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Applying the Payment Card Approach to Estimate the WTP for Green Food in China

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Abstract: This paper uses a payment card approach to reveal consumers' willingness to pay for green food in China. We first present a brief introduction of the payment card approach and introduce several methods to estimate the WTP with payment cards, which we subsequently use to estimate WTP values regarding green vegetables, green meat and green eggs in China. Our results indicate that consumers in big cities are willing to pay a higher premium for green food and that WTP values are relatively higher for more expensive food than for cheaper food. In addition, the ratios of premium to price range mainly between 25% and 50% and WTP values obtained from interval midpoint approach are relatively higher than those calculated by other approaches.

Key words: WTP, Payment card, Green food

1 Introduction

In the past 30 years, China has been experiencing significant structure changes in food demand: changing from quantity satisfaction to quality pursuit (Yu and Abler, 2009). Until the beginning of 1980s Chinese spent more than half of their expenditures in food, while the dominance of food spending in the budget of Chinese household has diminished as the income has grew rapidly along with the remarkable economic success (Gale and Huang, 2007). Following the "Engel's Law", the share of food in total expenditure has fallen dramatically from 68% in 1978 to 41% in 2010 in rural China, similarly, from 59% to 36% in urban China. As current literatures (e.g. Wang, 2003; Zhou, 2004; Yang, 2006; Gale and Huang, 2007; Wang et al., 2007; Yu and Abler, 2009) show, Chinese consumers concern more and more about food quality and safety, and are willing to pay a positive premium for food that has a higher quality and uses less pesticides and chemicals. In particular, food safety became a major concern in China in recent years due to a lot of reports of incidents and accidents involving food poisonings. In order to enhance the food safety, the Chinese government has set up a nationwide food inspection and monitoring system, as well as some national standards and certification systems (Wang et al., 2007).

Green food, which was developed by the Ministry of Agriculture of People' Republic of China in 1990, is the most widely accepted food label that stands for safe food in China's domestic market. Currently, certification and monitoring of "Green Food" are conducted by China Green Food Development Center under the Ministry of Agriculture of China, and the Green food[1] is officially defined as:

Under strict supervision, control and regulation in production, processing, packing, storage and transportation, Green Food adopts the whole-some quality control from field to table, while it requires reasonable applications of inputs, including pesticide, fertilizer, veterinary drug and additive etc. to prevent any pollution of toxic and harmful matters to produce and links in food processing so as to ensure environmental and product safety.[2]

In the past decade, the growth of certified "Green Food" is very fast. Table 1 reports the development between 2001 and 2006, and indicates that the certified green food increased by more than two folds in this period, and reached the output of 150 billion yuan in 2006.

[1] The certification of "Green Food" can be divided into 2 levels: Grade A (Allowing using certain amount of chemical materials) and Grade AA (equivalent to "organic food").

[2] Source: China Green Food Development Center.

Table 1: Development of Certified Green Food in China

Year	2001	2002	2003	2004	2005	2006
Number of Certified Firms	1217	1756	2047	2836	3695	4615
Number of Certified Products	2400	3046	4030	6496	9728	12868
Output Quantity (10,000 tons)	2000	2500	3260	4600	6300	7200
Annual Sales（100 Million Yuan）	500	597	723	860	1030	1500
Export(100 Million USD)	4	8.4	10.8	12.5	16.2	19.6
Output Area (10,000 mu)	5800	6670	7710	8940	9800	15000

We need to take a close look at the consumer preferences for the certified "green food" in China, which is measured by the willingness to pay. In this paper, payment card approach, one of the major contingent valuation methods (CVM), is used to reveal Chinese consumers' WTP for green food. Although CVM has been well developed and widely used by government departments in western countries, especially in the US, to measure the WTP for public and non-market goods, there are still very few studies focusing on China. Specially, this paper uses 6 different approaches to estimate WTP based on the same data to get a more robust and convincing result. In addition, we present WTP values for three foods (green vegetable, green meat and green egg) in two areas (Shijiazhuang and Qingxian), which shed some light on the comparison of WTP between different foods and regions.

The paper is organized as follows: Section 2 presents a brief introduction of the contigent valuation methods and the payment card approach, as well as several models that have been used in different studies; Section 3 serves to explain the survey and the statistical analysis of the primary data, which were collected in Shijiazhuang, the capital of Hebei province, and Qingxian County, which is also located in Hebei province; Section 4 estimates the WTP for green vegetables, meat and eggs using different methods and try to find the determinants of the WTP; and Section 5 presents our conclusions.

2 The Contingent Valuation Methods and Payment Card Approach

Contingent valuation methods have been widely used to measure values associated with public and non-market goods (Ready, 1996). These state preference techniques use surveys to discern individual respondents' preferences and to reveal their WTP values for non-market resources. Compared with some revealed preference techniques, such as hedonic pricing and the household production function approach, the contingent valuation method is a relatively flexible tool. It can be used to examine environmental goods and terms for providing them that is different from what has been observed now or in the past, and avoids many of the economic modeling problems that are common to most observational data (Carson and Hanemann, 2005).

Currently, there are four major types of elicitation techniques available in the literature, namely the bidding game, the payment card (PC) approach, as well as the open-ended (OE) and dichotomous choice (DC) approaches (Boyle et al., 1996). The dichotomous choice approach can be further divided into two types: The single-bounded dichotomous choice (take-it-or-leave-it) and the double-bounded dichotomous choice (take-it-or-leave-it with follow-up) (Venkatachalam, 2004). In addition, some new methods can also be found in the literature. Hu et al. (2006) for example developed a revised double-bounded approach by adopting a payment card in the second stage to measure the WTP for GM soybean oil in China.

All contingent valuation methods have different advantages and disadvantages. Even though the most popular approach is the dichotomous choice, which has been widely used after Hanemann's seminal work (1984, 1991) and also recommended by the National Oceanic and Atmospheric Administration (NOAA), it still faces a lot of problems, including starting point bias, uncertainty, inconsistent and strong assumptions (Ready et al., 1996, 2001; L. Venkatachalam, 2004; Hu, 2006). In this paper, we will shed light on the payment card approach, which is also widely used in practice.

The payment card approach (PC) has first been introduced by Mitchell and Carson (1984). Respondents are asked to choose the one value, which represents their maximum WTP values (Venkatachalam, 2004). The true WTP of the respondents is then assumed to be located above the indicated value and below the next higher one, if such a value exists (Hu, 2006). The advantages of the PC approach are obvious: First, respondents' WTP values can be determined directly from the original data; Second, PC respondents tend to state WTP values they are confident about (Ready et al., 2001); Third, WTP values estimated by a PC approach are more robust than those relying on a DC approach (Ready et al., 2001); Fourth, there is no starting point bias affecting the PC approach (Mitchell and Carson, 1986).

On the other hand, the PC method is far from perfect. For example, although the PC approach has originally been invented to avoid the starting point bias, it could possibly be affected by a range bias and a centering bias (Mitchell and Carson, 1986) as well as by an end point bias (Hu, 2006). Cameron and Huppert (1989) also find that the design of the payment card and the estimation technique employed to fit the valuation function can influence the WTP to a considerable extent.

Given the structure of the data in PC, Hackl and Pruckner (1999) provides five different methods to measure the obtained WTP. Following them we now present several methods to estimate the WTP when the payment card approach is opted for.

2.1 The Minimal Legal WTP Model (ML-WTP)

In the minimal legal WTP model, the chosen values on the payment card are supposed to represent a legal obligation to pay the stated amount. Since, as has been outlined earlier, the true WTP can be assumed to lie between that value and the next higher one, the stated value can be considered to be a lower bound for the WTP. In other words, it is the "minimal legal WTP". Given the different values from the payment card (A_i) and their respective frequencies (P_i) in the sample, it is possible to calculate the mean and the median of the WTP.

$$(1) \quad ML - WTP = \sum_{i=0}^{H} A_i * P_i$$

ML-WTP is the mean WTP. The median WTP can be obtained by sorting all answers according to their values and choosing the median one.

2.2 Interval Midpoint WTP Model (IM-WTP)

In the interval midpoint WTP model, we assume that the individual's WTP is systematically distributed within the given interval. Since the respondent's true point valuation lies somewhere in the interval between the chosen value and the next higher one (Cameron and Huppert, 1989), this assumption is reasonable. Under this assumption, a mean value can be computed as

$$(2) \quad IM - WTP = \sum_{i=0}^{H-1} \frac{A_i + A_{i+1}}{2} * P_i + \frac{A_H + A_T}{2} * P_H$$

IM-WTP is the mean WTP, A_H represents the highest value from the payment card and A_T the truncated value (upper limit value). A_i and P_i have the same meaning as before. The median WTP can again be calculated by sorting all the adjusted WTP values by size and choosing the median one.

2.3 Payment Card Double-Bounded Model (DB-WTP)

The model used in this paper is based on the random utility theory (McFadden, 1974). Since green food is much safer, we assume that consumers are willing to pay a non-negative premium for it. Other things being equal, when the safety level of food rises from a relatively low level (non-green food) to a higher level (green food), consumers can reach a higher level of utility due to an increase in their health stock (Yu et al., 2010). They are willing to pay a higher price for green food if and only if their new utilities are equal to or lager than their original utilities.

Using identical indirect utility function, we can calculate the probability of the true WTP lying within the interval (A^i, A^{i+1}) and the parameters in the indirect utility function are estimated by Maximum Likelihood Estimation.

There are two widely used econometric models for calculating the WTP in double-bounded models. The first one is the probit model, which assumes that the Cumulative Distribution Function (CDF) of the stochastic term ε used in the indirect utility function is the standard normal CDF. The second one is the logit model, in which CDF is the standard logistic variate (Hanemann, 1984). Since we assume that the indirect utility function is linear, the mean and median values of the WTP are identical.

In the probit model, the median and the mean WTP are:

$$(3) \quad DB - WTPp = \frac{C+\beta*X}{\alpha}$$

Where X is a vector of variables describing the individual respondent's characteristics, β denotes the associated coefficients, and α stands for the income elasticity.

In the Gumbel specification (logit model), both median and mean have a closed form.

$$(4) \quad DB - WTPl = \frac{C+\beta*X}{\alpha}$$

2.4 Payment Card Double-Bounded Spike Model (S-WTP)

In the payment card approach, the chosen value is supposed to be the minimum WTP of the respondents, which implies that when respondents refuse to pay any positive amount, their WTP is assumed to be between zero and the lowest value given on the payment card (Hu, 2006). In order to distinguish true zeros from what can be called positive zeros, the Spike model has been introduced (Kristrom, 1997).

In practice, the mean and median of the WTP in the Spike model can be calculated in a similar way as before.

In the probit model, the median and mean of the WTP can now be calculated as follows:

$$(5) \quad S - WTPp = S_i * \frac{C+\beta*X}{\alpha}.$$

where S_i is the probability that a respondent is willing to pay a positive premium for green food.

In the logit model, the median and mean of the WTP are again the same and take the following form:

$$(6) \quad S - WTPl = S_i * \frac{C+\beta*X}{\alpha}.$$

2.5 Ordered Probit and Ordered Logit Model (O-WTP)

There is one more alternative way to measure the WTP in a payment card double-bounded model, namely using Ordered Probit and Ordered Logit models. First, we categorize WTP values into several groups and express them as a function of the respondents' characteristics. Using a maximum likelihood model, we can obtain the estimates of the parameter. The mean and median of the WTP can be calculated analogous to the procedure explained for the interval midpoint model:

$$(7) \quad O - WTP = \sum_{k=0}^{n}(A_k * P_k)/(\sum_{k=0}^{n} P_k) .$$

O-WTP is the mean of the WTP, A_k represents the chosen WTP of the k^{th} respondent and P_k stands for the estimated probabilities from the Ordered Probit and the Ordered Logit model.

2.6 Interval Regression Model (I-WTP)

Assuming that a respondent's true WTP locates randomly between the chosen value and the next larger value on the payment card, we can also use an interval regression to study the WTP. However, this method can only be used to find out the determinants of the WTP and is not informative with respect to the exact values of the mean and median WTP.

3 Survey and Data

The data used in this paper have been collected by the School of Agricultural Economics and Rural Development at the Renmin University of China, by a survey in Hebei province (China) in 2003 in order to investigate consumers' WTP for green food. The survey was carried out in Shijiazhuang, the capital city of Hebei province, which is also the most populous city in this province, and in Qingxian, a County in Cangzhou city. 180 usable questionnaires were collected in Shijiazhuang and 179 in Qingxian County.

The questionnaire consists of 4 sections, the first section asks for demographical characteristics of the respondents, including sex, age, education, income and vocation. The second section investigates consumers' knowledge and their general perception of food safety and quality. The third section in turn looks into consumption behaviour and the WTP for green vegetables, green meat and green eggs. In the last part of the questionnaire respondents are asked for suggestions and comments on green food in China.

Table 2 reports the descriptive statistics for the data used in this study. We can find that there are more female respondents than male ones, which seem reasonable because women do most of the shopping in China. Hence, they are more likely to participate in such interviews. The average age of the respondents is around 33-34 years, which is a little higher than the

national average of 32 years. The reason for this is that only adults (at least 16 years old) have been interviewed in this survey. The average education level at both locations is slightly higher than 3 (secondary technical school). About 30% of the respondents in Shijiazhuang have graduated from middle school and 43% from secondary technical school and junior college. In Qingxian County the corresponding values are 40% and 42%, respectively. Most of the interviewed families have a monthly per capita income between 500 yuan and 1000 yuan. In Shijiazhuang the proportion of families in this interval is 41% whereas in Qingxian County it is 44%.

Regarding food safety, most consumers (73% in Shijiazhuang and 67% in Qingxian County) think food safety in China is serious, even though many of them are not very familiar with green food (77% of the respondents in Shijiazhuang stated that they have no good knowledge regarding green food or don't even know it; in Qingxian County the proportion is 73%). In both places, most respondents think the price of green food is high (81% in Shijiazhuang and 80% in Qingxian County). At the same time, most respondents have bought green food before. The proportions of families that never buy green food are only 5% and about 20% in Shijiazhuang and Qingxian County, respectively.

The preferred shopping places at the two survey sites are quite different. In Shijiazhuang, more than 90% of the respondents buy food in supermarkets, whereas in Qingxian County the corresponding share is only about 41%. Only about 10% of the respondents in Shijiazhuang buy food in shops, while in Qingxian County more than 30% of them do this. In both places about half of the respondents also buy food in farmers' markets. The vocational structure of the respondents in the two places is also quite different. In Shijiazhuang, about 33% of the respondents are workers, whereas in Qingxian County, about 33% of the respondents are medical staff and public servants accounts for another 26%. In the following section we will test whether profession has impact on WTP.

In the last six rows of Table 2 we find that the average WTP for green food in Shijiazhuang is higher than in Qingxian County, which is true for all three food categories, and that people in Shijiazhuang buy more green food than people in Qingxian County.

Table 2: Description of variables

Variable	Definition	Shijiazhuang		Qingxian	
		Mean	S. D.	Mean	S. D.
Price	Values in the payment card				
Male	Dummy variable=1 if the respondent is male	0.4121	0.4934	0.4327	0.4966
Age	Respondent's age	33.8141	12.0349	33.4375	11.7813
Education	1=primary school; 2=middle school; 3=secondary technical school; 4=junior college; 5= bachelor; 6=master and above	3.3769	1.2648	3.0625	1.1962
Income (RMB)	Per capita monthly income, 1=[0,500]; 2=(500,1000]; 3=(1000,1500]; 4=(1500,2000]; 5=(2000,2500]; 6=(2500,3000]; 7=(3000,∞)	2.6181	1.0940	2.1635	1.1260

Knowledge	Knowledge about green food. 1= don't know; 2= not so clear; 3=know; 4= completely know	2.8392	0.5897	2.8510	0.6964
Food safety	Perception of food safety, 1= not so serious; 2=serious; 3 =very serious; 4=no idea	2.1457	0.7547	2.2404	0.9630
Price valuation	Attitude towards the price of green food, 1= low; 2= right price; 3= little high but acceptable; 4=too high; 5=no idea	2.1212	0.9154	2.0769	0.8922
Frequency	Frequency of shopping, 1= seldom; 2=sometimes; 3= often	1.3266	0.5211	1.8894	0.7501
Supermarket	Buy food in supermarket	0.9045	0.2946	0.4135	0.4936
Shop	Buy food in shop	0.1105	0.3144	0.3173	0.4666
Farmer's market	Buy food in farmer's market	0.5779	0.4951	0.5288	0.5004
Profession	1=official; 2=scientist; 3=teacher; 4=medical staff; 5=worker; 6=retired; 7=unemployed; 8=other				
Vegetable WTP	WTP for green vegetables	1.4553	0.2363	1.3495	0.1761
Meat WTP	WTP for green meat	8.1206	0.9773	7.6635	0.8237
Egg WTP	WTP for green eggs	2.7628	0.4480	2.6529	0.2406
Vegetable rate	The proportion of green vegetables in total vegetable consumption	65.30%	25.8769	45.50%	28.2405
Meat rate	The proportion of green meat in total meat consumption	71.23%	27.2820	44.58%	30.0686
Egg rate	The proportion of green eggs in total egg consumption	72.82%	26.0213	50.16%	29.4225

Note: Prices of conventional vegetables, conventional meat and conventional egg are assumed to be 1 yuan/500g, 6 yuan/500g and 2 yuan/500g, respectively.

4 Values and Determinants of WTP

4.1 WTP

In this section, we estimate WTP values by means of different methods and present the results in Table 3. The reason for reporting both the mean and median WTP values is that they have different implications and might be quite different depending on the methods. The median reflects the turning point where 50% of the respondents will pay while the remaining 50% won't (Hanemann, 1984; Hu et al., 2006). The common rule of thumb in the related literature is to use the median as the true measure of WTP since it is less likely to be sensitive to perturbations like extreme observations than the mean. Furthermore, it is a more robust measure of the central tendency (Hanemann, 1984).

Table 3: WTP

Green food		ML-WTP	IM-WTP	DB-WTP		O-WTP	
				Logit	Probit	Logit	Probit
S-vegetable	mean	0.4553(45.53%)	0.5764(57.64%)	0.5054(50.54%)	0.4507(45.07%)	0.4055(40.55%)	0.4045(40.45%)
	median	0.5000(50.00%)	0.6500(65.00%)	0.5054(50.54%)	0.4507(45.07%)	0.6500(65.00%)	0.6500(65.00%)
Q-vegetable	mean	0.3495(34.95%)	0.4450(44.50%)	0.3971(39.71%)	0.3634(36.34%)	0.3137(31.37%)	0.3129(31.29%)
	median	0.3000(30.00%)	0.4000(40.00%)	0.3971(39.71%)	0.3634(36.34%)	0.4000(40.00%)	0.4000(40.00%)
S-meat	mean	2.1206(35.34%)	2.6910(44.85%)	2.4071(40.12%)	2.2884(38.14%)	1.9318(32.20%)	1.9292(32.12%)
	median	2.0000(33.33%)	2.5000(41.67%)	2.4071(40.12%)	2.2884(38.14%)	2.5000(41.67%)	2.5000(41.67%)
Q-meat	mean	1.6635(27.73%)	2.1827(36.38%)	2.0725(34.54%)	1.9710(32.85%)	1.5528(25.88%)	1.5548(25.91%)
	median	1.0000(16.67%)	1.5000(25.00%)	2.0725(34.54%)	1.9710(32.85%)	1.5000(25.00%)	1.5000(25.00%)
S-egg	mean	0.7628(38.14%)	0.9400(47.00%)	0.8066(40.33%)	0.7381(36.91%)	0.8750(43.75%)	0.8368(41.84%)

Q-egg	median	0.5000(25.00%)	0.6500(32.50%)	0.8066(40.33%)	0.7381(36.91%)	0.6500(32.50%)	0.6500(32.50%)
	mean	0.6529(32.65%)	0.8099(40.50%)	Divergence	Divergence	0.6041(30.21%)	0.5923(29.62%)
	median	0.5000(25.00%)	0.6500(32.50%)	Divergence	Divergence	0.6500(32.50%)	0.6500(32.50%)

Notes: 1. S refers to Shijiazhuang, and Q refers to Qingxian.

2. ML-WTP refers to minimum legal WTP; IM-WTP refers to interval midpoint WTP; DB-WTP refers to double-bounded WTP; O-WTP refers to WTP from an ordered regression.

3. The ratio of premium is reported in brackets.

4. Because of no zero observations in our data, the Spike model and the conventional DB model are identical.

5. The truncated values of vegetables, meat and eggs are assumed to be 2.5, 15 and 6, respectively.

Table 4: Comparison of results from different approaches

Approaches	Vegetable				Meat				Egg			
	Shijiazhang		Qingxian		Shijiazhang		Qingxian		Shijiazhang		Qingxian	
	WTP-S	Rank	WTP-Q	Rank	WTP-S	Rank	WTP-Q	Rank	WTP-S	Rank	WTP-Q	Rank
IM	0.5764	1	0.4450	1	0.4485	1	0.3638	1	0.4700	1	0.4050	1
ML	0.4553	3	0.3495	4	0.3534	4	0.2773	4	0.3691	6	0.3265	2
DBL	0.5054	2	0.3971	2	0.4012	2	0.3454	2	0.4033	4		
DBP	0.4507	4	0.3634	3	0.3814	3	0.3285	3	0.3814	5		
OL	0.4055	5	0.3137	5	0.3220	5	0.2588	6	0.4375	2	0.3021	3
OP	0.4045	6	0.3129	6	0.3212	6	0.2591	5	0.4184	3	0.2962	4

Notes: 1. IM refers to interval midpoint WTP; ML refers to minimum legal WTP; DBL and DBP refer to double- bounded-logit WTP and double-bounded-probit WTP; OL and OP refer to Ordered Logit and Ordered Probit.

2. WTP-S and WTP-Q refer to WTP values in Shijiazhuang and Qingxian County, respectively.

3. All values are the ratios of the mean premium to the price of conventional good.

The results in Table 3, Table 4, Figure 1, Figure 2 and Figure 3 show that the WTP values vary substantially between different regions, different green food categories and different methods.

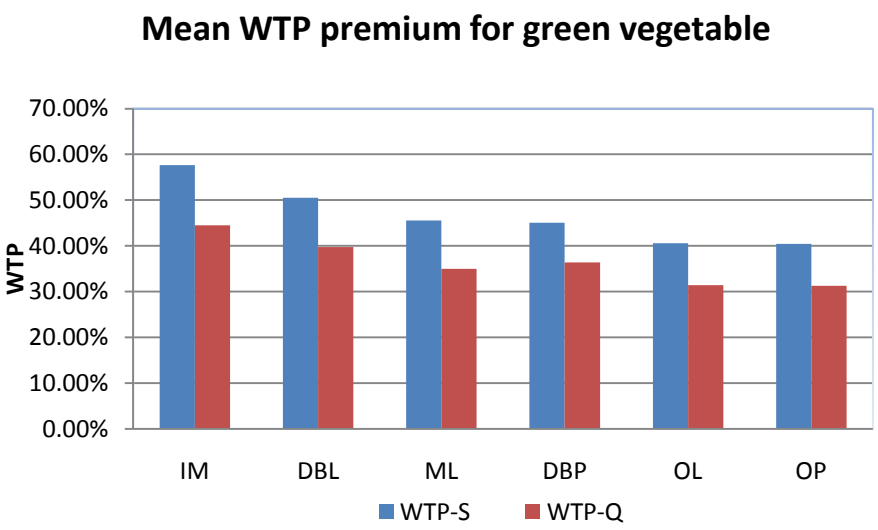
First, WTP values in Shijiazhuang are always higher than in Qingxian County, regardless of which approach is used and which food is compared. Since Shijiazhuang is the biggest city in Hebei province, while Qingxian is only a county, it seems plausible to argue that the WTP for green food in big cities is higher than that in county. This difference might be explained by the higher income and education level in Shijiazhuang.

Second, the WTP for green meat is higher than for green eggs and green vegetables, while the WTP premium (the ratio of the premium to the price of conventional good) for green meat is lower than for green vegetables and green eggs in both regions and all methods. This is consistent with the studies in other countries that consumers tend to be willing to pay higher price premiums for organic food with a shorter shelf life (Yiridoe et al., 2005).

Third, the WTP values calculated by means of the IM-WTP methods are always relatively higher compared with those obtained using other methods. It is plausible that IM-WTP is an optimistic estimation. Meanwhile, as we mentioned in section 2, ML-WTP is the lower bound of respondents' true WTP, any approach that get a smaller WTP than ML-WTP must be biased downward. According to table 4, WTP values in Ordered Logit and Ordered Probit models are almost always the lowest one, implying a bias in the estimations by ordered regression. It seems plausible that the results in double-bounded models are more reliable.

Fourth, the ratio of premium to price ranges between 16.67% (median ML-WTP for green meat in Qingxian County) and 65.00% (median IM-WTP for green vegetables in Shijiazhuang), while most results fall in the range of 25% to 50%. Compared with previous studies (Wang, 2003; Wang et al., 2007), our results show a much higher WTP for green food. But bear in mind that WTP is not the real purchasing behaviour. Zhong and Yi (2010) figure out that there is a big difference between consumers' concerns and actual purchasing behaviour regarding food safety in China, and consumers do not buy so much green food even though their willingness to pay is very high.

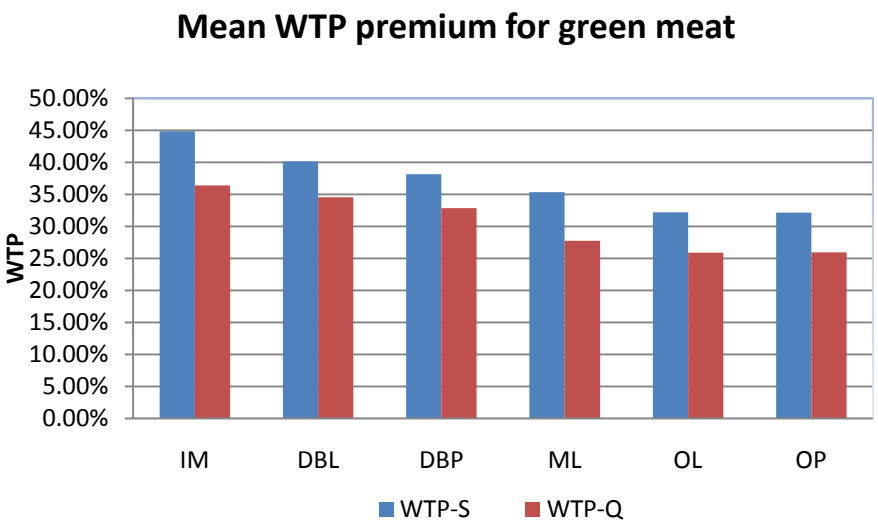
Figure 1: Mean WTP for green vegetables



Notes: 1. ML refers to minimum legal WTP; IM refers to interval midpoint WTP; DBL and DBP refer to double-bounded-logit WTP and double-bounded-probit WTP; OL and OP refer to Ordered Logit and Ordered Probit.

2. WTP-S and WTP-Q refer to WTP values in Shijiazhuang and Qingxian County, respectively.

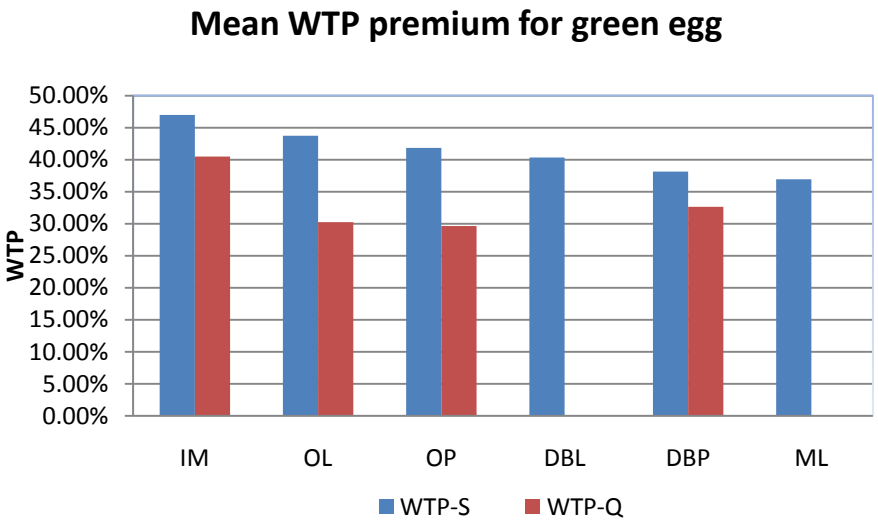
Figure 2: Mean WTP for green meat



Notes: 1. ML refers to minimum legal WTP; IM refers to interval midpoint WTP; DBL and DBP refer to double-bounded-logit WTP and double-bounded-probit WTP; OL and OP refer to Ordered Logit and Ordered Probit.

2. WTP-S and WTP-Q refer to WTP values in Shijiazhuang and Qingxian County, respectively.

Figure 3: Mean WTP for green egg



Notes: 1. ML refers to minimum legal WTP; IM refers to interval midpoint WTP; DBL and DBP refer to double-bounded-logit WTP and double-bounded-probit WTP; OL and OP refer to Ordered Logit and Ordered Probit.

2. WTP-S and WTP-Q refer to WTP values in Shijiazhuang and Qingxian County, respectively.

4.2 Determinants of WTP

In order to find out the determinants of consumers' WTP, we take the WTP values as dependent variables, and use demographic characteristics, knowledge, perceptions and consumption behaviour regarding green food as explanatory variables. Five different models are used in this paper, including a Double-bounded Probit model, Double-bounded Logit model, Ordered Probit model, Ordered Logit model and Interval regression. In the Double-bounded models we needed to convert the discrete WTP values from the payment cards into binary variables. For this purpose, we had to expand all responses into several observations. On the payment card of vegetables, for example, there are 5 values: 1.2, 1.3, 1.5, 1.8 and 2. If the respondent chooses 1.3, then we can convert this response into 5 binary variables, one for each value on the payment card. The first two variables (1.2 and 1.3) receive a value of 1 while the remaining three variables (1.5, 1.8 and 2) receive a value of 0. By this procedure the dependent variable becomes a binary one and we can use the Logit model and Probit model to analyze the impacts of our explanatory variables on the WTP. Regarding the Interval regression, we assume that the true WTP locates randomly between the chosen value and the next higher one.

First, we pooled all observations together and ran the regression, but a likelihood ratio test rejects the null hypotheses that there is no systematic difference between the coefficients of different regions and different green categories of food, which implies that we have to run the regressions for each region and category of food separately. The results regarding vegetables, meat and eggs are shown in table 4, 5 and 6, respectively.

In Table 5 we find that consumers are less likely to pay when their price are higher both in Shijiazhuang and Qingxian County (in DB models), which was to be expected. Furthermore, demographic characteristics have important impact on consumers' WTP for green food. Firstly, old people's WTP is significantly lower, which implies that old people have a lower preference for green vegetables compared than young people. This is consistent with previous studies (Dai et al., 2006; Wang et al., 2007). Secondly, people with higher levels of education tend to pay a higher price for green vegetables in Qingxian County, while no such result could be found for Shijiazhuang. This might be due to the fact that people with higher levels of education care more about food safety (Wang et al., 2007), while in big cities like Shijiazhuang, well educated people don't believe that green vegetables are safer. Thirdly, as income increases, consumers are more willing to pay a higher price for green vegetables, because they tend to care more about their health, which is also consistent with previous studies (Zhou, 2005; Wang et al., 2006). However, the respective coefficients for Qingxian County are not significant.

We also find that consumers' knowledge and perception regarding green food affect their WTP for green vegetables. People who know more about green food tend to pay a higher

premium in Qingxian County, which might imply that they prefer to pay a higher price to ensure their health. The same result however could not be found for Shijiazhuang. Consumers in Shijiazhuang in turn are less likely to pay a high premium for green vegetables if they think that the market price of green food is not acceptable. In Qingxian County the price valuation has no significant effect on the WTP.

In addition, the consumption behaviour also has some impact on the WTP. In Shijiazhuang, people who usually buy food from supermarkets tend to pay a higher premium for green vegetables, while in Qingxian County, where the results are more robust, people who buy food from supermarkets and shops tend to pay a higher premium for green vegetables. It's plausible to assume that in a county like Qingxian, those families who usually go to supermarkets and shops are much richer than the other families (usually farmers). This might explain why they are willing to pay a higher price for green vegetables.

Finally, we also studied the differences in WTP values between people with different professions. We find that in Shijiazhuang officials are willing to pay a higher premium for green vegetables, while scientists display a much lower WTP, which may be because they don't trust green food. In Qingxian County, workers and officials as well as medical staff are willing to pay a higher price for green vegetables. This is reasonable since they usually have a higher income and it's easier for them to accept new things in county. One confusing result is that the unemployed also have a higher WTP for green vegetables in Qingxian County. This needs further investigation.

Table 5: Vegetables

Variables	Shijiazhuang					Qingxian				
	DB-logit	DB-probit	O-logit	O-probit	Interval	DB-logit	DB-probit	O-logit	O-probit	Interval
Price	-7.077	-4.084				-9.566	-5.356			
	(-15.81)***	(-17.87)***				(-15.40)***	(-17.43)***			
Male	-0.249	-0.149	-0.244	-0.149	-0.050	-0.177	-0.091	-0.114	-0.049	-0.004
	(-1.06)	(-1.13)	(-0.78)	(-0.80)	(-1.19)	(-0.74)	(-0.68)	(-0.32)	(-0.24)	(-0.12)
Age	-0.033	-0.018	-0.037	-0.021	-0.004	-0.023	-0.014	-0.024	-0.016	-0.002
	(-2.57)***	(-2.49)**	(-2.08)**	(-2.04)**	(-1.90)*	(-2.20)**	(-2.32)**	(-1.47)	(-1.61)	(-1.62)
Education	-0.060	-0.030	0.026	0.007	0.002	0.304	0.171	0.318	0.190	0.031
	(-0.57)	(-0.51)	(0.19)	(0.09)	(0.13)	(2.84)***	(2.87)***	(1.84)*	(1.95)*	(1.95)*
Income	0.185	0.100	0.184	0.107	0.027	0.109	0.076	0.037	0.036	0.004
	(1.79)*	(1.76)*	(1.37)	(1.38)	(1.52)	(1.10)	(1.38)	(0.27)	(0.45)	(0.29)
Knowledge	-0.155	-0.090	-0.020	-0.017	-0.010	0.295	0.175	0.421	0.254	0.033
	(-0.81)	(-0.84)	(-0.08)	(-0.11)	(-0.28)	(1.74)*	(1.83)*	(1.65)*	(1.74)*	(1.44)
Food safety	0.125	0.060	0.114	0.062	0.010	-0.235	-0.129	-0.330	-0.204	-0.026
	(0.71)	(0.61)	(0.49)	(0.46)	(0.32)	(-1.49)	(-1.45)	(-1.45)	(-1.53)	(-1.20)
Price valuation	-0.871	-0.481	-0.820	-0.481	-0.106	0.056	0.027	0.073	0.046	0.007
	(-4.11)***	(-4.13)***	(-2.94)***	(-3.04)***	(-2.98)***	(0.45)	(0.38)	(0.40)	(0.42)	(0.39)
Frequency	0.219	0.116	0.175	0.094	0.027	0.041	0.039	-0.007	0.010	0.004
	(0.98)	(0.92)	(0.60)	(0.55)	(0.68)	(0.27)	(0.46)	(-0.03)	(0.08)	(0.18)
Supermarket	0.774	0.467	0.396	0.317	0.068	0.735	0.411	0.885	0.536	0.072
	(1.68)*	(1.77)*	(0.74)	(1.00)	(0.95)	(3.03)***	(3.04)***	(2.55)**	(2.68)***	(2.23)**
Shop	-0.476	-0.275	-0.374	-0.225	-0.067	0.722	0.417	0.860	0.542	0.083
	(-1.48)	(-1.49)	(-0.89)	(-0.88)	(-1.12)	(2.99)***	(3.09)***	(2.58)***	(2.80)***	(2.64)***

Farmer's market	0.076	0.059	-0.061	0.002	-0.003	0.353	0.175	0.544	0.299	0.037
	(0.32)	(0.45)	(-0.20)	(0.01)	(-0.08)	(1.42)	(1.26)	(1.57)	(1.48)	(1.13)
Official	0.744	0.408	0.456	0.279	0.086	0.605	0.351	1.152	0.727	0.101
	(1.75)*	(1.75)*	(0.77)	(0.82)	(1.11)	(1.48)	(1.5)	(1.91)*	(1.98)**	(1.74)*
Scientist	-0.466	-0.258	-1.163	-0.608	-0.114	-0.157	-0.094	0.179	0.107	0.028
	(-1.03)	(-1.01)	(-1.78)*	(-1.64)*	(-1.40)	(-0.28)	(-0.29)	(0.21)	(0.20)	(0.35)
Teacher	0.541	0.295	0.314	0.168	0.047	0.416	0.260	0.699	0.472	0.091
	(1.12)	(1.11)	(0.47)	(0.44)	(0.54)	(0.67)	(0.73)	(0.75)	(0.84)	(1.08)
Medical staff	0.255	0.151	0.274	0.156	0.051	0.434	0.246	0.934	0.587	0.089
	(0.32)	(0.33)	(0.29)	(0.27)	(0.39)	(1.16)	(1.14)	(1.64)	(1.70)*	(1.64)
Worker	0.200	0.112	0.062	0.056	0.017	1.098	0.640	1.414	0.902	0.134
	(0.69)	(0.69)	(0.16)	(0.25)	(0.32)	(2.31)**	(2.42)**	(1.90)*	(2.06)**	(1.89)*
Retire	0.551	0.264	0.290	0.136	0.017	0.257	0.179	0.576	0.424	0.061
	(0.91)	(0.76)	(0.38)	(0.30)	(0.17)	(0.62)	(0.75)	(0.95)	(1.15)	(1.03)
Unemployment	0.422	0.230	0.251	0.162	0.023	1.769	0.867	2.216	1.166	0.227
	(1.02)	(0.99)	(0.47)	(0.51)	(0.32)	(2.00)**	(1.92)*	(1.47)	(1.58)	(1.87)*
Intercepts	13.290	7.617			1.845	11.738	6.557			1.199
	(10.45)***	(11.10)***			(10.41)***	(10.29)***	(10.74)***			(10.57)***
/cut1			-3.778	-2.165				1.987	1.249	
/cut2			-2.627	-1.482				3.301	2.051	
/cut3			-0.579	-0.257				5.662	3.386	
/cut4			0.297	0.223				7.385	4.211	
Observations	820	820	180	180	180	975	975	179	179	179
Log likelihood	-314.446	-313.99	-245.217	-244.977	-280.504	-314.551	-314.423	-208.185	-206.67188	-264.652
LR chi2	505.29***	506.20***	35.28***	35.76***	35.76***	690.95***	691.21***	37.92***	40.95***	37.42***
Pseudo R^2	0.4455	0.4463	0.0671	0.068		0.5234	0.5236	0.0835	0.0901	

Notes: 1. DB refers to Double-bounded model; O refers to Ordered regression; Interval refers to interval regression.

2. *, ** and *** indicate statistical significance at 10%, 5% and 1% level, respectively.

3. t-values in parentheses.

Table 6 shows the corresponding results regarding meat. We find that the results are quite similar to those regarding vegetables. Firstly, people are less likely to pay if the price of green meat is higher (in DB models). Secondly, demographic characteristics again have some impact on WTP: Old people tend to pay a lower premium for green meat (only significant for Qingxian County); consumers with higher levels of education in Qingxian County are willing to pay a higher price for green meat. Thirdly, consumers' knowledge and perception regarding green food again matter. People who know more about green food in Qingxian County tend to pay a higher price for green meat, while consumers who think that the price of green food is too high are less likely to pay a high premium for green meat in Shijiazhuang. Fourthly, in Shijiazhuang consumers who usually buy food in supermarkets tend to pay a higher price. However, this result is not robust across different models. In Qingxian County, consumers who buy food in shops and supermarkets have a higher WTP for green meat, which corresponds to the results regarding green vegetables. Lastly, profession still has some impact on WTP in Qingxian County. Workers as well as officials are willing to pay a higher price for green meat.

Table 6: Meat

Variables	Shijiazhuang					Qingxian				
	DB-logit	DB-probit	O-logit	O-probit	Interval	DB-logit	DB-probit	O-logit	O-probit	Interval

Price	-2.287	-1.262				-2.207	-1.203			
	(-13.78)***	(-15.65)***				(-14.99)***	(-17.12)***			
Male	-0.264	-0.146	-0.406	-0.189	-0.251	-0.253	-0.161	0.0002	-0.016	-0.041
	(-0.95)	(-0.95)	(-1.22)	(-0.98)	(-1.58)	(-0.99)	(-1.13)	(0.00)	(-0.07)	(-0.30)
Age	-0.009	-0.004	-0.013	-0.009	-0.002	-0.024	-0.015	-0.025	-0.016	-0.009
	(-0.57)	(-0.50)	(-0.73)	(-0.86)	(-0.24)	(-2.04)*	(-2.27)**	(-1.42)	(-1.51)	(-1.44)
Education	-0.195	-0.114	-0.146	-0.058	-0.048	0.325	0.201	0.338	0.212	0.127
	(-1.55)	(-1.62)	(-0.99)	(-0.71)	(-0.71)	(2.84)***	(3.15)**	(1.98)**	(2.08)**	(1.92)*
Income	0.164	0.082	0.193	0.078	0.067	0.139	0.061	0.132	0.083	0.051
	(1.36)	(1.23)	(1.42)	(0.99)	(1.00)	(1.33)	(1.05)	(0.95)	(0.99)	(0.90)
Knowledge	0.010	-0.005	0.104	0.041	0.017	0.279	0.145	0.524	0.301	0.170
	(0.04)	(-0.04)	(0.39)	(0.26)	(0.13)	(1.52)	(1.44)	(1.97)**	(2.02)**	(1.76)*
Food safety	0.108	0.069	0.156	0.085	0.064	-0.223	-0.133	-0.272	-0.200	-0.134
	(0.52)	(0.59)	(0.66)	(0.61)	(0.56)	(-1.31)	(-1.42)	(-1.10)	(-1.43)	(-1.50)
Price valuation	-1.388	-0.774	-1.315	-0.699	-0.539	-0.045	-0.015	-0.066	-0.037	-0.037
	(-5.27)***	(-5.36)***	(-4.42)***	(-4.24)***	(-4.00)***	(-0.33)	(-0.20)	(-0.33)	(-0.32)	(-0.52)
Frequency	-0.313	-0.184	-0.393	-0.185	-0.150	0.213	0.147	-0.039	0.003	0.027
	(-1.18)	(-1.26)	(-1.26)	(-1.06)	(-1.01)	(1.30)	(1.62)	(-0.17)	(0.02)	(0.31)
Supermarket	0.946	0.531	-0.279	-0.241	-0.336	0.372	0.178	0.578	0.357	0.194
	(1.71)*	(1.70)*	(-0.48)	(-0.75)	(-1.25)	(1.46)	(1.26)	(1.62)	(1.69)*	(1.43)
Shop	-0.131	-0.090	-0.023	-0.072	-0.081	0.531	0.267	0.867	0.486	0.303
	(-0.34)	(-0.42)	(-0.05)	(-0.27)	(-0.36)	(2.09)**	(1.89)*	(2.50)**	(2.39)**	(2.29)**
Farmer's market	0.124	0.040	0.209	0.132	0.021	0.299	0.191	0.121	0.133	0.086
	(0.45)	(0.26)	(0.63)	(0.70)	(0.13)	(1.14)	(1.28)	(0.34)	(0.63)	(0.62)
Official	0.736	0.412	0.619	0.305	0.252	0.545	0.210	1.480	0.946	0.530
	(1.48)	(1.50)	(1.04)	(0.88)	(0.86)	(1.23)	(0.86)	(2.23)**	(2.36)**	(2.18)**
Scientist	0.629	0.415	0.439	0.271	0.154	0.656	0.313	0.393	0.449	0.346
	(1.15)	(1.36)	(0.68)	(0.74)	(0.50)	(1.07)	(0.95)	(0.37)	(0.77)	(1.01)
Teacher	0.479	0.313	-0.003	0.016	0.058	0.810	0.393	1.618	1.022	0.346
	(0.85)	(1.02)	(-0.00)	(0.04)	(0.12)	(1.19)	(1.03)	(1.62)	(1.74)*	(1.53)
Medical staff	-0.725	-0.420	0.081	0.074	-0.164	0.092	-0.022	0.965	0.672	-0.076
	(-0.77)	(-0.75)	(0.08)	(0.12)	(-0.60)	(0.23)	(-0.10)	(1.54)	(1.79)*	(-0.15)
Worker	0.214	0.147	0.254	0.109	0.050	1.010	0.458	1.433	0.932	0.545
	(0.63)	(0.77)	(0.63)	(0.47)	(0.26)	(2.01)**	(1.66)*	(1.85)*	(1.99)**	(1.84)*
Retire	-0.595	-0.362	-0.740	-0.515	-0.416	-0.310	-0.294	0.467	0.285	0.141
	(-0.81)	(-0.86)	(-0.91)	(-1.05)	(-1.07)	(-0.70)	(-1.19)	(0.70)	(0.70)	(0.56)
Unemployment	0.156	0.068	-0.023	-0.032	-0.022	-0.001	-0.101	-0.380	-0.217	0.599
	(0.32)	(0.25)	(-0.04)	(-0.10)	(-0.07)	(-0.00)	(-0.21)	(-0.27)	(-0.27)	(1.67)*
Intercept	23.953	13.322			10.996	16.465	9.065			7.343
	(11.61)***	(12.62)***			(16.47)***	(11.46)***	(12.20)***			(15.41)***
/cut1			-6.371	-3.583				2.507	1.573	
/cut2			-3.911	-2.130				4.485	2.727	
/cut3			-2.709	-1.466				5.928	3.450	
/cut4			-0.161	-0.308						
Observations	820	820	180	180	180	975	975	179	179	179
Log likelihood	-225.154	-226.845	-208.650	-210.059	-234.062	-275.278	-279.700	-175.106	-175.697	-203.922
LR chi2	664.46***	661.08***	39.07***	36.25***	32.48**	709.16***	700.31***	30.99**	29.80**	25.89
Pseudo R^2	0.5961	0.5930	0.0856	0.0794		0.5630	0.5559	0.0813	0.0782	

Notes: 1. DB refers to Double-bounded model; O refers to Ordered regression; Interval refers to interval regression.

2. *, ** and *** indicate statistical significance at 10%, 5% and 1% level, respectively.

3. t-values in parentheses

Table 7 displays the detailed results concerning eggs. Different from vegetables and meat, DB models cannot converge for Qingxian County. Thus, the discussion of the results regarding egg consumption in Qingxian County focuses on ordered regressions and interval regression. As before, people are less likely to pay if the price of green food is higher (in DB models). Old people tend to pay a lower price for green eggs, but the coefficients are not always significant. The most confusing finding is that people with higher levels of education

have a lower WTP in Shijiazhuang, which might be related to their mistrust towards green eggs. We also find that consumers who have more knowledge about green food tend to pay a higher premium for green eggs in Qingxian County, and people who think that the price of green food is too high are less likely to pay a higher price. Shopping places still have some impact on the WTP. In Shijiazhuang, consumers who often go to shops and farmers' markets to buy food have a lower WTP for green eggs. A possible explanation might be that they consider the eggs in farmers' markets and shops to be much safer. However, in Qingxian County the WTP for green eggs is higher for those people who usually go to supermarkets and shops. In addition, the profession still has some impact on the WTP. Officials, scientists and medical staff have a higher WTP for green eggs in Shijiazhuang, while in Qingxian County, workers' and officials' WTP for green eggs is higher.

Table 7: Eggs

Variables	Shijiazhuang					Qingxian		
	DB-logit	DB-probit	O-logit	O-probit	Interval	O-logit	O-probit	Interval
Egg price	-4.237	-2.047						
	(-13.38)***	(-15.76)***						
Male	0.007	0.03	-0.273	-0.179	-0.01	-0.408	-0.215	-0.064
	-0.03	-0.24	(-0.77)	(-0.88)	(-0.13)	(-1.10)	(-1.01)	(-1.78)*
Age	-0.021	-0.011	-0.017	-0.008	-0.004	-0.0004	-0.002	0.0005
	(-1.69)*	(-1.60)	(-0.94)	(-0.77)	(-0.88)	(-0.02)	(-0.18)	-0.28
Education	-0.209	-0.113	-0.115	-0.059	-0.0003	0.205	0.141	0.023
	(-2.05)**	(-1.97)**	(-0.76)	(-0.68)	(-0.01)	-1.15	-1.37	-1.36
Income	0.063	0.038	0.018	0.014	-0.005	0.076	0.044	0.006
	-0.65	-0.69	-0.13	-0.17	(-0.16)	-0.52	-0.51	-0.39
Knowledge	0.259	0.149	0.297	0.151	0.072	0.709	0.377	0.057
	-1.4	-1.43	-1.11	-0.95	-1.12	(2.59)***	(2.49)**	(2.27)**
Food safety	0.273	0.169	0.291	0.187	0.06	-0.28	-0.157	-0.018
	-1.63	(1.77)*	-1.17	-1.26	-1.05	(-1.13)	(-1.11)	(-0.75)
Price valuation	-0.511	-0.283	-0.564	-0.224	-0.086	-0.164	-0.119	-0.02
	(-2.54)**	(-2.51)**	(-1.93)**	(-1.33)	(-1.30)	(-0.81)	(-1.03)	(-1.04)
Frequency	0.044	0.022	0.02	0.023	0.025	-0.172	-0.092	-0.025
	-0.21	-0.18	-0.06	-0.12	-0.34	(-0.71)	(-0.67)	(-1.10)
Supermarket	0.414	0.243	0.238	-0.119	-0.017	0.484	0.261	0.077
	-0.92	-0.93	-0.38	(-0.34)	(-0.13)	-1.29	-1.21	(2.16)**
Shop	-0.524	-0.311	-0.72	-0.446	-0.139	0.611	0.339	0.088
	(-1.69)*	(-1.73)*	(-1.42)	(-1.49)	(-1.26)	(1.68)*	(1.64)*	(2.54)**
Farmer's market	-0.418	-0.285	-0.327	-0.242	-0.117	0.061	-0.008	-0.006
	(-1.87)*	(-2.25)**	(-0.97)	(-1.20)	(-1.49)	-0.17	(-0.04)	(-0.16)
Official	1.306	0.7	1.086	0.557	0.227	1.016	0.625	0.107
	(3.19)***	(3.17)***	(1.83)*	-1.6	-1.57	-1.57	-1.62	(1.69)*
Scientist	0.769	0.434	0.233	0.07	0.021	0.2	0.234	0.049
	(1.75)*	(1.78)*	-0.35	-0.18	-0.14	-0.2	-0.42	-0.55
Teacher	0.334	0.307	-0.348	-0.198	0.005	0.8	0.584	0.025
	-0.74	-1.22	(-0.51)	(-0.49)	-0.02	-0.81	-1.01	-0.43
Medical staff	1.367	0.676	0.802	0.311	-0.172	0.093	0.144	-0.092
	(1.74)*	-1.54	-0.88	-0.54	(-1.27)	-0.15	-0.39	(-0.70)
Worker	-0.126	-0.104	-0.196	-0.207	-0.108	1.812	1.14	0.256
	(-0.46)	(-0.66)	(-0.47)	(-0.84)	(-1.11)	(2.28)**	(2.50)**	(3.35)***
Retire	0.001	-0.054	-0.911	-0.698	-0.122	0.282	0.147	0.008
	0	(-0.16)	(-0.93)	(-1.25)	(-0.64)	-0.43	-0.38	-0.12
Unemployment	-0.394	-0.246	-0.635	-0.466	-0.006	-0.886	-0.587	0.121
	(-1.01)	(-1.09)	(-1.05)	(-1.32)	(-0.04)	(-0.66)	(-0.72)	-1.28
Intercept	13.501	6.593			3.136			2.626
	(10.00)***	(9.85)***			(9.53)***			(21.09)***
/cut1			-1.397	-0.722		-3.764	-1.839	
/cut2			-0.53	-0.204		2.197	1.201	

/cut3			1.001	0.651		3.792	2.127	
/cut4			1.669	0.99		5.591	3.096	
/cut5			2.301	1.28				
/cut6			3.938	1.921				
Observations	984	984	180	180	180	179	179	179
log likelihood	-330.411	-344.462	-217.321	-217.777	-319.441	-168.506	-167.671	-196.383
LR chi2	559.10***	531.00***	25.15	24.23	24.08	28.51*	30.18**	41.56***
Pseudo R^2	0.4583	0.4353	0.0547	0.0527		0.078	0.0826	

Notes: 1. DB refers to Double-bounded model; O refers to Ordered regression; Interval refers to interval regression.

2. *, ** and *** indicate statistical significance at 10%, 5% and 1% level, respectively.

3. t-values in parentheses

5 Conclusion

In this paper we first give a brief introduction into the payment card (PC) approach including the relevant theory and the different payment card methods. We furthermore use PC data collected in Hebei province to analyse consumers' WTP for green food in China.

Five different methods are used to calculate the WTP for green vegetables, green meat and green eggs. We find substantial differences between the results obtained by different methods and also that the WTP values for Shijiazhuang are always higher than those for Qingxian County. Even though there are 6 approaches of estimating WTP of PC, we find that WTP estimated from the Method of Interval Mid-Point is slightly higher than others, while those from ordered logit and ordered probit are the smallest. We find a downward methodological bias in ordered regression and suggest using the double-bounded model.

Furthermore, the WTP for green meat is higher than the WTP for green vegetables and green eggs. However, the ratio of the premium for green meat to the price of conventional meat is lower than in the case of the other products. In addition, we also find that the ratio of premium to price ranges mainly between 25% and 50%, which is quite high compared with current studies.

We also studied the determinants of consumers' WTP values. Our main conclusions include:

1. The price has a negative impact on consumers' WTP for green food.

2. The WTP for green food is partly determined by demographic characteristics. Firstly, old people have a significantly lower WTP for green vegetables, while sex and income don't have significant effects. Secondly, education has a positive effect on the WTP for green food in Qingxian County, while in Shijiazhuang people with higher education have a lower WTP for green eggs.

3. Knowledge is positively related with consumers' WTP for green food in Qingxian County, while in Shijiazhuang consumers' perception of the price of green food has a negative effect on their WTP values.

4. The shopping place also has some impact on the WTP. In Shijiazhuang, people who usually go to supermarkets have a higher WTP for green vegetables and meat, while people who usually go to shops or farmers' market have a lower WTP for green eggs. In Qingxian County, the WTP is higher for those who usually go to supermarkets and shops.

5. The profession affects consumers' WTP values. In Qingxian County, workers and officials always have a higher WTP, while in Shijiazhuang, officials prefer green vegetables and eggs, while scientists prefer only green eggs, and have a lower WTP for green vegetables.

Some issues, which could affect the results of our study, include possible interval and end point biases stemming from our use of the payment card approach. One more issue, which has to be mentioned, is the ordering effect, which refers to the sequence in which the WTP values have been collected. Ready et al. (2001) point out that there are two ordering effects; one is the pure ordering effect, which refers to the fact that the chosen value on a payment card is influenced by previous episode. In the present context this would imply that WTP for vegetables might affect that for meat and eggs. The other ordering effect is the learning effect. It results from the fact that respondents gain experience in the first round WTP question, which might affect their later responses. The direction of the pure ordering effect is ambiguous, while the learning effect is supposed to decrease the stated values during later rounds. However, we cannot be sure whether respondents would change their answers if the order of food categories changed. This issue remains to be analyzed in the future.

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