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How to Trigger Mass-Market Adoption for Electric Vehicles? - An Analysis of Potential Electric Vehicle Drivers in Austria

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Summary

As industry and governments are looking to counteract by incentivizing EV purchase, it becomes paramount to better understand potential EV adopters' and drivers of early adoption. Therefore, this study first analyzes early adopters, potential adopters and non-adopters of EVs drawing on a representative sample in Austria. Findings indicate that socio-psychological but less so, socio-demographic factors, play a significant role in predicting membership to defined adoption-segments. Non-adopters are more likely to have a more individualistic and less egalitarian worldview and also yield a less pro-environmental and pro-technological attitude compared to early adopters. Furthermore, early adopters are more likely to live in regions with EV policy incentives. Using cluster analysis this study further identifies four groups of potential EV adopters based on their evaluation of EV purchase and non-purchase motives. The potential adopter segments strongly differ in their socio-demographic and socio-psychological characteristics and their preferences for policy incentives. Implications for the design of effective policy schemes and marketing measures are discussed.

Keywords: BEV (battery electric vehicle), PHEV (plug in hybrid electric vehicle), consumers, mass market, policy

1. Introduction

In December 2015, the Paris Agreement signed by the parties of the United Nations Framework Convention on Climate Change set a clear, but ambitious target to combat climate change by limiting the global average temperature increase well below 2°C above pre-industrial levels [1]. The transportation sector is contributing almost a quarter of global energy-related greenhouse gas (GHG) emissions [2]. One promising pathway to curb emissions from fossil fuels in this sectors is the replacement of conventional internal combustion engines (ICE) with electric ones coupled with decarbonized energy production (e.g., [3]). Various studies underline the necessity of a major uptake of electric vehicles (EV)¹ within the next three decades to meet greenhouse gas reduction targets [3–5]. Recent advances in technology (e.g., lower battery cost or higher battery energy density) have extended vehicle range, [5] and along with policy support lowered vehicle costs in a number of countries [6], thereby reducing major consumer barriers. Nevertheless, sales growth has fallen short of industry expectations [5].

As industry stakeholders and policy makers are looking to counteract this trend, a better understanding of predictors for early EV adoption² and profiles of potential EV adopters' (i.e., people who can imagine to purchase an EV) is needed to create a mass market for EVs [8]. Larson and his team [9] see the lack of potential EV customer insights of stakeholders as a main reason for the slow EV-rollout. Glöcker and Nayum [10] argue that policy makers need to consider (potential) adopters' multifaceted attitudes and socio-psychological characteristics in creating incentives that more effectively accelerate EV diffusion.

Despite this evident need to learn more about (early) adopters and potential EV segments, prior work has shown that certain socio-demographic and socio-psychological differences[10–14] distinguish between actual EV owners and potential EV adopters currently using ICE vehicles. Our first research objective is to investigate a range of variables as predictors of EV-adoption including one particular group of socio-psychological variables. Existing literature so far has largely neglected the influence of cultural worldviews on the propensity to purchase an EV. Cultural worldviews can be described as “a general perspective from which a person sees and interprets the world” (15: 563) and they are conceptualized as an overarching sense-making system for complex questions [16]. For instance, previous research has shown that cultural worldviews are predictive of peoples' acceptance, attitudes and also behavioral intentions regarding a variety of issues such as, from gun legislation to climate change [17] but also climate change mitigation policies [18] and clean technologies [15]. Given this evidence and in additions to previously studied variables we introduce this concept here as we expect to find that respondents with certain cultural worldviews will be more likely to adopt clean technology vehicles such as EVs. To the best of our knowledge no study exists yet, which attempts to analyze the particular relationship of cultural worldviews and EV adoption.

Our second research objective is to contribute to the current discussion in literature and among stakeholders on the effectiveness of policy measures. On the one hand, research argues that policy incentives increase market penetration of EV (e.g., [19,6,20] and public institutions such as the International Energy Agency (IEA) keep on demanding additional policy support to achieve widespread adoption and deployment [5]. On the other hand, global automotive-leaders like Daimler CEO Dieter Zetsche argue that financial purchase incentives are the wrong way to improve acceptance of and create fascination for EVs among customers [21], an opinion which is in fact partly supported up by recent studies (e.g., [22,23]). Our study aims to contribute to this ongoing debate by investigating the influence of existing policy incentives on EV-adoption and evaluating preferences of different potential adopter segments regarding a variety of policy measures that have been proposed but also implemented already.

To achieve these objectives, our study examines the joint effect of different socio-demographic, socio-psychological as well EV-policy incentive variables on the adoption of EVs. Further, we conduct cluster analysis to identify different sub-groups of potential adopters with distinct socio-demographic and socio-psychological profiles. We build on data collected from 1,000 respondents, a sample representative of Austrian population. Respondents were asked to participate in a web-based survey in autumn 2016 by a market research company that handled the recruitment and remuneration process. Our findings suggest that socio-psychological in contrary to socio-demographic factors play a significant role in explaining differences between different adopter segments and are hence better predictors for early EV adoption. Furthermore, we argue that policy incentives decrease the time until EV purchase of a person, who can imagine purchasing an EV, but do not impact ICE-fans. In addition,

¹ EVs: battery electric (BEV) or plug-in electric (PEV) vehicles

² According to Rogers [7] definition Early-Adopters (incl. Innovators) comprise the first 16% adopting for a new technology

we find four main segments of potential adopters of EVs, which significantly differ in their attitude towards EV purchase and non-purchase motives as well as preference for policy incentives.

2. Theory and hypotheses

In recent years, a growing body of literature focused on people's general perception of EVs [11,12,22,24,25]. Fairly recently, researchers have also begun to analyze the profiles of actual adopters of EVs [14,26,27] who still represent a very small group (<0.1%) of the total car owner population globally [5]. Only little research has compared early adopters and other potential adopter groups of electric vehicles to identify differences among the groups and predictors of early EV-adoption. Initial insights suggest a significant influence of socio-demographic, socio-psychological and policy incentives on EV adoption [14,13,6]. In his seminal work Stern [28] argues that personal characteristics (e.g., socio-demographic characteristics), attitudinal factors (e.g., various socio-psychological factors) and contextual forces (e.g., government-implemented regulations or incentives) induce pro-environmental behavior and eventually facilitate the adoption of high-cost products. Therefore, in the following, we review the respective literature in more detail and derive hypotheses regarding socio-demographic, socio-psychological and contextual (i.e., EV policy incentives) variables as predictors for EV adoption.

2.1. Socio-demographic characteristics

Studies consistently find that early EV adopters have demographic and socio-economic characteristics that are significantly distinct from potential EV or non-adopters (i.e., ICE car buyers). At present, literature suggests that actual or early adopters (depending on the definition) tend to (1) be highly educated [13,11,27], (2) have higher income ([14,13,11,27] (3) are young to middle aged [11,13,29]; (4) live in multi-car households ([12,13,27,30]; (5) live in larger households [13], (6) are predominantly male [11], (7) and live mainly in small- to medium-sized municipalities [11].

However, results on these socio-demographic predictors for EV purchase need to be interpreted with caution as contradictory findings exist. For instance, Hidure and colleagues [29] were not able to confirm higher income and multiple car ownership as key-characteristics for early adopters of EVs. Furthermore, by including additional variables, e.g., psychological variables, the impact of socio-demographic variables on consumers' purchase intention for environmentally friendly cars has been found to be significantly lower [10]. These findings are corroborated by general research in the field of environmental behavior with several authors finding socio-demographic variables to be of little explanatory value for most environmental behaviors [31,32]. Considering all this, we define the following hypothesis:

Hypothesis 1. The socio-demographic characteristics (a) gender (being male), (b) education, (c) income, (d) household size, (e) number of cars per household are positively related, and (f) age and (g) dwelling density in area of residency are negatively related to the adoption of EVs.

2.2. Socio-psychological characteristics

As mentioned above some authors have presented evidence pointing to the importance of socio-psychological variables (e.g., values, attitudes, norms, etc.) as determinants of consumers' uptake of cars with emergent, cleaner technologies [33–36]. A recent study by Nayum and his team [13] tests the relevance of socio-psychological variables as predictors of purchase intentions for more environmentally friendly vehicles such as EVs. In their paper, they build on Klöckner and Blöbaum's [37] "comprehensive action determination model", which incorporates intentional, normative, situational, and habitual influences on environmentally friendly behavior. Overall, they conclude that, "for the design of effective measures to promote cars with emergent technologies, psychological characteristics of different target groups need to be addressed alongside economic factors" ([13]: p.8). Regarding socio-psychological factors predicting early adoption of EVs, the researchers were able to confirm environmentally friendly attitude, a positive attitude towards EVs and high behavioral control as significant predictors EV-purchase. The effect of e.g., social and personal norms were found to be non-significant [13]. Other studies also found that early adopters of EVs are more environmentally concerned [38], follow a green-lifestyle [29], have stronger pro-environmental attitudes [39] and yield higher engagement in an environment-orientated lifestyle [14]. Concerning attitudes towards EVs, it is argued that people with an interest in new technologies and living a technology-orientated lifestyle have a more positive attitude towards

EVs [14,22,39] further show that people, who have high interest in technology developments and are aware of the differences between EVs and cars with ICEs, are more likely to be early adopters of EVs. Based on these insights, we state that:

Hypothesis 2. (a) Pro-environmental and (b) pro-technological attitudes have a positive effect on the adoption of EVs.

One group of socio-psychological variables that existing literature has largely neglected so far is the influence cultural worldviews have on the intention to purchase an EV. Cultural worldviews can be described as an overarching guideline and sense-making system [16] and build on the cultural theory of risk [40]. The central idea in literature on cultural worldviews is that people form their preferences for complex topics through cultural cognition, which serves to maintain people's cultural worldviews. In essence this argumentation suggests that individuals use biased forms of information processing to promote their "interests in forming and maintaining beliefs that signify their loyalty to important affinity groups" ([41] p: 407).

Kahan [42] distinguishes two distinct dimension with four cultural worldviews typologies: hierarchism vs. egalitarianism and individualism vs. communitarianism. A person who can be described as egalitarian perceives greater risks and less benefits with regards to new technologies. Hierarchism and individualism by contrast are positively correlated with lower risk perceptions for personal risks (e.g., car driving) or environmental threats and equally positively associated with technological risk-taking [43]. Previous research has shown that devotion to one or another cultural worldview predicts opposition to and acceptance of a variety of issues including the disposal of nuclear waste, national security, possession of weapons, public health and climate change [42,44]. In particular, the concept of cultural worldviews appears to be highly suitable to predict individual differences regarding environmental attitudes, sustainable lifestyle choices and climate change perceptions [16,17,41,45]. For instance, studies have demonstrated that individuals adjust their perceptions of climate change (e.g., [17]) and even climate change mitigation policies [18] in accordance with their worldviews.

There is, however, little insight into the linkage between cultural worldviews and the acceptance of clean, low-carbon transportation technologies. Cherry and his team [15] researched the support of hierarchical and individualist worldviews on the acceptance for government-sponsored research projects on clean technologies (wind power and carbon capture/storage) finding that high individualism as well as hierarchism are associated with less support for research on low-carbon technologies.

Considering the effect of cultural worldviews on climate change related topics as well as on the acceptance of clean technologies as described above, the present study aims to investigate whether cultural worldviews can serve as predictors of respondents' EV purchase intentions. We expect to find:

Hypothesis 3. (a) Individualistic and hierarchical worldview are negatively and (b) communitarian and egalitarian worldview are positively associated with the adoption of EVs.

2.3. Contextual factors: EV policy incentives

There is a wide array of different policy measures designed to increase the appeal of EVs (e.g.,[6,46]). In this context, both purchase-based and use-based incentives are employed. Examples of the former policy are subsidies granted upon the purchase of the EV, or tax rebates that come into effect when it is registered. Examples of a use-based approach include privileges for EV drivers such as the waiving of parking fees or emission charges, or the use of bus lanes. Both types have been proven to support the sales-uptake of EVs [6,19,20].

However, other research argues that incentives may do little to influence adopters who lack conviction with regard to the technology [23] or have yet to perceive a satisfactory amount of EVs in their environment (a threshold effect) [47]. Zhang et al. [48] in fact confirmed a weak influence of monetary policy incentives on potential EV adopters' willingness to buy EVs. Others like Frey and Stutzer [49] for instance, observed that extrinsic incentives provided by the Norwegian government eliminated the "intrinsic motivation" associated with purchasing an eco-friendly vehicle. Nayum et al. [13] also tend to attribute the low level of social and personal norms to government incentives and policies. However, they also add that policies and regulations related to environmental behavior caused positive changes in the general public's attitudes on purchasing more fuel-efficient cars. 50) even arrives at the conclusion that a strong government policy is necessary to facilitate the proliferation of cars with emergent technologies due to the generally low inherent motivation of car buyers. Even though, we see mixed findings in literature, we expect to find a positive effect of policy incentives for EVs and therefore formulate the following hypothesis:

Hypothesis 4: EV policy incentives have a positive effect on the adoption of EVs.

3. Methodology and data

3.1 Sample

An online survey on public perceptions, preferences and willingness to invest regarding renewable energy and other low-carbon technologies representative for the population in Austria was conducted in the first two weeks of September 2016 (n=1.000). Austria has the highest growth rate (128%) and highest share of new registrations (1.2%) of electric vehicles in 2016 in the European Union [51]. A study on EV-attitudes and perceptions therefore represents a highly interesting case. The data was collected by an external market research company (Meinungsraum). A subsection of the questionnaire focused on participants' attitudes towards EVs and related policy incentives and their willingness to purchase EVs. In terms of gender, age, reported net income per household, and distribution of citizens across the Austrian federal states the sample we collected matches the Austrian population. Only in terms of educational level, our sample deviates from the Austrian population with a slightly higher educated group of respondents [52] (See Appendix A.1).

3.2. Questionnaire and measures

The survey instrument contained a variety of items and scale measurements, of which only the ones relevant to the study presented here will be described in more detail below.

The survey asked for details on participants' current car ownership (e.g., type, age, firm car yes/no, used vs. new, type of engine, etc.), their general preference regarding the fuel technology of their a next vehicle (Yes/No), and in case of a non-EV answer, their purchase intention for EVs in general on a 4-point Likert-type scale ranging from 1 (not likely at all) to 4 (very likely). Based on this information respondents were categorized into three groups (dependent variable)³:

- Early Adopters (17%): already purchased an EV⁴ or intend to buy an EV as their next car.
- Potential Adopters (32%): stated an interest in purchasing an EV, but not as their next car.
- Non-Adopters (51%): A little more than 50% of the respondents prefer a car with an internal combustion engine to an electric car and, at least at the time of our survey, have no intention to purchase an EV

To allow a comparison between different EV adopter segments, socio-demographic variables such as gender, age, education level, income, number of people per household, dwelling density in respondents' post code area and the number of cars per household were inquired. The contextual variable EV policy incentives was determined based on participants' postcode for the relative Austrian federal state.

The survey further employed questions designed to measure respondents' cultural worldviews, pro-technological and pro-environmental attitude.

Cultural worldviews were measured building on work by Kahan [44] using a scale which included six items that were chosen based on their applicability to an Austrian cultural context. The chosen items include statements such as "The government interferes far too much in our everyday lives." (individualism-communitarianism) and "Our society would be better off if the distribution of wealth was more equal." (egalitarianism-hierarchy). Answer options were presented on a 4-point Likert-type scale ((1) strongly disagree to (4) strongly agree). Responses for the various items were averaged so that an e.g., a higher score on the egalitarianism/hierarchy-question indicates more egalitarian cultural worldview or a higher score on the individualism-communitarianism questions indicate a more individualistic cultural worldview. Reliability of the scale for individualism-communitarianism was .55 and for egalitarianism- hierarchy .50.⁵ (See Appendix A6)

Pro-environmental attitude ($\alpha=.90$) was measured as environmental identity relying on three items by [55]. The scale presented items such as "Being environmentally friendly is an important part of my personality." which had to be rated on a 4-point Likert-type scale ((1) strongly disagree to (4) strongly agree).

³ 17% of the respondents currently do not have a car, but 2/3 of them are in the group of early or potential adopters, even though they could have chosen the answer: "Other - No need for a car".

⁴ Sample identified ten people as current EV and hybrid electric vehicle owners out of a 1,000, which is equivalent to the Austria current EV market share of approx. 0.1% ([53].

⁵ These Cronbach-Alpha values are in line with results from other researchers that applied the cultural cognition scale in their work in a non-US context (e.g. [54]. To increase scale's reliability one could argue that they need to be adjusted to specific cultural contexts. We discuss this drawback in more detail in the limitation and further research section of this paper.

Pro-technological attitude ($\alpha=.80$) was operationalized as participants' agreement (4-point Likert-type scale, (1) strongly disagree to (4) strongly agree) with six statements generated in expert discussions related to a general attitude towards digitalization such as "I see digitalization as an opportunity to better connect objects of daily life". (See Table 1 and Appendix A6 for summary and details).

Additionally, the questionnaire included questions, which asked respondents to evaluate EV policy incentives and purchase motives for or against EVs, which were used as input for the cluster analysis (see Appendix A2 and A3). EV policy incentives e.g., "purchase premium as a subsidy to the acquisition costs of an electric vehicle", "exemption from certain maturity payments", "free parking in downtown area", etc. were derived from literature [19,6] and discussions with policy experts. Respondents were asked to rate the attractiveness of these measures on a scale ranging from "not attractive at all" (1) to "very attractive" (5). Purchase motives and non-purchase motives for EVs were measured with ten items each stemming from literature (e.g., [22,25,38,56,57]) and tailored to the local context involving experts from an international consulting firm and a regional utility company. Respondents were asked to rate the importance of various EV-purchase motives such as "emission-free" and "status-symbol", as well as purchase barriers such as "range of the electric vehicle is too low" and "EV are too expensive" on a 5-point Likert-type scale ((1) not at all important to very important (5)).

Table 1: Description of variables for total sample and adopter groups

Variables	Variable code	Total Sample	Early adopters	Potential adopters	Non-adopters
No. of respondents		1,000	163	325	512
Willingness-to-purchase	3=Early Adopters 2=Potential Adopter 1=Potential Non-Adopter	1.56	3	2	1
<i>Socio-demographic variables</i>					
Gender	1=male, 2=female	49.0% 51.0%	56.1% 44.8%	48.4% 52.5%	47.6% 53.7%
Age	Years	45.0	45.01	43.8	45.8
Education	1=compulsory school 2=vocational training 3=high school 4=college	5.8% 44.1% 25.1% 24.2%	5.6% 40.5% 24.5% 29.4%	6.8% 39.7% 27.7% 25.8%	5.1% 48.0% 26.8% 20.1%
Household size	Number of people per household	2.43	2.24	2.67	2.31
Income	Net EUR per month per household	2,785	2,681	2,873	2,673
Number of cars per household	0=No car 1= One car 2= More than one car	17.1% 46.9% 36.0%	25.8% 44.2% 30.1%	18.2% 41.5% 40.3%	13.2% 51.2% 35.2%
Dwelling density	1=Municipal <10k 2=Town 10-100k 3=City >100k	30.2% 32.9% 36.9%	28.8% 33.1% 38.0%	30.5% 30.1% 39.4%	30.5% 34.5% 35.0%

Socio-psychological variables

1=disagree, 2=rather disagree, 3=rather agree, 4=agree

Pro-technological attitude	e.g., “I see the digitization as an opportunity for better networking.”	3.14	3.28	3.21	3.04
Pro-environmental attitude	e.g., “I would say of myself that I am environmentally conscious.”	3.02	3.25	3.15	2.87
Individualistic worldview	e.g., “The government interferes far too much in our everyday lives.”	2.84	2.66	2.85	2.91
Egalitarian worldview	e.g., “Our society would be better off if the distribution of wealth was more equal.”	3.11	3.30	3.17	3.01
<i>Contextual variable</i>					
EV policy incentives ¹	0=No EV policy incentive	48.0%	42.9%	52.0%	47.1%
	1=EV policy incentive	52.0%	57.1%	48.0%	52.9%

¹ Percent of respondents that live in federal states with/without EV policy incentives.

3.3. Data Analysis

We performed a multinomial logistic regression to test whether the socio-demographic, socio-psychological and context-variables (as *predictors*) are related to the willingness to purchase EVs (*dependent variable*).

In addition, a two-step approach is used to identify the extent to which potential adopters can be segmented. First, we apply an exploratory factor analysis to the electric vehicle *purchase and non-purchase motives* for the sub-sample of potential adopters. To determine the number of factors, we use an Oblimin rotation method and choose the Kaiser-criterion (eigenvalue greater than 1). Then, these factors serve as an input for a k-means cluster analysis with simple Euclidean Distance [58], identifying different sub-segments in the *potential adopter* group. We choose this cluster-method, because it is able to manage large sample-sizes, creating relatively homogenous groups and hence representing a more robust alternative to the hierarchical methods [59]. Following Mooi and Sarstedt [61] we analyzed the solutions for two to five clusters in order to choose the best number of clusters. We used a set of criteria including: interpreting the solution clearly, avoiding solutions with proportionally large classes (e.g., greater than 50% of sample) or very small classes (e.g., less than 10% of sample), avoiding solutions where two or more classes are essentially identical, and maximizing statistical measures of quality and parsimony. As a final step, clusters were validated by creating two subsamples (randomly splitting the sample) and then comparing two cluster solutions for consistency with respect to number of clusters and cluster profiles [60]. At the end, we characterized segments along a set of socio-demographic and socio-psychological variables and compared their preferences for policy incentives with multiple single ANOVAs.

4. RESULTS

4.1. Predictors of EV Adoption

We apply a multinomial logistic regression to predict membership to the adopter segments early adopters, potential adopters and non-adopters of EVs by using socio-demographic, socio-psychological and context-characteristics of respondents we find model fits the data (Model Chi2 (24) = 140.34 $p < .001$) explaining 16 % of total variance ($R^2 = .16$ (Cox & Snell), $.19$ (Nagelkerke)).

The regression results are presented in Table 2 and Table 3. Socio-demographic factors seem to play a marginal role in predicting the willingness to purchase an electric vehicle adopter segments. We do not find evidence in our sample that higher income (H1c) ($b = 0.05$, Wald Chi2 (1) = 0.65, $p > .05$), younger age (H1f) ($b = 0.00$, Wald Chi2 (1) = 0.42, $p > .05$), better education (H1b) ($b = -0.13$, Wald Chi2 (1) = 1.54, $p > .05$), or living in a small to medium-sized municipality (H1g) ($b = 0.31$, Wald Chi2 (1) = 1.02, $p > .05$) distinguishes between early adopters of EVs and potential adopters or non-adopters.

However, the other socio-demographic variables (gender, household size, number of cars) do have some predictive power. First, the number of people living in a household seems to have a positive impact as predictor for potential EV adoption compared to early EV adoption ($b = 0.24$ Wald Chi2 (1) = 5.89 $p < .05$), but not as indicator between non-adopters and early adopters ($b = 0.03$ Wald Chi2 (1) = 0.08 $p > .05$) (H1d partly supported). If the number of people increases in a household, the odds increase by 27% that an individual from this household is a potential adopter compared to an early adopter. In other words, people living in a smaller household are more likely to be an early EV adopter than potential EV adopter. Second, the number of cars owned by a household also predicts adopter segment membership, but in a less-intuitive way contradicting current literature (e.g., [13]). Our results suggests that a person currently not owning a car is significantly less likely to be a non-adopter ($b = -0.79$, Wald Chi2 (1) = 5.79, $p < .05$) or potential adopter ($b = -0.58$, Wald Chi2 (1) = 2.98, $p < .05$) than an early adopter. In other words, current non-car-users are in favor of electric cars, and ownership of one or more cars is not a significant predictor for early adoption. Hence, the thesis that early adopters have more than one car and use EVs as a second car is not supported (H1e not supported). Third, our analysis shows that men are less likely to be non-adopters ($b = -0.57$, Wald Chi2 (1) = 7.82, $p < .001$) or potential adopters ($b = -0.41$, Wald Chi2 (1) = 3.87, $p < .05$) than early adopters (H1a supported).

Socio-psychological variables seem to be better predictors of respondents' willingness to purchase an EV in the future. A more individualistic ($b = 0.78$, Wald Chi2 (1) = 18.38, $p < .001$) and less egalitarian ($b = -0.35$, Wald Chi2 (1) = 4.11, $p < .001$) cultural worldview of a person are significant predictors for non-adoption compared to early adopters. Similarly, car users that are less pro-environmental ($b = -0.71$, Wald Chi2 (1) = 19.70, $p < .001$) and less convinced of the benefits of new technologies ($b = -0.59$, Wald Chi2 (1) = 11.91, $p < .01$) are more likely to be non-adopters than early EV adopters. Our analysis also shows that socio-psychological characteristics are less useful to predict membership between potential and early adopter segments. People of both segments show no significant difference in their pro-technological attitudes technologies ($b = -0.18$, Wald Chi2 (1) = 1.07, $p > .05$) and egalitarian worldviews ($b = -0.05$, Wald Chi2 (1) = 0.07, $p > .05$). However, a higher pro-environmental attitude ($b = -0.36$, Wald Chi2 (1) = 4.55, $p < .05$) and less individualistic worldview ($b = 0.46$, Wald Chi2 (1) = 6.12, $p < .01$) increase the odds of being an early EV adopter compared to a potential adopter. Overall, we can thus accept hypotheses 2a (pro-environmental attitudes), 2b (pro-technological attitudes) and hypotheses 3a and 3b (cultural worldviews).

Regarding the effect of existing EV policy incentives our analysis shows mixed-results. On the one hand, a person living in a sub-region with no subsidies is 68% more likely to be a potential than an early adopter ($b = 0.52$, Wald Chi2 (1) = 4.54, $p < .05$). On the other hand, this context variable is non-significant for the differentiation between non-adopters and early adopters ($b = 0.23$, Wald Chi2 (1) = 0.93, $p > .05$). This finding thus only partially confirms our hypothesis 4, which assumes that policy incentives have a positive effect on the adoption of EVs. In addition, we tend to conclude, that EV policy incentives are only effective for people already convinced of an EV.

Table 2: Multinomial regression output: non-adopters vs. early adopters

Non-Adopters vs. Early Adopters	B (SE)	95% CI for Odds Ratio		
		Lower	Odds Ratio	Upper
Constant	4.31 (1.10)			
Age	.01 (0.01)	.99	1.00	1.01
Education	-.13 (0.11)	.71	.88	1.08
Household-size	.03 (0.10)	.85	1.03	1.24
Income	.05 (0.07)	.93	1.06	1.21
Gender (male)	-.57 (0.20) **	.38	.57	.85
# of cars per household=0	-.79 (0.32) *	.24	.45	.86
# of cars per household=1	.01 (0.24)	.63	1.01	1.62
Dwelling density: Municipal=1	-.31 (0.30)	.75	1.36	2.46
Dwelling density: town=2	-.13 (0.23)	.73	1.14	1.79

Pro-technological attitude	-.59 (0.17) ***	.40	.56	.76
Pro-environment attitude	-.71 (0.16) ***	.36	.49	.67
Individualistic worldview	.78 (0.18) ***	1.53	2.18	3.12
Egalitarian worldview	-.35 (0.17) *	.50	.70	.99
EV incentives = 0	.23 (0.24)	.79	1.26	2.00

Note: R²= .16 (Cox & Snell); .19 (Nagelkerke). Model Chi² (24) = 140.34 p < 0.001 † p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001.

Table 3: Multinomial regression output: potential adopters vs. early adopters

Potential Adopters vs. Early Adopters	B (SE)	95% CI for Odds Ratio		
		Lower	Odds Ratio	Upper
Constant	1.05 (115)			
Age	.01 (0.01)	.99	1.00	1.01
Education	-.04 (0.11)	.77	.96	1.19
Household-size	.24 (0.10) *	1.05	1.27	1.53
Income	.02 (0.07)	.88	1.02	1.16
Gender (male)	-.41 (0.20) *	.44	.66	.99
# of cars per household=0	-.58 (0.34) *	.29	.56	1.09
# of cars per household=1	-.25 (0.25)	.48	.78	1.27
Dwelling density: Municipal=1	-.07 (0.31)	.58	1.07	1.97
Dwelling density: town=2	-.16 (0.24)	.54	.86	1.37
Pro-technological attitude	-.18 (0.18)	.59	.83	1.18
Pro-environment attitude	-.36 (0.17) *	.51	.70	.97
Individualistic worldview	.46 (0.19) **	1.10	1.59	2.29
Egalitarian worldview	-.05 (0.18)	.67	.95	1.35
EV incentives = 0	.52 (0.24) *	1.05	1.68	2.71

Note: R²= .16 (Cox & Snell); .19 (Nagelkerke). Model Chi² (24) = 140.34 p < 0.001 † p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001.

4.2. Sub-Segments of Potential EV Adopters

As described in section 3.3. we apply a non-hierarchical k-means cluster analysis using standardized factor scores of purchase motives and non-purchase motives for EVs (see Appendix) as input variables (58). Potential adopters (n=325) were grouped into four segments as the increase in model fit flattened out considerably after four clusters and solutions with more than four clusters resulted in clusters with small cluster sizes (i.e., less than 10%) [60].

Table 4 summarizes these profiles, depending on the potential adopters' attitudes towards purchase and non-purchase arguments. Furthermore, we applied ANOVAs to test for statistically significant differences between these groups in socio-demographic, socio-psychological and policy incentives (see Appendix A.4 and A.5). The results of these tests are briefly described below.

Table 4: Four profiles of potential adopters

	Low purchase motives	High purchase motives
High non-purchase motives	Rural Non-Techs (34%): More likely to be female, better educated, live on the countryside and have a higher income Preference for purchase-based incentives	Undecided Individualists (28%): Lower education level, earn below average income, more likely from the countryside and have a more individualistic worldview High preference for any kind of policy incentive
Low non-purchase motives	Undiscerning Urbanites (16%): Live in an urban area, tend to be younger and more educated and yield a less strong environmental identity No real preference for incentives at all	Urban EV Supporters (32%): are more likely male, older and environmentally conscious car drivers, who show a strong environmental identity Moderate preference for purchase- and user-based incentives, similar to early adopters

Rural Non-Techs (n = 111): This sub-group is the largest group and can be described as less tech-affine and as individuals who seem to strongly respond to the structural product barriers (e.g., price, driving range, etc.). Members of this potential adopter sub-group are more likely female, better educated and in a higher income-class. In addition, they tend to have more than one car and are more likely to live on the countryside. In terms of incentives they prefer financial-orientated incentives e.g., purchase-subsidies, tax and fee cuts over user-orientated incentives.

Undecided Individualists (n = 91): Members of this potential adopter sub-segment score high in their evaluation of purchase and non-purchase arguments. A strong technological interest and above-average evaluation of general benefits of an EV is slightly overshadowed by the perception that EVs face structural barriers which unsurprisingly is accompanied by skepticism. They seem undecided as to whether the downsides of an EV outweigh its benefits. By looking at statistically significant differences in individuals characteristics, we discovered that potential adopters of this sub-segment are less educated, earn a below-average income, inhabit more likely the countryside and have a more individualistic worldview. In conformance with their attitudes for purchase and non-purchase motives, these respondents have a high interest in any kind of incentive (financial and user-orientated).

Undiscerning Urbanites (n = 52): This sub-segment of potential adopters value the environmental and operating benefits of EVs less than the other potential adopter segments and have below-average passion for technological benefits of EVs. On the other hand, they do not consider structural and product-related barriers as an issue and their perception of attitudinal barriers are in line with the average of the potential adopter segment. Their attitude could be explained by the fact that many of these adopters do not own a car yet, tend to be younger, more educated and live in an urban area. Thus, we labelled this sub-group ‘Undiscerning Urbanites’. Their low interest for EVs is also reflected in a low pro-environmental attitude. Further, they perceive EV benefits, which are related to environmental and operational benefits as less attractive. Their interest for policy incentives is very low irrespective of the type of incentive (purchase-/use-based) and comparable to the evaluation-level of non-adopters.

Urban EV Supporters (n = 71): This segment is very positive about the general and technological benefits of an EV, and low in evaluation towards EV structural and attitudinal barriers. Members of this group are more likely found in the in urban areas. The profile accounts for 22% of the potential-adopter segment and describes a male, older and environmentally conscious car driver. Since this segment is the closest to the early-adopters group related to attitudes, the members’ interest for incentives is high for any kind of incentive and similar to early-adopter respondents.

5. DISCUSSION

Many people exhibit positive attitudes towards EVs, but only a minor percentage of them has already bought one. Hence, to promote the diffusion of this low-carbon technology in individual transportation the identification and characterization of early adopters is highly relevant. Furthermore, knowledge of the growing segment of potential EV adopters is essential for the design of tailored marketing programs, novel and successful business models and effective policy measures. Our study contributes to research on EV adoption and aims at advancing our understanding of early and potential adopters of EVs. To achieve this we applied a multinomial logistic

regression to examine whether socio-demographic, socio-psychological (including cultural worldviews) and contextual characteristics (i.e. policy incentives) are related to the willingness to purchase EVs based on a representative sample of Austrian citizens (n=1000). Additionally, we aim to shed some light on the socio-demographic and socio-psychological characteristics of potential adopter segments and their preferences for policy incentives by applying a non-hierarchical cluster analysis and multiple single ANOVAs.

Our study reveals that socio-psychological and, less so, socio-demographic factors play a role in predicting membership to defined adoption-segments. This finding is in line with literature on environmental behaviors which equally found low explanatory effects for socio-demographic variables (e.g., [31,32]) but contrasts several research papers on early EV adoptions [10,11,13,14]. In line with Nayum and Klöckner [10] who already pointed to the idea that the inclusion of psychological variables lowers the effect of socio-demographics in explaining consumers' purchase intention for environmentally friendly cars, our study fully supports the conclusion that the usage of multiple variables creates a more comprehensive picture of the impact of socio-demographics on consumers' purchase intention for fuel-efficient cars. An implication derived from this, which might be of relevance to practitioners is that a focus on people's attitudes towards the environment, their interest in state-of-the-art technologies instead of only targeting younger, high-income, better educated men living on the countryside with two cars might prove more effective.

Our study equally contributes to the literature by providing first insights regarding the effect of cultural worldviews as predictors of EV purchase. Particularly individualism appears to significantly differentiate between the three identified adopter segments. The more individualistic a person in our sample, the less likely he or she will purchase an electric car. This result is in line with the general tendency of this ideological group who tend to have a less positive stance towards renewable technologies [15], are more skeptical regarding the existence of climate change [42,44] and perceive environmental threats as less severe [43]. Another avenue that might explain this relationship relates to the often reported range anxiety with regards to EVs and the hedonic and symbolic attributes people assign to the ownership of cars. It has been shown that parts of our society consider the ownership of a car as a symbol for status- or freedom experiencing joy and pleasure while driving [25]. Kahan et al. ([42] p:365) define a more individualistic worldview as "attitudes toward social orderings that expect individuals to secure their own well-being without assistance or interference from society (...)". The ownership of a car in some cases could represent just that appreciation of individual accomplishment. Individualist would thus not see their freedom desire satisfied with the purchase of an EV due to EVs range-restrictions. A potential implication here is that practitioners could stronger emphasize the climate change mitigating benefits of EVs and the roll of everyone for a sustainable world in future and offer products such as mobility-guaranties for EVs to overcome the range-anxiety. Or to market EVs as highly luxurious and exclusive, similar to what has been visible in TESLA's marketing strategy. Overall, future studies in this line of research are needed to better understand of the relationship between worldviews and the intention to buy an EV and to test the above-discussed assumptions and remedies to their refusal.

Regarding policy incentives, our analysis provides two main insights. First, early adopters are more likely to live in regions with EV policy incentives compared to potential adopters. Hence, we see some positive linkage between policy incentives and early EV adoption. Zhang et al. [48] also showed a significant, albeit small effect of government policies on the purchase intention, but additionally pointed out that there is a clear increase of public awareness and acceptance as a function of government policies. Second, EV policy incentives here were not found to distinguish between early adopters and non-adopters. Lane and Potter [36], among others, argue that incentives are only effective for individuals considering EVs and ICEs to be technologically similar. Our data suggests that particularly non-adopters perceive EV as too expensive and not equivalent to an ICE in terms of performance and convenience, which also corresponds to findings in the literature (e.g., [50]). Overall, we would suggest that the closer a person is to buying an EV and the more convinced a person is of the functional attributes of an EV, the more effective a policy incentive seems to be. This is in line with Green et al. [23] who propose to increase the effectivity and efficiency of incentives by targeting early adopters and special niches (e.g., EV car sharing fleets).

The four identified clusters (Urban EV Supporters, Undecided Individualists, Rural Non-Techs, and Undiscerning Urbanites) that vary in their attitudes and characteristics emphasize the need to target potential adopters differently with tailored products, incentives and mobility concepts. Compared to the early-adopter-group the Urban EV Supporters segment yields similar characteristics, but is more likely to live in urban areas. EVs tailored to city needs (e.g., smaller size) or car-sharing models with EV could be one logical lever to gain market share in this segment. A particularly interesting profile is exhibited by respondents that are part of the Undecided Individualist segment. Members of this cluster require more information about EV products to decrease their concerns about EV barriers and to strengthen their attitude towards EV benefits. Since Undecided Individualists are more likely to live on the countryside, the push of hybrids as a first step, might also contribute

to the goal of making EVs more acceptable to them, a proposal already made by Axsen et al. [14], who argue that “potential future buyers are more likely to be interested in PHEVs designs than BEV designs.” (p: 365). The Rural Non-Techs seem to be interested in EVs, but according to their evaluation of purchase/non-purchase motives they seem not to be well informed (e.g., they stronger evaluate “ICE as clean enough” than the other segments) and are less aware of recent developments in the EV market. Axsen et al. [14], confirmed that current ICE car drivers have less EV awareness and knowledge than EV drivers and call for awareness campaigns. Alternatively, Bühler and his team [62] propose real-life EV experience as a promising marketing/awareness strategy, as they found that consumers are significantly more interested in buying an EV after driving it. Undiscerning Urbanites evaluate attractiveness incentives and purchase motives as well as non-purchase motives lower as the other clusters. This might be attributable to the fact that they seem to be on average younger, more likely to live in a larger city, thus happily relying on public transport, and to not own a car. Their purchase intention for an EV, however could indicate a preference for using EVs provided by taxi- or car-sharing companies or public transportation (e.g., E-buses). Across all four clusters, we identified different preferences regarding the type of incentives. Hence, in contrast to existing literature (e.g., [19]) we argue that there are differences in preferences between user-orientated and purchase-incentives among potential customer segments. Our findings regarding different incentive preferences for potential-adopter subgroups can serve as a starting point to a potentially valuable field of further research, which focuses on the identification of proper incentive packages for different target groups.

6. LIMITATIONS AND FUTURE RESEARCH OUTLOOK

Though our research sheds some light on an under-investigated topic, the study also carries some limitations. Our unique dataset that is representative for the Austrian population allowed us to classify respondents into three distinct groups according to their propensity to purchase an EV. Our group of early adopters contains a small fraction of electric vehicle owners (n=10) but the majority of respondents in that segment is constituted by individuals that indicated that they would choose an EV as their next car. This segment constitutes 17% of our sample. A purchase intention however does not automatically translate into an actual purchase of an electric car, as real behavior may differ substantially from the stated. In addition, as in every self-report survey, the results of our analysis are likely to be influenced by social desirability. This phenomenon is also sometimes discussed in discussion on the attitude-behavior gap (e.g., Lane and Potter, 2007). For future studies to overcome this limitation, we propose oversampling actual adopters, which would make our analysis more compelling. Our study provides interesting new insights into potential EV adopters in the Austrian market, which has the highest growth rate (128%) and highest share of new registrations (1.2%) of EVs in 2016 in European Union. However, a downside of this focus on a single market is the generalizability of our findings and the limited transfer to other national contexts. Austria has distinctive geographical and topographical features with a large fraction of the population living in rural areas, which might have influenced our survey results. Further, national cultures differ in aspects such as pro-environmental attitudes (e.g., recycling, for instance, has a very long tradition in Austria and the market share of organic and local products has increased rapidly over the last years). We would encourage scholars to conduct similar studies in countries with distinct national cultures and topographical settings in order to verify our findings and to gain new valuable insights from a comparison of different markets.

Our findings regarding the relation between cultural worldviews and the acceptance of electric cars seem to be a first stone towards a new research field. However, findings need to be interpreted with caution. First of all, we could not use the complete worldview scale measurements due to length restriction of the questionnaire. Second, the low Cronbach-Alpha scores achieved might indicate an issue of applicability of the applied cultural cognition items to an Austrian cultural context despite our efforts to choose items, which should fit best. For future research in this field we would recommend the development of a dedicated measurement instrument tailored to a European cultural context in contrast to the US-American focused scales of Kahan and colleagues (e.g., [42]).

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APPENDIX

Table A.1. Sample characteristics and representativeness

Variables	Variable code	Sample mean	Austrian population mean
<i>Socio-demographic variables</i>			
Gender	1=male,	49.0%	48.9%
	2=female	51.0%	51.1%
Age	18-19 years	1.4%	3.3%
	20-29 years	18.0%	18.6%
	30-39 years	18.0%	18.4%
	40-49 years	23.9%	21.9%
	50-59 years	20.0%	21.1%
	60-69 years	19.0%	14.9%
	70 years	0.6%	1.4%
Education	1=compulsory school	6.0 %	19.8%
	2=vocational training	44.0%	49.8%
	3=high school	25.1%	14.8%
	4=university	24.2%	13.6%
Household income/month	25% Percentile	1,800	1,717
	50% Percentile	2,700	2,769
	75% Percentile	3,500	4,179
Federal state	Burgenland	4.1%	3.4%
	Carinthia	6.0%	6.5%
	Lower Austria	17.9%	19.0%
	Upper Austria	17.8%	16.8%
	Salzburg	6.3%	6.3%
	Styria	13.7%	14.3%
	Tyrol	7.9%	8.5%
	Vorarlberg	4.8%	4.4%
Vienna	21.5%	20.9%	

Table A.2. Results of the factor analysis: purchase motives

	General EV motives	Technological motives
Free of emissions	.876	
Protection of the environment and the climate	.859	
Low operating costs	.768	
Ideal for short journeys and city traffic	.710	
High efficiency of the electric motor	.612	
Charm of modern technologies		.790
Lower driving noise at low speed		.701
The battery of the car can also be used as a buffer storage for the in-house photovoltaic system		.688

Note: Extraction method: principal component analysis; rotation method: oblimin with Kaiser normalization. The purchase motives load on two factors explaining 59% of the variance, yielding a Kaiser Meyer-Olkin Measure (KMO) sampling adequacy value between .81-.85 and Barlett's test of Sphericity is significant at $p < 0.001$.

Table A.3. Results of the factor analysis: non-purchase motives

	Structural barriers	Attitudinal barriers
Low availability of electrical stations (in Austria and abroad)	.848	
Range of the electric cars too low	.779	
Too expensive	.772	
Batteries are rather short-lived	.689	
No loading possible near the apartment / house	.654	
Long charging duration	.631	
A petrol or diesel vehicle is clean enough		.817
EV is not save enough		.746
High complexity		.707
The electric car is only a transition technology		.637
Electric cars are rather small and therefore, e.g. not suitable for a family car		.543
Also electric vehicles are a burden on the environment (e.g., battery production and disposal, electricity production)		.480

Note: Extraction method: principal component analysis; rotation method: oblimin with Kaiser normalization. The non-purchase motives load on two factors explaining 58% of the variance, yielding a KMO sampling adequacy value between .82-.88 and Barlett's test of Sphericity is significant at $p < 0.001$.

Table A.4. ANOVA Socio-demographic and -psychological differences between potential adopter clusters

Dependent variable = WTP	Rural Non-Techs (Mean; SD)	Undecided Individualists (Mean; SD)	Undiscerning Urbanites (Mean; SD)	Urban EV Supporters (Mean; SD)	F-Value	P-Value
Age	43.14 (13.74) ^{a, b}	44.63 (13.87) ^d	38.17 (13.09) ^f	47.79 (13.68)	5.15	0.00
Education	2.73 (1.03) ^a	2.38 (0.90) ^d	2.94 (0.89) ^f	2.40 (0.92)	4.44	0.00
Household size	2.72 (1.23)	2.65 (1.24)	2.48 (1.15)	2.45 (1.41)	0.87	0.46
Income	3155.03 (1418.64) ^{a, b}	2617.18 (1262.61) ^e	2544.23 (1344.51) ^f	3058.54 (1751.67)	3.61	0.01
Gender (male)	1.58 (0.50) ^c	1.53 (0.50)	1.57 (0.50) ^f	1.37 (0.49)	2.99	0.03
Dwelling density	2.39 (0.84) ^{b, c}	2.20 (0.78) ^e	1.86 (0.84)	1.91 (0.89)	2.64	0.04
# of cars per household	1.37 (0.76) ^b	1.30 (0.70) ^d	0.94 (0.78)	1.23 (0.64)	4.17	0.01
EV incentives	0.51 (0.50)	0.54 (0.50)	0.37 (0.49)	0.44 (0.50)	1.68	0.17
Pro-technological attitude	3.28 (0.53) ^b	3.30 (0.51) ^d	2.85 (0.58) ^f	3.29 (0.56)	9.65	0.00
Pro-environment attitude	3.12 (0.60) ^{a, b, c}	3.32 (0.55) ^d	2.73 (0.55) ^f	3.34 (0.58)	11.91	0.00
Individualistic worldview	2.67 (0.65) ^a	3.21 (0.56) ^{d, e}	2.72 (0.49)	2.77 (0.74)	16.85	0.00
Egalitarian worldview	3.19 (0.65) ^b	3.28 (0.66) ^d	2.86 (0.59) ^f	3.23 (0.67)	5.18	0.00

^aRural Non-Techs vs. Undecided Individualists – $p < 0.05$, ^bRural Non-Techs vs. Undiscerning Urbanites – $p < 0.05$, ^cRural Non-Techs vs. Urban EV Supporters – $p < 0.05$, ^d Undecided Individualists vs. Undiscerning Urbanites – $p < 0.05$, ^e Undecided Individualists vs. Urban EV Supporters – $p < 0.05$, ^f Undiscerning Urbanites vs. Urban EV Supporters – $p < 0.05$

Table A.5. ANOVA policy incentives between potential adopter clusters

Dependent variable = WTP	Rural Non-Techs (Mean; SD)	Undecided Individualists (Mean; SD)	Undiscerning Urbanites (Mean; SD)	Urban EV Supporters (Mean; SD)	F-Value	P-Value
Purchase subsidies	4.41(0.72) ^{b, c}	4.59 (0.54) ^d	3.29 (0.91) ^f	4.70 (0.52)	54.37	0.00
Exemption toll payment	3.86 (0.96) ^{a, b, c}	4.48 (0.72) ^d	3.48 (0.78) ^f	4.31 (0.89)	19.54	0.00
Free parking	4.01 (1.08) ^{a, b, c}	4.52 (0.74) ^d	3.52 (0.75) ^f	4.44 (0.87)	16.87	0.00
Scrapping premium	3.86 (1.12) ^{a, b, c}	4.41 (0.82) ^d	3.11 (0.78) ^f	4.24 (0.95)	19.55	0.00
Tax benefits company cars	3.59 (1.21) ^a	4.26 (0.95) ^d	3.27 (0.77) ^f	3.85 (1.35)	9.27	0.00
(Partially) deductibility of purchase price in income tax return	4.17 (0.94) ^{a, b, c}	4.63 (0.57) ^d	3.31(0.70) ^f	4.55 (0.75)	36.64	0.00
Exemption NoVA and car tax	3.59 (1.21) ^{a, b, c}	4.26 (0.95) ^d	3.37 (0.77) ^f	3.85 (1.35)	52.88	0.00
Bus lane usage	3.27 (1.22) ^{a, c}	3.80 (1.14) ^d	3.13 (0.77) ^f	3.90 (1.20)	8.39	0.00
Reserved special parking lots	3.86 (1.05) ^{a, b}	4.29 (0.90) ^d	3.31 (0.83) ^f	4.14 (0.83)	12.02	0.00
No speed limits	3.31(1.23) ^a	4.10 (1.02) ^d	3.21 (0.89) ^f	3.73 (1.36)	10.27	0.00
Free public charging	4.56 (0.71) ^{a, b}	4.79 (0.44) ^d	3.40 (0.85) ^f	4.73 (0.48)	63.63	0.00
Legally prescribed number of public charging stations on	4.06 (0.88) ^{a, b}	4.52 (0.66) ^{d, e}	3.38 (0.72) ^f	4.10 (0.87)	23.76	0.00
Regulation of internal combustion engines	3.14 (1.11) ^a	3.84 (1.14) ^{d, e}	3.25 (0.88) ^f	3.10 (1.19)	9.32	0.00

^aRural Non-Techs vs. Undecided Individualists – p < 0.05, ^bRural Non-Techs vs. Undiscerning Urbanites – p < 0.05, ^cRural Non-Techs vs. Urban EV Supporters – p < 0.05, ^dUndecided Individualists vs. Undiscerning Urbanites – p < 0.05, ^eUndecided Individualists vs. Urban EV Supporters – p < 0.05, ^fUndiscerning Urbanites vs. Urban EV Supporters – p < 0.05.

Table A.6. Socio-psychological measurement scales used in the survey

Scale/Dimension	Items	Source(s)
Cultural worldviews: individualism-communitarianism	<p>The government interferes far too much in our everyday lives.</p> <p>Free markets – not government programs – are the best way to supply people with the things they need.</p> <p>The government should do more to advance society’s goals, even if that means limiting the freedom and choices of individuals. (Recoded)</p>	Kahan et al. (2011, 2007); Cherry et al. (2014)
Cultural worldviews: egalitarianism- hierarchy	<p>We have gone too far in pushing equal rights in this country. (Recoded)</p> <p>Our society would be better off if the distribution of wealth was more equal.</p> <p>Discrimination against minorities is still a very serious problem in our society.</p>	Kahan et al. (2011, 2007); Cherry et al. (2014)
Pro-environmental attitude	<p>I would say of myself that I am environmentally conscious.</p> <p>Being environmentally friendly is an important part of my personality.</p> <p>I would describe myself as someone who cares about the environment.</p>	Whitmarsh & O’Neill (2010)
Pro-technological attitude	<p>I see the digitization as ...</p> <p>... opportunity for better networking of objects of daily life.</p> <p>... possibility of networking with people worldwide.</p> <p>... essential facilitation of communication and the handling of everyday things.</p> <p>... possibility of access to fast, up-to-date and extensive information and knowledge.</p> <p>... danger to the privacy of the individual ("glass man"). (Recoded)</p> <p>... problematic with regard to hacker attacks. (Recoded)</p> <p>... predominantly negative development as regards the safety of people. (Recoded)</p>	

