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Willingness to Pay for Safer Dairy Product in China: Evidence from Shanghai Customers' Purchasing Decision of Bright Dairy's Baby Cheese

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Abstract

This study analyzes Shanghai customers' willingness to pay for safer Baby Cheese following a series of food safety incidents by a major Chinese manufacturer. Results from interval regressions of consumer survey responses indicate that consumers are willing to pay of 1.55 RMB(0.25$) or 14.0% premium for safer Baby Cheese.

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

JEL Classification: D12, Q13

Introduction

The dairy industry occupies an important position in the Chinese food sector. China's milk consumption was about 9.6 kg per person, accounting for 15.1% of global average per capita milk consumption in 2010 (China Dairy Yearbook, 2011). The national average annual expenditure of dairy products in urban China was RMB 68.57 ($8.60) per person in 2006, which grew to RMB 198.47 ($29.32) in 2010, an increase of 189% in four years. In Shanghai, the highest national dairy expenditure area, consumption expenditures far exceeded the national average, which was RMB 410.27 ($60.60) per person in 2010, an increase of 130% over 2006 (Table 1).

Since 2004, there have been several serious dairy safety incidents in China. In July 2008, several infants were diagnosed with kidney stones after consuming milk power produced by Sanlu Dairy & Food Co., Ltd. Melamine pollution has been detected in Sanlu Dairy's milk powder (Xinhua News, 2008). These dairy safety incidents created a heightened consumer awareness of food safety issues especially for dairy products. After the 2008 melamine poisoning milk crisis, dairy industry development and the social credibility of domestic dairy products (especially for infants and children) in China have fallen 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 (Dai Yingchun, 2006).

Most recently, Bright Dairy & Food Co., Ltd, another large dairy manufacture and seller in China, was involved in five food safety incidents in only four months from June to September 2012. Bright Dairy & Food Co., Ltd., a joint-stock company headquartered in Shanghai, is one of the biggest dairy manufacturers and sellers in China whose products include pasteurized milk,

fresh milk, yoghurt, UHT milk, milk powder, butter, cheese, and fruit juice. On June 15, 2012, six pupils from Anhui province started vomiting after drinking some Bright brand milk. On June 28, 2012, Bright Dairy had to recall its "problematic milk" and compensate customers. The cause of the problem was that alkaline water was accidentally mixed into its dairy products. Later on July 20, 2012, the Trade and Industry Bureau of Guangzhou city detected excessive amounts of bacterial colonies in Bright Dairy milk. 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 to found contain forbidden mineral salts.

After series of food safety incidents, the Chinese public believes the credibility of Bright Dairy brand, which means consumers are losing confidence in its products. Accordingly, this study focuses on how much Shanghai consumers are willing to pay for the safer dairy products, primarily Baby Cheese, and what factors impact their willingness to pay for safer cheese products.

Literature Review

An increasing number of empirical studies are focus on the willingness to pay (WTP) for several types of foods, the attribute labels (eco-labels, organic and GM free food labels, and fair-trade labels), as well as the ethical consumer behavior, which as defined by Doane (2001) is the purchase of a product that concerns a certain ethical issue like human rights, labor conditions, animal well-being, and the environment. For instance, consumers are willing to pay more for environmentally friendly products, which they perceive as beneficial to the environment, and are free from child labor, or certified as "fair trade" products. Consumers may decide to consider one or more ethical attributes when buying products (Pelsmacker, 2005).

There is a growing body of research on ethical consumer behavior. For example, the CRC-Commission (1998) found that American consumers agree with a price increase of 6.6% for green products, while French consumers were willing to pay 10%-25% more for apparel not made by children. Arnot et al. (2006) investigated consumers purchasing behavior with regard to fair trade coffee in Canada and found that buyers of fair trade coffee were much less price sensitive than those who bought conventional coffee. Menapace et al., (2011) analyzed consumers preferences for country of origin (COO) and protected designations of origin (PDO) olive oil and concluded consumers WTP varies with the oil's COO. Moreover, WTP is greater for regional geographical indicators than non-indicators from a given country.

Yang et al. (2012) also published a paper about the willingness to pay for fair-trade coffee in China. Their results showed that consumers in Wuhan City are willing to pay 22% more for fair trade labeled coffee than for traditional coffee. However, scholars also found that there is a so-called attitude-behavior gap for ethical consumption. MacGillivray (2000) concluded that most of the ethical labeling initiatives with respect to organic food, products free from child labor, and legally logged wood have market shares of less than 1%.

Several studies also tried to identify effective demographic characteristics for ethical behavior, such as the age, gender, education level, and income, that impact consumer willingness to pay behavior. Roberts (1995) indicated that people who did not buy the products that discriminated against minority groups or women were mainly women with a median age of 47 and slightly lower incomes but concluded that demographics were not very significant in identifying the socially responsible consumer. In addition, Dickson (2001) concluded that the age, income and employment status were not discriminating between socially conscious consumers who attach a lot of importance to no-sweat shop labels on apparel and those consumers who do

not. Idea Consult (2002) concluded that the Belgian fair-trade consumer is relatively highly educated and has a high income and social status. Besides, their personal values appear to play a role in fair-trade purchasing behavior. Devitiis et al., (2008) concluded that certain demographic characteristics, including younger age, female gender, higher education, and high income may be positively related to a higher WTP for fair trade coffee.

In China, research on consumer preferences and purchasing behavior on food safety focuses more on two main research dimensions. One is focus on the regulation of safe food market, and the other one is on the WTP for safe food (Dai, 2006). (Dai Yingchun, 2006). Yang Jinshen (2004), using survey data, concluded that consumers' age, gender, and family monthly income significantly affect the willingness to pay for pollution-free vegetables. The two factors which influence consumer purchasing decisions for pollution-free products are their relatively higher price and vegetable quality. Zhou Jiehong (2005) found that the younger the consumers are, the stronger their willingness to buy safer vegetables. Furthermore, married people were more motivated to buy safer vegetables than single people. As the education level of consumers rises, the consumers are more willing to purchase safer vegetables. Liu Jundi (2009) used survey data and CVM research methods to study the situation of consumer preference for safe food in China. Liu concluded that consumers were still in a very low level of WTP for safe food right now. Enhancing market information and government regulation for food market might be the rational approach to develop and improve a safer food market.

Several research methodologies have been utilized to analyze the consumer preference and behavior for food safety, e.g. experimental markets, consumer choice models, conjoint analyses, CVMs, and interval regression (Zhou and Peng, 2005).

Baker and Burnham (2001) used the consumer choice model to determine U.S. consumer response to genetically modified food. The hypothetical product used in this study was a box of corn flakes and the attributes evaluated included brand, price, and source of corn. Result from the logit model showed the level of risk aversion, knowledge about genetic modification, and opinion about genetic modification are highly significant. Pelsmacker et al. (2005) utilized the conjoint analysis to study consumer willingness to pay for fair-trade coffee. They found the average price premium that the consumers were willingness to pay for the fair-trade label was 10%. Zhou and Peng (2005) studied the WTP for food safety in China based on the method CVM. They chose Nanjing City and Suzhou City in Jiangsu Province as their survey location and vegetables as their study object. They demonstrated that people in these areas were willing to pay 335% for low residual vegetable, which was a surprising result. Researchers have used auction experiments to examine the demand relationships and willingness to pay for rBST-free milk (Bernard et al., 2009). Their two-stage heteroskedastic tobit model demonstrated that WTP premiums for the varieties differ significantly by demographics and beliefs regarding conventional products. The market segments for the rBST-free and antibiotic-free products could succeed alongside organic, benefiting consumers and producers. Jeffcoat et al. (2012) utilized interval regression to analyze Kentucky famers' willingness to pay for broadband access. Varying WTP scenarios were modeled based on the corresponding socioeconomic demographics of each farmer category. Their results suggest producers who were younger, cultivated larger farms, and those who already use the Internet but do not have broadband access, were WTP more in property taxes to support broadband infrastructure than other farmers.

Results from the above studies show there still lack of specialized the research topic on consumers' WTP for safe food after the effect of safety incidents in China. Our research focuses

on finding the average WTP for safer Baby Cheese products in the Shanghai after a continual series of dairy safety incidents have happened. We chose Shanghai city because it is not only where the Bright Dairy company is headquartered but also the largest dairy consumption area in China.

Data

The data used in this analysis were collected by a face-to-face survey in Shanghai, China, administered at two large nursery schools. A total number of 318 parents completed the survey from January to March 2013. Surveys were conducted on different days of the week and different times of the day to reduce sampling bias. We deleted those who had never purchased any Baby Cheese before, which left 174 respondents' data available for our analysis.

Data in Table 2 indicates that most respondents are females, who are around 30-39 years old, have as many as four family members, and a 4 to 5-year-old child. Not surprisingly, these respondents are mostly young parents. Furthermore, the majority of these respondents have attended college, and their family's monthly income is around 5,000 RMB to 10,000 RMB ($900 to $1700). These results show that the respondents are highly educated and relatively well-off economically in China.

In terms of purchasing attitude and safety recognition, a large number of the respondents think foods are generally safe, which shows that people are still confident in their food safety situation. When it comes to certification knowledge, data show that respondents knew a little about safety certifications, while the variable CertifT shows that they trust the certifications at some level. The average consumer is aware of Bright Dairy safety incidents and most respondents know something about its Baby Cheese safety situation.

As for the frequency of purchasing behavior, the mean of FreqBD is 1.85 which indicates the frequency that consumers purchase cheese mostly "2 or 3 times per week," while the mean of other Bright Dairy product frequency is about "one time per week." The majority of the respondents buy their Baby Cheese in the supermarket, which gives information about the Baby Cheese's main selling channel. After the series of safety incidents, respondents indicate that they may choose another domestic Chinese brand of Baby Cheese as a substitute for the Bright Dairy's Baby Cheese.

In terms purchasing preference for the safer Baby Cheese, the key variable in this analysis is the WPBC which stands for the WTP for safer Baby Cheese. For the WPBC, the mean is 1.89, which means that most of the respondents indicated a WTP for safer Baby Cheese around 0 to 0.99 RMB. Then, we can assume that the consumers have a tendency to pay a premium for the safer Baby Cheese. In order to examine our hypothesis, we will compute the exact WTP and premium through the interval regression model.

Methodology

In order to analyze customers' willingness to pay for safer Baby Cheese and the effective factors for their purchasing preference, interval regression is utilized as the econometric model. The econometrics specification is as follows:

$$y_i^* = x_i'\beta + \mu_i \,, \tag{1}$$

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

y_i is respondents' WTPs for safer Baby Cheese located within one of the mutually exclusive intervals, while $y^* \le 0$, $0 < y^* \le 0.99, \dots, 5 < y^* \le 6.99$ (in RMB) represents for the values inside of the intervals such as $(-\infty, a_1], (a_1, a_2], \dots, (a_j, \infty)$. x_i is a set of independent variables which are the potential effective factors for WTP. β is the estimated coefficient of this model.

The WTP for safer Baby Cheese could be calculated by the following empirical specification:

$$\text{WTP} = y^* = \beta_0 + \sum_{i=1}^{11} \beta_i x_i + \epsilon \tag{3}$$

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).

Except for FMI and NBDI, which are continuous variables, all others are discrete variables. After conducting this interval regression, the marginal impacts of explanatory variables can be estimated. Following Cameron and Huppert (1991), the marginal impact is $\partial \text{WTP} / \partial x_i$. Given Equation (3), the dependent variable represents the true monetary values. For example, 1 RMB to 1.99 RMB means a specific range of actual prices for willingness to pay. Given this nature, the marginal impacts in the interval regression are actually marginal values and can be interpreted similarly as in an OLS model (Yang Shang-Ho, 2012). Although the

observed interval data do not show the exact WTP for anyone, the average increase or decrease in WTP is still estimable, and we can compute the average WTP for individual or groups of consumers.

Our results indicate what customers' willingness to pay (WTP) for safer Baby Cheese is and what the effective factors are in WTP. As shown in Table 3, all but four coefficients were estimated with consistent signs and significance levels: age, SBC, FreqBD, and SubBC. Age and SBC coefficients are negative and statistically different from zero at the 1% significant level, while the FreqBD and SubBC are statistically different from zero at the 5% significant level and negative as well.

Specifically, in the interval regression model, the variable age was statistically different from zero at the 1% significance level. It has a negative sign, implying that the older respondents' WTP is 0.3323RMB *($0.054U.S.) less than that of the younger respondents. This may be because younger consumers can accept the potential improved or new products much easier than the older consumers. Or that older consumers do not have children in the household who may be impacted. Besides, SBC is statistically different from zero at the 1% significance level and has a positive sign. Thus, its influence is positive for the willingness to pay. It indicates that when the other variables remaining are unchanged, every additional level of trustworthy for Baby Cheese's safety (SBC) causes an increase in WTP by 0.8031RMB ($0.132 U.S.).

In addition, the estimated coefficient for FreqBD shows that the respondents are willing to pay 0.0998 RMB ($0.016 U.S.) more for safer Baby Cheese by adding their purchasing frequency for Bright Dairy's products. Though the last important variable SubBC implies a negative impact on the WTP for safer Baby Cheese, it still gives us information that the respondents who are more likely to stay with Bright Dairy's product have a lower WTP than

those who will change their brand preference. After the safety incidents happened, most of consumers chose turning toward another brand directly rather than paying more for potential safer Baby Cheese. On the other hand, the result from the interval regression did not support hypotheses that some consumers will have higher WTP for safer Baby Cheese, such as consumers with higher family monthly income, higher education levels, employment background, or more buying frequency.

The average WTP can be calculated by adding intercept with each significant variable's coefficient times their average mean values as shown in equation (3). As we already know, the intercept estimated value is 0.8528. The average means for Age, SBC, FreqBD, and SubBC are 2.07, 2.19, 1.57, and1.96, respectively, while their estimated coefficient values are -0.3323, 0.8031, 0.0998, and -0.2711, respectively. Thus, the average WTP for safer Baby Cheese should be 1.55 RMB/92g ($0.25). When comparing the recent retail price of 11 RMB/92g, to the estimated value, consumers in this Shanghai region are willing to pay a 14.0% premium for the safer Baby Cheese.

Conclusion

This study investigated Shanghai consumers' willingness to pay for safer Bright Dairy's Baby Cheese and the effective factors for their purchasing preference using survey questionnaire data collected at two nursery schools in Shanghai, China. The responses to the initial question "what is your general willingness to pay for safer Baby Cheese" results indicate that consumers are willing to show their appreciation of safer Baby Cheese through their stated WTP. Statistically, about 93 respondents (53.45% of total 174 respondents) would be willing to pay some additional amount for safer Baby Cheese above the retail price of 11 RMB/92g, while there are 81 respondents (46.55% of total 174 respondents) who do not want to pay any more than the

retail price of Baby Cheese. Then, data were further analyzed by the interval regression model. The average WTP premium for consumers in Shanghai for safer Baby Cheese is 14.0% or 1.55 RMB. This is calculated by adding the constant value with the significant variables' coefficient times their average means as shown in equation (3).

In terms of factors influencing respondents' WTP, regression results indicate that primarily, consumers age (Age), attitude for Baby Cheese's safety (SBC), purchasing frequency of Bright Dairy's products (FreqBD), and their potential choices of substitutes (SubBC) have significant impacts on their willingness to pay for safer Baby Cheese. Specifically, the Age variable reveals that younger consumers have higher WTP than older consumers. The SBC implies that when concern for Baby Cheese's safety intensifies, the WTP increases as well. FreqBD shows that consumers purchasing frequency for Bright Dairy's products have positive impacts on the WTP. SubBC indicates that consumers who tend to stay with Bright Dairy's product have a lower WTP than those who change their brand preference. Nevertheless, the results demonstrate that consumers in Shanghai are losing loyalty for the Bright Dairy company even it has been a trusted brand for a long time. This leads to the conclusion that the company should protect its brand value by enhancing its quality control and food safety.

In China, ensuring food safety is still a very serious and concerning issue for the government and consumers. Shanghai consumers' WTP for safer Baby Cheese may carry over to consumers' general attitude in many other regions in China. There might be several reasons for this outcome. The most important causes could be the rapid economic development in China, which makes consumers richer and want to spend their income on safer food. Because of the series of food safety incidents which injured children's health, consumers have had a strong

desire to see better, healthier, and safer foods. Thus, they are willing to pay more for higher quality and safer foods.

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Table 1. Average Annual Dairy Consumption Expenditure in China

Indicators	Unit	2006	2007	2008	2009	2010
National urban average dairy expenditure	1 RMB[a]	68.57	138.62	189.84	196.14	198.47
Beijing urban average dairy expenditure	1 RMB[a]	178.33	270.43	332.13	341.88	371.04
Shanghai urban average dairy expenditure	1 RMB[a]	200.9	246.88	341.69	361.73	410.27
Guangdong urban average dairy expenditure	1 RMB[a]	65.18	134.49	207.5	220.52	211.35

[a]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.

Table 2. Summary Statistics and Variable Definition(n=1 174)

Variable	Description	Mean	Std.	Min	Max
Gender	0=female ; 1=male	0.32	0.47	0	1
Age	1= age < 30; 2=age 30 to 39; ...; 5=age > 60	2.07	0.76	1	5
Family Size (Fsize)	Number of family members	4.17	1.09	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	2.41	0.66	1	3
Education Background (Edu)	1= under middle school level; 2=High school level; 3=college level; 4=above college level	2.85	0.58	1	4
Employment Background (RWB)	0=No; 1=Yes	0.13	0.34	0	1
Family Monthly Income (FMI)	1=FMI <5000RMB; 2= FMI from 5000 to 10000RMB; 3= FMI from 10000 to 20000RMB; 4=FMI >20,000RMB	2.31	0.88	1	4
Attitude for the whole food market (Safety)	1= very safe; 2= moderately safe; 3=Unsafe; 4= Do not know	1.44	0.53	1	4
Knowledge of safety certificates (CertifK)	1= know safety certifications well; 2= know a little; 3=unknown	2.2	0.47	1	3
Attitude for safety certificates (CertifT)	1=Trust safety certifications well; 2=Trust a little; 3=unknown	2.27	0.55	1	3
Numbers of knowing BD incidents (NBDI)	Number of BD incidents the respondents have heard	1.4	1.55	0	6
Attitude for BD safety (SBC)	1= not trustworthy； 2= it depends; 3=moderately trustworthy; 4=very trustworthy	2.19	0.53	1	4
Whether know BC safety incidents (KBCI)	1=know BC safety incidents; 2= know a little about BC safety incident; 3= do not known	2.22	0.67	1	3
Purchasing frequency of BD (FreqBD)	1= one time per week； 2= two or three times per week; 3=More than 3times per week	1.57	0.91	1	3
Purchasing frequency of BC (FreqBC)	1= Rarely； 2= one time a week; 3= Several times per week; 4= at least one time every day	2.08	1.09	1	4
Purchasing place of BC (PlaceBC)	1=buy BC in the supermarket; 2=home delivery milk...; 4=uncertain	1.05	1.35	1	4
Substitutes for BC (SubBC)	1= Other Bright Dairy's products; 2= Other native brands Cheese; 3=foreign brands Cheese	1.96	0.81	1	3
WTP for safer BC (WPBC)	1= 0RMB; 2= 0 to 0.99 RMB;...; 7= 5 to 6.99RMB	1.89	1.34	1	7

Notes: BD stands for Bright Diary; BC stands for Bright Diary Baby Cheese

Table 3. Interval Regression Results of Shanghai Consumers' WTP for Safer Baby Cheese

Maximum Likelihood Parameter Estimates		
Parameter	Estimate	Standard Error
Intercept	0.8528***	0.9898
Age (Age of respondents)	-0.3323***	0.1388
Gender (Gender of respondents)	-0.3080	0.2242
Edu (Education Background)	-0.1175	0.1882
RWB (Employment Background)	0.3307	0.2937
FMI (Family Monthly Income)	0.0537	0.1170
NBDI (Numbers of knowing BD incidents)	0.0326	0.0733
KBCI (whether know BC safety incidents)	0.0879	0.1710
SBC (Attitude for BD safety)	0.8031***	0.1846
FreqBD (Purchasing frequency of BD)	0.0998**	0.1204
FreqBC (Purchasing frequency of BC)	-0.2124	0.1183
SubBC (Substitutes for BC)	-0.2711**	0.1244
Scale	0.6806	0.0536
Log Likelihood		-212.806
Squared multiple correlation between lwtp and the predicted value		0.2181
Squared multiple correlation between uwtp and the predicted value		0.1164

Note: Standard errors are reported in parentheses.
*, **, ***denote 10%, 5%, and 1% significance, specifically (n=174).