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Abstract

The concern about vegetable safety, together with a booming population and the rise of the middle class has made Vietnam become a potential market for organic vegetables. This paper investigates the determinants of willingness to pay (WTP) for organic vegetables in Hanoi, Vietnam with a particular attention to regional differences and the effect of risk perception. Using Contingent Valuation Method to analyze the data from a sample of 498 consumers in Hanoi, the paper shows that the perceived use values of organic vegetables, trust in organic labels, and disposable family income increased WTP for organic vegetables in both urban and rural regions. Though risk perception of conventional vegetables was high in both regions, such heightened risk perception just translated into the WTP in the rural region. In addition, the percentage of home-grown vegetables in the total vegetable consumption of the family influenced the WTP in the rural region only. Moreover, being an organic purchaser was positively related to the WTP in the urban region but not in the rural region. The paper also discusses three policy implications for Vietnam to boost the demand for organic food.

Keywords: willingness to pay, organic vegetables, food safety, rural-urban difference, Hanoi
JEL Classification: Q18, D12, I12, Q13, R22

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1 Introduction

Rapid urbanization and industrialization have come at the cost of agricultural systems in Vietnam [1]. The loss of farmland has led to the intensive use of natural resources and agrochemicals, particularly pesticides. The quantity of pesticide use increased about five times, from 15,000 tons to 76,000 tons and the expenditures for pesticide import increased 9.8 times during 1991 and 2006 (Van Hoi et al., 2009). Particularly, pesticides use per hectare is highest in the vegetable production (Anh, 2002). These are evidence of farmer's reliance on pesticides in vegetable production. Being aware of the improper use of pesticides in vegetable farming, consumers' concern about food safety, particularly vegetable safety is accelerating.

Emerging food safety problems has urged Vietnamese consumers shift to safer food. Like consumers worldwide, Vietnamese consumers view organic products to be superior in terms of safety, taste, nutrition, and environmental values than conventionally grown alternatives. As a result, buying organic foods becomes a choice of wealthy consumers. The concern about food safety, together with a booming population and the rise of the middle class [2] has made Vietnam become a potential market for organic food. Having responded to a growing demand from both foreign and domestic market, organic agricultural land in Vietnam has expanded remarkably, from 11,365 ha in 2009 to 93,545 ha in 2017. However, organic vegetables just constitute a very small area, 151 ha, in 2015 (Willer et al., 2009; Willer and Lernoud, 2017).

There are a number of opportunities as well as challenges to the development of the organic vegetable market in Vietnam. The vegetable is one of the dominant food in Vietnamese's cuisine and demand for organic vegetables is growing (Willer and Lernoud, 2017). Due to the concern about food safety, particularly pesticide residues, buying organic vegetables is the first experience in the organic market for most of the organic purchasers. Nevertheless, there are many barriers to organic purchase such as high price, the lack of market information, and the distrust about product quality (Hai et al., 2013). The organic vegetable market is small, fragmented, and most of the organic purchasers are infrequent buyers, as a result. The future of organic farming depends on consumer demand for

[1] According to the Ministry of Natural Resources and Environment of Vietnam, more than 73000 ha of agricultural land has been converted to non-farming land annually.

[2] Vietnam's population is about 95 million with 13% of the population is middle class in 2017. http://www.worldbank.org/en/country/vietnam/overview

organic food. The insight into the determinants of willingness to pay (WTP) for organic vegetables, an indicator of demand is critical for organic producers and marketers to address consumer's needs, this, in turn, encourage organic vegetable demand. Moreover, this understanding would inform policymakers about the future of organic farming in Vietnam and therefore, enable them to prepare better for this.

A rich body of literature has uncovered some key determinants of WTP for safety attributes. Negative information about conventional products and positive information about organic alternative shapes consumer perception of organic products (Smed, 2012). The perception that organic products have unique values, as compared with conventionally grown alternatives are reasons to buy organic food of the majority of consumers (Shaharudin et al., 2010). According to Wier and Andersen (2003), an organic product might contain use values (e.g., taste, nutrition, health or food safety, and freshness) and non-use values (e.g., environmental improvement and animal welfare). In general, use values tend to be more important than non-use values in determining organic purchase. Moreover, consumer's trust or distrust in food safety labeling also affects WTP of safer food. Consumer's trust in food labels increases WTP for certified food products (Angulo et al., 2005) while the distrust would prevent organic purchase (Padel and Foster, 2005). Since food safety stands out as a credence characteristic, to distinguish organicfood from non-organic alternatives, consumers have to rely on quality signals, such as product labels (Yiridoe et al., 2005).

Risk perception was another determinant of WTP for safety attributes. Risk perception or the concern about food safety was found to influence WTP for organic and/or pesticide-free food in Iran (Haghjou et al., 2013), Italia (Boccaletti and Nardella, 2000), and United Stated (Misra et al., 1991). In Vietnam, food safety risk perceived from vegetables was alarming (Ha et al., 2019). We, therefore, expect that WTP for organic vegetables in the country might be explained by such risk perception. Mergenthaler et al. (2009) and Hai et al. (2013) examined how the concern about food safety, a measurement of food safety risk perception drove Vietnamese's WTP for organic food. However, there are no studies that intensively investigate and discuss the link between risk perception and WTP for organic food in Vietnam.

The insight into rural-urban differences in WTP for organic food is also important for decision making regarding organic farming and organic market. If such differences occur,

marketing strategies and agricultural policies relating to organic food must fit each region. Despite this important implication, the rural-urban difference in consumer's preferences for food safety are not well researched in the international literature. Some studies found rural and urban consumers had different attitudes and behavior toward organic food purchase. For example, urban people perceived better benefits of organic food and their willingness to use organic food was higher than rural residents (Yazdanpanah et al., 2015). With a better income, it was not a surprise that urban household had higher organic shares than their rural counterparts (Midmore et al., 2005). Though willingness to pay for organic food is likely to be higher in urban areas, a comprehensive understanding of rural-urban diversity in WTP for organic food is lacking. Especially, in developing and emerging countries, regardless of a growing research interest in consumer preferences for safe food, studies dedicated to analyzing rural consumers is very rare. For example, among several studies on WTP for organic food in Vietnam, only one of them compares the WTP between the rural and urban region by treating the region as a dummy variable (Mergenthaler et al., 2009). Hence, Ortega and Tschirley (2017) called for research in rural and peri-urban regions in emerging countries to draw a complete picture of the demand for food safety.

The objective of this paper is to investigates the regional differences in the determinants of willingness to pay (WTP) for organic vegetables in Hanoi, Vietnam. We are particularly interested in comparing how risk perception and other factors influence the price consumers are willing to pay for organic vegetables between the rural and urban region. The paper is organized as follows. The next section provides methods and data. Section 3 presents results and discussions. Concluding remarks and policy implications follow in the last section.

2 Method and data

2.1 Contingent valuation method (CVM) and Double bounded dichotomous choice

We used Contingent valuation method (CVM) to elicit WTP responses for organic vegetables. Though an organic product comprises unique attributes such as safety, nutrition, and taste we are interested in the whole product rather than its particular attributes. When the focus is the evaluation of the whole product, the use of CVM is relevant. More-

over, CVM provides preferences and information that is impossible to reveal when actual choice behavior is restricted (Kjær, 2005). There is no market data on WTP for organic food in Vietnam. Given this data constraint, the employment of CVM is useful. CVM demonstrates some additional advantages. The method is cost-effective, has a low time commitment, does not require geographical restrictions (Valeeva et al., 2004), and ensures sufficient variation in data (Kjær, 2005).

However, CVM method might lead to the hypothetical bias - the disparity between the reported WTP and actual WTP. To eliminate this bias, we selected a vegetable product that consumers are familiar, as suggested by Hutchinson et al. (1995). Organic choy sum was chosen since it is a common vegetable in Vietnam and organic choy sum is one of the preferred organic vegetables of Vietnamese consumers.

Applying CVM, we used Double-Bounded Dichotomous Choice (DBDC) because it produces more precise point estimates of parameters and narrower confidence intervals around mean or median WTP, as compared to single-bounded choice (Antony and Rao, 2010).

Figure 1 presents a flow-chart of the bidding process. Following a traditional DBDC, we provided respondents two consecutive bids (Q1 and Q2), measured in thousand VND to reveal their WTP. If the respondent says "yes" for the first bid (P*), the second higher bid (P^h) will be given. If she/he says "no" for the first bid, the second lower bid (P^l) will be asked. In total, there are four possible responses: Yes-Yes, Yes-No, No-Yes, and No-No. In addition, we modified the traditional DBDC by introducing an open-ended question asking about the maximum WTP (Q3) to end the WTP evaluation process.

The open-ended question (Q3) demonstrated some advantages. First, it enabled us to eliminate yea-saying bias (Bateman et al., 2002). When being asked this type of question, respondents could not continue to say "yea" automatically (if her/his responses are likely to follow a yea-saying pattern in previous questions). Instead, he/she must clarify and confirm his/her true WTP. Second, it helped to detect inconsistent responses right during the interviews. This, in turn, would reduce the hypothetical bias. Third, we expect that the maximum WTP (P^{max}) revealed in the open-ended question will lead to a tighter interval of the true WTP and better model fit, as shown in and (Sriwaranun et al., 2015).

We designed 5 sets of bids and randomly provided these to respondents in order to elicit more information in the support of the true WTP distribution. These 5 sets of bid

were determined on the basis of information acquired from a pilot survey on 30 respondents. In the pilot survey, the maximum reported WTP was 50,000 VND with 70% of the respondents expressing their WTP in the range from 15,000 VND to 30,000 VND (22,000 VND = 1$ USD). Hence, 4 out of 5 sets had the first bid (P*) ranged between 15,000 VND to 30,000 VND and the second higher bid (P^h) up to 43,000 VND. The smallest bid was set at 11,000 VND, a slightly higher than the average price of conventional vegetables at the survey time (10,000 VND). By doing so, we had various bid sets that are realistic to encourage the true responses from respondents. Description for each set of the bid is presented in Table 1.

Respondents' WTP was elicited through Question 1 to 3 in Figure 1. The true WTP of the respondent i, WTP_i^*, is a latent variable, which is given in the equation (1) below:

$$WTP_i^* = \beta X_i + \epsilon_i \tag{1}$$

where β is a vector of the coefficient and ϵ is an error term, X_i is a vector of 7 potential determinants of respondent's WTP including 1) Risk perception of vegetables, in general, 2) Perceived use value of organic vegetables, 3) Trust in organic labels, 4) Percentage of vegetable consumption are homegrown, 5)Whether the respondent holding university degree, 6) Monthly family expense, and 7) Value of the first bid. The characteristics of these variables are given in Table 4.

Since the true WTP (WTP*) is unobserved, it can be estimated based on the range of observed data. Using an open-ended question following double-bounded dichotomous choice allowed us to investigate 2 models (Model 1 and Model 2). They had the same set of independent variables but were different in terms of dependent variables (the values of the upper bounds of WTP). Table 2 presents such differences between these two models. Model 1 was the traditional model with the upper bounds of WTP determined from DBDC. Model 2 was the modified model with the upper bounds of WTP in Yes-Yes and No-No responses obtained from the open-ended question. We would compare the two models and select the one with a better goodness of fit. The selected model, therefore, is expected to facilitate a more precise estimate of WTP. WTP values are positive, as all the maximum WTP gathered from the open-ended question were higher than zero. Thus, for No-No responses, the lower bound of the true WTP is zero.

As shown in Table 2, for each model, the true WTP of the respondent i, which is presented in equation 1, lies in the range from a lower (L_i) to an upper bound (U_i). Since WTP, the dependent variable, is in the form of interval data, we used the interval model to estimate it.

According to Batte et al. (2007), the probability the respondent i chooses the range [L_i, U_i] is:

$$Pr(L_i \leq WTP^* \leq U_i) = Pr(L_i \leq \beta X_i + \epsilon_i \leq U_i) = Pr(L_i - \beta X_i \leq \epsilon_i \leq U_i - \beta X_i \quad (2)$$

where ϵ follows a normal distribution (0,σ^2). The probability the true WTP of the respondent i in the range [L_i, U_i] is presented as below:

$$Pr(L_i \leq WTP^* \leq U_i) = (\Phi(\frac{U_i - \beta X_i}{\sigma}) - \Phi(\frac{(L_i - \beta X_i}{\sigma})) \quad (3)$$

where $\Phi(.)$ is the standard normal cumulative distribution function. It was assumed that the errors across different respondents are independent and identically distributed. We used maximum likelihood estimation to estimate β and σ.

2.2 Survey design, questionnaire, variable measurement

2.2.1 Survey design

The data were collected through a consumer survey in 7 selected districts in Hanoi including 3 rural, 3 urban and 1 semi-urban. These districts had different levels of economic development with different geographical locations, comprising the West, the East, the Center and the North of Hanoi. We applied quota sampling. Each district was given a quota - the number of surveyed respondents. Survey participants were main food shoppers of households and at least 18 years old. In total, our sample includes 498 consumers (230 from rural and 268 from urban regions). We used face-to-face survey which is highly recommended for CVM studies due to its flexibility, high response rate and better control of the sample, as compared to other data collection methods (Pearce et al., 2002).

2.2.2 Questionnaire, variables, and survey results

To provide respondents a relevant background on issues to be asked, the questionnaire began with a brief introduction to organic farming and the definition of organic vegetables. After that, there were two questions revealed the degree of familiarities with organic vegetables. We found that only one-third of the surveyed consumers (175 respondents) were organic purchasers. Most of them (60%) are occasional organic buyers who just bought organic vegetables once or twice per month. In addition, the majority of them (78%) were urban residents. This is evidence of an undeveloped organic market in Vietnam.

We then proceeded the bidding process (see Figure 1). The distribution of WTP responses is presented in Table 3. When the initial bid values increased, the percentage of No-No responses presented an upward trend while the share of Yes-Yes responses experienced a downward trend (Table 3). This result complies with economic theory, suggesting the negative relationship between demand for organic vegetables and price.

The rest of the questionnaire was to gather data for independent variables. Table 4 presents the measurement and statistics of these independent variables. Since risk perception can be measured by the mean of perceived risk (Rosati and Saba, 2004), we used a question: "To what extent do you think that eating vegetables, in general, might cause the health risk to you". The responses were coded from 1 (not risky at all) to 10 (extremely risky). The mean score of risk perception from vegetables was quite high (7.14) (Table 4). We expected that such high-risk perception would prompt respondents to report a higher WTP for organic vegetables.

We used four items to capture different aspects of use values from organic produces including health, safety, nutrition, and taste. The mean scores of these items were in the range from 6.4 to 7.0, indicating that the respondents highly valued the attributes of organic vegetables. These four items generated a good construct, namely UseValue, with the Cronbach's alpha of 0.945. The score of UseValue was calculated as the average score of these four items. Tt was our expectation that UseValue would positively influence their WTP amount.

TrustLabel was also measured by a 10-point scale with 1 meaning "no trust at all" and 10 meaning "completely trust". Trust in organic labels was just at a medium level in Hanoi (5.17) (Table 4). This can be considered a barrier to organic consumption.

Hence, we expected that such level of trust might prevent consumer's decision on paying a premium and lower their WTP amount.

The estimated percentage of homegrown vegetables (VegGrow) might determine consumer's participation in the organic market. The demand for organic vegetables would be lower for the households that have a substitute such as homegrown vegetables. In other words, respondents whose family has a higher proportion of the homegrown vegetables will be less likely cite a lower WTP for organic vegetables, as compared with those having a lower share of homegrown vegetables.

Having experiences with organic consumption might lead to a higher WTP for organic food, as those who have been already organic purchaser may realize the unique values of organic food and obtain an understanding of organic food. For this reason, the variable "OrganicPurchase" was included.

Among various demographic characteristics, we were just interested in Income and education (University). Since household income represented a capacity to pay, we expected a positive relationship between the variable Income and WTP. Education is one of the personal determinants of organic food consumption and/or WTP for organic food in some studies such as Xu and Wu (2010) and Hughner et al. (2007). We, therefore, anticipated the positive relationship between variable University and WTP for organic vegetables.

We included the value of the first bid (Bid1) in our models to detect starting-point bias, which is common in CVM studies. A significant coefficient of the first bid would suggest the existence of starting point bias. It means the respondent' answers on WTP is influenced by the price offered in the first bid (Antony and Rao, 2010).

2.2.3 Characteristics of sample consumers

Table 5 presents the background information of the sample survey. The table shows the regional inequality, a current problem in Vietnam. There was a disparity in income and education between the rural and urban sample. Because of such income difference, the urban sample had a higher percentage of organic purchasers (52.61% for the urban region versus 14.78% for the rural region). The family structure was also typical for each region. Urban families had younger main food shoppers, more children, smaller household size.

3 Results and discussions

3.1 Diagnostic results

We fitted the two competing models to our observed rural and urban dataset. Likelihood ratio test confirms both the models under consideration, as a whole, are statistically significant (Likelihood ratio chi-square < 0, $p < 0.001$, Table 6).

We assessed the Goodness of fit of each model based on four criteria. These are Likelihood Value, Pseudo R2, Bayesian information criterion (BIC), and Akaike information criterion (AIC). These indicators are commonly used in model selection, considering not only model fit but also model complexity (Johnson and Omland, 2004). The Model 1 had a higher Likelihood value and Pseudo R2 than the Model 2, suggesting that the former provides a better fit than the latter within either the urban sample or the rural sample (Table 6). In addition, BIC and AIC that refer to information lost when an approximating model is used to generate observed data (full reality), was lower for the Model 1. Moreover, according to Bateman et al. (2002), Pseudo R2 of the Model should be at least 10%. Thus, Model 2, with Pseudo R2 of 6.11% for rural data and 8.38% for urban data, suffered from a weak explanatory power. All evidence above suggest that the Model 1, the traditional DBDC, yields a better explanatory power. The model 1 was selected, as a result.

3.2 Empirical results and discussion

Table 7 illustrates the results of interval regression for the selected model (Model 1) separately for the rural and urban region. Rural-urban differences with regard to the underlying drivers of WTP for organic vegetables were supported by our data. The effect of risk perception, the share of homegrown vegetables, and the decision whether to go for organic on the WTP differed between the rural and the urban region.

The significant effect of risk perception was observed for only the rural data ($\beta = 917.63$, $p < 0.01$). In this region, risk perception from conventionally grown vegetables was at a considerable level (mean score of 6.77) and positively affected WTP for organic food. This implies that consumers who perceived a higher level of food safety risk from regular vegetables were willing to pay a higher price for organic vegetables. Marketing literature indicated that when the risk perceived was higher than the acceptable level;

consumers would develop risk reduction strategies (Mitchell, 1999; Yeung and Morris, 2006). Being willing to pay a higher price for organic vegetables might be one of the rural consumers' strategies to reduce risks from unsafe vegetables. Moreover, living in the rural region, rural consumers knew about the production of conventional vegetables. They, therefore, were aware of the health risk from conventionally grown vegetables and such awareness or risk perception influenced their WTP for organic vegetables. This result is consistent with earlier literature, suggesting that heightened risk perception was the main driver of the demand for organic food (Hsu et al., 2016; Hughner et al., 2007).

Although risk perception in the urban region was higher than the rural region (mean score of 7.45), it did not determine WTP of urban respondents. The finding from our urban data is somewhat contrary to the result from Mergenthaler et al. (2009) who found the concern about food safety, an aspect of risk perception, exerted the largest marginal impact on the WTP for free-chemical-residue vegetables in Hanoi and Ho Chi Minh cities, Vietnam. Nevertheless, our result is consistent with some other related studies that show the effect of risk perception on WTP for organic or pesticide free vegetables was insignificant (Sriwaranun et al., 2015; Vidogbéna et al., 2015). A potential reason for the result from our urban sample is that risk perception in the urban region might be not sufficient to influence the WTP, as suggested by Angulo et al. (2005). Other factors rather than risk perception such as income and experience with organic vegetables might be more powerful in explaining and predicting WTP in the urban region. In other words, risk perception might not be an important consideration of urban consumers when they evaluated the benefit of consuming organic vegetables against its high costs.

According to Ha et al. (2019), homegrown vegetables were perceived to be very safe. Thus, we argued that homegrown vegetables can be completely substituted for marketed organic vegetables. This led to our expectation that consumers whose family had a higher share of homegrown vegetables would demand less organic vegetables, and therefore, report a lower WTP for organic vegetables. Unexpectedly, consumers with a higher proportion of homegrown vegetables were found to be willing to pay a higher price for organic vegetables in the rural region. Perhaps, the experience from growing vegetables to serve family needs might enhance rural consumer's understanding of organic farming. This thereby would encourage their WTP.

The significant effect of the variable percentage of homegrown vegetables was observed

for the rural data only. This finding is not surprising, as it is a consequence of our sample structure. Sample variance of this variable was limited for the urban data but not for rural data. The majority of the rural families engaged in growing vegetables and the percentage of homegrown vegetables varied a lot. In contrast, only about 30% of urban households were interested in growing vegetables. In addition, for urban respondents who were growing vegetables, homegrown vegetables just contributed a small share to the total family vegetable consumption.

Education determined the WTP in the urban region but not rural region. Urban respondents who had a university degree were likely to report a higher WTP than those who had not. The result from urban sample matches the finding of some related research in Vietnam such as (Hai et al., 2013), who found a positive significant effect of education on WTP for organic. Since education might correlate with income, we took into account this issue in our analysis by evaluating correlation coefficient between these two variables and including the interaction term between them in the WTP model. We found a weak correlation between them and the interaction term was not significant. Doing so, we controlled for the potential interlink between education and income.

Comparing the two regions, though some differences exist, rural and urban areas are largely similar in that they share some common determinants of the WTP including the perceived use values of organic food, trust in organic labels, and disposable family income.

As expected, perceived use values was an important determinant of WTP in both regions. One unit increase in the perceived use values of organic food led to a higher WTP of 1,423 VND and 774 VND in the rural and urban region, respectively.Rural consumers as well as urban consumers who had a higher evaluation of the safety, health, nutrition, and taste attributes of organic vegetables were likely to report a higher WTP for organic vegetables. This result suggests that consumers demand organic food because of the perception that organic food brings unique values that cannot be achieved from conventionally grown alternatives (Shaharudin et al., 2010; Lusk and Briggeman, 2009). A further investigation of our data provided an evidence that respondents, in general, held a positive attitude toward organic vegetables, as the mean scores of perceived use value from the rural and urban data were 6.71 and 6.73, respectively. The positive effect of perceived use values on the WTP and not-extremely high-mean scores of perceived use values of organic vegetables leads to an implication that there is still a potential to exploit more organic

market in Vietnam through enhancing consumers' perception of the use values of organic vegetables.

Our findings suggest the importance of consumer's trust in organic labels. Compared with other independent variables, the effect of trust on WTP was relatively important (Table 6). Agreeing with Bauer et al. (2013) and Perrini et al. (2010), the paper found that trust in organic labels significantly increased WTP for organic food. Based on this finding, it is reasonable to expect that one of the reasons why the majority of Hanoi consumers did not buy organic vegetables was a low level of trust in organic labels (see Table 4). In addition, it is worth pointing out that in Vietnam, organic vegetables were mainly sold in supermarkets. We found trust in supermarkets was also low (mean = 4.45 out of 10, SD = 2.44). In addition, we found a significant correlation between trust in supermarkets and trust in organic labels (correlation coefficient = 0.465 at 0.01 level). We suggest that consumer's trust in organic labels was low because of their distrust in supermarkets. Recent supermarket scandals relating to vegetable mislabeling has dampened consumers' trust in food retailers in Vietnam. Hence, to stimulate demand for organic food and this thereby escalates organic consumption, trust building for food retailers, particularly supermarkets is critical for Vietnam.

Family's disposable income was found to increase the WTP. Being consistent with some studies (Hai et al., 2013; Owusua and Anifori, 2013), we found income exhibits a significant positive relationship with the WTP for organic food in both regions. The effect of income on WTP in the rural region was higher than that of the urban region (585 VND versus 367 VND). This implies that with the same level of income increase in both regions, the growth in income in the rural region might facilitate a stronger push in the organic demand. However, the effect of income on WTP was very small, 1% growth in income only led to about 0.059% and 0.037% increase in WTP for the rural and urban region, respectively. It is worth noting that organic vegetables were considered by consumers as a luxury good (Poulston and Yiu, 2011). Theoretically, the income elasticity of demand for luxury food such as organic vegetables, therefore, is expected to be large. Nevertheless, our finding suggests that income elasticity of demand for organic food was small. This is comparable to finding from previous WTP studies showing that income elasticity of demand for organic food is very marginal or insignificant Yiridoe et al. (2005). This draws an implication: increasing consumer's income is not an optimal way to stimulate

the demand for organic food.

The coefficient of the variable Bid1 was positive and statistically significant, suggesting that respondent's WTP was positively influenced by the value of the first bid. This is an evidence of starting point bias. Therefore, we took into account this bias when estimating the mean and median of predicted WTP.

We used bootstrapping with 5000 replications to construct confidence intervals of the mean and the median WTP since it is a robust technique and does not require any assumptions about the nature of the data (Bateman et al., 2002). Table 8 reports the estimation results. Based on the coefficients estimated in the interval model (Table 7), we predicted the WTP value for each observation. Mean and median of WTP before controlling starting point bias were obtained from those predicted WTP values.

We employed the correcting model developed by (Herriges and Shogren, 1996) and Liou (2015) to correct the mean and median WTP. Let WTP^t denote the true WTP of a respondent. If he/she is uncertain about their WTP, his/her reported WTP, WTP^r, might be altered by the value of the first bid, as the respondent may perceive that the first bid provides information on the "correct" WTP value. Hence, the link between the true WTP and the reported WTP is sated in the equation following:

$$WTP^r = (1-k)WTP^t + kBid1 \tag{4}$$

Where k is an anchoring effect. As shown in Table 7, the coefficients of the variable Bid1 were statistically significant for the urban as well as the rural data ($p < 0.01$). Accordingly, $k = 0.407$ for the rural sample and $k = 0.461$ for the urban sample. Based on the equation (4), the true WTP was calculated as below:

$$WTP^t = (WTP^r - kBid1)/(1-k) \tag{5}$$

We employ the equation (5) to calculate the true WTP for each observation, then obtained the mean and median from these true WTP values (Mean and median after controlling bias).

After controlling the starting point bias, the mean WTP of rural consumers were about 22,000 VND while the corresponding figures for their urban counterparts were approximately 30,000. The two sample T-test confirms that the mean and median WTP of urban

consumers were higher than those of rural consumers ($p < 0.000$). As expected, urban consumers' WTP was higher than rural subjects' WTP.

The mean WTP for organic vegetables in both regions were far above the market price of conventionally grown vegetables (10,000 VND/kg). Accordingly, rural and urban consumers were willing to pay a premium of 109% and 205%, respectively. It suggests that in general, consumers in Hanoi are interested in organic vegetables. However, there was still a big gap between consumer's WTP with the market price of organic vegetables. When the survey was conducted the average market price of organic choy sum was about 40,000 VND/kg. Rural consumers' WTP was far below this price while the WTP of urban consumers just equaled to 76% of the market price of organic vegetables.

4 Concluding remarks

The anxiety about food safety, particularly the use of pesticides in conventional vegetable production has led Vietnamese consumers to seek safer vegetables. Organic vegetables with its superior perceived attributes is already the preferred choice of a proportion of the consumers. The organic vegetable market currently remains a niche market amid many barriers. An understanding of the determinants of consumers WTP not only help organic producers and marketers expand the organic market but also assist policymakers in designing policies on organic farming in Vietnam.

In this research, we applied CVM with double bounded dichotomous technique that was followed by an interval regression model. This allowed us to identify and then compare the determinants of WTP for organic vegetables between the rural and urban region. The two regions were found to have some similarities as well as important differences in regard to the underlying drivers of WTP for organic food. Since rural and urban consumers have different preferences toward organic food, they should not be treated as a homogenous group. This was not achieved in previous studies. Consequently, rural-urban differences must be considered when designing marketing strategies and policy on the organic market. This is the first study which thoroughly investigated rural-urban differences on WTP. By doing so, we contributed to the existing literature on consumer preference for food safety.

Our results indicate that a higher level of risk perception increased WTP significantly in the rural region, but not in the urban region. This suggests that when evaluating

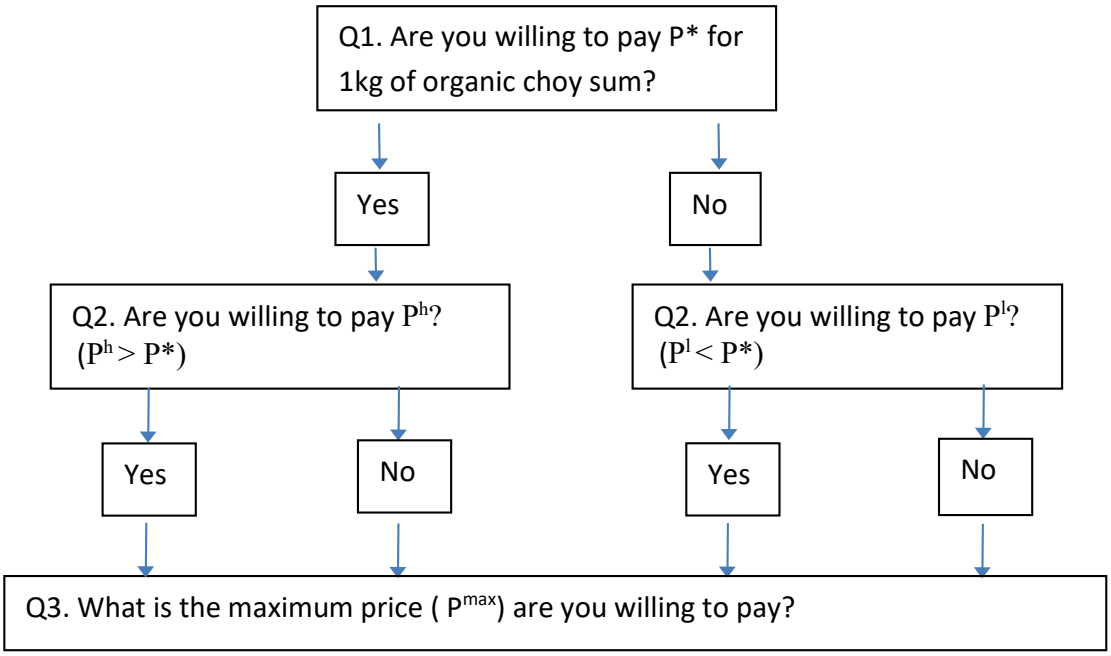
economic values of organic vegetables, risk perception was an important consideration of rural consumers but not urban. Applying risk perception theory to explain the effect of risk perception on WTP, our study provided better insight into the existing literature on consumer demand for food safety.

There is a potential to develop organic vegetables market in Vietnam. As shown in this paper, a majority of consumers were willing to pay for organic food with a price that is double or triple the price of the conventional products. With a strong economic growth, the rise of the middle class, rapid urbanization and a growing concern about food safety, the demand for high quality food such as organic food is expected to rise in Vietnam. However, contrary to popular belief, we found that higher income might contribute very little to the development of the organic market, as the effect of income on the WTP was marginal. Instead, many existing barriers to demand must be removed to facilitate higher organic vegetable intake.

First among these barriers is the high price. We found that although a majority of consumers were willing to pay the premium for organic vegetables, only a small percentage of them were able to access them because of a very high price. Secondly, a very low level of trust in organic labels, which is related to trust in supermarkets tend to be another key barrier. Such level of trust has dampened WTP for organic food. Thus, improving trust in organic food labels and lowering of price should be considered as priorities for higher acceptance of the organic market. Price reduction for organic food can be done by reducing the certification cost. Currently, Vietnam has no national certification bodies. Hence, organic producers have to rely on international certification organizations that are costly. Since food safety is a public good, it requires government intervention in areas like certification regimes in support of organic market initiatives. Trust in organic food labels can be built when supermarkets communicate trustworthy and transparent product information to consumers and the government enforces a better surveillance of food labelling. ewpage

5 Tables and figures

Figure 1: **Bidding process**



1.pdf

Source: Authors'own source

Table 1: Bid design

Bid name	Initial bid(VND)	Lower bid(VND)	Higher bid (VND)
A	15,000	11,000	19,000
B	20,000	15,000	25,000
C	25,000	19,000	31,000
D	30,000	23,000	37,000
E	35,000	27,000	43,000

Note: 1 USD = 22,000 VND
Source: Authors' surveyed data

Table 2: Lower bound and upper bound of the true WTP of two models

WTP Responses	Model 1		Model 2	
	Lower bound (L)	Upper bound (U)	Lower bound (L)	Upper bound (U)
Yes-Yes	P^h	Infinity	P^h	P^{max}
Yes-No	P*	P^h	P*	P^h
No-Yes	P^l	P*	P^l	P*
No-No	0	P^l	0	P^{max}

Note: Model 1 and Model 2 have similar independent variables but they are different in dependent variables, the upper bound of WTP.
P^* = first bid; P^h = second higher bid; P^l = second lower bid; P^{max} = Maximum WTP revealed from the open ended question.

Source: Authors's surveyed data

Table 3: Distribution of WTP answers by bid (n = 498)

Initial bid (VND)	Yes-Yes		Yes-No		No-Yes		No-No		Total	
	N	%	N	%	N	%	N	%	N	%
15,000	58	62.37	30	32.26	5	5.38	0	0.00	93	100
20,000	39	44.32	25	28.41	19	21.59	5	5.68	88	100
25,000	28	35.90	21	26.92	18	23.08	11	14.10	78	100
30,000	11	14.87	17	22.97	19	25.68	27	36.49	74	100
35,000	13	11.40	39	34.21	33	28.95	29	25.44	114	100

Note: 1 USD = 22,000 VND
Source: Authors' calculation

Table 4: Independent variables and statistics

Variable	Variable definition	Scale	Mean(Std. Dev)
VegetableRisk	Perception of food safety risk from vegetables, in general	[1-10]	7.14(2.01)
UseValue	Perceived health value of organic vegetables	[1-10]	6.85(1.97)
	Perceived safety value of organic vegetables	[1-10]	7.05(1.96)
	Perceived nutrition value of organic vegetables	[1-10]	6.59(1.98)
	Perceived taste value of organic vegetables	[1-10]	6.41(1.93)
TrustLabel	Trust in organic label	[1-10]	5.17(2.35)
VegGrow	Percentage of homegrown vegetables in the family's total vegetable consumption	[0-100]	26.95(1.48)
Income	Monthly family expense(million VND)	[1- 45]	8.99(5.67)
Bid1	Value of the first bid (thousand VND)	[15-35]	25.25(7.37)

Note: Values in brackets denote standard deviations.
Source: Authors' surveyed data

Table 5: Background information on the respondents and their household by region

Features	Rural	Urban
	Mean (Std.Dev)	Mean (Std.Dev)
Repondent's monthly income (million VND)	4.95*(2.98)	9.74* (6.60)
Repondent's age	46.00* (13.93)	38.32* (10.06)
Repondent's education level	2.87* (1.17)	3.90*(1.90)
Repondent's gender (1= male)	0.12 (0.33)	0.12 (0.33)
Number of children in the household	1.13* (0.97)	1.38* (0.85)
Household size	4.63* (1.60)	4.22*(1.12)
Household monthly expense (million VND)	6.09*(3.89)	11.46*(5.79)
Organic purcharer	0.14*(0.35)	0.52*(0.50)

Note:* Scores in one row are statistically significantly different at 5% using two-sample T-test; Numbers in brackets are standard deviation; Education levels are coded from 1(no schooling) to 6 (postgraduate qualification).
Source: Authors' surveyed data

Table 6: Goodness of fit of the competing Models

Indicators	Rural (n=230)		Urban(n=268)	
	Model 1	Model 2	Model 1	Model 2
Likelihood ratio chi-square (df=8) (p<0.000)	86.42	68.86	68.60	118.67
Likelihood Value	-259.95	-535.01	-317.99	-664.62
Pseudo R2 (%)	17.21	6.11	14.84	8.38
BIC (Bayesian information criterion)	568.84	1118.97	686.30	1379.56
AIC (Akaike information criterion)	537.90	1088.02	653.98	1347.24

Source: Authors' estimation

Table 7: Result of interval regression on WTP

Variables	Rural Coefficient [Std. E]	Urban Coefficient [Std. E]
VegetableRisk	917.60***	239.00
	[265.82]	[290.99]
UseValue	1423.68***	774.46**
	[325.90]	[334.30]
TrustLabel	772.38***	574.59**
	[252.49]	[259.40]
VegGrow	32.19**	-1.23
	[16.48]	[22.08]
Income	585.29***	367.06***
	[150.09]	[101.54]
University	-1173.41	2487.76*
	[1371.76]	[1277.21]
Bid1	0.407***	0.461***
	[0.08]	[0.08]
Constant	-11336.23	49.61
	[3459.73]	[3620.66]
Lnsigma_cons	8.881***	8.963***
	[0.07]	[0.07]
Log likelihood Value	-259.95	-317.99
Pseudo R2	17.21	14.81

Note:Values in parentheses denote standard errors; * $p < 0.10$, ** $p < 0.05$
*** $p < 0.01$
Source: Authors' estimation

Table 8: Mean and median of predicted WTP

Indicators	Rural	Urban
1. Mean WTP (before controlling bias)		
Mean	22980*	28478*
95% Confidence Interval	22260 - 23701	27839 - 29117
2. Median (before controlling bias)		
Median	23098*	28473*
95% Confidence Interval	22017 -24718	27696 -29521
3. Mean WTP (after controlling bias)		
Mean	22132*	30479*
95% Confidence Interval	21040 -23224	29708 - 31215
4. Median (after controlling bias)		
Median	21808*	30998*
95% Confidence Interval	20626 -22990	29709 - 32206

Note: * Scores in one row are statistically significantly different at 5% using two-sample T-test.
Source: Authors' estimation

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