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Article (Accepted Version)

Who Buys New Energy Vehicles in China? Assessing social-psychological predictors of purchasing awareness, intention, and policy

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Abstract: This paper investigates the salience of social-psychological factors in explaining why drivers purchase (or fail to purchase) New Energy Vehicles (NEVs)—including hybrid electric vehicles, battery electric vehicles, and fuel cell electric vehicles—in China. A questionnaire measuring six dimensions (including attitudes, subjective norms, perceived behavioral control, personal norms, low-carbon awareness and policy) was distributed in Tianjin, where aggressive policy incentives for NEVs exist yet adoption rates remain low. Correlation analysis and hierarchical multiple regression analyses are applied data collected through 811 valid questionnaires. We present three main findings. First, there is an "awareness-behavior gap" whereby low-carbon awareness has a moderating effect on purchasing behavior via psychological factors. Second, subjective norms has a stronger influence on intention to purchase New Energy Vehicles than other social-psychological factors. Third, acceptability of government policies has positive significant impact on adoption of New Energy Vehicles, which can provide reference potential template for other countries whose market for New Energy Vehicles is also in an early stage.

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Keywords: new energy vehicles; social-psychological factors; theory of planned behavior; low-carbon awareness; transport policy; China

1. Introduction

There has been a growing interest concerning the relationship between climate change and transportation in China (Schwanen et al., 2011). There, transportation has the fastest annual growth rates of both energy use and resulting greenhouse gas emissions (Tyfield et al, 2014). For instance, transportation accounted for about 365 million tons of national Chinese CO_2 emissions in 2010, an amount more than twice that of 2005[1].This doubling of emissions was mainly due to a rapid growth of vehicle ownership. China's private vehicle population has expanded rapidly with an average annual growth rate of 14.7% over the past two decades. Since 2009, China has been the world's largest car market, and car ownership per thousand persons escalated beyond 100 for the first time in 2014. Thus, vehicle emissions have become a major source of Chinese air pollution (Peng et al., 2015). According to national statistics[2], personal light duty vehicles emitted 34.39 million tons of carbon monoxide (CO) in 2013, 4.31 million tons of hydrocarbons (HC), 6.40 million tons of nitrogen oxides

[1]Edition Committee of China's National Assessment Report on Climate Change. China's National Assessment Report on Climate Change. Unpublished results.

[2]MEP, Ministry of Environmental Protection. Environment Statistical Annual Report 2013. ⟨http://zls.mep.gov.cn/hjtj/nb/2013tjnb/201411/t20141124_291867.htm⟩, November24, 2014.

(NOx), and 0.59 million tons of particulate matter (PM) in 2013.

To lessen greenhouse emissions, the Chinese government has announced its intention to reduce carbon emission intensity per unit GDP in 2020 by 45% compared to 2005 levels. To achieve this goal, planners have begun to endorse and incentivize New Energy Vehicles (NEVs) in China, a term that includes hybrid electric vehicles, battery electric vehicles, and fuel cell electric vehicles. Fig. 1 shows the sales volume of automobiles and NEVs in China between 2009 and 2014. As it indicates, 2014 saw a significant spike in the total sales of NEVs (about 75,000), but these numbers still pale in comparison to conventional automobiles (about 2.5 million in 2014).

These low uptake rates are unfortunate, to say the least, given that China has attempted to accelerate NEVs adoption through a variety of tools including demonstration projects, city development and transport planning policies, advanced research, and tax credits. However, these tools taken should be based on a thorough understanding of the drivers' social-psychological factors on purchasing NEVs. Moreover, psychological factors aimed at influencing intention have not yet been considered by policymakers in China (Wan et al., 2015). Therefore, prior to developing policies, it is necessary to analyze the current relationship between the people's perceptions of NEVs and social low carbon behavior.

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Figure 1

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Previous literature has suggested that several psychological factors can affect purchasing patterns and behavior for NEVs. Some studies narrowly argue that intention is a major predictor of actual behavior (Bamberg and Schmidt, 2001; Schuitema et al., 2013). But we take a more complex view, proposing that purchasing behavior will be conditioned by a series of social-psychological factors such as attitudes towards NEVs, subjective norms, perceived behavioral control and personal norms (Kim and Rasouli, 2014; Ajzen, 1991). Also, we argue that symbols and notions of self-identity that emerge from low-carbon awareness can also considerably influence pro-environmental behavior such as purchasing NEVs or favoring mass transit (Skippon and Garwood, 2011; Egbue and Long, 2012; Lane and Potter, 2007; Carley et al., 2013; Krupa et al., 2014; Nielsen et al., 2015; Geels et al. 2018).

Moreover, this paper further explains whether environmental awareness is necessarily related to intention or behaviors, which has been an ongoing debate by previous literature (Abrahamse et al.,2005; Ozaki and Sevastyanova, 2011). Most of the existing research explains this debate by comparing levels of awareness and behavior (Owens and Driffill, 2008; Van Raaij and Verhallen, 1983), Bai and Liu(2013) even argue that a low-carbon awareness-behavior gap exists between motivation and barriers. Although such an awareness-behavior gap hasbeen found in numerous previous studies, lesss literature exists whichexplains how the gap is formed or relates to low carbon awareness.Therefore, we regard low-carbon

awareness as a moderating variable (Lianying Zhang, 2016) and explain how it influences behavioral intention via social-psychological factors in the field of NEVs. Low-carbon value, low-carbon subjective knowledge and low-carbon objective knowledge are presented to measure moderating effect of low-carbon awareness on the intention to purchase NEVs in this paper.

In proceeding on this path, our study makes at least two contributions to the literature. First, we show how social-psychological factors can exert both direct and indirect influence on purchasing patterns. We find that extended TPB variables have significant direct influence on intentions to purchase NEVs. And low-carbon awareness has a moderating effect on purchasing behavior via psychological factors. Also, our study illustrates how the attitudes towards NEVs, subjective norms, and perceived behavioral control will be different among consumers based on varying levels of low-carbon awareness. The relationship between attitude or personal norms and behavioral intention is strengthened with higher low-carbon awareness. On the contrary, higher low-carbon awareness weakens the relationship between subjective norms/perceived behavioral control. Many studies ignore these dimensions and interactions altogether, including those that analyze the relationship between government policies and NEVs purchasing intention (Stern et al., 1999). Such studies generally focus on the intersection between awareness and adoption of vehicles, and thus they either ignore China or focus on only one class of vehicle, such as Kang and Park's (2011) work on fuel cell vehicles, Chandra et al.'s (2010) study on hybrid

116 flex-fuel vehicles, or Lin et al.'s (2017, 2018) work on e-bikes, rather than NEVs in a
117 comparative and holistic manner.

118 Second, drawn from previous psychological theories (Thøgersen, 2006; Helveston
119 et al., 2015), we posit that subjective norms are strongly correlated with
120 pro-environmental behavior. We propose and test an extended Theory of Planned
121 Behavior (TPB) research model which includes personal norms and government
122 policies to examine NEV purchasing intentions. Thus, we shed light on two central
123 research questions: (1) what are the major factors affecting intentions to purchase
124 NEVs, and (2) how does low-carbon awareness affect those factors?

125 2. Theoretical Framework

126 The theory of planned behavior are representative theories in the study of
127 pro-environmental behavior. The following paragraphs summarize recent literature on
128 each influential variables in the context of behavioral intentions towards
129 environmentally choices. The theoretical framework of this paper is based on this
130 discussion of relationships among influential variables.

131 2.1 Theory of Planned Behavior

132 The Theory of Planned Behavior (TPB) offers a model about the determinants of an
133 individual's behavior (Ajzen, 1991). According to the TPB model, an individual's
134 behavior is dictated by his or her behavioral intention, which in turn is anteceded by
135 three factors. The first of social-psychological factors is attitudes towards the behavior

136 (AB), which is the individual's positive or negative evaluation of the behavior. Second
137 is subjective norms (SN), which refer to an individual's estimation of the social
138 pressure to act or not to act the behavior. In addition, we include personal norms (PN)
139 (Schwartz, 1977), defined as feelings of an obligation to perform certain specific
140 behavior. Thøgersen (2006) differentiated personal norms and subjective norms, and
141 noted that personal norms were more relevant to actual behavior. Third is perceived
142 behavioral control (PBC), a person's personal perception on the difficulty of
143 performing the behavior.

144 TPB predicts that, generally speaking, a more positive attitude, stronger subjective
145 norms, and greater perceived behavioral control will strengthen an individual's
146 intention to adopt more environmentally conscientious behavior (Kaiser and Gutscher,
147 2003; Steg and Vlek, 2009). Many studies have therefore utilized TPB to explain
148 energy conservation (Harland et al., 1999), travel mode choice (Bamberg and Schmidt,
149 2001), the recycling of waste (Kaiser and Gutscher, 2003), purchasing green products
150 (Yazdanpanah and Forouzani, 2015), and purchasing new automobiles (Lane and
151 Potter, 2007). Nayum and Klöckner (2014) have combined the TPB with a concept
152 known as the norm activation model to explain consumer purchases of fuel-efficient
153 cars; Van Der Werff and Steg (2015) similarly used TPB and the norm activation
154 model to explain why consumers purchase energy efficient devices. Onwezen et al.
155 (2013) have also showed that attitudes, subjective norms, and perceived behavior

156 control alongside personal norms play an important role in environmentally friendly
157 lifestyles overall.

158 Therefore, our study draws on the TPB model and notions of personal norms to test
159 hypotheses about NEV purchases in China. More specifically, we argue that H1: (H1a)
160 attitudes (AT) toward NEVs, (H1b) subjective norms (SN), (H1c) perceived behavior
161 control (PBC), and (H1d) personal norms (PN) will have a positive direct effect on
162 NEVs purchasing behavior intentions (INT).

163 ## 2.2 Government policy and regulation

164 Behaviors and norms do not exist in a vacuum. Instead, they can be influenced by a
165 variety of policy mechanisms or government regulations, some of which attempt to
166 stimulate desire for a technology by lowering its price (a "supply push" strategy);
167 others by making a technology more desirable by increasing its desirability or
168 affordability (a "demand pull" strategy) (Sovacool, 2010). In other words, preference
169 for a new vehicle can be affected not only by a TPB but also government policies
170 which can create an external environment conducive, or corrosive, to NEVs
171 (Gallagher and Muehlegger, 2011; Stern et al., 1999). NEVs not only face challenges
172 due to rapid technological breakthrough but also changes in government policies.

173 In particular, we hypothesize that government incentives for buyers and charging
174 infrastructure support will have a positive impact on preferences for a NEVs
175 (Berensteanu and Li, 2009), though Zhang et al.(2013)and Kang and Park(2011)

suggest that such an impact may dissipate and may not be as strong as other TPB factors. Still, we hold that H2: Policy factors (POL) will have a positive direct effect on NEV purchasing behavior intentions (INT).

2.3 Low-carbon awareness

The last set of literature we incorporate into our hypotheses center on low-carbon awareness. Studies have shown, for instance, that sometimes large gap exist between stated preferences or awareness and actual behavior (Department for Transport, 2004). The impact of low-carbon awareness on behavior of purchasing New Energy Vehicles should not be ignored, although few measurement of low-carbon awareness was taken (Nemcsicsné Zsóka 2008). Most existing literatures consider that low-carbon awareness should be defined from multidimensional level (Maloney and Ward, 1973; Abdul-Wahab, 2010). Environmental value and knowledge are the most frequently mentioned components of awareness in the relevant literature (Goldblatt et al., 2005; Abdul-Wahab, 2010).

The low-carbon value refers to opinions about low-carbon issues given based on individual philosophy of life (Dunlap et al., 2000), which usually has a slight indirect influence on present behavioral intention (Bai and Liu 2013). Low-carbon knowledge is a kind of ability to identify relevant symbol, concept and behavior of environmental protection (Laroche et al., 2001). Moreover, the literatures have highlighted the impact of knowledge on low carbon behavior (Abrahamse et al., 2005; Goldblatt et al.,

196 2005; Wright et al., 2008). It is well accepted that low-carbon behavioral intention or
197 behavior would increase with the improvement of people's knowledge (Thondhlana
198 and Kua 2016).

199 That said, the effect of low-carbon awareness has often been studied as a direct
200 attribute of people's NEVs purchasing behavior or intention (Graham-Rowe et al.,
201 2012, Axsen and Kurani, 2013). We seek to explore, instead, the moderating effect of
202 low-carbon awareness on the relationship between people's perception of NEVs
203 (behavioral attitude, subjective norms, perceived behavior control, personal norms)
204 and purchasing behavior intention.

205 Previous studies have used different dimensions to assess mechanisms that can
206 overcome awareness gaps. Some research has suggested that as environmental
207 problems increase, antecedent motivation of people's pro-environmental behavior can
208 change (Maloney and Ward, 1973; Walton et a. 2004). Heffner et al. (2007) found that
209 individuals who showed higher levels of environmental awareness stated that they had
210 a preference for NEVs as symbols of "ethical" or "altruistic" behavior. Kahn (2007)
211 found that environmentalists are more likely to purchase hybrid vehicles than
212 non-environmentalists in Los Angeles County. Egbue and Long (2012) have found
213 that other values such as mobility or luxury can trump environmental values centered
214 on climate change. Other studies have explored the impact of environmental
215 knowledge as an antecedent for low-carbon behavior (Abrahamse et al., 2005; Barr,
216 2007; Bamberg 2003).

Environmental values or knowledge are presented as the most frequently mentioned components of awareness in the relevant literature (Goldwater et al., 2005; Abdul-Wahab, 2010). Especially in the domain of low-carbon behavior or practice, low-carbon awareness has been defined as the state of values, attitudes and knowledge about decreasing greenhouse gas emissions to mitigate the impacts of climate change (Bai Y., 2013). Hence, we propose in this paper that low-carbon awareness can be encapsulated and measured mainly via low-carbon values and low-carbon knowledge.

Specially, low-carbon knowledge was broken down into subjective knowledge and objective knowledge in order to indentify the different influencing mechanism between how much a person thinks he/she knows (subjective knowledge) and how much a person actually knows (objective knowledge). Differentiation between subjective and objective knowledge occurs when residents do not recognize how much or how little their actually know (Barber et al., 2009).

Low-carbon awareness can act as a moderating variable which can strengthen or weaken NEVs purchasing intentions. We propose that if an individual has a high level of low-carbon awareness, their attitude towards NEVs, subjective norms, perceived behavior control, and personal norms will strengthen their purchasing behavioral intention. Thus, we state that H3: Low-carbon value (LV) has a positive moderating effect on the relationship between the extended TPB variables and NEVs purchasing intention. H4: Low-carbon subjective knowledge (LSK) has a positive moderating

238 effect on the relationship between the extended TPB variables and NEVs purchasing
239 intention. H5: Low-carbon objective knowledge (LOK) has a positive moderating
240 effect on the relationship between the extended TPB variables and NEVs purchasing
241 intention.

242 Overall, many studies focus on psychological factors which influence consumers'
243 low-carbon transport behaviors, such as purchasing green products (Lane and Potter,
244 2007;Ozaki and Sevastyanova, 2011), and travel mode choice (Kahn and Morris,
245 2009). Rather than rely on one concept or set of literature in isolation, we decided to
246 draw upon three at once: the theory of planned behavior, the effects of government
247 policy, and the concept of low carbon awareness. Figure 2 depicts the synthesized
248 conceptual framework that results.

249 ==========

250 Figure2

251 ==========

252 ## 3. Materials and methods

253 ### 3.1 Study site and sample

254 To assess purchasing preferences for NEVs, our empirical study was conducted in
255 Tianjin, which is one of four municipalities directly under the control of central
256 government in China. In order to alleviate environmental problems brought by the
257 traffic department, Tianjin has become a central component of national efforts to

promote NEVs—it thus represents what methods scholars would call an “extreme” rather than a “representative” case since it looks at a policy exemplar, a part of China more committed than most to low-carbon energy and transport planning. Table 1 lists major NEVs demonstration programs and development progress in China. The municipal government of Tianjin took part in both of them. As described in the “Embodiments of promotion and application of new energy vehicles in Tianjin (2013-2015)”, it was expected that the sales volume of NEVs would reach 12,000 between 2013 and 2015. To incentivize this switch in Tianjin, consumers could get cash subsidies of 31,500-54,000 RMB by selecting some of the NEV models, plus free private vehicle registration plates. However, only a few consumers ever expressed interest, and a meager 1,726 NEVs were sold, accounting for 0.34% of total sales in Tianjin by September 2014. Moreover, a majority of the NEVs were used for the public service sector such as urban buses rather than the private vehicle market.

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Table1

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3.2 Survey questionnaire

To enable us to assess these hypotheses, our primary tool was survey questionnaire that we used to collect original data and verify our hypotheses about NEV purchasing

intentions. The questionnaire included three parts, and respondents were not given any technical information with regards to the performance of NEVs during or before they filled in the questionnaire. The first part attempted to survey public social-psychological perception towards NEV in Tianjin. The second part consisted of ten items to gauge low-carbon awareness. The third part asked for demographic information. In order to establish the content validity of the items, the questionnaire was adopted and modified from an extensive literature survey. It was fine-tuned through a focus group with academic experts in University.

To provide a bit more detail, the first part of the survey attempted to evaluate social-psychological factors influencing NEVs purchasing intention behavior among Tianjin drivers. It was measured by the TPB instructions (Cronbach α=0.896) proposed by Ajzen (1991). Factors were measured on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), with 3 serving as neutral. We used 4 questions to measure their attitudes (AB) (Cronbach α=0.789) with regards to NEV purchases (Knez, et al., 2014): (1) Compared to an internal combustion engine vehicle (ICEV), purchasing a NEVs would be more expensive; (2) Compared to an ICEV, purchasing a NEVs would be safer; (3) Compared to an ICEV, purchasing a NEVs would be more fashionable; and (4) Compared to an ICEV, NEVs have better performance. Subjective Norms (SN) (Cronbach α=0.863)were measured by another 3 questions (Ajzen, 1991; Bamberg et al., 2007): (1) My family members' perceptions are important factors which affect my decision on whether I should purchase a NEV;

(2) My colleagues would approve of me to purchasing a NEV; and (3) The 4S shop[3] will advise me to purchase a NEV. Perceived Behavioral Control (PBC) (Cronbach α=0.853) was measured by 2 questions (Ajzen, 1991; Klöckner et al., 2013): (1) I could afford to purchase a NEV if I want to; and (2) Whether or not I purchase a NEV is entirely decided by me. Personal norms (PN) (Cronbach α=0.861) were measured by 2 questions based on previous literatures (Klöckner et al., 2013; Nordlund and Garvill, 2003). (1) I think purchase a NEV is what I should do; (2) No matter what the others think, I feel that I purchase a NEV.

We used the term "acceptability of government policies (POL) (Cronbach α=0.866) " to connote a measurement of public knowledge and awareness of relevant government policies related to NEVs (Zhang et al., 2013, Kang and Park, 2011). What's more, we added to some new items considering China's context in the rewording process. It includes two policies in Tianjin, and two scenario policies. We have included four questions here: (1) after the implementation of vehicle license limit in Tianjin, it's efficient to give NEV purchases free vehicle licenses; (2) I have a strong willingness to purchase a NEV because of government subsidies; (3) I will purchase a NEV if charging infrastructure becomes more comprehensive; and (4) I will purchase a NEV if the tolls and fees are reduced or remitted. Lastly, behavior intention was measured by a single question (1): I intend to purchase a NEV when I buy a new car.

[3] A 4S shop similar to a car dealership in Europe or North America. In China, 4S shops offer both sales and maintenance services for consumers. The "4S's" relate to sales, spare parts, service and satisfaction.

The second part of the survey consisted of ten items to acquire basic information on Tianjin drivers' low-carbon awareness (Cronbach α=0.751). The low-carbon value was measured by the New Ecological Paradigm (NEP) Scale (Dunlap, 2008). The NEP is based on five items: (1) The current population is approaching the limitation which the earth can withstand.(2) Disastrous consequences will happen since human destroy nature.(3) Human are abusing and destroying the environment. (4) The balance of nature is easy to be disturbed. (5) We will suffer serious natural disasters if we don't take measures to protect environment. Low-carbon knowledge was measured from two dimensions: subjective knowledge and objective knowledge (Barber et al., 2009). The subjective knowledge was measured by two items (Sudarmadi et al., 2001). Participants were asked: (1) I know what a low-carbon product is; (2) I know a NEV is better as it has lower lifecycle greenhouse gas emissions. And objective knowledge was assessed by three questions(Nemcsicsné Zsóka, 2008; Barber et al., 2009): (1) The carbon emission can be reduced by taking public transportation than by driving car. (2) Buying low-emission cars is conducive to energy conservation. (3) To supply tire with air inflation timely can improve energy efficiency of vehicle and reduce carbon emission.

4.Results

The participants of this study were residents who had been living in Tianjin for at least one year. The survey data were collected from July to October of 2015, with the survey consisting of online random sampling via the Star Customer Questionnaire

platform[4], and a cluster sampling following the approach by Bai and Liu (2013). We divided Tianjin region into six urban districts (Nankai, Heping, Hexi, Hedong, Hebei and Hongqiao) and 30 collection blocks. Then we sent 25 trained postgraduate student interviews to these blocks. Each group of three students was responsible for 50 street-intercept interviews in each collection block. A total of 811 questionnaires were returned with a response rate of 87.2%. Table 2 shows the detailed demographic characteristics of this sample. In terms of representativeness, the sample has a similar number of male (42.5%) and female (57.5%) respondents. Most respondents were 26-35 years of age (48.7%) followed by 18-25 years of age (20.3%). The majority of the respondents held an undergraduate degree (49.8%) and 20.0% were postgraduate degree holders. Moreover, 54.0% respondents' reported a household size of three people. Almost two-thirds (66.3%) of respondents had a car, and 80.4% of the respondents had an IC bus card (a stored value card for bus passengers). Basically, the sample is in line with the demographical characteristics in Tianjin[5], which guarantee the representativeness of survey sample.

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Table2

[4] The Star Customer Questionnaire platform is a kind of platform of providing online random sampling for users. It can be accessed from website: https://www.sojump.com/.

[5] Source: Tianjin Bureau of Statistics. http://stats.tj.gov.cn/.

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4.1 Raw Data and Pearson Correlations

To analyze our daya, we relied on Pearson's correlation coefficient, a measure of the strength of the association between the two variables (Altiok et al., 2007). A correlation of less than 0.2 is considered a slight correlation, 0.2-0.4 is considered low, 0.4-0.7 is moderate, 0.70-0.90 is high and more than 0.9 is considered very highly correlated (Nunnally, 1978).

Table 3 presents the mean, standard deviation, and inter-correlation between various variables. All social-psychological factors have positive correlation with NEVs purchasing intentions. The acceptability of government policies (POL) (r=0.695, p<0.01) has stronger correlation with NEVs purchasing intentions than others. The extended TPB variables, including AB, SN and PN exhibited moderate correlation with intentions. Attitude towards NEVs (r=0.449, p<0.01), subjective norms (r=0.666, p<0.01), personal norms (r=0.583, p<0.01) and perceived behavior control (r=0.364, p<0.01) showed positive correlation with NEV purchasing intention.

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Table3

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376 4.2 Hierarchical Regression Analyses

377 To further analyze the purchasing intention of NEVs, main two additional steps
378 were taken. First, the extended TPB framework was tested by hierarchical multiple
379 regression analysis. Second, we more carefully analyzed the moderating effect of
380 low-carbon awareness (i.e. low-carbon value, low-carbon subjective knowledge, and
381 low-carbon objective knowledge) with other variables. Moderator variable (Cohen et
382 al., 2003) is a third variable that affects the direction and strength of the relation
383 between dependent and independent variables. In this study low-carbon awareness
384 was placed into the model as a moderator variable.

385 For the first task, we created a series of models to test our results. Model (1) is a
386 control model, which used to test for the effects of several control variables, which the
387 subjects' demography (i.e. gender, household size, age and income). The equation of
388 the Model (1) is expressed as follows:

389 $$INT=\beta_0+\beta_1 CONTROL+\varepsilon \quad (1)$$

390 Model (2) is an extended TPB model, which included attitudes towards behavior
391 (AB), subjective norms (SN), perceived behavioral control (PBC) and personal norms
392 (PN) as independent variables. In previous literature, it has been suggested that the
393 demographic characteristics of the respondents may be associated with the intention
394 to purchase NEVs (Wolf and Seebauer, 2014; Sovacool et al. 2018). Hence, gender
395 (0=male, 1=female), age, income, and household size were incorporated as control

396 variables. Age and income were treated as categorical variable. And household size
397 was treated as numberical variables. The equation of the Model (2) is expressed as
398 follows:

399 $$INT=\beta_0+\beta_1 CONTROL+\beta_2 AB+\beta_3 SN+\beta_4 PBC+\beta_5 PN+\varepsilon \quad (2)$$

400 In Model (3), we tested whether the inclusion of policy factors will increase the
401 explained variance of NEVs purchasing intentions. The equation of Model (3) is
402 expressed as follows:

403 $$INT=\beta_0+\beta_1 CONTROL+\beta_2 AB+\beta_3 SN+\beta_4 PBC+\beta_5 PN+\beta_6 POL+\varepsilon \quad (3)$$

404 In Model (4), the total moderating effect of low-carbon awareness has been tested.
405 The aim was to to explore whether low-carbon awareness has a moderating effect
406 among extended TPB variables and behavoral intention. $TPB_{variable}$ stands for AB, SN,
407 PBC and PN. LCA stands for LV, LSK, LOK, respectively.

408 $$INT=\beta_0+\beta_1 CONTROL+\beta_2 POL+\beta_3 TPB_{variable}+\beta_4 LCA+\beta_5 TPB_{variable}\times LCA+\varepsilon \quad (4)$$

409 Table 4 shows the regression results for four models. In Model (1), none of these
410 demography variables was found to be significant, except for income. Therefore, the
411 hypotheses were robust acoress variations in the control variables. In Model (2), the
412 relationships among the variables within the extended TPB theory were assessed
413 (H1).As expected, attitude ($\beta=0.203$, $p<0.001$), subjective norms ($\beta=0.496$, $p<0.001$),
414 perceived behavior control ($\beta=0.160$, $p<0.001$) and personal norms ($\beta=0.214$, $p<0.001$)
415 have a positive impact on NEV purchasing intentions. Therefore, hypotheses 1a, 1b,

1c and 1d were supported. The results of Model (3) revealed that government policies also have a significant impact on intention (H2). Model (3) constructs significantly increased the variance of explanation with an additional 2.9% of variance in intention explained. Hence, H2 was supported. Model (4) shows that there is an "awareness-behavior gap" whereby low-carbon awareness has a moderating effect on purchasing behavior via psychological factors with statistical significance.

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Table4

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To further test the individual moderating effects of low-carbon values, low-carbon subjective knowledge and low-carbon objective knowledge on the relationship between perception towards NEVs and purchasing intentions, a similar type of hierarchical multiple regression analysis was used. Following the methodology proposed by Cohen et al. (2003), we mean-centered each variable to ensure that multicollinearity between predictors and the interaction terms, which would prevent results from being affected. If the interaction term explains a significant proportion of variance in the outcome variable, then the change in R^2 (squared multiple correlation) for the interaction term added model was statistically significant with a moderating effect. Model (5), Model (6), and Model (7) tested the effect of low-carbon value, low-carbon subjective knowledge, and low-carbon objective knowledge respectively.

436 The equations of the Model (5), Model (6), and Model (7) are expressed as follows:

437 $INT=\beta_0+\beta_1 CONTROL+\beta_2 AB+\beta_3 SN+\beta_4 PBC+\beta_5 PN+\beta_6 LV+\beta_7 LV\times AB+\beta_8 LV\times SN+$

438 $\beta_9 LV\times PBC+\beta_{10} LV\times PN+\varepsilon$ (5)

439 $INT=\beta_0+\beta_1 CONTROL+\beta_2 AB+\beta_3 SN+\beta_4 PBC+\beta_5 PN+\beta_6 LSK+\beta_7 LSK\times AB+\beta_8 LSK\times SN+$

440 $\beta_9 LSK\times PBC+\beta_{10} LSK\times PN+\varepsilon$ (6)

441 $INT=\beta_0+\beta_1 CONTROL+\beta_2 AB+\beta_3 SN+\beta_4 PBC+\beta_5 PN+\beta_6 LOK+\beta_7 LOK\times AB+\beta_8 LOK\times SN+$

442 $\beta_9 LOK\times PBC+\beta_{10} LOK\times PN+\varepsilon$ (7)

443 Where β_i (i=1, 2, 3,……, 10) indicates the path coefficient between the independent
444 variables and purchasing intention; INT, AB, SN, PBC, SN, POL,LV, LSK, LOK refer
445 to behavioral intention, attitude, subjective norms, perceived behavior control,
446 personal norms, policies, low-carbon value, low-carbon subjective knowledge and
447 low-carbon objective knowledge respectively; and ε indicates the error term.

448 Table 5 summarizes the results of our hierarchical regression analyses. Model (5a),
449 Model (6a), and Model (7a) assessed the independent variables and moderating
450 effects of NEV purchasing intentions, while Model (5b), Model (6b), and Model (7b)
451 measured interaction variables to test moderating impacts on NEVs purchasing
452 intentions. Model (5b) showed that low-carbon value has not significant moderating
453 effects of social-psychological factors (AB, SN, PBC and PN) and the intention of
454 purchasing NEVs (Sig.F.Change=0.465) (β=-0.021, $p>0.05$; β=0.082, $p>0.05$;
455 β=-0.042, $p>0.05$; β=-0.048, $p>0.05$). This suggests that low-carbon value does not

provide effective driving force to purchase NEV via relative psychological factors. Hence, H3 was not supported.

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Table5

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Interestingly, Model (6a) accounted for 51.8% of variance in NEV purchasing intention that could be explained by AB (β=0.206, $p<0.001$), SN (β=0.498, $p<0.001$) and PBC (β=0.161, $p<0.001$), PN(β=0.215, $p<0.001$). Model (6b) accounted for 52.9% of variance in NEVs purchasing intention after the variable of low-carbon subjective knowledge was included. Moreover, the interaction of attitude and low-carbon subjective knowledge is significant (β=0.138, $p<0.05$). The more low-carbon subjective knowledge people grasp, the more impact of attitude on purchasing NEVs would be strengthen. However, the interaction of subjective norm and low-carbon subjective knowledge is negative significantly with the coefficients of -0.217 ($p<0.001$). This implies that the effect of subjective norm on NEV purchasing intention would decrease with any increase in low-carbon subjective knowledge. Therefore, H4 was supported partially.

Model (7a) accounted for 51.8% of variance in NEVs purchasing intention that could be explained by AB (β=0.208, $p<0.01$), SN (β=0.501, $p<0.001$), PBC (β=0.161, $p<0.001$) and PN (β=0.216, $p<0.01$). Model (7b) accounted for 52.3% of variance in

NEV purchasing intention when low-carbon objective knowledge was added into the model. The results revealed that the interaction of perceived behavioral control and low-carbon objective knowledge is significant with the coefficients of -0.092 ($p<0.05$), indicating that low-carbon objective knowledge weakens the influence of perceived behavioral control on intention of purchasing NEV. Therefore, H5 was not supported.

5.Discussion

The results of our analyses suggest at least five important points.

Firstly, the results of our direct effects model indicate that all psychological factors including attitude, subjective norms, perceived behavioral control and personal norms were significantly related to the behavioral intention in terms of purchasing new energy vehicles. This further confirms the hypothesis that attitude, subjective norm and perceived behavioral control may be predictors of behavioral intention, as expressed in the theory of planned behavior (Ajzen, 1991). More importantly, subjective norms ($\beta=0.496$, $p<0.001$) has the strongest influence among all psychological variables on NEVs purchasing intention. In line with Ozaki and Sevastyanova (2011), it confirms that subjective norms have stronger positive impacts on NEVs purchasing intention than the attitude, perceived behavior control, and personal norms, a finding vital for promotional efforts for VEVs around the world, wherever in Asia or even Europe. People are willing to purchase NEVs if they were advised by other people or if they previously had a NEV (Lane and Potter, 2007). Household members, colleagues, and friends are all more likely to purchase a NEV if

497 they personally know someone who owns one. Apart from individual judgment about
498 NEVs, positive or negative evaluations from households, colleagues, and friends are
499 also important. This implies that NEVs purchasing behavior is socially influenced (He
500 et al., 2014), which is consistent with Thøgersen (2006)'s research as well as research
501 on the so-called Chinese herd mentality[6]. The peer pressure and following trends may
502 impact NEVs purchasing behavior in significant ways (Larson et al. 2014).

503 Secondly, we ascertain that the acceptability of government policies has
504 significantly positive effect on NEVs purchasing intention, and the explanatory power
505 of model has been improved when policy was added into the expanded TPB. The
506 results are consistent with previous literature (Diamond, 2009) that government
507 policies play an important role on influencing the intention of purchasing NEVs. At
508 present, the policies were taken to deal with complicated demand in the new energy
509 vehicles market. Such complicated demand need to focus not only on empowering
510 individuals, but also on influencing neighborhoods, families, colleagues, and 4S shops.
511 Current incentives, most about lowering the cost of NEVs, are undoubtedly important,
512 but subsidy policy is not just the efficient ones (Wang, Liu et al. 2014). In previous
513 studies, consumers have focused on the costs of purchasing, driving and maintenance
514 of electric vehicles (EVs) (Larson et al., 2014). However, in our study, more than half
515 (55%) of respondents were interested in purchasing a NEV because of cost, and only

[6] Herd mentality (Raafat et al., 2009) is a form of convergent social behavior that canbe broadly defined as the alignment of the thoughts or behaviors of individuals in a group (herd) through localinteraction and without centralized coordination. It is a well-documented feature ofhuman behavior in a number of domains.

31.5% of respondents expressed a preference or interest in receiving a free code-plate lottery system[7] when their cars were registered. Surprisingly, almost two thirds of respondents (68%) indicated that they were willing to buy a NEV if the government improved the construction of infrastructure such as hydrogen fueling stations or charging facilities. What's more, more than half people who belong to these respondents[8] have high income, and they prefer to pay more attention on environmental technology and the improvement of public facilities than cost. Therefore, relative policies should focus not only on subsidy but also on improvement of NEV technology and infrastructure, which are also mentioned in previous literature (Åhman 2006) .

Thirdly, there is a gap between awareness and behavior because low-carbon awareness has slight moderating effect on purchasing intentions according to model 4. The measurement of low-carbon awareness involves low-carbon values, low-carbon subjective knowledge and low-carbon objective knowledge, which are explained in section 2.3. Consequently, the results of model 5 show that low-carbon value didn't have significant moderating effect on the relationship between psychological factors and intention of purchasing NEV (Sig.F.Change>0.05; p>0.05), which corresponds to Van Raaij and Verhallen's (1983) value-action gap. The presence of a value-action gap weaken the moderating effect on behavior via psychological factors, which might

[7] The code-plate lottery policy is taken in megacities of China such as Tianjin, Beijing, Shanghai and etc, which is a kind of auxiliary policy to prevent the number of vehicles from rising quickly.

[8] It refers to people who were willing to buy a NEV if the government improved the construction of infrastructure.

535 be caused by the motivators and barriers of purchasing behavior (Bai, Y. and Y. Liu,
536 2013).

537 Fourthly, low-carbon subjective knowledge has a significant moderating effect on
538 behavior via attitude and subjective norms. Also, according to the results of model 6
539 and 7, explanaotry power has been improved with the additoni of low carbon
540 knowledge. Model 6 suggests that high low-carbon subjective knowledge strengthens
541 the realtionship between attitudes and behaviroal intentions (β=0.138, $p<0.05$). This
542 finding clearly verifies that of Bamberg (2003), who suggested that individuals with
543 high levels of environmental knowledge would pay more attention to low-carbon
544 automobiles with positive attitude such as NEVs. In China, people who have more
545 low-carbon subjective knowledge also possess positive attitudes towards NEV
546 attributes such as energy conservation and environmental protection, which enhance
547 the probability of purchasing NEVs. Also, and surprisingly, we find that low-carbon
548 subjective knowledge exerts a negative influence on relationship between subjective
549 norms and intention of purchasing NEVs (β=-0.217, $p<0.001$). People who have
550 low-carbon subjective knowledge always have more confidence to make evaluations
551 of purchasing NEVs by themselves, compared to others who are perhaps influenced
552 blindly. As discussed above, most people are influenced by family members, friends
553 or colleagues when considering whether to purchase a NEV. Our findings suggest that
554 the motivation of purchasing NEVs for groups who grasp low-carbon subjective
555 knowledge might be their environmental attributes, and they are more likely to make

556 reasonable determinations of whether to purchase an NEV or reject it. Thus, the
557 probability of purchasing NEVs in a so-calledherd mentality would (paradoxically)
558 decrease as people grasp more low-carbon subjective knowledge.

559 Finally, we surmise that low-carbon objective knowledge exerts a negative
560 influence on the relationship between perceived behavioral control and the intention
561 of purchasing NEVs. This finding might be explained by some barriers existing in the
562 market of New Energy Vehicles in China (Ying Li, 2016). People who with
563 low-carbon objective knowledge may consider more detailed barriers of NEVs such
564 as inconvenience, immature technology and undeveloped infrastructure. This can
565 decrease intentions of purchasing NEVs since people feel more obstacles and doubts
566 towards NEVs technology. Some respondents even suggested that electricity
567 generation and distribution to NEVs would have a negative environmental impact,
568 especially given the emergent nature of the technology itself (Yuan et al. 2015). In this
569 manner, improving the environmental performance of NEVs can also serve to
570 positively moderate and increase consumer confidence in the technology.

571 6.Conclusion and policy implication

572 This paper has tested social-psychological factors based on an extended TPB model
573 (Chen and Tung 2014) Siu Hing Lo, 2016), with low-carbon awareness added as a
574 moderating variable to explain an “awareness-behavior” gap. Our investigation yields
575 several policy implications.

To summarize, attitudes towards behavior, subjective norms, perceived behavioral control and personal norms are strong determinants of intentions to purchase NEVs.The moderating effect of low-carbon awareness on the relationship between psychological factors and the intention of purchasing NEV is slight. The awareness-behavior gap can be explained partially for low-carbon awareness exerts slight moderating impact on the intention of purchasing NEVs. We develop the dimensions of measuring low-carbon awareness by analyzing low-carbon values and low-carbon knowledge. Low-carbon values does not have a significant moderating effect in social-psychological model due to *value-action gap* (Van, 1983). Low-carbon knowledge, however, has a positive significant moderating impact on behavioral intention via attitude, while has a negative significant moderating effect on behavioral intention via subjective norms and perceived behavioral control. Finally, the acceptability of policy has a positive significant influence on the intention of purchasing NEVs.

Better understanding these cognitive and emotional factors can enable marketing specialists and policymakers to calibrate their ongoing research, demonstration, outreach, and regulatory activities and to take more effective motivational measures throughout China (Egbue and Long, 2012). The self-perceived ability and psychological profile of potential adopters intersect deeply with the decision-making processes surrounding new energy vehicles. Government should encourage potential adopters and users to strengthen their own awareness of green consumption and

consumption concepts, and guide them playing a leading role in promoting the development of low-carbon transport infrastructure as well as various information and marketing channels. For example, broadening the channels of public participation in learning about the latest performance attributes (and costs) of the latest NEVs can increase awareness and knowledge. In addition, policymakers can promote low-carbon education and awareness and action related skills, which are comparatively low according to our research findings. Over time, consumer preferences and and the strength of NEV brands will undoubtedly increase or improve as well. . Last but not the least, forms of social media and digital interaction can be utilized be used to build a platform in which consumers cam continuously offer feedback about their needs, concepts, and suggestions for NEVs to manufacturers as well as dealerships, a potentially strong barrier to NEV adoption (Zarazua et al. 2018), so that the development of NEVs is consistent with the needs of consumers. This could motivate incumbents to further innovate NEV technologies and related innovations.

In presenting our findings, a few limitations deserve to be mentioned. First, although the demographics of respondents were not fully analyzed in this study, such factors may explain the heterogeneity among residents in terms of low-carbon awareness and purchasing intentions. Moreover, our study does not distinguish between adopters, potential consumers and reluctant adopters, and how these groups differ with respect to their psychological factors of NEV purchasing behavior. Future

work is needed to explore how consumers can be grouped into various psychological factors or demographical factors, and their NEV purchase decision processes, epecialyl inofar as some potential users may even resist new low-carbon innovations entirely (Kahma and Matschoss 2017). In addition, this study was based upon on voluntary and self-reported data concerning purchasing intentions for NEV rather than direct observation. Such data may not entirely reflect truthful purchasing intentions. Not withstanding such limitations, our study has yielded important insight into the various social and psychologicalmechanisms of affecting perceptions and possible adoption pattenrs of NEVs in China.

Acknowledgements

This study was supported by the National Natural Sciences Foundation of China under Grants 71431005, 71273185 and 71561137003, the Key Project of National Social Science Foundation of China under Grant 12&ZD208, and the the National Science & Technology Pillar Program under Grant 2014BAC26B00.

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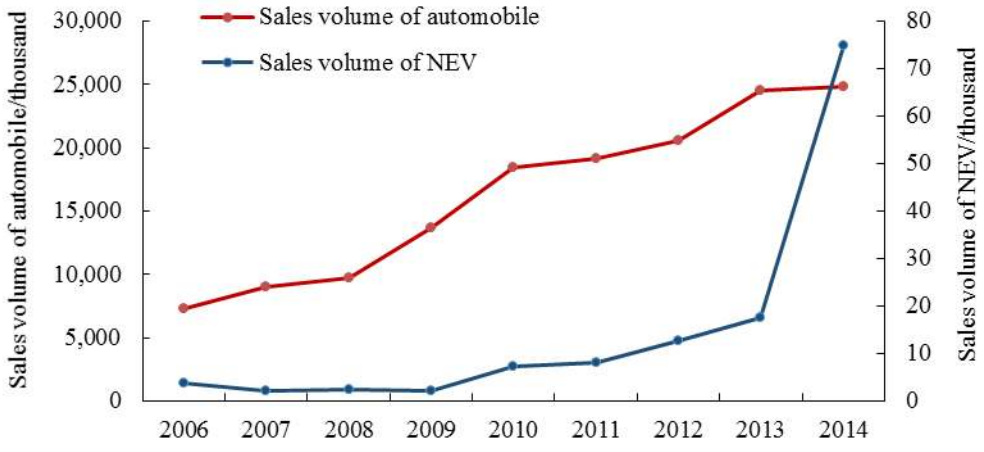
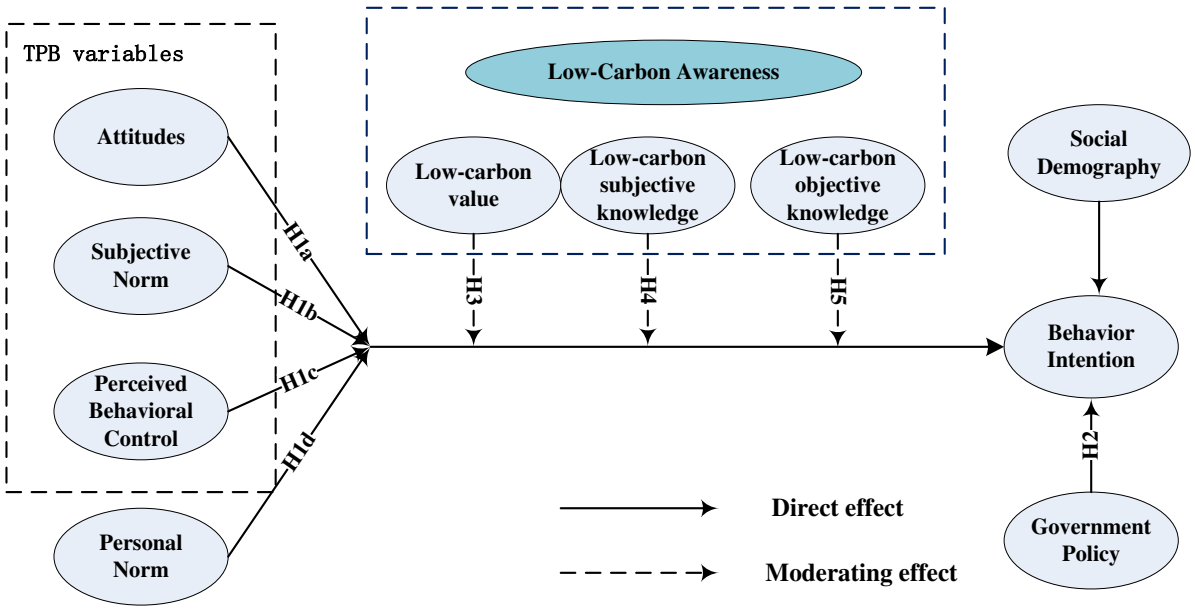


Fig. 1. Sales volume of automobile and NEVs in China between 2009 and 2014

Source: National Bureau of Statistics of China.



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870 **Fig.2.** Synthetic Conceptual Framework Drawing from TPB, Government Policy, and
871 Low-Carbon Awareness

872 Source: Authors

873 **Table 1**

874 NEV demonstration programs and development progress in China

	New Energy Vehicle Pilot Program		New Energy Vehicle Promotion And Application Program	
Timeline	2009-2012		2013-2015	
Policy	● Notice on promotion and demonstration of energy-saving and new energy vehicle ● Notice on implementing NEV private buyer subsidy pilot project		● Notice on work of continuous promotion and application of new energy vehicles ● Notice on further improving the work of promotion and application of new energy vehicles ● Options on Accelerating the Development of Energy-saving and Environmental Protection Industry	
Subsidy (thousand RMB/vehicle)	public sector	Public service HV: 50 (maximum) BEV: 60 FCV: 250 Bus longer than 10 m HV: 42 (maximum) BEV: 500 FCV: 600	Passenger cars Bus	BEV: 60 (maximum) PHV: 35 BEV: 500 PHV: 250
	Private sector	0.3 RMB/kWh HV: 50 (maximum)	BEV of special purpose	0.2RMB/kWh(<150)

BEV: 60

Target	25 each city: 1000 NEVs (include Tianjin) Automotive sales: 10% (2012).	28 cities or regions cumulative sales: 10,000 NEVs (megacities), ≥5000 NEVs (other cities, including Tianjin)
Progress	27,432 NEVs (public:23,032 NEVs, private 4400 NEVs) Completion rate: 40%	38616 NEVs by septmber,2014 Completion rate: 11.5%

Source: Compiled by authors

Table 2

Demographics of Survey Respondents

Background		Frequency	Percentage (%)	Background		Frequency	Percentage (%)
Gender	Male	466	57.5%	Income	<=2000	60	7.4%
	Female	345	42.5%		2001-4000	249	30.7%
Age	18-25	165	20.3%		4001-6000	239	29.5%
	26-35	395	48.7%		6001-8000	121	14.5%

	36-45	178	21.9%		>8000	142	17.5%
	46-60	69	8.5%		-	-	-
	>60	4	0.5%	Household size	1	20	2.5%
Education	High school	88	10.9%		2	90	11.1%
	Junior college	157	19.4%		3	438	54.0%
	College	404	49.8%		4 or above	263	32.4%
	Master or above	162	20.0%	Car ownership	Having	538	66.3%
IC Bus card	Having	311	80.4%	Driver’s license	Having	691	85.2%

880

Table 3

Variables and Correlation Matrix for NEV purchasing intentions (N=811)

	LV	LSK	LOK	AB	SN	PBC	PN	POL	INT
LV	1								
LSK	0.163**	1							
LOK	0.404**	0.174**	1						
AB	0.193**	0.302**	0.220**	1					
SN	0.244**	0.330**	0.257**	0.579**	1				
PBC	0.102**	0.235**	0.156**	0.185**	0.301**	1			
PN	0.257**	0.262**	0.211**	0.503**	0.654**	0.213**	1		
POL	0.160**	0.171**	0.185**	0.386**	0.423**	0.277**	0.389**	1	
INT	0.171**	0.259**	0.175**	0.449**	0.666**	0.364**	0.583**	0.695**	1
M	4.179	3.48	4.31	3.281	3.676	3.467	3.645	3.502	3.57
SD	0.603	0.733	0.592	0.561	0.764	1.135	0.984	1.027	0.986

Note.1.LV, Low-carbon value; LSK, Low-carbon subjective knowledge; LOK, Low-carbon objective knowledge; AB, Attitude; SN, Subjective norms; PBC, Perceived behavioral control; PN, Personal norms; POL, Policy; INT, Intention.2.*p<0.5; **p<0.01; ***p<0.001.

Table 4

Hierarchical multiple regression analysis of purchasing NEVs intention

	Control model	Direct effects model		Moderation model
	Model(1)	Model (2)	Model (3)	Model (4)
Independent variables				
AB		0.203***(3.720)	0.154**(2.885)	0.219***(3.936)
SN		0.496***(10.698)	0.451***(9.936)	0.473***(10.005)
PBC		0.160***(6.977)	0.132***(5.832)	0.179***(7.504)
PN		0.214***(6.412)	0.184***(5.636)	0.219***(6.489)
POL			0.188***(7.189)	0.184***(6.974)
Interactions				
LV				-0.048(-0.927)
LSK				-0.016(-0.302)
LOK				0.033(0.835)
LV×AB				-0.045(-0.524)
LV×SN				0.115(1.453)
LV×PBC				-0.016(-0.385)
LV×PN				-0.097(-1.395)
LSK×AB				0.129*(2.071)
LSK×SN				-0.242***(-4.595)
LSK×PBC				0.044(1.486)
LSK×PN				0.094(2.207)
LOK×AB				0.037(0.391)
LOK×SN				0.009(0.101)
LOK×PBC				-0.087*(-2.084)
LOK×PN				0.081(1.339)
Control variables				
Gender	-0.117(-1.684)	-.044(-0.899)	-0.019(-0.394)	-0.036(-0.722)

Household size		0.116(2.388)	0.040(1.151)	0.046(1.367)	0.041(1.200)
Age	18-25	0.053(0.376)	0.048(0.480)	0.013(0.132)	0.054(0.538)
	26-35	0.128(0.998)	0.054(0.587)	0.014(0.159)	0.060(0.660)
	36-45	0.062(0.485)	0.034(0.229)	0.036(1.222)	
	46-60	0.164(1.176)	0.106(1.065)	0.081(0.842)	0.121(1.224)
Income	<2000	0.207(1.775)	0.139(1.670)	0.143(1.766)	0.116(1.385)
	2000-4000	0.099(1.083)	0.060(0.914)	0.048(0.762)	0.039(0.591)
	4001-6000	-0.183(-1.826)	-0.161(-1.625)	-0.152(-1.417)	
	6001-8000	-0.389*(-4.276)	-0.143*(-2.191)	-0.130*(-2.058)	-0.147*(-2.256)
Adj R^2		0.043	0.518	0.547	0.568
R^2 change			0.525	0.029	0.021
F		5.484	73.190	75.847	57.087
Sig.F.Change			0.000	0.000	0.002
Sig. Model		0.000	0.000	0.000	0.000

Note.1.AB, Attitude; SN, Subjective norms; PBC, Perceived behavioral control; PN, Personal norms; LV, Low-carbon value; LSK, Low-carbon subjective knowledge; LOK, Low-carbon objective knowledge. 2. Coefficient is unstandardized coefficient. 3.T value is in paretheses. 4.*p<0.05; **p<0.01; ***p<0.001.

Table5

Post-hoc analysis of individual moderating effects on purchasing NEVs behavioral intention

		Model (5a)	Model (5b)	Model (6a)	Model (6b)	Model (7a)	Model (7b)
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
AB		0.206***(3.769)	0.204***(3.725)	0.206***(3.736)	0.213***(3.836)	0.208***(3.796)	0.203***(3.716)
SN		0.499***(10.750)	0.495***(10.562)	0.498***(10.668)	0.481***(10.312)	0.501***(10.743)	0.495***(10.593)
PBC		0.160***(6.975)	0.165***(7.063)	0.161***(6.958)	0.169***(7.238)	0.161***(7.015)	0.167***(7.261)
PN		0.219***(6.499)	0.217***(6.377)	0.215***(6.420)	0.216***(6.497)	0.216***(6.447)	0.215***(6.412)
LV		-0.046(-1.087)	-0.055(-1.130)				
LSK				-0.014(-0.391)	-0.019(-0.499)		
LOK						-0.043(-0.999)	-0.021(-0.446)
Mi × AB			-0.021(-0.265)		0.138*(2.277)		-0.005(-0.053)
Mi × SN			0.082(1.190)		-0.217***(-4.258)		0.045(0.543)
Mi × PBC			-0.042(-1.130)		0.040(1.363)		-0.092*(-2.518)
Mi × PN			-0.048(-0.761)		0.080(1.918)		0.070(1.253)
Gender		-0.046(-.929)	-0.049(-0.991)	-0.043(-0.856)	-0.036(-0.724)	-0.047(-0.955)	-0.043(-0.867)
Household size		0.042(1.199)	0.039(1.125)	0.039(1.134)	0.040(1.173)	0.040(1.156)	0.040(1.160)
Age	18-25	0.046(0.456)	0.054(0.533)	0.048(0.480)	0.048(0.483)	0.042(0.412)	0.046(0.454)
	26-35	0.061(0.668)	0.073(0.793)	0.055(0.597)	0.040(0.434)	0.054(0.586)	0.059(0.640)
	36-45	0.033(0.220)	0.084(1.161)	0.079(1.087)	0.079(1.087)	0.076(1.052)	0.083(1.142)

46-60	0.115(1.158)	0.122(1.226)	0.107(1.078)	0.105(1.067)	0.107(1.083)	0.111(1.118)
Income < 2000	0.141(1.691)	0.145(1.736)	0.138(1.660)	0.121(1.458)	0.276*(2.878)	0.274**(2.857)
2000-4000	0.058(0.891)	0.062(0.946)	0.058(0.893)	0.046(0.704)	0.196*(2.476)	0.192*(2.425)
4001-6000	-0.176(-1.785)	-0.209(-2.135)	-0.183(-1.863)	-0.193(-1.979)	0.189*(1.911)	0.210*(2.160)
6001-8000	-0.142*(-2.173)	-0.144*(-2.200)	-0.145*(-2.212)	-0.150*(-2.304)	0.138*(2.115)	0.143*(2.183)
Adj R^2	0.518	0.517	0.518	0.529	0.518	0.523
R^2 change	0.526	0.001	0.525	0.011	0.526	0.005
F	67.666	51.786	67.500	53.736	67.637	52.480
Sig.F.Change	0.000	0.465	0.000	0.000	0.000	0.001
Sig.Model	0.000	0.000	0.000	0.000	0.000	0.000

Note. 1.AB, Attitude; SN, Subjective norms; PBC, Perceived behavioral control; PN, Personal norms; LV, Low-carbon value; LSK, Low-carbon subjective knowledge; LOK, Low-carbon objective knowledge. 2.Mi is moderate variable, i.e. low-carbon value in model (5); low-carbon subjective knowledge in model (6); and low-carbon objective knowledge in model (7). 3. Coefficient is unstandardized coefficient. 4.T value is in paretheses.5.*p<0.05; **p<0.01; ***p<0.001.