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CHINESE CONSUMERS' PERCEPTION AND WILLINGNESS TO PAY FOR TRACEABLE DAIRY PRODUCTS

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ABSTRACT

With the rapid development of the dairy industry in China, many problems concerning safety and quality management have arisen. To reduce food safety risks and prevent serious food safety incidents, and enhance consumer confidence in food safety, the Chinese government has undertaken various policy measures to improve the safety and quality of dairy products in recent years. The implementation of traceability systems could lead consumers to perceive a higher value and to be willing to pay a premium price for dairy products. Meanwhile, it will lead to a higher price of products and would influence customer satisfaction and WTP. Some other factors may influence consumer WTP for traceable dairy products. In the present study, several critical factors that may influence the consumer WTP for traceable dairy products were identified.

Moreover, this study evaluated consumer perception and attitudes towards traceable dairy products. The present research comprises three section: (1) a literature review ; (2) a qualitative research on consumer perception and attitudes toward traceable dairy products using focus group discussion with consumers; (3) a quantitative research, aimed at investigating consumers' willingness to pay for traceable dairy products in two different information and auction size group treatments by using second-price auction. Results suggest that participants were willing to pay a price premium for the traceable dairy products.

This research contributes valuable information to the dairy product supply chain, providing insights to producers, distributors, and other actors of the dairy production chain. Results showed that the importance of information about food traceability for improving market demand for traceable dairy products.

Further work will be needed to improve consumers' understanding of the potential benefits of traceable systems in the dairy product quality and security system. Results also suggest that to avoid and reduce the harm of unsafe food, the food traceability system in the dairy industry should be supported to reach food safety targets and to promote the demand for traceable dairy products. Given Chinese consumers' lack of knowledge about traceable, propagating, and educating consumers to help them understand the benefits associated with traceable dairy products, and thus, consumers

can trust the system better. Moreover, encouraging producers to produce diversified traceable dairy products, decrease the production cost , decreasing the price of traceable dairy products may be the most effective way of increasing the traceable dairy food market share.

Keywords: consumers' perception; traceable dairy product; experimental auction;WTP

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EXECUTIVE SUMMARY

Dairy products are an essential part of a healthy diet, and dairy is an emerging food industry in China. Nevertheless, with the rapid development of the dairy industry in China, many problems concerning safety and quality management have arisen. Dairy quality and safety have emerged as crucial issues because food safety issues occur more frequently in this supply chain, thus causing consumers to lose their confidence in the dairy industry. To reduce food safety risks and prevent serious food safety incidents, and enhance consumer confidence in food safety, the Chinese government has undertaken various policy measures to improve the safety and quality of dairy products in recent years. Establishing food traceability systems is one of the top policy tools to attain this goal (C. Zhang, Bai, & Wahl, 2012). However, traceability has not been introduced as mandatory requirements for suppliers in the dairy industry in China.

Implementation of traceability systems could lead to higher production and distribution costs, thus to higher prices of products, and price perceptions would directly influence demand and customer satisfaction. Furthermore, it may lead consumers to perceive a higher value and to be willing to pay a premium price for dairy products. Therefore, firms working in the food business have to compare potential benefits and costs.

In order to implement food traceability system (FTS)in the dairy industry, it is important to understand consumers' perceptions of quality and safety of dairy products, purchasing behavior, and willingness to pay (WTP) for traceable dairy products. Furthermore, it is necessary to know whether the information about FTS may influence consumer WTP. The questions to be addressed here are: What is the Chinese consumers' perceptions of food safety in the dairy sector? What attitudes do Chinese consumers' attitudes towards traceable dairy products? Is information about traceability valid for Chinese consumers? How much are consumers willing to pay in order to get a traceable dairy product? Moreover, what other factors may affect consumer WTP for traceable dairy products? We shall attempt to answer these questions in this research.

Previous studies found that consumers' WTP for safe food is often affected by the associated consumer awareness and cognition of food safety certified products

(Napolitano et al., 2010; Poelman, Mojet, Lyon, & Sefa-Dedeh, 2008). The provision of information about the benefits of traceability system on food safety control may increase consumer willingness to buy traceable dairy products. When the number of bidders increase, the participants in auction perceive a greater risk of losing the auction, thus they tend to rise their bids during the bid process. The effect of information and the number of bidders on consumer WTP are the most important goals of our study.

The first essay is a literature review aimed to gather the present state of knowledge on the subject of Chinese consumers' perception and willingness to pay for safe food. Safe food in this study refers to hazard-free, green, organic, and traceable food. The literature shows that a high level of consumer concern exists about food safety and quality. Although consumers pay close attention to food safety, differences in the preference for food safety perceptions exists among people with different socio-demographic characteristics. Concern on health, environmental benefits, and safety characteristics are the main reasons for Chinese consumers to choose safe food. Even though Chinese consumers have a lack of knowledge about safe food, they still believed that certificated foods have good quality and safety than ordinary, and consumers were willing to pay a modest price premium for them. However, the price premium for safe food is not high. Besides, socio-demographic variables seem to play a critical role in the behavior and purchase intention for safe food. The literature indicated that, overall, income is the most important influencing factor on consumers' willingness to pay with the consumer trust in the safe food coming up next. It is followed by education level, age, food safety perception, price, gender, and knowledge about safe food.

In the second essay, we explored the Chinese consumers' perception of dairy food safety, purchasing behavior related to dairy products, as well as, analyzed the attitude towards the traceability system and traceable dairy product. Focus group discussions were conducted with consumers in three different provinces of China. Focus groups indicated that a high prevalence of food safety incidents triggers consumers to lower their confidence in food safety and to pay more attention to the news about food safety incidents in the media, including social media. Chemical residues were ranked as the first concern on food safety in the dairy industry. Meanwhile, traceable dairy products are not well known among consumers. Although the possibility to trace back all stages of the food supply chain in the dairy sector is considered important, consumers raise

doubts about the authenticity of traceability information. In particular, they are not confident about traceability information provided by enterprises that has not been certified by other third-party bodies. For the interviewers, the traceability information certified by the government has more value than the information certified by third-party agencies. Meanwhile, consumers suggest that the government should bear all or most of the cost of establishing the food traceability system.

In the third essay, we conducted the second-price auction to estimate willingness to pay for traceable dairy products and assess the effect of information about traceable production and the size of auction group on consumer bids, amongst a sample of 315 consumers in Xinjiang province, China. Three products, traceable milk, traceable condensed milk, and conventional milk were used in this auction. Fluid milk is most widely consumed dairy products in China, and condensed milk is also a widely marketable dairy products in the Chinese marketing. Although they have different shelf life and traceability levels, they are the one of the few traceable dairy products in China.

In the information treatment, the basic information treatment provided respondents with milk and condensed milk labeled traceability, while the second treatment included more information about traceable dairy products. Meanwhile, we compared the bids between three different auction size groups.

The results of quantitative research show that traceable food is beneficial for Chinses consumers. Chinese consumers are influenced by information about traceable food, and they are willing to pay a price premium for the traceability information. Chinese consumers have a lack of knowledge about traceable products, and it could be considered as barriers to traceable food market development. Results suggest that consumers' knowledge of traceable products play critical role in determining the development of traceable dairy products market. Further work will be needed to improve consumers' understanding of the potential benefits of traceable systems in the dairy product quality and security system. Results also suggest that to avoid and reduce the harm of unsafe food, food traceability system in the dairy industry should be supported to reach food safety targets and to promote the demand for traceable dairy products.

We found that trust in the certificated label and cognitive degree of the traceable food are critical factors in driving traceable food consumption, meanwhile consumers'

awareness of traceable food is relatively low. Given Chinese consumers' lack of knowledge about traceable food, propagating, and educating consumers to help them understand the benefits associated with traceable dairy products and thus consumers can trust the system better. It has to be also mentioned that household size was a critical barrier to purchase the traceable dairy product.

Our research also shows that consumers' household income plays a vital role in the WTP for traceable dairy products. Since consumer’s household income is unlikely to increase in the short run, we suggest that decreasing the price of traceable dairy products may be the most effective way of increasing the traceable dairy food market share. Compared to the older, the younger consumers have been showing more interest in the traceable dairy products and are more willing to pay a price premium. Younger consumers (under 50 years old) are a potential customer for traceable dairy products.

The auction size had a significant effect on WTP. However, the effect was different across the different auction products, as well as the effect of different auction size was not the same. Further research should compare the bids between different auction groups with larger differences and try to find out the effective marginal bidder number.

Chapter 1

INTRODUCTION

Dairy products are an essential part of a healthy diet, and dairy is an emerging food industry in China, Due to China's huge population, there is a great demand for dairy products. In 2014, the average amount of annual milk consumption was 12.6 kg per capita, generating a total milk yield of about 37,246 million tons in China, which was an increase of almost 200% since 2002 (X. Wu et al., 2018).

Nevertheless, with the rapid development of the dairy industry in China, many problems concerning safety and quality management have arisen. Dairy quality and safety have emerged as crucial issues because food safety issues occur more frequently in the supply chain, thus causing consumers to lose their confidence in the dairy industry.

Safety and quality are very important elements of people's conceptions of food and associated decision making(Aung & Chang, 2014). To reduce food safety risks and prevent serious food safety incidents, and enhance consumer confidence in food safety, the Chinese government has undertaken various policy measures to improve the safety and quality of dairy products in recent years. Since both quality and safety were shown to be related to confidence, traceability may indeed boost consumer confidence through quality and safety assessments(Van Rijswijk & Frewer, 2008).

Given that traceability is mainly a quality assurance tool, its implementation depends on many factors linked to the supply chain(Jan Hofstede, G., Fritz, Canavari, Oosterkamp, & Van Sprundel, 2010).Consumer perceptions and attitudes towards the traceability system also are key factors that should be considered by policymakers in the implementation. Moreover, traceability has not been introduced as mandatory requirements for suppliers in the dairy industry in China (except for Infant Formula Milk Powder). Therefore, an assessment of Chinese consumers' valuation for traceable dairy products will aid government in implementing more effective food safety regulations.

About Traceability system

The presence of information asymmetries between consumers and food suppliers is one of the critical reasons that caused food safety events worldwide (Bai, Zhang, & Jiang, 2013; Dickinson & Bailey, 2003). Food manufacturers, compared to the consumers, have far more information about the products offered by them (Nestorowicz, 2014), and consumers lack information about quality properties of foods than sellers on the market (Latvala & Kola, 2003). Therefore, ensuring a safe supply is a difficult task as there exists information asymmetry in food supply chains (Hobbs, 2004).

The traceability system is introduced and has been widely put into force to mitigate the risk of the food supply chain on account of its ability to trace the history and application of an entity by means of recorded identification throughout food supply chains (Sun & Wang, 2019).

Traceability systems provide consumers with food safety and quality information, allowing producers and distributors in the supply chain to track the product and possibility trace back the sources of any unqualified food. These types of the system may help supply chain participants overcome problems of asymmetric information. Therefore, it is considered a major tool for effective reduction of information asymmetry and fundamental prevention of food safety risks because of their ability to monitor food production and distribution by generating a reliable continuous flow of safety information in the supply chain (Linhai Wu, Wang, & Zhu, 2015). An effective traceability system can promptly identify, single out, and remove unsafe food products from the market (Rongduo Liu, Pieniak, & Verbeke, 2013).

Definition and Objectives of Traceability

There are numerous definitions of (food product) traceability in international regulations and standards. Traceability as defined in international standards (Aung & Chang, 2014b; Canavari, Centonze, Hingley, & Spadoni, 2010; Olsen & Borit, 2013, 2018).

According to ISO 8402(1994) quality standards, traceability is defined as" the ability to trace the history, application or location of an entity by means of recorded identification."

In ISO 9000:2005 standards, the definition is extended into "the ability to trace the history, application or location of that which is under consideration."

ISO guidelines further specify that traceability may refer to the origin of materials and parts, the processing history, and the distribution and location of the product after delivery.

In The European Union (EU) regulation 178/2002 (EU, 2002) traceability is defined as: "the ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution".

Authors also defined it and have explained the characteristics and benefits of the traceability system in the food sector. Hobbs, (2004) suggested that there are three functions of traceability systems for food suppliers (i) ex-post reactive systems that allow the traceback of affected products in the event of a contamination problem so as to minimize social costs; (ii) ex post systems that facilitate the allocation of liability, and (iii) information systems that provide ex ante quality verification. Olsen & Borit (2018) identified that the traceability system includes two mechanisms: "identifiers" and "recording."

In summary, the traceability is found to be defined as a tool, which it makes it possible to identify all of process and supply chain participants; makes it possible to rapid access all of the source and location information and makes it possible to link between all of the supply chain participants.

Previous studies have described the objectives of a traceability system in the agricultural and food supply chain suppliers and consumers.

Firms have three primary objectives in using traceability systems: improve supply management, facilitate traceback for food safety and quality, and differentiate and market foods with subtle or undetectable quality attributes (Aung & Chang, 2014). For the farmers/growers, traceability is part of the quality management system that can assist in continuous improvement and minimization of the impact of safety hazards (Slamet & Nakayasu, 2017).

From a consumer perspective, as mentioned in previous studies, the traceability system helps to build trust and increase confidence in the food system through provides information to consumers related to the food quality and safety (Aung & Chang, 2014;

Lai, Wang, Ortega, & Olynk, 2018). The traceability system is a record and transfer systems that show the path of a product from suppliers through intermediate steps to consumers. As showed in the Figure 1, the traceability mechanism is provided to gain access to recorded data, meanwhile can be moved from place to place.

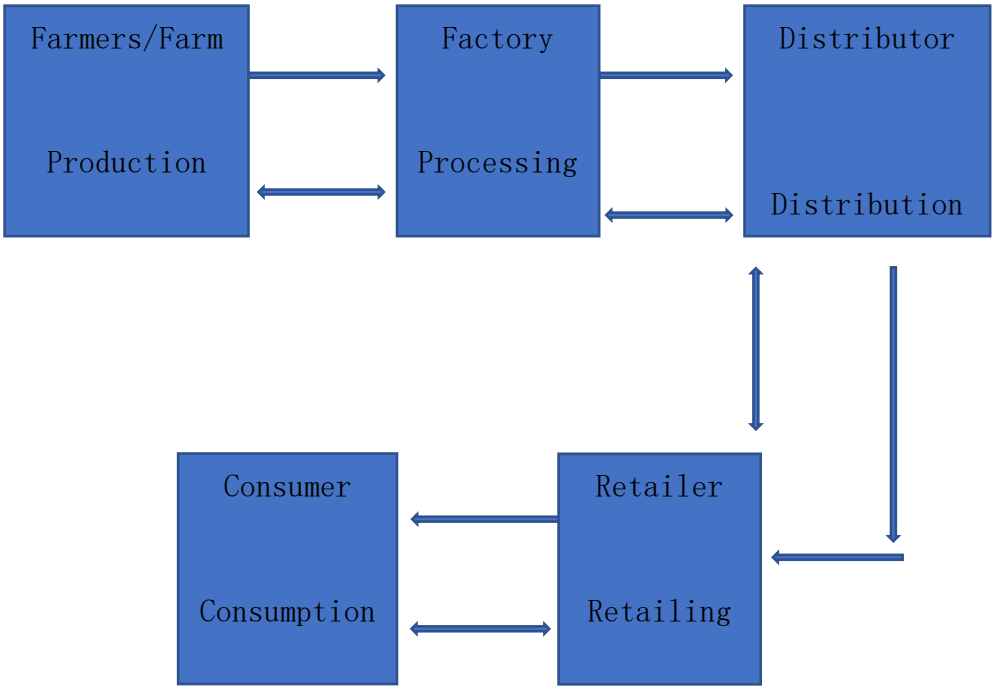

Figure 1 *Supply chain and information transfer*

Food Traceable system in China

Similar to many other developing countries, the Chinese food traceability systems are still in their infancy. The Chinese government has been implementing food traceability systems since 2000. In May 2002, the Chinese Agriculture Ministry issued Decree No. 13 "Measures for Managing Animal Immunity Identification," which prescribed that livestock such as pigs, cows, and sheep must wear ear tags, and an immunization records management system should also be established. In 2003, the National Bureau of Quality Inspection started to carry out the "Project of Promoting Bar Codes in China." In September 2004, the State Council published its "Decision on Further Enhancing Food Safety" that proposed a system of quality and safety standards for agricultural products and that established a routine monitoring and traceability

system for the quality and safety of agricultural products. In August 2007, China issued and implemented the Administrative Provisions on food recall. In 2008, China's Ministry of Commerce and Ministry of Finance intensified the construction of meat traceability systems in several pilot cities. A pilot beef and mutton quality safety traceability system involving the entire production and marketing chain was established in Inner Mongolia by the Ministry of Industry and Information Technology on July 2013. In June 2013, the State Food and Drug Administration issued the "Opinions on Further Strengthening the Quality and Safety of Infant Formula Milk Powder". The Law of Food Safety (2015 edition) required that all manufacturers of infant formula products are responsible for the quality control and management of the product from the raw material to the final product and should employ batch-by-batch inspection to the final product.

Traceability system in China characterized by a strong government push, prioritization of a few key food supply chains, that is, meat, vegetables and fruit, and aquatic products; under the supervision of various government departments. Overall progress has been slow, and the current enforcement of these traceability systems in the domestic market has been deemed ineffective (Duan, Miao, Wang, Fu, & Xu, 2017; Ruifeng Liu, Gao, Nayga, Arielle, & Ma, 2019).

Research questions, objectives and structure of the thesis

Implementation of traceability systems could lead, together with a better management of food safety, to higher production and distribution cost. Thus, to higher price of products, and price perceptions would directly influence demand and customer satisfaction. On the other side, the implementation of traceability may lead consumers to perceive a higher value and to be willing to pay a premium price for dairy products. Consumer knowledge and support is an essential external critical factor that influences traceability systems implementation success, and it has been stated that willingness to pay (WTP) for traceable products by consumers will ultimately drive the proliferation and implementation of traceability systems (Duan et al., 2017).

The significance of information and knowledge is emphasized in many markets (Latvala & Kola, 2003). This is especially true in the dairy product market. The value consumers put on a food product depends on the degree of the product-information that

was provided to consumers. Information asymmetry often leads to increased anxiety, uncertainty, and rapidly declining confidence among consumers(Hobbs, 2004), Consumer confidence in food purchases can be improved through providing information related to food quality or safety attributes (Gustafson, Lybbert, & Sumner, 2016; van Rijswijk, Frewer, Menozzi, & Faioli, 2008). Thus, it would be worth to explore the consumers' WTP for traceable dairy products presented in different information condition. Prior research mostly focuses on the consumers' preference for traceable information attributes, rather than comparing the WTP for traceable dairy products in the context of providing information and not providing information. Basic economic intuition tells us that a larger number of bidders increases competition level, and increased competition may elicit more aggressive bids from bidders(M. Wu, 2016).When the number of bidders increase, the participants in auction perceive a greater risk of losing the auction, thus they tend to rise their bids during the bid process. The effect of information and the number of bidders on consumer WTP are the most important goals of our study.

Some other factors may influence consumer WTP for traceable dairy products. Therefore, firms and policymakers working in the food supply chain have to compare potential benefits and costs.

The research questions to be addressed here are:

- What is the Chinese consumers' perceptions of food safety in the dairy sector?
- What attitudes do Chinese consumers' have towards traceable dairy products?
- Does information about traceability valuable to Chinese consumers?
- How much are consumers willing to pay in order to get a traceable dairy product?
- What other factors may affect consumer WTP for traceable dairy products?

We shall attempt to answer these questions in this research.

Previous literature provides a useful reference for our study. There have been some studies in the literature, which have attempted to examine consumers' attitudes and willingness to pay for traceable dairy products. However, there are still some remaining deficiencies.

First, there are some previous studies on Chinese consumers' attitudes toward traceable dairy products based on quantitative methods, but few studies are performed this analysis through qualitative studies. Missing qualitative studies may lead to a lack

of in-depth understanding of the issue at hand, since quantitative studies alone may have been designed only by the researchers' view of the problem, thus missing important aspects.

Second, previous quantitative research on Chinese consumers' WTP for traceable dairy products was performed using surveys collecting consumer's opinion and willingness to pay was estimated performing hypothetical choice experiments. Thus, the results of these studies may be affected by hypothetical bias that is the difference between what people say they are willing to pay in a hypothetical survey question and what they will actually pay in real purchase situation or in a non-hypothetical experiment when money is really on the line (Grebitus, Lusk, & Nayga Jr, 2013). Consumers may declare their high preference and intent for products in the hypothetical survey. However, it might be not representative of the behavior under realistic environmental conditions.

This research thus aimed to

1. explore Chinese consumers' perception of dairy food safety, purchasing behavior related to dairy products, as well as, analyze consumer attitude towards traceability system and traceable dairy products
2. analyze Chinese consumers' preference and willingness to pay for traceable dairy products
3. investigate the effect of information about traceable food
4. auction size on consumer bids.

To achieve objective 1, we investigated consumers' behaviors, concerns on dairy product purchase and safety, and attitudes toward traceability dairy products both reviewing the previous literature and doing an empirical explorative study using focus group interviews.

Regarding objective 2, 3, and 4, to measure Chinese consumers' willingness to pay for traceable dairy products we collected data with an empirical survey based on second-price auctions with a total sample of 315 consumers. The survey was also designed to test the influence of information and the effect of group size defined in the auction protocol on the average WTP.

The remainder of the thesis is composed of three main chapters:

1. **Chinese consumers' perception of food safety and the willingness to pay for safe food—a literature review**. This chapters gathers the published literature with the aim to summarize the current state of knowledge through the findings of studies on Chinese consumers' perception of food safety, motivations and barriers to purchase safe food, and willingness to pay a premium for safe food.
2. **Chinese consumers' perception of food safety and attitudes towards traceability dairy products: A qualitative study**. This chapter explores the Chinese consumers' perception of dairy food safety, purchasing behavior related to dairy products, and analyzes the attitudes towards the traceability system, and traceable dairy products. Nine focus group discussions were conducted with consumers in three different provinces in China. Data were analyzed by qualitative content analysis.
3. **Consumers' willingness to pay for traceable dairy products – evidence from experimental auctions**. This chapter illustrates the empirical study focused on Chinese consumers' preference and willingness to pay for traceable dairy products. Second-price auctions have been conducted with 315 participants in China. Three products, traceable milk, traceable condensed milk, and conventional milk were used in this study. Fluid milk and condensed milk were chosen as auction products because fluid milk is one of the most popular dairy products in China, while condensed milk is also a widely marketable product in China. Another important reason is that traceable milk and traceable condensed milk can be found on the market. The study allowed to measure WTP and to model it according to specific variables. In addition, it investigates the effect of information about traceable food comparing the average WTP between a sub-sample of respondents who received specific information and a control group who did not. Finally, the study also investigates the effect of auction

group size on consumer bids. An analysis of variance (ANOVA) has been used to find out whether there was a significant difference between the means of bids for three auction products in the information and auction size treatment. A generalized linear model (GLM) regression was also used to determine the factors potentially associated with the outcome variable.

CHAPTER 2

CHINESE CONSUMERS' PERCEPTION OF FOOD SAFETY AND WILLINGNESS TO PAY FOR SAFE FOOD—A REVIEW

Abstract: This paper deals with the consumers' perception of food safety and the willingness to pay for safe food. The findings show that most scholars who have analyzed food safety perception for different food categories in China have concluded that a high level of consumer concern exists about food safety and quality. Concern on health, environmental benefits, and safety characteristics are the main reasons for Chinese consumers to choose safe food, and consumers are motivated to buy safe food as insurance in health and followed by pesticide-free or lack of chemical content. Even though Chinese consumers have a lack of knowledge about safe food, they still believed that certificated foods have good quality and safety than ordinary, and consumers were willing to pay a modest price premium for them. However, the price premium for safe food is not high. Income is the most important influencing factor on consumers' willingness to pay with the consumer trust in the safe food coming up next. It is followed by the education level, age, food safety perception, price, gender, and knowledge about safe food.

Keywords: Food safety, consumers' perception, WTP, safe food

2.1 Introduction

Due to the frequent occurrence of food safety incidents in recent years, the issue of food safety has attracted more and more attention among Chinese consumers. The majority of consumers showed a high level of food safety concern(Cai, Wang, Zhu, & Wu, 2013; Ortega, Wang, Wu, & Olynk, 2010; Ren & An, 2009; W. Xia & Zeng, 2006; Y. Zeng, Xia, & Huang, 2007). Most scholars who have researched the field of food safety in various food groups in China have concluded that there has been a high level of consumer concern about food safety and quality. In 2011, a survey, food safety was

ranked first in the top five safety issues that were of concern to the Chinese population, surpassing public safety, traffic safety, health safety, and environmental safety(Lam, Remais, Fung, Xu, & Sun, 2013b). There is a high level of worry and a moderate degree of knowledge about safe food among Chinese consumers (Rongduo Liu et al., 2013).The same study also found that consumers were most worried about counterfeit and inferior quality food, probably because consumers have been frequently confronted with such products. A study conducted in four cities by Wang and Huo (2016) showed that 81.3% of the respondents of 504 fresh apple interviewees had experience with the purchase of unsafe fruit, and 66.6% of respondents pay close attention to fruit safety issues. The result consists of another quantitative study which reported that 73.2% of respondents in Beijing are "very concerned" or "concerned" about fruit safety (Shalamujiang et al.,2018).

Food-safety, scandals involving dairy products have repeatedly been occurring in recent years. There are 223 government and media reports related to dairy food safety incidents in China between 2004 and 2017 (X. Zhu, Yuelu Huang, & Manning, 2019). The "Sanlu melamine milk powder" incident in September 2008, which was China's worst-ever food-safety scandal shocked the whole dairy industry. An estimated 300,000 victims were reported in China, with 860 children hospitalized and six infants dying from kidney stones or other kidney damage caused by melamine poisoning in this incident (Y. Zhou & Wang, 2011). This food safety crisis attacked consumers' confidence in the quality and safety of dairy products. Since this scandal, food safety issues in the dairy sector have increasingly gained the attention of the Chinese government and the public. Consumers expressed a lower trust level regarding the entire dairy industry and the top three dairy brands, and they also had weak confidence regarding any safety improvement of the dairy industry in the next ten years(Li, Li, Li, & Peng, 2014).

2.2. Selection of relevant studies

With frequent incidents of food safety, many studies on consumer behavior as well as willingness to pay for safe food were carried out. The main aim of the literature review is to review previous research and to provide factors surrounding consumer behavior related to safe food and to determine if a relationship existed between

consumers' different characteristics and their perception of safe food and willingness to pay for safe food.

We carried out an online literature state-of-the-art research to identify all of the articles relevant to Chinese consumers' perceptions of food safety and purchasing behavior towards such as organic food, green food, traceable food published from 2008 to 2019 in English and Chinese language. The English language papers were selected from Scopus, Google Scholar, and Science Direct. The Chinese language papers were selected from the CNKI (China National Knowledge Infrastructure) database. CNKI is the biggest Chinses Literature database, and it includes academic journal articles, doctoral and master's dissertations, conference articles, and other types of documents (Rongduo Liu et al., 2013). The following keywords were used to identify the relevant articles: food safety in China or Chinese consumers' perception of safety food or Chinese consumers' willingness to pay for {traceable food}, {organic milk}, {traceable milk}, {traceable milk},{safety of dairy},{organic food}, or {green food}.

2.3 Consumer’s demographic characteristics and food safety perception

Overviewing the previous literature shows that consumers are widely concerned about food safety, at the same time, previous studies have found that a difference exists in the perception of food safety between consumers who have different socio-demographic characteristics such as income, gender, age, education level, etc.

2.3.1. Income and food safety perception of consumers

In the early literature-stage, education and income have often been perceived as the essential factors affecting consumer's perception of food safety or purchasing behavior. With increasing household income, the demand for food quality and safety has been increasing in China, and meanwhile, consumers are more concerned about food safety. Chinese consumers with relatively high monthly income were more concerned about safety issues on vegetables, such as pesticide residues, heavy metal contamination, and microbial and packaging contamination (L. Cheng et al., 2016a). Monthly income was also moderately correlated with consumer risk perception of safety in dairy products and was significant. Consumers with higher income will pay more attention to the quality of

life and have less confidence in food safety and quality. Zhang et al. (2010) reported that as incomes increased, consumers become sensitive to milk safety. These findings were similar to those reported by other studies in food consumption that have attempted to link family income levels with consumers' food safety concerns. They reported that high-income households pay more money for their families' health and are relatively more concerned about food safety issues in dairy industry than lower-income households (A. Liu & Niyongira, 2017a; Quan, Zeng, Yu, & Bao, 2018; P. E. I. Xu, Zheng, & Motamed, 2010). However, a study by (Fang Wang, 2014) showed different results, with respondents who had a high monthly income and therefore they were more likely to consume high-quality dairy products as of low risk while respondents who had a low monthly income were more likely to perceive high risk in consuming dairy products. A study conducted in six cities in China by Cicia et al. (2016) also reveals that at present Chinese lower income classes who often live outside of major urban centers are most worried about food safety.

2.3.2. Education and food safety perception of consumers

As stated above, education factors have attracted the attention of many scholars in the field of food safety. The literature review reveals that consumers' education level has a significant impact on their food safety perception. A study focuses on the correlation between education level and food safety perception of consumers. The study indicated that consumers with a lower level of education tend to be less concerned about certain food safety factors compared to those with a higher level of education (Feng Wang, Zhang, Mu, Fu, & Zhang, 2009). Consumers with higher education and income level pursue a higher living level. Thus, they are more concerned about food quality and safety(Z. Feng & Li, 2008). This result is similar to the findings of Chen, Jing, and He (2017) and Quan, Zeng, and Liu (2011), who reported that well-educated dairy products consumers are more likely to exhibit more significant concern about food safety than others. It is because consumers with higher education levels have better access to information about food quality and safety. However, some studies draw different conclusions. Cheng et al. (2016) reported that no significant difference in Consumers' concerns on food safety in different education groups. Cicia et al. (2016) surveyed 479 participants in six cities by using panel mixed logit conditional regression and obtained

the result that educational level amongst Chinese consumers would not appear to influence concerns over food safety with pork production.

2.3.3 Age and gender and food safety perception of consumers

Some authors have found a significant relationship between age and gender with the consumers' food safety perceptions. However, findings are not always consistent. The literature review reveals that males and females have significant differences in the concerns about food safety. With the use of the survey, a total of 1015 consumers data from Nanjing and Beijing, A. Liu & Niyongira (2017) showed that women have more concern about food safety than men. The finding is similar to the findings of Rongduo Liu, Pieniak, & Verbeke, (2014)who reported females paid more attention to food safety issues than men because they take more responsibility for buying and preparing food. Women are more family conscious than men, and they have taken the role of principal meal planners in the family, and they showed a relatively higher level of quality safety of dairy products (Quan et al., 2011). This finding is consistent with previous studies (Feng & Li, 2008; R. Liu et al., 2014; Y. Wang, Wang, & Xiu, 2013). However, these results do not consist of other quantitative studies, which reported that male consumers were more concerned about food safety issues (L. Wang & Huo, 2016b). There is an increasing number of males beginning to take responsibility for purchasing food in China, and they expressed more concern about the health issues of family members. Hence, they are more concerned about food safety than females(Z. Feng & Li, 2008).

Compared to gender, age was a research topic that was of greater interest to the scholars and pundits dealing with this subject. In general, consumers pay more attention to food safety and nutrition, with increases of age, and they are not very sensitive to price. These findings coincide with another report by L.Xu & Wu (2010) that consumers with different characteristics and different lifestyles have different levels of satisfaction with food safety. Young people and consumers with a low level of education are relatively satisfied with the food safety situation. The results are similar to the findings of Cheng. Li et al., (2016), who reported that consumers' concerns have increased with the increase of age, and young people were less concerned about vegetable safety problems than the older. The same study also found that women were more concerned about the price, brand, total quality, the degree of freshness, place of

origin, purchasing place and shelf life of vegetables than men, when purchasing vegetables. Some studies found the age variable inversely related to sensitivity to food safety in China (Cicia et al. 2016). People aged from 30 to 39 are generally characterized by a heightened interest in food safety issues than other age groups, and males are significantly more interested than females (Xiang Chen, Zhao, & Blackard, 2015).

2.3.4 Other factors and food safety perception

Some other factors have been discussed in the previous literature. Cheng. Li et al. (2016) reported that consumers who purchase vegetables frequently were more likely to pay attention to food safety and quality than the ones who have never brought vegetables. This result is consistent with the finding of Y. Zhou Wang et al. (2013) that consumers who are taking responsibility for family food purchases are more sensitive about food safety and more concerned about food safety issues. Compared with respondents who never buy dairy products, the people who regularly consume dairy products are worried less about the safety and quality of dairy products because they know how to choose safer dairy products in the market (Quan et al., 2011). Income is a critical factor that influences consumers' food safety perception and willingness to pay for safe food (Lin hai Wu, Xu, & Wang, 2010). Families with children or elderly members presented a high concern about food safety (Z. Feng & Li, 2008; A. Liu & Niyongira, 2017).

2.4. Consumers' perception and attitudes towards safe food

2.4.1 The motivation to purchase safe food

Chinese consumers relied upon organic or "Green food" or "Safe food" labels as a strategy to reduce the risk associated with food consumption (Hasimu, Marchesini, & Canavari, 2017; Yu, Gao, & Zeng, 2014; Zhou, Li, & Liang, 2015).Many researchers have attempted to explain the motivations and barriers to purchase safe food. Xie et al. (2015) showed that the main motives to purchase organic foods are health and environmental benefits, plus a feeling of non-GMO involved and better tastes. They also found that health benefit is the most important factor motivating the purchase of

organic food products for consumers. The result is consistent with the findings identified by Thøgersen et al. (2015), consumers' attitude toward buying organic food is strongly linked to beliefs about its healthiness, taste, and environmental friendliness. Sirieix, Kledal, & Sulitang (2011) reported that most interviewees stated on the link between organic products and their healthy characteristics, and health was considered as the primary motive by them. The same study reports that for most interviewees, the environment is a new matter of concern, and no interviewee developed ideas about animal welfare, even among those who are used to eating organic meat, eggs, or milk. Unlike in other countries, concern for animal welfare does not seem to be a motive for Chinese consumers to buy organic meat (Yip & Janssen, 2015a). Some other studies describe food safety as an essential motive for Chinese consumers to purchase safe food. Food safety and quality turned out to be the most important aspects for consumers when purchasing food. There are positive correlations between premiums for eco-labeled rice and consumers' concerns about food safety and the environment, suggesting that health benefits and environmental considerations are the two critical motivations(Q. Liu, Yan, & Zhou, 2017). It could be summarized that healthy, environment-friendly, quality and safety are the most important reason for Chinese consumers while purchasing safe food. However, animal welfare is not.

2.4.2 The barriers to purchase safe food

By reviewing the literature, we found that several factors will impact on household consumers' buying decisions. Notably, the price seems to be a more significant barrier to purchasing safe food in China. Price is the main barrier to choosing organic products. However, considered very expensive, and they seem to be, bought only by affluent people (Sirieix et al., 2011; Yin, Wu, Du, & Chen, 2010). A survey by Xie et al. (2015) revealed that in all, 81.7% of non-organic buyers said that they refuse to purchase organic food products because they have a much higher price premium compared to conventional ones.

In the same study, the authors also indicated that aside from high price and distrust for organic food, lack of knowledge and limited availability of organic food could be considered as barriers for organic food market development. Hou, (2011) and G. Liu & Chen, (2015) reported that distrust traceable information and price are mainly barrier for

consumers to purchase traceable fruits and vegetables. This result is similar to findings of Wu, Xu, & Gao, (2011) who reported that there are three reasons for lack of preference for certified traceable foods: unfamiliarity with certified traceable food and having doubts regarding its function, dislike for the information presentation style and concern about the higher price. A consumer survey that was conducted in Hong Kong, and Shanghai by Yip & Janssen, (2015) showed that high prices, difficult accessibility, and lack of variety of organic food are significant factors that hinder consumers from purchasing it. These findings were similar to those reported by Thøgersen et al. (2015), who reported that the barriers to buying organic food are substantially bigger in China, especially in terms of availability – organic food only being available in a handful of upscale supermarkets. To sum up, based on the present income level, the price inevitably becomes the most critical limiting factor for a safe food market scale in China. In addition to the price, there are some other barriers for consumers to purchase safe food, such as distrust, difficult accessibility, and have lack of knowledge about safe food.

2.4.3 Consumer's knowledge about safe food and label

Consumer' Knowledge about safe food is considered as one of the essential factors that can influence their purchase intention. A review of the literature showed that although different safe food like organic, green, and traceable food are becoming more common in the market, Chinese consumer knowledge about safe food is still spotted and unclear. Chinese consumers have a high awareness of safe food but limited knowledge about the concept of that, low recognition of the relevant labels, and limited ability to identify safe food (Rongduo Liu et al., 2013). This finding also was reflected in other studies. In the study of Xie et al. (2015), only 44.8 percent of 142 the respondents in Nanjing and Shanghai could correctly define organic food. Although most people have heard of green consumption, their knowledge of its content remains inadequate (H. H. Zhao, Gao, Wu, Wang, & Zhu, 2014). Consumers confused green and organic food, with 47% of consumers confusing the two with each other (Zengjin Liu & Qiao, 2011). There was a general lack of understanding of the food traceability system among consumers; only 28% of the respondents understood the three basic functions of the food traceability system (Linhai Wu, Xu, Zhu, & Wang, 2012). Besides, consumers

have difficulty in identifying safe food and labels. L. Wang & Huo, (2016) reported that 9.5 percent of the respondents did not know what certified apples were, whereas around half of them (50.6 percent) acknowledged they were unfamiliar with certified apples. A study carried out in three cities showed that only 36 percent of the participants know the labels of organic food, and only 15.7 percent of them can distinguish organic food from conventional food, green food, and non-harmful food in terms of quality and safety (Yin et al., 2010). Z.Feng & Li (2008) found that 78 percent of respondents clearly to know the label of hazard-free food, and about the green food, this rate is 82 %. From above the literature review, Chinese consumers lack knowledge about organic, traceable, hazard free and green food, so relatively speaking, consumers have higher-level knowledge about green food and its label than others, but it is still not high enough.

2.4.4 Purchasing channels of safe food

A study carried out in Beijing by Cheng et al., (2016), found that the majority of respondents took supermarket as the most trusted place of buying vegetables. Therefore, most consumers choose supermarkets to buy vegetables frequently. In the same study, the farmer market was chosen as the second trusted purchasing place by consumers. A review of the literature showed that supermarkets were the primary location for purchasing safe food, mostly because consumers have a high level of confidence in the safety and quality of food sold in supermarkets (R. Liu et al., 2013). The result is consistent with findings from a survey in the Zhejiang province, confirming that the place where consumers most frequently purchase grapes is fruit supermarket, followed by farming market and street vendors. The authors also point out that the main factors affecting consumers to select the place to purchase grapes are convenience, freshness, and price (H. Feng, Feng, Tian, & Mu, 2012). Besides that, these findings are similar to the results reported by (Z. Feng & Li, 2008). Consumers with a lower income have higher price sensitivity while purchasing agricultural products. Hu, Yu, & T.Reardon, (2003) reported that the consumers with under 1000Yuan monthly income, only consider the price and the purchasing place which could purchase the agricultural products at a lower price. A review of the literature showed that higher-income consumers have a more in-depth consideration of purchasing place. They intended to choose their trusted purchasing places to purchase food. Cheng et al., (2016) indicated

that respondents with the income level of “5001 to 20,000 RMB” were more concerned about purchasing place than others. They choose the chain supermarket as their primary purchasing places for food.

2.4.5 Price premium of safe food

By reviewing the existing literature, it seems that although Chinese consumers have a lack of knowledge about safe food, they were willing to pay a modest price premium for safe food. Consumers are willing to pay for high-priced green food and claimed that they would accept green food even if they were priced between 5-10% higher than conventional foods(W. Xia & Zeng, 2006; H. H. Zhao et al., 2014). Yu, Gao, & Zeng, (2014) reported 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. A study by Xie et al. (2015) showed that almost half of the respondents could accept the price premium for organic vegetables not higher than 30 percent, while 32.5 percent of the respondents were willing to accept the premium of 50 percent and more. A further study indicated that the price premium of traceable vegetables was no more than 30% for 95.8% of the consumers (Linhai Wu et al., 2012). Feng Wang et al. (2009) reported that about 60.1 percent of respondents expressed willingness to pay an average premium of less than 10 percent for traceable fish products.

The high frequency of the food risk accident in the dairy sector, the problems on the safety of food have appealed much common concern of the society, and consumers willing to pay a price premium for safe food, however, the price premium of safe food is not high.

A survey in six Beijing supermarkets indicated that a HACCP label is associated with a modest dairy product price premium of 5.2% (Z. Wang, Mao, & Gale,2008). Gao, Li, Bai, & Fu, (2016) reported that despite consumers' limited knowledge, Chinese consumers are willing to pay a 40% premium (on average) for sustainable milk over conventional milk. L. Chen & Zhang (2011) reported that Chinese college students pay more attention to the safety problems of dairy products, and they know little about traceable dairy products. The authors indicated that, despite their awareness of food safety issues, the willingness to pay is concentrated in a range under 30 percent

premium for the traceable dairy products. This result is more consistent with the 29 percent for certified dairy products (Yang, 2016). T. Chen et al., (2013) found that the average additional fee that consumer is willing to pay for GAP milk is 18.5% of the price of ordinary milk.

2.4.6 Influencing factors of consumer willingness to buy safe food

Literature reported that a profound impact of demographic characteristics on Chinese consumers' behaviors to safe food (L. Cheng et al., 2016a; Rongduo Liu et al., 2013).We reviewed a total of 63 published English and Chinese language articles (see table1) on Chinese consumers' purchase intention and willingness to pay for safe food, and the following factors have been pointed out by scholars as to the primary factors affecting consumers' willingness to purchase safe food.

Table 2-1 ***Variables mentioned in the papers***

Factors	**Papers**
Income And Expenditure	41
Consumers' Trust In Safe Food/Perception	33
Education	27
Age	24
Food Safety Perception	21
Price	19
Gender	15
Knowledge About Safe Food	11
Health	9
Whether Have child/older in the family	7
Availability To Purchase	7
Health Benefits	6
Family Size	5
Environment Benefits	4
Brand	3
Shopping Venues	3
Label Information	3
Living Place	2
Origin Of Products	2
Freshness	2
Employment Status	2
Purchasing Experience Of Safe Food	2
Attitudes Toward Safe Food	1
Shopper Status	1
Married Status	1
Access To Information Serve	1

Source: Data from the survey

2.5. Personal characteristics

2.5.1 Food safety perception

From the literature review, we found that, in most situations, the response of consumers to the risk related food is likely to affect their purchasing intention and their willingness to pay for safe food. (Yin et al., (2017) analyzed consumers' willingness to pay for traceability information attribute of infant milk formula with 1,225 consumers' data. They reported that the higher the food safety risk perception, the higher the WTP for traceability information. The result is consistent with the findings identified by G. Liu & Chen (2015) that risk perception has a positive effect on consumers' willingness to pay. Consumers who think that the situation of food safety is dangerous are willing to pay a higher price for traceable vegetables or beef. The inclination of consumers to buy the more expensive green-labeled seafood may be a result of Chinese society's concerns about the safety of seafood (P. Xu, Zeng, Fong, Lone, & Liu, 2012). Q. Liu et al. (2017) found that the higher the concern for food safety and the environment, the more likely consumers are willing to pay a higher price for eco-labels. These findings are in general congruence with the results and conclusions of other studies regarding the risk perception effects on willing to pay for safe food (Ortega et al., 2010; H. H. Zhao et al., 2014).

2.5.2 Income

The effect of income and education on consumers' willingness to pay has been widely studied in the literature, and they have been considered as the most important affecting factors on willingness to pay. As organic, traceable, or green food is consuming food that commands a high price, the consumers' income and education background have become essential factors affecting their demand for safe food. Income plays an important role in the WTP for Green Food in China (Yu et al., 2014). From the existing literature, it seems that income is a positive effect on consumers' willingness to pay for safe food， as consumer income increases, and consumers are more likely to pay extra charges for safe food. Consumers' income status has a positive effect on their

willingness to purchase safe food; the higher the income, the more likely for them to pay a price premium for safe food (G. Liu & Chen, 2015; Yin et al., 2010). These findings were consistent with the results reported by other researchers. A high-income level significantly affected both the willingness to pay and the actual price premium for traceable food, since the consumers with higher incomes are more likely to be able to afford the price premium of traceable food (Lu, Wu, Wang, & Xu, 2016; Lin hai Wu et al., 2010; Linhai Wu, Liu, et al., 2015; Linhai Wu, Wang, Zhu, Hu, & Wang, 2015; L. Xu & Wu, 2010). According to the above literature review, it is imaginable that there would be more consumers willing to purchase traceable foods as rising income could strengthen the preferences for safer food products in China (C. Zhang et al., 2012). There are some studies on the consumers' willingness to pay for dairy products. The consumer's income has a significant effect on willingness to pay. The higher the income possessed by the consumer, the greater the additional fee that the consumer would be likely to pay for GAP milk (Tinggui Chen et al., 2013). Zhang et al. (2012) reported that both respondents' education and per capita income levels show likely positive relationships with the percentage of respondents who would purchase traceable milk, which was confirmed by another study (Xiangyu Chen et al., 2017). However, Wu et al., (2016) showed different results that gender, age, and education level had an impact on consumers' WTP for traceable pork in the real choice experiment and the experimental auction, while income did not.

2.5.3 Education level

Education is also found to be an essential factor to affect Chinese consumers' willingness to pay amounts in previous studies. The variable of education is found to be significantly and positively correlated with WTP values (X. Hou, 2011; Shen, 2012). The result is consistent with the findings identified by P. Xu et al. (2012) that respondents were willing to pay more for eco-labeled seafood if they had a higher education level and a higher than average seafood expenditure. Organic buyers tend to be better educated and to have higher family incomes than those not purchasing organic foods (P.Xu et al.,2012; Xie, Wang, Yang, Wang, & Zhang, 2015). Education attainment had a significant impact on the willingness to pay for certified traceable food (Linhai Wu et al., 2012; R. Zhao, Qiao, & Chen, 2010). The result of a study focusing

on traceable milk powder by Guo & Li (2016) pointed out that the higher the education level of consumers is, the more they tend to buy traceable milk powder. The degree of education has a significant positive correlation with consumers' willingness to pay for traceable dairy products. In general, the consumers with a higher level of education will have a better income, they will easier accept new technology and will be willing to pay for traceable dairy products (Xiangyu Chen et al., 2017). This result is not consistent with some previous studies that education has either a negative or no effect on consumer willingness to pay for dairy products. T.Chen et al. (2013) reported that the level of education is not significant on consumers' willingness to pay for Gap–Certified Milk. However, another study using contingent valuation showed that education has a negative effect on WTP for sustainable milk. Compared to respondents with middle school or less, those with post-graduate degrees were willing to pay less for sustainable milk (Gao et al., 2016).

2.5.4 Health consciousness

Yin et al. (2010) found that consumers' concern for their health has a positive effect on their willingness to purchase organic food, which means that the health and safety characteristics of organic food are the main reasons that attract consumers. The result is consistent with findings from a survey in Beijing, Shanghai and Jinan areas, confirming that consumer health status has a positive effect on consumers' willingness to pay, the worse the consumers' physical conditions, the higher likelihood for them to pay for traceable food (G. Liu & Chen, 2015). Sirieix et al. (2011) reported that health is the main motive for choosing organic products. Shalamujiang et al. (2018) reported that consumers with bad self-reported health have a higher WTP premium for traceable fruits. For consumers with bad self-reported health, they pay more attention to the nutritional content and nutritional value of food, which is consisted of the previous study (Jin, Zhang, & Xu, 2017a; Z. Wang, Qian, & Zhou, 2013).

2.5.5 Gender and Age

Demographic characteristics such as age and gender have been widely investigated, and according to a review of the literature, gender was reported the inconsistent effect on Chinese consumers' willingness to pay. The results of Z. Wang et al., (2013), in their examination of 400 consumers from seven different districts of Beijing, gender has a

negative effect on consumers' willingness to pay, the females more willing to pay for traceable pork. This result has confirmed the results of the previous study (L. Xu & Wu, 2010). However, a study by Y. Wang et al. (2013) showed different results, with gender having a significant effect on consumer willingness to pay for traceable labels on vegetables, and male consumers are more inclined to buy compared with females. One possible reason is that generally, women are more price-sensitive than men when it comes to buying food. The result is consistent with the findings identified by L.Wang & Huo, (2016b) that male respondents with a better educational background and good salary have higher probabilities of being willing to purchase certified apples at a relatively higher price. Authors also found that female consumers are more likely to be price-sensitive when purchasing fresh apples, and price-sensitive consumers have a higher probability not to pay price premiums for certified apples.

There are many studies on the dairy product field. According to the review of the literature, gender has a significant effect on consumers' willingness to pay (Chen et al., 2017). Xu, Zhou, & Lone (2016) reported that female respondents tend to be more active when searching for information about organic milk, and females have shown the strongest consumption desire for organic milk compared to males. Female tends more to purchase milk powder with traceable certification. Thus the authors explain that taken as the leading player in purchasing dairy products in the family, females may have more chances to get information about traceable food, and they have a stronger consumption consciousness than males(F. Guo & Li, 2016). This finding is consisting of previous studies in the dairy field (Quan et al., 2011; Yang, 2016).

In the literature, age has a significant effect on consumers' readiness and willingness to pay for safe food. Feng Wang et al. (2009) reported that comparatively, younger people are more willing to pay a higher premium for fish products labeled with traceability, whereas middle-aged consumers are willing to pay fewer premiums or none at all. The result is similar to the findings by Xia & Zeng, (2006) that young people are more willing to pay for green milk, in contrast, middle-aged around 45 years old people pay least. P. Xu et al. (2016) also found that young females with a strong educational background have shown the strongest consumption desire for organic milk. Wu et al. (2012) have found similar results, and they explain that consumers in the middle age group (41-55) tended to have higher family responsibilities and, hence, greater financial

burdens. Thus, it is understandable that consumers in this age group were less willing to pay a price premium. Yu et al. (2014) found that younger people are willing to pay more for green vegetables than the elder. One explanation for this is that the youth has a longer life expectancy than the elder and may, therefore, have more benefits from good health. Another explanation is that older people are not willing to change their eating habits and are not willing to pay a price premium for new attributes such as organic or green food. These findings were similar to those reported by other authors (Shen, 2012).

2.5.6 Consumers' knowledge and trust of safe food

A positive correlation between consumers' knowledge and trust with WTP has been shown in some papers. L.Wang & Huo (2016) reported that consumers' knowledge and confidence influence their willingness to pay in the safety certificate. They explained that food safety issues often arise from asymmetric information between consumers and suppliers in the market, reliable information about certified food provided by the government, can be a dominant determinant of enhancing consumer WTP. The result of a study focusing on traceable pork, milk, and cooking oil by Zhang et al., (2012) pointed out that consumers' WTP for food traceability was positively affected by consumer knowledge about food traceability and awareness of food quality- and safety-related certification. The authors indicated that the more respondents are aware of the features of food traceability, and the more they know about China's food certifications, the more they are willing to pay for traceable products. The result is similar to the findings of Wu et al. (2012), who reported that the awareness of the food traceability system has a positive and significant influence on consumers purchasing choice. Consumers who have prior knowledge of the food traceability system are more likely to buy certified traceable food.

However, a study by Yin et al. (2010) showed a different result, with knowledge of organic food having a slight effect on their purchase intention. The authors indicated that knowledge of organic food functions as a threshold, determining consumers' willingness to buy. However, increased knowledge of organic food does not necessarily translate into a stronger willingness to purchase. The result is consistent with the findings of another study, confirming that the knowledge and awareness of the certificate are not showed that women have a higher meal in concern for safe food than

men a significant effect on the consumers' WTP for safe food. The cause may be consumers more rely on the brand ， public opinion, and past purchase experience, instead of the certificate (S. Guo & Li, 2017). A study also reveals that the knowledge of the certificate is a significant effect on the consumer's WTP, the more in-depth understanding of the certificate is willing to pay less for traceable food, because of the imperfection food traceable system lead to a decline in consumers' confidence (Z. Xia & Luo, 2018).

The trust of the certificate plays an important role in consumer's food purchasing behavior in the previous studies. LIu, Xu, Zhu, & Wu, (2015) found that Consumers who believed the tea traceability system could ensure quality and safety were willing to pay a higher price premium for certified traceable tea. Yin et al.,(2010) reported that consumers' degree of trust for organic food has a positive effect on their willingness to purchase. Hou (2011) reported that the consumers' willingness to purchase traceable fresh fruits is not only affected by the educational, income, health condition, and other objective factors but also affected by the degree of trust in traceability information. Xiangyu Chen et al., (2017) reported that the trust plays an important role in linking the willingness to pay values to actual traceable dairy products with the purchasing behavior, which means that the stronger the trust in the certificate is, the higher the willingness to pay for traceable dairy products will be. The result is consistent with the previous studies (Fan, 2017; Y. Lin, Ping, & Li, 2014; Y. Wang et al., 2013; Wen & Li, 2012).

2.5.7 Experience of food safety incidents

According to recent reviews of the published research, some studies found that experience with food safety incidents is also an important factor affecting consumers' purchasing intention for safe food. A study by L.Wang & Huo (2016) revealed that over half of the respondents admitted that their purchase behavior is highly influenced by the food safety incidents that occurred in recent years. Previous consumption experience, whether good or was not a significant factor affecting purchase intention (P. Xu et al., 2012). A study was conducted in Beijing by R.Zhao et al., (2010), found that the consumers having experienced food safety incidents will pay more attention to food safety, and the consumers' willingness to buy traceable food is affected by their

experience of food safety-related incidents. It is keeping with finding of another previous study that compared with the consumers who have not heard of the incidents of unqualified Mooncakes, those who have heard are willing to pay a higher price for the additive-free Mooncake (Yuanyuan Liu, Zeng, & Yu, 2009).

2.5.8 Family structure

Xie et al. (2015) reported that of the organic buyer group, 92.9 percent of respondents had a child or children, and the organic buyers are more likely to have children in their household than those not purchasing organic foods. R. Zhao et al. (2010) reported that family structure was the most significant factor influencing willingness to buy traceable food. The consumers living with elders or children were more likely to buy traceable food than others. A. Wang,(2016) found that whether consumers have child or children may have a significant effect on their willingness to pay for organic and "green pork", consumers with kids or an elder over 60 in the family are more likely to buy safe pork. The result corresponds with the results of other studies that consumers with kids below 18 are more likely to buy certified traceable food (Shalamujiang et al., 2018; L. Xu & Wu, 2010; J. Zheng, Wang, & Xu, 2016). A survey of milk consumers found that whether or not respondents had children has a significant effect on consumers WTP for sustainable milk, which respondents who had children were willing to pay more for sustainable milk (Gao et al., 2016). This finding corresponds with the result of another study that households with preschoolers are much more willing to pay more for certified milk T. Chen et al., 2013). The family with a child or older people expressed more concerns about food safety and are more likely to buy the safe food (Xinjin Chen, Dong, & Yi, 2014; Bei Zhang & Lin, 2014).

2.6. Conclusion and discussion

2.6.1 Consumers' concern about food safety

Most scholars who have analyzed food safety perception for different food categories in China have concluded that a high level of consumer concern exists about food safety and quality. Chinese consumers regard current food safety problems as very serious, primarily due to the frequent occurrence of food safety incidents in China in recent years. Especially the melamine scandal in 2008 has increased consumers'

concerns about food safety and quality. Although consumers pay close attention to food safety, differences in the preference for food safety perceptions exists among people with different socio-demographic characteristics. The households who have high-income are more interested in food safety than households who have low-income. Thus, they pay more money for their families' health and are relatively more concerned about food safety issues. From an education background, although majority studies identified that the higher the degree of education consumers obtain, the more likely they are to be concerned about food safety, and more likely also they had the higher intention of safe food purchase and vice versa. However, some studies draw a different conclusion. The higher educational level would not appear to influence concerns over food safety (L. Cheng et al., 2016a; Cicia et al., 2016c). Researchers have analyzed that gender and age may influence consumers' food safety perceptions.

Nevertheless, the findings are not as strong as the researchers expected. It can be concluded that age does not seem to play an essential role in consumers' food safety perception. Compared with age, the findings of research on gender with food safety perception are more consistent, and therefore, there were significant gender differences in the perceptions of safety. However, about whether females are more concerned with food safety issues, studies have shown mixed results. A review of the literature indicated that a majority of the studies have shown that women paid more attention to food safety issues than men because they take more responsibility for buying and preparing food (L. Cheng et al., 2016a; A. Liu & Niyongira, 2017; Rongduo Liu et al., 2013, 2014).

2.6.2 Motivation and barriers to purchase safe food

Concern on health, environmental benefits, and safety characteristics are the main reasons for Chinese consumers to choose safe food, and consumers are motivated to buy safe food as insurance in health and followed by pesticide-free or lack of chemical content. It seems obvious to relate the higher salience of this issue in China to the many extensively publicized food scandals in recent years (Thøgersen, de Barcellos, Perin, & Zhou, 2015). The environment is a new matter of Chinese consumers' concern, and the worsening environment caused consumers concern about food safety incidents due to environmental pollution. However, it is not strongly motivation for consumers as, like

health or lack of chemical content, it seems that people in China tend to pay more for environmental projects, such as recycling or protection for wetland but not for environmental-friendly food products (Xia & Zeng, 2006).

In terms of the reasons for refusing to purchase safe food, Price is the most substantial barrier for safe food consumption. There is numerous literatures consistently showed that consumers felt the price of safe food, which organic, traceability, or eco-label food is "too high." As Chinese rapid economic development, personal residents' income continued to improve, however, based on present income level, and the price is still a significant limiting factor for the safe food market scale in China. Aside from high prices, limited availability, lack of knowledge, distrust of safe food can be considered as barriers for consumers to purchase safe food.

Supermarkets have taken the role of assuring consumers of food safety and quality. Chinese consumer choice of supermarkets as the most trust-worthy purchase location because they believed that food which is sold in the supermarket has high quality and safety. Local farmer- markets that have the advantage of lower prices and fresher goods were also seen as an essential place for safe food, especially for consumers who have high sensitivity to price (L. Cheng et al., 2016).

2.6.3 Price premium of safe food

Even though Chinese consumers have a lack of knowledge about safe food, they still believed that certificated foods have good quality and safety than ordinary, and consumers were willing to pay a modest price premium for them. However, the price premium for safe food is not high. From the existing literature, the willingness to pay is concentrated in a range of under 10-20 percent premium(L. Wang, Wang, & Huo, 2019; Z. Wang et al., 2008; P. Xu et al., 2016; Yan, 2011). Chinese consumers often state they would be willing to pay more for safer food, however, compared with the deep concern about food safety, the consumer's willingness to pay for safe food is not as high as would be expected. It is observed that， household income determines the Chinese consumer's ability to buy safe food. Consumers' actual buying decisions show it is an economical convenience that still most affects purchasing decisions while purchasing food, not a statement of safety or certificate label of a product.

2.6.4 Influencing factors of consumer willingness to buy safe food

Income is the most important influencing factor on consumers' willingness to pay. From the existing literature, it can be stated that Consumers' income level is the most important factor influencing consumer behavior towards safe food with the education level of consumers coming up next. Most scholars have pointed out that they have a positive impact on willingness to pay. It is followed by the food safety perception, age, gender, Consumers' knowledge, and trust of safe food. Among them, gender was reported an inconsistent effect on Chinese consumers' willingness to pay. The price of safe food was pointed out that it was the most barriers factor while purchasing safe food. It has a negative effect on consumers' willingness to pay. The higher the price, the lower the likelihood for consumers to buy safe food. From the existing literature, it seems that the consumers living with elders or children were more likely to buy safe food than others. Consumer health status has a positive effect on consumers' willingness to pay; the worse the consumers' physical conditions, the higher the likelihood for them to pay for safe food.

2.7 Further research

In the literature, there are many studies on the field of Chinese consumer's perception and willingness to pay for traceable dairy products. However, researchers tend to the determinants of consumer purchase behavior for safe food using a questionnaire survey or hypothetical method instead of a qualitative method or a non-hypothetical experiment. Missing qualitative studies may lead to a lack of in-depth understanding of the issue at hand, and Qualitative methods provide a depth of understanding of issues. A qualitative study on consumer's perception attitude towards traceable dairy products should be conducted in order to obtain information about the perception of food safety, purchasing behavior about dairy products, attitude towards, and intention to buy traceable dairy products. Meanwhile, in hypothetical contexts may differ from consumers' actual behavior and true WTP. In the non-hypothetical experimental, real products and real money are exchanged. Further research on consumers' willingness to pay for traceable dairy products using no-hypothetical method could be conducted in order to obtain the willingness to pay values of Chinese consumers from individual subjects.

CHAPTER 3

CHINESE CONSUMERS' PERCEPTION OF FOOD SAFETY AND ATTITUDES TOWARDS TRACEABILITY DAIRY PRODUCTS: A QUALITATIVE STUDY[1]

Abstract: Dairy products are an essential part of a healthy diet, and dairy is an emerging food industry in China. With rapid economic development, Chinese consumers are increasingly health-conscious and are becoming more selective about the quality and safety of dairy products. Results from Nine focus group interviews show that a high prevalence of food safety incidents triggers consumers to lower their confidence about food safety and to pay more attention to the news about food safety incidents in the media, including social media. Chemical residues ranked as the first concern on food safety in the dairy industry. Meanwhile, traceable dairy products are not well known among consumers. Although the possibility to trace back all stages of the food supply chain in the dairy sector is considered important, respondents raise doubts about the authenticity of traceability information.

Keywords: Dairy products, traceable food, consumer perceptions, focus group

3.1. Introduction

The dairy industry in China is new, with huge development potential as part of China's food industry, with government support (X.Wu et al., 2018). Post forecasts 2018 consumption of milk will reach 41 million tons, about 9.5 percent higher than in 2017. However, the per capita milk consumption is much lower than in many other countries, per capita milk consumption is about 36 kg/person in 2017, which is less than 1/3 of the world average and less than 1/10 when compared to developed countries(Ward & Inouye, 2018). With the rapid development of the dairy industry in China, many problems concerning safety and quality management have arisen. With the rapid economic development and growth in the income of residents, Chinese consumers are

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increasingly health-conscious and are becoming more selective about the quality and safety of dairy products they consume, there appears to be room for substantial growth of high-quality dairy product consumption in China (Guozheng, Jueyu, & Fangfang, 2012; Qiao, Guo, & Klein, 2012; Ward & Inouye, 2018).

To enhance consumer confidence in food safety, the Chinese government has undertaken various policy measures to improve the safety and quality of dairy products in recent years. Meanwhile, dairy enterprises also began reducing consumer's perceived information asymmetry and mitigate uncertainty by providing traceability information and third-party certification. The implementation of traceability systems could lead consumers to perceive a higher value and to be willing to pay a premium price for dairy products. Clearly, traceability capacity measures have been shown to influence both costs and benefits (Asioli, Boecker, & Canavari, 2014). By deciding to adopt the traceability system or not, the dairy products companies in food supply chains have to compare potential benefits and costs. Implementation of the traceability system in this dairy sector will lead to a higher price of products, and price perceptions would directly influence customer satisfaction, furthermore, may influence their WTP and influence a firms' pricing strategy. In balancing benefits and costs, firms (even policymakers) have to consider how consumers' knowledge about the potential benefits, costs, and creditability of the tracking system will affect their preferences. Although some literature has been worked on in this field, however most of them applied the quantitative method to examine consumer attitudes toward and willingness to pay for traceability of dairy products in China, qualitative research in this field is lacking. This research aims to explore the perception of food safety, purchasing behavior about dairy products, attitude towards, and intention to buy traceable dairy products among 18 to 60 years old consumers through the qualitative method. This paper addresses the following objectives:

. briefly review the literature relating consumers' perceptions of food safety and attitudes towards traceable food in China

. to understand consumers' perceptions of food safety of dairy products

.investigate consumer attitudes and perceptions towards traceably dairy productions.

3.2. Literature Review

Milk products are important components of the diets, and there has been an upsurge in consumption worldwide, especially in developing countries (Handford, Campbell, & Elliott, 2016). Meanwhile, dairy safety incidents have been widely reported in countries such as China, Pakistan, and India (Kumar, Kumar, Mann, & Seth, 2016; Li， Zhu & Yingjun, 2017; Shaikh, Soomro, Sheikh, Khaskheli, & Marri, 2013; L. Xu & Wu, 2010). With frequent incidents of food safety, a large number of studies on Chinese consumers' perception and behavior for dairy products were carried out. Qiao, Guo,&Klein(2010) reported that consumers interviewed in the survey indicated their vital concern about the safety of the dairy products while they consume the products. Some previous studies have emphasized the demographic characteristics that could affect their risk perception of dairy products. For example, Quan et.all (2011) reported that personal experience and demographic characteristics mainly influence Consumers' risk attitudes towards dairy products. The students' family income was found to have significantly affected their milk safety concerns(P. Xu, Zheng, & Motamed，Mesbah, 2010). P. Xu, Zhou, & Lone (2016) analyze the questionnaire date of Beijing city in 2014. They reported that young females with a strong educational background have expressed a high safety concern and have the strongest consumption desire for organic milk. Those who shop for the family tend to support organic milk and willing to pay more for organic milk.

As a developing country with the largest world population, there is a great demand for dairy products in China. Hence, consumers' perception of dairy products with the certificate such as HACCP, organic, green, traceable has received increasing attention by scholars due to increasing concern about food safety. L. Wu, Yin, Xu, & Zhu (2014) reported that most Chinese consumers had a lack of knowledge of organic food but had a higher WTP for EU and U.S infant milk formula with organic certification labels. They also found that in addition to the price factor, the organic certification label, brand, and country of origin are most important for consumers while purchasing infant milk formula. Z. Wang et al. (2008) indicated that consumers were willing to pay for purchasing for HACCP certified dairy products.

There have been some studies in the literature which have attempted to examine consumers' attitudes towards traceable dairy products. In parallel, shortages of supervision in policy and system have come to light (X.Wu et al., 2018b). A traceability

system is not familiar with many consumers in China. However, most of the consumers would like to accept the traceability system and were willing to pay extra money for milk with a traceability system (Zhou, Nanseki, Hotta, Shinkai, & Xu, 2010). Consumers are generally willing to pay higher prices for organic labels and traceable labels, and generally do not approve of sales of pharmacies (L.Zhu & Xu, 2017). More than half of respondents were willing to purchase traceable milk, and the percentages of respondents who would pay a premium for food traceability are likely related to consumer's knowledge of safety certifications and some demographics. Yin et al. (2017) reported that traceability information was more important than brand or country of origin for Chinese consumers. A study by Yin et al. (2017) based on the analysis of policy background, analyzed consumers' willingness to pay to examine the effects of public management policy through choice experiment. The research showed that consumers had a higher WTP to infant milk formula with traceable information labels, famous brands, and overseas production place. Bai et al. (2013) indicated that consumers significantly prefer traceable milk to those carrying no traceability information. They also reported that a government certificate for traceability is currently valued more highly than certificates issued by a third-party, but consumers have expected to give more credit to the latter in the future. A study by L.Wu et al. (2015) showed similar results during the exploration and initial construction of traceability systems in China, credible institutions are required for the quality certification of traceable pork because consumers do not know about or trust traceability information. In this case, the government is undoubtedly the most credible institution.

3.3. Materials and Methods

Many methods are available for eliciting perception associations from consumers, ranging from qualitative techniques, such as collages and focus groups, to quantitative methods (Hasimu, Marchesini, & Canavari, 2017). From the literature, there are some previous studies on Chinese consumers' attitudes toward traceable dairy products based on quantitative methods, but few studies are performed through qualitative studies. Missing qualitative studies may lead to a lack of in-depth understanding of the issue at hand, since quantitative studies alone may have been designed only by the researchers' view of the problem, thus missing important aspects. To address this gap, we decided to

use a qualitative method, performing an initial exploration of consumer attitudes towards traceable dairy products. To understand consumers' perceptions of the traceable dairy products in China, we chose the focus group interview with consumers.

The purpose of using focus groups is to gather information about the topic of interest from a limited group of people. It is the content that results from the group discussion and interaction that is important (Lichtman, 2014). A focus group study design was chosen to take advantage of group dynamics interactions between participants, which allows for a better observation of consensus and disagreements between individuals (Belk et al., 2013). The methodology has been used in the study of consumers perception in the food markets in China or other countries (Asioli, Canavari, et al., 2014; Bruschi, Shershneva, Dolgopolova, Canavari, & Teuber, 2015; Cui, Liu, Woock, Zhang, & Cacciolatti, 2016; Kendall et al., 2018; Lindberg, Salomonson, Sundström, & Wendin, 2018; Roos, Hansen, & Skuland, 2016; Williams, Stewart-Knox, & Rowland, 2004).

3.3.1 Focus group procedure

Interview guides were defined based on the literature review. It contained three sections. In the first section, participants were asked to give their opinion relating to food safety concerns. In the second section, consumers were asked about purchasing behavior and food safety perception of dairy products. The last section led the group into discussions about consumer attitudes toward traceable dairy products and the actors in the food traceability system.

Each focus group interview lasted approximately 90 minutes; before starting the interview, participants were provided with the interview guide. The participants were told to discuss three categories of dairy products: (1) Milk, (2) Yogurt, (3) Milk powder. Nine focus group interviews with a total of 61 consumers were conducted in four cities. Geographically, data were collected in Urumqi and Changji in the Northwest of China (North Group), and in Haikou and Quanzhou in the South of China (South Group). Urumqi and Changji belong to the Xinjiang Uygur Autonomous Region (Xinjiang). Urumqi is the capital city of Xinjiang, which is one of the important high-quality milk sources and significant production areas of dairy products in China. Haikou is the capital, and most populous city of the Hainan province and Quanzhou is the largest

metropolitan region in the Fujian province，its GDP ranked first in the Fujian Province for 20 years, from 1991 to 2010. To a certain extent, the Haikou and Quanzhou are representative of the coastal regions of South China.

Figure 3.2 Focus group locations

The Focus groups were conducted from January to April 2018. Altogether, 61 consumers (24 male, 37 female) of dairy products participated in the focus group interviews. Two focus group sessions were held in each location, while three focus groups were held in Changji. Most scholars using focus group interviewing recommend a group size of six to twelve people. If there are more than 12, the session takes too long, and group interaction becomes more difficult to achieve, if there are fewer than six, there may be insufficient interaction (Lichtman, 2014). Consistently with best practice, in our study each focus group contained 6-9 participants recruited on the basis of selection criteria aimed of achieving a balance for demographic characteristics and purchasing habits, specifically: 1) gender (40% males and 60% females), 2) age (18–60 years), 3) education background, 4) socioeconomic status (middle/upper class) 5) purchase of dairy products in the last three months. The final composition of the groups is summarized in

Table 3.

Table 3.1 Focus group participants' characteristics

Focus group location	Focus group number	Participant No	Participant code	Age	Gender	Family members	Personal monthly income (RMB)	Education background
Urumqi	1	n=8	G1 M	21-25	4 M	2-5	1000-4000	BD
			G1 F		4 F			
	2	n=6	G2 M	21-24	3 M	3-4	1200-2000	BD
			G2 F		3 F			
Changji	3	n=9	G3 M	21-36	4 M	1-5	1000-8000	BD
			G3 F		5 F			
	4	n=6	G4 F	23-55	6 F	4-6	2500-4000	JMS,HS, BD
	5	n=6	G5 M	18-23	4 M	3-5	1000-2300	TD,BD
			G5 F		2 F			
Quanzhou	6	n=6	G6 M	22-26	3 M	3-8	1500-4000	BD
			G6 F		3 F			
	7	n=6	G7 M	40-60	2 M	3-5	1500-4000	PS,JMS, HS
			G7 F		4 F			
Haikou	8	n=6	G8 F	26-41	6 F	2-4	3000-8000	TD, BD
	9	n=8	G9 M	29-40	4 M	2-4	4000-7500	TD,BD
			G9 F		4 F			
Total	n=9	n=61		18-60	24 M	1-8	1000-8000	-
					37 F			

Foreign exchange quotation is 100 Euro =804.72 Yuan, 16th October 2018
M: male; F: female; PS: Primary school; JMS: Junior middle school; HS: High school;
TD: Technical or vocational degree; BD: Bachelor's degree;

3.3.2 Data analysis

The participants' agreement to take part in the focus groups was based on fully informed consent; all participants are anonymized. All of the focus group discussions were recorded and transcribed verbatim by two research assistants managing the interviews and checked by the first author to ensure consistency. Data input and

analysis were carried out using the software Nvivo version 11.4.0 for Windows, which has features such as character-based coding, rich text capabilities, and multimedia functions that are crucial for qualitative data management (Zamawe, 2015). The first author read and re-read the verbatim text and then carried out the open coding. The interview guide covered the following topics:1) Purchasing behaviors of dairy products, 2) Perception of food safety in the dairy sector, 3) Attitude toward traceability dairy products, 4) Viewpoint towards the actors in Food Traceability System. The full discussion guide is available from the authors on request.

Table3.2 Focus group interview guide

Topic of interested	Guiding questions
Purchasing behaviors of dairy products	1. Where do you usually purchase dairy products? 2. Do you read food labels? Do you pay attention to them?
Perception of food safety	1. What do you think about food safety? 2. What kind of aspects of food safety do concern you about dairy products? 3. How do you decide whether a source is reliable? 4. Have you ever personally experienced an issue with safety in dairy products?
Attitude toward traceability (dairy) products	1. How important is to you track all stages of dairy production, processing, and distribution? 2. How would you explain the meaning of traceability food? 3. Do you think traceability certification is useful? 4. Would you buy traceability dairy products? Why? Or why not? How much more would you pay for Traceability?
Actors	1. Which actor do you trust the most to manage traceability system food supply? Why? 2. Who should be responsible for ensuring that foods are traceable?

3.4. Results

3.4.1 Purchasing behaviors of dairy products

3.4.1.1 Consumers' concerns factors while purchasing dairy products

When asked to report which factors the participant's concerns while purchase dairy products, we surprisingly found that, overall, the most mentioned word was "freshness." However, safety and quality tied for second, followed by dairy company brand and price, while consumers did not very much mention nutrition. What caught our attention is that the "freshness" was more mentioned in the Northwest groups '(groups 1-5) discussions than South groups (groups 6-9). However, by contrast, "safety" or "quality" were more mentioned in the south groups. Participants described that they would prefer to select which ones are fresher while purchasing dairy products; they believe that the freshness is associated with closely related safety.

> "Freshness is very important for a dairy product, I looked at the expiry or manufacturing date in order to know whether the product is fresh, I also looked at the information about quality if it had, and I just hope to buy a safe food." (G4, female, 50).

> "I mainly pay attention to freshness; firstly, I would like to look at the production date and pick up the newest product to buy. For several years, I have always been bought just one brand's products, so I need to consider freshness". (G1, female, 23).

Food quality is a broader concept than food safety; food safety is the most important feature of food quality (Canavari, Castellini, & Spadoni, 2010; Sikora & Strada, 2005). From this point of view, whether participants said "quality" or "safety," they expressed concern about "quality" when they buy dairy products.

> "I often buy milk powder for our baby, and I pay more attention to the safety of dairy products" (G9, male, 35).

Brand of the dairy company is another factor that consumers consider when they buy. Some of them will consider the brand because they trust it; on the contrary, some people consider it because worried about their safety.

"Except for the freshness, I will consider the brand of dairy products while buying, and I trust the quality of foods which is produced by a big company" (G1, male, 23).

"In previous years, reports about food safety incidents, such as the "Sanlu milk powder incident..…had often been seen in the media so that I will pay more attention to the brand of the company, particularly a dairy company… because there is a child in my family, I am afraid to buy poor quality foods ... (G9 female, 34).

3.4.1.2 How do consumers determine the safety of dairy products?

We aimed to learn about how consumers determine the safety of dairy products. Discussion among the participants revealed the importance attached by consumers to brand during their purchase decision process. When extrinsic safety information attribute information is not readily available or does not lead to confidence, then consumers would look for other indicators of quality, such as brand name (Brucks, Zeithaml, & Naylor, 2000). Since consumers believe that food companies should comply with laws that are in place, as well as secure food the quality and safety to protect consumer health, well-known brand means a food safety guarantee for people, and it is especially important when consumers lack complete information related to food safety while purchasing.

"I believe that the dairy producers should guarantee the quality of its foods and services， be responsible to consumers, I pay more attention to the brand of dairy product, if the brand is credible and reliable, the food is safer certainly." (G8 female, 32).

When asked about their preference for dairy company brands, respondents who are from the northwest groups, overwhelmingly chose the local brand. They have confidence in those local dairy company brands, and among them, some dairy enterprises were members of a school milk program, so they are responsible for providing liquid milk to schools.

"For several years, I have been consuming the Xi Yuchun products (local dairy enterprises of Xinjiang), there have been no food safety accidents with this brand, additionally, they are the member of "school milk program", I trust this brand, so will pay more attention on the brand when I'm buying." (G1, female, 23)".

On the contrary, the respondents from the South of China chose the national brand over the local brand. The results from the discussion show that another important safety indicator while consumers purchasing dairy products is the purchase venue. Obviously, in search of safer dairy products, participants from both groups (Northwest and South) showed more trust in the supermarket. Some of the participants in the North group also expressed trust in a convenience store, but the supermarket is the first choice to purchase dairy products. Most of the time, the purchase venue represented the dairy company's reputation; for this reason, purchasing at the supermarket is perceived to be safer. Consumers believe that there should be some food safety and quality control requirements with retailers by the authorities, and retailers should be responsible for the quality and safety of the food they sell.

"I would like to buy dairy products in supermarkets like Carrefour, Friendship Supermarket, Wal-Mart … and so on; I think retailers should be responsible for the quality of foods that they sell, so I think the foods which are sold in big supermarkets are safer"(G1, male, 23)

"I usually buy the dairy products in the store near my home; I will often buy at there, I fell the foods include dairy products are safe in there, at the same time I will notice the certification information of products" (G3, female, 21)

The focus groups also revealed that some of the people prefer to trust safety certification, instead of brand or supermarket. What caught our attention is that more than half of the participants who trust the certification are highly educated. For example, in group 1, 23 years old women who had a bachelor's degree, said:

"I have more trust in safety certification rather than a brand because certified food adopts a third-party. Certification means it meets some quality standards. In the other way, some well-known brand has also had a problem with foods safety, for instance, Sanlu Milk.".

3.4.1.3. Purchase venue of dairy products

The supermarket was reported by the majority of participants to be the place where they preferred to buy dairy products. Participants are opting for the supermarket as the primary place for purchasing dairy products because they are perceived as more convenient to shop in, and they also offer many opportunities in terms of selecting and buying a safety product. This preference was much stronger among the participants in South groups. The supermarket was considered to offer wider ranges and greater assurances of product quality (Kendall et al., 2018). Consumers believe that the larger retailer is accountable for food quality, and they take it for granted that retailers should be responsible for the compensation if the food quality did not meet their expectations.

"Most of the time, I buy the dairy products in the supermarket, except for the occasional buy in the convenience store near my home. In most cases, the quality of foods there can be seen as guaranteed, so I am not worried about the quality problems. Furthermore, there are more varieties of dairy products in the big supermarket where I have more choice to buy". (G6, male, 26)

A large number of participants took the large retailers such as Carrefour or other supermarket chains as the most purchasing venue of buying dairy products. Also, there are some participants in North groups who showed that they would purchase the loose milk it in the small retailers such as convenience store (convenience shop, or corner store) or the street vendors. The consumers think that the loose milk which is sold there is safer and cheaper because they trust that the products are very fresh and without food additives.

"I buy dairy products like yogurt, milk powder in the supermarket or supermarket chain. I believe that the food safety standards are higher and have a quality guarantee there, but sometimes I have bought the loose milk in a convenience store close to my home because I think the loose milk is fresh and no food additives are added there. Freshness is quite important to milk for me". (G2, male, 21)

3.4.1.4. Food Label information

Concerning label information, with a few exceptions, most of the respondents stated that they have a habit of reading the label information while buying dairy products. They also noted that reading food labels could help them to obtain more information and make a good choice to purchase. The brand and quality certification got the most attention by consumers while purchasing milk powder. Nevertheless, the results from the discussion show that the respondents from different groups have different attention to the labels information during purchases milk and yogurt products. Most of the respondents in the North group indicated that they pay the most attention to the production and expiry date. In contrast, the brand and production dates are critical information for respondents in the South group while buying milk and yogurt.

"Usually, I read the labels information while buying dairy products, I prefer to buy locally produced milk and yogurt, so I just pay attention to the production or expired date when buying milk and yogurt. But when it comes to buying other dairy products, for instance, milk powder, I mostly pay attention to the brand, certificated, or enterprises among the information on the label," (G4, female, 42)

"For the milk, usually, I will pay attention to the brand information and production date, however, I think the brand and certificate information is most important for the milk powder. I will choose the well-known brand, and if it has the quality certification it is good, I also will pay attention to them when buying milk powder" (G7, male, 40)

3.4.2 Consumers' perception of food safety

3.4.2.1 Concerns about food safety

Focus group participants' discussion on how they perceive food safety issues, particularly about dairy products safety, demonstrates that the majority of participants expressed more concern about food safety. When asked about the safety of dairy products, the majority of participants reported that they were "worried" or "very worried" about the safety of dairy products. Food safety incidents were mentioned frequently, resulting in many consumers turning to imported safety and quality in dairy products. To enhance consumer confidence in food safety, the Chinese government has undertaken various policy measures to improve the safety and quality of food. However, consumers still have not enough confidence in the safety of dairy products.

> "Although the food safety situation is not as bad now, I'm still worried about food safety, especially dairy products" (G7, male 40).

The results from that discussion showed that consumers who live in different areas have a different perception of food safety in the dairy industry. As expected, participants in the North group have stressed the fact that they are also concerned about food safety issues, but on the other hand, they expressed more optimistic about food safety than participants in the South group. The main reason for that could be the region in which they live- Xinjiang is one of the five traditional pasturing areas and one of the most important milk source bases of China. Participants in the North group consistently expressed more confidence about the food safety of dairy products, mainly because they feel assured by the local origin of the product and the reputation of the area as specialized in livestock farming.

> "Food safety issue is my topic concern, and it is also what worries me most because I have a baby, so I'm more concerned and worried about the dairy products' safety. I feel the dairy product which is produced in Xinjiang is safer because I think the origin of the dairy product is significant, and the

> animal husbandry has been the traditional and primary industry in Xinjiang, so the products that are produced there should be fine. Another important reason is that I have not heard about safety incidents with dairy products that were produced in Xinjiang. (G3, male, 30).

> "Xinjiang is an animal husbandry area, and I think the source of dairy products is safe. Otherwise, similar "Sanlu milk powder" incident has not happened here before, and my relatives or I also have not any experience with dairy products, so I think the dairy products are safe in Xinjiang." (G1, female, 21)

Especially those participants who have older people or children (under 16 years old) in their family expressed more concern about food safety and quality in the dairy sector, due to the situation that they pay close attention to food safety when they prepare food for their children or parents.

> “I think the food safety situation is not very well now, more food safety accidents have occurred in the recent year, and this was very worrying, besides there are two elderly people (over 60) in my family and I am more concerned and worried about food safety (G5, male, 30).

3.4.2.2 The aspect of consumers concerns on dairy products

The collected answers from the discussion are graphically depicted in Figure 2 using word clouds. It is a visual representation of text data, widespread for reporting qualitative data (Cappelli et al., 2017). The most frequent words appeared to represent the aspect of participants' concern in the dairy sector, as it has demonstrated from the word cloud. From the data in Figure 2, it is apparent that the respondents had a great concern in chemical residues, followed by food additives and microbial pathogens as the top three concerns. Actually, according to reports from media and survey data, the number of food safety incidents caused by chemical contamination is less than those

caused by microbial agents, toxic animal, or plant foods. For example, in 2012, 6685 incidents were reported by mass media, most of them attributable to microbial agents (56.1%), followed by toxic animal or plant foods (14.8%), and chemical contamination (5.9%) (Lam, Remais, Fung, Xu, & Sun, 2013). The chemical residue was mentioned by more than half of the participants during the discussion, and it seems that consumers are more sensitive to chemical residues in the dairy sector. Part of the reason for this might be that the "Sanlu" milk powder incident, which is the most sensational. Melamine, an industrial chemical, had been added to milk somewhere along with the supply chain，twenty-two dairy companies were eventually implicated in the scandal. The contamination resulted in six infant deaths and over 30,000 children being severely sick with kidney stones and other complications(El Benni et al., 2019). Although it has been almost a decade since 2008, the incidents left a deep impression on consumers.

> "I'm concerned about chemical residue, food additive, microbial pathogens, and expired food, but particular concerned about chemical residue in dairy products, the Sanlu incidents were very typical" (G9 female,34).

Some other participants replied that they also worried about expired food and heavy metal pollution with dairy products.

> “I am afraid to buy counterfeit and shoddy products, especially worry about buying expired milk” (G6, female, 22).

Figure 3.2 Word Cloud the Aspect of Concerns of Consumers in the Dairy Sector

3.4.2.3 The influence of social media on consumers' perception

The news reports about food safety incidents have an impact on consumers' perception of food safety in the dairy sector. Media coverage plays an essential role in people's food-risk perceptions following a major food scare, as media perspectives on the safety of the food supply might have an impact on those of the general public (Zingg, Cousin, Connor, & Siegrist, 2013). Participants gave many examples of cases of food safety incidents, which had been reported in the media such as Sudan red, Melamine milk scandal, and so on. Although, after the melamine milk scandal of 2008 China's government reformed the management of dairy products and associated laws to strengthen food safety regulations and raise technical standards to improve the safety of dairy products (Zeng, Zhou, Pan, & Fowler, 2018), consumers' trust in food safety of dairy products remains low. Though it happened ten years ago, consumers have restored their confidence in the safety of dairy products, but some of them have not forgotten it, because this chemical contamination scandal left many families worried about dairy products.

“I think that the food safety situation of dairy products is currently not bad, but after all, there have been some serious food safety incidents like Sanlu melamine incident … it is terrifying…so I cannot feel quite at ease about food safety……I think the government should continue to increase investment and supervision on food quality control”. (G6， male, 20).

However, it should be noted that false news has the same effect on consumers. There are constant reports about food safety, and some media made false reports to increase their web traffic, particularly by using social media platforms such as Weibo and WeChat. Moreover, Chinses consumers find it very difficult to confirm the truthfulness of those reports because the response from the government or other official media is slow, and most consumers choose to trust the negative reports about food safety because they did not know how to identify the truth. (H. Zhu, Jackson, & Wang, 2017).

Personal or relatives' experience in food safety is another major factor affecting consumers ‘perception. A total of 15 participants of 61, replied that they or relatives had food security experience.

"I have bought expired milk products before, but I did not know that the product has already expired…so now I will pay more attention when I buy food (G4, female, 42).

"I do not have any experience with food safety, but I have heard within my circle that somebody had bought spoiled steamed bread" (G8, female, 40).

3.4.3 Consumer attitudes toward traceable dairy products

3.4.3.1 Track all stages of dairy production

Most of the participating consumers expressed that track all stages of dairy production, processing, and distribution is most important. They believe that tracking all of the stages (from farmer to table) can provide information which they want to know and will help them make the right choice while purchasing. Meanwhile, some part of them is worried about the reliability of track information. They are worried about the

fact that the enterprises might falsify traceability information for their own commercial interests.

> “I think the ability to track all stages of products’ history in the food supply chain is important for consumers because if there is a quality problem with food, it could help to find out who should be held responsible for that,” (G1 male 23).

> "A problem with any part of the food processor can cause food spoilage and affect our health. Track all stages of dairy production and figure out where does the problem comes from- this is of great importance to me. However, as the current situation, information provided by an enterprise is not reliable. So, I think to track back all stages is important, but if the information provided by the food enterprise itself, it is useless" (G7, male, 40).

In contrast, a small percentage of participants perceived traceable as unimportant. In this regard, some participants stated that traceability information would help authorities figure out where the problem does come from. It has been perceived almost as a relief measure, and it may not help much by improving the situation of food safety.

> "I do not think the traceability process is important. In my opinion, the traceable information helps the authorities to trace back the unqualified products and to recall them within a short timescale, but that could not be guaranteed throughout all of the stages are safety control” (G9, female, 29).

3.4.3.2 Awareness of "traceable food"

The results of the section on consumers’ awareness of traceable food indicated that most respondents do not know the traceable food very well. However, some of them just had heard about it before, and a small number of respondents expressed that they had purchasing experience.

> “I am well informed about the traceable food process, I have seen the traceable fruit in the supermarket before, and traceable food is that can be traced back the

production information, that is to say, consumers can find the production information” (G4 female, 50)

Interestingly, although some of them have not heard about traceable food before, whereas they could explain the concept of traceable food. The reason may be imputable to semantic reason: in the Chinese language, the word "ke zhui su" describes the concept of traceable, the literally means is "the ability to trace," so consumers can guess the mean of "traceable food" easily.

“I have not heard traceable food before, compared with the ordinary food, I think it should be able to track back some product information." (G1, male, 23).

"I do not know about that, and I guess it was able to provide for consumers with more product information compared to ordinary food, is it right?” (G 3, female, 26).

However, having awareness about the traceability of products means that the “traceable”- aspect does not necessarily equate with a full understanding of traceable food. When asked about the difference between traceability food and convenience food, they stated that traceable food could track back the production information, i.e., the place and date of production or producer information. They thought the traceability just include production information, however, according to the definition given by The Codex Alimentarius Commission Procedural Manual (FAO/WHO, 1997) traceability is "the ability to follow the movement of a food through specified stage(s) of production, processing and distribution"(Olsen & Borit, 2013). Most of the participants were not fully aware of the food traceability system.

3.4.3.3 Traceable label and consumers’ confidence

Although half of the participants did not know about traceable food after the investigators gave a brief video introduction, five out of the six participants believe that the food traceability system will be valuable to consumers. For them, it could enhance their confidence in food safety while purchasing dairy products. Participants explain that:

“I think the traceable label is useful because traceability of information will be valuable to both enterprises and consumers. The enterprises can ensure the reliability of the source of the raw materials through a traceability information process. Meanwhile, consumers also have to be able to check processing information”. (G1, female, 21).

“I like the system as it allows me to decide whether to buy the dairy product by tracking all of the stages of processing or production information” (G2, male, 23).

However, some other participants reported that it is not useful for them, or they do not know whether it is useful to them. Their main reason for that is the food traceability system is an ex-post measure, which can only provide the track information and allows for timely recall the all suspected products along the food supply chain in the event of food safety problems. It could help the government or enterprises determine who should be responsible for such problems. Furthermore, they also worried about the reliability of track information.

“I do not think it will be useful, because it is a relief measure, it will provide the track information. However, it is impossible to eliminate quality problems. Moreover, the information was provided by food enterprises itself, who can guarantee that the information provided by manufactures is true?” (G3, male, 36).

3.4.3.4 Purchase experience and willingness to buy

Most participants mentioned that they had not bought traceable dairy products before. Some of the participants stated that after the investigators gave a brief video introduction, they knew they had consumed traceable milk without knowing that this is called "traceable milk."

“I had bought the traceable milk before, have seen the traceable label on it while shopping, now I know what traceable milk means” (G3, male, 30).

"I haven't bought the traceable dairy products myself, however, my parents had bought, they have faith in the quality of higher-priced products while buying food,

they bought it because the price was higher than others, when they got home we knew it was traceable milk" (G1, male, 23).

We also asked about the extra charges for traceable dairy products and the reasons of participants do or do not buy the traceable dairy products. The results showed that most respondents are willing to bear under ten percent extra costs for traceable dairy products. It was evident that the extra charges consumers were willing to pay were not high. In the supermarket, the price of traceable foods is much higher than those of normal foods (L.Wu, Xu, Zhu, &Wang,2012). The result also showed that health benefits are an essential motive for the purchase of traceable dairy products. The main reasons for not been willing to buy were given as follows: "incomprehension, distrust， inconvenience to purchase and price."

"I haven't bought it because I haven't heard of it. Also, I don't know if there is a traceable dairy product in the market if its price is no more than 5-10 percent higher compared to ordinary dairy products, I would like to buy it " (G6, female, 60).

"I have not bought it before, and I do not know more about that, I guess they are few in the current market， I do not feel willing to buy it because I have never had any food safety problems with dairy products. To be frank, I do not trust it, and I do not want to buy it even if its price is more than 5 percent higher compared to the conventional products" (G1, female,22).

3.4.4 Actors

3.4.4.1 Creditable authenticity of traceability information

In our interviews, participants indicated that they suspected the authenticity of traceability information. They were more likely to trust the traceability information certified by the government, followed by third-party certified or international certificated. Most of them do not trust the traceability information provided by the producing company that has not been certified by any other third-party bodies. They

worried that the enterprises might falsify traceability information for their commercial interests.

“Comparing Government, enterprises, third-party agencies, and international certification bodies, I am more inclined to trust the traceability information certified by government， the government played a critical role in the process of quality supervision and controls now in our country, I think government certificated for traceable is most credible than others ”(G1, male,23).

“I trust more the government certificate, I think, it has a higher reliability” (G8, female,40).

However, some interviewees stated that the traceability information certified by the domestic third-party or international agencies is valued more highly than certificates issued by the government or enterprises. Participants explained this by saying:

“I more trust in traceability information certified by the professional third-party agencies rather than certified by the government, because the former is more professional and more reliable” (G8, female, 30)

“I think the government does not place enough emphasis on the food traceability system yet，I have a lack of trust in the traceable information on certificated products carried out by the government. In contrast, the domestic third-party or International agencies certificate for traceability has more value for me, because they are more professionally" (G1, female, 23).

Another issue is worth discussing the fact that participants who trusted government certificate or third-party agencies certificate have one thing is common lack of faith in enterprise certificate. They worried that the enterprises might falsify traceability information for their commercial interests. For example, a man 40- years old, said:

"Enterprises focus more on their commercial interests, the traceable information

certified by food enterprises itself is quite unreliable, and the traceability information provided by enterprises itself which are not certificated by any third-party bodies whether it is third-party agencies or government has any value for me."

3.4.4.2 Who should be responsible for the cost of a food traceability system?

The implementation of traceability systems could lead consumers to perceive a higher value and to be willing to pay a premium price for dairy products. However, traceable food with relatively complete production attributes is bound to have a higher production cost， which will be eventually reflected by the product price, and consumers will have to make trade-offs between complete traceability and higher prices for traceable food. (L. Wu et al., 2017). To understand consumers' perceptions about the cost of the food traceability system, the participants had discussed who should be responsible for the cost of the Food Traceability System. Most of the participants stated that the government should be responsible for all or most of the cost of establishing the food traceability system. A participant explains that.

> "I think food safety is the government's legal responsibility, and the government should ensure the safety and quality of the foods which were sold in the market. In this regard, the government should bear the most responsibility for this cost because if let enterprise paid most of the cost, I afraid they may falsify the traceability information to save money. On the other hand, consumers will pay the cost, which should be undertaken by the enterprise."(G1, female, 22).

However, some other participants reported that enterprises should bear all the cost for establishing the food traceability system except for a few participants stated that consumers should pay for it.

> “It is the responsibility of the enterprises to produce safe food and recall suspected products, so I think enterprises should pay this cost” (G6, female 23).

"In my opinion, the enterprise should be responsible for the cost of the establishment of the food traceability system, after all, the Food traceability System would make the enterprise more competitive in the food market" (G3, man, 36)

3.5. Discussion

The present study described the perceptions about the safety of dairy products for people living in part of Northwest and South of China and identified what factors affecting the consumers purchasing decision while purchasing dairy products as well as explore the consumers' attitudes toward traceable dairy products.

3.5.1 Factors affecting the consumers purchasing decision

The result of the discussion indicated that, for many consumers, freshness is the most important factor while shopping for dairy products, consumers believe the freshness is associated with closely related safety. This is peculiar for the Chinese culture since consumers are not used to consuming matured cheese and look for fresh milk, soft cheese, and yogurt, etc. Particularly the participants live in the dairy-producing region are in more confidence for a local brand; they prefer to choose fresher while shopping. The freshness has to be seen as the main cue for them in determining the safety of dairy products. This is probably because some of the dairy products such as fluid milk, yogurt, and ice cream will spoil quickly like other fresh foods, which are most common in the Chinese food market. In terms of milk powder, safety or quality was the most important factor for consumers when purchasing instead of freshness, on account of milk powder is a manufactured dairy product. This finding is in line with previous studies that accounted freshness as one of the most important affecting factors on consumers' fresh food purchase (Chamhuri & Batt, 2015; L. Cheng et al., 2016b; H. Feng, Feng, Tian, & Mu, 2012b; L. Wang & Huo, 2016c). The literature shows that Chinese consumers have a reputation for highly price-sensitive in food purchase decisions (Z. Wang et al., 2008). Our result goes beyond previous findings, showing that food safety, quality, and brand of dairy products are generally considered more important than price. Although previous studies reported that Chinese consumers are price sensitive to food purchases, our finding indicates that with improved living

standards, consumers tend to become less sensitive to price, and the trend is even more obvious among young Chinese consumers. This finding is consistent with the findings of P. Xu, Zheng, & Motamed (2010) that, though previously perceived to be relatively more price sensitive compared to other Asian consumers, younger generations of Chinese consumers have shown willingness to pay a modest premium for certified safe milk products.

3.5.2. How consumers determine the safety of dairy products

The results showed that consumers interviewed in the survey indicated the brand, purchase venue, and certification are the most important indicators for consumers to determine the quality of dairy products. The participants who live in the dairy-producing region strongly emphasized that their preference for location brand when purchasing; they have more confidence in the quality of the dairy products if they were produced there. This confidence may come from two aspects which, positive previous experience with dairy products and are familiarity with the brand.

Familiar with the brand is one of the most important drivers of choice for safe dairy products. Consumers preferred the dairy products that often consumed and have not a bad record in food safety. The literature has found that positive previous experience and familiarity with products may boost the evaluation of consumers (Verbeke, Scholderer, & Lähteenmäki, 2009). Another important driver of preference for the local brand is that those dairy enterprises participate in the school milk program and are responsible for providing milk to the pupils. Therefore, they are perceived to have higher food safety standards. This finding is in line with previous studies on Italian consumers' food risk perceptions (Tiozzo, Mari, Ruzza, Crovato, & Ravarotto, 2017).

Our findings show that the purchase venue is another most important distinguishing factor in determining the quality of food for consumers. Many participants stated that the purchase venue as an important indicator for them to whether food reliable while shopping. They prefer large retailers, such as supermarket chains, to buy dairy products. For that, there could be several reasons through a literature review F. Wang, Zhang, Mu, Fu, & Zhang (2009) reported that supermarkets are starting to provide more information on production origin, hygiene, and sanitation, trying to give the best assurance for food safety. Also, safety certification is one of the reliable sources

for consumers when shopping for food. Although it was put in a lower position, it ranked higher than the price.

The certification is more reliable for some respondents than brands or purchase venues. They stated that certified food had been tested by an independent third-party are more objective and impartial. It is worth noting that the participants who had a higher education level prefer to identify the safe dairy products by certification. This confirms findings by Bai et al. (2013) that highly educated consumers are more likely to value the third party and industrial association certificates higher in comparison to low educated persons. Despite the safety certification was ranked at a relatively lower position, as the increasing level of economy and education, more and more Chinese consumers will begin to pay attention to the certification, and the preference for safety certification will be increased. This suggests that government or associated authorities should urge dairy enterprises to increase investment into implementing a brand strategy to improve consumer brand loyalty and pay attention to construct an agri-food accreditation system that is suitable for the practical situation in China.

3.5.3. Purchasing venue

The results showed that most participants regard a supermarket as the primary place to buy dairy products. One of the reasons for that is that the customers perceive convenience, proximity, variety, and the food´s safety as very important to them. Similar to the results offered by Cheng et al. (2016), supermarkets were the most trusted purchasing places perceived by customers. Although many participants took the large retailers such as Carrefour or other supermarket chains as the most purchasing venue of buying dairy products, but also there are some participants in North groups who showed that they would purchase the loose milk in the small retailer shops such as the convenience store or street vendors. They think that the loose milk sold there which safer and cheaper, and because they are convinced that dairy products are very fresh and without food additives. Our study confirms the previous finding that the main factors affecting Chinese consumers to select street vendors to purchase foods are convenience, freshness, and price. Street vendors have large numbers of customers because it is highly convenient, and generally, they tend to offer lower prices (Feng, Feng, Tian, & Mu, 2012).

3.5.4. Label information

Our findings show that most participants have a habit of reading the label information while buying dairy products. This finding is in line with a previous study conducted by Qing, Yan,&Wang, (2006) and which has revealed that a large majority of consumers in Wuhan city claimed to read the information on food labels or production descriptions before making a purchase decision. However, this finding significantly differs from previous results reported in the literature (Zhu, Cai, & Wang, 2013; chan, Tse, Tam, & Huang, 2016; Wang et al., 2013). Our interviewees expressed the brand and quality certification got the most attention by them while purchasing milk powder. The respondents from different groups have different attention to the label's information during purchases milk and yogurt products. Most of the respondents in the North group have indicated that they pay the most attention to the production and expiry date. In contrast, the brand and production date is the key information for respondents in the South group while buying milk and yogurt.

3.5.5. Consumer's food safety concern

Food safety consistently ranks among the top concerns of participants in the discussion. The outcome of this discussion is not surprising. Chinese consumers are gravely concerned about the quality and safety of their food like consumers in other countries, and indeed the Chinese consumers have more reason to be concerned about food safety, especially for dairy products. Our study confirms previous findings that consumers have higher levels of concern regarding food safety, including dairy products (Chen et al.,2013; Qiao, Guo,&Klein,2010b; Veeck, Veeck,&Zhao,2015; Zhang, Bai, Lohmar,&Huang,2010). Notably, the participants with children or older people were more leaning to show concern about food safety in the dairy sector. Our findings are in line with the previous study that found that the respondents who had children are more concerned about milk safety (Gao, Li, Bai,&Fu,2015).

3.5.6. The aspect of consumer concern about dairy products

China's food safety crisis can be seen in the ranking by the survey respondents of counterfeit foods, and it has been described as the most important safety threat. Other major concerns among the Chinese respondents, such as chemical contamination and

pollution, ranked second and third (Veeck et al., 2015). Our results show that regarding the consumption of dairy products, chemical residues are the biggest concern for most consumers. Probably this is because China ranks among the highest users of fertilizers and pesticides (Jin, Zhang,&Xu, 2017). Due to frequently occurring food safety issues, consumers have increased attention to the reports related to food safety incidents in the media, which include social media such as blogs, microblogs, and WeChat. This situation is consistent with the one described in a previous study, which concluded that food-safety scandals revealed by the media could easily be noticed and reminded by consumers and further affect their judgments of expected utility and their purchasing behavior (Peng et al., 2015; Peng,Li,Xia,Qi,&Li,2015). However, it should be noted that false news has the same effect on consumers. There are constant reports about food safety, and some media hosted false reports published with the sole purpose of increasing web traffic, especially on social media platforms such as Weibo, WeChat. Another factor highlighted in the focus group discussion is that direct or indirect personal experience with food safety issues would affect consumers' confidence in food safety, as also confirmed by the previous literature (Hansstein, 2015).

3.5.7. Awareness about traceable food

In the opinion of most participants, can be track all stages of dairy production is considered important for consumers in our study. In line with the previous literature (Wang et al., 2013), consumers believe that tracking all of the stages (from farm to table) can provide information that they want to know and will help them make the right choice while purchasing. However, in our study, we find out that traceable food is not very well-known among the participants in focus groups. Some of them just had heard about it before, and many participants mentioned that they had not bought dairy products before. About the option to buy or not to buy, the main reasons given were as follows: "incomprehension, distrust, inconvenience to purchase and price." Similar to the study of L.Wu et al.,(2015), consumers do not know about or trust traceability information.

3.5.8 About the credibility and authenticity of traceability information

Despite that, tracking all stages of production, processing, and distribution in the dairy sector is considered important within the discussion. Respondents suspected that

the authenticity of traceability information, they are not confident about traceability information provided by enterprises that has not been certified by other third-party bodies. They are worried that the enterprises might falsify traceability information for their commercial interests. The traceability information certified by the government has more value for consumers than certified by third-party. These results of the present study corroborate previous findings that consumers were dubious about the authenticity of traceability information, and a government certificate for traceability is currently valued more highly than certificates issued by a third-party (Hansstein, 2015; Ortega, Wang, Wu, & Olynk, 2011).

Moreover, Bai et al. (2013) have found a slightly different result in their study that although government-issued certification is still currently valued at the highest position. However, third-party certification for traceability food will become increasingly important in the future, and the rising income and education are two driving forces. This finding has certain similarities with the conclusion of L.Wu et al. (2015) that consumers of different ages, education, and income level have different levels of trust in certification agencies. Young consumers with high education and income levels had a high relative willingness to pay for domestic third-party certification while purchasing traceable food.

3.5.9 About the cost of the food traceability system

Regarding the issue of the cost for the establishment of a food traceability system, on one side, consumers stated that the government should be responsible for all or most of the cost. Others argued that enterprises should bear all the costs of establishing the food traceability system. Moreover, the stated price-premium of consumers on the purchase of traceable dairy products is, in most cases, quite low, people often indicate less than ten percent. That means government or enterprises should play an essential role in the implementation of the food traceability system. The result corroborates the previous finding of L.Wu et al.,(2012), who found that if the price of certified traceable food is not acceptable or affordable to consumers, the implementation and promotion of food traceability system will be difficult. Therefore, government funding support is critical for the implementation of food traceability systems.

3.6. Conclusion

To better understand how Chinese consumers' perception of food safety and attitudes towards traceable dairy productions, nine focus group interviews with sixty-one participants in four cities were carried out. Focus group results indicated that there is generally a high concern with the safety of dairy products. High prevalence of food safety incidents triggers consumers to lower their confidence in food safety and to pay more attention to the news about food safety incidents in the media, including social media. Chemical residues ranked as the first concern on food safety in the dairy industry.

Meanwhile, traceable food was less known among the participants in the focus groups. Despite the can be traced back the all stages of the food supply chain in the dairy sector is considered necessary, respondents raise doubts about the authenticity of traceability information. In particular, they are not confident about the traceability information, which was provided by enterprises but has not been certified by other third-party bodies. Among the interviewed consumers, the traceability information certified by the government has more value than the information certified by third-party agencies. It is noteworthy to mention that the extra charges consumers state they were willing to pay for traceable dairy products are not high, and they hope that the government would bear all or most of the cost for establishing the food traceability system.

The current paper has some limitations. The research approach is qualitative and based on a small group of Chinese dairy products consumers. The focus group interviews covered different two regions (Northwest and South of China). The number of focus groups was limited to nine because of budget constraints. Therefore, results cannot be generalized and must be considered with care. A more representative sampling with a larger sample size would be necessary to increase the validity of the study and using a combination of qualitative and quantitative data would improve its significance. The integration of both approaches/methods would also help to understand the behavioral intentions better to buy traceable dairy products.

However, the results can serve as a useful input for further research, and they provide a rich insight into consumer views of dairy products’ safety problems in China. Some questions remain open, such as what the internal and external factors are are affecting consumers buying behavior and what is the consumers' willingness to pay for traceable dairy products.

3.7. Research limitations

The authors thank the individuals who participated in the focus groups for openly sharing their thoughts and experiences. The findings are qualitative and based on a small group of Chinese dairy products consumers. It has some limitations. The focus group interviews covered different two regions (Northwest and South of China). However, the number of focus groups was limited to nine because of budget constraints. The participants come from Northwest and South of the country, which means that the findings may not apply to another area of the country. A more representative sampling with a larger sample size would be necessary to increase the validity of the study. However, the results can serve as input for further research.

CHAPTER 4

Consumers' willingness to pay for traceable dairy products – evidence from experimental auctions

Abstract: This research aims to elicit consumer willingness to pay (WTP) for traceable dairy products, and to investigate the effect of information about traceable food and auction size on consumer bids. Results show that Chinese consumers are influenced by information about traceable food, and they are willing to pay a price premium for the traceability information. Our research also shows that consumers' household income plays a vital role in the WTP for traceable dairy products. Household size was a critical barrier to purchase the traceable dairy product. The auction size had a significant effect on WTP. However, the effect was different across the different auction products, as well as the effect of different auction size was not same. The bigger the auction group size, the lower the bids for traceable condensed milk. Participants in the four bidders' groups state a significantly lower willingness to pay a premium for traceable milk and conventional milk than the other two groups.

Keywords: Traceable dairy product, WTP, experimental auction, information

4.1. Introduction

Dairy products are an important part of a healthy diet, and dairy is an emerging food industry in China, Due to China's huge population, there is a great demand for dairy products. In 2014, the average amount of annual milk consumption was 12.6 kg per capita, generating a total milk yield of about 37,246 million tons in China, which was an increase of almost 200% since 2002 (X. Wu et al., 2018). With the rapid development of the dairy industry, recurrent food safety incidents have exerted a profound negative impact on consumer confidence. Food safety issues often arise from

problems of asymmetric information between consumers and producers of food with regards to product-specific attributes or characteristics (Ortega et al., 2011). Information asymmetry often leads to increased anxiety, uncertainty, and rapidly declining confidence among consumers (Ortega et al., 2011). The food traceability system will play a role as a bridge connecting all information in a food supply chain and reduce asymmetric information. It strengthens the provision of food safety information and defines the responsibilities of suppliers at different supply chain nodes, which aims to transform former experience or credence attributes of food safety into searchable attributes(R. Zhao & Chen, 2012). The implementation of traceability systems could lead consumers to perceive a higher value and to be willing to pay a premium price for dairy products.

Meanwhile, it will lead to a higher price of products, and price perceptions would directly influence customer satisfaction. Furthermore, it may influence their WTP. Therefore, firms working in the food supply chain business have to compare potential benefits and costs. Clearly, the traceability capacity metrics have been shown in order to influence both costs and benefits (Asioli, Boecker, et al., 2014). It is critical for firms to know how much consumers are willing to pay for traceable dairy products. Chinese consumers' willingness to pay for traceable dairy products has been given increasing attention since the milk scandal occurred in 2008.

Most of the current literature on consumer preferences of traceable dairy products focus on consumers' willingness to pay for traceable dairy products and the traceability information attribute. Certification of traceable foods can be significantly improved the consumers' expectations and willingness to pay for traceable dairy products. However, there are significant differences between consumers' willingness to pay for products certified by different certification bodies (C. Zhang, Bai, & Jiang, 2014). In a study by Zhang, Bai, & Wahl (2012), the highest mean WTP is for traceable milk, which is 21.7 per cent higher than regular milk prices. The same study also found that consumers' WTP for food traceability is significantly affected by age, income, household size, and their knowledge of traceability as well as the certification systems. This finding is consistent with the conclusions of Bai, Luo, & Zhang, (2019) and Bai, Zhang, & Jiang, (2013), they indicated that consumers have a strong desire for traceable milk, and a government certificate for traceability is currently valued more highly for consumers

than certificates issued by a third party. In a study by Chen, Jing, & He (2017), education, health consciousness, the perception of the price, knowledge of traceability have had a positive effect on the consumer's WTP for traceable dairy products. Yin, Li, Xu, Chen, & Wang (2017) determined the consumer willingness to pay for traceable infant milk formula profiles with different levels of five attributes. The research showed that the higher the food safety risk perception, the higher the WTP for traceability information and the higher the WTP for "foreign milk powder" compared with domestic products. A study by Zhou, Nanseki, Hotta, Shinkai, & Xu (2010) showed that consumers are concerned about the information of animal medicine usage record especially on antibiotics, and there are willing to pay more for that kind of information. Liu, Yang, Feng, & Sun, (2017) indicated that the most valuable traceable information is the basic information of raw milk, followed by the quality information of dairy products. Lin, Qian, & Wang, (2016) reported that household size, the number of child or older people in the family, monthly family income, monthly expenditure for food, the price, the level of understanding of traceable food, degree of certification trust have significantly impacted on the consumers purchasing decision. The same study also indicated that the importance of the four attributes of traceable milk was traceability platform, information query mode, traceability information, and product price. Among them, the traceability platform is a key factor affecting consumer purchasing decisions.

Some scholars have examined and measured the influence of the number of bidders in the auction on the results of the auction (Coey, Larsen, & Sweeney, 2019; Liang, 2014). When the number of bidders increases, the participants in an online auction perceive a greater risk of losing the auction. Thus, they tend to raise the price during the bid process, and so the auction will have a higher-end price (Kagel, Levin, & Harstad, 1995; Liang, 2014; Y. Liu, Wei, & Chen, 2010). However, previous studies about the impact of number of bidders on bidding have largely focused on bidding behavior in online auction (T. Y. Chan, Kadiyali, & Park, 2007; De Haan, De Vries, & Zhou, 2013; Yuewen Liu et al., 2010; Suter & Hardesty, 2005; Walley & Fortin, 2005).

Existing literature provides a useful reference for our study. However, there are still some remaining deficiencies.

First, there is a lack of study on the effect of information on consumer willingness to pay for traceable dairy products. Prior research mostly focuses on the consumers'

preference for traceable information attributes, rather than comparing the WTP for traceable dairy products in the context of providing information and not providing information.

Second, previous literature on consumers' WTP for traceable dairy products involved hypothetical experiments. Hypothetical bias is the difference between what people say they are willing to pay in a hypothetical survey question and what they will actually pay in a non-hypothetical experiment when money is really on the line (Grebitus et al., 2013). Consumers may declare their high preference and intent for products in the hypothetical survey. However, it might be not representative of the behaviour under realistic environmental conditions.

Third, although there are some studies on the number of bidders, however, not enough previous studies on the effects of the number of bidders on Chinese consumers' behaviour in the experimental auction.

This study aims at analyzing consumers' willingness to pay for traceable dairy products, with a particular interest in investigating the effect of information about traceable production process and bidders on consumers' willingness to pay.

This paper aims to contribute to the literature in three main ways:

(1) assess the effects of information about traceable dairy products on consumers' WTP for traceable and untraceable dairy products. The information provided was designed to be neutral in the sense that the information treatment was not intended to affect participant attitudes toward traceable or conventional dairy products intentionally;

(2) examine the effects of auction size on the bidding behaviour

(3) elicit the significant variables affecting the level of willingness to pay.

These three contributions are provided using data from a survey among Chinese consumers of milk product in the Xinjiang province of China.

The remainder of the article is organized as follows: first we illustrate materials and methods, focusing on the type of products chosen, the sample, the data collection tool, the auction procedures and on the design of the experiment, the data analysis methods; then, we describe the main results and we discuss them; finally, we draw some conclusions and we make suggestions on further research.

4.2. Materials and Methods

4.2.1. Selection of food type

Three products, namely traceable milk, traceable condensed milk, and conventional (non-traceable) milk, were used in this study. We chose milk because fluid milk accounts for about 95% of Chinese consumers' dairy consumption (Cheng, Ren, Wang, & Xiu, 2017). Condensed milk is also a widely marketable product in China. Another important reason is that traceable milk and traceable condensed milk can be found on the market. Although traceable milk powder is also a more marketable product, it was not selected because it is offered to particular consumer groups.

4.2.2 Selection area

This experiment was conducted in Urumqi, which is the capital city of the Xinjiang Uygur Autonomous Region (Xinjiang). The reason for choosing Urumqi is based on the fact that it is a high dairy product consumption area. Except for some specific regions (such as Shanghai and Heilongjiang), the level of Chinese dairy consumption per capita is characterized by "west high and low east," that is, urban and rural high consumption areas are mainly distributed in Beijing, Qinghai, Xinjiang, and Tibet. The per capita consumption of dairy products in China's dairy high-income areas far exceeds the national average. Taking Tibetan rural residents as an example, the per capita consumption is 38 kg. In comparison, the per capita consumption in Guangxi is only 0.8 kg (Cheng, Ren, Wang, & Xiu, 2017).

4.2.3. Selection of Experimental Method

Although several techniques could be employed to measure consumers' willingness to pay for a certain product, most of the studies that address Chinese consumer WTP for dairy products (e.g. organic, green, sustainable, or traceable etc.) rely on survey-based hypothetical choice experiments (Bai et al., 2019, 2013; F. Guo & Li, 2016b; Jin, Zhang, & Xu, 2015; W. Lin et al., 2016; Quan et al., 2018; Yin et al., 2017; L. Zhu & Xu, 2017b). Only a few studies used non-hypothetical auctions to measure WTP for pork traceability information (Cai et al., 2013; B. Hou et al., 2019; Jin et al., 2015; Linhai Wu et al., 2016) and genetically modified rice (H. De Steur, Gellynck, Feng, Rutsaert, & Verbeke, 2012). Therefore, this study is based on a non-hypothetical value perception elicitation method in an attempt to fill this gap.

The main objective of this part is to investigate consumers' willingness to pay for traceable dairy products. The research was designed to elicit consumers' perceptions and values for traceable dairy products using a non-hypothetical experimental method.

In non-hypothetical experiments, real products and real money are exchanged, thus participants have more incentive to reveal their true value for a product than in a hypothetical survey setting (Jayson L. Lusk, Feldkamp, & Schroeder, 2004) because stated responses in hypothetical contexts may differ from consumers' actual behaviour and are therefore unable to reveal the true WTP.

In a typical experimental auction, participants bid to obtain the auctioned products, and the highest bidder(s) have to pay real money to buy them. Then, participants face a well-defined economic incentive structure that enables researchers to more accurately elicit the value of an objective product (Gracia & De-Magistris, 2016). In addition, experimental auctions allow researchers to directly collect willingness to pay values from individual subjects, in contrast to other elicitation techniques (e.g., choice experiments), which generally rely on statistical models and assumptions about people's utility functions to generate estimated willingness to pay values (Jayson L. Lusk & Shogren, 2007).

4.2.4 Mechanism of the auction

Among the different incentive-compatible auction mechanisms, we used a second-price auction. In second-price auctions, the bidder with the highest bid buys the product and pays a price equal to the second-highest bid. Theoretically, it has been shown that second-price auction is an incentive compatible auction mechanism in the sense that a bidder's optimal bidding strategy is to report a bid equal to his/her true WTP (Akaichi, Glenk, & Revoredo-giha, 2019). Several studies have shown that although participants "overbid" in the second-price auction, it works well for margin bidders (De Magistris, Del Giudice, & Verneau, 2015). Due to its incentive compatibility and it is relatively easy to explain to subjects and implement, second-price auction has been the most widely used auction mechanism in empirical applications on consumers' WTP for food attributes (Jayson L. Lusk & Shogren, 2007). Previous applications of this method have measured consumers' willingness to pay for product attributes such as organic, genetically modified food products, humane animal care-certified products etc. (M.

Chen, Yin, Xu, & Wang, 2015; Levan Elbakidze, Nayga, & Li, 2013; H. D. Steur, Buysse, Feng, & Gellynck, 2013a; Uchida, Roheim, Wakamatsu, & Anderson, 2014).

Scholars applied the BDM auction to investigate the impact of traceability information on the consumers' WTP in China (Cai et al., 2013; B. Hou et al., 2019; D. Zhu, Cai, & Wang, 2013). To the best of our knowledge, not much research has used the second-price auction to study consumer WTP for traceable dairy products in China. A closely related study is Wang and Mu (2014), who applied second-price auctions in an analysis of the Chinese students' willingness to accept (WTA) of organic milk under different labelling information. Jin, Zhang, & Xu, (2017) adopted random nth price experimental auction to investigate the willingness to pay for traceability based on abbreviated and detailed information among consumers in China. H. D. Steur, Buysse, Feng, & Gellynck, (2013) conducted second-price auction to investigate the role of information on willingness-to-pay for folate-bio fortified rice in a Chinese folate-deficient region.

Although the Chinese consumers' preferences and willingness to pay for traceable food has been examined in previous studies, the use of large-scale experimental auction for traceable dairy products is kind of new in the research conducted in China. We conducted second-price experimental auction for 315 Chinese consumers to investigate the WTP for traceability based on abbreviated and detailed information, while to measure consumers' WTP in the different auction size.

4.2.5 Treatments

In order to investigate the wheather providing consumers with additional information regarding traceable food could help increasing consumer demand. We chose to introduce two information treatments.

Two information treatments are: with and without information about traceable treatment in dairy production. There were six rounds in each session, in the first three rounds were without information, and after third round provided the information to participants. Before the auction begins, participants were provided with a short explanation about traceable food in order to give the first impression. It mimics that participants would get a general impression of the quality attribute "traceable" from the packaging. After the third round we showed the video to participants about traceable

dairy products (about 4 minutes in length) and answered their question about traceable food in order to help participants to understand the meaning and implications of providing traceable food. This procedure of comparing bids immediately before and after the information shock in the information treatment have been used by scholars in their research (De Magistris et al., 2015; L. Elbakidze & Nayga, 2012; J. L. Lusk, 2004).

When the number of bidders increase, the participants in auction perceive a greater risk of losing the auction, thus they may tend to rise their bids during the bid process. The effect of the different auction size on consumers' WTP is another goal of our study. In order to achieve this goal, we conducted the experiment for conducted for three different auction sizes which three bidders' groups, four bidders' groups, and five bidders' groups in respectively.

4.2.6 Preparation and procedure of experimental auction

The study was conducted at the entrance of the supermarket and we ran 82 separate experimental sessions for a total of 315 participants. Consumers were recruited and screened for eligibility from shoppers. All of the subjects were above 18 years old and had experience in purchasing dairy products. The participants were asked to bid for three different milk products. In addition to questions related to perception toward food safety in the dairy industry, attitudes towards safety labels and socio-demographic information have been collected from each participant. The study was conducted at the entrance of the supermarket.

In the experiment, we used three different dairy products:

- traceable milk (net weight 250ml),
- traceable condensed milk (net weight 350g), and
- untraceable milk (net weight 250ml).

Both traceable milk and untraceable milk were produced by the same manufactory and belong to be the same brand. And thus, the brand effect can be ignored while analyzing the bids for traceable milk and untraceable milk. In terms of the traceable condensed milk, comparing the market price of condensed milk.

Before starting the real auction, we informed the target group that they can bid zero for the auction items if they do not want these products. We believe that providing this

option mimics what happens in the real market. All exchanges of money and products in our study took place immediately after each session.

The experimental procedure of auction sessions consisted of the following steps:

1) Upon arrival, the participants received a paper script with directions of the auction, identification number, the consent form, and questionnaire. Subjects were informed that no identifying information would be collected and that results would remain anonymous. Subjects were asked to fill out the questionnaire that contained socio-demographic questions, as well as questions about their level of awareness about traceable food.
2) The session began with the experimenter explaining that this was an experiment in individual decision-making and truthfully revealed their WTP values and fully explained the rules of the experiment. Furthermore, the subjects were asked to read and sign the consent form which has committed them to buy a product if they won the auction (a sample copy of instructions can be found in Appendix A).
3) After a brief explanation, one practical auction was conducted with chocolate to ensure that subjects fully understood the procedures of the auction. The subjects were told that if this was a real experiment, then the top bidder in the binding round would pay the second-highest bid for the binding quantity of the binding product in the binding round. All participants were encouraged to ask questions about the procedures and the mechanism.
4) After the practice auctions, the subjects started the actual experiment with the first round. The subjects submitted bids for the "Auction item A-traceable milk," "Auction item B-traceable condensed milk," and "Auction item C-untraceable milk"(). The subjects were told only one of the auction items would be selected randomly as binding. Therefore, they would be buying only one of the auction items if they won the auction.
5) After each round, the top bids with the ID number for auction items were posted to all of the subjects. This process was repeated in three rounds.
6) After the first three rounds, a short video about traceable dairy products (about 4 minutes in length) was showed to participants to help them to understand food traceability principles and answered their question about traceable food.

7) Once the fourth round had been started, and one of the rounds was then selected as binding in the end.

8) The winner paid the binding price for the binding product in the binding round.

9) At the end of session, all subjects received a 10 CNY（ Chinese yuan）participation fee .

Figure 4.1 Products auctioned in the Second-Price Auctions

4.3. Data analysis and modelling

The statistical data analysis procedure included two steps.

In the first step, an analysis of variance (ANOVA) has been used to find out whether there were significant differences between the means of bids for three auction products in the information and auction size treatment. In the ANOVA statistics, the null hypothesis for ANOVA is that the mean (average value of the dependent variable) is the same for all groups. The alternative or research hypothesis is that the average is not the same for all groups. If the P-Value (P_{ANOVA}) <0.05, we reject the null hypothesis, and we can conclude that the average of the dependent variable is not the same for all groups.

In our study, the null hypothesis is:

$_{TM}\mathbf{HI}_0$=the average of the bids for traceable milk is the same for all groups in different information treatment

$_{TCM}\mathbf{HI}_0$=the average of the bids for traceable condensed milk is the same for all groups in different information treatment

$_{CM}\mathbf{HI_0}$=the average of the bids for Conventional milk is the same for all groups in different information treatment

$_{TM}\mathbf{HZ_0}$=the average of the bids for traceable milk is the same for all groups in different auction size group

$_{TCM}\mathbf{HZ_0}$=the average of the bids for traceable condensed milk is the same for all groups in different auction size group

$_{CM}\mathbf{HZ_0}$=the average of the bids for Conventional milk is the same for all groups in different auction size group

Second step, previous studies showed that consumer WTP for traceable food is affected by knowledge about traceable food, food safety perception, trust in the certificate, and socio-demographic characteristics (Bu, Zhu, & Wu, 2013; Ruifeng Liu et al., 2019; Linhai Wu, Wang, Zhu, et al., 2015). Therefore, in addition to investigating the effect of the information provided to participants and auction group size, we also assessed the robustness of the information effect after controlling the effect of other variables. Toward this end, a generalized linear model (GLM) was used to determine the factors potentially associated with the outcome variable. GLM with a Gaussian function was used to estimate the associations of WTP with the characteristics of the participants. In GLM, the observed value of the dependent variable Y for observation number i (i = 1, 2..., n) is modeled as a linear function of (p − 1) independent variables x_1, x_2,..., x_{p-1} as

$$Y_i = \beta_0 + \beta_1 x_{i1} + ... + \beta_{p-1} x_{i(p-1)} + e_i \qquad (4.1)$$

Considering the continues variables (bids) tend to follow distributions like the Gaussian distribution, a GLM with identity link function and gaussian distribution was used for the WTP estimates. Thus, in the model specified previously:

$$Y_i = a + \beta_{1i}\,\text{Information} + \beta_{2i}\,\text{GroupWise} + \beta_{3i}\text{Male}_i + \beta_{4i}\text{Age}_i + \beta_{5i}\text{Hhsize}_i + \beta_{6i}\text{Education}_i + \beta_{7i}\text{Income}_i + \beta_{8i}\text{Withchild}_i + \beta_{9i}\text{Withelder}_i + \beta_{10i}\text{Healthstatus1}_i + \beta_{11i}\text{Healthstatus2}_i + \beta_{12i}\text{Healthconsc}_i + \beta_{13i}\text{Healthconcern}_i + \beta_{14i}\text{Safetyconcern}_i + \beta_{15i}\text{Experience}_i + \beta_{16i}\text{Trust}_i + \beta_{17i}\text{Heardtf}_i + e_i \,. \qquad (4.2)$$

Where:

i stands for the product types, i.e. i=traceable milk, traceable condensed milk, and conventional milk.

Y_r=Participant's bid for auction product,

Information = participants were provided with information on traceable products,

$Groupsize_i$ = auction group size (3bidder,4bidder, and 5bidder).

$Male_i$, Age_i, $Hhsize_i$ = gender, age, and number of members in the participant's household, respectively.

$Education_i$ = education level,

$Income_i$ = monthly household income,

$Withchild_i$ = (having at least one child ages <16 in household),

$Withelder_i$ = (having at least one elder people above 60 years in household),

$Healthstatus1_i$ = number of medicines taken last month,

$Healthstatus2_i$ = number of medical check-up every year,

$Healthcons_i$ = health consciousness of participants (knowing of their health condition),

$Healthconcern_{ir}$ = health concern,

Safety $concern_{ir}$ = the food safety concern of participant,

$Experience_{ir}$ = the participants' experience in purchasing unsafe dairy products,

$Trust_{ir}$ = the participants' trust in the food quality certificate ,

$Heardtf_{ir}$ = the whether or not heard about traceable food, and e_i is an error term.

4.4. Results and Discussion

4.4.1 Data Description

The summary statistics of the selected socio-demographic variables are described in Table 4.1 More than half of the participants were female (59.4%), as expected when targeting the purchasing decision-makers while purchasing food. Respondents aged 18~25 and 42~49 accounted for the majority of this survey. Almost half of the participants had a bachelor or undergraduate degree, and the median monthly household income was between 256 and 897 euro (rate of 7.80) （the average per capita income in Xinjiang was 350 euro in 2018).Approximately half of the respondents have 3~4 family members in households. One-third of respondents had children (31.4%) or older people

(34.6%) in the household. More than half of the participants reported that they have an annual health checkup and did not take medicine in the last month. As 61.2 % of participants stated that they know fairly or very well their health condition, and almost 76% of participants reported that more or strongly paid attention to their health condition. Almost 56% of participants expressed strong concern about the safety of dairy products, and 60% of participants stated that they trust the food safety certification on the food label. Recurrent food safety incidents have exerted a profound negative impact on chinse consumers' confidence in the dairy industry. However, consumers still have trust in certified food. This may reflect that there is a potential market demand for certification food. One in five stated they had experience of purchasing unsafe dairy products, and the majority of the participants expressed the fact that they have never heard of the traceable food before. Chinese consumers have a lack of knowledge about traceable food, and therefore further work will be needed to improve consumers' understanding of traceable food.

Table 4.1. Socio-demographic characteristics of the sample (N=315)

Variable	Percentage
Gender	
Female	59.4
Male	40.6
Age of the respondent	
18~25	42.2
26~33	9.8
34~41	8.6
42~49	20.6
Above 50	18.7
Education level	
Under middle school	14
High school	15
College	12.4
Bachelor	50.8
Master or above	7.9
Household income classes	
Under 2000 RMB	19.1
2001~5000RMB	27.7
5001~7000RMB	24.8
7001~10000RMB	14
Above 10000RMB	14.6
Household size of participants	
1	27
2	11.7
3	24.8
4	25.4
Above 5	11.1
Family with child	
Yes	31.4
No	68.6
Family with elder	
Yes	34.6
No	65.4

Variable	Percentage
Health Status1	
1	53.3
2	29.52
3	1.27
4	2.54
5	13.3
Health Status2	
1	14
2	75.8
3	8.8
4	1.3
Health consciousness	
1	3.5
2	35.2
3	51.1
4	10.16
Health concern on the health condition	
1	1.3
2	22.9
3	50.5
4	25.4
Food safety concern	
1	10.8
2	55.6
3	9.2
4	22
5	2.5
Trust of food safety certification	
1	2.5
2	32.7
3	59.4
4	5.4
Experience with food safety incidents	
Yes	22.5
No	77.5
Heard about traceable food	
Yes	26.35
No	73.65

4.4.2 Information Treatment

The results of Table 4.2 showed that the bids for traceable milk are significantly higher than the bids for conventional milk. In terms of the traceable condensed milk, comparing the market price of condensed milk (8~11RMB in the supermarket), and the mean of WTP 9.43 is not low. Furthermore, after information is provided, there is a clear tendency for bids for traceable milk and condensed milk to increase.

Table 4.2 Descriptive statistics of the bids

Variable	Obs	Mean	Std.Dev.	Min	Max	% of zero bids
Tra.Milk	1,890	5.730196	2.754196	0	24	0.6
Tra.Co.Milk	1,890	9.434952	5.107978	0	50	1.4
Con.Milk	1,890	3.399233	1.875731	0	17	2.2

Tra.Milk=traceable milk; Tra.Co.Milk=Traceable condensed milk; Con.Milk=Conventional Mil

In the information treatment, to capture the effect of information on the willingness to pay, participants were shown a short video about traceable dairy products (about 4 minutes in length) after the first three rounds, in order to promote participants to an understanding about traceable food.

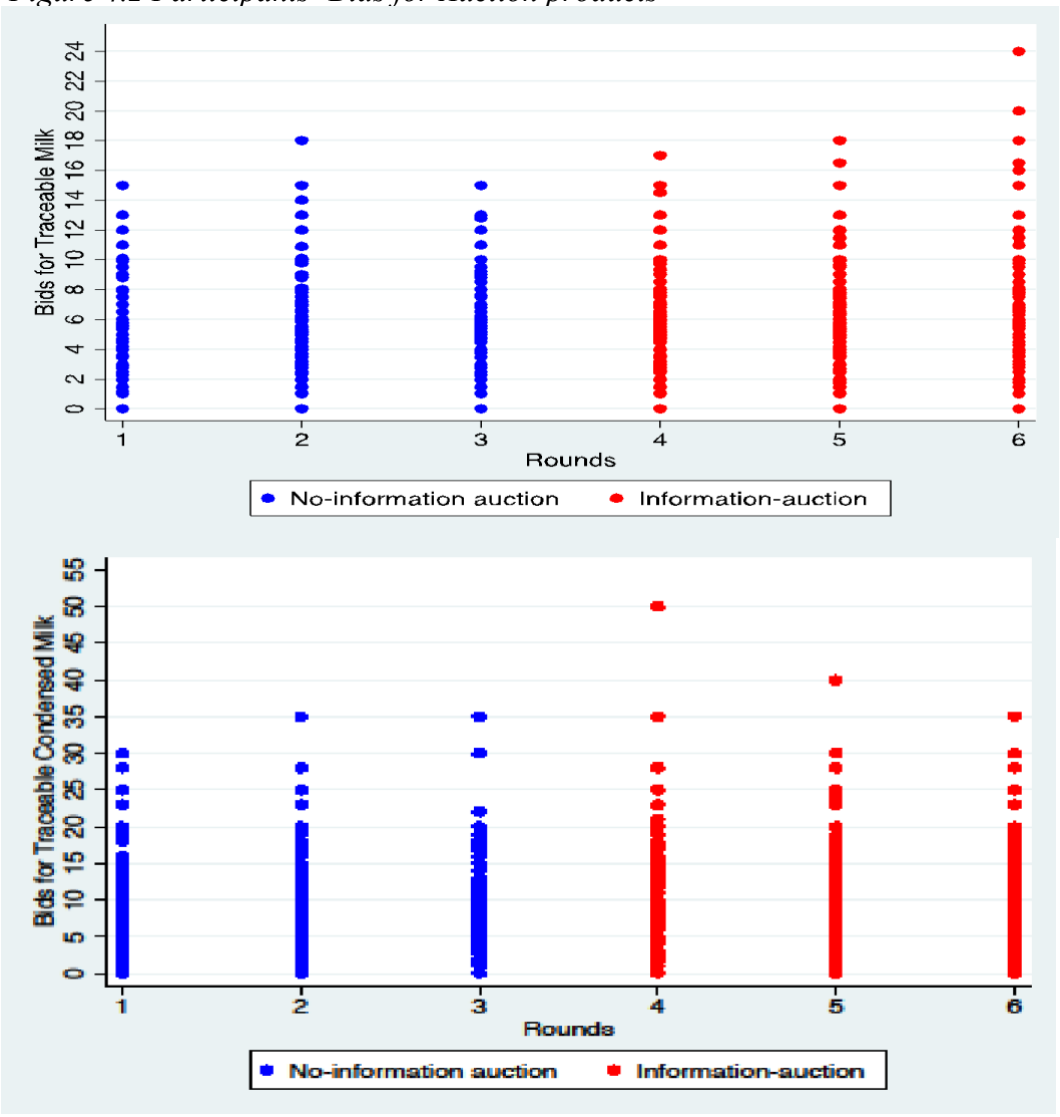
Figure1 shows the effect of information provided to the participants regarding traceable dairy products on the WTP for three auction products across treatments and rounds. As expected, after providing the information about traceable dairy products from the fourth round, the bids obviously increased. The most obvious change occurred in the fourth round. Then, the bids for traceable milk continue to rise, while the bids for traceable condensed milk fell slightly, but they are still higher than the first three rounds.

Table 4.3 show that providing the traceability information increases the mean bids to 6.050974 and 9.760169 for traceable milk and traceable condensed milk, respectively. And the increases was almost same level between traceable milk (0.641556) and traceable condensed milk (0.650434). That is, the same sensitivity exists between two kind of traceable products.

This seems to suggest that the information about traceable dairy products has increased the demand of consumers to purchase traceable dairy products. However, unexpectedly, the bids for conventional milk also changed. The mean WTP for conventional milk has dropped by 0.05 after provided the traceable information to

participants (see table 4.3). Overall, the change was remarkably small. It is interesting that and the change was more significant in the fourth round, too (see figure 4.2). A possible reason for this could be, for the consumers, raising the value of the traceable dairy products leads to a decline in the values of the conventional dairy products.

Figure 4.2 Participants' Bids for Auction products



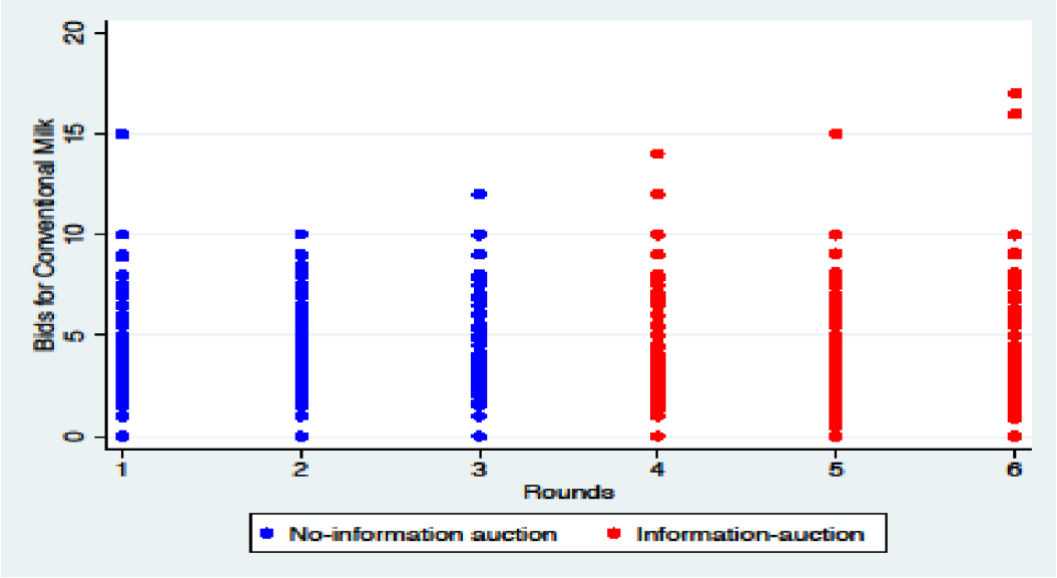


Table 4.3 The Mean Bids in Information Treatment

Variable	Obs	Mean	Std. Dev.	Min	Max
Tra.Milk					
No-Info	945	5.409418	2.488624	0	18
Giv-Info	945	6.050974	2.9631	0	24
Tra.Co.Milk					
No-Info	945	9.109735	4.847893	0	50
Give-Info	945	9.760169	5.33823	0	50
Con.Milk					
No-Info	945	3.424857	1.809184	0	15
Giv-Info	945	3.373608	1.940618	0	17

Tra.Milk=traceable milk; Tra.Co.Milk=Traceable condensed milk; Con.Milk=Conventional Mil; No-Info=without information; Give-Info=Provided information.

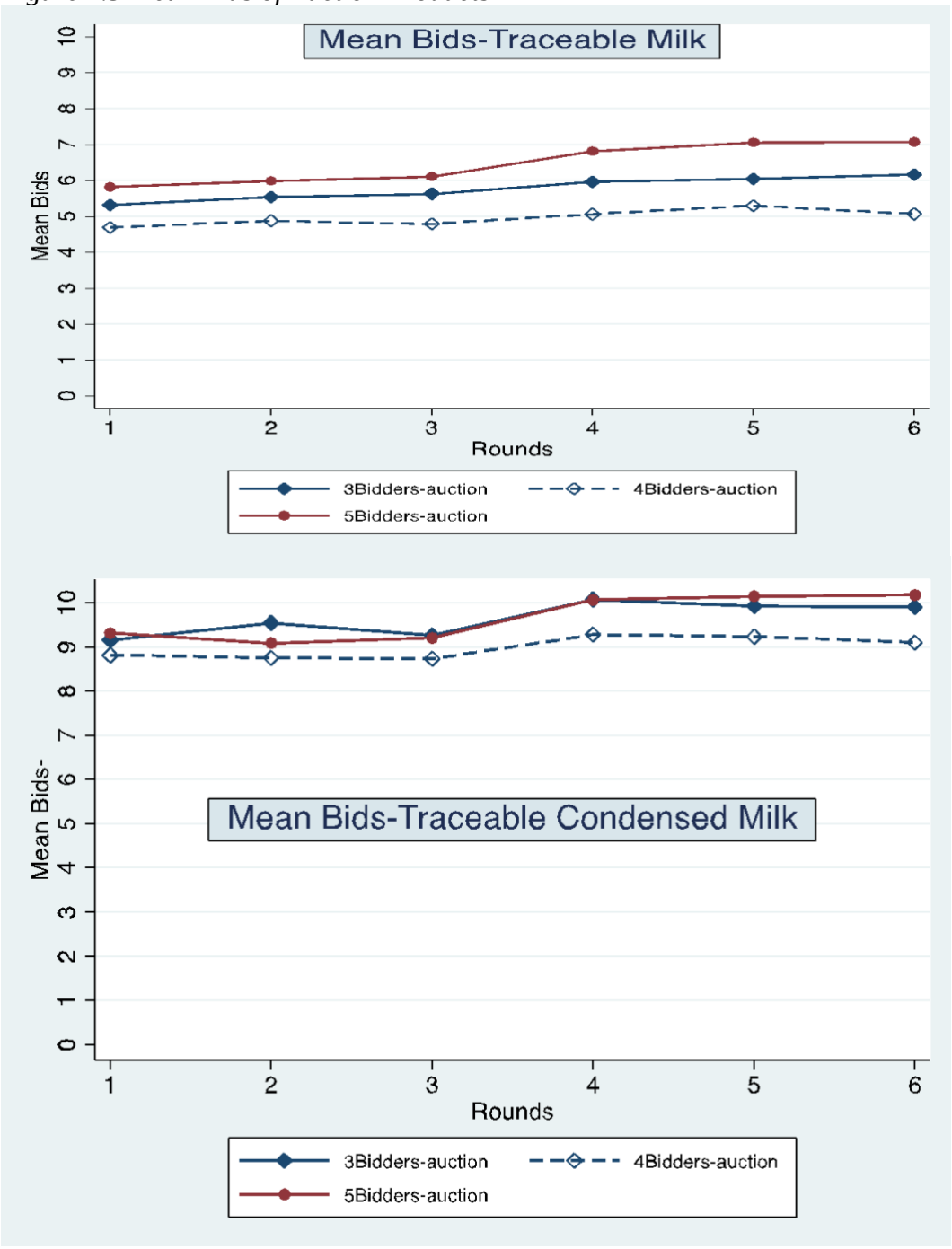
4.4.3 Auction Size Treatment

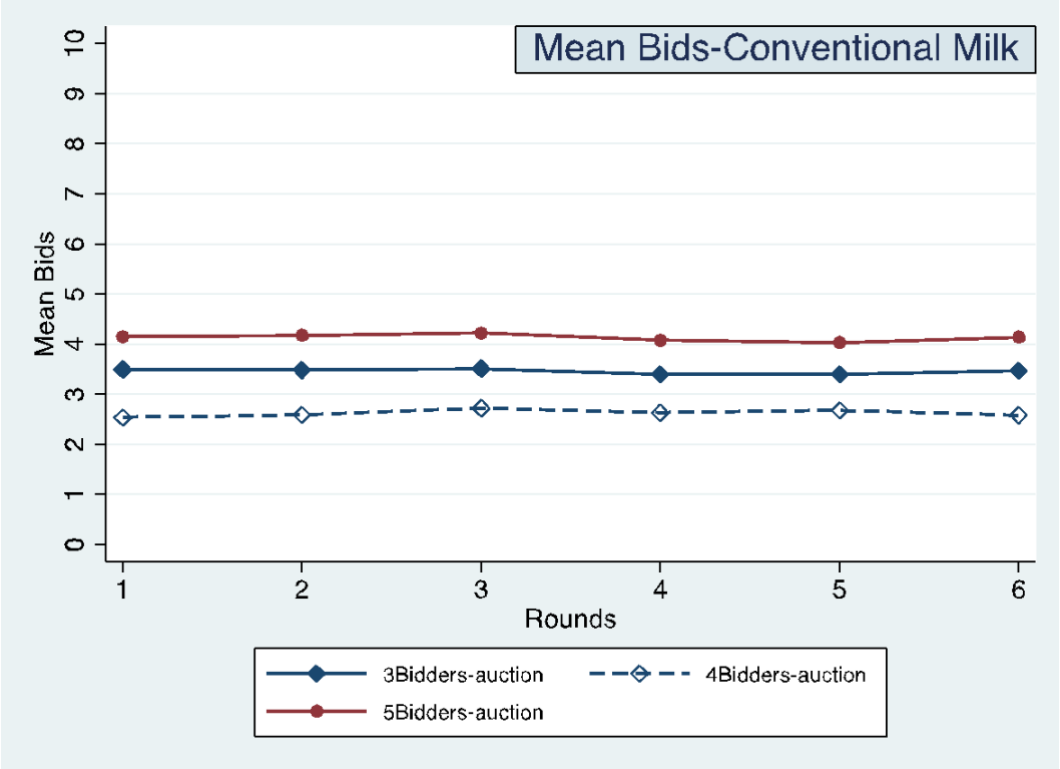
We designed an auction size treatment to investigate the effect of varying the number of bidders on bid values. Three hundred fifteen consumers participant in the study and were randomly assigned to three-bidders, four-bidders, and five-bidders group, respectively. Each subject in each group submitted their bids for the same auction products, "Auction item A-traceable milk," "Auction item B-traceable condensed milk," and "Auction item C- untraceable milk."

Participants' bids for three auction products are shown in Figure 4.3. The results showed that the mean WTP for auction products in the five-bidder group is significantly higher than two other auction size groups. Although, in the auction for the traceable condensed milk, it's slightly lower than mean WTP of the three-bidder group in the

second round. However, the difference is slightly negligible. And unexpectedly that the mean WTP in the three-bidder group higher than the four-bidder group. When the number of bidders increase, the participants in auction perceive a greater risk of losing the auction, thus they tend to rise their bids during the bid process, so the auction will have a higher-end price. However, it could not be fully verified.

Figure 4.3 Mean Bids of Auction Products

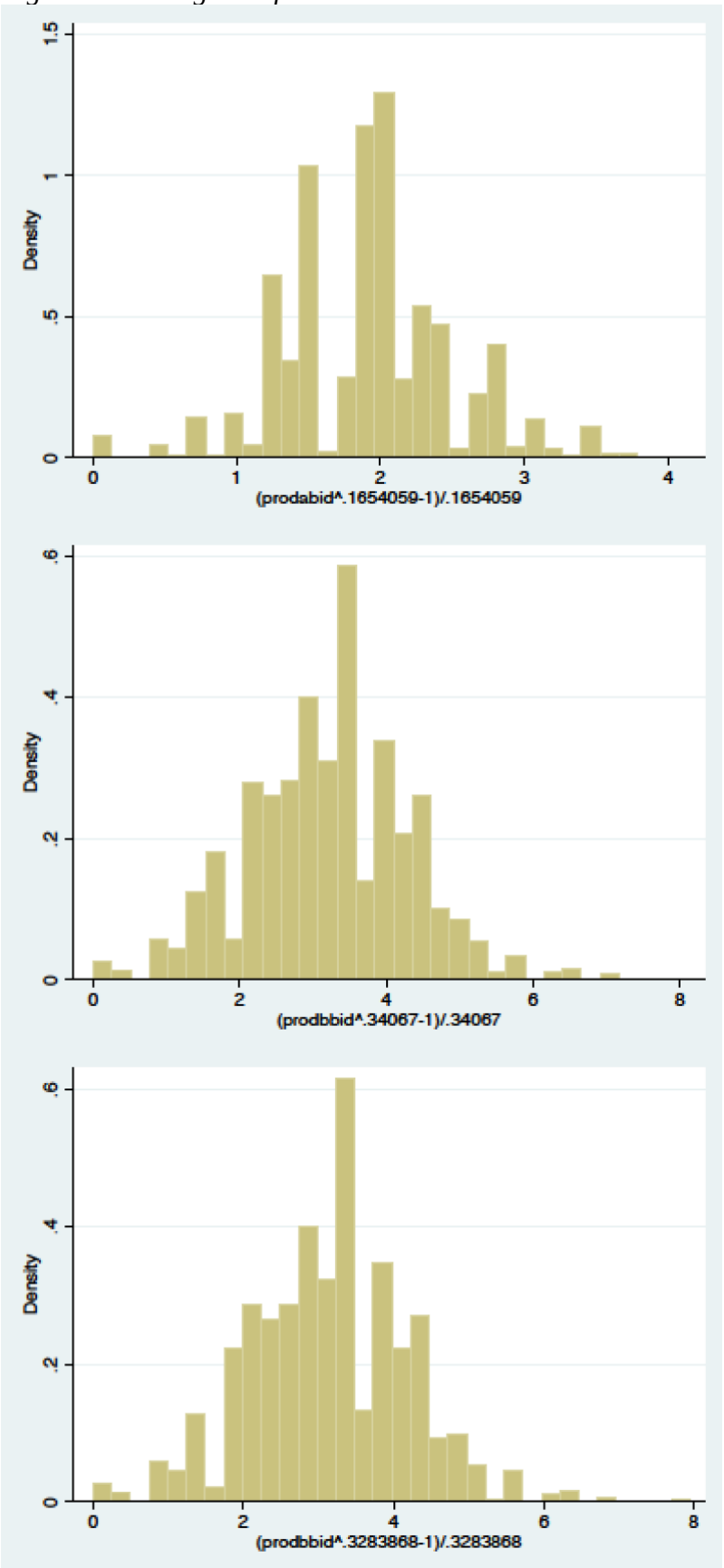




4.5. WTP analysis and models

One-way ANOVA was performed on Stata (14.0 version) to compare the difference in mead bids among the two-information treatment and three auction size. One-way ANOVA requires normal distribution for the manifest variables. Before performing the ANOVA, we examined the dependent variable for normal distribution and found that the dependent variable was not a normal distribution. In order to meet the requirements of ANOVA analysis, the dependent variables were transformed to normality using Box-Cox transformation, tested with normal distribution using Skewness and kurtosis test. The normality hypothesis was then accepted for all variables (Figure 4.4).

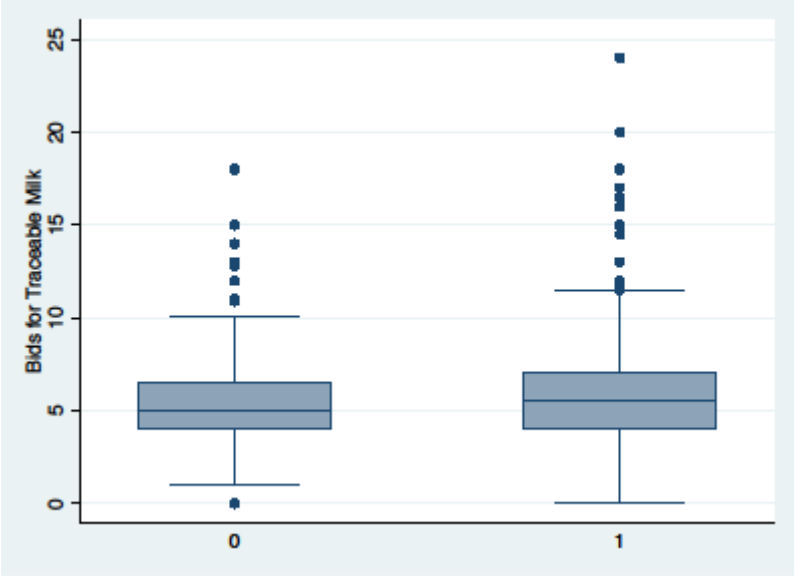
Figure 4.4 Histograms for the three measurement variables



The average and range of bids for traceable milk in different information treatment displayed in the figure 4.5. It showed that the average and range of bids for traceable milk increased significantly after providing information.

The results in Table 4.4 shows that the p-value of traceable milk (PANOVA) <0.001,so we can reject the null hypothesis $_{TM}$**HI$_0$**=the average of the bids for traceable milk is the same for all groups in different information treatment. We can conclude that the average of the bids for traceable milk was not the same between two different information treatments. This outcome indicates that there was a highly significant variation between the average bids for traceable milk before and after information was provided. Combined with the results of **Figure 4.2**, we can confirm that the information provided affected participants' bids.

Figure 4.5 Boxplot of bids for traceable milk in information treatment



Note: 0=before providing the information; 1=after providing information

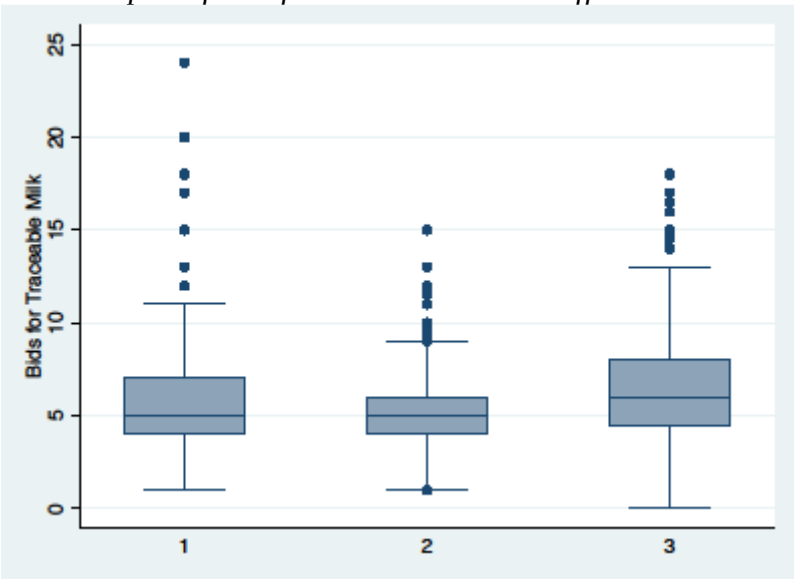
Table 4.4 Analysis of variance of bids by Information on traceable milk

Source	ss	Df	Ms	F	Prob>F
Between groups	8.7449352	1	8.7449352	24.23	0.0000
Within groups	677.057426	1876	.360904811		
Total	685.802362	1877	.36537153		

Bartlett's test for equal variances: chi2 (1) =3.9148 Prob>chi2= 0.048

For the auction size treatment, the average and range of bids for traceable milk in different auction size group displayed in the figure 4.6. It showed that the average and range of bids for traceable milk was significantly different between three auction size groups. The results in **Table 4.5** showed that the P_{ANOVA} <0.001, and it is less than the significance level of 0.05, so it was also rejecting the null hypothesis $_{TM}\mathbf{HZ_0}$=the average of the bids for traceable milk is the same for all groups in different auction size group. And there were highly significant differences in the average bids between three different auction sizes. Combined with the results of **Figure 4.2**, the auction size has effects on the participants' bids for traceable milk.

Figure 4.6 Boxplot of bids for traceable milk in different auction size



Note: 1=3bidders group ; 2=4bidders group; 3=5bidders group

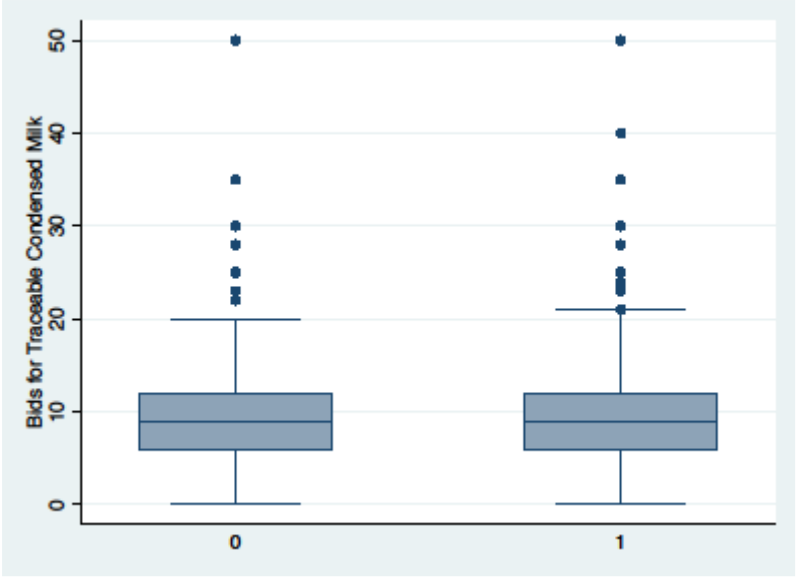
Table 4.5 Analysis of variance of Auction Size (traceable milk)

Source	ss	df	Ms	F	Prob>F
Between groups	37.230143	2	18.6150715	53.82	0.0000
Within groups	648.572219	1875	.345905183		
Total	685.802362	1877	.36537153		

Bartlett's test for equal variances: chi2 (1) = 63.2789 Prob>chi2= 0.000

The average and range of bids for traceable condensed milk in different information treatment and auction size groups displayed in the figure 4.7 and figure 4.8. It showed that the average and range of bids for traceable condensed milk increased after providing information. The average and range of bids in 4bidders group was significantly smaller than other two auction size groups. Tables 4.6 and table 4.7 show the differences in the average bids for traceable condensed milk in both the information and auction size treatments. The *p*-values for both information and auction size were $P_{ANOVA} < 0.005$. The null hypothesis $_{TCM}\mathbf{HI_0}$ and $_{TCM}\mathbf{HZ_0}$ can thus be rejected. The evaluation scores for traceable condensed milk were highly significant differences in the average bids between the information and auction size treatment. Results from the tests above indicate that both information and auction size have an effect on the mean bids for traceable condensed milk.

Figure 4.7 Boxplot of bids for traceable condensed milk in information treatment



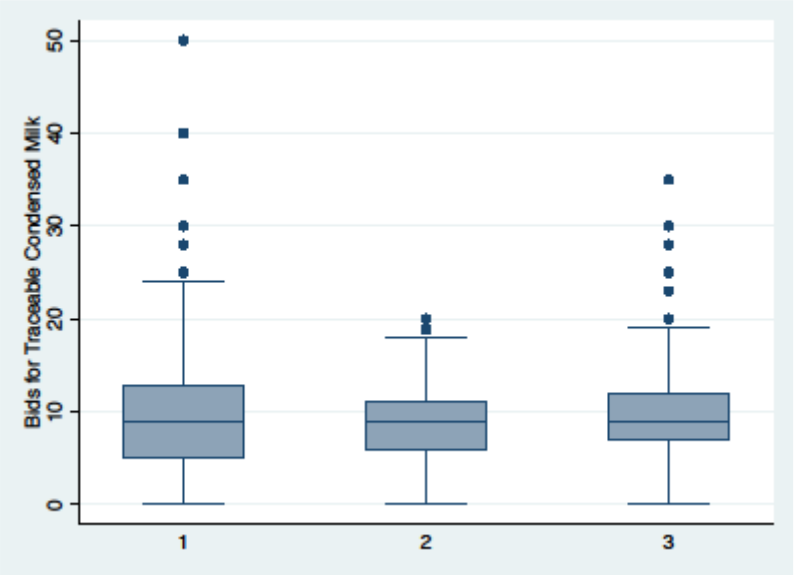
Note: 0=before providing the information; 1=after providing information

Table 4.6 Analysis of variance of Information (traceable condensed milk)

Source	Ss	df	Ms	F	Prob>F
Between groups	10.3777761	1	10.3777761	9.04	0.0027
Within groups	2131.96398	1858	1.14745101		
Total	2142.34176	1859	1.15241622		

Bartlett's test for equal variances: chi2 (1) = 1.1969 Prob>chi2 = 0.274

Figure 4.8 Boxplot of bids for traceable condensed milk in different auction size



Note: 1=3bidders group; 2=4bidders group; 3=5bidders group

Table 4.7 Analysis of variance of Auction size (traceable condensed milk)

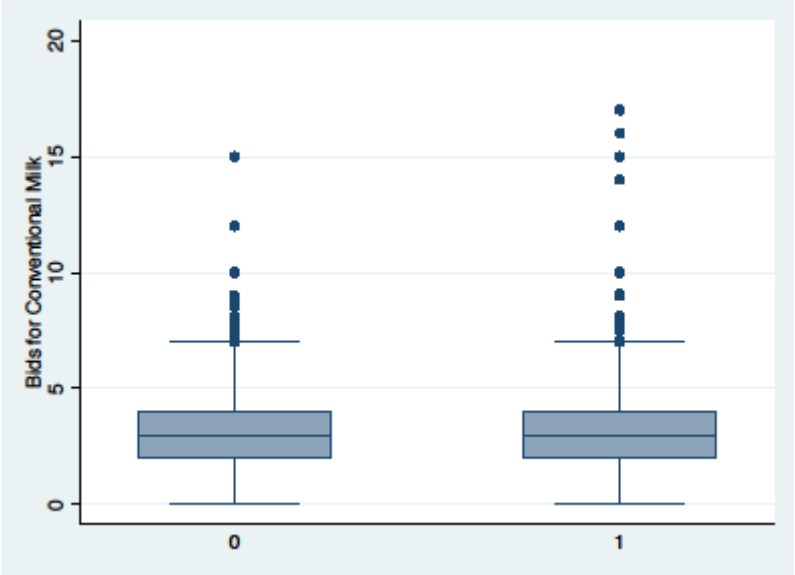
Source	ss	df	Ms	F	Prob>F
Between groups	12.9244968	2	6.46224841	5.64	0.0036
Within groups	2129.41726	1857	1.1466975		
Total	2142.34176	1859	1.15241622		

Bartlett's test for equal variances: chi2 (1) = 79.4445 Prob>chi2= 0.000

Since information was provided to participants in the information treatment refers to traceable dairy products, in theory, it should not have a direct effect on the bids for

conventional milk. However, we cannot ignore possible indirect effects. The figure4.9 showed that the average and range of bids for conventional milk were same, with only a handful of exceptions.

Figure 4.9 Boxplot of bids for conventional milk in information treatment

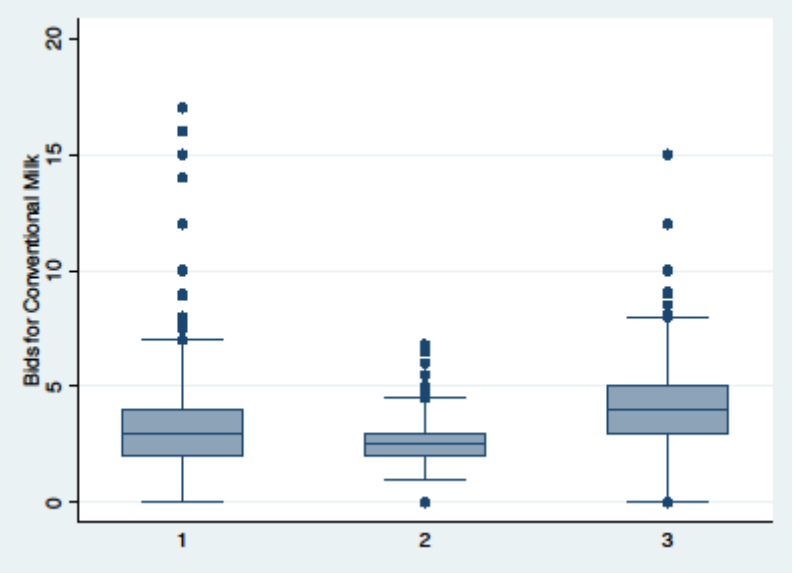


Note: 0=before providing the information; 1=after providing information.

A one-way ANOVA was carried out to identify whether a statistically significant association between the information treatment and the bids for conventional milk exists. The results in **Table 4.8 and Table 4.9** show that the P_{ANOVA} for information was far higher than the significance threshold of 0.05, so we cannot reject the $_{CM}\mathbf{HI_0}$, . We can then state that, as expected, there were the no difference between the mean bids for conventional milk among the two groups and that information provided did not affect the bids for conventional milk, thus ruling out indirect effects.

For the auction size treatment, the average and range of bids for conventional milk in different auction size group displayed in the figure 4.10. It showed that the average and range of bids for traceable milk was significantly different between three auction size groups.

Figure 4.10 Boxplot of bids for conventional milk in different auction size



Note: 1=3bidders group; 2=4bidders group; 3=5bidders group

The PANOVA for auction size was below the significance threshold level of 0.05, thus, we reject the null hypothesis CM**HZ₀**=the average of the bids for Conventional milk is the same for all groups in different auction size group. We confirmed that there is a difference in the average of the bids for traceable milk based on the auction size.

Table 4.8 Analysis of variance of Information (conventional milk)

Source	ss	df	Ms	F	Prob>F
Between groups	.234389256	1	.234389256	1.11	0.2912
Within groups	387.760089	1844	.210282044		
Total	387.994479	1845	.21029511		

Bartlett's test for equal variances: chi2 (1) = 2.7445, Prob>chi2= 0.098

Table 4.9 Analysis of variance of Auction size (conventional milk)

Source	ss	df	Ms	F	Prob>F
Between groups	45.6858427	2	22.8429213	122.99	0.0000
Within groups	342.308636	1843	.185734474		
Total	387.994479	1845	.21029511		

Bartlett's test for equal variances: chi2 (1) = 115.9287 Prob>chi2 = 0.000

4.6. Factors affecting consumers' WTP for traceable milk

Due to a small number of zero values in the bids (less than 3%), it was not necessary to consider a censored model. In this paper, we analyzed data which includes categorical variables and the usual linear regression model that assumes the outcome to be continuous could not therefore be utilized (Hast, Alimohammadisagvand, & Syri, 2015). A generalized linear model (GLM) was used to consider the effects of respondents' and auction's characteristics on consumers' bids for the auctioned products.

GLM models are mathematical extensions of linear models that do not force data into unnatural scales via transformations, and thereby allow non-linearity and non-constant variance structures in the data (Acuña, Ricci, Excoffon, & Zamponi, 2004).Thus, GLMs are more flexible and better suited for analyzing data in our study.

Considering the continues variables (bids) tend to follow distributions like the Gaussian distribution, a GLM with identity link function and gaussian distribution was used for the WTP estimates. We also summarized the bids of the auctioned products and the results in table 4.10 show that the results are within acceptable limits.

Table 4.10 Test of Traceable Milk

	Percentiles	Smallest		
1%	1	0		
5%	2.5	0		
10%	3	0	Obs	1,890
25%	4	0	Sum of Wgt.	1,890
50%	5		Mean	5.730196
		Largest	Std. Dev.	2.754196
75%	7	18		
90%	9.85	18	Variance	7.585595
95%	10.1	20	Skewness	1.407992
99%	15	24	Kurtosis	6.482147

Test of Traceable Condensed Milk

	Percentiles	Smallest		
1%	0	0		
5%	2.8	0		
10%	4	0	Obs	1,890
25%	6	0	Sum of Wgt.	1,890
50%	9		Mean	9.434952
		Largest	Std. Dev.	5.107978
75%	12	35		
90%	15	40	Variance	26.09144
95%	18	50	Skewness	1.540808
99%	28	50	Kurtosis	9.568681

Test of Conventional Milk

	Percentiles	Smallest		
1%	0	0		
5%	1	0		
10%	2	0	Obs	1,890
25%	2	0	Sum of Wgt.	1,890
50%	3		Mean	3.399233
		Largest	Std. Dev.	1.875731
75%	4	15		
90%	6	15	Variance	3.518365
95%	7	16	Skewness	1.707671
99%	9.06	17	Kurtosis	9.022642

Table 4.11 Generalized linear regression for traceable milk

Bids	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
1.groupsize	0.000	.	.	.	.	.	
2.groupsize	-1.224	0.179	-6.83	0.000	-1.575	-0.873	***
3.groupsize	0.392	0.163	2.41	0.016	0.073	0.710	**
information	0.642	0.116	5.51	0.000	0.413	0.870	***
male	-0.386	0.131	-2.94	0.003	-0.643	-0.129	***
1b.age	0.000	.	.	.	.	.	
2.age	0.482	0.227	2.13	0.033	0.038	0.927	**
3.age	0.758	0.261	2.91	0.004	0.247	1.269	***
4.age	0.242	0.188	1.29	0.198	-0.127	0.612	
5.age	-0.618	0.223	-2.78	0.005	-1.054	-0.182	***
1b.hhsize	0.000	.	.	.	.	.	
2.hhsize	0.058	0.237	0.24	0.807	-0.406	0.521	
3.hhsize	-0.512	0.203	-2.52	0.012	-0.910	-0.114	**
4.hhsize	-0.707	0.212	-3.34	0.001	-1.122	-0.292	***
5.hhsize	-0.945	0.258	-3.67	0.000	-1.450	-0.440	***
education	-0.383	0.066	-5.83	0.000	-0.512	-0.254	***
	0.000	.	.	.	.	.	
1b.incomeclass							
2.incomeclass	1.040	0.205	5.07	0.000	0.638	1.442	***
3.incomeclass	0.868	0.229	3.79	0.000	0.418	1.317	***
4.incomeclass	0.825	0.270	3.05	0.002	0.295	1.354	***
5.incomeclass	1.869	0.258	7.25	0.000	1.364	2.374	***
withchild	-0.071	0.156	-0.46	0.648	-0.377	0.235	
withelder	-0.455	0.137	-3.33	0.001	-0.722	-0.187	***
healthstatus1	-0.110	0.052	-2.12	0.034	-0.212	-0.008	**
healthstatus2	-0.041	0.121	-0.34	0.731	-0.278	0.195	
healthconsc	0.024	0.104	0.23	0.814	-0.179	0.228	
healthconcern	-0.065	0.100	-0.65	0.514	-0.260	0.130	
safetyconcern	-0.253	0.061	-4.12	0.000	-0.374	-0.133	***
experience	0.182	0.149	1.22	0.222	-0.110	0.474	
trust	0.491	0.103	4.78	0.000	0.290	0.692	***
heardtf	0.325	0.145	2.24	0.025	0.041	0.609	**
Constant	6.361	0.529	12.02	0.000	5.324	7.399	***

Mean dependent var	5.730	SD dependent var	2.754
Number of obs	1890.000	Chi-square	377.274
Prob > chi2	0.000	Akaike crit. (AIC)	8899.496

** Significantly different from zero at the 0.05 level,
***/ significantly different from zero at the 0.001 level

Table 4.12 Generalized linear regression for traceable condensed milk

Bids	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
b.groupsize	0.000	.	.	.	.	.	
2.groupsize	-1.693	0.333	-5.09	0.000	-2.346	-1.041	***
3.groupsize	-0.638	0.302	-2.12	0.034	-1.230	-0.047	**
information	0.650	0.216	3.01	0.003	0.227	1.074	***
male	-0.847	0.243	-3.48	0.000	-1.324	-0.370	***
1b.age	0.000	.	.	.	.	.	
2.age	1.976	0.421	4.69	0.000	1.150	2.801	***
3.age	2.417	0.484	4.99	0.000	1.468	3.365	***
4.age	1.399	0.350	4.00	0.000	0.714	2.085	***
5.age	-0.816	0.413	-1.98	0.048	-1.626	-0.006	**
1b.hhsize	0.000	.	.	.	.	.	
2.hhsize	1.043	0.439	2.38	0.018	0.182	1.904	**
3.hhsize	0.809	0.377	2.14	0.032	0.069	1.548	**
4.hhsize	-0.526	0.393	-1.34	0.181	-1.297	0.244	
5.hhsize	-0.450	0.479	-0.94	0.347	-1.388	0.487	
education	-0.373	0.122	-3.06	0.002	-0.612	-0.134	***
1b.incomeclass	0.000	.	.	.	.	.	
2.incomeclass	1.921	0.381	5.04	0.000	1.175	2.668	***
3.incomeclass	2.671	0.426	6.27	0.000	1.837	3.506	***
4.incomeclass	2.115	0.501	4.22	0.000	1.132	3.098	***
5.incomeclass	3.434	0.479	7.17	0.000	2.496	4.372	***
withchild	0.624	0.290	2.15	0.031	0.056	1.192	**
withelder	-0.166	0.254	-0.65	0.513	-0.663	0.331	
healthstatus1	-0.046	0.097	-0.48	0.631	-0.236	0.143	
healthstatus2	-0.138	0.224	-0.62	0.536	-0.577	0.300	
healthconsc	-0.321	0.193	-1.66	0.096	-0.699	0.057	
healthconcern	-0.362	0.185	-1.96	0.050	-0.724	0.000	
safetyconcern	-0.104	0.114	-0.92	0.360	-0.328	0.119	
experience	1.084	0.276	3.92	0.000	0.542	1.626	***
trust	1.126	0.190	5.91	0.000	0.752	1.499	***
heardtf	0.782	0.269	2.91	0.004	0.255	1.310	***
Constant	7.754	0.983	7.89	0.000	5.827	9.680	***

Mean dependent var	9.435	SD dependent var	5.108
Number of obs	1890.000	Chi-square	371.945
Prob > chi2	0.000	Akaike crit. (AIC)	11238.823

*** Significantly different from zero at the 0.05 level,*

****/ significantly different from zero at the 0.001 level*

Table 4.13 Generalized linear regression for conventional milk

Bids	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
1b.groupsize	0.000	.	.	.	.	.	
2.groupsize	-1.058	0.118	-8.96	0.000	-1.289	-0.826	***
3.groupsize	0.419	0.107	3.91	0.000	0.209	0.629	***
information	-0.051	0.077	-0.67	0.504	-0.201	0.099	
male	-0.309	0.086	-3.58	0.000	-0.478	-0.140	***
1b.age	0.000	.	.	.	.	.	
2.age	0.535	0.149	3.58	0.000	0.242	0.828	***
3.age	0.533	0.172	3.10	0.002	0.196	0.870	***
4.age	0.584	0.124	4.70	0.000	0.341	0.827	***
5.age	0.335	0.147	2.28	0.022	0.047	0.622	**
1b.hhsize	0.000	.	.	.	.	.	
2.hhsize	0.291	0.156	1.87	0.062	-0.014	0.596	
3.hhsize	0.259	0.134	1.93	0.053	-0.004	0.521	
4.hhsize	-0.555	0.139	-3.98	0.000	-0.828	-0.282	***
5.hhsize	0.115	0.170	0.68	0.498	-0.218	0.448	
education	-0.077	0.043	-1.78	0.075	-0.162	0.008	
	0.000	.	.	.	.	.	
1b.incomeclass							
2.incomeclass	0.195	0.135	1.45	0.148	-0.070	0.460	
3.incomeclass	0.240	0.151	1.59	0.113	-0.056	0.536	
4.incomeclass	0.440	0.178	2.48	0.013	0.092	0.789	**
5.incomeclass	0.805	0.170	4.74	0.000	0.472	1.138	***
withchild	0.325	0.103	3.16	0.002	0.123	0.527	***
withelder	-0.642	0.090	-7.13	0.000	-0.818	-0.465	***
healthstatus1	-0.105	0.034	-3.08	0.002	-0.173	-0.038	***
healthstatus2	-0.207	0.079	-2.61	0.009	-0.363	-0.051	***
healthconsc	-0.245	0.068	-3.59	0.000	-0.379	-0.111	***
healthconcern	-0.093	0.066	-1.42	0.154	-0.222	0.035	
safetyconcern	-0.078	0.040	-1.93	0.053	-0.157	0.001	
experience	0.186	0.098	1.90	0.058	-0.006	0.378	
trust	0.099	0.068	1.46	0.144	-0.034	0.231	
heardtf	-0.303	0.095	-3.18	0.001	-0.490	-0.116	***
Constant	5.119	0.349	14.68	0.000	4.436	5.802	***

Mean dependent var	3.399	SD dependent var	1.876
Number of obs	1890.000	Chi-square	531.621
Prob > chi2	0.000	Akaike crit. (AIC)	7321.515

*Note: ** significantly different from zero at the 0.05 level,*
****/ significantly different from zero at the 0.001 level*

4.6.1 Information about traceable dairy products

Table 4.11 and **Table 4.12** illustrate our research results on the effects of information and auction size. Results indicate that the information about traceable dairy products has had a significantly positive influence on consumers' WTP for traceable milk ($P < 0.001$) and traceable condensed milk ($P < 0.001$). Meaning that the effect of the traceable information as it relates to the dairy products has increased the magnitude of bids. The information about the traceable dairy products significant increases consumer's willingness to pay. The findings confirm that the traceability information is perceived as higher valuable by consumers, they have strong demand for traceable dairy products. We also found that most participants had not heard of the traceable dairy products before. Although not more participants knew what traceable food was, they were more likely to buy traceable dairy products when they were provided with information about traceable dairy products. This result agrees with previous studies (Bai et al., 2013; Jin et al., 2017a; Yin et al., 2017) that found out that Chinese consumers perceive a higher value (and are willing to pay a significantly positive premium) for milk carrying traceability information. We also confirm that providing information about the major features of food traceability significantly increases consumers' likelihood to purchase traceable foods (C. Zhang et al., 2012).

Through the literature review and qualitative research, we found that Chinese consumers have a lack of knowledge about traceable products, and it could be considered as barriers to traceable food market development. Our results suggest the importance of information about food traceability to improve market demand for traceable dairy products. Further work will be needed to improve consumers' understanding of the potential benefits of traceable systems in the dairy product quality and security system. For the conventional milk, the information about traceability and traceable food did not have a significant effect on the WTP. This result was consistent with expectations and an indirect effect was ruled out.

4.6.2 Auction size

In terms of auction size, we predict that when the number of bidders increase, the participants in auction perceive a greater risk of losing the auction, thus they tend to rise their bids during the bid process. This prediction is consistent with the study of Hellyer,

Fraser, & Haddock-Fraser (2012). They point out that the individual participating in the food auction may be influenced by other participants around them to overvalue the auction products to ensure that they have a higher chance of being the purchaser at the end of the experiment.

Contrary to our expectations, the auction size had a significant effect on WTP but

1) the effect was different across the different auction products, and

2) the effect of the auction size was not consistent across products.

For the traceable condensed milk, group size was statistically significant at the 1% level, and the Coefficient of group size was negative, which means group size had a negative effect on the WTP. The result indicates that the bigger the auction group size, the lower the bids for traceable condensed milk. Thus, this is opposite to our prediction.

About traceable milk and conventional milk, the results also show that compared to Group size 1 (three bidders), the Group size 2 (four bidders) had a statistically significant negative effect on WTP. However, Group size3 (five bidders) had a significant positive effect on WTP and it demonstrates a positive effect on the consumer WTP for two out of three auctioned products. Participants in the five bidders' groups are willing to pay a higher premium price for traceable milk and conventional milk than others. That is, participants in the four bidders' groups state a significantly lower willingness to pay a premium for traceable milk and conventional milk than the other two groups.

In summary, the group size had a negative effect on consumer WTP for traceable condensed milk, by contrast, had a positive effect on consumer WTP for traceable milk and conventional milk in the three and five bidders' group, while a negative effect on the WTP was recorded in the four bidders' group. This result is not consistent with the predictions, and our predictions could not be verified. However, this result is consistent with some previous studies that if participants have reference dependent preferences, then the equilibrium bid is lower when the number of bidders is larger (Banerji & Gupta, 2014; Rosato & Tymula, 2019). Another study also indicated that under certain assumption, the bid function decrease with the number of bidders (Kagel & Levin, 1993).While it cannot be said what exactly causes this effect within the limitations of this study, one reason for this is probably the outcome that the difference between the three auction size groups was not large enough. The result of the previous study by

(Akaichi, Nayga, & Gil, 2014) could provide clues to our explanation that an increase in the number of bidders from 2 to 10 led to a significant increase in the average of the second-unit bids. Secondly, comparing the four and five bidders' group, the participants in the three bidders' group were more likely to perceive traceable condensed milk to have better quality. Further research should compare the bids between different auction groups with more significant differences and try to find out the effective marginal bidder number. The author will investigate this matter further in future research.

4.6.3 Gender

About gender, we got the consistent result that male gender had a negative coefficient for all the auction products and is statistically significant at the 5 %, 5% level for traceable milk, 1% level for traceable condensed milk and conventional milk, respectively. Thus, compared with males, female consumers would like to pay more premium for traceable milk and conventional milk. Females have taken as the leading player in purchasing dairy products in the family. Therefore, they cared more about food safety and were more sensitive to safety food than males. This may explain why females value traceable dairy products more than males. Many studies have documented significant gender differences, with female consumers generally showing greater willingness to pay for safe food in the dairy field. Xu, Zhou, & Lone (2016) reported that female respondents tend to be more active when searching for information about organic milk, while females have shown the strongest consumption desire for organic milk compared to males. Females are more inclined to purchase milk powder with traceable certification, they may have more chance to get information about traceable food, and they have a stronger consumption consciousness than male (Guo & Li, 2016; Quan, Zeng, & Liu, 2011; Yang, 2016).

4.6.4 Age

The results indicated that the consumers' age plays a different role for them purchasing different auction products. Except, older consumers (above 50 years old), respondents' age had positively ($P<0.001$) effects on the consumers' willingness to pay for condensed milk, and the age of older (above 50 years) significantly adverse effects on the WTP. For the traceable milk, compared to participants with 18~25 years old, 26~41 years old participants more willing to pay, the WTP of participants above 50

years old significantly lower, while the WTP of participants with 42~49 years was not significantly different. The results indicated that comparatively, younger consumers are more willing to pay a higher premium for traceable dairy products, whereas older consumers are willing to pay less premium. These findings coincide with the previous study (W. Xia & Zeng, 2006; P. Xu et al., 2016), in which younger consumers are more willing to pay for dairy products with certificate label. It might be the case that the traceable system is a new concept to Chinese consumers (Y. Wang et al., 2013; S. Zheng, Xu, Wang, & Song, 2012), where younger consumers were more receptive to the new products than older consumers. Thus, compared with the older, the younger consumers have been showing more interest in the traceable dairy products and are more willing to pay a price premium.

4.6.5 Household size

For the different three auction products, the household size was slightly different effects on the WTP across the three auction products. The P-value showed that the household size had significant ($P<0.05$) effects on the consumers' WTP for traceable milk, however, the Coef was minus and gradually decreased, the larger the household size, the lower the consumer's willingness to pay for traceable milk. About the traceable condensed milk, compared to the household size of one, the household size of two and three had a statistically significant positive effect on WTP, and the household size of four and five had not significant. For the conventional milk, the household size of four members was significantly ($P<0.001$) and negatively affected on the WTP. The results show that, overall, the household size had negative effects on consumers' willingness to pay for traceable dairy products, meaning that as the household size is getting bigger, the consumers' WTP will be decreased. In general, the larger the family size, the expenditure of the households will increase. Hence household economic conditions will be worse and will decline the purchasing power, thus unwillingness to pay for food at a higher price. This situation was more prominent in the middle-lower economic family. The previous study also described the negative relationship between household size and WTP for traceable food. The number of households increases, losing their purchasing power and unwilling to pay a premium for pork traceable food(Y. Zhou, Wang, & Geng, 2008; Y. Lin, Ping, & Li, 2014). However, our result is not consistent with other

quantitative studies, which reported that households with more family members have a higher proportion stating that they are willing to purchase traceable pork, milk, and cooking oils than those families with fewer members(C. Zhang et al., 2012).

4.6.6 Household Income

As seen from the results, apparently, consumers' willingness to pay for traceable dairy products are significantly related to household income, we got the results as expected and consistent with the literature. The results indicate that the consumer's household had significance and a positive effect on the WTP for traceable milk and condensed milk. Consumers with higher incomes pay higher prices for traceable milk and condensed milk. The finding that consumers with higher income are willing to pay a premium price for certified dairy products is consistent with the conclusions of many previous studies (Tinggui Chen et al., 2013; Xiangyu Chen et al., 2017; El Benni et al., 2019; Linhai Wu et al., 2014; W. Xia & Zeng, 2006; P. Xu et al., 2016; C. Zhang et al., 2012). The results suggested that income is most important as a driving force for that future market demand changes. As the increase in income, consumers will be more willing to pay a higher price to obtain better quality food.

It is imaginable that there would be more Chinese consumers willing to buy traceable dairy products with economic development and rising income. This should give the government and dairy enterprises confidence and an incentive to invest in the production of high-quality dairy products.

4.6.7 Education level

According to the regression results, education has significant ($P<0.001$) and a negative effect on consumer WTP for traceable milk and traceable condensed milk. Compared with consumers who had a lower education level, highly educated consumers were not prepared to pay a higher premium for traceable dairy products. This finding is consistent with a previous study that compared to respondents with lower education degree, those with higher degrees were willing to pay less for sustainable milk(Gao et al., 2016; Jin et al., 2017). However, the negative effect of education on the consumers' WTP for traceable dairy products is contradictory to the findings in previous studies that education has either a positive or no effect on consumer preference of traceable food (X. Chen et al., 2017; Guo & Li, 2016b). One possible explanation might be that, as

mentioned in the previous study, consumers with lower education levels are more likely to accept new products than higher educated (Gao et al., 2016; Ho, Vermeer, & Zhao, 2006),Therefore, the former believes and accepts that traceable food is the highest quality food. However, people with higher education are more rational than those with higher education, so they have less impulse to a new concept of traceable products and are cautious about them.

4.6.8 Family structure

The result showed that there is a positive relationship between family structure and WTP. However, the family structure was significantly different affects consumers' WTP across the auction products. Table 4.11 and Table 4.12 showed that there are significantly ($P<0.05$) correlation between the presence of the child (under sixteen years old) and WTP for condensed milk and conventional milk. Respondents who had a child in the family are willing to pay more for traceable condensed milk and conventional milk. While whether or not respondents had an elder (sixty years old) in the family has significantly and negatively affected consumers' WTP for traceable and conventional milk. Compared to participants had not elder in the family, those who have an elder in the family were unwilling to pay a price premium for traceable and conventional milk. As pointed out in previous reports (Gao et al., 2016; Biao Zhang et al., 2018), we expected the respondents with children or elders in the family to be more willing to pay a premium for traceable dairy products. However, our prediction was not fully confirmed by the results. The reason for that is probably that consumers have a lack of confidence in traceable dairy products. Older people are more careful while purchasing compared to the youngsters. The significantly negative correlation between fifty age levels and WTP can also confirm this.

4.6.9 Health Condition and Health Concern

Health condition contains two indexes in our study, health status 1-Number of taking medicine in last month and Health status2 -Number of the medical check-up. The result showed that health status 1 was negatively correlated with consumer WTP for traceable milk and conventional milk. The more often a participant took medicine, the less willing is he to pay for traceable milk. About health concerns, it is not significant we consider the significance at 5% level in our study, even the significance at 10%, and

the Coef was minus. These findings are contradictory to the findings in other studies that the consumers with bad health condition and paid more attention to own health and are more willing to pay a price premium for safe food (Z. Wang et al., 2013; Yin et al., 2010; S. Zheng et al., 2012). A possible explanation is that consumers with a bad health condition and highly concerned about their health tend to be older(W. Zhao & Liu, 2013). However, older consumers are unwilling to pay a price premium for certified food with high price labels and prefer to choose conventional milk at a lower price.

4.6.10 Food safety concern and experience

The result of regression showed that consumer concern about food safety of dairy products had significance at the 1% level and negative effect on consumer WTP for traceable milk. That is, consumers who are less concerned about the food safety of dairy products are relatively less willing to pay a premium for traceable milk. The more satisfied with the current food safety and had higher confidence in dairy quality and safety. Consequently, they are unwilling to pay a price premium for traceable milk at a higher price. This finding is confirmed by the results of (S. Zheng et al., 2012). Table 4.12 also shows that participant experience in purchasing unsafe dairy products had significantly at the 1% and positive effects on the consumer WTP for traceable condensed milk. It implies that consumers who had experience of purchasing unsafe dairy products are relatively more willing to pay a premium for traceable condensed milk. It is contradictory to the finding of (B. Hou et al., 2019). As mentioned in the previous study, one consumer had a bad experience with the purchase of dairy food or have heard about someone who had bought unsafe dairy products. Thus, they are willing to pay a premium for safe food (J. Wang, Hong, & Qing, 2010). As a result of this, it has been proposed that the government and dairy enterprises should pay more attention to taking active measures to improve the quality and safety of dairy products.

4.6.11 Trust in food quality certificate and Cognitive of the traceable food

The trust in the food quality certificate had a significant positive effect at the 1% level on the willingness to pay a premium price. The results indicate that the higher the trust of consumers in the food quality certificate, the more likely they are to pay a higher price for traceable milk and condensed milk. Consumers are willing to pay for traceable food ,but their valuations can differ upon the degree of their trust in food

labels (Ruifeng Liu et al., 2019). Our result is consistent with findings identified by (Xiangyu Chen et al., 2017) that consumers traceability dairy consumption was positively affected by the degree of trust in the traceable certificate. This finding is in the same results in other studies on a variety of safe food in china(Yin et al., 2010; Biao Zhang et al., 2018). The whether or not heard about traceable food had significant at the 1% level and positive effects on the consumer WTP for traceable milk and traceable condensed milk, while had significant negative effects on the WTP for conventional milk. The consumers who have heard about traceable food before are willing to pay a premium for the traceable dairy products. The same result was found in other studies on traceable food(Fan, 2017; Zeng-jin Liu & Qiao, 2014; Shalamujiang et al., 2018). On the contrary, the consumers have heard about traceable food, are unwilling to pay for conventional milk. It is an inevitable phenomenon of market competition, which is what entices consumers to choose between certificated milk (such as traceable milk) and conventional milk. It can be suggested that increasing consumers' awareness and knowledge of traceable dairy products is very necessary for improving the market demand for traceable dairy products.

Conclusion and Future Research

This study uses a second-price auction to estimate willingness to pay for traceable dairy products and assess the effect of information about traceable food and the size of auction group on consumer bids, amongst a sample of 315 consumers in Xinjiang province, China. Our results suggest that traceable food is beneficial for Chinese consumers. It also shows that consumers are influenced by information about traceable food and they are willing to pay for the traceability information, as predicted, there was not an effect on WTP for conventional milk. As an emerging market, China has not been so efficient and strict in food safety supervision yet, and scandals related to food safety still occur currently (Ruifeng Liu et al., 2019).

To avoid and reduce the harm of unsafe food, the food traceability system in the dairy industry should be supported to reach food safety targets and to promote the demand for traceable dairy products.

Our results suggest that consumers with different social demographic characteristics differed in their preference for the traceable dairy products. Trust in the

certificated label and cognitive of the traceable food are critical factors in driving traceable food consumption, meanwhile consumer awareness relatively low. Given Chinese consumers' lack of knowledge about traceable, propagating, and educating consumers to help them understand the benefits associated with traceable dairy products, and thus consumers can trust the system better. Our research also shows that consumers' household income plays a vital role in the WTP for traceable dairy products. Meanwhile, household size is an important barrier to purchase traceable dairy products. Hence, decreasing the price of traceable dairy products may be the most effective way of increasing the traceable dairy food market share.

An important limitation of the study is that the experimental auctions were conducted in the Xinjiang province (Northwest of China), and participants were mainly from two cities: Urumqi and Turpan. Therefore, the results cannot be generalized in terms of being relevant for the whole province and less than that for China as a whole.

We also tested the possible effect of auction size on the average bids and we found mixed results, so on this respect we are not able to provide a conclusive evaluation. A possible reason for this is that the difference between the three auction size groups (3, 4, 5 participants, respectively) was not large enough to show a significant effect with this sample size. A more representative sampling with a bigger difference and larger sample size would be necessary to increase the validity of the study.

Previous research has reported robust evidence of overbidding in the Second-price auction, and future research could also try to use an alternative auction mechanism (e.g., N-price auction) to elicit consumer WTP.

CHAPTER 5
SUMMARY AND CONCLUSION

5.1 Summary and further research

This research presents an analysis of the current state of knowledge through the findings of studies on Chinese consumers' perception of food safety, motivations and barriers to purchase safe food, and willingness to pay a premium for safe food. The analysis has been made for consumers' behaviour and purchase intention. The previous research regarding Chinese consumers' perception of food safety and attitudes and behaviour towards safe food were reviewed. Consumer perceptions and attitudes of traceable dairy products were analyzed. Consumer preference and their willingness to pay for traceable dairy products were investigated.

Chapter 2 contributes to the literature, presenting the current state of Chinese consumers' perception of food safety, motivations and barriers to purchase safe food, and willingness to pay a price premium for safe food. What emerges from the literature is that a high level of consumer concern exists about food safety and quality. Although consumers pay close attention to food safety, differences in the preference for food safety perceptions exists among people with different socio-demographic characteristics. There is also evidence that concern on health, environmental benefits, and safety characteristics are the main reasons for Chinese consumers to choose safe food. Even though Chinese consumers have a lack of knowledge about safe food, they still believed that certificated foods have good quality and safety than ordinary, and consumers were willing to pay a modest price premium for them. However, the price premium for safe food is not high. Besides, socio-demographic variables seem to play a critical role in the behavior and purchase intention for safe food. The literature indicated that, overall, income is the most important influencing factor on consumers' willingness to pay with the consumer trust in the safe food coming up next. It is followed by education level, age, food safety perception, price, gender, and knowledge about safe food.

Chapter 3 presents the results of the qualitative research that were conducted in three different provinces of China. The main findings suggest that a high prevalence of food safety incidents triggers consumers to lower their confidence in food safety and to pay more attention to the news about food safety incidents in the media, including social

media. Chemical residues were ranked as the first concern on food safety in the dairy industry. Meanwhile, traceable dairy products are not well known among consumers. Although the possibility to trace back all stages of the food supply chain in the dairy sector is considered important, consumers raise doubts about the authenticity of traceability information. In particular, they are not confident about traceability information provided by enterprises that has not been certified by other third-party bodies. For the interviewers, the traceability information certified by the government has more value than the information certified by third-party agencies. Meanwhile, consumers suggest that the government should bear all or most of the cost of establishing the food traceability system.

The limitation is that the research approach is qualitative and based on a small group of Chinese dairy products consumers. The focus group interviews covered different two regions (Northwest and South of China). The number of focus groups was limited to nine because of budget constraints. A more representative sampling with a larger sample size would be necessary to increase the validity of the study and using a combination of qualitative and quantitative data would improve its significance. The integration of both approaches/methods would also help to understand the behavioral intentions better to buy traceable dairy products.

However, the results can serve as a useful input for further research, and they provide a rich insight into consumer views of dairy products' safety problems in China.

Chapter 4 presents a second-price auction to estimate willingness to pay for traceable dairy products and assess the effect of information about traceable food and the size of auction group on consumer bids, amongst a sample of 315 consumers in Xinjiang province, China. In the information treatment, the basic information treatment provided respondents with milk and condensed milk labeled traceability, while the second treatment included more information about traceable dairy products. Meanwhile, we compared the bids between three different auction size groups.

Results show that traceable food is beneficial for Chinses consumers. Chinese consumers are influenced by information about traceable food, and they are willing to pay a price premium for the traceability information. Chinese consumers have a lack of knowledge about traceable products, and it could be considered as barriers to traceable food market development. This finding implies that the importance of information about

food traceability for improving market demand for traceable dairy products. Further work will be needed to improve consumers' understanding of the potential benefits of traceable systems in the dairy product quality and security system.

The findings indicated that that trust in the certificated label and cognitive of the traceable food are critical factors in driving traceable food consumption, meanwhile consumers' awareness relatively low. Given Chinese consumers' lack of knowledge about traceable food, propagating, and educating consumers to help them understand the benefits associated with traceable dairy products, and thus, consumers can trust the system better. It has to be also mentioned that household size was an important barrier to purchase the traceable dairy product.

Our research also shows that consumers' household income plays a vital role in the WTP for traceable dairy products. Since consumer’s household income is unlikely to increase in the short run, we suggest that decreasing the price of traceable dairy products may be the most effective way of increasing the traceable dairy food market share. Compared to the older, the younger consumers have been showing more interest in the traceable dairy products and are more willing to pay a price premium. Younger consumers (under 50 years old) are a potential customer for traceable dairy products. The auction size had a significant effect on WTP. However, the effect was different across the different auction products, as well as the effect of different auction size was not the same. Further research should compare the bids between different auction groups with larger differences and try to find out the effective marginal bidder number. Surprisingly, the results show that the consumers’ WTP for traceable dairy products was not positively affected by the education level.

The limitation of the chapter is that the experiment auction was conducted in Xinjiang province (Northwest of China), and participants are mainly from Urumqi and Turpan two cities. Therefore, the results cannot be generalized in terms of being relevant for all China as a whole. An important limitation is that the difference between the three auction size groups was not big enough. A more representative sampling with a more significant difference and larger sample size would be necessary to increase the validity of the study. Previous research has reported robust evidence of overbidding in the Second-price auction, and future research could also try to use an alternative auction mechanism (e.g., N-price auction) to elicit consumer WTP.

5.2 Conclusion

This study suggests that participants were willing to pay a price premium for traceable dairy products. The findings have important implications for the food quality control policy and marketing strategies of the firms in the dairy industry. Results suggest that the importance of information about food traceability for improving market demand for traceable dairy products. Further work will be needed to improve consumers' understanding of the potential benefits of traceable systems in the dairy product quality and security system. Results also suggest that to avoiding the harm of unsafe food, the food traceability system in the dairy industry should be supported to reach food safety targets and to promote the demand for traceable dairy products. Given Chinese consumers' lack of knowledge about traceable, propagating, and educating consumers to help them understand the benefits associated with traceable dairy products, and thus consumers can trust the system better. A government certificate for traceability is currently valued more highly, followed by third-party certification. Consumers are not confident about the traceability information, which was provided by enterprises but has not been certified by other third-party bodies. Consumers' household income plays a vital role in the WTP for traceable dairy products. Theses finding suggested that the government providing the necessary policy environment to regulate certification systems for food traceability while opening certification markets to third parties. Our findings suggest also government encouraging producers to produce diversified traceable dairy products, decrease the production cost which can better meet the consumer need. As our results show, compared to the older, the younger consumers have been showing more interest in the traceable dairy products and are more willing to pay a price premium. Younger consumers (under 50 years old) are a potential customer for traceable dairy products.

Future research could try to use choice experiment (hypothesis or non- hypothesis) to investigate consumers’ WTP for different dairy products with combined levels of traceability information in order to provide a basis for decision making on promoting traceable food market systems by government regulators.

CHAPTER 6
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Appendix A

Instructions and Questions

Welcome：

Today you can participate in our experiment called "Experimental Auction"!.Before starting, make sure you have registered your presence, read and signed the informed consent form. At the end of the auction, you will receive a 10RMB cash. We remind you that this tribute is a thank you for your participation and will receive it at the end of the experiment, whatever its outcome.
To start, enter the codes that have been assigned to you.

ID:
Group:
A: 3 bidders' group
B: 4bidders' group
C: 5bidders' group

Consent：

There will be some steps to follow, and you will finally be asked what the maximum value that you would really spend for traceable milk, traceable condensed milk, and conventional milk, which we will present later is. In this experimental auction, the participant who makes the highest bid will actually purchase the auctioned product. However, the auction is NOT aimed at selling the product. This is a research method that uses the offers of participants in the auction to estimate the value perceived by consumers and predict demand based on price.We use real money and real products because, in this way, we can know the true value that you attribute to the product under examination, without relying on "hypothetical" evaluations.

（ ）I understand that at the end of the auction if I win the product, I will pay a lower price than my offer. If I do not win the product, I will not pay anything.
（ ）I am not available to buy if I get the product

Abandon：

（ ）I want to abandon the experiment

（ ）I understand that at the end of the auction if I win the product, I will pay a lower price than my offer. If I do not win the product, I will not pay anything

Instructions：

In this auction, the participant who makes the highest bid wins the product.However,the price to be paid will not be equal to the highest bid, but to the second-highest bid. This mechanism is called "second price auction." With this price definition mechanism, those who win the auction certainly pay less than what they offered.

According to your own understanding, please select the correct one below:

（ ）Get the product who makes the highest offer by paying a figure corresponding to the highest offer

（ ）Get the product who makes the highest bid by paying a figure corresponding to the second-highest bid

Incentive Compatible:

The value you assign to the product is a purely personal evaluation. The best strategy to participate in the second price auction is to offer your reserve price, that is the maximum that you are willing to pay to get the product.If you offer the maximum amount you are willing to pay, the probability of obtaining the product is maximum, and you are sure that you will be satisfied with the purchase anyway because in the event of a second price auction, the price paid will be lower. If, on the other hand, the product is not awarded, there will be no regrets because the price of the product will be greater than or equal to the maximum that you were willing to pay.

If you offer more than your reserve price, the probability of winning the product increases, but it could happen that the price to pay is higher than the reserve price, and

therefore, you have to pay the product more than its value. It means that you will regret having purchased it!

If instead, you offer less than your reserve price, the probability of winning the product decreases, moreover you can lose the opportunity to buy the product at an acceptable price (lower than the reserve price) because another participant has offered more. It means that you will regret NOT having purchased!

According to your own understanding, please select the correct one below:

The best strategy is to offer the maximum you are willing to pay. ( )

The best strategy is to offer less than you are willing to pay. ( )

The best strategy is to offer more than you are willing to pay. ( )

Example:

Each participant knows the maximum price he is willing to pay but does not know which of the other participants who compete to win the product. The auction, therefore, allows the assignment of the product only to those who attribute the highest value to it. If there are three participants, only one wins the product and will pay the price that corresponds to the second-highest bid.At the same time, the auction allows us, researchers, to know the value that each participant attaches to the product.

The ad, for example, in this situation:

Participate	offer
A	6.5
B	6.9
C	10
D	7.2
E	4.5

Trial Round

Now we propose a test shift to understand the mechanism of this experimental Auction better.We will use a product different from the one under study, and in this case, the final exchange of the product will not take place for the sum decided by the second

highest offer.However, we recommend that you think about the value you assign to this product and behave as if it were a real auction.

Step-1: Product presentation

Brand: Ferrero Rocher

Net Weight:376g

Prefecture produced: in Italy

Country of Origin: Italy

Certification: QS

Package Information:

2-Step: Indicate the offer in a sealed envelope

What is your offer to get the “Chocolate” in this auction?

We remind you that the best strategy is to offer the maximum amount you are willing to spend on this product, no more and no less.

If you are not interested in buying this oil even for the price of a penny, you can indicate “0”.

The offer for this bottle must be expressed in RMB (Chinse money) using two decimals.

We advise you also to use cents, they can make the difference!

Write the figure on the sheet and cover it in the box.

Use the point (.) And not the comma to separate the decimals.

( )

3-Step: Ordering of offers and appointment of winners

The envelopes with the offers are withdrawn, opened, and ordered from the highest to the lowest.
The participant who made the highest bid is awarded the auction.

What is the highest bid in this auction?
Use the point (.) And not the comma to separate the decimals.

( )

Do you win the auctioned product?

( ) yes
( ) No

4-Step: Price definition

The price to pay corresponds to the second-highest bid.
How much must pay those who win the chocolate in this trial auction?

Use the point (.) And not the comma to separate the decimals.

（ ）

Really Auction
Now let's start the actual auction that concerns the product under investigation.
We remind you that in this case, at the end of the auction, the product will actually be delivered to whoever wins it, who will actually pay a sum of money decided by the second-highest bid.

We, therefore, recommend that you think about the value it assigns to this product and remembers that it is a real auction.

Product presentation

The product was made by the Mengniu Company and is not yet available on the market. Moreover, it can be traced directly back to the original dairy farm source.

Bid True

How much does it offer to get this Traceable Milk, Traceable condensed milk and conventional milk?

The offer for the product must be expressed in RMB using two decimals.

Write the figure on the sheet and cover it in the box.

USE THE POINT (.) And not the comma to separate the decimals

Check

Your offer for Traceable Milk:
1. ( )
2. ( )
3. ( )
4. ( )
5. ( )
6. ( )

Your offer for Traceable condensed milk**: ( )**
1. ( )
2. ( )
3. ( )
4. ( )
5. ( )
6. ( )

Your offer for Conventional milk**: ( )**
1. ( )
2. ( )
3. ( )
4. ( )
5. ( )
6. ( )

We remind you that if this were the highest bid, you would win the product and pay the amount corresponding to the second-highest bid.

Instead, if this were the second-highest bid, you would NOT win the product, while those who bid it would pay exactly

( ). Yes, I confirm the offer.

( ). No, I would like to change the offer.

Thanks for participate

The product was not auctioned, so he can simply ask the researcher for the 10RMB cash. as a thank you for his participation in this survey.

The next question is the last one.

Evaluation
Thank you again for taking part in our investigation.

Do not hesitate to contact us if you are interested in knowing the results of our research!

We would be grateful if you also left an assessment of this experience.

Interest ( )
Fun ( )
Understandable ( )
Comfort ( )

Basis information of the participants

ID:

1.Group:
A: Three-bidders' group; B: Four-bidders' group; C: Five-bidders' group

2. What is your gender?
A: Male B: Female

3. What is your Age?
A: 18-25; B: 26-33; C: 34-41;
D: 42-49; E: Above 50

4. How many persons including you live in your household?
A:1; B:2; C:3; D:4; E:5 or more

5. What is the highest level of education level you have completed?
A: Under middle school; B: High school; C: College degree;
D: Bachelor; E: Above Master

6. How much is your household income per month?

A: Under 2000 RMB; B: 2001-5000 RMB; C: 5001-7000 RMB;
D: 7001-10000 RMB; E: Above 10000 RMB

7. Is there a child (under age 16) in your family?

A: Yes; B: No

8. Is there an elder (above age 60) in your family?
A: Yes; B: No

9. How many times did you take medicine in the last month?
A: No; B: 1-5; C: 5-10;
D: 10-15; E: over 15 times

10. How many times do you medical check-up in the year?
A: 0; B: One time in the year; C: In every half year;
D: In every three months. E: In every month

11. Do you know about your health condition?

A: No; B: A Little Bit; C: Fairly; D: Very Well

12. Did you pay attention on yourself health condition?

A: No; B: A Little Bit; C: More Attention; D: Strongly

13. Do you concern about the food safety of dairy products?

A: Strongly Concern; B: Concern; C: Not Care;
E: No Concern; F: Total No Concern

14. Do you concern about the food safety of dairy products?

A: Strongly Concern; B: Concern; C: Not Care;
D: No Concern; E: Total No Concern

Do you or your relatives have had experiences with food safety incidents?
A: No; B: Yes

Do you trust the food safety certification on the food label?
A: Completely Distrust; B: A Little Bit; C: Trust; D: Strongly Trust

Have you heard about traceable food before?
A: No; B: Yes