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Chinese consumers' willingness to pay for green- and eco-labeled seafood☆

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ABSTRACT

As the world's largest seafood consumer and exporter, China is challenged by frequent seafood contamination incidents. To restore consumer confidence in seafood safety, China's Ministry of Agriculture (MOA) mandated a nation wide quality standard that awards a green label to qualified safer seafood. MOA is also planning for an environmental friendly label to address consumers' concerns about wild sea species sustainability. This study developed a three-stage purchase framework model and applied a multivariate Probit regression to analyze questionnaire information collected from 14 supermarkets in Beijing, China. The results show that Chinese consumers consider the seafood label a more important information source than previous consumption experience. They are willing to pay more for green-labeled seafood for the protection of individual benefits. Moreover, consumers are willing to pay more for the eco-labeled seafood for the protection of societal benefits. Gender, shopping venues, education, seafood expenditure and knowledge of the labeled products affected purchase intention and willingness to pay. Price was not a statistically significant factor affecting purchase decisions.

Introduction

China is the world's largest seafood supplier, feeding major world markets such as the United States, Europe, Korea and Japan (Qian, Zhao, & Li, 2010). In 2010, its total seafood exports were $13.8 billion, accounting for 27% of its total agricultural revenue (Southern China News, 2011). However, international demand for seafood from China has fallen in recent years due to growing concerns about product quality; and this has resulted in rejected Chinese seafood imports to these countries. For example, from 2006 to 2008 the U.S. Food and Drug Administration suspended entry permissions for selected Chinese food items, 37.5% of which was seafood. During the same period, the European Imported Food Quality Alarm System reported 16% of the seafood imported from China failed to meet their food-safety standards (Qian et al., 2010).

China is also the world's largest seafood consumer. Its 2009 per capita consumption was 26 kg, four times that of the United States, and it is expected to increase another 40% by 2020. The increase is believed to occur because of growth in the Chinese middle class population, which will reach 0.3 billion by 2020, with many of these individuals believing seafood is healthier than other animal protein sources (China Daily News, 2010; China Food Network, 2011). But frequent reports of contaminated seafood worry domestic Chinese consumers. In 2006, freshwater fish exported to Hong Kong were found to contain malachite green, a chemical used to reduce fish skin infections but also a human carcinogen (Hong Kong Government Food Safety Center, 2006). In another case, high antibiotic residues were detected in shellfish and shrimp marketed in a Guanzhou providence city (Lin, Li, He, Liu, & Yu, 2009). Consequently, urban consumers have been willing to accept a modest price premium in exchange for safer food produced with controlled the use of chemicals and reduced environmental negativities (Wang, 2003).

In an effort to promote seafood safety for the consumers' protection, China's Ministry of Agriculture (MOA) established a nationwide food standard in 2000. Under this standard a green seafood label was introduced to various local seafood markets (MOA, Fishery Administrative, Year 2000, Document #17). The food

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standard requires that: 1) to qualify as top grade, green-labeled seafood (Grade AA), production cannot involve synthetic chemicals; and 2) to qualify as secondary grade, green-labeled seafood (Grade A), production must limit the use of a small list of approved chemicals. According to China's 2010 government statistics, 787 seafood brands were granted a green label. This represented a total market volume of over 0.26 million tons and an export volume of 60 thousand tons, or 90 million U.S. dollars (China Green Food Government Official Website).

The concept of food-safety labels applying to all food categories has a short history in China. Green-labeled food first appeared in 1992 when the MOA started its green food program. At that time China established the Green Food Development Center (CGFDC) to draft green-label qualification standards, coordinate inspections, review applications, and award certificates of compliance (Paull, 2008). Specifically, the regulation states: "strict inspections and controls are used to minimize pesticide residues and to control food bacteria contaminations during production and transportation, in order to minimize food borne risks" (Agricultural Products Quality & Safety Net in Chongqing, 2006). Under the program product inspections are conducted on a yearly basis and products which pass the tests are awarded a green label.

In contrast to the mandated green label, the environmentally friendly label is a new concept to the Chinese. Although, the government has not yet passed any regulation to formally establish this label, public discussion about the label has focused on consumers' awareness of sea species sustainability and policy makers' intention to improve society's awareness of sea species protection. The idea of protecting wild animals was introduced to China in 1988 when the government passed its first Endangered Wild Species Protection Act. This act was its first effort to sustainably allocate wildlife resources, wherein the central government mandated local administrations control the harvest of scarce wild species, including sea animals (China's Endangered Wild Species Management Act, 1998). The act promoted the idea of wild fish protection to China's rural and urban population. For example, to protect wild sharks, China's large cities launched a Wild Sharks Conservation Program on Earth Day 2010 to stop the purchase of shark fin, a popular seafood item. The National Wild Fish Protection Association sponsored another event in 2010 to educate the public about wild sea species protection. The presentation took place at Beijing Sea World and attracted millions of visitors. These two activities, as well as other events, indicate Chinese consumers understand the importance of sea animal protection. The events are also an opportunity for the Chinese government to formally establish the eco-label.

This study gathers public opinions about the hypothetical eco-label in order to describe public policy implications. In addition, the study hopes to determine: 1) if a consumer accepts green-labeled seafood, it is due to concern for their own wellbeing; and 2) if a consumer accepts eco-labeled seafood, it is due to concern for society's benefits. Finally, the study will compare behavioral differences regarding purchase and willingness to pay for these two benefits.

A recent study determined labeled food carries a price premium of 10–50% above non-labeled food in China (Paull, 2008; Wang, Mao, & Gale, 2008). Over a decade ago, researchers found Chinese consumers were price sensitive toward the purchase of seafood (Wu, Li, & Samuel, 1995). Based on these studies, it could be inferred the Chinese would be less likely to accept the more expensive green-labeled seafood and more likely to choose the less expensive non-labeled seafood, which is equally available in the marketplace. However, another recent study noticed a different trend showing Chinese consumers are willing to pay extra for safer food (Wang et al., 2008). This change in food consumption behavior was believed to be a result of frequent reports about contaminated seafood and other food risk incidences (Wang, 2003; Wang et al., 2008; Xu, Zheng, & Zhou, 2011; Zhou, Nanseki, Hotta, Shinkai, & Xu, 2010).

Academic research has provided scant evidence to help understand: 1) Chinese consumers' attitudes toward green-labeled seafood and their acceptance of the proposed eco-label; 2) whether they are willing to pay a premium for either type of labeled seafood; and 3) what factors affect their information gathering, behavior purchase intention, and willingness to pay. In an effort to develop efficient marketing plans, seafood marketers in China and worldwide often look for academic evidence to help answer these questions. China's seafood safety inspection authorities also seek academic evidence to develop effective government interventions. This study is the first to examine these issues; it uses a three-stage purchasing framework model and multivariate probit regression to conduct data analysis.

Informational labeling

Consumers in the Western world have become increasingly knowledgeable about the food they eat. A good example is the nationwide advocacy in the United States requesting labeling of milk produced from hormone-treated cows. This public request was aborted because the U.S. Food and Drug Association believed there was no known health risk associated with the consumption of bST-treated milk. However, public desire for a regulatory solution reveals a perceived benefit associated with publicity regarding food production methodologies. The U.S. case exemplifies consumers' demand for informed food choices. Other examples of specific information requests include product safety attributes and the impact of production practices on the environment (Gutierrez, 2008; Wessells, 2002).

The economic impact of labels is largely determined by the expected utility associated with food consumption (Caswell & Mojduszka, 1996). However, the risk preferences associated with food consumption affect expected utility and thus alter the selection of food bundles. When consumers initially perceive a low risk, the demand for additional information is low. Upon determining the true risk is higher, the demand for information increases because they feel forced to take more risk than they are willing to bear. The assumption of perfect information renders all market participants are fully informed about the quality and safety of food, and thus know the potential risks involved. Perfect information disregards the rule that food suppliers respond to economic incentives, and producers and marketers are willing to provide safe food only if they profit. However, the higher the safety level achieved, the higher the marginal cost incurred by suppliers, which depicts a sharply upward sloping food-safety supply curve. The level of food safety supplied to the market interacts with the demand for food safety to determine the market equilibrium level of food safety (Caswell & Mojduszka, 1996). Indeed, food economists have noticed sellers are usually better informed about food safety than buyers and food safety is often undersupplied (Akerlof, 1970, p. 488).

Economists portray information as a valuable resource for market participants. On the demand side, whoever wishes to acquire the most favorable product must inspect different sellers until the marginal benefit of obtaining additional information is equal to the marginal cost of searching for the information. The effort involved in the search affects consumers' willingness to pay to acquire the information (Stigler, 1961). In a study focusing on lemons, Akerlof (1970) found the abundant availability of lower quality products in the marketplace is a result of sellers' incentive to market poor quality products, given the fact it is difficult for the

public to identify who sells the low quality products and thus punish the seller. As a result the quality of goods falls, which makes government interventions desirable to help the market restore the food-safety supply and demand equilibrium (Akerlof, 1970, p. 488; Caswell & Mojduszka, 1996).

So how do consumers attain information? Nelson (1970) explains the information search is similar to trying on a new dress or tasting a new food. However, Darby and Karni (1973) noticed information may not always be obtained through consuming the products because producers have more information than consumers, i.e. asymmetric information. In addition, Wessells (2002) explained it is difficult for a consumer to perform laboratory tests to detect if seafood is safe, nor would they follow the entire production process to examine the environmental negativities of food production. Thus, labeling from a credible third party such as the government provides the pubic a sense of quality assurance, reducing consumers' responsibilities to search for information (Caswell & Mojduszka, 1996). In summary, a consumer learns:1) the attributes of a dress through asking assistance from a sales representative, or trying it on (called a search attribute); 2) the attributes of a new seafood through sampling or a small first time purchase (called an experience attribute); and 3) the level of bacteria contained in a bottle of milk from checking the information provided by a credible third party (called the credence attribute).

The consumption of raw shellfish such as oysters harvested from contaminated water is a good example of how consumers' perception of food safety is affected by influential factors. These influential factors include: 1) illness associated with previous consumption; 2) exposure to negative publicity about oysters (Wessells, Kline, & Anderson, 1996); and 3) demographics such as age and education (Lin, Milon, & Babb, 1991). According to previous studies, consumers believe they are able to identify safe sea mussels; however, they are willing to pay a high premium for information certifying safer products in order to avoid the high risk associated with eating unsafe mussels (Brooks, 1992; Celsi, Rose, & Leigh, 1993). In another study, Wessells et al. (1996) found labeling greatly impacts the food choices of those who were unconfident in their knowledge about the safety of seafood.

Eco-labeled seafood is popularly used in developed economies to address public concerns about the ecological sustainability of seafood harvesting. The eco-label is posted on the package if production and marketing meet the requirements of prescribed ecological sustainability standards. The label is used to inform consumers of the environmental impacts of production methodologies and the fishermen's efforts to reduce over-exploitation of natural fish stocks. Consumers who value sustainable harvesting highly demand eco-labeled seafood (Johnston, Wessells, Donath, & Asche, 2001).

Green-labeled and eco-labeled food in China

Green- and eco-labeled food products have become more prevalent in China (Liu, 1994; Zeng & Wei, 2007). In two studies conducted around the year 2000, a marketing scholar noted Chinese consumers were less willing to pay a premium for environmentally friendly products (Chan, 1999, 2000). Chan (1999) detected a low perceived credibility (average credibility score of 2.6 on a 5.0 scale) of environmentally friendly produced, and labeled, products and concluded consumers seek additional government assurance to believe the information provided on the labels. Chan (2000) later found Chinese consumers were willing to pay a small premium of 4.5% above the base price for eco-labeled products, compared to a larger premium of 6.6% for U.S. consumers. An earlier study found Chinese citizens care about the environment and this concern is rooted in their culture, which traditionally emphasizes living in harmony with nature (Kluckhohn & Strodtbeck, 1961). This man-nature philosophical orientation is commonly believed among modern Chinese and was especially praised by Lao Tzu, the greatest philosopher in ancient China. The man-nature philosophical orientation was found to affect Chinese consumers' attitudes toward the purchase of environmentally friendly products (Yau, 1994; Zhang, 1998).

The model

Stage I: the information gathering stage

Planned information gathering is assumed to occur prior to the purchase of seafood. In this information search stage the level of information acquired determines whether or not a consumer: 1) is able to recognize the benefits of labeled seafood; and 2) considers the labeled product a potential choice. A consumer's optimal information level is assumed to be a function of search attributes, which change with the food retailing formats used, along with previous consumption experience. Unlike seafood at wet markets, wholesale or retail stands, labeled seafood are more available in China's supermarkets where product information is often written on large signs or store flyers (Wang et al., 2008; Zhou et al., 2010). These signs or flyers reduce search costs and help promote labeled seafood to shoppers who are interested and consider the label an important product attribute. Thus, it is assumed supermarkets facilitate easier information access which reduces search costs. Seafood consumption literature suggests information can be obtained by using the product, a so-called experience attribute (Lin et al., 1991; Wessells et al., 1996). In these studies, experience is defined as the frequency of previous purchases. It is further assumed that compared to someone who does not often eat seafood, a frequent consumer is likely to know more about the product and rely more on self-experience to make their choice.

When the information acquired reaches a threshold level, the consumer collects enough information to judge product quality. The consumer's optimal information level is an outcome of the underlying utility maximization problem:

$$K^* = f(s, e, d) \tag{1}$$

where K^* denotes the optional information level, s represents the search attributes associated with retail format, e represents the experience attributes represented by consumption frequency, and d represents socio-demographic characteristics. If the consumer is informed about labeled seafood, then $k^*(s, e, d) > k^0$, where k^0 is the threshold information level to be determined along with the coefficients (Kaiser, Scherer, & Barbano, 1992).

Stage II: the purchase or not stage

Consumer behavior studies involving Western consumers have determined knowledge about a product (the level of information acquired) affects purchase intention (Hoch & Deighton, 1989; Park, Mothersbaugh, & Feick, 1994). According to Chan (2001), Chinese consumers' knowledge about green-labeled products changes their purchase of these products (Chan, 2001). Therefore, product knowledge (Stage 1) is assumed to explain whether or not consumers intend to purchase the labeled seafood:

$$B = f\left(K^*, d, p\right) \tag{2}$$

where B denotes a consumer's purchase intention for the labeled seafood; K^* is the optimal information level estimated in stage one; d denotes the socio-demographic characteristics of household

income, number of family members and whether the purchaser is the primary shopper for the household; and p is the impact of price on purchase intention. In this study, survey respondents were asked to rate the impact of price on purchase intention. It was assumed consumers intended to purchase labeled seafood if the price was similar to unlabeled seafood.

Stage III: the willingness to pay more stage

If the consumer has heard about the labeled seafood (stage I) and intends to purchase the labeled seafood (stage II), then the consumer's willingness to pay a price premium is examined (stage III). In this study willingness to pay is modeled as:

$$P = f\left(B^*, d, p, i\right) \tag{3}$$

where P represents a consumers' willingness to pay more for labeled seafood, B^* is the stage II purchase intention, d denotes socio-demographic information, p represents the impact of price, and i represents the household seafood expenditure amount.

In stage I, a consumer considers the label an important factor only if the acquired information exceeds a given threshold level k^0:

$$Y^{K^*} = k^*(d) - k^0 > 0 \tag{4}$$

Such that:

$$Y^{K^*} = X^K * \beta^K + \varepsilon^K > 0 \tag{5}$$

where X^K is a vector representing retailing venue types, previous consumption experience and socio-demographic factors. If the consumer considers label an important attribute, then $Y^{K^*} > 0$, otherwise $Y^{K^*} = 0$.

In stage II, a consumer decides to purchase the labeled product if the perceived benefits associated with purchase exceed the perceived costs:

$$Y^{P^*} = E\left[f\left(B^*, d, p, i\right)\right] > E[c] \tag{6}$$

Such that:

$$Y^{P^*} = X^P * \beta^P + \varepsilon^P > 0 \tag{7}$$

where X^P is a vector of explanatory variables representing information gathering, sensitivity to price, and socio-demographic factors. If the consumer purchases the product, then $Y^P = 1$, (if $Y^{P^*} > 0$), otherwise $Y^P = 0$.

In stage III, willingness to pay Y^M is estimated by:

$$Y^M = X^M * \beta^M + \varepsilon^M \tag{8}$$

where X^M is a vector representing purchase intention, sensitivity to price, seafood expenditure amount, and socio-demographic factors. If the consumer is willing to pay a premium, $Y^M = 1$ (if $Y^{M^*} > 0$), otherwise $Y^M = 0$.

Assume a consumer's willingness to pay more for a labeled product is conditional on hearing about the labeled product as well as their willingness to purchase the labeled product. For the consumer to be willing to pay more, they must perceive the label as an important product attribute. Thus, Y^M and X^M are observed only if $Y^K = 1$ and $Y^P = 1$. In this trivariate probit case, the log-likelihood function for an N independent observations case is:

$$L = \sum_{i=1}^{N} \log \Phi_3(\mu_i; \Omega) \tag{9}$$

where Φ_3 is the trivariate standard normal distribution with argument μ_i, and $i = 1,\ldots,N$ observations.

$$\mu_i = \left(S_{i1}\beta'^K X_{iK}, S_{i2}\beta_1'^P X_{iP}, S_{i3}\beta_1^{M\prime} X_{iM}\right) \tag{10}$$

where $S_{i1} = 2Y_i^K - 1$; $S_{i2} = 2Y_i^P - 1$; $S_{i3} = 2Y_i^M - 1$; and matrix Ω:

$$\begin{aligned} \Omega_{ij} &= 1 \quad j = 1,2,3 \\ \Omega_{21} &= \Omega_{12} = S_{i1}S_{i2}\rho_{21} \\ \Omega_{31} &= \Omega_{13} = S_{i1}S_{i3}\rho_{31} \\ \Omega_{23} &= \Omega_{32} = S_{i1}S_{i3}\rho_{32} \end{aligned} \tag{11}$$

where the correlation coefficients between equations are $\rho_{21}\rho_{31}\rho_{32}$.

Fig. 1 presents a conceptual framework describing the Chinese Consumers' knowledge, purchase behavior, and willingness to pay for green- and eco-labeled seafood. A multivariate probit model was constructed to estimate the coefficients, where the three error terms $\varepsilon^K\varepsilon^P$ and ε^M follow a multivariate normal distribution with mean zero and a variance–covariance matrix of Ω as specified above. The Geweke–Hajivassiliou–Keane (GHK) smooth recursive-conditioning simulator accurately estimates the multivariate normal distribution function utilizing the production of sequentially conditioned univariate normal distribution functions (Greene, 2003). Univariate Probit estimation is applied to compute the marginal effects for the selected variables, STATA 11 software is used for the estimation.

Survey descriptive results and variable definitions

Currently, green-labeled and non-labeled seafood are marketed to Beijing's food supermarkets. Although the eco-label for wild caught seafood is not available in China, an opportunity exists to test consumers' purchase opinions about the hypothetical label since supermarkets and hotel outlets often sell wild caught seafood. To this end, a two-page questionnaire comprised of 29 questions was created for this study. The questions inquired about seafood consumption frequency, dominant factors affecting the purchase decision, consumers' knowledge about labeled seafood, their attitudes toward wild fish sustainability, the reasons why they would purchase labeled seafood, and the amount they would pay for labeled seafood.

Agricultural economics students conducted face-to-face interviews with respondents in supermarkets located in Beijing's seven urban districts. One large and one medium-size supermarket were visited in each district, for a total of 14 supermarkets. Interviews were conducted in late November 2009 and occurred during the weekend to ensure all consumer groups, including those who work

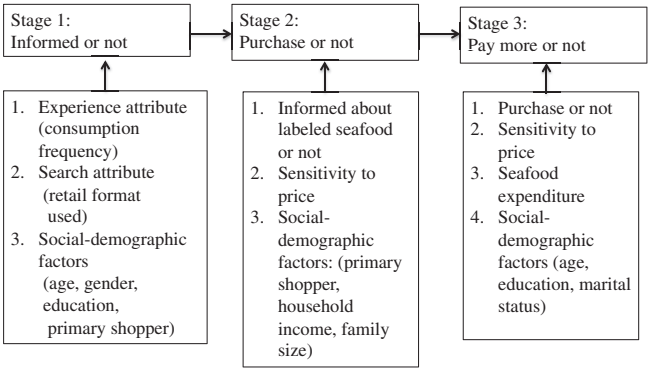

Fig. 1. Three-stage purchase decision making: Chinese consumers' purchase of green- and eco-labeled seafood.

during weekdays, were represented. Small-size supermarkets were not visited due to the fact they seldom sell seafood. A total of 450 consumer interviews were conducted. Due to some consumer's refusal to complete the questionnaire in its entirety and some questions having substantial missing information, 386 observations were used in the analysis.

Survey tabulations indicate many of the respondents purchased seafood once per week, with 57% purchasing seafood more frequently than once per week, and only 5% never purchasing seafood ($n = 366$). The average purchase quantity was 3.2 pounds each visit and mean expenditure was 26.7 Chinese Yuan per visit, which is equivalent to $3.9 when using the November 2009 exchange rate of 1 USD = 6.83 Chinese Yuan (Table 1). The majority (58%) of our respondents shopped for seafood mainly at large- or mid-size supermarkets and convenience stores. Besides visiting supermarkets, about 20% of the respondents preferred buying seafood in morning markets. Similar to this study's findings, another study reported 50.25% of the Chinese consumers purchased seafood at supermarkets (Questionnaire Star Website, 2012). In addition, 57% of our respondents spent 80 Chinese Yuan or more each month (equivalent to $11.7) on seafood purchases; and 74% of the respondents had a monthly seafood expenditure of 700 Chinese Yuan or more (equivalent to $102). Eighty seven percent of our respondents had a total household monthly income of 2500 Chinese Yuan or more (equivalent to $366).

Respondents were asked to rate the influence of 10 factors on their seafood purchase decisions using a 1–7 scale, with 1 representing the least amount of influence and 7 the most amount of influence. Results indicate appearance (6.63), smell (6.37), color (6.22), and texture of the meat (6.12) were selected as the most influential factors affecting seafood purchase decisions (Table 2). Unlike what was suggested by previous studies, a great majority of the respondents in this study believed price was not an indicator of quality (85%), and price was less likely an influential factor affecting purchases (rating of 4.56 out of 7.0). Ninety-seven percent of the respondents considered it important to protect wild sea species and they believed the harvest should be planned to maintain ecological sustainability. When asked what actions they would take to protect wild species, 89% indicated they would not purchase endangered species and 79% believed seafood retailers should post a "no-overfishing" label on the package when selling wild caught fish.

Respondents were also asked whether they were willing to pay more for green- and eco-labeled seafood. If their answer was 'Yes', they were asked to choose from a list of seven categories to indicate how much more they would pay for green- and eco-labeled seafood. If their answer was 'No', they were asked to explain their reasons for not wanting to pay more. Survey results for these two questions appear in Table 3. Tabulation indicates 76% of the respondents were willing to pay more for green-labeled seafood. Forty-one percent of these respondents were willing to pay a premium of 10% or more for green-labeled products and 48% were willing to pay 1–6% more. Fifty-three percent of the respondents who indicated a willingness to pay a premium for eco-labeled seafood were willing to pay a small premium of 1–6% and 35% were willing to pay a larger premium of 10 or more percent (Table 3). On average respondents would pay a premium of 7–9% to purchase green-labeled seafood and 4–6% to purchase eco-labeled seafood.

When asked about their awareness of labeled seafood, 88% of the respondents had heard about green-labeled seafood and 78% had heard about eco-labeled seafood (Table 4). With regard to intent to purchase labeled seafood, 76% considered purchasing green-labeled seafood and 67% eco-labeled seafood (Table 3).

The independent variables included in the model are age, education, monthly household income, price, total seafood expenditure, and the search variables of retailers used and seafood shopping frequency (Table 5). In the first stage estimation, the expectation is respondents who often shop at large- or mid-size supermarkets are more likely to have heard about labeled seafood, resulting in a positive sign for the RETAILER variable. Similarly, respondents who purchase seafood frequently are also more likely to have heard about labeled seafood, thus a positive sign for the FREQUENCY variable is expected. In the second stage estimation, consumer sensitivity to price should have a negative impact on purchase intention, resulting in a negative sign for the PRICE variable. In addition, monthly household income (HHINCOME) is expected to have a positive impact and household size (HHSIZE) to have a negative impact on purchase intention. In the third stage estimation, the expectation is a positive impact of monthly seafood expenditure (FEXPEN) on willingness to pay (Table 5).

Table 1
Seafood purchase frequency, quantity, retail venue used, and expenditures (2009 data).

Purchase frequency		
	Counts	*Percentage*
Once per three days or more often	59	16%
Once every four days to once per week	186	41%
Once every two weeks or less often	104	28%
Never bought fish	17	5%
Total	366	100%
Purchase quantity		
	Counts	*Mean*
Mean quantity	356	3.2 Pound
Mean expenditure	355	26.7 (Chinese Yuan)
Purchase venue		
	Counts	*Percentage*
Large supermarkets	175	49%
Mid-size supermarkets and convenience stores	32	9%
Seafood wholesale markets	17	5%
Seafood specialty stores	32	9%
Morning markets	71	20%
Other venues	22	8%
Total	349	100%
Monthly seafood expenditure (Chinese Yuan) (n = 368)		
Less than 80	43%	
80–150	30%	
150 and Above	27%	Total: 100%
Monthly food expenditure (Chinese Yuan) (n = 368) (n = 365)		
Less than 700	26%	
700–1400	44%	
1401 and Above	30%	Total: 100%
Monthly household Income (Chinese Yuan)		
Less than 2500	13%	
2500–6000	49%	
6001 and Above	38%	Total: 100%

Table 2
Factors affecting purchase decisions (2009 data).

Variable	Number of observations	Mean	Standard deviation
Appearance	366	6.63	0.88
Smell	366	6.37	1.25
Color	365	6.22	1.20
Texture	366	6.12	1.26
Fish species	367	5.09	1.71
Price	361	4.56	1.65

Table 3
Respondents willingness to pay for green- and eco-labeled seafood (2009 data).

	Categories	Number responded	Percent of all responded	Acceptable premium	Number responded	Percent of the pay more group
Willing to pay more for green-labeled seafood ($n = 386$)	Yes	294	76%	1–3%	58	20%
				4–6%	84	28%
				7–9%	32	11%
				10–12%	76	26%
				13–15%	17	6%
				≥16%	27	9%
				Total	294	100%
	No	73	19%			
	Did not answer	19	5%			
Willing to pay more for eco-labeled seafood ($n = 386$)	Yes	259	67%	1–3%	63	25%
				4–6%	72	28%
				7–9%	31	12%
				10–12%	58	22%
				13–15%	11	4%
				≥16%	24	9%
				Total	259	100%
	No	105	27%			
	Did not answer	22	6%			

Table 4
Dependent variable descriptions and means (2009 data).

Variable name	Variable meaning	Variable categories	Percentage chosen ($n = 386$)
WTP (if green-labeled)	Acceptable premium for green-labeled seafood	0 If willing to pay a premium of 1–3%; 1 if 4% or more	0.64
WTP (if eco-labeled)	Acceptable premium for eco-labeled seafood	0 If willing to pay a premium of 1–3%; 1 if 4% or more	0.53
BUY (if green-labeled)	Intend to purchase green-labeled or not	1 If intend to buy green-labeled; 0 otherwise	0.76
BUY (if eco-labeled)	Intend to purchase eco-labeled or not	1 If intend to buy eco-labeled; 0 otherwise	0.67
HEARD (if green labeled)	Heard about green-labeled seafood or not	1 If heard about green labeled; 0 otherwise	0.88
HEARD (if eco-labeled)	Heard about eco-labeled seafood or not	1 If heard about eco-labeled; 0 otherwise	0.78

Table 5
Independent variable descriptions and means (2009 data).

Independent variables			Mean ($n = 353$)	Standard deviation	Min	Max	Expected sign
AGE	Age	Continuous variable	39.53	13.38	18	77	+/–
EDUCATION	Education	(Categorical: 1–3)	2.48	0.69	1	3	+
		Middle school or lower	11%				
		High school or technology school	29%				
		2 Year or 4 year college	60%				
MARRIED	Marital status	1 If married; 0 otherwise	0.77	0.42	0	1	+/–
FEXPEN	Monthly seafood expenditure (categorical:1–3)	(Categorical: 1–3)	1.75	0.75	1	3	+
		80 Chinese Yuan or less	44%				
		81–180 Chinese Yuan	37%				
		181 Chinese Yuan or above	19%				
PRICE	Price influence (categorical: 1–3)	(Categorical: 1–3)	2.10	0.74	1	3	–
		Less likely to consider price when buy fish	23%				
		Consider price when buy fish	44%				
		Heavily consider price when buy fish	33%				
HHSIZE	Family size	1 If greater than three; 0 otherwise	0.25	0.43	0	1	–
HHINCOME	Household monthly income	(Categorical: 1–3)	2.24	0.67	1	3	+
		2500 Chinese Yuan or less	13%				
		2501–6000 Chinese Yuan	49%				
		6001 Chinese Yuan	37%				
GENDER	Gender	1 If female; 0 male	0.61	0.49	0	1	+/–
RETAILER	Retailers frequently visited	1 If large- or mid-size supermarket; 0 otherwise	0.58	0.49	0	1	+
FREQUENCY	Seafood purchase frequency	1 If buy fish on a weekly base or more often; 0 otherwise	0.66	0.47	0	1	+
SHOPPER	Primary shopper or not	1 If a primary shopper; 0 otherwise	0.65	0.47	0	1	+

Table 6
Estimated coefficients from multivariate probit model.

Dependent	Independent	Green-labeled		Eco-labeled	
		Coefficients ($N = 353$)	$P > \|z\|$	Coefficients ($N = 342$)	$P > \|z\|$
WTP	AGE	0.003	0.692	0.004	0.591
	EDUCATION	0.049	0.104	0.072**	0.041
	MARRIED	−0.020	0.911	0.197	0.392
	FEXPEN	0.065**	0.01	0.063**	0.034
	PRICE	−0.043	0.348	−0.020	0.681
	BUY	0.468	0.406	5.756	0.939
	CONSTANT	−0.642	0.397	−6.731	0.929
BUY	HHSIZE	−0.141	0.29	−0.032	0.843
	HHINCOME	0.014	0.435	0.009	0.665
	PRICE	−0.021	0.625	−0.053	0.227
	HEARD	0.963**	0.026	0.363	0.419
	CONSTANT	−0.043	0.931	0.589	0.099
HEARD	AGE	−0.011	0.152	−0.005	0.371
	GENDER	−0.382*	0.061	0.135	0.380
	EDUCATION	0.050	0.202	0.014	0.675
	RETAILER	0.500***	0.007	0.330**	0.030
	FREQUENCY	0.189	0.315	0.227	0.136
	SHOPPER	−0.145	0.494	−0.134	0.428
	CONSTANT	1.710	0.03	−0.717	0.241
Correlations					
HEARD vs. BUY		0.868***	0	−0.355	0.148
HEARD vs. WTP		0.041	0.788	0.227**	0.02
BUY vs. WTP		−0.359**	0.07	−0.251	0.361
Log likelihood		−439		−575	
Prob > chi^2		0.006		0.008	

*Alpha = 10%; **alpha = 5%; ***alpha = 1%.

Results

Table 6 provides estimated coefficients and test statistics from the multivariate probit model, and Table 7 provides marginal effects from the univariate probit estimation. For the green-label estimation, the estimated correlations between error terms for equations (5) and (7), and, (7) and (8) are statistically significant at the 10% level. This indicates the equations for each stage should be estimated simultaneously using the multivariate estimation procedure, rather than estimated separately. The log-likelihood statistics and the chi square statistics are also significant, which again suggests the applied statistical methodology is appropriate.

Table 7
Estimated marginal effects from univariate probit model.

Dependent	Independent	Green-labeled ($N = 353$)		Eco-labeled ($N = 342$)	
		Marginal effect	$P > \|z\|$	Marginal effects	$P > \|z\|$
WTP	AGE	0.001	0.644	0.002	0.456
	EDUCATION	0.013	0.203	0.031**	0.032
	MARRIED	−0.024	0.718	0.084	0.367
	FEXPEN	0.025***	0.004	0.031**	0.011
	PRICE	−0.011	0.453	−0.016	0.413
	BUY	Omitted	Omitted	Omitted	Omitted
Model goodness of fit		Prob > chi^2	0.183	Prob > chi^2	0.004
BUY	HHSIZE	−0.050	0.326	−0.007	0.908
	HHINCOME	0.011*	0.088	0.002	0.756
	PRICE	−0.006	0.665	−0.020	0.184
	HEARD	0.057	0.405	0.005	0.924
Model goodness of fit		Prob > chi^2	0.183	Prob > chi^2	0.729
HEARD	AGE	−0.002*	0.088	0.002	0.449
	GENDER	−0.078**	0.042	−0.030	0.578
	EDUCATION	0.006	0.438	−0.002	0.824
	RETAILER	0.0756**	0.039	−0.118**	0.020
	FREQUENCY	0.042	0.265	−0.050	0.340
	SHOPPER	−0.033	0.413	0.053	0.381
Model goodness of fit		Prob > chi^2	0.015	Prob > chi^2	0.169

*Alpha = 10%; **alpha = 5%; ***alpha = 1%.

The univariate probit model estimating the three stages separately shows poor goodness of fit because Prob > chi^2 is greater than 0.1 (Table 7).

In stage I ("Informed or not"), the selected factors of 'gender' and 'frequently visited retailers' affected awareness of green-labeled seafood. Male respondents were 7.8% more likely than females to have heard about green-labeled seafood, and those who frequently visited large- or medium-size supermarkets were 7.6% more likely to have learned about green-labeled seafood. This is not surprising given a previous study noted some supermarkets in China manage to keep a high rate of returning consumers through selling certified foods (Wang et al., 2008). The current study also shows consumers who shop at these supermarkets were more likely to consider green-labeled seafood compared to those who shopped elsewhere. The 'frequently visited food retailers' factor also positively affected awareness of eco-labeled seafood.

Stage II ("Purchase or not") investigated whether having heard about the green label had a significantly positive impact on buying intention. Results confirm those who heard about the green label tended to purchase the green-labeled product (alpha = 5%). The study did not identify a significant impact of household size or monthly household income on purchase intention. This result was different from previous findings, which showed a significantly negative impact of household size on milk purchases (Xu et al., 2011) and a significantly positive impact of household income on food purchases (Guo, Mroz, Popkin, & Zhai, 2000). Price had a negative impact on buying intention, even though the result was not statistically significant, indicating surveyed respondents tend to become less sensitive to price.

In stage III ("Pay more or not"), all signs for the variables were as expected. For example, we expected education to have a positive impact on awareness and willingness to pay for eco-labeled labeled seafood, and the estimated positive coefficient confirmed these expectations. The marginal effect indicated respondents with a higher education level were 3% more likely to pay a 4% price premium for eco-labeled seafood (Table 7). Monthly seafood expenditure also had a positive impact on willingness to pay for green- and eco-labeled seafood. Analysis indicated a respondent was 3% more likely to pay a premium for eco-labeled seafood, given they had higher than average monthly seafood expenditure (Table 7).

Conclusions

In response to consumers' increased awareness of seafood safety, the Chinese government introduced a number of seafood qualification standards, know as green labels, to provide consumers with additional product information. A primary goal of these labels was to restore consumer confidence in the safety of consuming seafood. Many rural and urban regions adopted the green seafood labels, and seafood marketing media and government news media encouraged the adoption. This study examined Chinese consumers' acceptance of the green-labeled seafood and found many respondents: 1) have heard about the green label, 2) intend to purchase the green-labeled seafood, and 3) were willing to pay more for it. The results provide important information for seafood marketers and government policy planners. Consumers' increased awareness, acceptance, and willingness to pay extra for green-labeled seafood suggests an opportunity for the government to establish, implement, and regulate effective seafood supply systems. Previously, the seafood supply chain was mainly composed of millions of unsupervised small seafood producers supplying retailers in morning markets. Thus, it was a challenge for the government to establish and implement effective seafood safety standards. This study suggests supermarkets are the preferred seafood retail venue, consumers do read the label, and consumers are willing to pay more for labeled seafood. Thus, the government may focus first on supermarkets when developing and implementing effective seafood safety systems.

For marketers, this study identified a new consumer segment for green-labeled seafood: 1) male consumers; 2) people who shop at large and mid-size supermarkets; 3) people who have heard about green labels, and 4) people who have higher than average seafood expenditures. This new consumer group is likely to seek additional information from labels to better understand product quality. Promoting labeled seafood to reputable supermarket chains first and specifically focusing on male consumers could result in higher sales returns to better cover the high costs associated with product labeling. Additional evidence from this study in support of targeting males is that male respondents tended to be the first to hear about the green label. This may be explained by the fact that Chinese males pay more attention to government food policies.

The inclination of Chinese consumers to buy the more expensive green-labeled seafood may be a result of Chinese society's concerns about the safety of seafood, which was cited by 94% of our respondents. Previous consumption experience, whether good or was not a significant factor affecting purchase intention. This study also found Chinese consumers rely more on third party information to understand unobservable production practices.

The sample of respondents gathered from Beijing indicated consumers' acceptance of green-labeled seafood differs from their acceptance of the hypothetical eco-labeled seafood. Respondents who often visit large- or mid-size food retailers were likely to have heard about the eco-labeled products. These respondents were willing to pay more for eco-labeled seafood if they had a high education level and a higher than average seafood expenditure. Thus, Chinese consumers' willingness to pay not only reflects their desire for safer food to protect themselves from potential food borne hazards, but also reflects their concerns for the societal benefits of protecting the wild seafood resources. This willingness to pay for seafood with an eco-label is a result of Chinese society's improved understanding of wild species sustainability and the willingness to reduce the negative environmental impact of overfishing.

Though this study identified an emerging green-label seafood consumer segment, results of the study must be explained with caution because the sample was gathered from Beijing regions and from people who shop in modern supermarkets. Labeled seafood is also available in rural markets and consumption preferences in these regions may differ greatly from the urban areas. In addition, seafood labels are used less for live seafood. Since live seafood represents a substantial market share in China, findings from this research cannot necessarily be taken to represent consumers' acceptance of non-labeled live seafood. Future research may extend knowledge by emphasizing the purchase trends associated with live seafood.

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