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ARE CONSUMERS WILLING TO PAY MORE FOR TRACEABILITY? EVIDENCE FROM AN AUCTION EXPERIMENT OF VIETNAMESE PORK

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Abstract

This study aims to conduct the consumer's willingness to pay (WTP) for traceable pork products by using the auction experiments methods, estimate the factors affecting to the WTP and identify the demand for specific information in traceability systems from information of consumers in Vietnam. The results indicated that, the WTP for traceable pork products of consumers is higher than 24%, comparing to the non-traceable pork products. The frequency of pork consumption, gender, age, education, health self-report and consumer's attitude from risk of unsafe pork products were the influencing factors to the consumer's WTP for traceable pork. The necessary information of traceability, suggested by consumers, included: information of additives included in the purchased pork, place of origin, expiration date and quality certificate.

Keywords: *auction experiment, food safety, pork, traceability, willingness to pay.*
JEL Codes: *D10, L15, Q18*

1. Introduction

Recently, information of food safety and quality has been calling attention of consumers. Previous studies have indicated the major constraints in foods contaminant, remained pesticide, harmful additives and information asymmetry in these potential risks in the food products (Quinlan, 2013; Rather et al., 2017; Resende-Filho & Hurley, 2012; Wang & Chen, 2016; Chen et al., 2011; Malarkodi et al., 2017; Handford et al., 2015). The information asymmetry between producers and consumers even causes of market failure and abuses to defraud purchases (Sweeting, 1998; Hobbs, 2004; Darby & Karni, 1973). Also, consumers have to make choices among food products without a variety of information in their purchased food in spite of that values and reasoning are diverged among consumers (Nelson, 1970; Hobbs, 2004).

In order to transfer food information from producers to other stakeholders including consumers, same nations have implemented specific policies and regulations for food traceability, such as Country of Origin Law (COOL) of United States, European traceability regulations (EU178/2002), Japan Agriculture Sanitary (JAS) and other countries including Australia, Canada and New Zealand (Uddin, 2009; Derek, 2010; Caswell, 1998; David & Bailey, 2002).The main purposes of these regulations are to be able to identify from whom and to whom a food product has been supplied with the approaches of traceable rule "one step backward–one step forward". Those regulations help stakeholders to trace products affected from incidences, reduce asymmetry of the product information, protect the right to know about the purchased food of consumers and prevent risks of unsafety food (Charlebois et al., 2014).

Besides that, applying of traceability systems may provide advantages to food suppliers for quality controls of their products (FSA, 2002). It, therefore, supports to specify the liability responsibility between producers along supply chains in food incidents (Bosona et al., 2013). Traceability systems, then, may support to improve the reputation and reduce operating costs of food producers (Umberger et al., 2003).

On the other hand, traceability requirements are currently included in the quality assurance certificates, such as, Global GAP, MSC or ISO (Chan, 2016) besides the requirements in food safety, environmental and social welfare (Lap et al., 2015). Those certificates, with the attached eco-labeling on food products, play as a signal and commitment of producers to their clients about the quality assurances (Kehagia et al., 2007; Gudmundsson & Wessells, 2000).

Despite indicated benefits, traceability systems for food products are not always well established in some countries (Trienekens & Zuurbier, 2008; Derek, 2010). The costs for application, monitoring and maintenance of traceability are high, so allocation of budgets to develop a traceability system is the major challenge in some countries with limited productions and lack of financing resources (Wakamatsu & Wakamatsu, 2017). The price of food products with application of traceability may be higher than the former products, so a price premium for the product is required to encourage the application of traceability from producers' side (Bjornlund et al., 2017).

In Vietnam, pork is a common product as a daily food material, accounting for an average of 32-40% of meat expenditures of Vietnamese household (The Centre for Global Food and Resources, 2018). The consumption of pork products has been increasing still, but cares in the quality of those products are not as improved as increased demands. Foodborne illness from pork products frequently occurs in recent years due to uses of banned chemicals in breeding for shorting of the harvest period and for fatting before slaughtering (Hieu et al., 2014).

Vietnam Government introduced Vietnam Good Agriculture Practices (VietGAP) for the purpose of safety and quality controls to products from agriculture and aquaculture farms in 2008. The VietGAP labeling expects to ensure food safety and quality, animal health, environmentally friendly, social responsibility and traceability. Especially, the requirements of recording and keeping information are emphasized in VietGAP to ensure information exchanges of "one-step backward and one-step forward" along the supply chains from farms to processors.

Though VietGAP labeling is an epochal system in Vietnamese food security, there are still issues to practice especially for pork industries. For example, Vietnamese meat industries producers are small-scale (Tisdell, 2009). So, applications and maintenances of VietGAP standards face financial challenges. Moreover, the provision of information on labeling is depended on food suppliers. Consumers, therefore, have limitations to track the quality and safety information of products (Kehagia et al., 2007). Another constraint was the low public awareness for VietGAP certificates (Tran et al., 2013). It resulted in the inadequately low-price premium for certified products in both domestic and international market. In 2017, Department of Industry and Trade established a pilot program of monitoring, identification and traceability for pork products by using smartphone in Ho Chi Minh city, one of the largest food consumers market in Vietnam (Le et al., 2018). Under this system, each of individual pig at farms have an identification tag. This tag will be active by farmers before the pig is sold from farms to slaughterers. All information about pig from farms, slaughters, transportation to retailers therefore, is uploaded to the cloud database and monitored by Department of Industry and Trade of Ho Chi Minh city. Consumers also can trace back the information of purchased pork products by using smartphone through those activated identification tags. The one of most innovative points in this program is that all participated farmers are obliged to apply for VietGAP standards to their farm. The participated pork products under this program are ensured the quality and safety as the specific requirements in VietGAP standards and expected to be sold with higher price premium.

In the future, the program is expected to be widened to the other large cities in other provinces including Can Tho city in the southern part of Vietnam, to control for food safety and traceability requirements and plays as the center province of Mekong Delta. Since there is a variety of social and cultural perspectives with a diversity of values over regions of Vietnam, the variety of consumers have a different demand in the information of products to optimize their benefits and costs for participated producers to implement and practices the system in different cities. However, the acceptance and consumers' willingness to pay have not scientifically investigated for traceable pork products in the southern Vietnam.

Many previous studies have conducted to examine the WTP of consumer for traceable foods in over the world with experimental auctions. Lu et al. (2017) combined the experimental auction and real choice experiment to identify the consumers' WTP for the pork products with government certification information of farms and farming methodologies. Jin et al. (2017) applied experimental auction to estimate the price premium for apple products with traceability information. Lee et al. (2011) applied this method to measure the WTP of Korean consumers for the traceable imported beef. The experimental auctioning method is conducted using the real goods and money that can simulate a real market, so the method, is practical to evaluate of consumers' willingness and the pricing of goods realistically with high incentives (Lusk, 2003). In Vietnam, some scholars have focused on assessing Vietnamese consumers' WTP for organic, safe products as well as labeled products (i.e., Viet GAP label, food quality certifications) (Thai et al., 2017; Huynh et al., 2017; My et al., 2017; Pham et al., 2018). However, there are currently no such work for traceable foods products to be able to answer the economic incentives in order to enhance the application for traceability systems.

Thus, in the current study, we aimed to assess the premiums that consumers were willing to pay for traceability. To be able for the assessment, we examine the consumers' willingness to pay and influencing factors to the WTP for traceable pork product; and identify the demand of consumers for types of information in traceability systems in the city of the southern Vietnam.

2. Materials and Methods

2.1 Data Collection

Experimental auctioning methods have been applied to gain the estimation of consumers' WTP of goods with the real money and real goods practices (Lusk & Shogren, 2007). The random *n*th-price sealed-bid auction method (Shogren et al., 2001), a combination of Becker-DeGroot-Marschak method (BDM) and Vickrey auction method were applied in this study to collect data of unbiased WTP. In Vickrey auction, bids are not open at first. Participants submit a sealed price of their willingness to pay for one auctioned product. The highest bidder is the winner of auction, and he or she only has to pay the second highest price to purchase the product.

In our past auctioning experiments in Vietnam, we found significant influences on biddings from the atmosphere and the individual relationships among bidders. So, we applied sealed biddings in this method to have information of "true" WTP of bidders (Breidert, 2005). We ran the experimental auction in multiple rounds to find true bid values from the participants (Noussair et al., 2004; Irwin et al., 1998).

Vickrey auction has demerit of overbidding (Vickrey, 1961; Kagel et al., 1987). The participants may submit the higher their WTP to win the auction. In BDM auction, prices to draw are randomly generated from the submitted prices of participants. Participants, who has the equals to or higher bids than the drawn price are the winners to purchase the products (Becker et al., 1964). BDM methods may make bidders to expect to win the auction and it may reduce bidders' overbidding (Breidert, 2005)

The random *n*th-price sealed-bid auction mechanism is a combination of the features of Becker-DeGroot-Marschak (BDM) and the Vickrey auction. In a random *n*th price auction, the participants submit their WTP for one auctioned product in sealed forms. A bid from the sample, then, is drawn by auctioneer. The winners of auction are the bidders that have the equal to and higher than the randomly drawn bid and winners pay an amount equal to the randomly drawn bid. Advantages of the method for unbiased WTP has been suggested from comparisons of results from BDM or Vickrey method (Parkhurst et al., 2004; Lusk & Rousu 2006).

The auction experiments were conducted from March 7th-25th, 2018. Total 78 participants signed up for experimental auction in Can Tho city. The experimental auction was only performed in two rounds. In our experiments, we firstly prepared 500 grams of pork with traceable information of farmers, slaughterers, transporters and retailers by using smartphone. To compare the differences of WTP for pork with and without traceability, we also prepared other 500 grams pack of pork with a reference price of 50,000 VND, which was equivalent to 2.21 USD at the time of auction based on the currency rate of Vietnam State Bank.

After explanations of the procedures of auction, participants received 70,000 VND bills to join the experimental auction for the product with traceability. Each participant obtained an individual ID code to be identified in the experiment. Information in present and expected traceability systems for pork products in Ho Chi Minh city was explained both in an oral presentation and a video footage. Additional information was provided in the question-and-answer session. In the auction, all participants were divided into 7 groups. Each group comprised 10-12 participants. The participants of each group submitted the sealed bid for 500

grams of pork with traceability. One bid from the sample was randomly chosen and posted for bidders, and bidders who had the bid equal to and higher than posted bid chosen were winners. The same procedures were repeated in the additional round. In the first round, we announced the highest bid and lowest bid to all participants of auction group as the references for the second round.

After the auction, all participants were required to complete the questionnaire to obtain the most likely influencing factors to WTP for pork with traceability and the specification of necessary the information for traceability systems.

2.2 Data Analysis

In this study, the consumers' WTP for the product with traceability system is defined as mean of WTP from two rounds of our experimental auction. We assumed that the relationship of WTP and explanation variables is a linear function as suggested by Hanley & Barbier (2009). Ordinary Least Square (OLS) regression model, therefore, was applied to identify the affecting factors to WTP of consumer for pork product with traceability.

The OLS model was adopted as following:

$$WTP_i = \beta_0 + \sum_{j=1}^{j=n} \beta_j x_j + \varepsilon_j, \quad (1)$$

Where WTP is the difference between mean of consumer i[th]'s WTP for pork product with traceability in two rounds of experimental auction and ordinary pork products. x_j (j=1, n) is explanatory variables which are observed as the potentially influencing factors to WTP, ε_j is an error terms, which is assumed to have a normal distribution with zero mean and constant variance (σ^2), β_0 is intercept, and the β_j indicates the parameters respective to the explanation of x_j on WTP. F statistics were used to test the statistical relationship at α = 0.05 level. Coefficient of determination (r2) were examined as the indicator of the goodness of fit. The multicollinearity (Gujarati, 2004) was also examined before the OLS modeling at Pearson's r = 0.8 by pairwise correlation analyses.

As explanatory variables described in Table 1, both demographic and socioeconomics characteristic were included to estimate consumers' WTP with OLS. Demographic characteristics, including age, gender and years of educations of the auction participants, were added in the model because of their roles in decision making for purchasing (Hanley & Barbier, 2009; Maloma, 2014). Total income per month of household was also included because of its substantial influences from changes in behaviors of consumers from their expectations and the other member's decisions in the household (Duc, 2008; Duc, 2009). On the other hand, elders with poorer health status might be precautious on the quality of products (Drichoutis, 2005; Lazaridis & Nayga, 2009; Jin et al., 2017).

Awareness of consumers in the food quality and risks of food incidents may affect to their WTP (Pennings et al., 2002; Lim, Maynard & Goddard, 2014). For example, risk averse consumers were often expected to pay a higher price premium for pork products with traceability (Jin et al., 2017). In our study, risk attitude of participants was also included as the independent variables in the OLS analysis (Table 1). The couple of sub-questions was applied to distinguish that bidders are risk tolerance, neutral or risk adverse.

Frequency of consumptions (Hanley & Barbier, 2009) was one of the independent variables in the regression analysis. We intended that it may be influential to the WTP with increase of food incidents on pork products in recent years in Vietnam. Pork products with traceability may or may not have an incentive for purchasing with high price premium for Vietnamese consumers.

Table 1. Definition of Variables in OLS

Variables	Descriptions	Mean	SD
WTP	Differences mean of respondent's WTP in two rounds of auction for traceable pork (VND per 500 grams of pork	12,001	5,990
Gender	1 = Male; 0 = Female	0.32	0.47
Age	Age of respondent (years old) (> 18 years)	31.32	15.54
Education	Total participated years in school (Years)	12.68	2.84
Income	Total income per month of household (Thousand VND per month)	11,981	7,658
Health status	1 if family members, including respondents has the self-reported healthy with chronic diseases; 0=otherwise	0.36	0.48
Risk attitude*	Consumer attitude towards food safety, 1 = Risk averse consumers, while 0 indicates risk loving consumers.	0.67	0.47
Frequency of Consumption	1= Respondents consumed pork more than 3 times per week, while 0 indicates the respondents consumed pork equals to or less than 3 times per week.	0.53	0.50
Required information by traceability system	1= Respondents were interested to know the information regarding quality assurance issues in traceability systems of pork product (expire date, quality assurance certificates, production progress and additives). 0 indicates respondents were not interested to know the information regarding quality assurance issues in traceability systems of pork product.	0.37	0.49

Note: SD is the abbreviations of standard deviations. * If respondents answered "Yes" to both sub questions, including "*Do the information about unsafe pork influence to my consumption behavior?*" and "*Do you care about food additives and chemical residue in purchased pork?*", they are defined as "risk averse consumers", while respondents who marked "No" to both or either one, are defined "risk loving consumers".

Additionally, we investigated to understand bidders' needs or demands in the information relating to traceability. Eight different types of information were listed in the questionnaire: expired date, information of producers, retailers, distributors, quality certificate, place of origin, production process, product quality and additives information based on the included information of the currently performed traceability systems for pork products in Ho Chi Minh city. Among those, the information of quality certificate, production process, product quality and additives were included in the traceability systems for pork products to cover the quality assurance issue. The traceability issue was considered by the information of place of origin, expired date, information of producers, retailers, distributors.

We assumed that respondents were interested and concerned in the food poisoning and unsafety food incidents in Vietnam from the adding of chemical and additives to pork products such as uses of illegally banned chemicals in breeding or the pump up the water for fatting before slaughtering as earlier mentioned. Probably the recent cases with the food quality and safety called attentions and influenced to the WTP from the experiment (Wu et al, 2016; Hobbs, 2004). In the regression model, we included the needs of consumers for the including of quality assurance information in traceability systems as the one of the factor influencing to the WTP for traceable products. The consumers, who were interested to know about the quality assurances information in traceability systems, might be willing to pay a higher price for traceable pork products.

All statistical analysis was made with Stata 11 software (Lightstone Corporation).

3. Results and Discussion

3.1 Consumers' WTP for Traceable Pork and Factor that Influenced their WTP Premium

Total 78 of samples were collected and analyzed (Table 1). The ratio between male and female in respondents were 25:53, female account for more than twice of male in the bidders responded in the experiment. The average age of respondents in the sampling was about 31 years old (SD=15.54). Their years of formal educations were more than 12 years (SD=2.84).

The average household income of respondents was about 11,981 thousand VND (~529 USD) per month (SD=7,658). There was 53% of total respondents consumed pork frequently in their family (>3 times per week). In the experiment, there was 36% of total respondents answered that their family members including themselves had the chronic diseases, such as diabetes, stroke, heart disease, cancer and obesity. The risk attitude of respondents towards food safety issues, there were 52 of total 78 respondents (67%) answered as "Yes" for both risk attitude sub-questions, suggesting that those respondents were risk averse consumers. The information about related incidents of pork products may have led responded bidders to the reduction in consumption frequency of pork products.

Table 2. The Bids of WTP for Traceable Pork Products of Respondents

Category	WTP in auction			ΔWTP		
	WTP_1	WTP_2	Mean	ΔWTP_1	ΔWTP_2	ΔWTP Mean
Minimum	35,000	40,000	62,001	-15,000	-10,000	12,001
Maximum	70,000	70,000		20,000	20,000	
Mean	60,074	63,928		10,074	13,928	
Standard Deviation	7,877	5,625		7,877	5,625	
n	78	78		78	78	

Source: Data from experimental auction.

Note: The "*n"* indicated of the total of respondents in the experimental auction. The average price of ordinary pork sold on markets was 50,000 VND per 500gr. "Δ" indicates the differences of the WTP of consumers for traceable pork products in the auction and the average price of ordinary pork sold on markets. The subscriptions "1" and "2" indicate the 1st and 2nd round of the auction, respectively. VND is abbreviation of "Vietnamese Dong", WTP is abbreviation of "Willingness to pay". The prices included in the table are the price per 500gr of pork products.

The bidders' WTP for pork with traceability information range from 60,074 VND (~2.65 USD) per 500 gr in the 1st round to 63,928 VND (~2.82 USD) per 500 gr in 2nd round in the experimental auction (Table 2). The mean bid on the product with the traceability indicated at 62.001 VND (~2.74 USD) per 500 gr pork products. It meant that consumers are willing to pay 24%[1] premium more for pork with traceability information than the product without it. Our result corresponded to Huynh et al. (2017) who suggested a high demand for safe quality pork products of Vietnamese consumers in Mekong Delta, Vietnam with the maximum WTP premium for safe pork products were higher than ordinal pork products.

In the auction, we also found the differences of bidder's WTP for traceable pork products in the auction and the average price of ordinary pork products were increased from 10,074 VND (~0.44 USD) per 500 gr in the 1st round to 13,928 VND (~0.61 USD) per 500 gr in the 2nd round. As the explained rules, the auction would be experimented in two rounds. Thus, in the 1st round of auction, the bidders were deliberation to show their true desire about traceable pork products to avoid the overbidding. In the 2nd round of auction, the bidders' WTP was changed since we noticed the WTP of the 1st round as the references. The bids were increased because the bidders would like to win the auction. However, we found the minimum bids of bidders in two round of the auction for traceability pork products were lower than the average price of ordinary products as showed in Table 2. Thus, it meant that there were the bidders who were not willing to pay a higher price premium for the traceable pork products. We would propose that the bidders were not familiar with traceability even we explained about it as a system which support to improve the safety of food products, but the bidders did not really connect the included information in the current traceability system for pork products and safety.

Table 3. The Estimated Results of OLS Regression Model

Explanatory variables	β_i
Intercept (β_0)	-118.62
Age (x_1)	-74.76
Education (x_2)	667.32*
Gender (x_3)	3,184.94*
Income (x_4)	-0.03
Health status (x_5)	3,340.32*
Risk attitude (x_6)	4,353.23*
Frequency of consumption (x_7)	1,911.43*
Required information about quality assurance (x_8)	672.61
n	78
r^2	0.68
F-test	17.89

Note: The estimated results of OLS regression model with the including of 78 observations of the sampling and its coefficient of determination r^2, and the results of F-test statistical relationship between explanatory variables and WTP at significant level $\alpha < 0.05$. The β_j is the parameter of the first (1) to the eighth (8) explanatory variables (x_j) in OLS regression as described in the text, β_0 is the intercept of OLS regression model. The asterisks "*" denote the statistical significance of the relationship between explanatory variables and WTP in OLS model at $\alpha<0.05$. The *n* is the included number of observations in the OLS regression model.

The result of OLS regression analysis indicated significance of the independent variables ($P< 0.05$, Table 3). The model explained 67.5% for the relationship with consumers' WTP. Correlation coefficients were less than 0.8 in any pairs of independent variables (Table 4).

Years of educations of respondents also significantly contributed to the model. The consumers with higher educations were willing to pay more for pork with traceability. Our results did not correspond to the previous works (Jin et al., 2017; De Vriendt et al., 2009; Drichoutis, 2005). Those previous studies suggested that highly educated consumers are able to obtain more information of the products from a variety of information channels, so they may not trust on and utilize the information from only the available traceability systems. In Vietnam, public concerns and interests in the risk of pork products is high, but available traceability applications or information in them to the food product is fairly limited. Our results may suggest public interests in the risk and limitations in accessibility to the traceability information of the pork product in Vietnam.

Genders had a positive relationship with consumers' WTP for pork products with traceability, suggesting that male respondents were willing to pay higher premium for the products with traceability than female respondents were. In Vietnam, we found the Vietnamese female consumers, especially in rural areas, spent most of their times in the house-works. They may have limited access to available information channels about food security concerns and significance of the traceability, compared to Vietnamese male consumers, who may have more channels to get information about unsafe foods in socials.

Found statistical relationship between the WTP and self-reported health status in this study corresponded to the studies of Drichoutis (2005) and Lazaridis & Nayga (2009). The responses of consumers, who had the family's members including themselves with chronic diseases were willing to pay a higher prime for traceability.

Similar as discussed by Pennings et al. (2002) and Lim, Maynard & Goddard (2014) about the potentials of risk perspectives for consumptions of traceable foods, the statistical relationship between risk attitude and the WTP of this study indicated that risk averse respondents were willing to pay a price premium to buy pork products with traceability. We would suggest that the information security and safety of the pork products may influence to the consumption behaviors of risk averse consumers.

Table 4. The Pair-Wise Correlation Coefficient between Explanatory Variables in OLS Regression Model

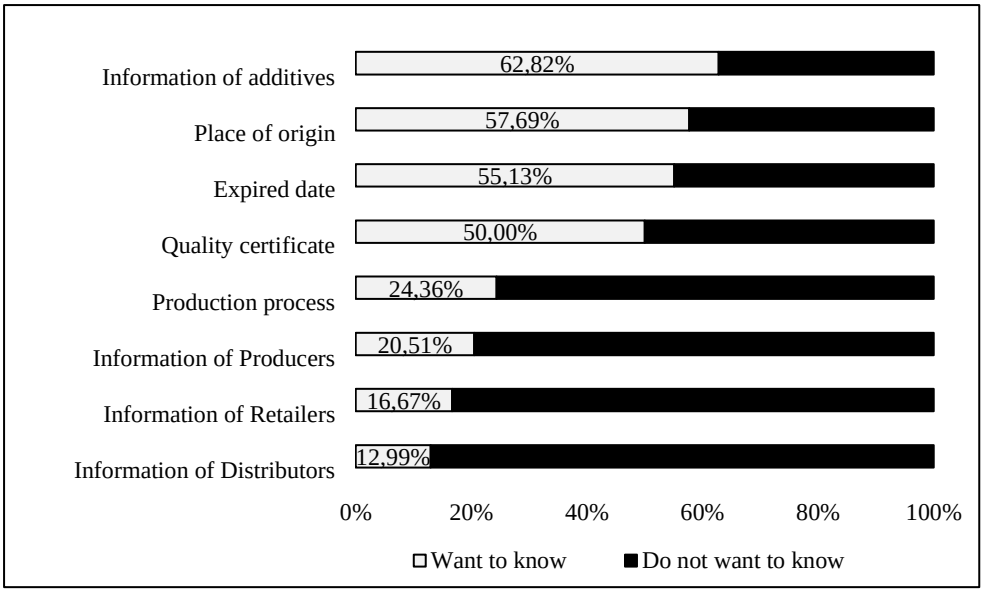
	(x_1)	(x_2)	(x_3)	(x_4)	(x_5)	(x_6)	(x_7)	(x_8)
Age (x_1)	1							
Education (x_2)	-0.62	1						
Gender (x_3)	0.07	-0.24	1					
Income (x_4)	0.27	-0.16	-0.01	1				
Health status (x_5)	-0.25	0.18	0.12	-0.05	1			
Risk attitude (x_6)	0.07	-0.08	0.02	0.17	0.36	1		
Frequency of consumption (x_7)	-0.26	0.03	-0.01	0.28	0.34	0.42	1	
Required information about quality assurance (x_8)	-0.30	0.26	-0.07	-0.20	0.03	-0.02	-0.07	1

Note: The x_j (i=1, 8) is the abbreviations of the first (1) to the eighth (8) explanatory variables in the OLS regression as described in the text.

3.2 Demand for Specific Information Provided by Food Traceability Systems

Among the eight types of necessary information for contribution of traceability, respondents preferred to know the information about additives as their most prioritized information (Figure 1). Information of product origins (57%), expired date (55%) and information of quality assurance certificates of pork products (50%) were also selected by respondents.

As discussed above, the food poisoning and unsafe quality of pork products in Vietnam may result of the attention of consumers about the information related to the quality assurance in traceability system. In the results of OLS regression models, we could not find the statistically significant influencing of the requirements of consumers about the quality assurance information at $\alpha < 0.05$ level. However, its positive relationship with consumers' WTP for pork products with traceability, suggesting the information about quality assurance should be included in the traceability to call the attention from the Vietnamese consumers about traceability system.



Note: The "want to know" information of consumers by traceability system was shaded with gray. The black shades represented for the "do not want to know" information of consumers by traceability system.

Figure 1. Demand for Specific Safety and Quality Information Provided by Pork Traceability Systems of Consumers

Moreover, in recent years, quality assurance certificates were developed and applied to many food products as the signal and indicator of quality and safety (Hobbs et al., 2005; Kehagia et al., 2007; Gudmundsson & Wessells, 2000). In Vietnam, although the perception of Vietnamese consumers about the quality assurance certificates is still limited as previously discussed by Huynh et al. (2017), Lap et al. (2015) and Tran et al. (2013). However, in this study, we found the focusing of consumers on the quality assurance certificates of pork products. The results of our study may probably be a positive signal from the consumers' side to encourage the development and application for those certificates of producers.

The information of distributors, retailers, producers, and production process were not as interested (13% to 24% of respondents) as the other information. Vietnamese consumers often buy pork products in traditional markets and choose the familiar retailers. Thus, they may not be interested to know in these information of producers as well as distributors and retailers in the traceability system (Huynh et al., 2017).

4. Conclusion

We conclude that Vietnamese consumers were willing to pay more for the pork products with traceable information because of their expectation to know about product quality and safety. Specifically, the information of additives, place of origins, expired date and quality assurance certificates pork products are expected from Vietnamese consumers. Notably, needs in and status of family members are important to understand the consumer's WTP and potential pricing for traceability products in markets. The consumers are willing to pay more for traceability for health and safety of their family members including themselves. Vietnamese consumers need information to make their own decision to deal with risks and to protect their family with traceability systems.

Recent foodborne illness incidents relating pork products probably called participated consumers' interests in the traceability in our experiment. Probably, we found the higher WTP for the pork products with traceability as the consequence. To discuss the consumers' behavior in the real markets for implementations of traceability systems, it would be practical to carry out qualitative investigations in their reasoning of the WTP in the future. From perspectives pork producers, the higher WTP of consumers may encourage them to apply the traceability and practices for their food security to their products. Economic incentives may enhance the improvement of their activities for their firms and individuals. Application of traceability system most likely help to enhancing marketing of pork products as well as to protect consumers in Vietnam with fair disseminations to call consumers' attentions.

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[1] This result was calculated by (62.001-50,000)/50,000 = 0.24 = 24%