

WILLINGNESS TO PAY FOR SAFER DAIRY PRODUCTS IN CHINA: EVIDENCE FROM  
SHANGHAI CUSTOMERS' PURCHASING DECISION OF BRIGHT DAIRY'S BABY  
CHEESE

by

YIWEI YAN

(Under the Direction of Glenn C.W. Ames)

ABSTRACT

Bright Dairy & Food Co., Ltd., a joint-stock company headquartered in Shanghai, was involved in five food safety incidents from June to September 2012. The objective of this study is to analyze Shanghai customers' willingness to pay (WTP) for the safer baby cheese from Bright Dairy. This study utilized interval regression to investigate the impact of consumers' demographic characteristics, buying habits, and food safety perceptions on their WTP. A total of 318 adult respondents from two nursery schools in Shanghai were involved in a survey of food safety attitudes and consumer behavior. Results show that consumers' age, attitude for baby cheese's safety, purchasing frequency of Bright Dairy's baby cheese product, and their alternative choice of other native or foreign brands of baby cheese, have significant effects on their willingness to pay for safer baby cheese. Finally, consumers are willing to pay a 16.54% premium (RMB 1.82/92g) for safer baby cheese.

INDEX WORDS: Food Safety, Willingness to Pay, Interval Regression, Cheese

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## 1. INTRODUCTION

### 1.1. Overview

Food safety is an increasingly significant public health issue around the world. In recent years, food safety in China has become a primary focus of the media and a major concern for consumers because of repeated food safety incidents (Lin, et al. 2009). In China, categories of food safety incidents include adulterated food products and expired food products (Wang, Mao, and Gale 2007). With these growing concerns on food safety, the demand for safe food in China is raising especially among consumers with rising living standards (Liu, Pieniak, and Verbeke 2013). Moreover, investigators and research findings confirm that Chinese consumers are losing their confidence and trust in the safety of domestic food products (Qiao, Gui, and Klein, 2010).

Consumers' confidence plummets especially when they face food safety incidents that may affect their children's health, such as the melamine incident (an industrial compound that was found in infant milk formula) which have caused six babies' death and 300,000 babies to become sick in 2008 (Qiao, Guo, and Klein 2010). After this nightmare, most Chinese households with young children began to buy imported rather than domestic dairy products. Attempting to maintain consumer confidence and rebuilt the reputation of the domestic dairy industry, the Chinese government has adopted stringent food safety standards and new regulations.

Before the series of food safety incidents, Chinese consumers were highly price-sensitive in food purchasing decisions. However, after food safety became a major public concern,

consumers' willingness to pay (WTP) for safe food has increased overtime. Some evidence indicates that urban Chinese consumers have a higher WTP for safe food than rural Chinese consumers (Yang 2006; Wang 2003). Additional research findings show that urban consumers are willing to pay a significantly higher price for traceable milk, specifically 21.7 % higher than regular milk prices (Zhang, Bai and Wahl 2012).

Chinese consumers with and without children behave differently towards safe foods as many researchers have noted recently. Some studies conclude that after the 2008 melamine crisis, many Chinese households with young children reacted differently to food safety than the households with no young children (Qiao, Guo, and Klein 2012). Zhang, Bai, Lohmar, and Huang (2010) also confirm that the reputation of milk producers have a higher importance for households with children in determining milk safety than those without children. Since young children frequently consume dairy products every day and have the least capacity to deal with the toxic substances from consuming unsafe dairy products, parents naturally become more concerned over the safety of dairy products ingested by their children. However, there is no research which specifically concentrates on those consumers with young children and estimates their willingness to pay for safe dairy products.

## 1.2. Safety Standards for food

The government has adopted comprehensive food safety standards and a certification system to enhance and ensure food safety in China (Yu 2012). According to the strict standards, the certification system is made up of three significant safety levels: No-pollution Food Certification<sup>1</sup>, Green Food Certification<sup>2</sup> and Organic Food Certification<sup>3</sup>.

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<sup>1</sup> No-pollution Food Certification is a Chinese government certification scheme for safe food.

<sup>2</sup> Green Food Certification is also a Chinese government certification scheme for safe food, but it is stricter than No-pollution Food Certification.

<sup>3</sup> Organic Food Certification is a Chinese certification scheme for organic food.

The food certification system in China is tedious and multi-leveled compared to the unified international standards for organic food (Yu, Gao, and Zeng 2014). In 1989, the Environment Protection Department of China published the Organic Food Certification, which followed generally international specifications, stipulates the avoidance of using fertilizer, chemical pesticides, additives and genetic technology in the cultivation of plants and animal feed. It is the strictest certification among the Green Food and the No-pollution Food Certifications. In the 1990s, the Agricultural Department of China published the Green Food Certification. There are two levels of Green Food Certifications, they are the A standard and the AA standard.

The AA standard is almost equally strict as the Organic Food Certification. In general, the Green Food Certification only allows the limited utilization of fertilizer and chemical pesticides into the production process. Then, in 2001, China's Agricultural Department again published another Certification named the No-pollution Food Certification, which became the most basic and the least stringent safety certification. It allows the use of genetic technology, pesticides, and fertilizer in production, but it is still at a basic food safety level for consumers. Consequently, China's dairy products are required to confirm to the three safety certifications (Table 1.1).

### 1.3. Dairy Industry

Compared with other developed countries, the dairy industry occupies an important position in the food sector of China. Currently, the development of the dairy industry in China is increasing (Wang 2009). Specifically, China's milk production accounted for 1.6% of global milk production in 2000, increasing an average of 26.8% per year (Table 1.2). China's import volumes of dairy increased rapidly, from 347,000 metric tons in 2006 to 728,000 metric tons in 2010, an increase of 110% (Table 1.3). The importation of infant powered milk formula increased from

140,000 metric tons in 2008 to 450,000 metric tons in 2011, which accounts for 33% share of the total Chinese powered milk's consumption. In 2012, this figure jump to 583,000 tons (China Customs Statistics Yearbook 2013).

On average, 66% of urban citizens in China who drink milk are mainly children and elderly people (Yao 2011). China's milk consumption was about 9.6 kg per person accounting for 15.1% of average global milk consumption in 2010 (Table 1.2). The national average annual expenditure on dairy products in urban China was RMB 68.57 (USD 8.60) per person in 2006, which grew to RMB 198.47 (USD 29.32) in 2010, an increase of 189% in four years. In Shanghai, the highest national dairy expenditure area, the consumption far exceeded the national average, which was RMB 178.33 (USD 22.38) in 2006 and RMB 410.27 (USD 60.60) in 2010 per person, an increase of 56.53% in four years (Table 1.4).

#### 1.4. Dairy Safety Incidents

While dairy production and consumption has been growing in recent years, so have the number of food safety incidents involving dairy products. Several dairy safety incidents have happened in China since 2004. For example, the Bingdu dairy incident, 13 infants died and 200 infants were malnourished after consuming milk powder from Bingdu dairy company in Fuyang City, Anhui province, where the most serious 2008 melamine dairy incident caused fatalities and illnesses among young children. Then, as a result, consumers heightened their awareness of food safety incidents, especially involving dairy products. Consequently, the Chinese government is paying much more attention to the safety of dairy products than before, especially for products consumed by infants and young children (*Guangming Daily* 2012).

Unfortunately, most recently from June to September 2012, Bright Dairy & Food Co., Ltd. was involved in five food safety incidents in China. Specifically, on June 15, 2012, six

pupils from Anhui province started vomiting after drinking Bright Dairy brand milk. On June 28, 2012, Bright Dairy had to recall its “problem milk” and compensate customers because alkaline water was accidentally mixed into its dairy products. On July 20, 2012, Trade and Industry Bureau of Guangzhou city detected bacterial colonies in Bright Dairy’s milk that exceeded standards. On September 8, 2012, Bright Dairy in Shanghai received 952 customers' complaints for the rancid taste of its bottled milk. Ten days later on September 18, 2012, Bright Dairy’s baby cheese was found to contain forbidden mineral salts.

Bright Dairy & Food Co., Ltd. is a joint-stock company headquartered in Shanghai, China. It is one of the biggest dairy manufacturers and sellers in China whose products include pasteurized milk, fresh milk, yogurt, UHT milk, milk powder, butter, cheese, and fruit juice (Website from Bright Dairy, URL: <http://en.brightdairy.com/home.php>). After this series of food safety incidents, Chinese customers are losing confidence in Bright Dairy products.

Since the 2008 melamine milk poisoning crisis, the dairy industry development and the social credibility of domestic dairy products (especially for infants and children) in China fell dramatically. Results from a survey of 1500 urban residents in Beijing, Shanghai, Guangzhou, Wuhan, and Chengdu indicated that 44% of dairy customers do not believe dairy producers’ commitment to quality; 45% of customers do not believe the source of raw milk is under good control (Liu 2010). To sum up, most urban consumers now lack confidence in China domestic dairy products, especially those for children and babies.

### 1.5. Objectives




Based on the most recent “baby cheese” dairy safety incident, this study analyzes Chinese parents’ willingness to pay for safe dairy products. The objective of this study is to estimate a sample of Shanghai parents’ willingness to pay for safer Bright Dairy’s baby cheese product,

which is developed for young children under six years old. It is hypothesized that socio-demographical characteristics, buying habits, and safety perceptions may affect parents' willingness to pay for safer dairy products. Additional factors are hypothesized to influence parents' willingness to pay. They include age, gender, monthly income, education, employment background, knowledge of Bright Dairy's food safety incidents, attitude towards the safety of baby cheese, frequency of buying Bright Dairy's products, and the availability of substitute dairy products.

#### 1.6. Thesis Organization

In the following chapters, we review the relevant literature, discuss the data and econometric models, and analyze consumers' willingness to pay for safer food. In Chapter 2, we review the relevant articles which summarize the general food safety situation in China, and the Chinese consumers' purchasing behavior towards safe food. We also review the research methodology utilized in consumer behavior analysis, and the advantage of the interval regression model. In Chapter 3, we discuss the questionnaire and the survey data. In Chapter 4, we specify the internal regression model and estimate consumers' willingness to pay. Lastly, we discuss the estimated results and provide some implications of our study.

Table 1.1. Pollution-Free Food Certification, Green Food Certification, and Organic Certification

Item	Pollution-Free Food Certification	Green Food Certification	Organic Food Certification
Logo			
Administration	Agricultural Department	Agricultural Department	Environment Protection Department
Valid term	Three years	Three years	One year
Fertilizer	Allow	Limited	Forbidden
Chemical pesticides	Allow	Limited	Forbidden
Genetically engineered seed	Allow	Forbidden	Forbidden
Growth regulator	Allow	Forbidden	Forbidden
Preservative	Allow	Forbidden	Forbidden
Additive	Allow	Forbidden	Forbidden

Source: Introduction of Food Safety Certifications (Zhu 2005)



Table 1.2. Comparison of Global and Chinese Dairy Production and Consumption Data

Year	2000	2005	2006	2007	2008	2009	2010
Global total dairy herds (Thousand)	140846	145513	108953	106988	146496	146852	146336
China dairy Herds (Thousand)	5238	12161	13632	12180	12335	12607	12607
Percentage	3.70%	8.40%	12.50%	11.40%	8.40%	8.60%	8.60%
Global total milk production (Thousand tons)	526453	568319	573057	580864	595028	597779	606829
Chinese milk production (Thousand tons)	8420	27534	31934	35250	35558	35188	35756
Percentage	1.60%	4.80%	5.60%	6.10%	6.00%	5.90%	5.90%
Global average milk consumption (Kilogram)	72.5	75.8	67.2	66.1	60.7	60.4	63.7
Chinese milk consumption (Kilogram)	1	8.8	NA	NA	8	9.4	9.6
Percentage	1.40%	11.60%	NA	NA	13.20%	15.60%	15.10%

Source: China Dairy Yearbook (2011)

Table 1.3. Dairy Production in China

Indicators	Unit	2006	2007	2008	2009	2010
Numbers of Dairy Herds	Ten thousand	1363.2	1218	1233.5	1260.7	1260.7
Milk Production	Ten thousand tons	3193.4	3525	3555.8	3518.8	3575.6
Production of Dairy Products	Ten thousand tons	1460	1787	1935.1	1934.7	2138
Import Volume of Dairy Products	Ten thousand tons	34.7	29.8	59.7	58.3	72.8
Export Volume of Dairy Products	Ten thousand tons	7.49	13.46	3.7	15.9	10.1

Source: China Dairy Yearbook (2011)

Table 1.4. Average Annual Dairy Product Consumption Expenditure in China

Indicators	Unit	2006	2007	2008	2009	2010
National average						
dairy expenditure (Urban)	1 RMB <sup>a</sup>	68.57	138.62	189.84	196.14	198.47
Beijing average						
dairy expenditure (Urban)	1 RMB <sup>a</sup>	178.33	270.43	332.13	341.88	371.04
Shanghai average						
dairy expenditure (Urban)	1 RMB <sup>a</sup>	200.9	246.88	341.69	361.73	410.27
Guangdong average						
dairy expenditure (Urban)	1 RMB <sup>a</sup>	65.18	134.49	207.5	220.52	211.35

<sup>a</sup>Exchange rates for RMB are as follows:

Year	Exchange Rate
2006	7.97RMB/USD
2007	7.61RMB/USD
2008	6.94RMB/USD
2009	6.83RMB/USD
2010	6.77RMB/USD

Source: China Dairy Yearbook (2011); World Bank annual middle exchange rate for US dollar to Chinese RMB.

## 2. LITERATURE REVIEW

### 2.1. Consumer Behavior Towards Food Safety in China

The Chinese Ministry of Health reported that there were between 590 and 900 food safety incidents annually from 2003 to 2005 in China, which affected 15,000 to 20,000 people every year. These safety incidents include pesticide residues, intensive use of growth hormones, heavy metals poisoning, air and water pollution, carcinogenic dyes, and adulterated foods. In addition, there also have been a number of dairy food safety incidents, such as the 2008 melamine contaminated infant formula, and the poisoned milk powder (Wang, Mao, and Gale 2008). These incidents have contributed to a generally heightened level of social concern about food safety. Therefore, the body of research on Chinese consumer behavior towards food safety is growing dramatically due to the increasing number of incidents in recent years.

Most research findings on behavioral intentions towards safe food conclude that consumers prefer safe food and that they are willing to pay a premium for safe food (Wang, Mao, and Gale 2008). Specifically, Li (2007a) reveals in the research about Nanjing consumers' buying behavior on green milk<sup>4</sup> that the 98% of Nanjing consumers like to purchase green milk<sup>4</sup>. Tang, Li, and Jiang (2010) analyzed the buying behavior of consumers of safe eggs in Nanjing City. They indicate that the majority of consumers (94%) in Nanjing City are willing to buy safe eggs.

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<sup>4</sup> Green milk means the milk which has been certified with the Green Food Certification. Green Food Certification is one of the Chinese food safety certifications.

Zhang and Wang (2009) concluded in their research that consumers who are willing to pay a higher price premium for safe food are mostly young and unmarried people, with a monthly income between RMB 10,000 to RMB 11, 999 (USD 1,639 to USD 1,967) per household, and with higher education level. Ortega, Wang, Wu, and Olynk (2011) reveal that Chinese consumers are willing to pay more for a food with government safety certification. Moreover, those consumers give high credit to the food traceability system. Wang, Zhang, Mu, and Fu (2009) analyze consumers' willingness to pay (WTP) for traceable agricultural products in Chengdu City. They reveal that consumers are willing to pay approximately a 10 % price premium for the traceable agricultural products. They conclude that enhancing market information and government regulation for food markets can be the rational approach to improving food safety.

Consumption of dairy products has been increasing by 15% annually since 1995 (Pei et al. 2011). Li (2007a) reports that 23% of Chinese consumers purchase green milk every day; 13% of them buy three times per week, 29% purchase once or twice per week, 23% buy twice to three times per month, and 12% once a month or less frequently.

On the other hand, Jin and Zhao (2008) conclude that although Chinese consumers show a rising concern for food safety, they also claim a high willingness to pay extra money for safe food. However, these claims do not generally turn into their actual purchasing behavior. Chen (2013) points out that it is the trust that plays an important role in linking the willingness to pay values to actual purchasing behavior. Additionally, the study indicates that Chinese consumers do not trust Organic Food certification, a similar scenario applies to the Green Food certification.

In terms of the purchasing places, Li (2007b) shows that supermarkets are the place where Chinese consumers think the foods are safer than in other outlets. Besides, most

consumers who like to buy safe food at the supermarkets have a higher education level, higher WTP and higher frequency of purchasing safe food. Wang and Yu (2007) reveal that farmer's markets, small vegetable markets and stalls are also important places for Chinese consumers to buy safe food. Chen (2013) points out that consumers believe that supermarkets are more reliable and that they trust the products more there than those purchased in the farmers' markets or food stores. Since safe food stores<sup>5</sup> are not very popular among Chinese consumers right now, they are not as important as supermarkets for urban Chinese consumers (Jin and Zhao 2008).

As mentioned by Steenkamp (1997), the behavior of consumers is influenced by four main factors: personal, economic, socio-cultural characteristics, and marketing. Thus, many studies focus on the factors which may affect safe food consumption in China.

The characteristics of Chinese consumer such as gender, education, marital status and age have been widely investigated and have been reported to have a profound effect on purchasing behavior regarding safe food (Liu, Pieniak, and Verbeke 2013). For example, Wang, Zhang, Mu, Fu, and Zhang (2009) conclude that the age and the education level of consumers are the main determinants of their WTP for the traceable products. Zhang (2011) shows that consumers who are female, married and highly educated often have more knowledge about green food<sup>6</sup> than other consumers. Zhang and Wu (2010) also indicate that consumers who are female, younger or well-educated have higher intentions of buying green food than other consumers. Zhou (2004) confirms that the knowledge (education) level is an important associated factor for safe food purchasing behavior. With more knowledge about safe food, consumers will be more concerned about the safety of fresh vegetables.

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<sup>5</sup> Safe food stores mean stores which only sell only certified safe food.

<sup>6</sup> Green food means that the food products carry the Green Food Certification label.

Income is another important factor that affects Chinese consumer behavior. Yang (2004) concludes that consumers' monthly family income significantly affects their WTP for pollution-free vegetables. Xu et al. (2012) reveal that consumers' monthly green-labelled seafood expenditure is positively related to their WTP for the certified seafood. Yin et al. (2008) points out that because of the high producing cost of organic food, most consumers still believe that organic foods are not affordable for middle-income-level households in China. Ma and Qin (2009) conclude that the prices of safe foods are much higher than that of conventional foods. The large price gap between safe foods and conventional foods provides a motivation for consumers to learn more about safe food.

Social-cultural factors like employment background, family size and composition are also important factors influencing buying behaviors. Specifically, Zhang and Wu (2010) conclude that Chinese families with infants, children or elders usually have more knowledge about safe food and also are more willing to buy safe food. Li (2007b) reports that Chinese consumers who are working in research and education, health care, the catering trade, finance and insurance, real estate, and service industries are more inclined to buy green food. Zeng and Wang (2008) conclude that consumers who work in food or safety related industries (such as catering, trade, government institutions, medical care services, education and research institutes) show higher concern and knowledge about food safety.

In addition, Liu (2008) also indicates that brand sensitivity is another important factor influencing the frequency of purchasing safe food. Liu investigated the brand sensitivity of green food in Wuhan City, and concluded that in general consumers purchase green food 2.5 times less than those with brand sensitivity. Zeng, Xia, and Huang (2007) reveal that there is a strong brand loyalty for safe milk produced by large-scale producers because consumers believe large

producers provide high quality products. They also conclude that advertising has a positive effect on consumers' WTP for safe food in China.

## 2.2. Consumer Behavior towards Dairy Safety in China

The previously mentioned studies have contributed to a general understanding of Chinese consumers' responses to food safety incidents. As people know, dairy product food safety incidents are one of the most serious and frequently reported cases in China. In 2008, Chinese consumers were shocked by the melamine crisis, in which six babies died and around 300,000 babies were sickened by consuming the infant milk powder that had been produced by Sanlu Dairy Company, which was contaminated by melamine, a chemical used mainly to produce plastics. Unfortunately, the confidence of Chinese consumers for the burgeoning dairy industry plummeted and they decreased their consumption of national brand dairy products greatly (Wang, Mao, and Gale 2008).

There are several interesting studies on consumer behavior towards dairy product safety. Specifically, Zhang, Bai, Lohmar, and Huang (2010) analyze the consumer indicators for milk safety. They conclude that the place of purchase and the brand of the milk are the two most important indicators for consumers to determine milk safety, while the milk price, the appearance of milk products, and the safety certification of milk are at relatively low ranking incidents. Besides, consumers with high income levels prefer the milk brand and the safety certification rather than the appearance of milk products. Consumers who work in public sectors prefer certification to appearance of products more than other indicators. Young and middle aged Chinese consumers have a higher probability of ranking the safety certification over the appearance of products, but place a lower ranking on the place of purchase and the milk brand. Wang, Mao, and Gale (2008) surveyed consumers' purchasing decisions of dairy product. Their



study reveals that Chinese consumers clearly show their concern about the safety of the dairy products. Although the Chinese consumers have a reputation for being highly price-sensitive in food purchase decisions, only 4.2% of consumers in their survey indicate that price is a main consideration in their dairy purchasing decision. Qiao, Guo, and Klein (2010) analyze Chinese consumers' confidence in national dairy products. They indicate that despite some lingering worries about the safety of dairy products, most Chinese consumers are cautiously optimistic about food safety after only two months past the melamine incidents. Indeed, consumers who regularly purchase dairy products expressed higher confidence in the dairy industry than those who rarely consume them.

In the study by Ortega et al. (2011), their results indicate that consumers place a higher value on government safety certification following a national brand with respect to UHT milk. In addition, a non-government certification program is also positively valued by consumers, which, if it is implemented, will generate market competition and may eliminate some inefficiency that comes from the government monopoly on the food safety and quality assurance certification. Yin et al. (2008) concluded that Chinese consumers are willing to pay more for the frequently purchased and tasty products, which are mostly fruits and vegetables with a low level of chemical residues rather than the grains or dairy products.

Since dairy products are obviously one of the most important foods for young children, they typically have the least capacity to deal with food safety incidents. Therefore, after a series of dairy safety incidents which mainly threaten children's health and lives, parents naturally become more concerned about the safety of dairy products than consumers without children. As Qiao et al. (2012) confirm in their study, that households which with young children reacted differently to the melamine contaminated milk product crisis in China compared to families that

have no children. They find that after one year of the public being told of the melamine incident, a higher percent of households with young children in Hohhot City show higher concerns with melamine polluted dairy products than the households without children. Similarly, Benson (2011) notes that it is the affected party's feelings regarding the value of what may be lost that shapes consumers' attitudes towards the risk of food safety hazard.

Baker (2003) reveals that in the United States, women with young children and households with young children are the groups which are most likely to have an avoidance reaction to food safety incidents. Moreover, Xue and Sun (2009) confirm that when the food safety incidents for infants exist, women prefer to increase their time to spend with their children rather than go to work in China. Other consumers' reactions are important factors in determining responses to food safety incidents. However, there is still a lack of research focusing on the consumer behavior of parents with young children towards dairy product safety in China.

### 2.3. Research Methodology on Consumer Behavior

Several research methodologies have been utilized to analyze the consumer behavior for food safety, e.g. experimental markets, consumer choice models, Contingent Valuation Method (CVM), and conjoint analysis (Zhou and Peng 2005). Each method has advantages and disadvantages based on different research purpose.

For example, Baker and Burnham (2001) use the consumer choice model in their study to determine U.S. consumer response to genetically modified foods. They use a box of corn flakes as the hypothetical product, where consumers' attributes evaluated in the study include the brand, price, and the source of corn. Their results reveal that the level of risk aversion, consumers' knowledge about genetic modification, and consumers' opinion about genetic modification are

the three most significant factors in determining consumers' attitudes toward food containing GMO corn.

Pelsmacker, Rap, and Driesen (2005) utilize conjoint analysis to study consumer willingness to pay for fair-trade coffee. They confirm that consumers are willing to pay 10% premium for fair-trade labelled coffee.

Zhou and Peng (2005) studied the WTP for food safety in China based on the CVM methodology. They choose Nanjing City and Suzhou City in Jiangsu Province as their survey location and vegetables as their study object. They demonstrate that people in these areas are willing to pay 335% more for low residual vegetable<sup>7</sup>, which is a surprising result.

In addition, Bernard and Bernard (2009) use auction experiments to estimate consumers' demand and WTP for the rBST-free milk. They indicate that WTP premiums for the rBST-free milk are differing by demographic characteristics and consumers' beliefs toward conventional food products. The market segments for the rBST-free and antibiotic-free milk can successfully benefit both consumers and producers alongside organic food.

#### 2.4. Methodology: Interval Regression

Interval Regression is a generalization of censored regression methodology which is used to estimate the model when the ordered category into which each observation falls is known, but the exact value of every observation is not known. It is efficient to dealing with ranges of values and easy to estimate consumers' willingness to pay (WTP).

When the dependent variable  $y$  is used to indicate respondents' discrete choices of intervals, given  $x_i$  as the explanatory variables, an ordered probit and logit model can be estimated. However, Alberini (1995) suggest that based on Monte Carlo simulations, an interval

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<sup>7</sup> Low residue vegetable here means that the vegetables contain less pesticide and fertilizer residues than general vegetables.

model is often more efficient than a discrete choice model. As in most models dealing with the ranges, maximum likelihood estimation should be employed. The marginal impacts in the interval regression are actually the marginal values, which can be interpreted similarly as in an OLS model. However, the coefficients in probit and logit models cannot be interpreted directly (Yang et al. 2012). Moreover, Cameron and Huppert (1991) also outline the benefit of the interval regression model. They point out that the main difference between interval regression models and the ordered probit and logit models is that the interval regression model assumes that the WTP cut points are known rather than unknown when given by ordinal category indicators. Some researchers utilize interval regression model in their studies.

For example, Yang et al. (2012) use interval regression to analyze the determinants of fair-trade coffee consumption in China. They investigate 564 people in Wuhan City, and their results show that the respondents' individual demographic characteristics and their consumption characteristics impact the WTP for the fair-trade coffee. Their estimates indicate that, on average, respondents are willing to pay a 22% price premium for a medium cup of fair trade coffee.

This study uses interval regression to analyze Shanghai parents' average WTP for the safe baby cheese product after Bright Dairy's most recent safety incident. Our goal is to gain more information about Chinese consumers' reaction towards dairy products' safety. If there is a large portion of respondents willing to pay a premium for safer dairy products, it will be a positive market signal and incentive for producers to increase the quality of products and regulators to better ensure the safety of dairy market.

### 3. SURVEY QUESTIONNAIRE AND DATA DESCRIPTION

The data used in this study was collected by a face-to-face survey questionnaire in two large nursery schools in Shanghai, China. A total number of 318 parents completed the questionnaire from January to February 2013. The survey process was conducted on different days of the week and at different times of the day to reduce sampling bias.

#### 3.1. Questionnaire Design

The questionnaire, with 19 questions, was divided into two different parts, which included dairy safety and socio-demographic questions. In the first part, respondents were asked about their awareness of and attitudes towards the safety of the Chinese food market. In addition, they were asked about their knowledge of food safety certifications, how many numbers of Bright Dairy's food safety incidents they have known about, and whether or not they have known specifically about baby cheese safety incidents. Moreover, consumers were asked several questions about their purchasing behaviors as well, such as their purchasing frequency of Bright Dairy's products, their purchasing frequency of baby cheese, and their purchasing venue for baby cheese. They were also asked about their potential choice of substitutes for baby cheese. Then, they were asked about how much they were willing to pay for safer baby cheese above the current retail price of RMB 11 per 92g, in which they were given mutually exclusive price intervals to choose from (Figure 3.1).

In the second part of the questionnaire, respondents were asked about their age, gender, education level, employment background, and family monthly incomes. Out of the total 318 parents who were surveyed, only 174 parents who had previously purchased baby cheese before were included in our willingness to pay analysis.

### 3.2. Data Description

Specifically, among the 174 respondents most are females (67.24%); 77.01% of them are around 30-39 years old, and have as many as four family members, including one 4 to 5-year-old child (Table 3.1 and Appendix 2). Not surprisingly, these respondents are mostly young parents, while the rest are grandparents. Over 73.56% of these respondents have attended and graduated from college. A majority of the respondents (48.28%) reported that their family's monthly income ranged from approximately RMB 5,000 to RMB 10,000 (USD 900 to USD 1,700). These results show that the majority of the respondents are highly educated and relatively well-off economically in China.

According to the answers to the questions about the respondents' attitude towards the safety of the entire Chinese food market (*Safety*), most of them (45.98%) believe that foods are generally safe in the market place. This indicates that people still have confidence in the safety of food markets in the Shanghai region. Regarding their knowledge of food safety certification (*CertifK*), the mean value is 2.2, which indicates that most respondents know very little about the food safety certifications. Moreover, the responses to the question "Do you trust these food safety certifications" (*CertifT*) reveal that the respondents do trust the Chinese safety certifications to some extent; 67.24% of the 174 respondents chose "moderately trust" food safety certifications.

Sixty-two percentages of the respondents are generally aware of the Bright Dairy's food

safety incidents. In addition, 66.09% of the 174 respondents also indicated that they have heard about the baby cheese safety incident before. Most of them thought that the safety of baby cheese was uncertain.

The mean value of the response of the question “What is the purchasing frequency of Bright Dairy’s products for your household” (*FreqBD*) is 1.57, which indicates that respondents purchase its products mostly “two or three times per week”. Moreover, the mean value of the question “What is the purchasing frequency of Bright Dairy’s baby cheese” (*FreqBC*) is 2.08, which indicates that 51.71% respondents choose “one time per week”. This implies that most of the 174 respondents’ purchase the baby cheese one time per week.

In response to the question “What is your usual purchasing place for Bright Dairy’s baby cheese” (*PlaceBC*), the majority of respondents (78.74%) indicated that they usually purchased baby cheese in the supermarket. Consumers were also asked about substitute products, “If you do not want to purchase baby cheese ever, what substitutes would you choose” (*SubBC*), respondents replied that they might change their preference to other native or foreign cheese brands.

Last but not least, when it comes to the question asking about “How much above the retail price (RMB 11 per 92g) are you willing to pay for a better quality control and certified safe baby cheese (*WPBC*)”, the mean value for the multi-choice question is 1.89, which means that over half of the respondents are willing to pay a premium for the safer baby cheese from ranging RMB 0 to above RMB 5.00 per 92g. Therefore, we can assume that the respondents have a willingness to pay for the safer baby cheese. In order to examine our hypothesis, we analyze the average consumers’ WTP through an interval regression model which is developed in Chapter 4.

In terms of the statistical results of all the 318 samples’ statistical results, as reported in

Table 3.2, the means and variances are very similar to those of the 174 samples. From Table 3.3, the only significant difference between 174 and 318 sample sets lies in the questions “What is the purchasing frequency of Bright Dairy’s baby cheese” (*FreqBC*) and “What is your usual purchasing place for Bright Dairy’s baby cheese” (*PlaceBC*). Since the 318 samples include the 144 respondents who had never purchased Bright Dairy’s baby cheese before, the means and variances of *FreqBC* and *PlaceBC* from 318 samples are much larger than those from 174 respondents who actually purchased baby cheese. Except for the variables *FreqBC* and *PlaceBC*, the inclusion of respondents who did not purchase baby cheese did not change the sample means and variances.

In summary, we only use the data from the 174 respondents who had previously purchased baby cheese in our willingness to pay analysis. The answer of willingness to pay among those repeated consumers can be thereby estimated, and it is a reasonable reflection of consumers’ reaction to Bright Dairy’s baby cheese food safety incidents.



Table 3.1. Variable Definition and Summary of Statistics Used in the Analysis of Consumers' WTP for Safer Baby Cheese (n=174)

Variable	Description	Mean	Var	Min	Max
Gender	0= female ; 1= male	0.33	0.22	0	1
Age	1= age < 30; 2= age 30 to 39; ...; 5= age > 60	2.12	0.64	1	5
Family Size (Fsize)	number of family members	4.20	1.22	3	8
Children's Age (Cage)	1= kid's age 3 to 4; 2= kid's age is 4 to 5; 3= kid's age is 5 to 6	2.38	0.47	1	3
Education Background (Edu)	1= 12th grade or less; 2= high school graduate; 3= college graduate; 4= master's or doctorate degree	2.90	0.31	1	4
Employment Background (RWB)	0= no; 1= yes	0.15	0.13	0	1
Family Monthly Income (FMI)	1= less than RMB 5000; 2= RMB 5000 -10000; 3= RMB 10000 - 20000; 4= more than RMB 20000	2.37	0.77	1	4
Attitude for the whole food market (Safety)	1= very safe; 2= moderately safe; 3= unsafe; 4= unknown	1.92	0.95	1	4
Knowledge of safety certificates (CertifK)	1= know well; 2= know a little; 3= unknown	1.78	0.24	1	3
Attitude for safety certificates (CertifT)	1= trust; 2= moderately trust; 3= not trust	1.75	0.27	1	3
Numbers of knowing BD incidents (NBDI)	number of BD incidents the respondents have heard	1.49	2.60	0	6
Attitude for BC safety (SBC)	1= not trustworthy; 2= it depends; 3= moderately trustworthy; 4= very trustworthy	2.24	0.30	1	4
Whether know BC safety incidents (KBCI)	1= know BC safety incidents; 2= know a little about BC safety incident; 3= unknown	2.18	0.46	1	3
Purchasing frequency of BD (FreqBD)	1= rarely; 1= one time per week; 2= two or three times per week; 3= more than three times per week	2.41	0.76	1	3
Purchasing frequency of BC (FreqBC)	1= rarely ; 2= one time per week; 3= Several times per week; 4= at least one time every day	1.73	0.80	1	4
Purchasing place of BC (PlaceBC)	1= in the supermarket; 2= home delivery milk; 3= in the store; 4= uncertain	1.53	1.38	1	4
Substitutes for BC (SubBC)	1= other Bright Dairy's products; 2= other native brands Cheese; 3= foreign brands Cheese	2.00	0.69	1	3
WTP for safer BC (WPBC)	1= less than or equal to RMB 0; 2= RMB 0 to RMB 0.99 ; ...; 7= equal or more than RMB 5	1.86	1.58	1	7

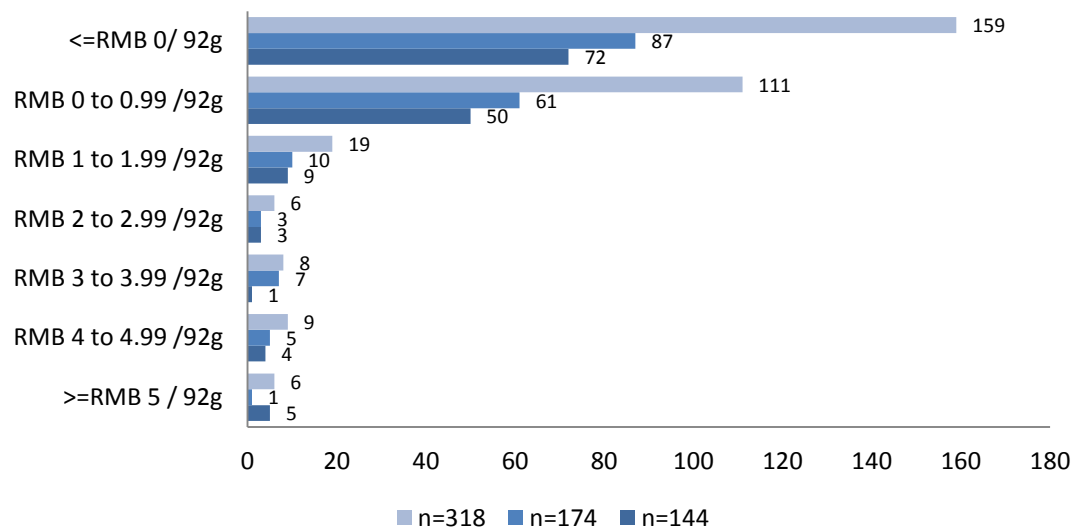
Notes: BD stands for Bright Dairy; BC stands for Bright Dairy's baby cheese; WTP indicates willingness to pay for safer baby cheese.

Table 3.2. Summary Statistics and the Comparison of Mean and Variance Values for all Respondents and Subsets of the Sample

Variable	Description	n=318		n=174 <sup>a</sup>		n=144 <sup>b</sup>	
		Mean	Var	Mean	Var	Mean	Var
Gender	0= female ; 1= male	0.32	0.22	0.33	0.22	0.33	0.22
Age	1= age < 30; 2= age 30 to 39; ...; 5= age > 60	2.07	0.57	2.12	0.64	2.01	0.49
Family Size (Fsize)	number of family members	4.17	1.21	4.20	1.22	4.13	1.19
Children's Age (Cage)	1= kid's age 3 to 4; 2= kid's age is 4 to 5; 3= kid's age is 5 to 6	2.42	0.44	2.38	0.47	2.46	0.40
Education Background (Edu)	1= 12th grade or less; 2= high school graduate; 3= college graduate; 4= master's or doctorate degree	2.85	0.34	2.90	0.31	2.78	0.037
Employment Background (RMB)	0= no; 1= yes	0.14	0.12	0.15	0.13	0.12	0.10
Family Monthly Income (FMI)	1= less than RMB 5000; 2= RMB 5000 -10000; 3= RMB 10000 - 20000; 4= more than RMB 20000	2.30	0.77	2.37	0.77	2.22	0.76
Attitude for the whole food market (Safety)	1= very safe; 2= moderately safe; 3= unsafe; 4= unknown	1.83	0.82	1.92	0.95	1.72	0.65
Knowledge of safety certificates (CertifK)	1= know well; 2= know a little; 3= unknown	1.80	0.22	1.78	0.24	1.82	0.19
Attitude for safety certificates (CertifT)	1= trust; 2= moderately trust; 3= not trust	1.76	0.28	1.75	0.27	1.78	0.3
Numbers of knowing BD incidents (NBDI)	number of BD incidents the respondents have heard	1.4	2.39	1.49	2.60	1.29	2.14
Attitude for BC safety (SBC)	1= not trustworthy; 2= it depends; 3= moderately trustworthy; 4= very trustworthy	2.27	0.28	2.24	0.30	2.30	0.25
Whether know BC safety incidents (KBCI)	1= know BC safety incidents; 2= know a little; 3= unknown	2.22	0.44	2.18	0.46	2.26	0.42
Purchasing frequency of BD (FreqBD)	1= rarely; 2= one time per week; 3= two or three times per week; 4= more than three times per week	2.25	0.78	2.41	0.76	2.06	0.74
Purchasing frequency of BC (FreqBC)	1= rarely; 2= one time per week; 3= Several times per week; 4= at least one time every day	3.21	3.09	1.73	0.80	5.00	0.00
Purchasing place of BC (PlaceBC)	1= in the supermarket; 2= home delivery milk; 3= in the store; 4= uncertain	1.64	1.82	1.53	1.38	1.78	2.33
Substitutes for BC (SubBC)	1= other Bright Dairy's products; 2= other native brands Cheese; 3= foreign brands Cheese	1.96	0.65	2.00	0.69	1.90	0.61
WTP for safer BC (WPBC)	1= less or equal to RMB 0; 2= RMB 0 to RMB 0.99 ; ...; 7= equal or more than RMB 5	1.88	1.78	1.86	1.58	1.91	2.03

Notes: BD stands for Bright Dairy; BC stands for Bright Dairy's baby cheese; WTP indicates willingness to pay for safer baby cheese;

<sup>a</sup> Respondents who purchased baby cheese; <sup>b</sup> Respondents who did not purchase baby cheese.



Notes: total number of respondents was 318; total number of respondents including in analysis were 174.

Figure 3.1. Survey Results on Purchasing Premium Consumers are Willing to Pay for the Better Quality Control and Safe Certified baby cheese.

## 4. METHEDODOLOGY AND RESULTS

### 4.1. Model Choice

In this study, the independent variable willingness to pay (*WTP*) is described by the respondents' selection of the interval ranges of their willingness to pay for safer baby cheese (*WPBC*). With the original count variable *WPBC*, the analysis of the ordinary least square (*OLS*) could be used. However, count data are highly non-normal, and *OLS* regression would not reflect the uncertainty concerning the nature of the exact *WTP* values within each interval, nor would it deal adequately with the left and right censoring issues in the distribution tails (Yang et al., 2012). For discrete choices, a conventional ordered logit or ordered probit model could be estimated. However, some scholars believe that an interval-data model is often more efficient than a discrete choice model (Alberini 1995). First of all, interval regression assumes known *WTP* cut points rather than unknown cut points given by ordinal category indicators. Besides, the coefficients cannot be interpreted directly in an ordered logit or probit model, but since the marginal impacts are actually marginal values in the interval regression, its coefficients can be interpreted as in an *OLS* regression. The estimation results of *OLS*, ordered logit and probit models are shown in Table 4.1.

Since the survey choice for *WPBC* is composed of several interval ranges, and interval regression can give the most intuitive explanation of the data estimation, we utilize interval regression model for this study.

## 4.2. Interval Regression

In order to analyze customers' willingness to pay (*WTP*) for safer baby cheese and the effective factors for their preference, interval regression is utilized as the econometric model to deal with the interval ranges of the independent variable. As shown in Figure 4.1, since the independent variable is with a positive-infinity right censoring, and a negative-infinity left censoring where 50% of respondents chose to pay zero or less than a zero premium, normality is assumed for the interval regression. The econometrics specification is as follows:

$$y_i^* = x_i' \beta + \mu_i, \quad (1)$$

$$\Pr[a_j \leq y^* \leq a_{j+1}] = \Pr[y^* \leq a_{j+1}] - \Pr[y^* \leq a_j] = F^*(a_{j+1}) - F^*(a_j) \quad (2)$$

$y_i$  is respondents' WTPs for safer baby cheese located within one of the mutually exclusive intervals, while  $y^* \leq 0$ ,  $0 < y^* \leq 0.99$ , ...,  $5 < y^* \leq 6.99$  (in RMB) represents the values inside of the intervals such as  $(-\infty, a_1]$ ,  $(a_1, a_2]$ , ...,  $(a_j, \infty)$ .  $x_i$  represents a set of independent variables which are the potential associated factors for the respondents' willingness to pay.  $\beta$  is the estimated coefficient of the interval regression model. Then, the WTP for safer baby cheese can be calculated by the following empirical specification:

$$WTP = y^* = \beta_0 + \sum_{i=1}^{11} \beta_i x_i \quad (3)$$

where

$x_1$  = Age of respondents (*Age*),

$x_2$  = Gender of respondents (*Gender*),

$x_3$  = Education background of respondents (*Edu*),

$x_4$  = Employment background of respondents (*RWB*),

$x_5$  = Family monthly income (*FMI*),

$x_6$  = Numbers of Bright Dairy safety incidents respondents had known (*NBDI*),

$x_7$  = Whether respondents have known about baby cheese safety incident (*KBCI*),

$x_8$  = Respondents' attitude for the safety of baby cheese (*SBC*),

$x_9$  = Purchasing frequency of any Bright Dairy product (*FreqBD*),

$x_{10}$  = Purchasing frequency of baby cheese (*FreqBC*), and

$x_{11}$  = Substitutes for baby cheese (*SubBC*).

Given Equation (3), the dependent variable represents the true monetary values. For example, RMB 1 to RMB 1.99 means a specific range of actual prices for willingness to pay. As we all know, the marginal impact is  $\partial WTP / \partial x$  (Cameron and Huppert 1991). Besides, the marginal impacts in the interval regression are actually the marginal values (Yang Shang-Ho et al. 2012). Therefore, after conducting this interval regression, the marginal impacts of explanatory variables can be estimated. The observed interval values do not give us the exact WTP, but the average value of WTP is still estimable, which means we can compute the average WTP for individuals or groups of the respondents.

### 4.3. Results

Our results show that what customers' willingness to pay (*WTP*) for safer baby cheese is and what the effective factors are in WTP. As shown in Table 4.2, four coefficients were estimated with consistent signs and significance levels: respondents' age (*Age*), their attitudes towards baby cheese safety (*SBC*), purchasing frequency of Bright Dairy's products (*FreqBC*), and potential substitutes for baby cheese (*SubBC*). However, with respect to gender (*Gender*), the education level (*Edu*), employment background (*RWB*), family monthly income (*FMI*), the

numbers of Bright Dairy safety incidents respondents had known about (*NBDI*), whether respondents know about baby cheese safety incident (*KBCI*), and purchasing frequency of baby cheese (*FreqBD*), the coefficients of these factors are statistically insignificant.

Coefficients of *Age* and *SubBC* are negative and statistically different from zero at the 5% significant level, respectively, while the coefficients of *SBC* and *FreqBD* are positive and statistically different from zero at the 1% and 5% significant levels.

The variable age (*Age*) has a negative sign, implying that the older respondents' WTP is RMB 0.5760 (USD 0.0944) less than that of the younger respondents. In China, the purchasing habit of the older generation is very different from that of the younger generation. The older generation prefers to buy cheaper and familiar commodities rather than relatively expensive and new commodities. Furthermore, this kind of buying attitude is hard to be changed in a short-term. Thus, this result may indicate that younger consumers may accept new products such as baby cheese much more easily than the older consumers and they are willing to pay more for them.

The respondents' attitude for baby cheese safety (*SBC*) has a positive effect for the willingness to pay. The baby cheese safety incident has impacted consumers' attitudes toward the safety of baby cheese. Negative sign of *SBC* reveals that when the other variables remain constant, those respondents' trustworthiness for the safety of baby cheese causes an increase in *WTP* by RMB 1.1093 (USD 0.1819).

In addition, the estimated coefficient for the purchasing frequency of Bright Dairy's baby cheese products (*FreqBC*) implies that respondents who have higher buying frequency of baby cheese are more willing to pay a modest premium of RMB 0.0259 (USD 0.0040) for safer baby cheese than those with less purchasing frequency. The higher frequency of purchasing Bright Dairy baby cheese may indicate that consumers have established a strong brand loyalty for

Bright Dairy's baby cheese, which results in a willingness to pay slightly more for the product.

The last significant variable "the potential substitutes for baby cheese" (*SubBC*) shows a negative effect on the WTP for safer baby cheese. If consumers have substitute products available in the market (like other native brands' or foreign brands' of baby cheese), they are willing to pay less RMB 0.6315 (USD 0.1035) for Bright Dairy's baby cheese. This result also reflects the fact that the respondents who are more likely to stay with Bright Dairy's product have a higher WTP than those who will change their brand preference. However, after baby cheese safety incident happened, consumers may choose to purchase another brand directly rather than pay more for safer baby cheese.

On the other hand, some important hypotheses suggested in other WTP research were not statistically significant, such as higher family monthly income level (*FMI*) and higher education level (*Edu*) of respondents who may have a higher willingness to pay for safer products. Even the family monthly income (*FMI*) has a positive sign for willingness to pay for safer baby cheese as expected, but its coefficient is insignificant. There are some explanations for these results. Specifically, the sample utilized in the study is not exactly a random sample of consumers but chosen from a purposeful sample of a special group of people. The respondents are mostly parents who send their children to two similar nursery schools in Shanghai. Thus, these parents probably have a similar family economic condition and educational level. As shown in the Appendix 2, the means of the education and income variables indicates that 73.56% of respondents have a college education and 48.28% of respondents belong to the RMB 5000-10000 family monthly income range. Thus, variables *Edu* and *FMI* are not statistically significant.

Also, related employment background (*RWB*), purchasing frequency of Bright Dairy's



products (*FreqBD*) are insignificant, but the coefficients have a positive sign as expected.

Numbers of knowing Bright Dairy's safety incidents (*NBDI*) and knowledge about baby cheese safety incident (*KBCI*) are insignificant in this case. As noted in Barker and Burnham (2001), consumers' behavior is determined less by how much consumers know, and more by what they believe. Thus, even the sample of parents who know about the Bright Dairy safety incidents and baby cheese safety case in different levels, their WTP are not significantly determined by their knowledge of the incidents but more by their attitudes for the baby cheese safety (*SBC*).

Lastly, the average willingness to pay (*WTP*) can be calculated by adding each significant variable's coefficient times their average mean values as shown in equation (3). As we know, the average means for *Age*, *SBC*, *FreqBC*, and *SubBC* are 2.12, 2.24, 1.73, and 2.00, respectively. Their estimated coefficient values are -0.5760, 1.1093, 0.0259, and -0.6315, respectively. Thus, *WTP* for safer baby cheese is RMB 1.82/92g (USD 0.30/92g). When comparing the estimated WTP premium to the retail price of RMB 11/92g at the time of the survey, consumers in this Shanghai region are willing to pay a 16.54 % premium for the safer baby cheese.

#### 4.4. Discussion

This study investigated Shanghai consumers' willingness to pay for safer Bright Dairy's baby cheese using survey questionnaire data collected at two nursery schools in Shanghai, China. In response to the initial question of "How much do you want to pay for safer baby cheese above the retail price of RMB 11/92g", 87 respondents of 50 % of the total of 174 respondents indicate that they are willing to pay some additional amount for safer baby cheese above the retail price of RMB 11/92g, while others do not want to pay a premium price for safer baby cheese. The respondents' data were further analyzed by the interval regression model. The estimated WTP premium for consumers in Shanghai for safer baby cheese is 16.54% or RMB 1.82/92g. This is

calculated by adding the intercept value with the significant variables' coefficient times their average means as shown in equation (3).

Regression results shows that respondents' age (*Age*), attitude towards baby cheese's safety (*SBC*), purchasing frequency of Bright Dairy's baby cheese (*FreqBC*), and their potential choices of substitutes for baby cheese (*SubBC*) have significant impacts on their willingness to pay for safer baby cheese. However, factors such as gender (*Gender*), the education level (*Edu*), employment background (*RWB*), family monthly income (*FMI*), numbers of Bright Dairy safety incidents respondents had known about (*NBDI*), respondents' knowledge about baby cheese safety incident (*KBCI*), and purchasing frequency of Bright Dairy's products (*FreqBD*) were insignificant.

In terms of the variables with significant coefficients, *Age* reveals that younger consumers have higher WTP than older consumers. The positive sign *SBC* implies that when concern for baby cheese's safety intensifies, the willingness to pay of safer baby cheese increase. *FreqBC* also has a positive impact on *WTP*, which shows that consumers who frequent purchase of Bright Dairy's baby cheese product are willing to pay a premium for safer baby cheese. The sign on the coefficient of *SubBC* indicates that consumers, when asked about "if you do not want to purchase the baby cheese, what substitutes would you choose" have a lower willingness to pay than those who may turn to other native brands or foreign brands. Nevertheless, as a well-known big company with a large portion of loyal consumers, the Bright Dairy should attach importance to protect its brand value by enhancing its quality control and food safety oversight.

Liu, Zeng, and Yu (2009) found somewhat different results in their study of consumers' willingness to pay for food safety with regard to food additives in moon cakes, traditional pastries consumed during the mid-Autumn Festival, in Beijing. In their study, Liu, Zeng, and Yu

found that income, age, consumers' cognition of food safety, and supermarket size where moon cakes are purchased were statistically significant. They also found that consumers' cognition (knowing) of food safety incidents had a positive impact on of WTP while this study of Shanghai consumers' knowledge of food safety incidents involving Bright Dairy products or baby cheese were not statistically significant. In this study, consumers' knowledge about baby cheese incidents was limited to "knowing a little about baby cheese safety incidents." However, consumers' attitude toward baby cheese safety in Shanghai was positive and statistically significant with regard to their willingness to pay for safer food.

There were some additional similarities and differences in these WTP studies. Income was positively correlated with consumers WTP for safer food in the Beijing study (Liu, Zeng and Yu 2009) but not in this study of Shanghai consumers. Age was a significant factor in WTP in both studies but the signs of the coefficients were opposite. Education was not significant in either study of Chinese WTP for food safety. However, the results of these studies and others indicate that consumers' concern about food safety is relatively high in China and therefore the benefits of tighter food safety regulation are relatively high.

In China, ensuring food safety is still a very serious issue for both the government and companies. Shanghai consumers' WTP for safer baby cheese may carry over to consumers' general reaction and attitude in many other urban regions in China. Even the premium percentage of the WTP for safer baby cheese (16.54%) is not extremely high, but it still gives a positive market signal and incentive. There may be several reasons for the positive outcome. The most important causes could be the rapid economic development in China, which makes consumers richer and willing to spend their income on safer food. Consumers have had a strong desire to purchase better, healthier, and safer foods. Thus, they are willing to pay more for higher

quality and safer foods because of the series of food safety incidents which injured children's health.

Table 4.1. Results for OLS, Ordered Logit, and Ordered Probit Models

Variable	OLS Coefficients	Ordered Logit Coefficients	Ordered Probit Coefficients
<i>Age</i> (Age of respondents)	-0.2463* (0.1260)	-0.6260*** (0.2411)	-0.3742*** (0.1370)
<i>Gender</i> (Gender of respondents)	-0.1311 (0.2009)	-0.6439* (0.3583)	-0.3825* (0.2043)
<i>Edu</i> (Education Background)	-0.0879 (0.1783)	-0.1817 (0.3047)	-0.0907 (0.1764)
<i>RWB</i> (Employment Background)	0.2683 (0.2658)	0.5014 (0.4277)	0.2414 (0.2481)
<i>FMI</i> (Family Monthly Income)	0.1272 (0.1100)	0.0673 (0.1865)	0.0692 (0.1072)
<i>NBDI</i> (Numbers of knowing BD incidents)	0.0479 (0.6587)	0.0478 (0.1144)	0.0399 (0.0650)
<i>KBCI</i> (Whether know BC safety incidents)	0.0918 (0.1579)	0.1582 (0.2708)	0.1102 (0.1550)
<i>SBC</i> (Attitude for BC safety)	0.5204*** (0.1742)	1.4575*** (0.3159)	0.7965*** (0.1763)
<i>FreqBD</i> (Purchasing frequency of BD)	-0.0291 (0.1091)	0.2087 (0.1900)	0.0516 (0.1089)
<i>FreqBC</i> (Purchasing frequency of BC)	0.1880* (0.1083)	0.3619* (0.1777)	0.2184** (0.1017)
<i>SubBC</i> (Substitutes for BC)	-0.1559 (0.1140)	-0.5025** (0.2001)	-0.2356** (0.1142)
Intercept	0.9539 (0.8164)	Not reported	Not reported

Note: \*, \*\*, \*\*\*denote 10%, 5%, and 1% significance, respectively (n=174);  
BD stands for Bright Dairy; BC stands for Bright Dairy's baby cheese.

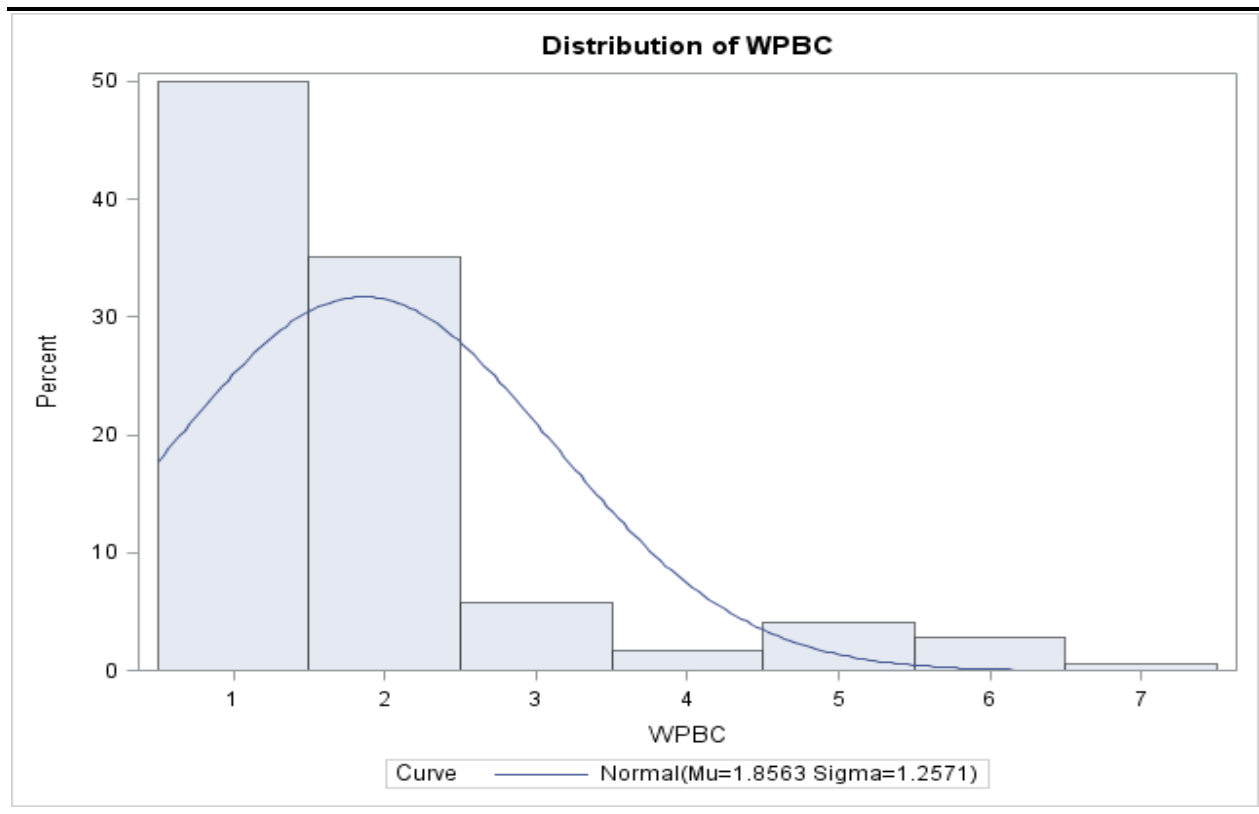
Table 4.2. Interval Regression Results of Shanghai Consumers' WTP for Safer baby cheese (Normal Distribution Assumption)

Maximum Likelihood Parameter Estimates		
Parameter	Estimate	Standard Error
Intercept	1.7782	1.3351
<i>Age</i> (Age of respondents)	-0.5760**	0.2338
<i>Gender</i> (Gender of respondents)	-0.5107	0.3378
<i>Edu</i> (Education Background)	-0.1691	0.2840
<i>RWB</i> ( Employment Background)	0.3717	0.4114
<i>FMI</i> (Family Monthly Income)	0.1609	0.1733
<i>NBDI</i> (Numbers of knowing BD incidents)	0.2865	0.1066
<i>KBCI</i> (Whether know BC safety incidents)	0.6911	0.2544
<i>SBC</i> (Attitude for BC safety)	1.1093***	0.2897
<i>FreqBD</i> (Purchasing frequency of BD)	0.0998	0.1812
<i>FreqBC</i> (Purchasing frequency of BC)	0.0259**	0.1682
<i>SubBC</i> (Substitutes for BC)	-0.6315**	0.1903

Note: Standard errors are reported in parentheses;

\*, \*\*, \*\*\*denote 10%, 5%, and 1% significance, respectively (n=174);

BD stands for Bright Dairy; BC stands for Bright Dairy's baby cheese.



Note: n=174

Figure 4.1. Distribution of the Independent Variable *WPBC*

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APPENDIX 1

Dairy safety Questionnaire

Name \_\_\_\_\_ Date \_\_\_\_\_

*(For each question, please circle the best answer)*

**DAIRY SAFETY QUESTIONS**

1. What's your opinion on the safety of the whole food market recently?

- A. very safe                      B. moderately safe                      C. unsafe                      D. unknown

2. Do you have knowledge on the Green Food Certification, No-pollution Food Certification, Organic Food Certification, HACCP, GAP, etc.?

- A. know well                      B. know a little                      C. unknown

3. Do you trust these food safety certifications?

- A. trust                      B. moderately trust                      C. not trust

4. In 2012, the media reported many dairy safety incidents of Bright Dairy. How many dairy safety incidents have you heard?

\_\_\_\_\_

5. What is your opinion on the safety of the baby cheese from Bright Dairy company?

- A. not trustworthy                      B. it depends on different period or different shopping venue  
C. moderately trustworthy                      D. very trustworthy

6. Have you heard about baby cheese dairy incident?

- A. know baby cheese safety incidents                      B. know a little about baby cheese safety incident  
C. unknown

7. What is the purchasing frequency of Bright Dairy's products for your household?

- A. rarely                      B. one time per week  
C. two or three times per week                      D. more than three times per week

8. Have you purchased Bright Dairy's baby cheese before?

- A. yes, I have                      B. no, I haven't

9. What is the purchasing frequency of Bright Dairy's baby cheese?

- A. rarely  
 C. several times per week
- B. one time per week  
 D. at least one time every day
10. What is your purchasing place for Bright Dairy's baby cheese usually?  
 A. from the supermarket  
 C. from the store
- B. through home delivery  
 D. uncertain
11. If you do not want to purchase baby cheese ever, what substitutes would you choose?  
 A. other Bright Dairy's products  
 C. foreign brands of cheese
- B. other native brands of cheese
12. Base on baby cheese's retail price (11RMB per 92g), how much above the retail price are you willing to pay for a better quality control and safe certified baby cheese per 92g?  
 A.  $\leq$  RMB 0  
 B. RMB 0 to 0.99  
 C. RMB 1 to 1.99  
 D. RMB 2 to 2.99  
 E. RMB 3 to 3.99  
 F. RMB 4 to 4.99  
 G.  $\geq$  RMB 5

### SOCIODEMOGRAPHIC QUESTIONS

1. Your gender is:  
 A. female                      B. male
2. Your age is:  
 A. less than 30              B. 30-39              C. 40-49              D. 50-59              E. equal or more than 60
3. How many people are currently living in your household, including yourself?  
 \_\_\_\_\_
4. How old is your child?  
 A. 3-4                      B. 4-5                      C. 5-6
5. What is the highest level of education you have completed?  
 A. 12th grade or less              B. high school graduate  
 C. college graduate              D. master's or doctorate degree
6. Have you had any employment experience working for agribusiness or the food safety regulation department?  
 A. yes                      B. no
7. What is your total combined monthly family income, from all sources including wages, public



assistance/benefits, help from relatives, alimony, and so on?

- A. less than 5000 RMB    B. 5000-10000 RMB    C. 10000-20000 RMB    D. more than 20000 RMB

*Thank You*

## APPENDIX 2

Table 1. Frequency and Percentage Results for the First Part of the Survey Questionnaire

Variable	Description	Frequency	Percent%	Frequency	Percent%	Frequency	Percent%
		n=318		n=174 <sup>a</sup>		n=144 <sup>b</sup>	
Attitude for the whole food market (Safey)	unsafe	129	40.57	66	37.93	63	43.75
	moderately safe	149	46.86	80	45.98	69	47.92
	very safe	6	1.89	4	2.3	2	1.39
	unknown	34	10.69	24	13.79	10	6.94
Knowledge of safety certificates (CertifK)	unknown	74	23.27	45	25.86	29	20.14
	know a little	235	73.9	123	70.69	112	77.78
	know well	9	2.83	6	3.45	3	2.08
Attitude for safety certificates (CertifT)	not trust	91	28.62	50	28.74	41	28.47
	moderately trust	211	66.35	117	67.24	94	65.28
	trust	16	5.03	7	4.02	9	6.25
Numbers of knowing BD incidents (NBDI)	none	129	40.57	66	37.93	63	43.75
	one	47	14.78	27	15.52	20	13.89
	two	82	25.79	47	27.01	35	24.31
	three	37	11.64	20	11.49	17	11.81
	four	5	1.57	1	0.57	4	2.78
	above four	18	5.66	13	7.47	5	3.47
Whether know BC safety incidents (KBCI)	know baby cheese safety incidents	43	13.52	27	15.52	16	11.11
	know a little about baby cheese safety incidents	162	50.94	88	50.57	74	51.39
	unknown	113	35.53	59	33.91	54	37.5
Attitude for BC safety (SBC)	not trustworthy	9	2.83	7	4.02	2	1.39
	it depends on different periods or shopping venues	219	68.87	121	69.54	98	68.06
	moderately trustworthy	86	27.04	43	24.71	43	29.86
	very trustworthy	4	1.26	3	1.72	1	0.69
Purchasing frequency of BD (FreqBD)	rarely	149	46.86	92	52.87	57	39.58
	one time per week	77	24.21	37	21.26	40	27.78

	two or three times per week	83	26.1	37	21.26	46	31.94
	more than three times per week	9	2.83	8	4.6	1	0.69
Purchasing place of BC (PlaceBC)	supermarket	248	77.99	137	78.74	111	77.08
	home delivery	15	4.72	10	5.75	5	3.47
	grocery store	12	3.77	11	6.32	1	0.69
	uncertain	43	13.52	16	9.2	27	18.75
Substitutes for BC (SubBC)	other products of Bright Dairy	111	34.91	60	34.48	51	35.42
	other native brands of cheese	110	34.59	54	31.03	56	38.89
	foreign brands of cheese	97	30.5	60	34.48	37	25.69
WTP for safer BC (WPBC)	less or equal to RMB 0/92g	159	50	87	50	72	50
	RMB 0 to 0.99 /92g	111	34.91	61	35.06	50	34.72
	RMB 1 to 1.99 /92g	19	5.97	10	5.75	9	6.25
	RMB 2 to 2.99 /92g	6	1.89	3	1.72	3	2.08
	RMB 3 to 3.99 /92g	8	2.52	7	4.02	1	0.69
	RMB 4 to 4.99 /92g	9	2.83	5	2.87	4	2.78
	equal or more than RMB 5 /92g	6	1.89	1	0.57	5	3.47
Purchasing frequency of BC (FreqBC)	rarely	50	15.72	50	28.74	-	-
	one time per week	90	28.30	90	51.72	-	-
	several times per week	25	7.86	25	14.37	-	-
	at least one time everyday	9	2.83	9	5.17	-	-
	never purchased before	144	45.28	0	0	-	-
Have You Purchased BC Before	yes	174	54.72	-	-	-	-
	no	144	45.28	-	-	-	-

Notes: BD stands for Bright Dairy; BC stands for Bright Dairy's baby cheese; WTP indicates willingness to pay for safer baby cheese;

<sup>a</sup> Respondents who purchased baby cheese; <sup>b</sup> Respondents who did not purchase baby cheese.

Table 2. Frequency and Percentage Results for the Second Part of the Survey Questionnaire

Variable	Description	Frequency	Percent%	Frequency	Percent%	Frequency	Percent%
		n=318		n=174 <sup>a</sup>		n=144 <sup>b</sup>	
Gender	female	215	67.61	117	67.24	98	68.06
	male	103	32.39	57	32.76	46	31.94
Age	under 30	43	13.52	19	10.92	24	16.67
	30-39	236	74.21	134	77.01	102	70.83
	40-49	22	6.92	10	5.75	12	8.33
	50-59	7	2.2	3	1.72	4	2.78
	above 59	10	3.14	8	4.6	2	1.39
Family Size (Fsize)	three	126	39.62	68	39.08	58	40.28
	four	47	14.78	24	13.79	23	15.97
	five	119	37.42	66	37.93	53	36.81
	six	19	5.97	12	6.9	7	4.86
	seven	6	1.89	4	2.3	2	1.39
	eight or above	1	0.31	0	0	1	0.69
Children's Age (Cage)	3-4	31	9.75	20	11.49	11	7.64
	4-5	124	38.99	68	39.08	56	38.89
	5-6	163	51.26	86	49.43	77	53.47
	12th grade or less	8	2.52	3	1.72	5	3.47
Education Background (Edu)	high school graduate	58	18.24	27	15.52	31	21.53
	college graduate	227	71.38	128	73.56	99	68.75
	above college	25	7.86	16	9.2	9	6.25
Employment Background (RWB)	yes	97	30.5	59	33.91	38	26.39
	no	221	53.46	115	53.45	106	73.61
Family Monthly Income (FMI)	less than RMB 5000	52	16.35	24	13.79	28	19.44
	RMB 5000-10000	154	48.43	84	48.28	70	48.61
	RMB 10000-20000	76	23.9	44	25.29	32	22.22
	more than RMB 20000	36	11.32	22	12.64	14	9.72

Notes: BD stands for Bright Diary; BC stands for Bright Diary's baby cheese; WTP indicates willingness to pay for safer baby cheese;

<sup>a</sup> Respondents who purchased baby cheese; <sup>b</sup> Respondents who did not purchase baby cheese.