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Consumers' Perception of Risks, Awareness of Products and Willingness to Pay: A Case Study of Organic Milk

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Abstract Based on survey data from Ji'nan city and some other cities in Shandong province, this paper conducted a research on consumers' perception degree of the food safety risk, and the awareness degree about organic food. Then taking organic milk as an example, the factors affecting the customers' buy willingness to pay for organic milk were analyzed by binary logit model and the willingness to pay was also calculated. The results show that the consumers' food safety risk perception degree is high, and the awareness about organic food is low. The consumers' age, level of education, whether the family has children below 12 years old, whether the family has a man (woman) older than 60 years, health situation self-evaluation, organic food cognition and food safety risk perception have significant effect on customers' willingness to pay organic food. According to the calculation, the consumers were willing to pay a price premium of 60% for organic milk above ordinary milk.

Key words Organic food, Perception of risks, Awareness of products, Willingness to pay

As the material and cultural level is improved and the basic food and clothing problem is solved, China's consumers start to pay attention to improving the quality of life, and the proportion of dairy products in the residents' consumption structure has been increased greatly in recent years. Taking fresh milk for example, it was increased from 11.90 kg per capita in 2001 to 14.91 kg per capita in 2009^[1]. But there is still a large gap between this data and the Asian average or world average, and China's ranking of amount of milk possession is disproportionate to its status of the world's second largest economy. According to expert estimates, China's dairy consumption growth will remain at about 6% by 2020. Empirical studies show that for every 1% increase in the income of residents, the urban residents' dairy consumption will grow 0.67% and rural residents' dairy consumption will increase 0.27%. With the sustained development of national economy and further improvement of urban and rural residents' income levels, the milk consumption is expected to continue to significantly increase^[2].

With economic development and social progress, food safety has upgraded from quantity safety to quality safety. Organic food industry, as an important measure to improve food quality safety, has gradually attracted the world attention^[3]. Organic food production began slowly in the mid-twentieth century, and it began to accelerate from the late seventies of last century. The countries with rapid development of organic food production at present in-

clude Austria, Sweden, Finland, Denmark and the United States^[4]. China's organic food production started late, and in 1994, the State Environmental Protection Administration of China established the National Organic Food Development Center, beginning to engage in the research, development and extension of organic food. Organic vegetables and organic fruits have been actively developed firstly. The development of organic milk started late. On December 13, 2005, Inner Mongolia Yunhai Qiulin Animal Husbandry Co., Ltd. was approved as China's first certified organic milk corporate, and the domestic organic milk began to enter people's consumption ranges. Over two decades of development, China's organic food industry has been developed slowly.

Therefore, taking milk for example, we aim to understand consumers' perception of food safety risks and their awareness of organic food, and examine their willingness to pay and the influencing factors, which is of great reference significance to targeted marketing and management of organic food producers, and of positive reference value to the formulation of organic food development policy.

1 Data sources and sample description

1.1 Scope of the survey The research area is Shandong Province, a typical province in the eastern coastal areas of China. Shandong Province is a typical populous province and economically strong province. The sixth national census data show that the permanent population in Shandong Province was 957.931 million in 2010, and the born population was 0.84373 million, ranking third among the 34 first-level administrative regions of China^[5]. Moreover, the per capita GDP of Shandong Province reached \$ 8224.07 in 2012, ranking tenth among the first-level administrative regions^[6], so the per capita disposable income is higher.

In view of a huge number of annual births and relatively high per capita disposable income in Shandong Province, there will be

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bound to have an inevitable huge demand for organic milk, so we choose Shandong Province as a typical case to survey consumers' perception of organic food, perception of food safety risk, willingness to pay and the influencing factors. In this paper, we choose two cities from eastern, central and western parts of Shandong Province, respectively (East: Qingdao, Yantai; Central: Ji'nan, Tai'an; West: Dezhou, Heze).

1.2 Survey content Given the higher price of organic food, the survey object is urban consumers. Specifically it includes consumers' perception of food safety risks, awareness of organic food, purchase behavior and willingness to pay.

In addition, we survey consumers' individual characteristics, such as gender, income, education and health. The investigators are the undergraduate and graduate students from School of Economics, Qufu Normal University, who receive comprehensive and systematic training before the field survey. The field survey was conducted in the summer of 2013. In the survey, it was agreed to take the third consumer in sight as the survey object, in order to

ensure the randomness of the sample selection^[7]. 60 consumers were surveyed in each city with a response rate of 100%, and 11 copies of incomplete or incorrect questionnaires were excluded, so we finally got 349 valid questionnaires and the proportion of valid questionnaires was 97%.

2 Descriptive statistical results

2.1 Basic characteristics of the consumers The descriptive statistical results of the basic situation of consumers are shown in Table 1. From the survey data, we know that there are more women than men in consuming organic food, which is consistent with the fact that food is mostly purchased by women. From the age distribution, the 31–40 age group consumers are the most, possibly because they generally have infant or pursue fashion, so they are more likely to buy organic food; the small number of other age groups may be due to consumers' insufficient trust in organic food or low income.

Table 1 Descriptive statistical results of basic features of consumers

Variables	Categories	Sample size	Sample percent // %
Gender	Male	136	38.97
	Female	213	61.03
Age	20–30 years old	105	30.37
	31–40 years old	45	12.89
	41–50 years old	76	21.78
	51–60 years old	67	19.20
	More than 60 years old	55	15.76
Educational level	Junior high school or below	60	17.19
	Senior high school	80	22.93
	College	170	48.71
	Master or above	39	11.17
Annual family income	Less than 50000 yuan	100	28.66
	50000–100000 yuan	158	45.27
	More than 100000 yuan	91	26.07
Whether the family has the children under the age of 12	Yes	78	22.35
	No	271	77.65
Whether the family has the old man above the age of 60	Yes	46	13.18
	No	303	86.82
Evaluation of their health status	Good	238	68.19
	So-so	70	20.06
	Not good	41	11.75

From the educational level, most of them have university degrees, which partly is a direct result of expanded university enrollment since the end of the last century, and partly is due to the fact that less educated consumers' awareness of organic food is low, and their income is generally low, and they are reluctant to pay a higher price to enjoy high quality of organic foods. The consumers with family members under the age of 12 years account for 22.35%; the consumers with family members over the age of 60 years account for 13.18%. The consumers' subjective evaluation of their health status affects their willingness to buy organic food. In this survey, 68.19% of consumers believe that their health is better, while 31.81% of consumers believe that their health status is so-so or bad.

2.2 Consumers' perception of food safety risks and awareness of organic foods The question is set in the questionnaire, "How do you think about the China's current food safety risk?". It is measured using Likert Scale (1–5 representing "very small", "small", "so-so", "large" and "very large", respectively). Most consumers choose "large" and "so-so", accounting for 39% and 20%, respectively, indicating that consumers believe that China's current food security situation is not good enough, and they do not trust most food manufacturers.

Through the statistics of options on organic food awareness, consumers' awareness of organic food is low. The majority of consumers (51%) only have heard of organic food; 34% of consumers know some about it; 15% of consumers have a better under-

standing of it. Therefore, the relevant government departments and manufacturers' promotion of organic foods has yet to be further strengthened.

3 Consumers' willingness to pay for organic foods

3.1 Variable definition In this paper, we use binary logit model to research the consumers' willingness to buy organic milk. The dependent variable y_i is used to indicate whether consumers are willing to buy organic milk. When consumers choose "willing", y_i takes value of 1, and when consumers choose "unwilling", the dependent variable y_i takes value of 0.

Table 2 Variable definition, sample mean and the expected direction

Variables	Meaning	Mean	Expected direction of action
Willingness to buy	Willing = 1, unwilling = 0	0.776	- - -
Gender	Male = 1, female = 0	0.389	+ -
Age	Actual age	37.683	-
Educational level	Actual years of schooling	15.619	+
Whether the family has the children under the age of 12	Yes = 1, no = 0	0.381	+
Whether the family has the old man above the age of 60	Yes = 1, no = 0	0.192	+
Health status self-evaluation	Good = 1, so-so = 2, not good = 3	1.325	-
Awareness of organic food	1 - 5 from never knowing to well knowing	2.586	+
Perception of food safety risk	1 - 5 from low risk to high risk	3.819	+

Note: " + " indicates that the relevant variables and willingness to buy are in the same expected direction; " - " indicates that the relevant variables and willingness to buy are in the opposite expected direction; " + - " indicates that the expected direction is not clear; " - - - " indicates that the item is blank.

In this paper, the binary logit model used is as follows^[8]:

$$y_i = \ln\left(\frac{p_i}{1-p_i}\right) = \alpha + \sum_{k=1}^K \beta_k x_{ki} + \lambda M + \varepsilon_i \quad (1)$$

where p_i is the probability of consumers to buy organic milk; α is constant term; x_{ki} is the variable influencing the willingness to buy organic food; M is the price that the consumers are willing to pay for the organic milk; ε_i is the error term.

Thus we get the average price that the consumers are willing to pay for the organic milk $E(M)$ as follows:

$$E(M) = -\frac{\alpha + E\left(\sum_{k=1}^K \beta_k x_{ki}\right)}{\lambda} \quad (2)$$

So we can derive the average consumers' willingness to pay for the organic milk $E(WTP)$ as follows:

$$E(WTP) = E(M) - P_0 \quad (3)$$

where P_0 is the average price of organic milk.

3.2 Result analysis of consumers' willingness to pay for the organic milk

The regression results of formula (1) using EViews 6.0 can be seen in Table 3. From the relevant data in Table 3, we know that the impact of gender on willingness to pay for organic milk is not significant. The survey results of Wang Ying *et al.* (2008) on the Beijing consumers show that men are more willing to consume organic food^[9], which may be related to the fact that this paper is to study based on specific organic milk while Wang Ying's paper is based on the organic food in a general sense. Age, educational level, whether the family has the children under the age of 12, whether the family has the old man above the age of 60, health status self-evaluation, awareness of organic food and perception of food safety risk, have a significant impact on the

The independent variables are divided into three categories. The first category is to take the actual values, including the variables of age and years of education. The second category is the dummy variables, including the variables of gender, whether the family has the children under the age of 12 and whether the family has the old man above the age of 60. The third category uses Likert Scale to measure, including the variables of health status self-evaluation, awareness of organic food and perception of food safety risk. Variable definition and the related information are shown in Table 2.

consumers' willingness to buy organic milk. Younger consumers are more likely to buy organic milk, which may be due to the fact that such consumers generally have younger children.

Highly educated consumers are more willing to buy organic milk, because the consumers with higher level of education have a better understanding of organic milk, and they well know the benefits of organic milk to health and the contribution of organic milk to environmental protection, so they are more willing to pay premium for the organic milk. The studies of Yin Shijiu (2008) believe that the impact of age and educational level on consumers' willingness to buy organic food is not significant, which may be related to the fact that this paper is to study based on specific organic milk while Yin Shijiu's survey is based on the organic food in a general sense^[10].

The consumers with children under the age of 12 or old man above the age of 60 in the family are more willing to consume organic milk for the sake of the children and the elderly's health, which is consistent with the research findings of Haghjou (2013)^[11]. The consumers with poor health status self-evaluation are more willing to buy organic milk from the perspective of protecting his body. The consumers with high awareness of organic food have a better understanding of organic milk, who believe that the organic milk industry is of great value to ensuring people's life security, reducing carbon emissions, and protecting the ecological environment and ecological diversity, so they are more willing to pay premium for organic milk.

The consumers with higher perception of food risk have not enough confidence in the ordinary food, but have a higher degree of trust in organic food, so they are more willing to pay premium

for organic milk. The studies of Roitner-schobesberger et al (2008) on the Thai consumers' willingness to buy organic food also believe that the improvement in the awareness of organic food

and perception of food safety risk plays a significant role in promoting the degree of consumers' willingness to buy organic food^[12].

Table 3 The regression results of consumers' willingness to buy organic milk

Variable	Coefficient	Standard deviation	z-statistic	Probability
Gender	0.653248	1.009704	0.646970	0.5177
Age	-0.085136	0.050732	-1.678173	0.0933
Education level	0.524994	0.171683	3.057931	0.0022
Whether the family has the children under the age of 12	0.198171	0.099223	1.997232	0.0458
Whether the family has the old man above the age of 60	0.192208	0.112199	1.713101	0.0867
Health status self-evaluation	-0.110997	0.061325	-1.809970	0.0703
Awareness of organic food	0.322791	0.185789	1.737408	0.0823
Perception of food safety risk	0.252042	0.125532	2.007793	0.0447
C	0.307914	1.059754	0.290552	0.7714
McFadden R-squared	0.107204	Mean dependent var	0.275449	
LR statistic	21.07555	Avg. log likelihood	-0.525503	
Prob(LR statistic)	0.003660			

3.3 The price that the consumers are willing to pay for the organic milk According to formula (2), the price that the consumers are willing to pay for the organic milk $E(M)$ is 16 yuan per liter. Therefore, the average consumers' willingness to pay for the organic milk $E(WTP)$ is as follows:

$$E(WTP) = E(M) - P_0 = 6 \text{ Yuan per liter}$$

where P_0 is 10 yuan per liter, namely the price of ordinary milk is 10 yuan per liter.

Thus we know that the consumers are willing to pay the premium of 6 yuan per liter for the good quality organic milk, which is 60% of the price of ordinary milk. The current market price of organic milk is about three times the price of the ordinary milk.

Therefore, there is still a gap between consumers' willingness to pay for organic milk and the market price. The possible reasons are as follows: (i) The consumers' awareness of organic food is low, having not the correct understanding of difference in the costs and scarcity between organic food and ordinary food; (ii) In recent years, some negative news has been exposed, eroding the consumers' confidence in organic food that has not been effectively established.

4 Conclusions and policy recommendations

4.1 Conclusions On the basis of the survey data on consumers in Ji'nan City and other five cities of Shandong Province, this paper carries out the statistical analysis of consumers' perception of food safety risk and awareness of organic food, and taking organic milk for example, uses binary logit regression model to analyze the main factors influencing consumers' willingness to buy organic food, and calculate the consumers' willingness to pay for the organic milk.

The results show that the consumers have high perception of food safety risk but low awareness of organic food; the impact of age on consumers' willingness to pay for the organic milk is not significant; for the well educated consumers, or the consumers with children under the age of 12 years in the family, or the con-

sumers with old man above the age of 60 years in the family, or the consumers with poor health status self-evaluation, or the consumers with high awareness of organic food or the consumers with high perception of food safety risk, they are more willing to buy organic milk. The calculation results show that the consumers are willing to pay 60% of premium for the organic milk.

4.2 Policy recommendations

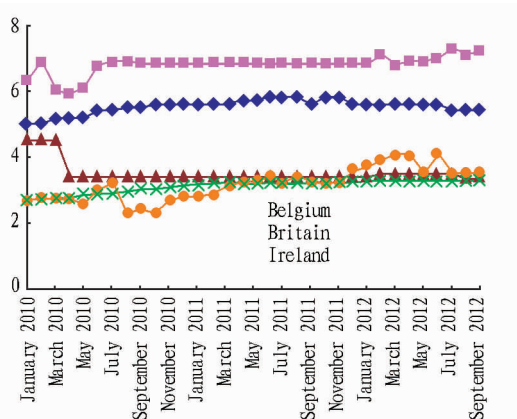
4.2.1 Timely disclosing information to enhance consumer trust. In view of the important significance of food safety to people's health and security, the relevant government departments should timely release the food safety status systematically, comprehensively and authoritatively on relevant websites, to deny various rumors and avoid the phenomenon of food safety scares; establish the incentive mechanism to promote organic food production enterprises to truthfully disclose the food safety information for consumers, trying to improve the level of consumer trust.

4.2.2 Increasing the organic food publicity efforts to improve consumers' awareness of organic food. Organic food industry in China has been developed for more than twenty years, but there has been no substantive progress. We find in the survey that consumers' awareness of organic food is low. Government departments at all levels should step up efforts to increase the public welfare publicity of positive contribution of organic food to health and the environment, such as television public service ads and public service broadcasting. We can film a documentary with the brief development history of China's food as the theme, to make people better learn organic food industry. There is a need to give preferential policies for the publishing of organic food-related books; in the elective course in college, it is necessary to increase organic food-related courses.

4.2.3 Increasing the business publicity to seize the opportunity. Currently, organic food is still a new thing to the vast majority of consumers who know little about it. Thus, the relevant enterprises can take this opportunity to increase publicity, gain the initiative, and get first-strike advantage to win organic food battle victory.

(To page 38)

From January 2010 to September 2012, the average purchase price of raw milk was 3.51 yuan per kilogram in Israel; since 2010, the purchase price of raw milk in Israel has been very stable. From April 2010 to January 2012, the purchase price of raw milk in Israel was maintained at 3.4 yuan per kilogram. There are frequent fluctuations in the Vietnam's purchase price of raw milk. Before August 2011, the purchase price of raw milk in Vietnam was lower than that in Israel, but after December 2011, the purchase price of raw milk in Vietnam was higher than that in Israel. From January to September 2012, the average purchase price of raw milk in Vietnam was 3.77 yuan per kilogram, 9.59% higher than that in Israel (3.44 yuan per kilogram).



Source: The data of Holstein Farmer.

Fig. 5 The trend of change in the raw milk prices in major Asian countries

6 Comparison of the purchase price of raw milk between China and other countries in the world

6.1 Compared with other Asian countries, the domestic price of raw milk remains low In recent years, the purchase price of raw milk has experienced a slight increase in China. From January 2010 to October 2012, the purchase price of raw milk in

10 major producing provinces (regions) was 3.11 yuan per kilogram, and from January to October 2012, the average price was 3.28 yuan per kilogram. Compared with other Asian countries, the domestic price of raw milk remains low, and the average level of the purchase price of raw milk is not only significantly lower than in Japan, South Korea, Israel and other countries with scarce resource endowments and high economic level, but also lower than in Vietnam with low economic level.

6.2 Compared with the countries in other continents, the domestic purchase price of raw milk is relatively high Compared with Oceania, the Americas, Europe and other continents, the domestic purchase price of raw milk is relatively high. Among the 15 countries selected from Oceania, the Americas and Europe, except Norway with the purchase price of raw milk of 4.89 yuan per kg, higher than the purchase price of raw milk in China, the purchase price of raw milk in other 14 countries is significantly lower than the purchase price of raw milk in China. The average purchase price of raw milk in China is 0.38 yuan per kilogram higher than the purchase price of countries in Oceania, the Americas and Europe. This conclusion is basically consistent with the existing finding that the domestic purchase price of raw milk is relatively high in the world^[5].

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(From page 34)

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