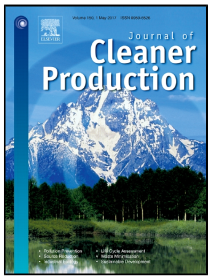


Examining drivers of sustainable consumption: The influence of norms and opinion leadership on electric vehicle adoption in Sweden

Johan Jansson, Annika Nordlund, Kerstin Westin

PII:	S0959-6526(17)30650-9
DOI:	10.1016/j.jclepro.2017.03.186
Reference:	JCLP 9313
To appear in:	*Journal of Cleaner Production*
Received Date:	26 October 2016
Revised Date:	14 February 2017
Accepted Date:	27 March 2017

Please cite this article as: Johan Jansson, Annika Nordlund, Kerstin Westin, Examining drivers of sustainable consumption: The influence of norms and opinion leadership on electric vehicle adoption in Sweden, *Journal of Cleaner Production* (2017), doi: 10.1016/j.jclepro.2017.03.186

Examining drivers of sustainable consumption: The influence of norms and opinion leadership on electric vehicle adoption in Sweden

Authors

Johan Jansson[a, b, *], Annika Nordlund[a, c], Kerstin Westin[a, d]

[a] Transportation Research Unit (TRUM), Umeå University, Umeå, SE-90187, Sweden

b * **Corresponding author:** Umeå School of Business and Economics, Department of Business Administration, Umeå University, SE-901 87 Umeå, Sweden, johan.jansson@umu.se, telephone +46 90 786 50 00. Present address: School of Economics and Management, Lund University, Box 7080, SE-220 07 Lund, Sweden, johan.jansson@fek.lu.se, telephone +46 46 222 02 70.

[c] Department of Psychology, Umeå University, SE-901 87 Umeå, Sweden, annika.nordlund@umu.se, telephone +46 90 786 50 00.

[d] Department of Geography and Economic History, Umeå University, SE-901 87 Umeå, Sweden, kerstin.westin@umu.se, telephone +46 90 786 50 00.

Word count revised manuscript: 8,368

Abstract

Transportation accounts for a large and growing part of carbon dioxide emissions. With an increasing vehicle fleet worldwide private car use is becoming an acute problem in need of urgent attention and action. Policy interference and cleaner cars are not enough; alternative fuel vehicles such as electric vehicles need to be adopted by consumers as well. Previous research on pro-environmental consumer behavior and sustainable consumption has proven the importance of norms and pro-environmental attitudes. However, little research has focused on understanding interpersonal influence found influential in consumer behavior research relating to innovation adoption. Consumer opinion leading and opinion seeking are two such interpersonal influence attitudinal constructs that have not been empirically analyzed in relation to sustainable consumption and alternative fuel vehicles. The main aim of this study is thus to analyze the influence of a set of attitudinal constructs on electric and flexfuel vehicle adoption: personal norms, social norms, ecological attitudes, opinion leading, and opinion seeking. Data from a questionnaire survey on three groups of electric vehicle adopters and non-adopters is used (N=1,192). The results confirm the importance of personal norms, opinion leading and opinion seeking in the three groups also when controlling for socio-demographic factors. The main contribution of this study is that it shows the importance of both interpersonal influence and attitudinal factors as drivers for eco-innovation adoption. The study also contributes in showing that electric vehicle and flexfuel vehicle adopters differ in relation to non-adopters on several factors.

Keywords

Consumer behavior, interpersonal influence, sustainable consumption, eco-innovation adoption, flexfuel vehicles, electric vehicles

Highlights

- Highlights the importance of personal norms in electric and flexfuel vehicle adoption.
- Opinion leading is significantly positively related to electric vehicle adoption.
- Opinion seeking is significantly negatively related to electric vehicle adoption.
- Eco-innovations such as electric vehicles would benefit from being marketed not only as cleaner, but also as socially desirable products.
- A suggestion is to label cleaner cars visibly to show others the owner's environmental responsibility taking.

1. Introduction

Fossil fuel combustion is the single largest human influence on the climate, accounting for approximately 80% of anthropogenic greenhouse gas emissions such as carbon dioxide (CO_2). These emissions have more than doubled since 1970 from the transport sector, and have increased at a faster rate than from any other energy end-use sector. Around 80% of this increase has come from road vehicles and in 2010 the final energy consumption for transport reached 28% of total end-use energy according to the Intergovernmental Panel on Climate Change (IPCC; Creutzig et al., 2015; Sims et al., 2014). Thus there are strong links between transportation, fossil oil use and CO_2 emissions that need urgent address in order for temperatures not to reach dangerous levels and cross the climate change planetary boundary for a safe operating space for humanity (Rockström et al., 2009; Steffen et al., 2015). With the aim of developing less fossil oil dependent societies and curbing CO_2 emissions, policies are beginning to be put in place to curb these problems. Together with strategies to build cities for less transport, increase the share of trips using public transportation and bicycling/walking, policies aimed replacing fossil fuels and cars with biofuels and less energy consuming vehicles are being implemented across the world (Mannberg et al., 2014; Rezvani et al., 2015; Sang and Bekhet, 2015).

In terms of cleaner production, car manufacturers have during the last years introduced many types of alternative fuel vehicles (AFVs), i.e., cars that can be fueled by fossil alternative fuels such as biogas, bioethanol/E85, and electricity. These cars are by many currently seen as offering great potential for sustainable transport development (e.g., Borén et al., 2016; Robèrt et al., 2016). Considering that only a few years ago a consumer could choose between two fuels (gasoline and diesel), the situation today in many markets is radically different (e.g., Sierzchula et al., 2012). Due to the introduction of AFVs, car buyers today may have to consider similar cars that can be fueled by different fuels associated with different environmental impacts, driving ranges, fueling procedures, and image status. As governmental incentive schemes and consumer preferences are in constant flux, car producers aiming to produce cleaner cars and thus meeting policies of decreasing their fleet's environmental impact, need to continuously monitor these changing conditions. As often pointed out, for cleaner products and innovations such as AFVs to succeed in decreasing environmental impact, wide market diffusion is critical if current mobility intense consumer lifestyles are wished to be maintained. Thus, consumer acceptance is an important condition for a technological shift and the long-term success of a new, less environmentally harmful, transport system (Chekima et al., 2016; Mau et al., 2008; Ozaki and Sevastyanova, 2011). However, in spite of many different types of incentives to both producers and consumers of AFVs, the consumer uptake of these cars has been slow. Car manufacturers as well as policymakers are struggling to understand consumer acceptance and adoption of these technologies.

In general, research concerning environmental, social and ethical consumer behaviors and sustainable consumption has often pointed to the importance of attitudinal factors such as ecological attitudes and interpersonal social influence such as norms (Axsen and Kurani, 2011; Byrka et al., 2016; Griskevicius et al., 2008; Jansson and Dorrepaal, 2015; Steg et al., 2014; Stern et al., 1999). More specifically, these factors have also been proven important in understanding AFV adoption in different markets (Byrne and Polonsky, 2001; Jansson, 2011; Lane and Potter, 2007; Li et al., 2013; Moons and De Pelsmacker, 2015; Sang and Bekhet, 2015). The majority of these studies use pro-environmental and pro-social attitudinal factors in order to establish the link to sustainable consumption and usually find that pro-environmental attitudes explain a relatively large part of intention and/or actual green behavior. Implications from these types of studies often point to the importance of producers to emphasize the green aspects of the products in marketing in order to match the green consumer segment of the market. Following this type of advice might be one reason why most green products on the market are still alternatives and niche products instead of the main ones (cf. Burchell et al., 2013; Rettie et al., 2014). So, although studies focusing on pro-environmental attitudinal factors have brought the understanding further it seems as if there are pieces missing to the sustainable consumption puzzle. A starting point for this study is that not only green consumer attitudes are important but also other types of attitudes, and that these differ among consumers. Marketing and consumer behavior studies point to the importance of attitudes and the social aspects of consumption both in terms of influence and outcomes. This is beginning to be recognized in the sustainable consumption literature as well in the form of normative social influence (Aagerup and Nilsson, 2016; Axsen and Kurani, 2011; Griskevicius et al., 2010, 2008; Johansson-Stenman and Martinsson, 2006). In addition, marketing and consumer adoption literature has also pointed to the importance of some consumers being relatively earlier than others in adopting innovations but also spreading the word about them (Fisher and Price, 1992; Rogers, 2003). These are often called innovators or early adopters and some of these, called opinion leaders, are particularly interesting for understanding social influence. Opinion leaders, to a higher degree than others, influence the attitudes and actions of others and are thus important in diffusing innovations in a social system (Goldenberg et al., 2009; Rogers, 2003). In the green and sustainable consumption literature an important question that has not been addressed thus far is whether opinion leading is related to eco-innovation adoption. A few studies hypothesize around this link (i.e., Goldsmith and Goldsmith, 2011; Keys et al., 2010), but there are no generalizable empirical studies as of yet and also no studies comparing the possible strength of this relationship in different adopter groups (i.e. from early adopters so non-adopters).

Against the background of the sustainability problems and lack of research on social influence discussed above, the main aim of this paper is to analyze the influence of norms (personal and social), ecological attitudes, and opinion leading as well as opinion seeking on alternative fuel vehicle (AFV) adoption. Since there is a gap between stated intentions and actual adoption behavior, especially concerning pro-environmental behaviors (i.e., Kollmuss and Agyeman, 2002), a secondary aim is to analyze the influence of these factors among different adopter groups, i.e. electric vehicle (EV) adopters, Biofuel FlexFuel Vehicle (FFV) adopters and Non-adopters, and to compare these groups on the attitudinal factors as well as on socio-demographic factors. The aims are fulfilled by way of a questionnaire survey in order to test six hypotheses developed based on the literature review. Before describing the results and analysis, the methods are detailed and the Swedish context concerning consumer EV and FFV adoption are presented. At the end of the paper, the implications for sustainability, communication, policy makers, manufacturers, and for further research are outlined.

2. Literature review

Research on drivers of consumer pro-environmental behavior and sustainable consumption have arrived at a multitude of factors with varying influence. Although different behaviors from purchases, to use and to the discarding of products are influenced by different factors, a few general elements have been shown to hold across many pro-environmental consumer behavior areas. For example, social influence is often found important in sustainable consumption just as in most types of ordinary consumption. The recognition of social influence (in the form of normative beliefs) as an important factor has developed out of theories such as the theory of reasoned action (TRA; Fishbein and Ajzen, 1975) and its extension into the theory of planned behavior (TPB; Madden et al., 1992). Another influential theory explaining consumer pro-environmental behavior is the norm activation model (NAM; Schwartz, 1977) which in turn has been developed into the value belief norm Theory (VBN) by Stern and colleagues (Stern, 2000; Stern et al., 1999). Although these theories differ somewhat on how norms are defined and operationalized (cf., Thøgersen, 2006), the common ground is that social influence has an important function in guiding individual behavior, and especially behavior which can be viewed as pro-social and/or pro-environmental. Below, definitions on social influence, personal and social norms are presented.

2.1 Social influence, personal and social norms

That social influence is important in innovation adoption has been established in the diffusion of innovation and consumer adoption literature since early conceptualizations (Rogers, 2003, 1962; Venkatesh et al., 2003; Wejnert, 2002; Young, 2009). The explanation for the effect of social influence on adoption relates to that support from influential others has an important influence on what action a potential adopter chooses to take since individuals adapt their attitudes and behaviors to the social context. Since innovations create uncertainty about expected consequences of adoption for potential adopters, social influence is especially important. Individuals interact with their social networks to consult on their adoption decisions since they are uncomfortable with this uncertainty (Burkhardt and Brass, 1990; Lu et al., 2005). In many areas there is wide support for the importance of interpersonal influence in adoption and diffusion. A few examples include high-tech innovations such as personal digital assistants (Kulviwat et al., 2009), new drugs and health risk perceptions (Morton and Duch, 2001; Prosser et al., 2003), electronic services such as banking, online gifts and wireless internet (Kim and Park, 2011; Lee et al., 2002; Lu et al., 2005; Venkatesh et al., 2003). Several studies have also pointed to the importance of social influence in AFV adoption (Axsen et al., 2009; Axsen and Kurani, 2011; Mau et al., 2008; Nordlund et al., 2016; Nyborg et al., 2006; Ozaki and Sevastyanova, 2011; Struben and Sterman, 2008) and it has been argued that social influence theory is important in environmental studies and for those trying to increase or promote pro-environmental behavior at the individual, family or household level (Goldsmith and Goldsmith, 2011).

An important aspect of social influence is norms, of which usually two types are distinguished: personal and social. Personal norms are shared beliefs about how individuals perceive they ought to act which are enforced by the internalized threat of sanctions or the promise of rewards (Schwartz, 1977; Stern et al., 1999). It is well proven that personal norms influence both intentions for pro-social behavior and actual behavior (Biel and Thøgersen, 2007; Thøgersen, 2006). Personal norms have been defined by Schwartz (1977) as a self-expectation of specific action in a particular situation, experienced as a feeling of moral obligation. Thus, personal norms are adhered to for internal reasons consistent with internal values, conceptions of right and wrong, good or bad (Thøgersen, 2006). Many studies show positive correlations between personal norms and pro-environmental behavior in areas such as acceptability of energy policies (Steg et al., 2005), recycling (Thøgersen, 2003; Vining and Ebreo, 1992), and consumer purchase behaviors (Tanner and Kast, 2003; Thøgersen and Zhou, 2012). Also in the transport sector social influence in the form of norms have been found important in for example minimizing or switching travel choices to more environmentally friendly alternatives (Bamberg and Schmidt, 2003; Jansson, 2009; Nordlund and Garvill, 2003) and adoption of AFVs (Jansson, 2011; Nordlund et al., 2016; Petschnig et al., 2014). Less internalized norms are generally referred to as social norms. Rather than following internalized expectations, following social norms is based on perceived group expectations for reward and punishment. It is assumed that individuals adhere to social norms because of (objective or subjective) social pressure (Ajzen and Fishbein, 2005; Thøgersen, 2006). Social norms are perceived as shared by members of a subgroup and they vary from one individual to another in how internalized they are. Thus, personal norms arise or are learned from shared expectations in social interaction, they are altered in the particular interaction history of each person, and they represent standards against which events are evaluated (Schwartz, 1977). Social norms are thus closely related to personal norms in that both types of norms drive behavior to conform but for different reasons. Concerning social norms there is evidence of correlations between these and different types of behaviors such as climate change mitigation behaviors (Griskevicius et al., 2008), conservation behavior (Goldstein et al., 2008), car use (Bamberg and Schmidt, 2003) and travel mode choice (Hunecke et al., 2001). Correlations between social norms and behavior are generally weaker and become significantly weaker or disappear when personal norms are added to these models (Biel and Thøgersen, 2007; Thøgersen, 2006). Thus, internalized personal norms are more effective in explaining pro-social behavior than perceived external social norms due to their lesser level of internalization. This makes personal norms particularly important since they are conceptualized as the last attitudinal factor influencing behavior as established in research on the VBN theory (Jansson et al., 2011; Steg et al., 2005; Stern, 2000; Stern et al., 1999).

2.2 Ecological attitudes

In this study we use an inclusive definition of attitudes as "*a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor*" (Eagly and Chaiken, 2007, p. 1). In general pro-environmental attitudes have been found to be able to explain a relatively large part of intentions or actual pro-environmental behavior (Chekima et al., 2016; Heberlein, 2012; Sang and Bekhet, 2015; Steg and Vlek, 2009; Vredin Johansson et al., 2006). Ecological attitudes are also related to other attitudinal factors such as norms and values in the VBN theory. Often ecological attitudes are conceptualized as a worldview or paradigm called the new ecological paradigm (NEP). The NEP has been described as a "folk" ecological theory from which beliefs about the adverse consequences of environmental changes can be deduced and which covers views on the balance of nature, the limits to growth, and humankind's domination of nature (Dunlap et al., 2000; Stern, 2000). The NEP has been extensively tested and found valid as one type of ecological attitudes in relation to many pro-environmental behaviors and in many countries (Dunlap, 2008; Poortinga et al., 2004; Vikan et al., 2007; Widegren, 1998). In terms of AFV adoption, only a few studies have analyzed the relationships between the NEP and intentions to adopt or actual adoption and found weak but positive results (Jansson et al., 2011, 2009; Nordlund et al., 2016). Although the research on green consumer behaviors focusing on norms and ecological attitudes as described above, is important, there are also non-green goals and attitudes driving green consumer behaviors (Heberlein, 2012; Joshi and Rahman, 2015; Lindenberg and Steg, 2007; Miller, 2009). For example it has been found that consumers choose AFVs not only for their green attributes but also for their technological newness and their appeal as innovations (Jansson, 2011; Jansson et al., 2009; Petschnig et al., 2014). Closely related to these types of attitudes, but also to social influence, are attitudinal constructs concerning opinion leading and opinion seeking.

2.3 Opinion leading and opinion seeking

In diffusion of innovation research, opinion leaders are identified as focal points for the communication of innovative ideas and practices in social networks (Nair et al., 2010; Rogers, 2003; Summers, 1970). A large number of studies have been conducted to identify potential opinion leaders, understand the characteristics distinguishing them from their followers, and learn how they exert their personal influence to change opinions and actions of the many (Venkatraman, 1989; Weimann et al., 2007). Many of these studies have validated that opinion leaders do indeed exist and influence others in areas, ranging from fashion and consumer decisions, politics and health issues such as HIV (Burt, 1999; Kelly et al., 1991; Summers, 1970; Valente and Davis, 1999). Such opinion leaders, also referred to as influentials, are individuals regarded as having expertise and knowledge on a particular subject. The definition of opinion leaders is that they to a higher degree than others influence the attitudes and actions of others and thereby are important in diffusing innovations in a social system (Goldenberg et al., 2009; Rogers, 2003; Ruvio and Shoham, 2007; Shoham and Ruvio, 2008). Opinion leaders tend to be competent technically, are heavy consumers of the mass media and are socially active (Shoham and Ruvio, 2008). Other characteristics attributed to opinion leaders include changing the opinions and values of a critical mass of people to move towards system transformation, and, recognizing opportunities to connect political interest to problem perception (Folke et al., 2005; Keys et al., 2010). Opinion seekers on the other hand have been found to be individuals who seek information or opinions from interpersonal sources in order to find out about and evaluate products, services, current affairs, or other areas of interest (Shoham and Ruvio, 2008). Flynn, Goldsmith, and Eastman (1996) view opinion seeking as a co-phenomenon of opinion leadership, which occurs when people seek information and advice about products and services from knowledgeable others. They also argue that there is agreement in the literature that opinion leading and seeking are domain specific phenomena, meaning that an individual can be an opinion leader in one area (such as electronics) but at the same time an opinion seeker in another area (such as fashion). The case is similar for their expertise in that opinion leaders are monomorphous (experts in one areas) as opposed to polymorphous (experts in many areas) (Weimann et al., 2007). This perspective is adhered to here as well. As such, the conceptualizations of opinion leaders and opinion seekers suggest that they are related, but independent concepts. Several researchers have pointed to the importance of opinion leaders in promoting both pro-environmental attitudes and actions (Goldsmith and Goldsmith, 2011; Keys et al., 2010; Moser and Mosler, 2008), however there is a lack of studies relating both opinion leading and opinion seeking to sustainable consumption practices in general and AFV adoption in particular.

2.4 Vehicle adopter groups

A problem with the budding EV research is that most EV studies rely on intentions to adopt, and not on actual adoption (Rezvani et al., 2015). This creates problems since the majority of consumers (non-adopters) yet have not come in contact with EVs and thus have not formed an explicit attitude about them. However, this does not preclude researchers asking people about their attitudes and thus make them manifest (for a discussion on implicit and explicit attitudes see for example Eagly and Chaiken, 2007). There is also a well-known intention-behavior gap pointing to that not all intentions become actual behaviors (Fennis et al., 2011; Sheeran, 2002). However, currently, some consumers have already adopted an EV and others have adopted other types of environmentally classified AFVs such as biofuel flexfuel vehicles (FFVs) that can be fueled by a mixture of a fossil fuel and ethanol/E85 in different mixtures, or a fossil fuel and biogas in different mixtures. Thus, for the purposes of this study, and to avoid relying on adoption intentions, three groups of adopters and non-adopters are at the center: EV adopters, Biofuel FFV adopters, and Non-adopters.

The first group, EV adopters, consist of car buyers that have adopted some type of electric vehicle: hybrid electric vehicle (HEV; which have both an internal combustion engine (ICE) fueled by fossil fuels, and an electric drivetrain which's battery is charged from the ICC), plugin hybrid electric vehicle (PHEV; basically the same as HEVs but with the added possibility of the vehicle being charged from the electricity grid), and battery electric vehicle (BEV; a vehicle that lacks an ICC and that needs to be charged from the grid). The second group we call Biofuel FFV adopters and this group contains individuals how have not adopted any type of EV but some type of bio-fueled flexfuel vehicle (FFV; which can be fueled in full or in part by alternative biofuels such as bioethanol/E85 or biogas in combination with a fossil fuel such as gasoline and diesel). The last group, Non-adopters, consist of individuals who have not adopted any type of EV or bio-fueled FFV. Thus, this last group own cars that can only be fueled by conventional fossil gasoline or diesel often called conventional fuel vehicles (CFVs). Based on what decision an individual has made concerning a car purchase and against the background above we developed a set of hypothesis concerning adoption of EVs and biofuel FFVs:

- H1a-e: There are significant differences between: EV adopters, Biofuel FFV adopters, and Non-adopters on the following constructs: (a) personal norms (PN), (b) social norms (SN), (c) ecological attitudes (NEP), (d) opinion leadership (OL), and, (e) opinion seeking (OS).
- H2: There is a positive significant influence of personal norms (PN) for less environmentally harmful vehicles on EV and biofuel FFV adoption.
- H3: There is a positive significant influence of social norms (SN) for less environmentally harmful vehicles on EV and biofuel FFV adoption.
- H4: There is a positive significant influence of ecological attitudes (NEP) on EV and biofuel FFV adoption.
- H5: There is a positive significant influence of opinion leadership (OL) concerning cars on EV and biofuel FFV adoption.
- H6: There is a negative significant influence of opinion seeking (OS) concerning cars on EV and biofuel FFV adoption.

Hypotheses H2 to H6 are summarized in Figure 1.

Please insert Figure 1 about here

2.5 Controlling for socio-demographic influence

Studies in consumer behavior and sustainable consumption using values and attitudinal factors as independent variables often control for effects of socio-demographic factors such as gender, age, education length, and income level. Although these effects in general explain little of the studied behavior in general (e.g., Diamantopoulos et al., 2003) some studies related to transportation and AFVs find statistically significant influence to different degrees (e.g., Jansson, 2011; Mannberg et al., 2014; Petschnig et al., 2014; Potoglou and Kanaroglou, 2007). Thus due to ambiguous results in earlier studies, it is not possible to state beforehand what effects social influence such as norms and opinion leadership might have when socio-demographic control factors are introduced. However, there was interest in analyzing if relationships between the main variables hold given the introduction of control variables that were available (further discussed in the method section).

2.6 Study context

At the time of this study Sweden had almost 4.7 million passenger cars. According to Swedish traffic analysis, by the end of 2015, 7% of these were AFVs (Trafikanalys, 2015). Over the years, several policies have been enacted in Sweden to decrease the environmental impact of the car fleet both in terms of supporting the use of biofuels and increasing the consumer uptake of EVs (Borén et al., 2016; Robèrt et al., 2016). As a start, in 2004 a directive was enacted requiring government agencies to procure and lease AFVs to a higher degree (SFS, 2004) which also had an effect on the private car market. In 2006, a filling station mandate was enacted requiring filling stations above a certain size to supply at least one alternative fuel (SFS, 2005). In a few years this meant that Sweden had the largest bioethanol (E85; 85% bioethanol and 15% gasoline) distribution network outside Brazil (Pacini and Silveira, 2011). The sales of ethanol cars were also promoted by a financial incentive (approximately 1,000 Euros bonus from 2007 to 2009), exemption from a congestion tax in Stockholm (from 2006 to 2012) and, in some municipalities, free or reduced parking fees (Börjesson et al., 2012; Mannberg et al., 2014). Although the sales of ethanol cars has since then declined, the relative success of these cars around 2007 and 2008 partly led to the development of a policy in 2009 proposing that Sweden should aim for a "fossil fuel independent car fleet by 2030" (Swedish government, 2009). Since then, this policy has been publicly debated and in 2012 a finical incentive was enacted for cars with "very small" (below 50 grams per kilometer) CO_2 emissions (i.e., EVs) amounting to approximately 4,000 Euros (SFS, 2011). In spite of weakening sales of flexfuel ethanol cars during the last years, partly due to the availability of more fuel efficient diesel cars on the market (cf. Kågeson, 2013), in 2016, Sweden was still among the lead markets in sales of biofuels for transport, AFVs and the different types of EVs (Bil Sweden, 2016; Energimyndigheten, 2016), although in an international comparison, the consumer subsidies were among the lowest (Sierzchula et al., 2014). In addition to this context, Sweden has recently been pointed to as particularly suiting for replacing fossil fuels in the transport sector due to the relatively low greenhouse gas emissions rates in electricity generation (Canals Casals et al., 2016). Although different types of EVs only constituted about 1 percent of the vehicle fleet in 2014, the increase in the past years has been significant. HEVs are the most common among the different EVs, while BEVs are few. At the end of 2014 (the year this study was conducted) there were 34,930 HEVs, 4,922 PHEVs, and 2,172 BEVs (Trafikanalys, 2015). During and after 2014 the sales have increased and more models in more price ranges have become available to consumers. PHEVs and BEVs were also subsidized by the incentive mentioned above. Although the price of EVs and PHEVs is still substantially higher than for other vehicles it should be noted that also in conventional vehicles classes there are cars that are much more expensive than the cleaner cars. Thus, the price is not in focus here and recent research supports the notion that, as a decision criteria, price is not as important as environmental performance of the car when forming purchase intentions (Degirmenci and Breitner, 2017). Another important factor concerns chagrining infrastructure for EVs. The number of public charging points have steadily increased and were around 600 in 2014 in Sweden. Research from Norway, the leading EV country, has shown that the majority of EV charging is carried out at home or at work (Haugneland and Kvisle, 2015), pointing to that public charging points might not be as important for consumer EV adoption as previously thought. Taken together, conducting a study in Sweden on influential factors on EV adoption, has the potential to both theoretically and empirically advance current understanding.

3. Methods

A questionnaire survey approach was used in this research and questionnaires to 3,000 car randomly chosen car owners in Sweden between the ages of 20 and 75 were distributed. The survey, conducted in 2014, was managed by the authors and conducted together with Statistics Sweden (SCB) to guarantee sampling quality and in order to corroborate responses with socio-demographics and car owner data. This meant that before the final questionnaire was distributed, numerous checks were done concerning response time, correct wording of items in Swedish and layout. Through SCB, the respondents had the option of filling out the questionnaire on paper and returning it in an envelope, or to fill it in on a provided web link. This was done in order to minimize non-response. Participation was voluntary and no response incentive was offered. In order to find sufficient numbers for each of the three groups a stratified sampling method was chosen meaning that 1,000 questionnaires were sent to randomly chosen car owners in each group. In total 1,192 responses were returned comprising a total response rate of 39.8% (EV adopters = 494, response rate = 49.4%; Biofuel FFV adopters = 386, response rate = 38.6, Non-adopters = 312, response rate = 31.2%). Although the sizes and response rates of the responding groups were different from each other, controls were made to check if they were representative which was found to be the case.

3.1 Measures

The questionnaire for this study was part of a larger survey focusing on EVs, cars and transportation in the future. For this study five constructs adopted from previous literature and research as discussed above, were utilized. The number of items, wording in English, mean values and Cronbach's alpha values for the constructs can be found in the factor analysis in Table 1. The three items on personal norms were adopted from Jansson et al. (2011) and Nordlund and Garvill (2003) and tapped into norms for less environmentally harmful cars. The three items for social norms were adapted from Jansson (2011) and tapped into social norms concerning environmentally classified cars (not a particular engine or fuel type). Ecological attitudes were assessed using four items from the new ecological paradigm (NEP) scale from Dunlap et al. (2000). Although the original scale is 15 items, a short version was used in order to decrease response time and increase response rate. The four items have been found to correlate well with the full Swedish NEP scale in other studies by the authors (Jansson et al., 2011; Jansson and Dorrepaal, 2015). The opinion leadership and opinion seeking constructs were based on Flynn et al. (1996) and their original scales, but adopted to fit the car domain. For this study three items from the original six item opinion leadership scale were used in order to keep questionnaire length down. Also for opinion seeking three items from the original six item scale version were used. Although shorter versions were used for these scales, the Cronbach's alpha values were only slightly lower (.71 and .70 respectively, see Table 1) than the original and replicated scales, and above acceptable levels (Nunnaly, 1967). All items used in this study were assessed on a seven point scale ranging from 1, Strongly disagree, to, 7, Strongly agree. Surveying the factor analysis and Cronbach's alpha values for all constructs and comparing to the respective scales, the construct measures were deemed acceptable.

Please insert Table 1 about here

A set of socio-demographic factors were assessed both based on the SCB data from the sample and by asking respondents in the questionnaire. Overall the sample correlated highly with the Swedish car owning population. For example, according to official statistics (Trafikanalys, 2015) in 2014, 35% of all cars in Sweden were owned by women (our sample 36.8%). The descriptive statistics of the sample's three groups is presented in Table 2.

Please insert Table 2 about here

To assess the validity, reliability and to test the developed hypotheses several analyses were conducted. First, a preliminary analysis was conducted to ensure non-violation of the assumptions of normality, linearity, homogeneity, heteroscedasticity and multicollinearity. Then the sample's correlation with the population was analyzed and found satisfactory. The mean values, standard deviations, skewness and variance inflation factors were used to check the data. A factor analysis using principal components was conducted and Cronbach's alpha values were assessed as well as factor loadings (Table 1). The factor analysis showed that all five factors had acceptable internal consistency and all factors loaded on their corresponding scale. Subsequently the three groups were compared using Chi-square tests and t-tests. (Table 2 and 3). Finally logistic regressions were conducted to determine the strength of the relationships between the independent variables and the dependent variable (Table 4). In total four different logistic regression models were tested using the different adopter group classifications as dependent dichotomous variables and including socio-demographic factors: gender (SCB data), age (SCB data), education, income (SCB data), cohabitation, children in the household, urban or rural area of living (SCB data), and the number of cars owned at the time of the survey (SCB data). SCB data here denotes that this data was made available by SCB (Statistics Sweden) for each respondent and was thus not self-reported by the respondents. This is especially important relating to the income variable, where there might be a tendency among respondents to either not report at all, or over- or underestimate to some degree.

4. Results

First the socio-demographic and descriptive data was analyzed and compared across the groups using Chi-square tests and t-tests (means). From Table 2 it is concluded that males to a significantly higher degree are among the EV adopter and Biofuel FFV adopter groups. Furthermore, EV adopters have more education, higher income, cohabitate, and live in larger cities than the other groups. This is in line with previous research on AFV adoption in Sweden (e.g., Jansson et al., 2011). Not surprisingly, EV adopters have significantly newer cars than Biofuel FFV adopters and Non-adopters.

Please insert Table 3 about here

Concerning the attitudinal factors, the results show that there are significant differences between EV adopters, Biofuel FFV adopters and Non-adopters on all but one construct. As can be seen in Table 3, EV adopters exhibit higher levels of personal norms (PN), social norms (SN), and opinion leadership (OL). However, as can be expected, the levels of opinion seeking (OS), is significantly lower among EV adopters than among Biofuel FFV adopters and Non-adopters. Thus H1a, H1b, H1d and H1e are all supported in so far as it comes to PN, SN, OL and OS. However, no support for H1c, that concerned the difference of ecological attitudes (NEP) between the groups, was found.

In order to analyze what factors distinguish the groups, four logistic regressions were run as per Table 4. At the top of the table the specification of each model is presented. In Model A, EV adoption was tried against non-adoption. The results of this analysis showed that PN ($p<.001$), and OL ($p<.001$), positively influenced adoption. SN was not significant ($p=.413$). As expected OS contributed negatively in the analysis ($p<.001$) showing that higher levels of OS is related to lower levels of EV adoption. Unexpectedly NEP was found to be negatively related to early EV adoption (p=.017) however not at the strictest confidence interval. Based on this analysis, support for H2, H5 and H6, but not for H4, was found in keeping to the strictest significance level (p<.001). Concerning the socio-demographic control factors it was found that children in the household was the only significant correlate (p=.001) indicating that households with children were more likely to be EV adopters. Model A achieved the best fit of all the models with an explanatory power of 28% (.280 Nagelkerke R^2, N=746, p<.001).

In the next model (B) Biofuel FFV adopters were analyzed in comparison with Non-adopters. This model achieved the lowest model fit of the four models (Nagelkerke R^2=.086, N=658) and was not significant at the strictest level (p=.005) indicating that the aggregated differences between these two groups on the chosen factors were not discernable. In fact none of the constructs, attitudinal or controls, were significant at the strictest level (p<.001). However looking at a less strict significance level (p<.05) it is noticeable that the model discerns differences between the groups on SN, sex and co-habitation meaning that individuals with higher perceived social norms, males and individuals living together were more likely to be in the Biofuel FFV adopter group.

In model C, EV adopters were compared to Biofuel FFV adopters and this model achieved the second best fit (Nagelkerke R^2=.172, N=847, p=.002). Although the model in itself was not statistically significant at the strictest level, PN and OL contributed significantly positively while OS contributed significantly negatively (all p<.001). None of the control factors contributed at the strictest level, however, age was significant at the p=.003-level indicating that older people we more likely to be in the EV group than in the Biofuel FFV adopter group.

In the last model (D) EV adopters and Biofuel FFV adopters were analyzed in comparison with the non-adopting group. The model achieved a reasonable fit (Nagelkerke R^2=.137, N=1,145, p<.001) and was significant at the strictest level. In the model PN (p<.001) was the only significant correlate at the strictest level and OL at a lesser level (p=.004). Also at lesser significance levels cohabitation (p=.016) and children in the household (p=.022) contributed to the model's explanatory power.

Please insert Table 4 about here

Overall PN, OL and, OS were the most predictive variables at the strictest confidence level and the largest differences between the groups were between EV adopters and Non-adopters. At a slightly lower level of significance (p<.005) it was found that the difference between EV adopters and Biofuel FFV adopters concerned PN, OL and OS as well. The results hold also when including socio-demographic factors.

The six hypotheses tested and the results and significance levels are presented in Table 5. In this table (and the discussion below) the strictest confidence level (p<.001) is used.

Please insert Table 5 about here
----

5. Discussion and implications

The main aim of this study was to analyze the influence of norms (personal and social), ecological attitudes, and interpersonal influence in the form of opinion leading and opinion seeking on EV adoption. A secondary aim was to analyze the influence of these factors among different adopter groups, i.e. EV adopters, Biofuel FFV adopters and Non-adopters, and to compare these groups. The aims were fulfilled by way of a questionnaire survey in order to test the developed hypotheses ($H1_{a\text{-}e}$ to H6). The results showed that personal norms together with opinion leadership and opinion seeking are the most important constructs for explaining EV adoption in this approach. These factors are the most consistent in explaining both EV adoption and Biofuel FFV adoption. Thus the results demonstrate that a combination of personal norms for less environmentally harmful vehicles and opinion leadership concerning cars to a significant degree drive EV and FFV adoption and that opinion seeking is negatively related to both EV and FFV adoption. The results also show that there are significant differences between EV adopters, Biofuel FFV adopters and Non-adopters on personal norms, social norms, opinion leading and opinion seeking, but not on ecological attitudes. EV adopters exhibit the highest values for the first three constructs whereas Biofuel FFV adopters exhibit the highest values for opinion seeking. This points to the notion that EV adoption could be more likely to occur among individuals who have previously adopted a biofuel FFV. Finally, the results show that even when controlling for socio-demographics the main results hold. However some minor influence can be found from age, cohabitation, children in the household and gender in the different models.

The main contribution of the study is that is shows the importance of interpersonal influence, on eco-innovation adoption. The study points to the importance of interpersonal social influence on eco-innovation adoption in general and opinion leadership and personal norms in particular. Including measures of opinion leadership and opinion seeking in studies assessing actual consumer adoption of eco-innovations, such as the EV, develops the understanding of how ecological attitudinal factors can be combined with traditional non-green attitudinal factors. In turn this points towards more than one motive for sustainable consumption (so called motive alliances). Certain groups are driven more by opinion leadership attitudes such as techno savviness and social activeness than other groups (cf. Jansson et al., 2009; Shoham and Ruvio, 2008). Yet, others are driven more by ecological motives and personal norms as also previous research has detailed (Jansson et al., 2011; Thøgersen, 2006), and yet others are driven by these motives in combination as this study points to. Thus social influence and ecological personal norms interact in driving pro-environmental behavior. Adopting an EV is a relatively observable behavior giving the adopter ample opportunities to socially show off the adoption decision to others such as drivers and neighbors. This exhibition can both show that the adopter is an environmentally aware driver but also that the individual is an opinion leader and early adopter. This combination likely creates added value for the adopter that influences adoption in a positive way as the discussion on symbolic green consumer behavior or social currency points to (Aagerup and Nilsson, 2016; Berger, 2014, 2013). In this light, it is also important to recognize the negative effect of opinion seeking in the results indicating that EV adopters and Biofuel FFV adopters are less opinion seeking than opinion leading. The results, that opinion leading and opinion seeking were negatively related among EV adopters is in line with previous research using other products (Shoham and Ruvio, 2008), and points to the importance of targeting the right individuals with the right information using the right channels of communication. Whereas opinion leaders use a variety of sources for information such as store visits and category specific magazines for information, opinion seekers are more likely to look to opinion leaders for information (Ruvio and Shoham, 2007; Shoham and Ruvio, 2008). This reinforces the idea that eco-innovation adoption is not only related to pro-environmental attitudes but also to other values and attitudes. Biofuel FFV adopters in the study exhibit the highest mean values for opinion seeking pointing to that they are the ones most open for expert influence in making a future vehicle purchasing decisions. This in total reinforces the overall conclusion of social influence in eco-innovation adoption both concerning non-adopters and individuals who have adopted similar innovations.

Although most of the results were in line with the developed hypotheses, there were also some surprising findings. Firstly, adherence to the NEP was not significantly related to EV adoption in the models. Although adherence to the NEP has been found valuable in explaining variations in norms and behavior in several studies (Jansson et al., 2011; Steg et al., 2005), the direct relationship between worldviews and actual behavior has in general not been found to be strong (Poortinga et al., 2004; Schultz, 2001) partly due to the interlinked relationships between values, beliefs and norms as pointed to in VBN theory. In addition, adherence to the NEP in Scandinavia is generally high overall compared to other countries (Vikan et al., 2007) which for this study can mean that a threshold level has been reached cautioning against definitive conclusions on its overall influence. A second unexpected finding concerns social norms. Social norms were not found to have influence at the strictest significance level in any of the models. As discussed in the literature review section, there is a relationship between social and personal norms usually meaning that personal norms can take some or all the variation in social norms in the models (Bamberg et al., 2007; Goldstein et al., 2008). The study here shows that EV adopters and Biofuel FFV adopters exhibit higher levels of social norms but in the regression models these differences are likely caught by variation in personal norms.

Finally, concerning socio-demographics, although there are some effects, at the strictest confidence level it cannot be concluded that there are any general patters. Instead, controlling for these factors (both self-reported and objective SCB data) shows that attitudinal constructs are more reliable in terms of understanding sustainable consumption and pro-environmental behavior. Next the implications of the results are discussed.

5.1 Theoretical implications

The theoretical contribution of this study lies in validating the combination of social influence factors together with environmental attitudinal factors in understanding eco-innovation. The findings imply that in order to understand why consumers choose cleaner or more sustainable products and behaviors, non-environmental attitudinal factors such as opinion leadership are important. Thus the study not only brings in the issue of multiple motives for performing a specific behavior but also implies that different consumers are motivated to different extents by these factors. As such this study adds to the emerging literature in sustainable consumption that points to the importance of social influence on consumer pro-environmental behavior in general and eco-innovation and EV/AFV adoption in particular (Aagerup and Nilsson, 2016; Axsen and Kurani, 2011; Kim and Park, 2011). In addition, this study adds to the literature on the importance of opinion leadership in driving eco-innovation adoption (e.g., Keys et al., 2010) and to the environmental psychology literature dealing with personal norms for pro-environmental behaviors (Nordlund et al., 2016; Nordlund and Garvill, 2003; Thøgersen, 2006).

5.2 Managerial implications

This study offers implications for managers of both companies and non-governmental organizations. Firstly, as the study points in general towards the importance of social influence of norms it is important for managers to recognize that sustainable consumption is affected by the surrounding values and norms in society at large. Therefore acting to change these norms in general might be a long-term effective strategy. For example pointing to that fossil fueled based vehicles, although the norm now, might be at odds with future more environmentally enlightened norms. This might be done by providing examples of influential reference persons such as celebrities or other opinion leaders in the area that are questioning and acting towards changing the fossil fuel based vehicle norm. Recognizing the interpersonal influence it might also be wise to make cleaner cars more noticeable by for example labeling them in a coherent fashion in order for others to see how more and more drivers are taking environmental responsibility. Another suggestion is to direct marketing and communication to opinion leaders in domains related to cars and transportation in order to help these individuals act according to their intentions and influence others (i.e. opinion seekers). This since research has pointed to that opinion leaders in general are more knowledgeable and better informed than other consumer groups (e.g., van Eck et al., 2011). Using an opinion leadership communication strategy can also speed up innovation adoption among broader layers of the population(Valente and Davis, 1999), which would then mean, in this context, a faster arrival of the fossil fuel free future. In this light it might not be the most effective way to push environmental and sustainability arguments of products to the fore since this risks putting off certain segments of the consumer market. Thus, careful segmentation analysis is important before any type of communication effort in order to understand what arguments, social and/or environmental, to use in facilitating a behavior change. In this regard, and as pointed to by other researchers (Burchell et al., 2013; Rettie et al., 2014), it is also important to note that marketing green consumer products, such as cars, as niche products, instead of replacing all products for a given company with greener ones, might prolong the sustainability transition and confuse or even upset consumers. Thus, incumbent manufacturers should proactively strive to shape the electric vehicle market instead of adopting a waiting position as has been pointed out previously (Kieckhäfer et al., 2016). A genuine approach to sustainability might thus facilitate a speedier transition to more pro-environmental norms that then have a chance of becoming self-sustaining over time.

5.3 Policy implications

Market regulators and policymakers on local, national and international levels can have a long term impact on how norms develop and are adhered to in society. Forming international treaties, making certain behaviors less attractive for consumers and others more attractive, sends important signals to both companies and consumers on what to produce and consume. Understanding that markets and consumers are influenced by different factors facilitate for better policy and communication strategies. For example, by communicating policy changes in benefit of more FFVs and EVs using personal norms might be more effective than general communication without considering social influence effects. In addition, showing how past policy has been implemented and become norm (the Stockholm congestion charges is a good example (Börjesson et al., 2012; Mannberg et al., 2014)) might point the way forward for fossil fuel free policies. From a strong sustainable consumption perspective (Akenji, 2014; e.g., Lorek and Fuchs, 2013) it is also important to point out that although EVs are less harmful for the environment in that they rely less on fossil fuels, management policies aiming at reducing car traffic overall are imperative as well (Hiselius and Rosqvist, 2016). This is especially important where the electricity mix is higher in greenhouse gas emissions than the Swedish or Scandinavian one (Canals Casals et al., 2016; Nurhadi et al., 2017). To conclude, and especially important in the post VW "dieselgate" affair, it is important for policymakers to steer manufacturers towards more energy efficient and cleaner products using necessary regulations (Kieckhäfer et al., 2016; Zapata and Nieuwenhuis, 2010). This will, in combination with consumer targeting efforts, likely make a fossil fuel free future more viable.

6. Limitations and further research

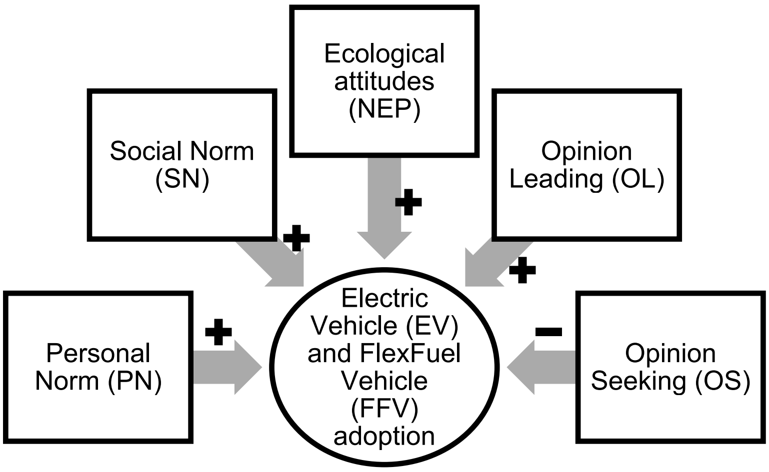
Even though the results are in line with previous research in the area of social influence and environmental psychology there are certain limitations that need to be addressed. In any study using respondent self-reported data there is a risk of biases relating to for example non-response. In order to correct for these possible effects a relatively high response rate was secured and also the strictest significance levels in testing the hypotheses were used. Although response rates differed between the three groups, checks were made so that the samples were generalizable and the methods used were also robust in treating different sizes of groups. It is not uncommon is consumer adoption studies focusing on actual adoption (as opposed to adoption intentions) to find that adopters are more prone to respond given that they are more interested in the product or phenomena as such. This does not necessarily mean that these respondents would answer other questions in a systematically different way. In order to partially control for this, some of the more sensitive respondent data (such as income) that is prone to misreporting was delivered by an objective source using actual records in order to avoid response bias. Another problem in these types of studies is that the researchers need to choose what variables to include since all types of factors cannot be included for limitation reasons. In the models the explanatory power is in line with similar studies in the literature thus pointing to external validity. The study was carried out in Sweden where the discussion on green cars has been continuous the last ten years and where different makes and models have been introduced over time. This has given consumers the opportunity to express themselves using the products available on the market thus facilitating a good research context for these issues. However, the results would be strengthened if studies, using cars or other types of eco-innovations, could be conducted in other empirical contexts as well. It would also be valuable to test whether personality traits, such as the big five, are related to early EV adoption to further the understanding of eco-innovation adoption overall and in relation to interpersonal influence in particular. The results here also hint at that FFV adoption can precede EV adoption in that Biofuel FFV adopters are to a higher degree opinion seekers than EV adopters. Further research, using a longitudinal approach could explore this further since it would have interesting marketing implications. In any case, the results of this study, pointing to the importance of social influence on eco-innovation adoption are important in enhancing the understanding for cleaner production and consumption in the future.

Acknowledgements

The authors would like to acknowledge the Swedish Energy Agency (Energimyndigheten) for funding the research project (ref 37031-1) from which this data stems. The authors also express their sincerest gratitude to the three anonymous reviews in improving the manuscript.

Figures

Figure 1: Hypothesized factors influencing EV and FFV adoption



Tables

Table 1: Construct measures and scale reliability for the independent constructs

	Mean	SD	Component 1	2	3	4	5
Personal norms, summated	*4.49*	*1.71*					
To own a car that is not classed as environmentally sound would give me a bad conscience	3.79	2.10	.865				
Based on my values it is/would be right for me to own/buy an environmentally classified car	5.10	1.90	.803				
I feel a moral obligation to decrease the negative aspects of my car driving	4.51	1.90	.774				
Social norms, summated	*2.30*	*1.21*					
Most people that are important to me own an environmentally classified car	2.44	1.52		.819			
I believe that many people who are important to me expect me to own/choose an environmentally classified car	2.67	1.80		.818			
People who are important to me have suggested that I switch to an environmentally classified car	1.73	1.26		.797			
Ecological attitudes (NEP), summated	*5.19*	*1.23*					
We are approaching the limit of the number of people the earth can support	4.67	1.80			.741		
If things continue on their present course, we will soon experience a major ecological catastrophe	5.18	1.57			.876		
The balance of nature is very delicate and easily upset	5.49	1.47			.886		
When humans interfere with nature it often produces disastrous consequences	5.35	1.47			.827		
Opinion leadership, summated	*2.69*	*1.41*					
When others choose cars they do not turn for me for an opinion (RC)	3.39	2.20				.843	
People that I know pick cars based on what I tell them	2.29	1.53				.800	
I often influence people's opinions about cars	2.40	1.61				.816	
Opinion seeking, summated	*3.67*	*1.66*					
When I consider buying a car, I often ask other people for help	3.61	2.04					.893
I like to get others' opinions before I buy a car	3.90	2.04					.874
When choosing a car, other peoples' opinions are not important to me (RC)	3.50	2.25					.762
Cronbach's alpha			.83	.66	.79	.71	.70
Percentage of variance explained			21.83	14.96	12.31	10.21	7.30

*Scale for all items: 1, Strongly disagree, 2, 3, 4, 5, 6, 7, Strongly agree. RC=Reversely coded.

Note: Principal component analysis, Varmiax rotation with Kaiser normailization, loadings less than .50 are not shown. Total variance explained = 66.6%; KMO = 0.727; Bartlett's Test Chi-sq = 6135.557, df = 120, p < .000, N = 1,192

Table 2: Comparison of socio-demographic and car statistics

		Full sample	EV adopters	Biofuel FFV adopters	Non-adopters	Overall p-value	N
Sex, percent	Female	36.8	33.8	33.9	45.2		
	Male	63.2	66.2	66.1	54.8	.002	1,192
Highest education, percent	Low	28.2	25.0	31.0	29.9		
	Basic	18.4	14.8	17.5	25.2		
	Intermediate	15.8	15.4	14.0	18.6		
	High	37.6	44.8	37.6	26.2	.000	1,159
Income, gross	SEK	387,885	416,615	384,593	346,561	.000	1,192
Living status, percent	Single	21.1	18.8	18.7	27.8		
	Co-habit	78.9	81.2	81.3	72.2	.004	1,192
Children in home, percent	Yes	29.7	27.1	36.5	25.3		
	No	70.3	72.9	63.5	74.7	.001	1,192
Mean age	Years	55.0	56.8	53.1	54.5	.000	1,176
Living area/City	Small	19.7	21.9	17.6	18.9		
	Medium	38.9	33.2	44.8	40.7		
	Large	41.4	44.9	37.6	40.4	.011	1,192
Cars in household, percent	1	50.2	47.7	54.4	49.0		
	2	39.2	40.7	37.2	39.5		
	3 or more	10.5	11.6	8.4	11.5	.281	1,167
Car model year of newest car, mean	Years	6.8	5.7	6.3	9.1	.000	1,192
Car weight, mean	Kilograms	1498.0	1554.6	1462.6	1452.2	.000	1,192

Table 3: Comparison of attitudinal constructs between adoption groups

	EV adopters	Biofuel FFV adopters	Non-adopters	p-value	N
Personal Norm (PN)	5.00	4.28	3.93	.000	1,177
Social Norm (SN)	2.46	2.33	2.02	.000	1,165
Ecological attitudes (NEP)	5.20	5.12	5.25	.397	1,161
Opinion Leading (OL)	2.99	2.61	2.32	.000	1,171
Opinion Seeking (OS)	3.37	3.93	3.82	.000	1,170

Table 4: Binary logistic regression models A to D including socio-demographic control variables

	Model A			*Model B*			*Model C*			*Model D*		
Dependent variables:	1= EV adopters 0=Non-adopters			1=Biofuel FFV adopters 0=Non-adopters			1=EV adopters 0=Biofuel FFV adopters			1=EV Adopters + Biofuel FFV adopters 0=Non-adopters		
Independent variables	*B*	*exp. ß*	*sig.*	*B*	*exp. ß*	*sig.*	*B*	*exp. ß*	*sig.*	*B*	*exp. ß*	*sig.*
Personal Norm (PN)	.417	1.517	.000	.073	1.076	.205	.303	1.353	.000	.232	1.261	.000
Social Norm (SN)	.066	1.068	.413	.202	1.224	.012	-.159	0.853	.023	.136	1.146	.055
Ecological attitudes (NEP)	-.170	.844	.017	-.084	.919	.234	-.040	.961	.533	-.115	.892	.059
Opinion leadership (OL)	.293	1.340	.000	.038	1.039	.559	.269	1.308	.000	.168	1.183	.004
Opinion seeking (OS)	-.209	0.811	.000	.007	1.007	.900	-.214	0.807	.000	-.099	0.906	.034
Controls												
Sex	.269	1.308	.159	.463	1.589	.011	-.260	.771	.136	.364	1.439	.023
Age	.023	1.023	.008	-.004	.996	.650	.025	1.025	.003	.008	1.008	.251
Education	.000	1.000	.142	.000	1.000	.385	.000	1.000	.251	.000	1.000	.204
Income	.184	1.202	.087	.027	1.028	.747	.076	1.079	.342	.094	1.098	.298
Co-habitation	.443	1.557	.035	.443	1.558	.027	-.030	0.971	.886	.421	1.523	.016
Children in household	.249	1.283	.001	.053	1.055	.479	.135	1.144	.046	.148	1.160	.022
Urban or rural area	-.259	.772	.254	-.274	.760	.195	.134	1.144	.517	-.224	.799	.244
Number of cars	.003	1.003	.812	-.014	0.986	.434	.044	1.045	.302	-.006	0.994	.638
N	746			658			818			1,111		
Nagelkerke R^2	.280		.000	.086		.005	.172		.002	.137		.000

Table 5: Tested hypotheses and results

Hypothesis		Supported/Rejected	Tested	Significance level
H1a	Difference between groups on Personal Norms (PN)	Supported	T-test	$p < .001$
H1b	Difference between groups on Social Norms (SN)	Supported	T-test	$p < .001$
H1c	Difference between groups on Ecological attitudes (NEP)	Rejected	T-test	n.s.
H1d	Difference between groups on Opinion Leadership (OL)	Supported	T-test	$p < .001$
H1e	Difference between groups on Opinion Seeking (OL)	Supported	T-test	$p < .001$
H2	Personal Norms (PN) for less environmentally harmful vehicles positively influence EV and FFV adoption	Supported	Models A, C, D	$p < .001$
H3	Social Norms (SN) for less environmentally harmful vehicles positively influence EV and FFV adoption	Rejected	All models	n.s.
H4	Ecological attitudes (NEP) positively influence EV and FFV adoption	Rejected	All models	n.s.
H5	Opinion Leadership (OL) concerning cars positively influence EV and FFV adoption	Supported	Models A, C	$p < .001$
H6	Opinion Seeking (OL) concerning cars negatively influence EV and FFV adoption	Supported	Models A, C	$p < .001$

n.s.=non-significant at $p<.001$

References

Aagerup, U., Nilsson, J., 2016. Green consumer behavior: being good or seeming good? Journal of Product & Brand Management 25, 274–284. doi:10.1108/JPBM-06-2015-0903

Ajzen, I., Fishbein, M., 2005. The influence of attitudes on behavior, in: Albarracín, D., Johnson, B.T., Zanna, M.P. (Eds.), Handbook of Attitudes. Lawrence Erlbaum Associates, Mahway, NJ, pp. 173–221.

Akenji, L., 2014. Consumer scapegoatism and limits to green consumerism. Journal of Cleaner Production 63, 13–23. doi:10.1016/j.jclepro.2013.05.022

Axsen, J., Kurani, K.S., 2011. Interpersonal influence in the early plug-in hybrid market: Observing social interactions with an exploratory multi-method approach. Transportation Research Part D: Transport and Environment 16, 150–159. doi:10.1016/j.trd.2010.10.006

Axsen, J., Mountain, D.C., Jaccard, M., 2009. Combining stated and revealed choice research to simulate the neighbor effect: The case of hybrid-electric vehicles. Resource and Energy Economics 31, 221–238. doi:10.1016/j.reseneeco.2009.02.001

Bamberg, S., Hunecke, M., Blöbaum, A., 2007. Social context, personal norms and the use of public transportation: Two field studies. Journal Of Environmental Psychology 27, 190–203. doi:10.1016/j.jenvp.2007.04.001

Bamberg, S., Schmidt, P., 2003. Incentives, morality, or habit? Predicting students' car use for university routes with the models of Ajzen, Schwartz, and Triandis. Environment And Behavior 35, 264–285. doi:10.1177/0013916502250134

Berger, J., 2014. Word of mouth and interpersonal communication: A review and directions for future research. Journal of Consumer Psychology 24, 586–607. doi:10.1016/j.jcps.2014.05.002

Berger, J., 2013. Contagious : why things catch on. Simon & Schuster, New York.

Biel, A., Thøgersen, J., 2007. Activation of social norms in social dilemmas: A review of the evidence and reflections on the implications for environmental behaviour. Journal of Economic Psychology 28, 93–112. doi:10.1016/j.joep.2006.03.003

Bil Sweden, 2016. Sverige etta i Europa på biodrivmedel [Sweden number in Europe one on biofuels] [WWW Document]. URL http://www.bilsweden.se/publikationer/pressmeddelanden/sverige-etta-i-europa-pa-biodrivmedel (accessed 9.12.16).

Borén, S., Nurhadi, L., Ny, H., Robèrt, K.-H., Broman, G., Trygg, L., 2016. A strategic approach to sustainable transport system development – part 2: the case of a vision for electric vehicle systems in southeast Sweden. Journal of Cleaner Production. doi:10.1016/j.jclepro.2016.02.055

Börjesson, M., Eliasson, J., Hugosson, M.B., Brundell-Freij, K., 2012. The Stockholm congestion charges—5 years on. Effects, acceptability and lessons learnt. Transport Policy 20, 1–12. doi:10.1016/j.tranpol.2011.11.001

Burchell, K., Rettie, R., Patel, K., 2013. Marketing social norms: Social marketing and the "social norm approach." Journal of Consumer Behaviour 12, 1–9. doi:10.1002/cb.1395

Burkhardt, M.E., Brass, D.J., 1990. Changing Patterns or Patterns of Change: The Effects of a Change in Technology on Social Network Structure and Power. Administrative Science Quarterly 35, 104–127. doi:10.2307/2393552

Burt, R.S., 1999. The Social Capital of Opinion Leaders. The ANNALS of the American Academy of Political and Social Science 566, 37–54. doi:10.1177/000271629956600104
Byrka, K., Jędrzejewski, A., Sznajd-Weron, K., Weron, R., 2016. Difficulty is critical: The importance of social factors in modeling diffusion of green products and practices. Renewable and Sustainable Energy Reviews 62, 723–735. doi:10.1016/j.rser.2016.04.063
Byrne, M.R., Polonsky, M.J., 2001. Impediments to consumer adoption of sustainable transportation alternative fuel vehicles. International Journal of Operations and Production Management 21, 1521–1538. doi:10.1108/EUM0000000006293
Canals Casals, L., Martinez-Laserna, E., Amante García, B., Nieto, N., 2016. Sustainability analysis of the electric vehicle use in Europe for CO2 emissions reduction. Journal of Cleaner Production 127, 425–437. doi:10.1016/j.jclepro.2016.03.120
Chekima, B., Syed Khalid Wafa, S.A.W., Igau, O.A., Chekima, S., Sondoh, S.L., 2016. Examining green consumerism motivational drivers: does premium price and demographics matter to green purchasing? Journal of Cleaner Production 112, 3436–3450. doi:10.1016/j.jclepro.2015.09.102
Creutzig, F., Jochem, P., Edelenbosch, O.Y., Mattauch, L., Vuuren, D.P. van, McCollum, D., Minx, J., 2015. Transport: A roadblock to climate change mitigation? Science 350, 911–912. doi:10.1126/science.aac8033
Degirmenci, K., Breitner, M.H., 2017. Consumer purchase intentions for electric vehicles: Is green more important than price and range? Transportation Research Part D: Transport and Environment 51, 250–260. doi:10.1016/j.trd.2017.01.001
Diamantopoulos, A., Schlegelmilch, B.B., Sinkovics, R.R., Bohlen, G.M., 2003. Can socio-demographics still play a role in profiling green consumers? A review of the evidence and an empirical investigation. Journal Of Business Research 56, 465–480. doi:10.1016/S0148-2963(01)00241-7
Dunlap, R.E., 2008. The New Environmental Paradigm Scale: From Marginality to Worldwide Use. Journal of Environmental Education 40, 3–18. doi:10.3200/JOEE.40.1.3-18
Dunlap, R.E., Van Liere, K.D., Mertig, A.G., Jones, R.E., 2000. Measuring endorsement of the new ecological paradigm: A revised NEP scale. Journal Of Social Issues 56, 425–442. doi:10.1111/0022-4537.00176
Eagly, A.H., Chaiken, S., 2007. The advantages of an inclusive definition of attitude. Social Cognition 25, 582–602. doi:10.1521/soco.2007.25.5.582
Energimyndigheten, 2016. Sverige är bäst i EU på biodrivmedel [Sweden the best in EU on biofuels, Swedish Enery Agency] [WWW Document]. URL http://www.energimyndigheten.se/nyhetsarkiv/2014/sverige-ar-bast-i-eu-pa-biodrivmedel/ (accessed 9.12.16).
Fennis, B.M., Adriaanse, M.A., Stroebe, W., Pol, B., 2011. Bridging the intention–behavior gap: Inducing implementation intentions through persuasive appeals. Journal of Consumer Psychology 21, 302–311. doi:10.1016/j.jcps.2010.12.003
Fishbein, M., Ajzen, I., 1975. Belief, attitude, intention and behavior : an introduction to theory and research. Addison-Wesley, Reading, Mass.
Fisher, R.J., Price, L.L., 1992. An Investigation Into The Social-Context Of Early Adoption Behavior. Journal of Consumer Research 19, 477–486.
Flynn, L.R., Goldsmith, R.E., Eastman, J.K., 1996. Opinion leaders and opinion seekers: Two new measurement scales. Journal of the Academy of Marketing Science 24, 137–147. doi:10.1177/0092070396242004

Folke, C., Hahn, T., Olsson, P., Norberg, J., 2005. Adative governance of social-ecological systems. Annual Review of Environment and Resources 30, 441–473. doi:10.1146/annurev.energy.30.050504.144511
Goldenberg, J., Han, S., Lehmann, D.R., Hong, J.W., 2009. The role of hubs in the adoption process. Journal of Marketing 73, 1–13. doi:10.1509/jmkg.73.2.1
Goldsmith, E.B., Goldsmith, R.E., 2011. Social influence and sustainability in households. International Journal of Consumer Studies 35, 117–121. doi:10.1111/j.1470-6431.2010.00965.x
Goldstein, N.J., Cialdini, R.B., Griskevicius, V., 2008. A room with a viewpoint: Using social norms to motivate environmental conservation in hotels. Journal of Consumer Research 35, 472–482. doi:10.1086/586910
Griskevicius, V., Cialdini, R.B., Goldstein, N.J., 2008. Social norms: An underestimated and underemployed lever for managing climate change. International Journal of Sustainability Communication 3, 5–13.
Griskevicius, V., Tybur, J.M., Van den Bergh, B., 2010. Going green to be seen: Status, reputation, and conspicuous conservation. Journal of Personality & Social Psychology 98, 392–404. doi:10.1037/a0017346
Haugneland, P., Kvisle, H.H., 2015. Norwegian electric car user experiences. International Journal of Automotive Technology and Management 15, 194–221. doi:10.1504/IJATM.2015.068548
Heberlein, T.A., 2012. Navigating environmental attitudes. Oxford University Press, New York ;
Hiselius, L.W., Rosqvist, L.S., 2016. Mobility Management campaigns as part of the transition towards changing social norms on sustainable travel behavior. Journal of Cleaner Production 123, 34–41. doi:10.1016/j.jclepro.2015.08.055
Hunecke, M., Blobaum, A., Matthies, E., Hoger, R., 2001. Responsibility and environment: Ecological norm orientation and external factors in the domain of travel mode choice behavior. Environment And Behavior 33, 830–852. doi:10.1177/00139160121973269
Jansson, J., 2011. Consumer Eco-Innovation Adoption: Assessing Attitudinal Factors and Perceived Product Characteristics. Business Strategy and the Environment 210, 192–210. doi:10.1002/bse.690
Jansson, J., 2009. Car(ing) for our environment? Consumer eco-innovation adoption and curtailment behaviors: The case of the alternative fuel vehicle (Dissertation). Umeå School of Business, Umeå University, Umeå.
Jansson, J., Dorrepaal, E., 2015. Personal Norms for Dealing with Climate Change: Results from a Survey Using Moral Foundations Theory. Sustainable Development 23, 381–395. doi:10.1002/sd.1598
Jansson, J., Marell, A., Nordlund, A., 2011. Exploring consumer adoption of a high involvement eco-innovation using value-belief-norm theory. Journal of Consumer Behaviour 10, 51–60. doi:10.1002/cb.346
Jansson, J., Marell, A., Nordlund, A., 2009. Elucidating green consumers: A cluster analytic approach on proenvironmental purchase and curtailment behaviors. Journal of Euromarketing 18, 245–267. doi:10.1080/10496480903364242
Johansson-Stenman, O., Martinsson, P., 2006. Honestly, why are you driving a BMW? Journal of Economic Behavior & Organization 60, 129–146. doi:10.1016/j.jebo.2004.08.006
Joshi, Y., Rahman, Z., 2015. Factors Affecting Green Purchase Behaviour and Future Research Directions. International Strategic Management Review 3, 128–143. doi:10.1016/j.ism.2015.04.001

Kågeson, P., 2013. Dieselization in Sweden. Energy Policy 54, 42–46. doi:10.1016/j.enpol.2012.09.006

Kelly, J.A., St Lawrence, J.S., Diaz, Y.E., Stevenson, L.Y., Hauth, A.C., Brasfield, T.L., Kalichman, S.C., Smith, J.E., Andrew, M.E., 1991. HIV risk behavior reduction following intervention with key opinion leaders of population: an experimental analysis. American Journal of Public Health 81, 168–171. doi:10.2105/AJPH.81.2.168

Keys, N., Thomsen, D.C., Smith, T.F., 2010. Opinion leaders and complex sustainability issues. Management of Environmental Quality: An International Journal 21, 187–197. doi:10.1108/14777831011025535

Kieckhäfer, K., Wachter, K., Spengler, T.S., 2016. Analyzing manufacturers' impact on green products' market diffusion – the case of electric vehicles. Journal of Cleaner Production. doi:10.1016/j.jclepro.2016.05.021

Kim, S.-H., Park, H.J., 2011. Effects of social influence on consumers' voluntary adoption of innovations prompted by others. Journal of Business Research 64, 1190–1194. doi:10.1016/j.jbusres.2011.06.021

Kollmuss, A., Agyeman, J., 2002. Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? Environmental Education Research 8, 239–260. doi:10.1080/13504620220145401

Kulviwat, S., Bruner II, G.C., Al-Shuridah, O., 2009. The role of social influence on adoption of high tech innovations: The moderating effect of public/private consumption. Journal Of Business Research 62, 706–712. doi:10.1016/j.jbusres.2007.04.014

Lane, B., Potter, S., 2007. The adoption of cleaner vehicles in the UK: Exploring the consumer attitude-action gap. Journal of Cleaner Production 15, 1085–1092. doi:10.1016/j.jclepro.2006.05.026

Lee, E.-J., Lee, J., Schumann, D.W., 2002. The Influence of Communication Source and Mode on Consumer Adoption of Technological Innovations. Journal of Consumer Affairs 36, 1–27. doi:10.1111/j.1745-6606.2002.tb00418.x

Li, X., Clark, C.D., Jensen, K.L., Yen, S.T., English, B.C., 2013. Consumer purchase intentions for flexible-fuel and hybrid-electric vehicles. Transportation Research Part D: Transport and Environment 18, 9–15. doi:10.1016/j.trd.2012.08.001

Lindenberg, S., Steg, L., 2007. Normative, gain and hedonic goal frames guiding environmental behavior. Journal Of Social Issues 63, 117–137. doi:10.1111/j.1540-4560.2007.00499.x

Lorek, S., Fuchs, D., 2013. Strong sustainable consumption governance – precondition for a degrowth path? Journal of Cleaner Production 38, 36–43. doi:10.1016/j.jclepro.2011.08.008

Lu, J., Yao, J.E., Yu, C.-S., 2005. Personal innovativeness, social influences and adoption of wireless Internet services via mobile technology. The Journal of Strategic Information Systems 14, 245–268. doi:10.1016/j.jsis.2005.07.003

Madden, T.J., Ellen, P.S., Ajzen, I., 1992. A Comparison of the Theory of Planned Behavior and the Theory of Reasoned Action. Personality and Social Psychology Bulletin 18, 3–9. doi:10.1177/0146167292181001

Mannberg, A., Jansson, J., Pettersson, T., Brännlund, R., Lindgren, U., 2014. Do tax incentives affect households′ adoption of "green" cars? A panel study of the Stockholm congestion tax. Energy Policy 74, 286–299. doi:10.1016/j.enpol.2014.08.029

Mau, P., Eyzaguirre, J., Jaccard, M., Collins-Dodd, C., Tiedemann, K., 2008. The "neighbor effect": Simulating dynamics in consumer preferences for new vehicle technologies. Ecological Economics 68, 504–516. doi:10.1016/j.ecolecon.2008.05.007

Miller, G., 2009. Spent: Sex, Evolution, and Consumer Behavior. Penguin.

Moons, I., De Pelsmacker, P., 2015. An Extended Decomposed Theory of Planned Behaviour to Predict the Usage Intention of the Electric Car: A Multi-Group Comparison. Sustainability 7, 6212–6245. doi:10.3390/su7056212

Morton, T.A., Duch, J.M., 2001. Communication and Health Beliefs: Mass and Interpersonal Influences on Perceptions of Risk to Self and Others. Communication Research 28, 602–626. doi:10.1177/009365001028005002

Moser, S., Mosler, H.-J., 2008. Differences in influence patterns between groups predicting the adoption of a solar disinfection technology for drinking water in Bolivia. Social Science & Medicine 67, 497–504. doi:10.1016/j.socscimed.2008.04.002

Nair, H.S., Manchanda, P., Bhatia, T., 2010. Asymmetric Social Interactions in Physician Prescription Behavior: The Role of Opinion Leaders. Journal of Marketing Research 47, 883–895. doi:10.1509/jmkr.47.5.883

Nordlund, A., Jansson, J., Westin, K., 2016. New Transportation Technology: Norm Activation Processes and the Intention to Switch to an Electric/Hybrid Vehicle. Transportation Research Procedia 14, 2527–2536. doi:10.1016/j.trpro.2016.05.334

Nordlund, A.M., Garvill, J., 2003. Effects of values, problem awareness, and personal norm on willingness to reduce personal car use. Journal Of Environmental Psychology 23, 339–347. doi:10.1016/S0272-4944(03)00037-9

Nunnaly, J.C., 1967. Psychometric theory. McGraw-Hill, New York.

Nurhadi, L., Borén, S., Ny, H., Larsson, T., 2017. Competitiveness and sustainability effects of cars and their business models in Swedish small town regions. Journal of Cleaner Production. doi:10.1016/j.jclepro.2016.04.045

Nyborg, K., Howarth, R.B., Brekke, K.A., 2006. Green consumers and public policy: On socially contingent moral motivation. Resource and Energy Economics 28, 351–366. doi:10.1016/j.reseneeco.2006.03.001

Ozaki, R., Sevastyanova, K., 2011. Going hybrid: An analysis of consumer purchase motivations. Energy Policy 39, 2217–2227. doi:10.1016/j.enpol.2010.04.024

Pacini, H., Silveira, S., 2011. Consumer choice between ethanol and gasoline: Lessons from Brazil and Sweden. Energy Policy 39, 6936–6942. doi:10.1016/j.enpol.2010.09.024

Petschnig, M., Heidenreich, S., Spieth, P., 2014. Innovative alternatives take action – Investigating determinants of alternative fuel vehicle adoption. Transportation Research Part A: Policy and Practice 61, 68–83. doi:10.1016/j.tra.2014.01.001

Poortinga, W., Steg, L., Vlek, C., 2004. Values, environmental concern, and environmental behavior: A study into household energy use. Environment And Behavior 36, 70–93. doi:10.1177/0013916503251466

Potoglou, D., Kanaroglou, P.S., 2007. Household demand and willingness to pay for clean vehicles. Transportation Research Part D: Transport and Environment 12, 264–274. doi:10.1016/j.trd.2007.03.001

Prosser, H., Almond, S., Walley, T., 2003. Influences on GPs' decision to prescribe new drugs—the importance of who says what. Family Practice 20, 61–68. doi:N/A

Rettie, R., Burchell, K., Barnham, C., 2014. Social normalisation: Using marketing to make green normal. Journal of Consumer Behaviour 13, 9–17. doi:10.1002/cb

Rezvani, Z., Jansson, J., Bodin, J., 2015. Advances in consumer electric vehicle adoption research: A review and research agenda. Transportation Research Part D: Transport and Environment 34, 122–136. doi:10.1016/j.trd.2014.10.010

Robèrt, K.-H., Borén, S., Ny, H., Broman, G., 2016. A strategic approach to sustainable transport system development - part 1: attempting a generic community planning process model. Journal of Cleaner Production. doi:10.1016/j.jclepro.2016.02.054

Rockström, J., Steffen, W., Noone, K., Persson, A., Chapin, F.S., Lambin, E.F., Lenton, T.M., Scheffer, M., Folke, C., Schellnhuber, H.J., Nykvist, B., de Wit, C.A., Hughes, T., van der Leeuw, S., Rodhe, H., Sorlin, S., Snyder, P.K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R.W., Fabry, V.J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P., Foley, J.A., 2009. A safe operating space for humanity. Nature 461, 472–475. doi:10.1038/461472a

Rogers, E.M., 2003. Diffusion of innovations, 5. ed. Free press, New York.

Rogers, E.M., 1962. Diffusion of innovations. Free Press of Glencoe, New York.

Ruvio, A., Shoham, A., 2007. Innovativeness, exploratory behavior, market mavenship, and opinion leadership: An empirical examination in the Asian context. Psychology and Marketing 24, 703–722.

Sang, Y.-N., Bekhet, H.A., 2015. Modelling electric vehicle usage intentions: an empirical study in Malaysia. Journal of Cleaner Production 92, 75–83. doi:10.1016/j.jclepro.2014.12.045

Schultz, P.W., 2001. The structure of environmental concern: Concern for self, other people, and the biosphere. Journal Of Environmental Psychology 21, 327–339. doi:10.1006/jevp.2001.0227

Schwartz, S.H., 1977. Normative influences on altruism. Advances in Experimental Social Psychology 10, 221–279. doi:10.1016/S0065-2601(08)60358-5

SFS, 2011. Förordning (2011:1590) om supermiljöbilspremie [Decree on super environmental car rebate].

SFS, 2005. Lag (2005:1248) om skyldighet att tillhandahålla förnybara drivmedel [Law on obligation to supply renewable fuels].

SFS, 2004. Förordning (2004:1364) om myndigheters inköp och leasing av miljöbilar [Decree on autorities' purchases and leasing of environmentally friendly cars].

Sheeran, P., 2002. Intention—Behavior Relations: A Conceptual and Empirical Review. European Review of Social Psychology 12, 1–36. doi:10.1080/14792772143000003

Shoham, A., Ruvio, A., 2008. Opinion leaders and followers: A replication and extension. Psychology and Marketing 25, 280–297. doi:10.1002/mar.20209

Sierzchula, W., Bakker, S., Maat, K., van Wee, B., 2014. The influence of financial incentives and other socio-economic factors on electric vehicle adoption. Energy Policy 68, 183–194. doi:10.1016/j.enpol.2014.01.043

Sierzchula, W., Bakker, S., Maat, K., van Wee, B., 2012. Technological diversity of emerging eco-innovations: a case study of the automobile industry. Journal of Cleaner Production 37, 211–211. doi:10.1016/j.jclepro.2012.07.011

Sims, R., Schaeffer, R., Creutzig, F., Cruz-Núñez, X., D'agosto, M., Dimitriu, D., Figueroa Meza, M.J., Fulton, L., Kobayashi, S., Lah, O., others, 2014. Chapter 8: Transport. Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

Steffen, W., Richardson, K., Rockström, J., Cornell, S.E., Fetzer, I., Bennett, E.M., Biggs, R., Carpenter, S.R., de Vries, W., de Wit, C.A., Folke, C., Gerten, D., Heinke, J., Mace, G.M., Persson, L.M., Ramanathan, V., Reyers, B., Sörlin, S., 2015. Planetary boundaries: Guiding human development on a changing planet. Science 347. doi:10.1126/science.1259855

Steg, L., Bolderdijk, J.W., Keizer, K., Perlaviciute, G., 2014. An Integrated Framework for Encouraging Pro-environmental Behaviour: The role of values, situational factors and goals. Journal of Environmental Psychology 38, 104–115. doi:10.1016/j.jenvp.2014.01.002

Steg, L., Dreijerink, L., Abrahamse, W., 2005. Factors influencing the acceptability of energy policies: A test of VBN theory. Journal Of Environmental Psychology 25, 415–425. doi:10.1016/j.jenvp.2005.08.003

Steg, L., Vlek, C., 2009. Encouraging pro-environmental behaviour: An integrative review and research agenda. Journal Of Environmental Psychology 29, 309–317.
Stern, P.C., 2000. Toward a coherent theory of environmentally significant behavior. Journal Of Social Issues 56, 407–424. doi:10.1111/0022-4537.00175
Stern, P.C., Dietz, T., Abel, T., Guagnano, G.A., Kalof, L., 1999. A value-belief-norm theory of support for social movements: The case of environmentalism. Human Ecology Review 6, 81–97.
Struben, J., Sterman, J.D., 2008. Transition challenges for alternative fuel vehicle and transportation systems. Environment and Planning B: Planning and Design 35, 1070–1097. doi:10.1068/b33022t
Summers, J.O., 1970. The Identity of Women's Clothing Fashion Opinion Leaders. Journal of Marketing Research 7, 178. doi:10.2307/3150106
Swedish government, 2009. Regeringens proposition 2008/09:162: En sammanhållen klimat- och energipolitik [Swedish government proposition 2008/09:162: A coordinated climate- and energy policy].
Tanner, C., Kast, S.W., 2003. Promoting sustainable consumption: Determinants of green purchases by Swiss consumers. Psychology and Marketing 20, 883–902.
Thøgersen, J., 2006. Norms for environmentally responsible behaviour: An extended taxonomy. Journal Of Environmental Psychology 26, 247–261. doi:10.1016/j.jenvp.2006.09.004
Thøgersen, J., 2003. Monetary Incentives and Recycling: Behavioural and Psychological Reactions to a Performance-Dependent Garbage Fee. Journal of Consumer Policy 26, 197–228. doi:10.1023/A:1023633320485
Thøgersen, J., Zhou, Y., 2012. Chinese consumers' adoption of a "green" innovation – The case of organic food. Journal of Marketing Management 28, 313–333. doi:10.1080/0267257X.2012.658834
Trafikanalys, 2015. Fordon 2015 [Cars 2015] by Trafikanalys [Transport Analysis].
Valente, T.W., Davis, R.L., 1999. Accelerating the Diffusion of Innovations Using Opinion Leaders. Annals of the American Academy of Political and Social Science 566, 55–67. doi:10.1177/000271629956600105
van Eck, P.S., Jager, W., Leeflang, P.S.H., 2011. Opinion Leaders' Role in Innovation Diffusion: A Simulation Study. Journal of Product Innovation Management 28, 187–203. doi:10.1111/j.1540-5885.2011.00791.x
Venkatesh, V., Morris, M.G., Davis, G.B., Davis, F.D., 2003. User acceptance of information technology: Toward a unified view. MIS Quarterly: Management Information Systems 27, 425–478.
Venkatraman, M.P., 1989. Opinion leaders, adopters, and communicative adopters: A role analysis. Psychology and Marketing 6, 51–68. doi:10.1002/mar.4220060104
Vikan, A., Camino, C., Biaggio, A., Nordvik, H., 2007. Endorsement of the new ecological paradigm: A comparison of two Brazilian samples and one Norwegian sample. Environment And Behavior 39, 217–228. doi:10.1177/0013916506286946
Vining, J., Ebreo, A., 1992. Predicting Recycling Behavior from Global and Specific Environmental Attitudes and Changes in Recycling Opportunities. Journal of Applied Social Psychology 22, 1580–1607. doi:10.1111/j.1559-1816.1992.tb01758.x
Vredin Johansson, M., Heldt, T., Johansson, P., 2006. The effects of attitudes and personality traits on mode choice. Transportation Research Part A: Policy and Practice 40, 507–525. doi:10.1016/j.tra.2005.09.001
Weimann, G., Tustin, D.H., van Vuuren, D., Joubert, J.P.R., 2007. Looking for Opinion Leaders: Traditional vs. Modern Measures in Traditional Societies. International Journal of Public Opinion Research 19, 173–190. doi:10.1093/ijpor/edm005

Wejnert, B., 2002. Integrating models of diffusion of innovations: A conceptual framework. Annual Review of Sociology 28, 297–326. doi:10.1146/annurev.soc.28.110601.141051

Widegren, Ö., 1998. The new environmental paradigm and personal norms. Environment And Behavior 30, 75–100. doi:10.1177/0013916598301004

Young, H.P., 2009. Innovation Diffusion in Heterogeneous Populations: Contagion, Social Influence, and Social Learning. The American Economic Review 99, 1899–1924. doi:10.1257/aer.99.5.1899

Zapata, C., Nieuwenhuis, P., 2010. Exploring innovation in the automotive industry: new technologies for cleaner cars. Journal of Cleaner Production 18, 14–20. doi:10.1016/j.jclepro.2009.09.009