Willingness to Pay for the "Green Food" in China

Xiaohua YU [#]
Professor
Courant Research Center "Poverty, Equity and Growth"
University of Göttingen
CRC-PEG, Whilhelm-Weber-Str. 2
Göttingen, 37073 Germany
+49-551-3919574
xyu@uni-goettingen.de

Zhifeng Gao
Assistant Professor
Food and Resource Economics Department
University of Florida
zfgao@ufl.edu

Yinchu Zeng
Professor
School of Agricultural Economics and Rural Development
Renmin University of China
No. 59, Zhongguancun Street
Haidian District
Beijing, 100872, China
Zengyc@ruc.edu.cn

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Abstract:

With use of payment card survey data of willingness to pay (WTP) for the "Green Food", a unique food certification in China, this study finds that age and income are important for the WTP for the Green Food in China. There are structural differences in consumer preference for Green Food between the large city and the small county. Consumers in China, on average, are willing to pay 47% more for Green vegetables and 40% more for Green meat than for their conventional counterparts. Compared with the real markets and the previous studies, our results are very consistent and reliable.

Key Words: WTP, Green Food, Interval Regression, China,

JEL: I12, Q18

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Introduction

As income increases, consumers tend to consume high-quality food (Deaton 1988, Yu and Abler 2009, Tian and Yu 2013). Food safety and sustainability are two important dimensions in food quality, so that green or organic food with less chemical residuals has become more popular across the world (Huang 1996, Sirieix et al. 2011, Yin et al. 2010). China is no exception. After a series of severe food safety scandals (e.g. adulteration of Melamine in milk in 2008 and the recent gutter oil scandal), the Chinese government has adopted a comprehensive food certification system to enhance and ensure safety (Yu 2012). According to the stringency of standards, the certification system is made up of three levels for food production: Safe Food Certification, Green Food Certification and Organic Food Certification. In comparison with the unified international standard of organic food, the Chinese food certification system is multi-leveled and tedious. The definition and certification logos are shown in Figure 1.

[Insert Figure 1]

First introduced in 2003, "Safe Food" Certification is the least stringent, allowing certified food products to contain some pesticides residues, heavy metals and microorganism contents, but still at a level safe for consumers. In contrast, "Green Food" , more stringent than "Safe Food", is more widely accepted in China, as it was initiated as early as 1989 (Sanders 2006). Food that is permitted to be sold with the "Green Food" logo and trademark (as shown in Figure 1) is safe and nutritious. It is

produced and processed by specific models under the principle of sustainable development and certified by a particular organization based on special standards. The third and also the most stringent certification is "Organic Food", which has a similar definition and standards to the equivalent in other countries and is certified by a number of non-government organizations. The details of the certification system in China are demonstrated in Figure 1.

"Safe Food" and "Green Food" are two certifications unique in China. Their certification is managed by government agencies under the Ministry of Agriculture. The Chinese government realizes that most food products in China, as a developing country, cannot reach the stringent standards of organic food elsewhere and that it would be more practical to develop some less stringent certifications to fulfill the market demand. Though the certification of "Green Food" has a long history and is widely accepted by consumers in China, studies on consumer preference for it are only conducted in a very limited way. This paper tries to fill in the gap by using a consumer survey to quantitatively study consumer willingness to pay (WTP) for "Green Food" in China,

Currently, certification and monitoring of "Green Food" is conducted by the *China Green Food Development Center* under the Ministry of Agriculture in China, and the "Green Food" 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.[1]

The certification of "Green Food" can be divided into two different levels: Grade A (allowing the use of a certain amount of chemical materials) and Grade AA (equivalent to "organic food"). The Grade A "Green Food" lays the foundations for the development of grade AA. However, due the intensification of the "Organic Food" Certification, *China Green Food Development Center* officially suspended the certification of Grade AA "Green Food" in June 2008. Certification of Green Food is only valid for three years, and the firms should reapply for certification before the expiration. Thiers (1999) and Sanders (2006) have conducted comprehensive reviews of the history and the controversies of "Green Food" certification in China.

It is believed that the development of "Green Food" and organic food can increase the environmental sustainability of agriculture, can reduce the food-borne diseases and may increase farmers' income in China (Sanders 2006, Sirieix et al. 2010, Yang et al. 2013, and Yin et al. 2011). In addition, the certification of "Green Food" and organic food has important implications for international agricultural trade. For example, it could reduce trade barriers (Martinez and Banados 2004) as certification controls and ensures food quality and therefore such food can be more easily accepted by consumers in importing countries.

[1] Source: China Green Food Development Center.
http://www.greenfood.org.cn/sites/GREENFOOD/List_3675_3812.html

Since the initiation of "Green Food" in 1989, both the numbers of certified firms and the certified products have steadily increased, however this has leveled off in recent years (Figure 2). It evidences that the certification market of Green Food in China is relatively mature now. In the year of 2012, China newly certified 2,614 firms and 6,862 products. Until 2012, a total of 6,196 firms obtained "Green Food" certifications covering 17,125 products. Compared with the figure a decade before, both the number of certified firms and the number of products increased by more than 4 folds.

[Insert Figure 2, 3]

The increase in "Green Food" certification has a substantial impact of agricultural land use in China. Figure 3 demonstrates the change in land area (including farmland, grassland, aquaculture water area) covered by Green Food certification. The area has increased from 58 million *mu*[2] in 2001 to 242 million *mu* in 2012, in which 205 million *mu* is farmland. The proportion of the farmland covered by Green Food certification has reached 11.4%, which is an impressive figure given that total farmland area is about 1.8 billion *mu* in China. This implies that the Green Food certification has been widely accepted in China, particularly for producers.

However, the current literature gives a mixed picture about the yield difference between certified and conventional food products in China. For instance, Yang (2005 pp. 99-102) reported that there is no significant yield difference for spinach and leeks, but that of Green tomatoes is significantly higher than conventional ones, while the yield of Green cucumbers is significantly lower.

After more than two decades of the development of Green Food certification, it is important to conduct an assessment for the policy of extension of "Green Food" in China.

[2] mu is a measurement unit of land area: 1 hectare = 15 mu.

The cost-benefit analysis is prevalent for policy analysis in the current literature. When the benefit is a non-market good, willingness to pay (WTP) is often used as a proxy for calculating the benefits of food safety for consumers (Golan and Kuckler 1999).

There is a large body of literature studying the perception of or the WTP for food safety, organic food, less pesticides residuals and food production origins (Golan and Kuckler 1999; Thompson 1998; Florax, Travisi, and Nijkamp 2005; Padilla et al. 2007; Wang et al. 2007; Wier et al. 2008; Gracia and de Magistris 2008; Roitner-Schobesberger et. al 2008; Gao, House and Yu 2010; Gao and Schroeder 2009; Xia and Zeng 2008). A general finding is that certification can increase consumer welfare (Padilla et al. 2007), because greater information on organic food or general certified food can increase the demand (Wier et al. 2008; Gracia and de Magistris 2008).

Even though consumers' attitudes towards Green food in China are not well researched, plenty of studies have been conducted on preferences for organic food in different countries, and their results can be used for comparison. In a meta-analysis of 96 observations, Xia and Zeng (2008) find the WTP values for organic food are very diverse: the mean premium is 36%; the highest value reaches 509.2%, while the lowest is only 2.3%. In a study on WTP for organic food in China, Yin et al. (2010) find that the premiums for organic food are as high as 130% in some Chinese cities. Other related research is on consumer WTP for reduced use of pesticides or chemicals because the main purpose of Green Food certification is to reduce inputs of chemical use in food production. In a meta-analysis of 60 studies with 316 WTP observations, Florax, Travisi, and Nijkamp (2005) find the WTP values for reduced risk exposure are approximately 15% and 80% from low to medium and high risk-exposure levels, respectively.

The standard of organic food certification is too stringent for most producers in China. Most Chinese consumers still feel that organic food is too expensive (Yin et al. 2010), and cannot afford it. The certification of Green Food, which has a lower standard, has become more prevalent in China. It hence is important to study the consumers' preference for it.

The objective of this study is to empirically analyze the WTP for the unique Green Food certification in China. This paper is outlined as follows: First, an econometric model is constructed; second, the survey data of WTP for Green vegetables and meat is introduced from Shijiazhuang City (a large city) and Qingxian County (a small county) in Hebei Province; and finally the conclusions and policy implications are obtained. Particularly, we compared the results between the large city and the small county to make the results more representative.

Model

Following the theoretical framework of Hanemann (1984) and Yu and Abler (2010), we assume there are only two food choices in the market: conventional food and Green/organic food. All Green products have certification and the information is symmetric. $u(p_0, 0; X)$ and $u(p_1, 1; X)$ are the utility functions for consumption of a unit of conventional and Green/organic food respectively. Here, 0 and 1 denote respectively the indices for conventional and Green/organic food products; p_j ($j = 0,1$) is the price and X is a vector of other control variables, such as income and demographic variables (Yin et al. 2010; Sirieix et al. 2011; Xia and Zeng 2008).

We specify that the utility function is separable, so that

$$u(p_j, j; X) = \alpha_j(X) - bp_j \qquad (1)$$

where $\alpha_j(X)$ is the direct utility from food consumption; b is a scalar and $b > 0$. We define WTP for Green Food as the price premium that makes people indifferent between buying conventional food and Green Food, $u(p_0 + T, 1; X) = u(p_0, 0; X)$, which yields,

$$T = \frac{1}{b}[\alpha_1(X) - \alpha_0(X)] \qquad (2)$$

where $T = p_1 - p_0$, defined as the WTP for the Green/organic food.

We assume the utility function $\alpha_j(X)$ is linear and that $\alpha_j(X) = X\beta_j$, where β_j is the corresponding coefficient vector for X, denoting the marginal effect of X on direct utility $\alpha_j(X)$. Finally, we could obtain an estimatable econometric model:

$$T = X\beta \qquad (3)$$

where $\beta = \frac{1}{b}(\beta_1 - \beta_0)$, and it denotes the marginal effect of X on the WTP values. However, our model also indicates that β is the difference between the marginal effects of X on Green/organic food utility and on conventional food utility. In the rest of the paper we will specifically estimate the model with use of a survey data of WTP for green food respectively in a small county and a major city in China.

Method and Data

- **Sample**

The data used in this study is from the survey of WTP for Green Food in Qingxian County and Shijiazhuang City in the Hebei Province in North China, conducted by the

School of Agricultural Economics and Rural Development at Renmin University of China in 2003. Qingxian County neighbors Tianjin City and is located about 150 km in the southeast of Beijing City. It has a population of about 385 thousand, of which about 330 thousand are in rural areas. The survey in Qingxian County only includes the urban areas. Shijiazhuang City, as the capital of the Hebei Province, is located about 270 km to the south of Beijing City. It is also a major city in China and has a population of 2.17 million.

The survey includes 408 samples: 208 in Qingxian County and 200 in Shijiazhuang City. All samples are randomly selected in local supermarkets and questioned by our investigators. Table 1 gives the explanations for the variables and shows the descriptive statistics. The variables include WTP for Green vegetable and meat, the demographic characteristics, such as age, sex, education, and family income, the characteristics of food shopping behavior, such shopping place, and food shopping frequency. Comparing the main demographic variables between the two regions, we find that (1) the proportion of females in Shijiazhuang city is slightly higher than that in Qingxian County, which is perhaps due to the fact that females in large cities are more likely to go shopping; (2) there is no significant difference in the mean ages; (3) intuitively, both the education level and income of consumers in the large city (Shijiazhuang) are higher than those in the county (Qingxian County).

[Insert Table 1]

- **Eliciting Method**

Green Food certification is a typical non-market good. There are two approaches to measure the benefits of Green food: the revealed (non-hypothetical) preferences approach

and the stated (hypothetical) preferences approach (Ready et al. 1996; Bockstael and Freeman 2005). Even though a non-hypothetical survey might be more reliable and has less bias (Olesen et al. 2010), the hypothetical survey is more prevalently used as it is more convenient. Specifically, List and Shogren (1998), and Alfnes and Rickertsen (2011) indicate WTP values in hypothetical markets are often slightly higher than those in real markets. Due to the difficulty of the revealed approach in survey designs, this survey uses the stated preferences approach, and particularly payment card, to reveal the willingness to pay for Green food.

The eliciting method is critical for estimating WTP values. The prevalent approaches in the current literature include: open-ended, payment card, dichotomous choice approach, and choice experiment (Ready et al. 1996, Yu and Abler 2010, Yang et al. 2013, Alfnes and Rickertsen 2011, Yang et al. 2014). Even though the open-ended approach, which lets respondents freely give a number of WTP, is very flexible, it suffers from a problem of many zero WTP observations. Those zero observations may have different scenarios. It could be a true zero WTP, or a protest zero WTP, or just a missing answer (Ready et al. 1996, Yu and Abler 2010). This could eventually cause technique problems in econometric exercises and bias the final results. Ready et al. (1996) point out that the dichotomous choice approach could avoid the problem of zero observations, but it may cause strategic bias due to the initial bidding number. In general, the current literature finds that WTP values from the dichotomous choice approach is higher than those from the open-ended approach.

The payment card approach stands somehow between the open-ended approach and the dichotomous choice, as it allows respondents to pick a number or an interval from a

list of given values. Hence it reaps both advantages of the above two approaches and is therefore prevalent in the current literature (Hackl and Prucker 1999, Yang et al. 2013, Yang et al. 2014).

- **Survey Design**

In the survey, we select vegetables and meat (pork) as our hypothetical products. Vegetables and pork are two major Green products certified in China. Particularly, pork accounts for more than 60% of Chinese meat consumption[3].

The price for the conventional vegetable is set as 1 *yuan/ jin*[4]; and the price for the conventional meat (pork) is set as 6 *yuan / jin*. According the study of Xia and Zeng (2008), the WTP premiums are quite diverse, from 2% to 500%; but more than 95% studies find that the premium is below 100%.

In the survey, we requested the respondents to pick the maximum acceptable price for Green Food products in the price list. The choices of prices for the Green vegetable in the payment card include 6 intervals, 1.0-1.2 yuan 1.2-1.3 *yuan*, 1.3-1.5 *yuan*, 1.5-1.8*yuan*, 1.8-2.0 *yuan*, and 2.0 *yuan* or above. The choices for the green meat are 6-7 *yuan*, 7- 8 *yuan*, 8-9 *yuan*, 9-10 *yuan*, 10-12 *yuan,* and 12 *yuan* or above.

The frequency distribution of the respondents' choices is demonstrated in Figure 4. It makes sense that the consumers in Shijiazhuang City are more likely to pay higher premium for Certified Green Food than those in Qingxian County. Note that neither the price of '2.0 *yuan* or above' for Green vegetable, nor the price of '12 *yuan* or above' for Green meat is selected by a consumer in our survey. It indicates that consumers are very

[3] Source: The Statistical Yearbook of China (2012).
[4] *jin* is a weight unit used in China, 1 *jin*=500 g = 0.5 kg.

conservative and not willing to pay a premium of more than 100% for Green food in the two regions.

[Insert Figure 4]

- **Statistics for WTP**

There are two main statistical methods to calculate the WTP values obtained from the Payment Card Eliciting Approach (Yang et al. 2013). The simple one is the Ordinary Least Squared estimation (OLS) calculated by assuming the independent variable (true WTP value) is the middle point of the interval. The other is the interval regression, which is the more prevalent method with more flexible distribution assumption of WTP values in each interval (Yang et al. 2014).

Table 1 reported that the means of WTP by assuming the true values is the middle point of the interval (the WTP value for the up-open interval is equal to the sum of the lower boundary and the half distance of the neighboring interval). Then, the mean WTP values for the Green vegetable are 0.40 *yuan*, 0.38 *yuan* and 0.43 *yuan, respectively* for the whole sample, Qingxian County and Shijiazhuang City; and the mean WTP values for the Green pork are 2.56 *yuan*, 2.26 *yuan* and 2.86 *yuan*. This indicates that the consumers in Hebei Province are willing to pay about 40% more for Green vegetable than conventional vegetable, and about 43% more for Green meat than conventional meat; and that the WTP for "Green Food" (either for vegetables or for meat) in Shijiazhuang City is significantly higher than that in Qingxian County. These values are consistent with the

current literature on WTP for organic food (Xia and Zeng 2008) or food with reduced risk exposure (Florax, Travisi, and Nijkamp 2005)

Even though consumers are willing to pay 40% more for Certified Green food in China, the prevalence of Green Food is still not high enough, particularly in rural area, as the proportion of the farmland related to Green Food certification reaches a number of 11.4%. Chen (2013) points out that trust plays an important role in linking the WTP values to actual purchase. Yin et al. (2010), Sirieix et al. (2011) and Chen (2013) indicate that consumers do not have a high level of trust in organic certification in China. Similar scenario would apply to the Green Food certification in China.

The current literature shows demographic characteristics are important for WTP for Green food / organic food (Thompson 1998, Xia and Zeng 2008; Yin et al. 2011, Sirieix, et al. 2010). The following section will empirically study the determinants of WTP for "Green Food" in China. Specifically, we will take look at the impacts of income and other demographical variables on the WTP values.

Estimation

The WTP values obtained by the Payment Card methods are not continuous, consisting of intervals and censoring observation. The Interval Regression Approach, a generalized Tobit model (Amemiya 1983), is the main technique to tackle such a data structure (Yang et al. 2014, Davidson and MacKinnon 2004, sec. 11.6). Table 2 reports the estimation results of Equation (3) for the samples in Qingxian County, Shijiazhuang

City, and the whole sample, respectively.[5] The results for eight different models are basically consistent, evidencing their robustness.

The pooling estimation with a regional dummy could detect the regional difference in WTP under the condition of no structural difference. It shows that consumers in Shijiazhuang City would like to pay 0.075 yuan (or 7.5%) and 0.383 cents (6.4%) more than those in Qingxian for certified Green vegetables and meat respectively.

We use a likelihood ratio test to specify the model between pooling and separable estimation, testing the structural difference between Shijiazhuang City and Qingxian County. The test rejected the null hypothesis of no structural difference at the significant level of 1% for both meat and vegetables. It reveals a structural difference between the two regions. The discussion in the next section will be based on the results of the separated estimation.

Another important issue for studying WTP for food certification is the computation of means and median values for the WTP. This could yield important policy implications (Thompson 1998). Table 3 presents the means and median values for WTP for the Green vegetable and meat both in Shijianzhuang City and Qingxian County respectively, using both the raw data and the predicted value. The tests for regional difference are also reported.

[Insert Table 2 & 3]

Results

[5] We also run OLS regressions, and the results are very consistent with those of the interval regression. The OLS results are not reported.

The regression results in the two regions are quite consistent regarding the coefficients signs and significant levels. The coefficients for age are all negative and statistically significant both for Green vegetables and for Green meat, either in Qingxian County or in Shijiazhuang City. An explanation to this is that, as the youth have longer life expectations than the elder they may have more benefits from good health, and are therefore willing to pay more for Green Food than the elder. Another explanation might be that the elder are less likely to change their eating habits and are less likely to pay for new food attributes, such as Organic/ Green Food.

The coefficients for income2 (1000≤monthly family income<2000) are not statistically significant for the two food products in both regions and the coefficients for income3 (2000≤monthly family income<3000) are only marginally significant for Green meat in Shijiazhuang City. All the coefficients for income4 (3000≤monthly family income) are positive and statistically significant except for the vegetables in Shijiazhuang City. The coefficients are greater than those for income2 and income3. This implies that the differences in the WTP for Green Food in the class of monthly family income less than 1000 *yuan*, the class between 1000 *yuan* and 2000 *yuan*, and the class between 2000 *yuan* and 3000 *yuan* are not significant. Only when the monthly family income is more than 3000 *yuan*, the behaviors of consumers change dramatically. Consumers with a monthly family income of more than 3000 *yuan* in the two regions are willing to pay more for the Green food than consumers with a family income of less than 3000 *yuan*. It makes sense that the rich class pays more attention to the attributes of Green/Organic Food and is consistent with findings in the current literature (Yin et al. 2010).

Table 2 also shows that the coefficients for the variable of supermarket are positive and statistically significant only for the vegetables in Qingxian County. Chen (2013) and Sirieix et al. (2011) point out that consumers think that supermarkets are more reliable and they trust the products more in the supermarkets in comparison to farm markets and food stores. This is especially important for vegetables, which are less standardized than meat. It is easier for consumers to punish supermarkets than to punish the sellers in farmer markets if there are disputes over food quality.

In addition, the coefficient for high-school-education is marginally significant only for the Green vegetables in Qingxian County. Gender differences are not significant for both foods, either in Shijiazhuang City or in Qingxian County.

The computation of the mean and median values of WTP has very important policy implications. Table 3 reports the mean and median values of WTP using both the raw data (the middle point of the intervals) and the predicted values from the above interval regressions. The results indicate that the mean and median values of WTP for Green vegetables in the whole sample are, respectively, 0.40 *yuan* and 0.25 *yuan* in the raw data, and 0.47 and 0.30 using the predicted values. The mean and median values of WTP for Green meat in the pooled sample are 2.56 *yuan* and 2.50 *yuan* using the raw data, and 2.39 and 2.46 when using the predicted values.

Three facts could support that the predicted values are usually more reliable than the raw data (Yu and Abler 2010). First, it is well known that the variance of the raw data is often larger than that of the predicted values. Second, the distribution in each interval is unknown, so that arbitrarily taking the middle-point may cause bias. Third, the deviation between the mean and median WTP values is much higher in the raw data, implying that

the skewness for the predicted values is smaller. We hence use the predicted WTP values in our discussion.

The estimation implies that the consumers in China, on an average, are willing to pay 47 % more for Green vegetables than for conventional vegetables, and 40% more for Green meat than for conventional meat. The higher price premium for vegetables than for meat might be caused by the fact that vegetables are less standardized than meat.

List and Shogren (1998) point out that the bids in hypothetical markets are often slightly higher than those in real markets. It is also reasonable that the price premiums for certified Green Food would be different for different products in the real markets. According to Yang's study (2005 pp. 99-102), the Green A premiums for spinach, leeks, tomatoes, and cucumbers are 17%, 60%, 67%, and 31% respectively. The mean price premium for these products is 44%, which is comparable to the results of our hypothetical market. In addition, our estimates are also consistent with the mean premiums of 36% for organic food from the meta-analysis of Xia and Zeng (2008), and the median premiums of 47.5% for food with reduced risk exposure from the meta-analysis of Florax, Travisi, and Nijkamp (2005) .

Compared with the high premiums of more than 130% for organic food in the study of Yin et al. (2010), the WTP values for the Green Food are much lower. It is possible that consumers recognize that the standard of the Green Food is less stringent than that of Organic Food.

Table 3 shows that the means of WTP for the Green food products in Shijiazhuang City are higher than those in Qingxian County. More specifically, the mean is 0.13 *yuan* higher for the Green vegetables and 0.46 *yuan* higher for the Green meat in

Shijiazhuang City than in Qingxian County. It might result from the fact that the consumers in Shijiazhuang city are in general much wealthier than those in Qingxian County. It is widely observed in the current literature that rich people are more likely to pay more for organic food.

Table 3 also reports the t-test results for the differences between two regions using both the raw data and the predicted values. All the tests reject the null hypothesis—The mean WTP for either Green vegetables or Green meat in Shijiazhuang City is less than the mean WTP in Qingxian City, at a significant level of at least 5%. Hence, we can conclude that consumers in the large city are more willing to pay a price premium for Green Food than those in the small County in China.

As China is experiencing a rapid urbanization and the economic growth rates has been kept above 7% for more than three decades, more wealthy people move to cities. It can be expected that more consumers are willing to pay high premium for Green Food in China. Given the sheer size of Chinese population, this would create a huge market of premium food in the future.

Conclusion

In order to promote food safety and agricultural sustainability, China adopted a unique food certification system. In addition to the stringent international standard of organic food, another two less stringent certifications were introduced: Safe Food and Green Food. Although Green Food is well recognized in China, very few studies have focused on this topic. In light of this, this research could fill the research gap.

With use of the survey data from a major city and a small County, we find that age and income are important for WTP for the Green food in China.

Younger people are willing to pay more for Green Food than the elder. One explanation for this is that the youth have a longer life expectancy than the elder, and may therefore have more benefits from good health. Another explanation is that the elder are not willing change their eating habits and are not willing to pay a price premium for new attributes such as organic or Green food.

Income plays an important role in the WTP for Green food in China. This study shows that when monthly family income is less than 3000 *yuan*, the income is not important for the WTP for Green food. When monthly family income is more than 3000 *yuan*, the consumer preferences for Green Food change dramatically, and they are willing to pay significantly more for Green Food than those with family income less than 3000 *yuan*. It indicates that 3000 *yuan* might be a threshold of preference for Green food in China in 2003[6].

The regional difference of WTP between the major city and the small county is very significant. The WTP for Green food in Shijiazhuang City is significantly higher than in Qingxian County. The mean of the WTP premium in Shijiazhuang City is 0.13 *yuan* (13%) higher for Green vegetables and 0.46 *yuan* (8%) higher for Green meat than those in Qingxian County. Besides, structural differences are detected for the WTP functions of both products.

This study also finds that the consumers in China, on average, are willing to pay 47% more for Green vegetables than for conventional vegetables, and 40% more for Green meat than for conventional meat. Compared with the price premium of Green

[6] 3000 *yuan* in 2003 prices is equal to 3864 *yuan* in 2011 prices

Food A Certification in the real market, and the WTP values for organic food and for the food with reduced risk exposure in the current literature, our results from a hypothetical market are consistent and reliable.

However, even though consumers are on average willing to pay a premium of 40% for Certified Green Food in China, this does not mean everyone will purchase the Green Food in the market. The prevalence of consumption of certified Green Food is not high for two reasons. First, this study finds that the high income class is willing to pay significantly higher premium for Green Food. The low income classes may be willing to pay some premium for Green Food, but this does not mean that they would purchase it in reality. Second, Chen (2013) points out that trust plays an important role in linking WTP values to actual purchase. However, the trust level of the certification system is still not high in China (Yin et al. 2010, Sirieix et al. 2011, and Chen 2013). In order to promote the consumption of Green Food in China, the government should strengthen the enforcement of the certification system to enhance the trust of consumers for certified Green Food.

China has maintained high economic growth rates above 7% for more than three decades, and now is experiencing a rapid urbanization. By the end of 2012, total urban population reached 712 million, or 52.6% of the total population, rising from 26% in 1990. More wealthy people move to large cities, and more consumers are rich enough to buy premium food products. Given the sheer size of Chinese population, a small increase in the proportion of the consumers who would buy premium food, could create a huge market for producers.

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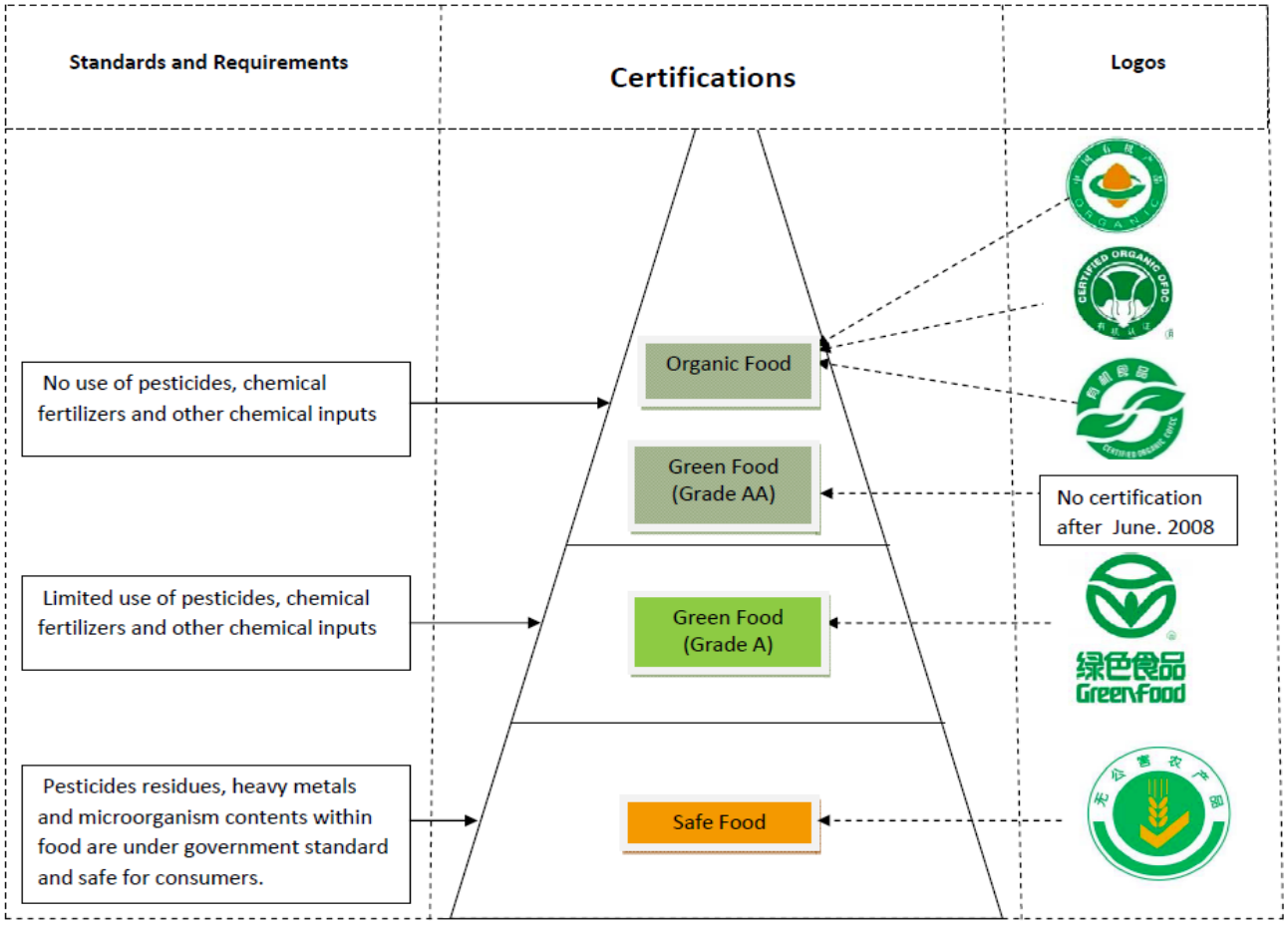

Figure 1, Food Certification System in China

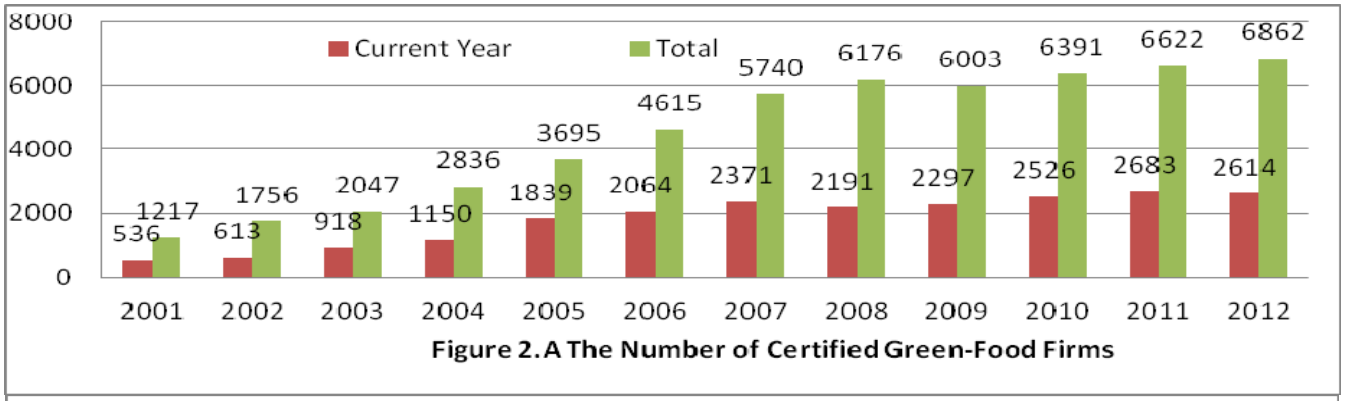

Figure 2 The Number of Certified Green-Food Firms and Products (2001-2012)

Source: *Annual Statistical Report of Green Food (2001-2012)*, China Green Food Development Center.

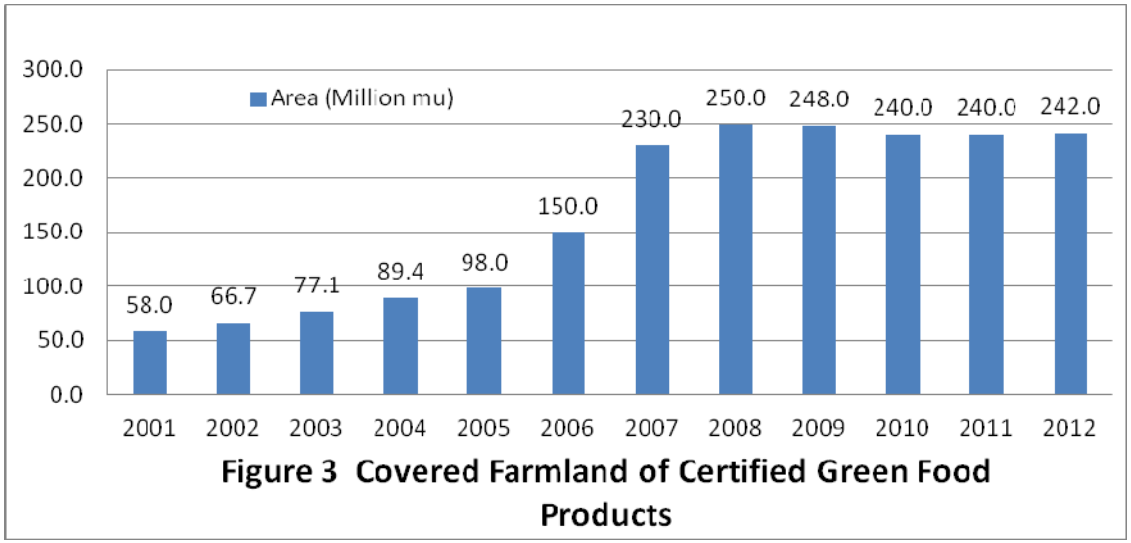

Figure 3 Covered Farmland of Certified Green Food Products

Source: *Annual Statistical Report of Green Food (2001-2012),* China Green Food Development Center.

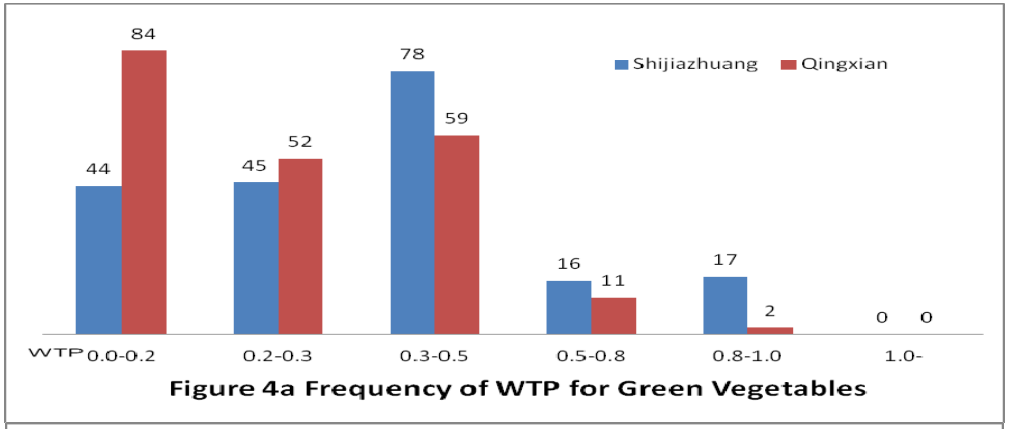

Figure 4a Frequency of WTP for Green Vegetables

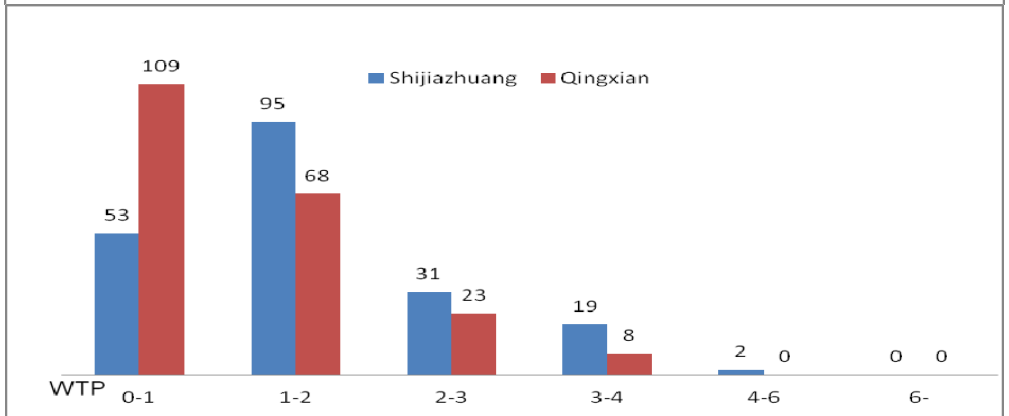

Figure 4b Frequency of WTP for Green Meat

Table 1 Descriptive Statistics

Variables	Description	Whole Sample		Shijiazhuang City		Qingxian County	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
WTP_V	Willingness to pay for Green Vegetables	***0.404***	0.204	***0.425***	0.216	***0.383***	0.191
WTP_P	Willingness to pay for Green Meat	***2.555***	1.404	***2.863***	1.558	***2.260***	1.167
Female	Female=1; Male=0	0.510	0.501	0.590	0.493	0.433	0.497
Age	Respondents' Age	33.539	11.994	33.645	12.240	33.438	11.781
Edu_C	High school education or above=1; otherwise=0	0.414	0.493	0.465	0.500	0.365	0.483
Income1	(Monthly family income < 1000) =1;otherwise=0	0.650	0.478	0.530	0.500	0.764	0.425
Income2	(1000≤monthly family income<2000) =1;otherwise=0	0.299	0.458	0.415	0.494	0.188	0.391
Income3	(2000≤monthly family income<3000)=1;otherwise=0	0.039	0.194	0.050	0.218	0.029	0.168
Income4	(3000≤monthly family income)=1;otherwise=0	0.012	0.110	0.005	0.071	0.019	0.138
Shop_Freq	Respondents' food shopping frequency: almost never =0; occasionally=1; often=2	1.387	0.706	1.675	0.520	1.111	0.750
Supermarket	Purchase of Green-food from supermarket=1;otherwise=0	0.652	0.477	0.900	0.301	0.413	0.494
Farm_Market	Purchase of Green-food from farm-market=1;otherwise=0	0.554	0.498	0.580	0.495	0.529	0.500
Food_Store	Purchase of Green-food from food-store=1;otherwise=0	0.216	0.412	0.110	0.314	0.317	0.467
Green_K	Knowing Green-food Consumption in the family=1; otherwise=0	0.887	0.317	0.905	0.294	0.870	0.337
Sample Size		408		200		208	

Table 2 Estimation of WTP equation

Variables	Qingxian County				Shijiazhuang City				Whole Sample							
									Model W1				Model W2			
	WTP_{Vege}		WTP_{Pork}		WTP_{Vege}		WTP_{Pork}		WTP_{Vege}		WTP_{Pork}		WTP_{Vege}		WTP_{Pork}	
	Coef.	t-Ratio	Coef.	t-Ratio	Coef.	t-Ratio	Coef.	t-Ratio	Coef.	t-Ratio	Coef.	t-Ratio	Coef.	t-Ratio	Coef.	t-Ratio
Region_Dummy													0.0751	2.63***	0.3834	3.47***
Female	0.0374	1.28	0.1178	0.97	0.0457	1.14	0.1804	1.22	0.0615	2.67***	0.1979	2.21**	0.0513	2.21**	0.1453	1.62
Age	-0.0026	-2.21**	-0.0109	-2.26**	-0.0052	-3.09***	-0.0112	-1.79*	-0.0038	-3.95***	-0.0129	-3.44***	-0.0036	-3.80***	-0.0120	-3.25***
Edu_C	0.0514	1.75*	0.0972	0.80	-0.0517	-1.37	-0.0546	-0.39	0.0003	0.01	0.0177	0.19	0.0024	0.10	0.0295	0.32
Income2	-0.0401	-1.15	0.1873	1.29	0.0065	0.17	-0.0504	-0.35	-0.0037	-0.14	0.0916	0.91	-0.0157	-0.60	0.0294	0.29
Income3	-0.0008	-0.01	0.0131	0.04	0.1068	1.22	0.5412	1.64*	0.0643	1.08	0.3363	1.43	0.0611	1.03	0.3190	1.38
Income4	0.1997	2.08**	1.1474	2.83***	1.7448	0.04	2.5071	2.20**	0.2961	2.82***	1.3121	3.15***	0.3054	2.92***	1.3614	3.29***
Shop_Freq	0.0154	0.79	0.0840	1.04	0.0465	1.21	-0.0931	-0.65	0.0373	2.10**	0.1087	1.57	0.0256	1.41	0.0487	0.69
Supermarket	0.0556	1.88*	0.1147	0.94	0.0931	1.40	-0.0725	-0.29	0.0989	3.68***	0.2475	2.36**	0.0646	2.18**	0.0727	0.63
Farm_Market	0.0181	0.64	-0.0074	-0.06	-0.0299	-0.74	-0.0926	-0.62	-0.0005	-0.02	0.0031	0.03	-0.0108	-0.45	-0.0488	-0.52
Intercept	0.4061	8.17***	2.2502	10.85***	0.5447	5.92***	3.1826	9.30***	0.4387	10.17***	2.3453	13.89***	0.4485	10.44***	2.3961	14.35***
LR test for Pooling vs. Separable Estimation									chi2(11) = 34.93***		chi2(11) = 27.10***					
Samples	208				200				408							

Note: (1) Region_Dummy: 1-Shijiazhuang City; 0-Qingxian County.
(2) *---Significant of 10% level; **--- Significant of 5% level; ***--- Significant of 1% level.

Table 3 Mean and Median of WTPs

WTP			Obs	*Mean* WTP			*Median* WTP		t test for regional difference
				yuan	%	Std. Dev.	*yuan*	%	
Raw Data	WTP_{Vege}	Whole Sample	408	*0.40*	40	0.20	*0.25*	25	
		Shijiazhuang City	200	*0.43*	43	0.22	*0.25*	25	t = -2.09*
		Qingxian City	208	*0.38*	38	0.19	*0.25*	25	
	WTP_{Pork}	Whole Sample	408	*2.56*	43	1.40	*2.50*	42	
		Shijiazhuang City	200	*2.86*	48	1.56	*2.50*	42	t = -4.44**
		Qingxian City	208	*2.26*	38	1.17	*1.50*	25	
Predicted Values	WTP_{Vege}	Whole Sample	408	*0.47*	47	0.25	*0.30*	30	
		Shijiazhuang City	200	*0.53*	53	0.28	*0.63*	63	t = -5.60**
		Qingxian City	208	*0.40*	40	0.19	*0.30*	30	
	WTP_{Pork}	Whole Sample	408	*2.39*	40	0.85	*2.46*	41	
		Shijiazhuang City	200	*2.63*	44	0.91	*2.51*	42	t = -5.69**
		Qingxian City	208	*2.17*	36	0.73	*1.63*	27	

Note: 1, **---significant of 1% level; *--- Significant of 5% level.
2, Predicted values from the models of Interval Regressions
3, Test for the Difference of the WTP between Shijiazhuang City and Qingxian County.
(H0: the Mean of the WTP in Shijiazhuang City < the Mean of WTP in Qingxian County)