Consumers' Preferences and Motives for Pro-environment Purchasing Behavior: An Empirical Analysis Based on the Choice Experiment

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Abstract: The present study attempts to separate the environmental motivation and healthy motivation of consumers' choice for pro-environmental products through choice experiment and latent class model. Moreover, the different motives behind pro-environmental purchase and its impact on heterogeneity of consumer preferences needs to be further examined. Data are collected by means of face-to-face interview in Zhejiang, Shanghai, Jiangsu and Guangdong of China with a total sample size of 477 consumers. The results reveal that the consumers who are willing to buy pro-environmental products are motivated by health benefits as well as environmental considerations due to the higher consciousness of food safety and eco-environment in China. However, the healthy attributes tend to prevail in consumers' motivations. Consumers who have stronger environmental motivation will show higher preferences for pro-environmental products. It is also found that these consumers have the following characteristics: higher perception and knowledge of pro-environmental products， lower income , convenient purchase and female. Our results have implications for the improvement of government's consumption policies and the precision marketing of producers to induce consumers' participation to buy pro-environmental products, which in turn do a great benefit to environmental-friendly production and sustainable environment.

key words: pro-environmental purchase motives; consumer preference; choice experiment, latent class model

Food consumption is associated with various environmental impacts, and consumers' food choices therefore represent important environmental decisions. Grunert (1993) points out that 40% of the environmental degradation has caused by consumption activities of individual households. Therefore, people are becoming increasingly concerned about the environmental influence of their everyday actions (Gifford and Nilsson, 2014). Some of consumers has translated their environmental concern into actively purchasing pro-environmental products commitment(Martin and Simintiras,1995; Abdul-Muhmim,2007). The "pro-environmental purchase" can effectively prevent environmental damage of producers through market mechanisms, which promote environmental sustainability (Mont and Plepys, 2008; Peattie, 2010; Hui-hui Zhao et al, 2014). Moreover, whether and to what extent consumers perceive pro-environmental products as healthier and more eco-friendly than conventional products is of great importance for producers to develop new goals and market segmentation strategies (D'Souza et al, 2007; Rongduo Liu.et al 2013). It is quite clear that the future of green industries will largely depend on consumers' ultimate motivations (Stewart Lockie et al, 2002). Examining consumers' preferences and motives have implications for the design of effective marketing to induce consumers' participation to buy pro-environmental products, which in turn do a great benefit to environmental-friendly production and sustainable environment (Marchand and Walker, 2008; Ellen J and Van Loo, 2014).

Pro-environmental products typically mix private (perceived health) and public (environmental benefits) characteristics (Bougherara and Coubris，2009). A large body of studies have examined the determinants of eco-friendly food purchases and generally reveal that consumers who are willing to pay a premium for such products are motivated by considerations such as food safety,

health benefits, environmental protection and animal welfare (Yiridoe et al., 2005; Honkanen, 2006; Tsakiridou, 2006; Chen, 2009; Olesen et al., 2010; Grunert et al., 2014) . Consumers' preference for health attributes and environmental traits are the most important factors that explain consumers' decision-making process for pro-environmental products (Aertsens et al, 2011; Honkanen et al, 2006; Douadia et al, 2009; Zanoli et al, 2013). However, no consensus has emerged on the relative importance of different motives. Some studies associate the consumption of pro-environmental products with motives in which the environmental attributes play a predominant role (Aertsens et al., 2011; Honkanen et al., 2006; Douadia et al., 2009; Zanoli et al., 2013). Differently, a greater number conclude that the purchase of such products are primarily for their own health or food safety considerations (Chen,2009; Hamzaoui and Zahaf, 2008; Magistris and Gracia，2008; Onyango et al., 2007; Schmid and Fontguyon, 2007; Vega-Zamora et al., 2014). In short, it is questionable whether such premiums for eco-friendly products are linked to health worries or environmental concerns. The recent foreign scholars are trying to distinguish various motives to assess consumers' willingness to pay for pro-environment attributes while controlling the effect of health benefits.

Few studies have attempted to investigate the motives behind such purchase decision in China. Green and organic products are environmental-friendly products in China which maintain technical standards with quality control, non-pollution and carry a special logo (Shijiu Yin et al, 2010;Wangyun Hao,2015). Many studies have investigated consumers' purchasing behavior ,willingness to pay and its influencing factors of pro-environmental products from a food safety standpoint (Zhang Haiying, 2010; Chen New, Dong Tao, 2012; Han Zhanbing, 2013; T Zones et al., 2012; Chen New et al., 2014). Limited studies have been dedicated to understand

consumers' motivations behind. For instance, Jin Ming and Zhao Chang (2008) used a single indicator to measure consumers' motivations of green consumption. Results revealed that 72.8% of people choose green products for the sake of food safety and only 9.7% of consumers are motivated by the environmental considerations. Similarly, Wang Xia et al.(2009) analyzed the motives of organic products and found that 90% of consumers select organic products for their perceived health. Shijiu Yin.et al.(2010) also showed that the purchase of pro-environmental products are primarily out of food safety concerns and the impact of environment is not significant. The prevailing role of healthy attributes is closely related to the severe food safety situation in China. With the extensive media coverage about food safety incidents and non-point source pollution in China, consumers pay more attention to food safety issues (Cheng Peigang et al., 2009; Zeng Yinchu et al., 2007; Zhou Yingheng and Zhuo Jia,2010), which increase the demand for green and organic products. However, these results are based on consumers' response to questions which are typically characterized by important noise, i.e. response bias and numerous uncontrolled variables of decision. In order to avoid a possible confound between the various choice determinants, we implement a discrete choice experiment. Green and organic products are pro-environmental products in China which must be under control of the certification system and carry a special label. So consumers' needs for environmentally-friendly rice can be transformed into preferences for certification label. preferences. Our research has the specificity to focus on two different environmental attributes: green label and organic label. We intend to find out whether the nature of the environmental attribute may influence consumers' behavior. Using a choice experiment, we estimate the WTP for these two environmental attributes.

Our study provides insight on consumers' preferences and motives for pro-environment

purchasing behavior in China by analyzing individual choices of eco-friendly rice. Rice is selected because it is a staple product in the Chinese diet and the population is very familiar with it. This paper is among the first to test whether the choices of eco-friendly products are driven by environmental concerns in terms of environmental protection using a choice experiment (CE).Specifically, a mixed logit model is applied to investigate the existence of preference heterogeneity, while a latent class model(LCM) is used to examine the sources of heterogeneity across respondents. Given that environmental sustainability of agriculture is a major challenge to crop production in present China, the study is partly designed to offer a better understanding of consumers' motives for eco-friendly purchase and to provide a reasonable guidance for effective policy aiming at encouraging the sustainable consumption and the market orientation strategies of companies.

Methodology: choice modeling

Choice experiments are widely used in food marketing and environmental economics studies to elicit respondents' preferences and WTP for goods(Loureiro and Umberger, 2007; Yue and Tong,2009; Ortega et al., 2011; Bello and Abdulai, 2016). This attribute-based choice method is rooted in the consumer theory(Lancaster,1966), which proposes that utilities for goods are a function of the characteristics or attributes contained by it rather than the good per se, and random utility theory(McFadden,1974). According to random utility theory, individuals would select a given alternative if the perceived utility provided by such alternative was the highest among the various choices. This study apply the choice experiments to investigate consumers' preferences for rice, which permitted individuals to select among three possible alternatives, two types of rice described in term of the relevant attributes at different levels and a ""do not buy" option. The "do

not buy" option is also included since it makes the choice task more similar to the actual purchase decisions(Hensher,2010;VanWezemael et al., 2014).

Formally, the utility that an individual i choose an alternative m in choice set t can be specified as

$$U_{imt} = V_{imt} + \varepsilon_{imt} \quad (1)$$

where V_{imt} is the deterministic component and ε_{imt} is a random component of the utility function. The probability of ith consumer selects type m is given by

$$P(A) = Prob\{V_{imt} + \varepsilon_{imt} \geq V_{int} + \varepsilon_{int}; m \neq \mathrm{n}, \forall n \in C\} \quad (2)$$

If ε_{imt} are independently and identically distributed which follow a Type Ⅰ extreme value distribution, Eu.(1) can be converted to a conditional logit model (Train,2009),such as

$$L_{imt}(\beta_i) = \frac{e^{\beta x_{nit}}}{\sum_j e^{\beta x_{njt}}} \quad (3)$$

If there are heterogeneous preferences across respondents, the CL model results become biased. Consequently, the unconditional probability is the integral of this product over all values of β

$$P_{nit} = \int L_{nit}(\beta) f(\beta|\theta) d\beta \quad (4)$$

Economic model and Empirical specification

Consumers are widely recognized as heterogeneous in their taste and preferences (Lusk et al., 2005). For choice experiment data, the mixed logit model does not need the independence of irrelevant alternatives assumption, which is known as appropriate approaches for capturing unobserved heterogeneity (Lusk et al., 2005; Ouma et al., 2007; Tonsor et al., 2009; Zhou et al., 2013). However, while the mixed logit model allows continuous heterogeneity, it is not well suited for explaining sources of heterogeneity (Boxall and Adamowicz, 2002). A latent class model can simultaneously perform market segmentation and segment-specific estimation of

parameters so as to explain the sources of heterogeneity. Thus, the delineated segments exhibit different consumer preference and price sensitivity in connection with additional socio-demographic or attitudinal consumer characteristics which might have importantly managerial implications (Wedel and Kamakura, 2000). The assumption is that respondents in one class have the same preferences but differ in their preferences from respondents assigned to another class (Swait and Adamowicz, 2001). Therefore, we apply the latent class model to investigate consumer segmentations in terms of their attitudes, perceptions and individual characteristics (Boxall & Adamowicz, 2002; McFadden, 1986).

If the distribution $f(\beta|\theta)$ is discrete, equation (4) can be further converted to latent class models. Each individual is assigned to the latent class with the highest predicted likelihood of belonging. These classes are computed using the probability distribution function estimated by the logit model. Specifically, If a latent class q is identified within Q classes, the probability of the *n*th consumer selecting option *i* in scenario *t* is:

$$P(nit|c) = \prod_{q=1}^{Q}[\exp(\beta_q x_{nit}) / \sum_{j=1}^{J} \exp(\beta_q x_{njt})] \quad (5)$$

Where x_{nit} is the vector of the observable quality and safety attributes of the*i*-th option; β_q is the parameter vector of class-specific utility to capture heterogeneity in preferences across classes ; and t is the number of times that the *n*th consumer visited the experimental scenario. The probability estimate of this model is as follows:

$$P(c) = \frac{\exp(z_t' \gamma_q)}{\sum_{q=1}^{Q} exp(z_t' \gamma_q)} \quad (6)$$

When γ_Q=0, z_t is a series of observed characteristics that affects classification of consumer *n* into a certain latent class.

After the estimation of the parameters in latent class model, the WTP values for different

attributes can be further calculated using the following formula:

$$WTP_k = -\beta_k/\beta_p \quad (7)$$

Where β_k is an estimated parameter for the rice-specific attribute; and β_p is the estimated price coefficient. A delta method is used to obtain the standard errors of the derived willingness-to-pay values (Hole, 2007).

Survey Design and Data Description

The data were collected through a cross-sectional consumer survey in Zhejiang, Shanghai, Jiangsu and Guangdong of China from April to July in 2015 that targeted the main person in the household responsible for rice purchasing. The purposive selection of these 4 cities was due to their economic nature, major rice consumption status and prevalence of food safety incidents and scandals in China. Our survey instrument included choice experiment questions and other questions regarding consumption behavior, attitudes, and the socio-demographic characteristics of the participants.

The CE design followed the procedures suggested by Street and Burgess (2007) and involved a three step approach: (i) specifying choice attributes and levels, (ii) constructing an orthogonal design for the first alternative of the design, and (iii) applying suitable design generators to construct new alternatives to add to the set of choices within the first alternative.

In the first step, we described rice using a combination of four attributes: brand ,certification place of origin and price (Loureiro and Umberger, 2007； Zanoli et al.,2013； Ortega et al.,2011； Yabe et al. 2013). Attributes such as taste were excluded because consumers were not available prior to consumption. The definitions of these attributes are shown in Table 1. The determination of prices included the base price, the middle price and the highest price, which were derived from

national available retail prices data.

In the second step, we used the selected attributes and their levels to come up with an orthogonal factorial design for the first alternative of our CE design using the SAS-based software JMP (R) software, reducing the original 54（3^3×2）combinations to just 18.

Table 1. Attributes for rice products in choice experiments

attributes	Level considered		
certification	none	Green-certification	Organic-certification
brand	none	local	National
Place of origin	labeled		None-labeled
Price(￥/500g)	2.5￥/500g	4.4￥/500g	7.5￥/500g

In the third step, The 19 choice sets were divided into two blocks of nine and the participants were randomly assigned to one of the two blocks. To increase the similarity with a real shopping experience, a no-buy alternative was added to each choice set. Hence, in each choice set, participants were presented three alternatives: two types or product profiles of rice as well as a no-buy option (Fig. 1). Due to the hypothetical nature of our CE, a cheap talk was included, explaining to participants the importance of reacting as realistically as possible (Aprile et al., 2012; Silva et al., 2011; Van Loo et al., 2011) (Appendix A). Before answering the questions participants were provided with information about the attributes of rice.

	Option A	**Option B**	**Option C**
certification	Green certification	Organic certification	Neither A or B is prefered
brand	National brand	none	
Place of origin	Yes	No	
price	4.4	7.5	
I would like to choose	□	□	

Fig. 1 Example of choice set question

In addition to the choice experiment, structured questionnaire survey was also conducted to explore all the possible influencing factors of consumers' preference factors base on the framework of MOA. The theory is that consumers' behavior can be determined by three groups of

factors: motivation, ability and opportunity. This framework has been adopted to induce environmentally friendly behavior (Ölander and ThØgersen 1995; Grunert et al., 2014). In the current context, we suspect that a pro-environment claim may affect a consumer's perception of a product with respect to these motivations, which in turn influences his or her WTP. Motivation is defined as consumers' desire or readiness to buy eco-friendly products. Ability refers to consumers' skills or knowledge in interpreting the pro-environmental attributes. Opportunity is defined here as the availability and accessibility of purchase stores. The more motivated consumers are, the more knowledge they have and the more convenience they feel, The greater possibility of pro-environmental purchasing behaviors. Coupled with the demographic characteristics, these are the main factors that affect eco-friendly purchasing behavior of consumers as well as the sources of preference heterogeneity. We draw on previous work measuring health motivation by two levels and environmental motivation by 4 items(Mostafa, 2006; Chen & Tai, 2010). Respondents' motivation with regard to pro-environmental issues related to rice in general was measured by asking respondents how concerned they were with food safety and agricultural pollution issues. Concern was measured on a 5-point scale with the end points 1 = only slightly concerned'' and 5 = ''extremely concerned'' to ensure optimal scale use. The Cronbach's α value was 0.71 and 0.73, indicating a high degree of internal consistency of the ratings. The ability was measured by consumers' subjective perception and objective knowledge. The former involved self-reported scales related to cognition level of pro-environmental rice (Cronbach's $\alpha = 0.878$), the latter included five specific questions with respect to environment-friendly production standards of rice. The perception of pro-environmental rice and the number of correct answers could be used to assess consumers ability. Opportunity was

measured by asking respondents "how they feel the purchase convenience to buy green or organic rice "

results

Characteristics of the sample

A total of 477 participants completed the survey (Table 3). 59.96% of the sample was female and 40.04% male, which matches with women being the main individuals responsible for food purchasing in a majority of households; most of the respondents were married; 25-34 years old and 35-44 years old were the major age groups which account for 38.16% and 30.19%; Household income of most participants (27.88%) were more than 14000 yuan; the average education level is some college degree; In addition to the basic demographics, our study also requested information on participants' motivation, ability and opportunity. The respondents paid more attention to quality and safety and environmental protection issues; Participants' understanding of pro-environmental rice need to be improved; consumers feel convenient to buy environment-friendly rice.

Table 2. Socio-demographic characteristics of the sample (*n*=477)

Variables	Description	Mean	SD
Gender	1=Male; 0=Female	1.58	0.49
Marriage	1=married; 0=unmarried	1.76	0.43
age	1=18-24 years old; 2=25-34years old; 3=35-44 years; 4=45-54years; 5=55-64years old; 6=more than 65 years old	2.60	1.05
Monthly income	1=less than 5000; 2=5001-8000 yuan 3=8001-11000 yuan; 4=11001-14000 yuan 5=more than 14000 yuan	3.31	1.34
Food buyer	1=always 2=frequently 3=occasionally	2.57	1.10
Healthy motivation	How concerned you are with food safety issues (1-5) How worried you are about the rice quality and safety (1-5)	3.690	0.875
Environmental motivation	The large-scale use of chemical pesticides and fertilizers will pollute the environment (1-5) The severity of current agricultural pollution caused by planting process (1-5) The overall situation of China's agricultural pollution (1-5) The choice of eco-friendly products will do great benefits to environmental protection (1-5)	4.010	0.622
subjective perception	I am familiar with the green rice (1-5) I am familiar with the organic rice (1-5)	2.842	0.990
objective knowledge	Based on your understanding, whether the following statement is correct or not(correct=1;wrong=0)： Chemical fertilizers can be limited used in green planting; Chemical pesticides is allowed in green planting; he highly toxic, high pesticide residues green rice planting; Organic planting respect environmental protection and ecological balance. Chemical pesticides are allowed in organic planting; Chemical fertilizers are allowed in organic planting;	3.486	1.070
purchase convenience	How do you fell the convenience of purchasing eco-friendly rice (1-5)	3,595	0.740

Estimates of mixed logit model

Table 3 presents the results of the mixed logit model. As expected, the coefficient of the no-buy option was negative and statistically significant suggesting that consumers increase their utility more when choosing one of the presented rice alternatives (options A and B) than when choosing

the no-buy option (option C). This indicates that the attributes selected for the experiment were relevant and important to consumers. Moreover, the hypothesis of correlation across utilities was verified since the standard deviation of the error component for the purchase alternatives was statistically significant. The coefficient of price is negative and statistically significant at the 0.01 level, indicating that consumer utility decreases with increasing price. All the other coefficients are positive and statistically significant at the 0.01 level suggesting that consumer utility increases when a pro-environmental traits are included. The two certification labels gave the largest increase in utility, followed(in descending order) by national brand ,place of origin, local brand.

Table 3. Simulated maximum likelihood estimates from mixed logit model

Variables	Mean Coefficient	Derived S.D. Coefficient
price	-0.198*** (0.014)	NA
No-buy option	-0.857*** (0.077)	NA
Green-certification	0.853*** (0.051)	0.596*** (0.065)
Organic-certification	0.996*** (0.054)	0.741*** (0.071)
Local brand	0.245*** (0.041)	-0.047 (0.135)
National brand	0.457*** (0.0401)	-0.550*** (0.070)
Place of origin	0.417*** (0.048)	0.68*** (0.044)
No. of observations	12879	12879
Log-likelihood value	-3692.180	
Chi-square value	357.920	

Notes: Standard errors are in parentheses. Single(*), double(* *) and triple(* **)denote significant variables at 10%, 5 %, and1 % levels, respectively.

Estimates of latent class model

The maximum likelihood estimates for the latent class model for rice is reported in tables 4. To identify the number of latent classes to be used in the analysis, we employed both the Bayesian Information Criterion and Akaike Information Criterion（Boxall and Adamowicz,2002; Ouma et al., 2007；Hole,2013）.This criterion is low and more intuitive for the model with four classes for rice (BIC values of the second classes to the five classes are: 6873.27, 6549.44, 6412.48, 6461.80). Therefore, we estimated four-class latent class model (LCM) for rice. The LCM results indicate

significant heterogeneity in preferences across latent classes as revealed by the differences in magnitude and significance of the parameter estimate. The class membership coefficients for the fourth class were normalized to zero in order to be able to identify the remaining coefficients of the model.

First and foremost is a "price-driven" Class 1, where the absolute value of the coefficient for price (0.87) is the highest among all parameters, which means participants in class 1 are the most sensitive to the change in price. This Class constitutes 9.3% of the overall sample. The membership coefficients indicate that members of this class are likely to be non-major rice buyers, low income, weakly motivated by healthy concerns relative to class 4 . The "certification oriented "is reflected in Class 2, where organic label and green label are highest estimated and significantly positive. Roughly 16.4% of respondents belong to this Class. We have discovered consumers who are female with children or elder people, have high level of subjective perception and objective knowledge, influenced by both environmental and health motivation, feel easy to buy eco-friendly rice, are the most likely members of this class. The "information oriented" group is reflected in Class 3, which is the majority segment that consists of 37.9% of total participants. This group is called "information oriented" as the coefficients of brands and place of origin are significantly positive, which indicates that participants pay more attention to reduce Information asymmetry. The respondents in this class are more likely motivated by environmental protection and receive a good education. Group 4, "quality oriented consumers", has 174 participants (36.4% of the total sample),where all the estimated coefficients are statistical significant at the 1% level. Participants in this group show positive preference for all the quality attributes. It is clear that consumers' purchasing behavior are affected by both pro-environmental and health motivations,

where the impact of health motivation (1.365) is greater than the environmental motivation (0.363).

Table 4. Maximum likelihood estimates of rice attributes from Latent class model

Variables	Class1	Class2	Class3	Class4
Utility function coefficients				
No-buy option	-1.958***	-5.110***	1.886***	-2.692***
	(0.482)	(0.428)	(0.196)	(0.217)
Price	-0.87***	-0.224***	0.009	-0.176***
	(0.050)	(0.098)	(0.028)	(0.031)
Green-certification	0.187	1.056***	0.572***	0.625***
	(0.118)	(0.154)	(0.080)	(0.734)
Organic-certification	-0.0872	1.081***	0.916***	0.949***
	(0.119)	(0.163)	(0.083)	(0.091)
Local brand	-0.0343	0.0959	0.550***	0.322***
	(0.113)	(0.148)	(0.084)	(0.063)
National brand	-0.00489	0.0489	1.008***	0.382***
	(0.114)	(0.166)	(0.095)	(0.069)
Place of origin	0.292***	0.369***	1.433***	0.313***
	(0.099)	(0.130)	(0.078)	(0.045)
Class membership coefficients				
Healthy motivation	-0.770**	1.365***	-0.254	-
	(0.316)	(0.359)	(0.191)	
Environmental motivation	-0.170	0.363*	0.375*	-
	(0.322)	(0.337)	(0.216)	
subjective perception	0.272	0.836**	0.196	-
	(0.264)	(0.328)	(0.148)	
objective knowledge	-0.0829	1.163***	0.104	-
	(0.212)	(0.259)	(0.135)	
purchase convenience	-0.200	0.643**	0.279	-
	(0.327)	(0.287)	(0.175)	
gender	-0.0888	0.815*	0.369	-
	(0.455)	(0.439)	(0.251)	
marriage	-0.673	-0.979	-0.668	-
	(0.673)	(0.700)	(0.421)	
age	0.0993	0.0123	0.138	-
	(0.248)	(0.285)	(0.155)	
education	0.0999	-0.155	-0.233*	-
	(0.250)	(0.265)	(0.138)	
Household income	-0.00643	-0.176	0.0963	-
	(0.166)	(0.186)	(0.097)	
shopper	-0.462*	-0.354	-0.0252	-
	(0.279)	(0.286)	(0.157)	

Special care groups	0.0288	0.833*	0.0734	-
	(0.442)	(0.477)	(0.257)	
constant	3.691*	-0.908	-1.150	-
	(2.06)	(2.303)	(1.37)	

Notes: Standard errors are in parentheses. Single(*), double(* *) and triple(* **)denote significant variables at 10%, 5 %, and1 % levels, respectively.

Consumers' WTP for attributes of rice

The estimated means and standard deviations of marginal WTPs for the attributes of rice are summarized in Table 5. We can conclude that respondents are willing to pay the highest price premium for certificated rice than other attributes, indicating that consumers are happy to pay a premium for environment-friendly products. Moreover, WTP for organic rice is 0.724 yuan more than green rice. The LCM results reveal that consumers in "quality-oriented" class and "certification-oriented" class are more likely to pay more money for pro-environmental products than others.

Table 5. Implicit Price Estimates of rice traits

Traits	Mixed logit model	latent class model			
		Class1	Class2	Class3	Class4
Green certification	4.306[a] [3.656[1]，4.956[2]]	NS[b]	4.714*** [0727，1.215]	NS	3.553*** [2.210，4.896]
Organic certification	5.030 [4.257，5.801]	NS	4.826*** [0.711，1.278]	NS	5.390*** [3.448，7.331]
Local brand	1.231 [0.820，1.643]	NS	NS	NS	1.828*** [0.970，2.685]
National brand	2.102 [1.542，2.662]	NS	NS	NS	2.169*** [1.103，3.234]
Place of origin	3.012 [2.441，3.483]	0.336*** [-0.29，0.575]	0.400*** [-0.119，0.560]	NS	1.781*** [1.014，2.547]

[a] Marginal willingness to pay estimates of rice attributes in RMB yuan

[b] NS: trait not statistically significant

[1] Maximum: lower 95% confidence interval level

[2] Minimum: upper 95% confidence interval level

Single(*), double(* *) and triple(* **)denote significant variables at 10%, 5%, and 1% levels

Conclusions

This article has employed mixed logit and latent class models to examine farmers' preferences and motives for pro-environmental products in China, using choice experiment data for rice.

We chose to focus on rice because it is a staple product in the Chinese diet and the population is very familiar with it. Few studies in China have evaluated consumers' motives of eco-friendly purchasing behavior. To our knowledge this study is the first CE study that test whether the choices of eco-friendly products are driven by environmental concerns in terms of environmental protection. This study makes a contribution to the Chinese literature since it brings together health motivation and environmental motivation, whereas previous studies have focused on just the food safety and health concerns. By doing so we have been able to infer not only how consumers value pro-environmental products but also how such preferences are heterogeneous across respondents.

Our results show that consumers are willing to pay the highest price premium for certificated rice. The choices of pro-environmental products are influenced by the possible health benefits of those goods as well as by the environmentally friendly production they promote. Meanwhile, the private attributes tend to prevail in consumers' motivations. The empirical results provide implications for the design of effective marketing to induce consumers' participation to buy pro-environmental products, which in turn do a great benefit to environmental-friendly production and sustainable environment.

The results of this study may be useful to companies by allowing more effective targeting of their market positioning. The consumers' sensitivity to health, environment and quality could indicate that these may be good strategic angles to give products a higher market profile. In order to encourage consumers' willingness to buy organic foods, a useful strategy might be to use some claims for marketing communication campaigns, specially stressing more the properties of pro-environmental products such as healthiness and environmental protection. On the other hand, consumers with higher knowledge on organic food products present more positive attitudes

towards the organic food products because they believe to a greater extent that organic foods are healthier, and of higher quality. This demonstrates that increasing consumers' knowledge is of vital importance for the development of pro-environmental products demand. The government could convey more messages that essentially appeal to the emotions and focus on health, quality and protecting the environment, which will tend to have a greater effect on behavior by inducing a favorable attitude toward purchasing eco-friendly products.

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Appendix A. Cheap talk script

Studies have shown that people often respond to a survey in one way but act differently in real life. In studies where people are asked to indicate a product preference but do not have to pay for the product in question, they often state a higher willingness to pay than what they would actually be willing to pay in the store. One possible reason is that people do not really consider how large the impact of this extra cost would actually be on the available family budget. It is easy to be generous when you do not really have to pay for it. In a store, people might think differently: since the money spent on this good cannot be spent on other things.

We ask you to respond to each of the following preference questions exactly as you would if you were in a real store and had to pay for your choice. Please keep this in mind when answering the survey questions.