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Comparison of socio-psychological characteristics of conventional and battery electric car buyers

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ABSTRACT

Knowledge about consumer groups is important for effective measures to encourage consumers to adopt fuel-efficient or alternative fuel cars. In this study, a latent class cluster analysis was conducted to differentiate consumer groups among conventional car buyers based on the latest purchased car's features. Consequently, a series of analysis of variance and a partial least square path modelling were performed to compare five conventional car buyer groups and a group of battery electric car buyers on a range of socio-psychological variables. The results indicated that battery electric car buyers had a significantly different socio-psychological profile from any group of conventional car buyers. In general, conventional car buyers evaluated convenience and performance attributes of the car more important than battery electric car buyers. All groups, however, generally held positive attitude and a high level of perceived behavioural control over buying fuel-efficient cars. Meanwhile, they exhibited weak social and personal norms to choose such cars. Implications for design of effective measures are discussed.

1. Introduction

Road transportation is a major contributor to depletion of natural resources and environmental problems at a global scale (Hertwich and Peters, 2009; U.S. Energy Information Administration, 2013). Among measures to combat the problems, increasing the amount of cars with emergent technologies (i.e., cars equipped with improved internal combustion engine, hybrid or electric powertrain) in the total car fleet is identified as one of the most significant pathways in the transport sector (Bleijenberg et al., 2013). To achieve this goal, governing bodies generally seek to implement policies, which often heavily rely on monetary costs or benefits, aimed at encouraging consumers to adopt such cars (European Commission, 2009; Norwegian Ministry of the Environment, 2012).

Although the impact of financial benefits and other policy-related advantages in general, and cost of purchase and ownership in particular, is the paramount attribute governing consumers' uptake of cars with emergent technologies (Coad et al., 2009; Graham-Rowe et al., 2012; Mannberg et al., 2014; Turcksin et al., 2013), it has also been suggested that their effects may rely on consumer's general and behaviour-specific predisposition and beliefs (Stern, 2000). For the design of effective measures to promote cars with emergent technologies, socio-psychological characteristics of different target groups therefore need to be addressed alongside economic factors.

1.1. Economic approach to car purchase and todays' car market

In the consumer research literature from the 1980s and 1990s, the purchase and ownership of cars have often been explained by aggregated models, cohort models and disaggregated micro-economic models (see de Jong et al., 2004). Choice modelling studies carried out then reveal that the cost of purchase and use, socio-demographics, income, household characteristics and location strongly affect consumers' purchase decisions (Dargay, 2001, 2002; Liu et al., 2014; Whelan, 2007).

While economic influences on the acquisition of cars with emergent technologies remain strong (Green et al., 2011; Mau et al., 2008), the existence of large variation in engine size, engine power, fuel type, gear type, and drive system through and within all car size segments in todays' car market (de Haan et al., 2009) needs to be reflected in consumers' purchase decisions as well. Put it another way, in order to reflect the current process of consumers' car purchase decision, it seems helpful to use car features like the ones mentioned above to cluster cars. Consequently, close examination of characteristics of consumer segments, which are

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based on the car clusters, may add new material to the body of existing knowledge.

1.2. Socio-psychological approach to car purchase

Notwithstanding the contribution of the economic models being widely acknowledged in surging research on the purchase of cars with emergent technologies (Axsen et al., 2009; Mannberg et al., 2014), empirical evidence has also revealed the importance of various socio-psychological variables in consumers' uptake of such cars (Heffner et al., 2007; Jansson et al., 2010; Kahn, 2007; Ozaki and Sevastyanova, 2011; Peters et al., 2011; Turrentine and Kurani, 2007). In this regard, Stern's (2000) categorization of determinants of environmentally significant behaviour provides a general framework, which addresses a range of variables that the economic approach and the socio-psychological approach have emphasized in the research on consumers' purchase of cars with emergent technologies.

Contextual forces (e.g., interpersonal influences, community expectations, government regulations or policies, monetary factors, and various features of the broad social, economic, and political context) are one of the categories of determinants suggested by Stern (2000) as having huge impact on private sphere environmental behaviours. According to the attitude-behaviour-context theory (Guagnano et al., 1995; Stern, 2000), when the contextual forces are strongly positive or negative, they effectively compel or prohibit consumers' acquisition of cars with emergent technologies. This assumption is in line with economic preferences for acquisition of cars put forward by the economic approach and choice modelling studies.

Stern (2000) proposes that contextual forces and personal capabilities (e.g., knowledge and skills for particular actions, the availability of time to act, and general capabilities and resources indicated by sociodemographics), which is the other category of determinants, shape an individual' general and behaviour-specific predisposition and beliefs to act. These individual sphere predisposition and beliefs are then categorized by Stern (2000) as attitudinal factors. Cognitive behavioural theories like the theory of planned behaviour (TPB, Ajzen, 1991; Fishbein and Ajzen, 2010), and normative behavioural theories like Schwartz' (1977) norm-activation model (NAM) and Stern's (2000) value-belief-norm theory (VBN), provide good theoretical accounts of the attitudinal factors.

The TPB identifies behaviour specific predisposition like a person's overall evaluation of performing the particular behaviour (i.e., attitude toward behaviour), and behaviour specific beliefs like a person's perception of the ease or difficulty of performing the particular behaviour (perceived behavioural control) as factors affecting the behaviour. In addition, a person's beliefs about if other important persons approve or disapprove the particular behaviour (i.e., subjective norms) are also suggested to affect the performance of the behaviour. The subjective norms in the TPB resemble interpersonal influences and community expectations mentioned in contextual forces by Stern (2000). The TPB further suggest that a person's inclination to perform the particular behaviour (i.e., behavioural intention), which is generated by weighing the importance of each of the above three factors, is a direct antecedent of the behaviour. The TPB thus emphasizes expectancy-value assessment of individuals (Ajzen, 1991; Fishbein and Ajzen, 2010), and therefore views individuals as "utility maximizing actors" (Bamberg and Schmidt, 2003, p. 267).

Meanwhile, the NAM identifies behaviour specific predispositions like specific personal norms (i.e., strong intrinsic feeling of obligation to engage in the particular behaviour) and behaviour specific beliefs like awareness of need (i.e., the need to protect natural resources, the environment etc.), awareness of consequences (i.e., the particular behaviour's consequences for self, others, or the environment), and ascription of responsibility (i.e., accepting responsibility that the person holds for these consequences) to affect the behaviour. Besides, the NAM acknowledges the importance of the perception of the own ability to execute the behaviour (Schwartz and Howard, 1981), which is a construct comparable to perceived behavioural control in the TPB. The VBN theory extends the NAM, and adds a person's general predisposition to act according to value orientations and environmental beliefs as having an effect on environmentally significant behaviours. Both the NAM and VBN propose personal norms as direct determinant of the behaviour.

While the cognitive behavioural theories, such as the TPB, emphasize utility maximization or self-interest of individuals, normative behaviour theories shift the view toward moral obligation to help others or environment. However, neither of them comprehensively addresses the multifaceted attitudinal bases of environmentally significant behaviour. Considering environmentally significant behaviour as a mixture of self-interest and concern for others or environment, researchers have suggested an integration of the theories (Bamberg and Möser, 2007; Klöckner and Blöbaum, 2010). Studies employing the integrated approach have then found empirical evidence for the role of the above-mentioned attitudinal factors in uptake of cars with emergent technologies (Nayum et al., 2013; Peters et al., 2011).

In addition to the attitudinal factors mentioned above, Stern (2000) also suggest that attitudes about attributes of consumer products (e.g., drive wheel, colour, comfort, energy label in cars) can affect environmentally significant behaviour. This notion is supported by empirical research, in which consumers' attitudes toward a car's environmental attributes (i.e., the overall evaluation of environmentally friendly aspects of a car), attitudes toward the car's performance attributes (i.e., the overall evaluation of aspects of a car that enhance driving performance and the image of a car), and attitudes toward a car's convenience attributes (i.e., the overall evaluation of aspects of a car that enhance the practicality and comfort of a car) have been found to relate with behaviour (van Rijnsoever et al., 2009). A recent review of research on purchase of cars on alternative fuels and drive trains shows that the purchase decision is mainly driven by price characteristics, performance and convenience attributes (Turcksin et al., 2013).

To summarize, environmentally significant behaviour like consumers' acquisition of cars with emergent technologies, is determined by multiple variables, often in interaction (Stern, 2000). As a result, approaches based solely on financial benefits and other policy-related advantages hardly produce much change on their own in longer term. On the other hand, neither moral approaches (i.e., appealing values to change broad world views and beliefs) nor educational approaches (i.e., providing information to change specific attitudes and beliefs) alone result in satisfying track records (Gardner and Stern, 1996). There is, however, strong evidence that significant governmental incentives and regulations combined with information or moral appeals are much more effective (Gardner and Stern, 1996; Stern, 1999).

1.3. The present study

The Norwegian government's progressive tax policy has been in favour of cars that have low emissions. The study coincided with recent policy from the Norwegian government recognizing a wide range of benefits and advantage (e.g., exemption from one-off registration tax, no road and ferry tolls, free parking and charging in municipal parking areas, access to collective transport lane etc.) for buying and using battery electric cars. Although the important role of a facilitating context requires no refute, the recognition of a multifaceted motivation base of consumer behaviour poses a