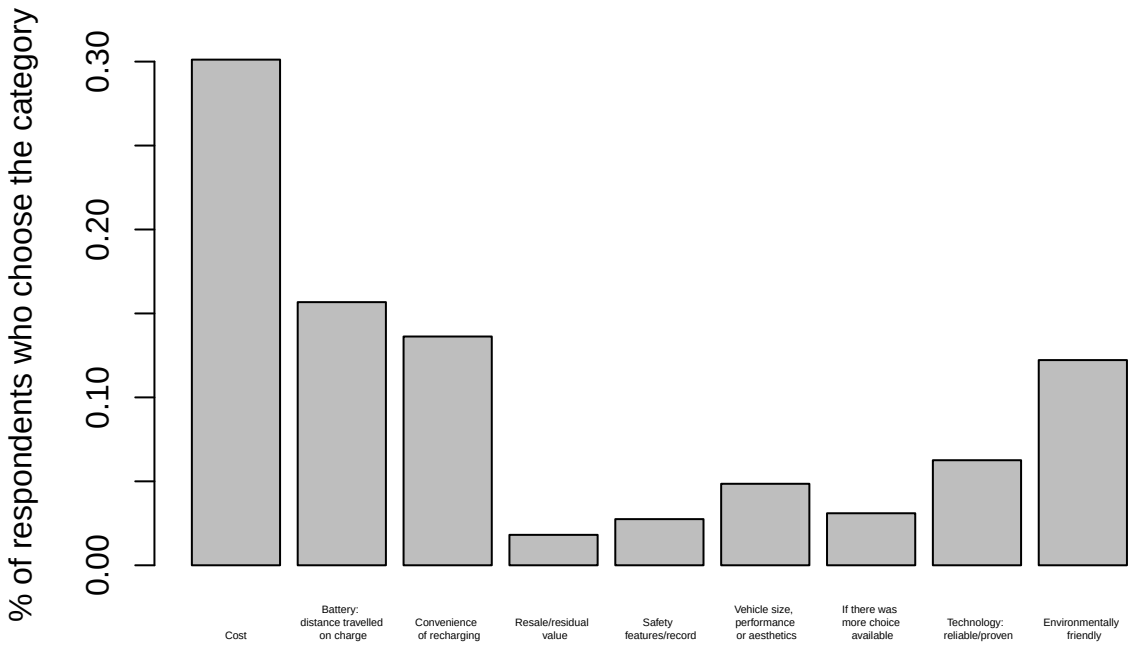

Figure 7: Factors encouraging buying EVs

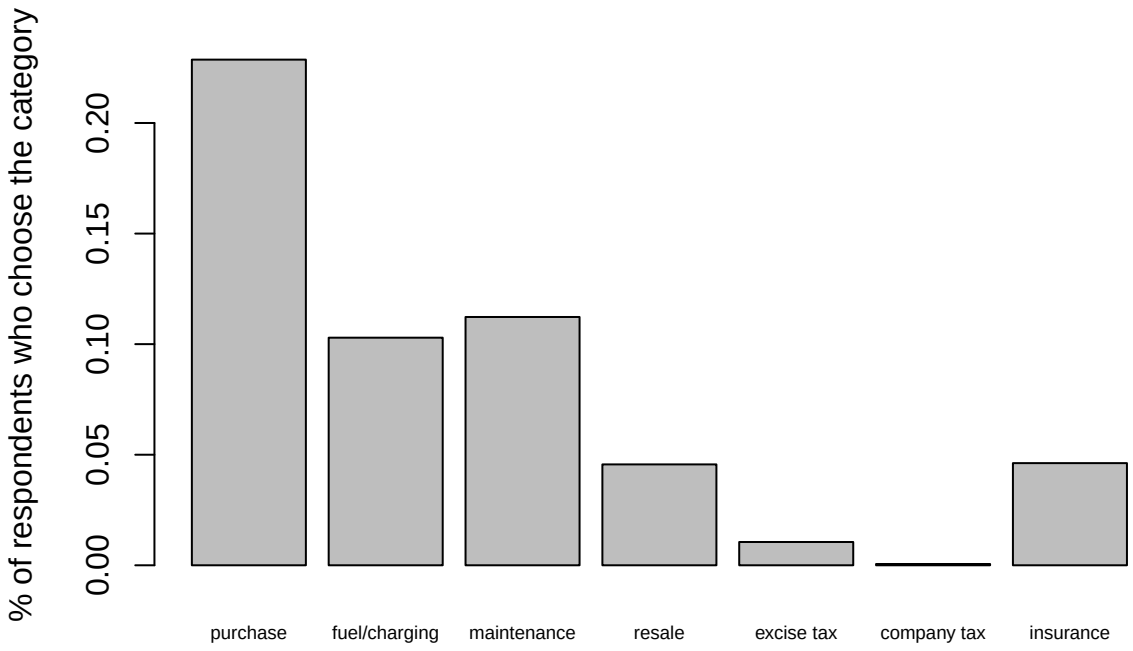

Figure 8: Cost-related factors that put off buying EVs

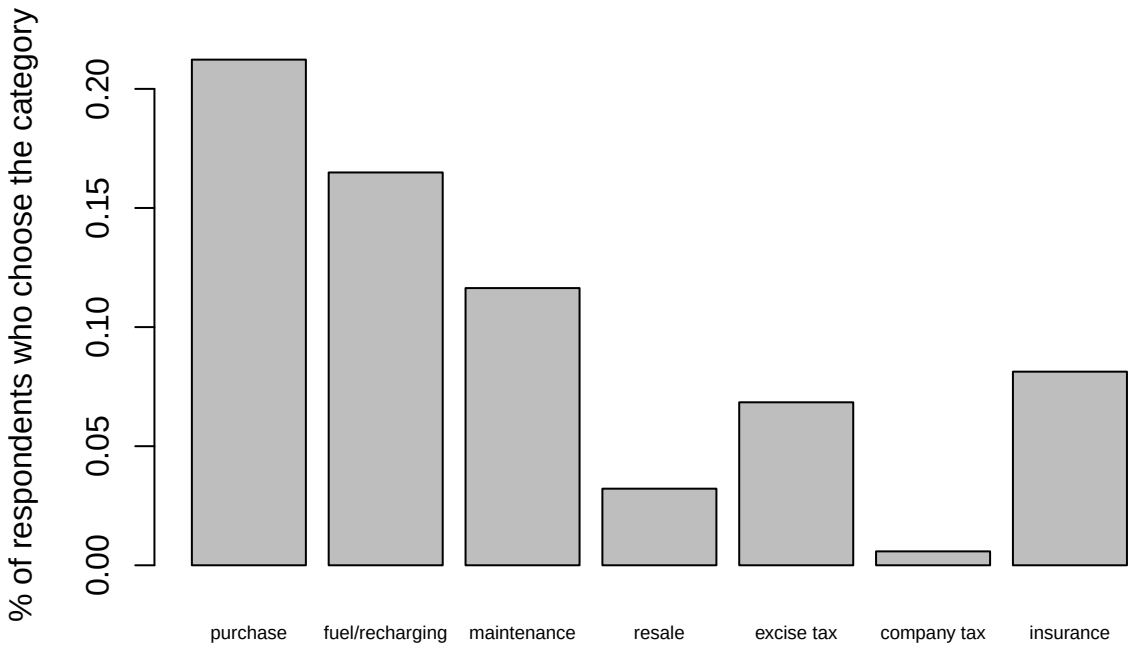

Figure 9: Cost-related factors that encourage buying EVs

clearly identify the costs that are most likely to be considered when making a car purchase, and these are where government can go in and provide financial incentives to consumers.

4.3.3 Similar considerations for different groups

In an attempt to formulate policy recommendations that resemble differentiated marketing strategy, we compare the relative weight given to the factors by different groups. We find that in most cases, different groups share their relative weight given to different factors. However, we do find some differences that can be used in differentiated marketing strategy.

1. Young people's stronger environmental awareness is somewhat confirmed in our results. They actually rank environmentalism before battery capacity and recharging conditions. So are females, people without driver's licence, people without cars and people living in Scotland, compared with males, people with driver's licence, people with car(s) and people living elsewhere respectively. Therefore, although people are most encouraged by practical improvements, people can also be motivated by ideological affinity.
2. Higher-middle income people will be very encouraged by increased convenience of recharging. Reason for this might be that this group are mainly white collars who work in city centers and they might be concerned about the cost of charging at home.
3. People with one car pay special attention to the potential of resale of EVs. Middle-income people (including people with lower-middle and higher-middle income) share this attention comparatively speaking. The majority of these groups of people might not be able to afford having one car. Therefore, they might want to make sure that they can esaily resale their EVs if EVs turned out to be a bad fit for them. This mindset is very common with the first generation who experience a new product.
4. Lowering the insurance cost of EVs would be most effective with young people, people with lower-middle income and people in Scotland. Lowering the insurance cost is harder, because it depends on the pool insurance companies have and as only a minority of people possess EVs, the pool is small. Also, it is because maintaining and repairing EVs are relatively more expensive since they require specially-made components.

5 Recommendations

Based on analysis in the previous section, we make the following policy recommendations on how to promote EVs in the UK.

1. Information campaign targeted on low-interest groups, in addition to general information campaign, is needed. Admitted, the general interest in EVs is still rather low, as only about 18% of the respondents show interest. However, we find great gaps among different groups and believe that these closing these gaps will great increase the level of interest. Females and people without a college degree are two groups in question. Information campaign on channels that are popular with these groups and catering the campaign to their tastes could be helpful in promoting EVs.
2. Removing obstacles by investing in R&D related to battery and recharging facilities must be continued. EVs, in many ways, are very different from traditional cars, and thus might even alter people's driving and other habits. Therefore, constantly improving battery and recharging facilities to reduce the changes consumers need to make will encourage more people to accept EVs.
3. Putting recharging facilities in place should be a priority, as most respondents are put off by the inconvenience of recharging. There needs to be a long-term plan for this, since charging EVs takes much time and making sure that recharges needs are met in time can be hard if the number of EVs increase greatly in the future.

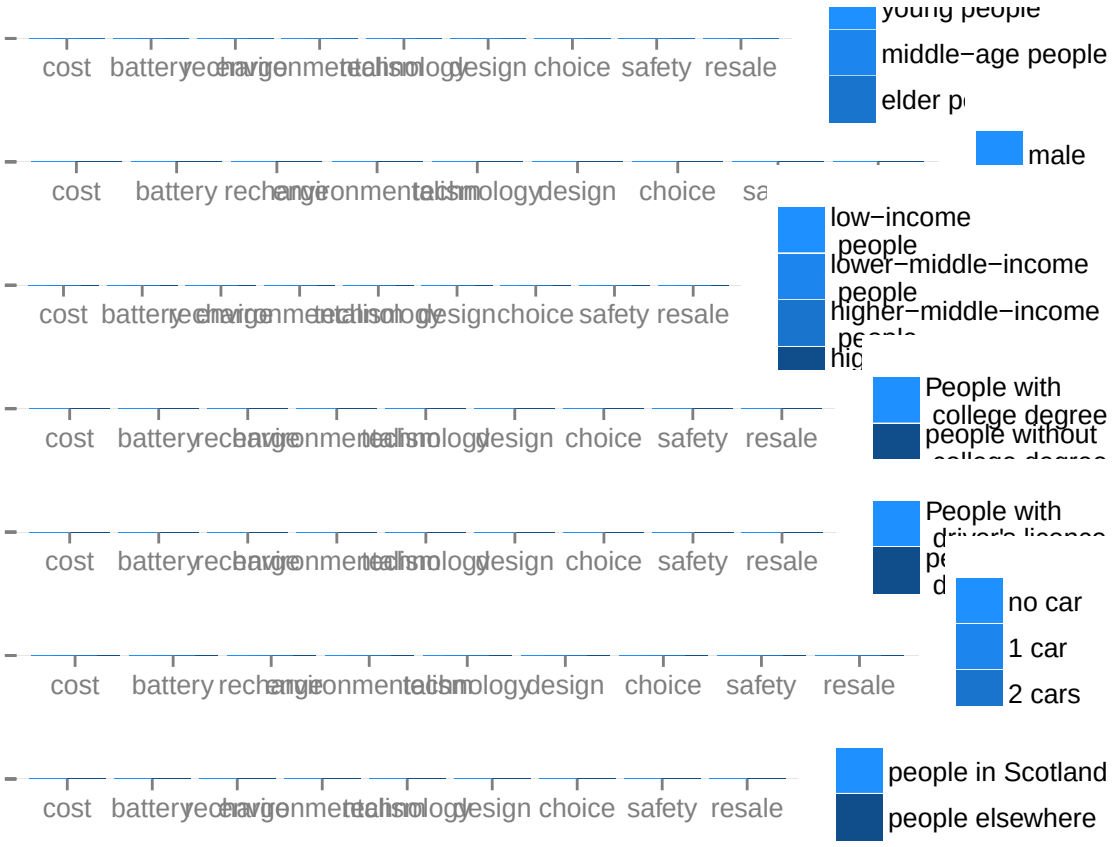

Figure 10: Relative weights to factors that encourage buying EVs among groups

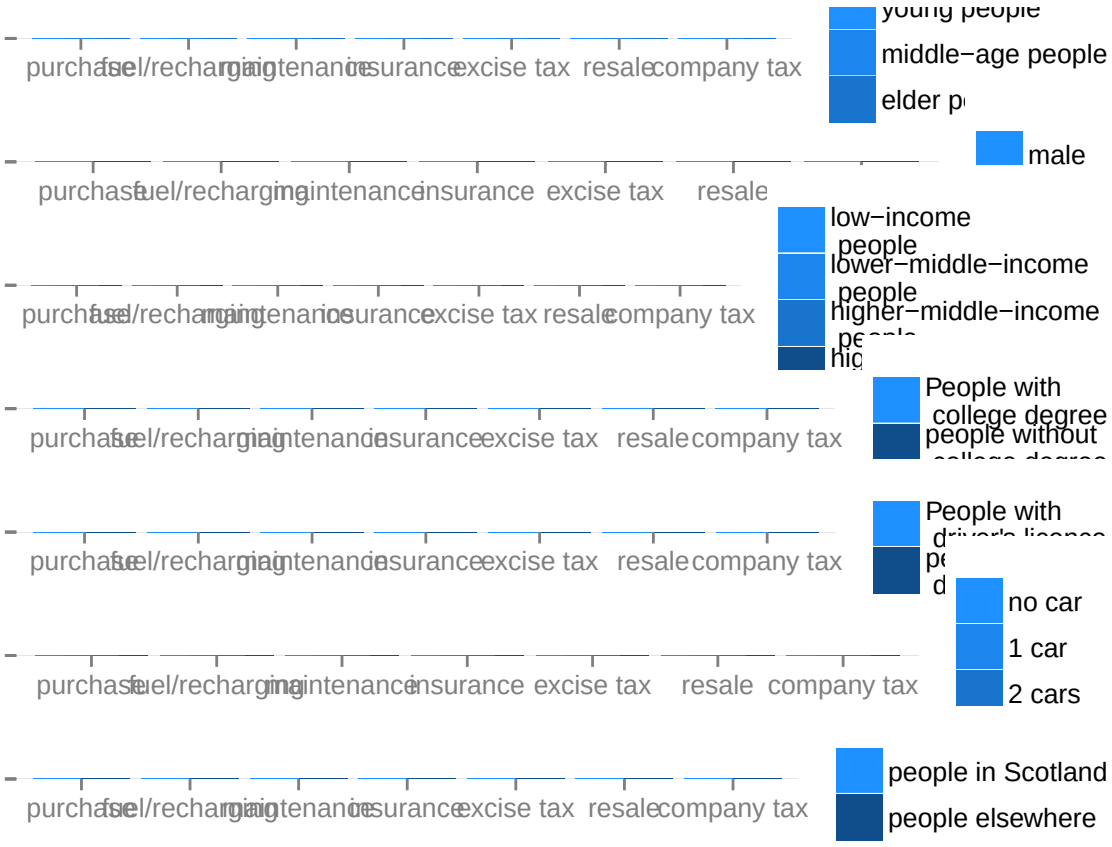

Figure 11: Relative weight to cost-related factors that encourage buying EVs among groups

4. Providing financial incentives, especially the ones regarding lowering purchase prices, is necessary. There are many ways to desgin financial incentives and lower EV prices, and different policies can have very different results.Generally speaking, the policies that immediately reduce the price (as constrast to refund) are most effective (Gallagher and Muehlegger 2011).

5. Advertising the economic benefits of EVs could be encouraging. Suprisingly, energy cost ranks the third among nine cost-related factors that put off buying EVs, since EVs are cheaper than conventional vehicles in terms of energy cost (Herron 2015a). Highlighting this information may change some people's minds.

6. Differentiated marketing strategies could be adopted in possible. They might help catalyze the process of turning interest into actual consumption of EVs.

Admittedly, there are some aspects that are beyond the capacity of government. For example, higher maintenance and insurance costs are largely the results of market. Relatively limited choices of models of EVs are probably due to companies' market projections as well. However, we believe that there are still much that can be done by the government to promote EVs, although there is still long way to go before EVs replace conventional cars too.

6 Limitations

One limitation is due to the design of the survey, which did not exclude respondents who are not interested in buying cars in general. Therefore, variables, including having driver's license and number of cars available, need to be interpreted with great caution. The low interest shown in groups without driver's license or cars might not be caused by their lack of interest in EVs, but by their lack of interest in cars.

Another limitation is that R^2 of the model is only 0.12, meaning that these variables only explain 12% of the variations in the probability of having an interest in EVs. Partly, this is because of a lack of available information, as it is impossible to survey everything. Partly, attitudes are just not easy to explain, because they could be influenced by countless factors, sometimes as trivial as an image or some careless words. Nevertheless, we believe that there are patterns and these patterns are what we should better understand if EVs are to be further promoted.

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