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This paper aims to assess the preferences and willingness–to–pay for organic milk attributes among Chinese consumers. A discrete choice experiment was used to elicit preferences for organic milk attributes from 181 consumers regarding the importance of five organic milk attributes: organic feeding, animal welfare concerns, chemical– concerns, certification and price. The random parameters logit (RPL) model was used to determine preference heterogeneity among respondents. The derived coefficients of the RPL model was used to estimate the implicit price of the milk attribute, and the respondent's willingness to pay for combined features of milk attributes. The willingness to pay for combined features of milk attributes was estimated at 3.190 Yuan per 250 ml of milk. Respondents preferred milk that comes from organically–fed cattle, with certification label and with a lower price. Respondents' preferences for animal welfare attribute exhibited age and education specific differences. The negative effect of price on consumers' preferences can be offset by targeting older, highly–educated and male consumers and by increasing consumer awareness about organic milk.

Key words: Discrete Choice Experiment, Random Parameters Logit, Implicit Price, Compensating surplus, Willingness to Pay

INTRODUCTION

Organic milk is produced by cattle raised according to organic livestock husbandry standards which require the feeding of good–quality organically grown forage and feeds and includes a respect for the physiological and behavioral needs of the cattle (IFOAM, 2012). More specifically, it prohibits the use and inclusion of synthetic chemicals and growth promoters in feeds, as well as routine treatment using antibiotics, hormones or other veterinary drugs to maintain the health and well–being of the cattle. It also mandates the implementation of ethical animal welfare standards such as providing the cattle with a hygienic and comfortable environment, providing periodic access to fresh air and direct sunlight and grazing on pasture. The application of these practices ensures that the resulting milk has a minimal impact on the environment, takes heed of animal welfare issues and offers quality and safety advantages to consumers. The consumers' demand for organic milk has been growing in recent years as a result of changing income levels and increasing concerns about food safety and environmental quality (Hammarlund, 2001; Dimitri and Venezia, 2007). The global market for organic milk and other dairy products amounted to US\$ 9,357.4 million in 2011 with demand expected to reach US\$ 15,115.1 million by 2017 (PRNewswire, 2012). At present, the organic milk market is dominated by the US and Europe, which together accounted for 93.1% of the global demand in 2011.

China is the third largest producer of cattle milk globally with an output of 37.4 million metric tons in 2012 (FAOSTAT, 2012). Its cattle milk industry exhibited an annual growth rate of 10–20% in the years before 2008, but dropped below 2% in the years from 2008 to 2012 following the melamine–tainted milk scandal (FAOSTAT, 2012). In an effort to regain market share and to address the health and food safety concerns of consumers, since 2009 a few dairy manufacturers have started to promote organic milk brands. Some organic milk brands currently available on the Chinese market include the Jindian (Yili) and Telunsu OMP (Mengniu) brands both from Inner Mongolia, the Guiyi brand (Shandong Yinxiang Dairy), Fucheng and Yuantianran from Hebei Province and Guiyuan from Beijing (Woolsey *et al.*, 2010). Available estimates suggest that organic milk constitutes only 1% of the 40 million metric tons of total milk production in 2012 (Dairy Food, 2012). Many farmers are still hesitant to adopt organic milk farming because of weak supervision of the organic food market, and issues related to market demand and profitability (Dairy Food, 2012).

While there are some challenges for growth, there are also significant and real opportunities for developing the organic milk market because of the growing interest in dairy products in urban areas, increasing household incomes, expanding numbers of retail outlets and increasing awareness of higher quality produce and food safety concerns among Chinese consumers. Considering these developments, the future of organic milk production in China will to a large extent be dependent on consumer demands. A consumer–oriented approach towards understanding the demand for organic milk is important to provide the information needed for the organic milk industry to expand its market and improve its profitability. Therefore, the main objective of the present study is to examine Chinese consumers' preferences and valuation

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of organic milk using discrete choice experiments. Organic milk was selected in this study because it constitutes an important part of the organic food industry with promising potential for market growth and for restoring consumer confidence after the infamous melamine milk scandal.

PREVIOUS LITERATURE

Several studies have investigated the consumers' preferences and valuation for organic milk. Glaser and Thompson (2000) examined the demand for organic and conventional beverages using retail sales data from US supermarkets. They showed that the price premiums for organic milk averaged 60% above branded milk prices and 75% above private label milk prices, and that organic milk was highly own–price elastic suggesting a considerable response to lower prices. Dhar and Foltz (2003) investigated US consumers' willingness to pay for milk free of recombinant bovine somatotropin (rBST) and organic milk using revealed preference analysis. Their findings revealed that consumers would pay significantly more for rBST–free and organic milk, with significant benefits from having them both on the market. Kiesel and Villas–Boas (2007) found that the presence of the USDA organic seal increased the probability of purchasing organic milk. More specifically, consumers who were older, relatively well–informed women were most willing to pay for milk quality. Brooks and Lusk (2010) used both choice experiments and scanner data to determine consumer preferences and willingness to pay for organic, cloned, and rBST–free milk. They found that consumers were willing to pay premiums three times as much to avoid milk from cloned cows ($5/gallon) compared with organic or rBST–free milk (about $1.50/gallon). Wolf et al. (2011) also concluded that consumers were generally willing to pay substantial premiums for milk produced without the use of rBST growth hormone, produced on local family farms, with assured food safety enhancement and with USDA verified claims. Managi et al. (2008) used choice modeling to explore how Japanese consumers evaluated the latent demands and conventional attributes of organic milk. Their analysis indicated that for milk, a better taste, an image of environmental friendliness in the production process and an image of the health and comfort of the cows are important factors that influence Japanese consumers' purchasing decisions. The available literature has tended to focus largely on understanding the preferences for organic milk among consumers in developed countries, with the exception of Wayua et al. (2009) who confirmed that Kenyan consumers are willing to pay a premium of more than a 19% for enhanced sensory characteristics and assurances about milk safety. Little is known about the emerging preferences regarding organic milk attributes among consumers in developing countries who maybe more sensitive to price than to the production process (Bansal and Ramaswami, 2007).

A closer review of the Chinese literature also indicates limited information regarding consumer prefer-

ences and valuation on organic milk. Yin et al. (2010) identified the key factors affecting Chinese consumers' intent to purchase organic food, which included income, age, education level, degree of trust in organic food, price and concerns about their health and environmental protection. Wang et al. (2008) investigated Beijing consumers' awareness and willingness to pay for milk products manufactured using the Hazard Analysis Critical Control Point (HACCP) system. Their study indicated that only 1 in 6 consumers were aware of HACCP certification of milk and that the premium associated with HACCP–certified milk product is small, estimated at about 5% of the purchase price. Zhang et al. (2010) used ranked–ordered logistic regression to analyze how consumers in Beijing determined milk safety when they purchased liquid milk. Their findings ranked milk brand and purchase venue as the first two important indicators in fluid milk purchases. Zheng et al. (2013) examined Chinese consumers' preferences for organic and non–genetically modified attributes of soybeans used in soymilk. They revealed that Chinese consumers were willing to pay a premium for organic, non–genetically modified soymilk and information on its origin.

These studies have shed some light on how Chinese consumers value the food safety attributes of conventional milk and the quality attributes of soymilk. However, no quantitative studies have examined the consumers' acceptability of key attributes in organic cattle milk production process as encompassed in the international standard for organic dairy production such as organic feeding, restricted use of synthetic chemicals and hormones, animal welfare concerns and certification labels (IFOAM, 2012). While these attributes provide a clear and identifiable boundary between the organic and conventional milk production processes, exactly how Chinese consumers value these attributes has not been investigated and therefore warrants research attention. Considering the recent melamine–tainted milk scandals and rising food safety concerns, it is important that a better understanding of the consumers' preferences in the milk production process is achieved to provide information for designing appropriate policy measures related to food quality and safety and marketing strategies for the emerging organic food markets.

METHODS

Design and Administration of Survey

A discrete choice experiment (DCE) questionnaire was designed assuming that the consumers' preferences for organic milk were a function of five attributes: organically–fed cattle, presence of chemicals and hormones, animal welfare concerns, certification and price. These attributes were adopted from the criteria of the IFOAM organic milk production standard, the review of previous literature and consultation with an academic agricultural food expert. In the design of the choice experiment, four milk attributes (organic feeding, presence of chemicals & hormones, animal welfare concerns, and certification) were assigned two levels and one attribute (price), four

levels (Table 1). A total of 16 hypothetical milk profiles were created by creating an orthogonal fraction of the $2^4 \times 4^1$ design. From these milk profiles, choice sets were then created as shown in Table 2. Each choice set contained two milk choice options (Options A and B) and an *opt–out* Option C. The milk choice Option A contained 16 hypothetical milk profiles. A cycle fold–over technique was applied to Option A to create milk profiles for Option B (Louviere *et al.*, 2000). This was done by switching the attribute levels of Option A. For example, in the case of a two–level attribute, level 1 was replaced by 2, and level 2 with 1. The milk profiles were then systematically arranged to minimize any correlation between attributes and to ensure that each attribute level appeared only once in a choice set and occurred at an equal frequency.

Four versions of the questionnaire were created, with each version having 4 choice sets. The questionnaire began with questions about milk consumption behavior and the respondent's knowledge about organic milk. The second section introduced a detailed description of each milk attribute and its respective levels, including the

choice sets to elicit the respondent's preference. The final section asked about the socio–demographic profile of the respondents. The questionnaire was pre–tested to check the ease of completion and to identify potential problems before the start of the full survey. Following feedbacks from the pre–test, revisions were made to improve the words and phrasing of the attribute descriptions and levels to prevent misinterpretations and some questions were re–arranged into a more logical order.

The choice experiment survey was conducted in May and June 2011 in Dalian City. This is a leading city in northeastern China and a notable center for urban agricultural development and ecologically–sound agricultural modernization (Dalian China, 2013). Face–to–face interviews were conducted with 200 shoppers at five large shopping malls and supermarkets located in the center of the city, because this is where purchasing decisions are made and so could better elicit the respondents' true preferences. The shoppers were randomly selected, asked to participate and verified that they were 18 years of age or older. The qualifying shoppers who gave their consent were advised that their participation was volun-

Table 1. Milk Attributes and levels

Attributes	Description	Levels
Organic feeding	This attribute provides information on whether or not the cattle are being fed with organically grown feeds.	(1) Milk comes from organically fed cattle (2) Milk comes from non–organically fed cattle
Animal Welfare Concern	This attribute provides information related to animal welfare standards such as whether the cattle live in comfortable and hygienic environment, and allowed to graze on pasture to minimize animal stress.	(1) Milk comes from cattle that allow to graze on pasture or move freely to minimize stress (2) Milk is produced in confined and stressful environment (feedlots)
Chemicals	This attribute provides information on whether or not the cattle are treated with antibiotics agents and other hormonal agents.	(1) Milk comes from cattle free from antibiotics and hormonal agents (2) Milk comes from cattle treated with antibiotics and hormonal agents
Certification	This attribute provides information on whether or not the milk underwent the certification process and received labels from certifying organizations.	(1) Milk has certification label (2) Milk without certification label
Price	Amount of money that the respondents willing to pay for a 250 ml milk.	(1) 3.79 Yuan/250 ml (2) 5.44 Yuan/250 ml (3) 6.52 Yuan/250 ml (4) 7.82 Yuan/250 ml

Table 2. An example of choice set

Attributes	OPTION A	OPTION B	OPTION C
Organic feeding	Organically fed cattle	Non–organically fed cattle	
Chemicals	Antibiotics and hormone free	Contains antibiotics and hormonal agents	
Animal welfare Concern	Pastured	Feedlots	Usual milk brand
Certification	With certification label	Without certification label	
Price	3.79 Yuan/250 ml	6.52 Yuan/250 ml	
I will buy	☐	☐	☐
	A	B	C

tary and their responses were anonymous. After completing the choice experiment survey, the responses generated were encoded using the software package NLOGIT 4 (ESI, 2007). Data from 181 respondents were considered valid responses and were included in the analysis using the random parameters logit model.

Sample Characteristics

Table 3 shows the demographic characteristics and milk consumption behavior of the 181 respondents. About 61% percent of the respondents were aged between 18 to 35 years with a mean age of 34.53 years, which is similar to the overall average median age (34.6 years) in China (UN–DESA, 2013). Most respondents (80.11%) were highly educated, having completed a Bachelor, Masters or PhD degree, an educational level above the Liaoning Province average level—equivalent to junior secondary education (China Statistical Press, 2001). The predominance of young and highly educated respondents in the sample reveals the typical demographic group that is drawn to large malls and supermarkets in China (Fuller and Hu, 2005). About 50% of respondents had no child at home, and 54% were female. Most respondents (40.52%) were in the household income group of 1,000 to 3,999 Yuan per month. Their estimated average household income was 3,650 Yuan per month, which is above the city's monthly per capita disposable income of 2,369 Yuan (Dalian China, 2012).

When asked about their milk consumption behavior, nearly half (47.69%) of the respondents purchased milk twice per week, while 68% purchased milk in 250ml containers. Only a few respondents (6.15%) stated that they were aware of organic milk and knew a lot about it. A large proportion of the respondents (70.76%) stated that they heard about organic milk, but had no idea what constituted organic milk. Most respondents (40%) learned about organic milk from media sources such as TV, newspapers and magazines. The low level of awareness about organic milk among the respondents in our sample is consistent with the previous studies of Yin *et al.* (2010) and Chen (2011) on Chinese consumers' attitudes towards organic food.

ANALYTICAL FRAMEWORK

The consumer's preference for organic milk was analyzed using Random Parameters Logit (RPL) model to take into account preference heterogeneity among respondents, and to avoid the independence of irrelevant alternative (IIA) violation caused by the introduction of the opt–out (option C) alternative in the choice set. The random utility function with random parameters is given by (Revelt and Train, 1998)

$$U_{ij} = V_{ij} + \varepsilon_{ij} \equiv X'_{ij} (\beta + \eta_i) + \sum_{k=1}^{m} Z_{ik} X'_{ij} \phi_k + \varepsilon_{ij}$$

where respondent $i(i = 1...N)$ obtains utility U from choosing milk options $j(j = A, B, C)$, , in the given choice set. The utility is composed of indirect utility function V and unobservable error term ε. The indirect utility com-

Table 3. Characteristics of the sample respondents (n=181)

Socio–demographics	%	Milk consumption behavior	%
Age (in years)		Frequency of purchasing milk	
18–35	61.50	Everyday	15.89
36–55	30.30	Once per week	11.30
56+	8.21	Twice per week	47.69
Education		Thrice per week	25.12
Primary	9.08	Milk size often purchased	
Secondary (Junior, Senior)	10.81	250 ml	68.00
Higher (Bachelor, MS, PhD)	80.11	500 ml	23.00
Gender		1000 ml	9.00
Male	45.35	Organic milk awareness	
Female	54.65	Never heard of organic milk	21.56
Household income (Yuan/month)		Had heard of organic milk,	70.76
<1,000	15.38	but didn't know much	
1,000–3,999	40.52	Knew a lot about it	7.68
4,000–7,999	25.68	Information sources about organic milk	
8,000–11,999	12.86	Media	40.00
12,000–15,999	3.63	Internet	23.59
16,000+	1.93	Stores	26.67
Presence of child in the family		Family or friends	9.74
With child	49.17		
None	50.83		

ponent V is assumed to be a function of the vector choice specific milk attributes X_{ij} with the mean coefficients β; and the vector of interaction between the k–th (k $=1\ldots K$) socio–demographic characteristic of respondent i, z_{ik}, and the vector milk attributes X_{ij} with vector coefficients ϕ_k. Due to preference heterogeneity, the estimated mean coefficients β may vary across respondents in accordance to stochastic deviation η that captures respondent i preference relative to the average preference of the population. Specifying the distribution of ε and β derived the probability of choosing milk option j in the choice set. The coefficients are estimated through simulated maximum likelihood based on n Halton draws from specified distribution. Choice probabilities are estimated by integrating the joint simulated distribution In this study, the distribution of the coefficients of price attribute was fixed, while the distributions of the coefficients of organic feeding, animal welfare concerns, chemicals and certification were set as random parameters with a normal distribution (Train, 1998; Revelt and Train, 1998). The distribution was simulated based on 500 Halton draws (Goibov *et al.*, 2012). The statistically significant coefficients of the milk attributes obtained from the RPL model were used to calculate the implicit price for each of milk attribute.

The implicit prices are used to express the marginal willingness to pay for one level change of the milk attribute in the choice set (Morrison *et al.*, 1999) The implicit prices were calculated by taking the negative ratio of the estimated coefficient on the verified attribute β_k to the price coefficient β_p. The coefficient on the verified attribute k was multiplied by two in the implicit price ratio in this analysis due to effects coding (Hu *et al.* 2004):

$$\text{Implict Price}_k = - \left(\frac{2*\beta_k}{\beta_p} \right)$$

In order to consider statistical variability in estimates of implicit prices, the 95% confidence intervals for the implicit price values were calculated using the delta method implemented from the Wald command in NLOGIT. The respondents' willingness to pay (WTP) for combined features of milk attributes can also be derived through estimates of compensating surplus (CS). The CS shows the change in income that would make a respondent indifferent between the base–case and the alternative scenarios with specified combination of milk attributes. Estimates of compensating surplus (CS) were calculated as follows (Boxall *et al.*, 1996; Morrison *et al.*, 1999)

$$\text{Compensating Surplus} = - \frac{1}{\beta_m} (V_0 - V_1)$$

where β_m is the marginal utility of income assumed to be equal to the coefficient of the price attribute; V_0 represents the utility of the base–case scenario; and V_1 represents the utility of an alternative scenario.

RESULTS & DISCUSSIONS

Discrete Choice Experiment

The results of coefficient estimates of the random parameters logit model, including the estimates of marginal willingness to pay are presented in Table 5. The RPL models were specified for choice–specific milk attributes (Model 1) and with interaction terms between milk attributes and respondents' socio–demographic characteristics (Model 2). Between the two models, the RPL Model 2 was preferred because it had a better parametric fit than RPL Model 1 based on the log–likelihood ratio

Table 4. Description of variables used in the model

Variables	Description
Milk Attributes	
ASC	Alternative Specific Constant 1=Option A&B; 0= Option C (usual milk brand)
ORGFED	1=milk from organically–fed cattle; –1=milk from non–organically fed cattle
CHEMICAL	1=milk from cattle free of antibiotics and hormonal agents; –1=milk from cattle treated with antibiotics and hormonal agents
ANIMALWEL	1=milk from pasture–grazed cattle; –1=milk from feedlot raised cattle
CERTIFICATION	1= milk has certified label; –1= milk has no certified label
PRICE	3.79 Yuan/250 ml; 5.44 Yuan/250 ml; 6.52 Yuan/250 ml;7.82 Yuan/250 ml
Demographic and Socio–economic Attributes	
AGE	Age of the respondents (in years)
CHILD	1=respondent has a child/children; 0=none
EDUC	1=respondent completed college education; 0= otherwise
GENDER	1= respondent is a male; 0=female
INCOME	Household income of the respondent (in '000 Yuan/month)

test statistics. The calculated log–likelihood ratio test for both RPL models was –2[–745.774–(–719.807)] = 51.94 which is larger than the critical value of the χ^2 distribution (18.307) using 10 degrees of freedom at the 5% significance level. This result leads to the rejection of the null hypothesis of structural similarity between the two RPL models, such that, adding the interaction terms significantly changes the parameter fit of Model 1.

As evident from Model 2, only three milk attributes were found to be significant determinants of consumer choice namely: *ORGFED, CERTIFICATION* and *PRICE*. The positive coefficient of the *ORGFED* attribute suggests that respondents preferred milk that comes from organically–fed cattle than from non–organically fed cattle. Managi *et al*. (2008) reported similar findings regarding milk preferences among Japanese consumers and subsequently indicated that organically–fed cattle were positively associated with a better taste and consumers' perception of an environmental–friendly production process. This finding suggests that milk producers in China may want to take advantage of the consumers' positive preference for milk that comes from organically–fed cattle by highlighting that it has a better taste quality and environmentally–friendliness to gain a competitive market advantage over conventional milk.

The certification label plays a critical role in ensuring the integrity of the products. It conveys to consumers that a product has successfully met all the requirements of a nationally or internationally recognized best practice approach or standard. Our study showed a significant and positive coefficient of *CERTIFICATION* indicating that respondents preferred milk with a certification label than milk with no certification label. Previous studies have indicated that certification label has become a more important indicator of milk safety for Chinese consumers (Bai *et al*., 2013; Zhang *et al*., 2010). However, the occurrence of severe food safety scandals has created a lack of trust in the Chinese food system among domestic and international consumers (Ortega *et al*., 2011). Zheng *et al*. (2013) also reiterated growing concerns among Chinese consumers about the integrity and reliability of domestic organic–certification agencies. Our study did not investigate the effect of different types of certification systems (government or third–party approach), however it did show that a certification label increases the probability of purchase intention among consumers. This suggests that milk producers in China could also take advantage of certification systems to obtain better milk prices. Additionally, a more robust certification system should also be enforced to ensure that standards are met and to regain the consumers' trust in certification labels.

The negative coefficient for the *PRICE* attribute suggests that respondents obtained disutility with an increasing price for milk. Our findings are consistent with those of Bai *et al*. (2013) and Zheng *et al*. (2013) who reported negative associations between the price and the consumer's decision to purchase milk. Considering that Chinese consumers have a strong reputation for being highly price sensitive in food purchase decision (Wang *et al*.,

2009), our results may imply that price could be likely to act as a deterrent to milk consumption demand in the future. A further examination on the magnitudes of the estimated coefficients reveals that *ORGFEED* and *CERTIFICATION* had larger coefficients than *PRICE*, indicating that consumers are likely to be more concerned as to whether their milk comes from organically–fed cattle and with a certification label than its price. This finding strongly suggests that the negative effects of the price attribute on consumers' utility can be compensated through the use of the organically–fed cattle and certification label attributes of the milk as a tool for quality management and product differentiation. For instance, milk producers could still increase the price of milk using both organically–fed cattle and certification label as indicators of quality and safety, without the fear of losing market share as a result of a price increase.

The inclusion of interaction terms between the socio–economic characteristics and milk attributes allowed us to detect the sources of preference heterogeneity among the respondents. The results show that only the interaction of respondents' age and animal welfare attribute (*ANIMALWEL*AGE*) had a positive and significant effect on consumer choice. This indicates that as the age of the respondents increased the more likely they would choose milk from humanely–raised cattle. One possible explanation for this finding could be that older respondents exhibit a higher level of ethical awareness and sensitivity in their purchase decision than younger consumers. Available literature suggests that older consumers care more about animal welfare than younger Chinese consumers (Zhao and Wu, 2011). Other studies have also reported that older consumers are more likely to buy ethically than younger consumers (Carrigan *et al*., 2004; Roberts, 2010; Vitell, 2003; Vitell *et al*., 1991). An alternative explanation could be related to differences in health behavior between older and younger consumers. Older consumers are known to be health conscious in their food choices because of their perceived health vulnerability (Cole *et al*., 2008). Therefore, they are more likely to choose milk from humanely–raised cattle possibly because of its perceived health and nutritional benefits compared to milk from cattle raised on a feedlot (Kelly *et al*., 1998; Dhiman *et al*., 2005).

The positive and significant coefficient of *ANIMALWEL*EDUC* suggests that highly educated respondents were more likely to accept milk from humanely–treated cattle. This finding is consistent with the findings of Makdisi and Marggraf (2011) indicating a positive effect of higher education on consumers' decision to support farm animal welfare. This result can be explained by the greater possibility for highly–educated individuals to obtain information and to make better–informed choices about animal welfare issues. Hence, suitably designed educational campaigns are important to encourage future consumers to seek out products from animal welfare–friendly practices.

The positive and significant coefficient of *PRICE*AGE, PRICE*EDUC* and *PRICE*GENDER* indi-

Table 5. Results of Random Parameter Logit (RPL) Model and Implicit Prices for significant Milk Attributes

Variables	RPL Model 1: Main effects		RPL Model 2:With Interaction		Implicit Price (RPL Model 2)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Yuan/ 250ml	95% C.I.
ORGFED	0.302***	0.098	0.243***	0.087	0.896	1.564~0.228
CHEMICAL	0.17*	0.093	0.096	0.079	n.s.	
ANIMALWEL	0.617***	0.123	−0.555	0.385	n.s.	
CERTIFICATION	0.300***	0.092	0.260***	0.085	0.958	1.563~0.352
PRICE	−0.113***	0.037	0.106***	0.106		
ASC	0.153	0.181	0.281	0.184		
ANIMALWEL AGE*			0.019**	0.009		
*ANIMALWEL*CHILD*			0.063	0.201		
ANIMALWEL EDUC*			0.477**	0.228		
*ANIMALWEL*GENDER*			−0.048	0.160		
ANIMALWEL INCOME*			0.015	0.049		
*PRICE*AGE*			0.006***	0.002		
*PRICE *CHILD*			−0.002	0.042		
*PRICE*EDUC*			0.155***	0.049		
*PRICE*GENDER*			0.132***	0.035		
*PRICE*INCOME*			0.005	0.006		
Standard Deviations for Random Parameters						
ORGFED	1.114***	0.404	0.937*	0.353		
CHEMICAL	0.788*	0.437	0.044	1.347		
ANIMALWEL	0.005	0.369	0.006	0.366		
CERTIFICATION	0.039	0.631	0.577	0.396		
Log–likelihood	−745.774		−719.807			
χ^2 Statistics	99.243***		151.177***			
No of parameters	10		20			

Notes: Attributes with non significant interaction terms were excluded in model 2;

***significant at 1%; **significant at 5%; *significant at 10%; n.s. denotes not significant

cate that older, highly–educated and male respondents were more likely to purchase milk even if its price increased. These findings may indirectly provide implications for the marketing promotion of organic. Considering that a higher price may reduce the probability of milk purchase and that the price of organic milk is usually higher than that of conventional milk, Chinese consumers who are older, highly–educated and male may represent a viable target market for organically produced milk because of the possibility that they are less responsive to a higher price.

Implicit Prices and Willingness to Pay for combined milk attributes

The implicit prices represent the marginal rates of substitution between the attribute of interest and the price attribute. The implicit prices were estimated only for the milk attributes in Model 2 that were found to have a significant effect on consumers' choice decision. As shown in Table 5, respondents were willing to pay an extra of 0.896 ¥/250 ml for milk comes from organically–fed cattle and 0.958 ¥/250 ml for milk with a certification label.

The implicit prices, however, do not provide estimates of the total willingness to pay for combined features of milk attributes. Using the compensating surplus, the total willingness to pay for combined features of milk attributes was estimated by calculating the utility of the base case scenario and the alternative option being considered. The base–case scenario represents milk that comes from cattle that are not organically fed, confined in feedlots (stressful environment), treated with antibiotics and hormonal agents, and without a certification label. The alternative scenario represents milk that comes from cattle that are organically–fed, graze on pasture, free from antibiotics and hormonal agents, and with a certification label. Based on equation 4, the willingness to pay for an improved feature of milk attributes was estimated at 3.190 ¥/250 ml of milk.

CONCLUSIONS

This study sought to determine Chinese consumers' preferences for organic milk attributes using a discrete choice experiment. The random parameters logit model with interaction terms between milk attributes and socio–

demographic characteristics was used to describe the respondents' purchase intention because it exhibited parameter fit than the model consisting only of milk attributes. Our findings allow us to draw several insights that could be relevant to the development and market promotion of organic milk in China. First, while price is likely to be a primary factor that inhibits the purchasing decision, milk producers could make good use of significant attributes such as organically–fed cattle and certification labels to promote products and encourage consumer demand. Second, a more specific marketing strategy could also be carried targeting older, highly educated and male consumers to offset the negative effect of price on the probability of purchase. The communication strategy should also focus on encouraging milk consumption because the production process complies with ethical welfare practices. Third, while the presence of a certification label continues to improve the acceptability of the milk, it is also important that strict standards and a robust monitoring system should be enforced to strengthen the consumers' degree of trust in the certification labels. Fourth, our findings indicated that only a few respondents had higher awareness about organic milk. A more generic marketing strategy that is address to a wider range of consumers could be implemented to increase their level of awareness and positive perceptions about organic milk. The market promotional campaigns should communicate to the consumers the health and environmental benefits derived from consuming milk that comes from organically–fed cattle, and should stress the importance of having compliance to animal welfare standards and having a certified label on milk products.

Finally, we note that our study focused primarily on the stated preferences of the consumers towards organic milk and may not directly correspond to their actual purchasing behavior. Nonetheless, the stated preference approach enables us to cover a range of attribute levels not commonly captured by revealed preference data, especially for organic milk where the market is still relatively new. Perhaps it would be interesting for future studies to compare or combine hypothetical choices with actual purchasing behavior to examine the preference and demand for organic milk.

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