Chinese consumers' preference for selected food safety attributes of milk powders

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Abstract

A series of milk safety scandals have occurred in China since the early 2000s that not only led to thousands of consumers falling ill, but also caused the deaths of infants. The milk scandals scared many consumers in mainland China away from domestic dairy products. Foreign branded dairy products, especially baby formulas, have become increasingly popular in China. Current little research has been dedicated to analyzing Chinese consumers' preference for selected milk powder attributes such as "Hazard Analysis and Critical Control Point (HACCP)" and "Organic." This study utilized an in-person interview of 1,404 respondents across 18 different locations in the Chinese cities of Beijing and Zhengzhou to study Chinese consumers' preference for "Traceability", "Direct Ownership of Farms", "Country-of-origins", "Farming Method (Organic vs. Conventional)" and "Safety Production Standards (Hazard Analysis and Critical Control Points). A Mixed Logit Model was used to estimate consumers' preference and willingness to pay for milk powder safety attributes. The research revealed that 64% Chinese consumers believe imported milk powders are safer than domestic milk powders. Consumers are willing to pay more milk powders with "Traceability" and "Direct ownership of farm" attributes. Consumers with better education and full-time employment are more likely to pay attention to the "Traceability" and "Direct ownership of farm" attributes of milk powder.

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Chapter 1: Introduction and Background

1.1 China's Milk Safety Scandals

China's rapid growth and development is often described by economists as one of the economic success stories of modern times. But it still faces setbacks and challenges. A series of milk safety melamine scandals have occurred in China since the early 2000s that not only led to thousands of consumers falling ill, but also caused the deaths of infants (Xin and Stone 2008). As a result, the image of Chinese food in both foreign and domestic markets has suffered. Many countries have been rejecting a big portion of all imported food products from China. Calvin et al (2006) mentioned that Chinese food export dropped significantly after failing to meet the international safety standards of seafood, vegetables and poultry. Furthermore, a majority of Chinese consumers report being anxious about the quality of their daily food and foreign consumers' confidence in imported food from China has decreased significantly due to the scandals (Xia and Zeng 2006; Qiao, Guo and Klein 2012).

Berges and Casellas (2009) mentioned that dairy products are more easily contaminated. Approximately 300,000 kids became ill because of contaminated melamine dairy products in 2008 (BBC News 2010). The consumption of milk products is largely influenced by its brand name (Reshanov 2013; Fuller and Huang 2006; Ma and Razelle 2006). Unfortunately, the milk scandals in China involved some leading brands: Mengniu, Yili, and Sanlu. For example, aflatoxin, a toxin that can cause liver disease, was found in Mengniu products in May 2011. The amount of this toxin in the dairy products was 140%

higher than the safety standard (Fang and Lin 2011). Six months after that, China's biggest dairy company by revenue, Yili Group, was also involved in a dairy scandal due to a large amount of mercury being found in its milk products (BBC News 2010).

Currently, the major producing areas of Heilongjiang, Inner Mongolia, Shandong, Hebei and Xinjiang province account for about seventy percent of dairy production in China (Xu 2015). Chinese dairy production is dominated by relatively smaller scale producers. China's dairy consumption has increased greatly, averaging 13% annual growth rate since 2000 and it encouraged by Chinese authorities and nutritional experts (Sharma 2014). However, Chinese dairy consumption is still one of the lowest in the world. Review and Outlook of China's Dairy Industry (2012) states that China is a big importer in the global dairy market, the amount of imported dairy products doubled from 1996 to 2010, reaching over US$1.9 billion in 2010. The Chinese raw milk price is non-competitive because other milk producers in the world markets are better quality and less expensive. The top three suppliers, Australia, New Zealand and Germany, occupied about 83% of the total fluid milk imports in 2012 and they are expected to occupy at least as big share in the future (Scott and Zhang 2012; Beijing Orient Agribusiness Consultants Limited, 2012; Agriculture and Agri-Food Canada, 2012).

Food safety standards, as both a trade policy and public health issue, have become increasingly important in developing countries. Dairy safety attributes, as factors contributing to brand equity, can be used as a differentiating attribute when marketing food products. A Chinese consumer surveys reveal that food safety is ranked among major concerns in the domestic food market, and that individuals are willing to pay price

premiums of around 5.2% of the purchase price for safety improvement (Wang, Mao and Gale 2008).

1.2 Milk Quality

According to USDA, milk quality depends on the following factors: Nutritional value of milk, such as the amount of fat, protein, lactose and minerals; microbial count and somatic cell counts, which can determine the load of heat-resistant enzymes in milk; the hygiene of milk, which means that milk from cows are checked whether normal for consumption. More than that, absence of antibiotics, the health of the cows, the cleanness equipment used, proper cleaning and collection during milking is important as well. Next, the safe transportation of the milk is also important to minimize contamination (Chirlaque 2011).

1.3 Milk Consumption in China

Historically, fluid milk was perceived by the general population as a luxury nutrition supplement and was provided primarily to the elderly and infants (Fuller et al 2006). The results from Xu, Zhang, and Motamed (2010) suggest that the forward growth in milk powder consumption in China is likely to continue well into the future, as the growth in nutrition concerns, access to modern food retailers and household incomes rise.

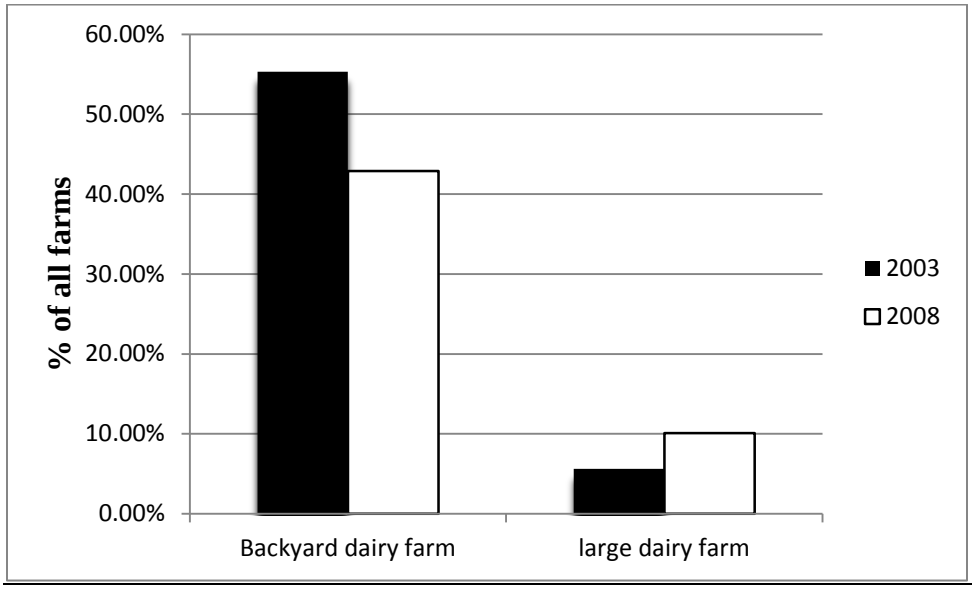
Besides those factors, the Chinese government played an important role in boosting milk consumption. For example, the school milk programs starting from 2000 have greatly increased the milk consumption in urban areas. Furthermore, a project called "2nd Hope Project" highlighted the idea that milk products should cover kids in both poor and rich

regions (Niu 2005) and this project contributed to the supplement of fresh milk to the children in relatively undeveloped regions of China (FAO 2005).

1.4 China's Dairy Sector Development

One key trend of China's dairy sector development is that its dairy cow numbers and dairy processing capacity have increased dramatically. Ma et al (2011), the National Development and Reform Commission categorized dairy farms into different levels, such as large dairy farms (>500 herd), medium dairy farms (50<head≤ 500), small dairy farms (10<head≤50) and backyard dairy farms (≤10 head). Looking at Figure 1, while the number of backyard dairy farms has significantly dropped from 55.3% (2003) to 42.9% (2008), the number of large dairy farms has dramatically increased from 5.6% (2003) to 10.1% (2008). Meanwhile, Chinese dairy cow numbers and processing capacity have dramatically increased in order to meet the increased demand of dairy products. The total dairy cow numbers have jumped from 8.93 million to 12.33 million between 2003 and 2008. Correspondingly, the investment in the dairy processing sector has increased from 450.96 RMB (the official currency of China) to 932.56 RMB during the same period. As a consequence, total processed milk powder production jumped from 1.14 million metric tons to 2.85 million metric tons during those five years (Ma et al. 2011).

Figure 1. Percentage of backyard dairy farms and large dairy farm numbers



1.5 Importance of Third Party Certification

Many safety problems in China have arisen because of asymmetric information, which means the person selling or producing the food has better information about the quality and safety of the food products than do the consumers. In other words, producers have information about the products that consumers do not have (Mansfield 1997).

Providing customers with sufficient information may be too costly for producers; at the same time, customers cannot afford the time and money for finding all the information related to the products. In the case of dairy products, information on some quality traits such as healthy and production processing aspects cannot be obtained by consumers even after consuming the products unless a third party spends time and effort to convey that information to the consumers. So third party certification such as HACCP certification and

can play an important role in discovering information on credence attributes, and reducing the information gap between producers and consumers (Mansfield 1997).

1.6 Structural Contrasts of the Canadian, United States' and Chinese Dairy Industry

In Canada, the dairy industry operates within a supply management system. The Canadian Dairy Commission (CDC) plays a central role in monitoring, managing national milk supply and production, and setting the price of milk annually. It also determines the amount of quota. The Provincial Dairy Farms Organizations in each province can get quota from CDC and give quotas to dairy farms. If there is more quota, the CDC will give them to different dairy farms. In Canada, the milk marketing boards in each province behave like intermediaries because milk processing companies can only get raw milk from its milk marketing boards. For example, in Manitoba, Dairy Farmers of Manitoba which represent the interests of local farmers at national and provincial level, manages the supply of local mike, picks up the milk from Manitoba farms, and sells them to milk processors and scheduling its transportation. While Chinese and American farmers face inexplicable and unexpected market fluctuations, Canadian farmers are paid stable and constant prices with supply management system (Charlebois et al 2007).

In the U.S., dairy farms sell their raw milk directly to the dairy processors who do not have their own farms. Unlike Canada, dairy organizations in the U.S. do not set quotas and do not control supply. In both the U.S. and Canada, milk processing companies also follow strict regulations for dairy packaging, equipment sanitation, pasteurization and labeling. Canadian Food Inspection Agency (in Canada) and USDA Food Safety and Inspection

Service (in the United States) set and control regulations for dairy products. Besides the government regulations, many dairy processing plants have voluntarily adopted the Hazard Analysis and Critical Control Point System (HACCP) to further ensure the safety of their systems and equipment (McGraw 2014).

In China, some large-sized dairy farms belong to milk processing companies, while some small dairy farms that only own a few cows operate independently from dairy processors and sell their milk to indirect milk collection stations, which in turn sell milk to milk processors. The "milk collection stations" are quite common in Chinese market; the milk collection stations in China include two major types: spot market chains and co-operative chains, and around 80 percent of the milk collected in China are through those two prominent modes (Pei et al, 2011). Spot market chains are traditional dairy supply chain where cow farmers milk their cows and sell the milk to retail markets, it is important to note that milk from spot market chains is not pasteurized or treated. The second mode is the co-operative chains, in which individual farmers bring their cows to intermediate milk stations to be milked. In contrast to the American and Canadian supply chains, there are no specific regulations and organizations to take charge of the facilities in the indirect milk collection stations which potentially can have negative effect on safety and quality; for example, there is no organization to oversee the inspection of pipes sanitization. Because Chinese milk processing companies do not have full control of their production bases, they have to buy milk from the indirect milk stations in most cases. The many steps in the Chinese dairy supply chain and inadequate inspectors for backyard farms make it impossible for downstream players to guarantee the safe handling from the upstream

players.

1.7 Milk Safety Laws and Regulations

Recent milk scandals have caused consumer concerns regarding dairy safety. In order to reestablish China's international reputation for producing safety milk products, national food safety standards have been increased to meet international standards (Ranzy 2009). However, limited amount of the food safety standards are mandatory (such as National Food Safety Standards and Food Hygiene Law) but others like "Green Food" and "pollution free" are voluntary and food products companies are often use those safety logos to differentiate themselves (Wang, Mao and Gale 2007).

Chinese food safety is regulated by the joint efforts of different government entities. The Ministry of Agriculture is the lead entity for enhancing food safety, and the most obvious efforts involve facilitating pollution-free and organic food standards mean to guarantee consumer products are free of harmful materials. More than that, the State Administration of Quality Inspection, Supervision and Quarantine, and the Food and Drug Administration contributes to various responsibilities for oversight of food safety (Calvin et al 2006).

The pollution free and organic agriculture commodities in 2005 were only six percent and one percent respectively among all Chinese food (Calvin et al 2006), therefore, the gap between the pollution free, green agriculture commodities and the regular production is huge, although beginning to narrow. It is unclear whether these latest efforts will make China's food safer and improve the country's image.

1.8 Objective and hypothesis

While much attention has focused on the negative effect of melamine toxicity in milk powder on human, little research has studied Chinese consumers' concern over milk powder. This study aims to measure consumers' preference and willingness to pay for milk powder attributes. Taking into account the heterogeneity in consumer preferences in choosing milk powders, the hypothesis of the study is that consumers prefer milk powder with those attributes and want to determine how factors like age, education, economic status affect their preference.

An analysis of Chinese consumer preference for selected milk attributes would aid policy makers in establishing more effective regulation, restore Chinese consumers' confidence in milk powder and retain Chinese image in the world market. This analysis will also help retailers, wholesalers and producers to gain the knowledge of demand determinants. An attribute-based choice experiment approach is selected in this study to elicit consumers' preference and willingness-to-pay for selected milk attributes in milk powder. Specifically, some milk attributes such as "Traceability", "Direct Ownership of Farms", "Country-of-origins", "Farming Method (Organic vs. Conventional)" and "Safety Production Standards (Hazard Analysis and Critical Control Points)"were evaluated. A cluster analysis was used to identify homogenous groups based on ranking of milk powder attributes. Using cluster analysis, dairy companies can then target each of these groups by positioning themselves in a unique niche or launch competitive marketing strategies for a unique group.

1.9 Thesis Outline

This thesis consists of six chapters; the first chapter discusses the recent milk scandals and background of China's dairy sector. The second chapter provides an overview of the relevant literature and Chapter three contains the methodology used. Chapter four discusses the economic model and data summary. Chapter five focuses on the results of this study. The last chapter concludes the major findings, limitations and recommendations for future research.

Chapter 2: Literature Review

2.1 Review of Relevant Research Pertaining to Milk Powder

There are a number of studies about the negative effect of melamine toxicity in milk powder on human health (Wei and Liu 2011; Afoakwa 2008; Nshisso 2010). There are also some studies focused on food safety regulation (Broughton and Walker 2010; Chen 2009; Ortega et al 2012; Pei et al 2011). However, there are only two studies globally related to selected milk attributes in milk powder studying Chinese markets.

Xu and Wu (2010) measured consumers' willingness to pay for certified traceable food in China and highlighted the importance of establishing a traceability system for food. The results of this study call for the direct involvement of the Chinese government to establish the traceability system. In addition, their analyses found that 63% of respondents have never heard of food traceability systems and consumers' willingness-to-pay for traceability food are highly related to education level, income, gender and age.

Zhou and Wang (2009) used an orderly logit model to examine Chinese consumers' attitude about safety of milk powders. Their results reveled that consumers lacked the confidence in milk safety. Levels of education, awareness of milk safety incidence of milk melamine problem and government's related actions influence consumers' attitude toward milk powder safety.

2.2 Review of Safety Attributes Using Choice Experiment

During the last two decades, the choice experiment has become a popular method used by

economists to determine consumer preferences and willingness to pay for food safety attributes.

Wang, Zhang, Mu, Fu and Zhang (2009) used a choice experiment to estimate Chinese consumers' awareness of quality and safety attributes toward fish products. The sample included 286 questionnaires from consumers in Beijing, China. The four major categories, which consisted of respondents purchasing behavior, demographics, awareness and willingness to pay for safer fish products, were asked in the questionnaire. Their results showed that respondent background and brand consciousness play a crucial role in fish products consumption. In addition, they also found that around 60% consumers are willingness to pay less than 10% extra for a safer fish product.

Ortega, Wang, Wu and Olynk (2010) employed a choice experiment to examine Chinese consumers' willingness to pay a price premium assuring that their pork is safe after severe food safety scandals. The food safety attributes included in this study were certificated system, government-run certification program, non-government certification program traceability. A fractional factorial design with 16 choice scenarios was used to design the choice experiment. Consumers were asked to select between two pork options. They found that consumer willingness to pay for government certification (10.59 RMB) is the highest among the 4 safety attributes, followed by traceability system (6.9 RMB), and a more strict monitoring system will improve both consumer welfare and consumers' trust so they suggest the direct involvement of government for more strict monitoring system.

Wang et al (2014) utilized a similar choice experiment to calculate Chinese consumers'

willingness to pay for traceable pork attributes based on a survey in 1,489 respondents in 7 Chinese cities. Respondents were divided into four classes: appearance-preferred (20%), certification-preferred (53%), price-sensitive (13%), and scared consumers (14%). Their results found that Chinese consumers have the highest willingness to pay for quality certification, followed by traceability information. Heterogeneous preference exist among respondents and age, education level, monthly family income have significant impact on preference.

2.3 Review of Relevant Research Pertaining Chinese Consumers' Perception and Behavior about Food Safety

Previous research has focused on whether or not Chinese consumers hold positive attitudes and high awareness about food safety. Liu, Pienak and Verbeke (2013) provided a detailed outlook of Chinese consumers' perception and behavior toward food safety. Their results revealed that television and newspaper are the two main resources for consumers to get food safety information. Respondents generally hold a high awareness and positive attitudes about safe food but have inadequate knowledge about how to read labels and identify safe food. Xu et al (2012) examined consumers concern toward the hypothetical safer seafood label in order to investigate public policy implications in Beijing, China. They also tested consumers' concerns about green-labeled and eco-labeled seafood in order to estimate the effects of individual benefits and social benefits. Their results showed that most respondents have known, preferred and are willing to pay extra for green-labeled seafood. This paper also found that supermarkets are perceived as a reliable place to purchase labeled seafood. Therefore, the government should focus on the supermarkets to

promote the seafood traceability system. Xu and Wu (2010) used a nine page questionnaire to determine Chinese consumers' safety concerns among post-secondary students about their perceived dairy product risk and milk consumption. Three remarkable conclusions were reached from this study. First of all, about 64% of students stated high concerns about milk safety, with chemical pollutions being among their top concerns. Second, consumers' health concerns play an important role in the change of the consumption pattern and consumers from big families with high income are more favor of safer milk. One weakness of this research is that it merely focused on college students. Hence cannot apply to the whole population because college students cannot stand for the population as a whole. Xia and Zeng (2006) used the payment card (continuous CV method) to identify the relationship between socio-demographic and perception variables and consumers' willingness to pay for green labeled food in Beijing, China. Survey respondents were informed about the differences in attributes between the normal and green milk in term of the animal welfare, logo, environmental friendly and safety. Subsequently, they were asked the maximum willingness to pay for these attributes. Their results showed that most respondents were quite worried about food safety scandals and about 50.3% of the respondents were doubtful about green food. However, in the case of dairy products, consumers hold strong brand loyalty, more than half of the respondents prefer to buy milk produced by "Mengniu." Their results also indicated that consumer responses differ widely by average age group and young people aged 20-30 are more willing to pay price premiums for green food compared with middle age (40-50 years old customers).

2.4 Milk Powder Safety Attributes

It is necessary to understand how consumers look at the milk powder market and how safety attributes of milk powder contribute to consumers' purchase behavior. This chapter will describe the different milk powder attributes that will be examined in this study. The key milk powder attributes of this study are "Traceability", "Direct Ownership of Farms", "Country-of-origins", "Farming Method (Organic vs. Conventional)" and "Safety Production Standards (Hazard Analysis and Critical Control Points)."

2.4.1 Traceability

Economists define traceability as "the information system necessary to provide the history of a product or a process from origin to point of final sale" (Snyth and Philips 2002). Nicholson offers a definition of traceability more closely linked to dairy products when he identifies "data collection", "traceability protocol" and "record keeping" as necessary procedures for maintaining dairy product safety through traceability. With precise monitoring, this system can answer questions such as where does the raw milk originally come from and where does the raw milk end up. Previous milk safety crises have shown the special significance of being able to swiftly identify and isolate contaminated milk powders in order to prevent them from reaching consumers. Hence, the traceability system plays an important role in identifying a potential risk that can arise in milk and tracing it back to its source. For example, when the Minister of Agriculture or related authorities identify a risk, they can track the problem milk in order to swiftly isolate and block the problem milk. Hence, the problems can be further solved with the help to identify the

problems

The dairy supply chain of China composed of a number of players: the dairy farmers, the intermediate milk stations, processors, packers, distributors, and retail stores. Raw milk moves through markets and various dairy related processing industries. Most of these steps are anonymous, making it impossible for downstream players to guarantee the safe handling from the upstream players. It is difficult for consumers to distinguish between high quality milk powder from normal average milk powder, however, traceability, as a tool to ensure food safety, enables regulatory authorities, business operators and consumers to track food at specific stages from production to distribution. Traceability has been accepted worldwide. Pouliot and Sumner (2008) found that food traceability system plays an essential role in reducing safety issues. Currently, the United States, the European Union (EU) and Japan have mandated their own traceability system standards to monitor the food supply chains. In May 2002, the Chinese Ministry of Agriculture established a Food Traceability System. However, only a limited number of food producers in China agreed to adopt this system because of the high cost. In order to encourage the adoption, the Chinese government has been engaged in subsidizing and guiding the implementation of this policy, but with only minimal success (Xu and Wu 2010).

Research from western countries have done a lot research on consumers' preference and willingness to pay for traceable food. However, there is only one paper focused on the Chinese market, revealing that 32.3% of the respondents purchased certified traceable food, and only 68% were willing to pay a premium for traceable food (Xu and Wu 2010).

2.4.2 Direct Sourcing

There was a lot of conflict among various types of producers over responsibilities for the 2008 milk scandal. Consumers blamed the dairy companies for selling tainted milk powders. The dairy companies, in turn, blamed the farmers for adding the melamine to artificially increase the protein readings of their milk. Meanwhile, dairy farmers blamed the milk collection stations for diluting the milk where collected raw milk from them and water it down before selling it to dairy companied. Farmers also complained that the government did not take care of them because they were required to kill their cows and dump their milk. Moreover, they had been squeezed by the price control on food in 2007, which created incentives among dairy companies and many dairy farms to dilute milk and use melamine to increase the protein content. The milk collection stations blamed the operators of their milk collection stations, and regulations were unclear and they got no support from the government authorities. Given so many mutual blame accusation, it is difficult to assign responsibility to one sector for the 2008 milk scandal and it is even hard to pick one sector holding primary responsibilities because all the parties blamed other parties.

The indirect milk stations seems the likeliest or the most culpable for the milk scandals. Fu and Nicoll (2011), found that there were no specific regulations for and no organizations monitoring indirect milk stations prior to the melamine scandal. Her findings imply that, due to the lack of regulations, the quality of the milk from indirect milk collection stations cannot be guaranteed. In addition, some studies such as Kong and Zhong (2012) found that, in terms of melamine, the milk quality of small farms is lower than that of large dairy

farms while the quality of milk from indirect stations is much lower than the milk from companies owned by dairy centers. In other words, milk powders that are directly sourced from dairy companies that own their own cows and collect their own milk are safer than the milk from indirect milk stations, because direct sourcing remove the possibility that middle man doing something to reduce the safety of milk and the manufactures has more control of food quality by direct sourcing. For example, if the dairy companies have their own direct sourcing centers, the companies can take good care to ensure the safety from the beginning to the end of the Milk Supply Chain. More specifically, they can control the cow factors and ensure the safety of milk on a dairy farm is transferred from cow to sanitized pipes into bulk tank. Also, they can check the cleanness and sanitation of the tanks before milk is tested when the tanker truck arrived and milk that fail to meet any of these extensive tests are forced to discard. In addition, they even can adhere to stringent tests and safety standards in order to follow dairy packaging procedures, equipment sanitation, pasteurization, hauling and labeling.

In response to the dairy scandals, the Dairy Hygiene Law of the People's Republic of China (Chapter 8) states the urgency for dairy companies to develop their own direct sourcing centers in order to avoid the potential safety issues associated with the intermediate milk station level. In order to coordinate this new policy and develop a comparative advantage, some companies, such as Nestle, dropped indirect sourcing in China from 30,000 farms to 12,000 farms and converted to only direct sourcing in 2012(Global Intelligence Alliance, 2012). Therefore, companies which can develop their own direct sourcing centers can reduce the potential safety issues associated with the

indirect milk stations, which in return, might have safer milk than the ones come from indirect milk stations. Also with the increased safety concerns, consumers are willing to pay a price premium for safety improvement (Wang, Mao and Gale 2008). Therefore, there might be a potential market for dairy companies which can develop their own direct sourcing centers.

2.4.3 Country-of -Origin

Products are generally considered as a list of information cues, both intrinsic and extrinsic. Intrinsic cues are characteristics related to the nature of products, such as design and color. Whereas extrinsic cues are those characteristics that cannot be related to the inherent characteristics of goods such as brand reputation, price and country-of-origin (Mesanovic, Rubil and Rylander 2009; Said, Hassanand and Musa 2012). Some studies showed that consumers sometimes cannot evaluate extrinsic and intrinsic cues correctly both before and after purchase (Veale 2006). However, those cues still play a fundamental role in evaluating the products. Country-of-origin label has been proven to be an important extrinsic cue. Studies by researchers such as Insch and McBride (2002), Rezvani et al (2012) and Becker (2000) among others have shown that consumers use country-of-origin to evaluate products. Country-of-origin is especially important when there is not enough information about the intrinsic cues or when consumers have limited knowledge about the product.

Several of studies have investigated to the question of how consumers respond to goods from other geographical locations. The influence of country-of-origin label image

on consumers' purchase behavior has been studied in different countries with different products by researchers including Mesanovic, Rubil and Rylander (2009), Umberger (2010), Lim, Maynard, Hu and Goddard (2011) and Said, Hassanand and Musa (2012). Country-of-origin is the overall image consumers and businesses attach to a product from a certain country. This image is influenced by political and economic backgrounds. It has a strong effect on consumers' purchasing behavior and it is associated with their prior perceptions (Cai 2002, Mesanovic, Rubil and Rylander 2009, Lim et al 2011).

Lim, Maynard, Hu and Goddard (2011) mentioned that consumers experience higher utility when the products they consumed came from their desired geographical origins while they experienced lower utility when the products they consumed from less preferable locations. Previous studies also showed that the image associated with country-of-origin can influence consumers' perception of products. For example, Loureiro and Umberger (2002) conducted research to estimate consumer willingness to pay for country-of-origin labeling program. Their results showed that consumers are quite concerned about country-of-origin information and as a consequence, they are willing to pay a price premium for the products with country-of-origin information.

In 2008, Sanlu Baby Formula was certified as "the National Inspection-free product" "Green Good ", was found to contain high level of melamine. It was determined that the melamine was deliberately added to baby formula. The addition of melamine increases the protein percentage of infant powder. In response to the melamine scandal, Administration of Quality Supervision, Inspection and Quarantine of China invalidated all "National Inspection-free Products" (Zhou and Wang 2011). The news about scandals and the

government's invalidation of quality certificates made consumers wonder how dairy products acquire their certificates and whether the certification system could effectively guarantee the quality of domestic dairy products.

As a result, the milk scandal scared many consumers in the Chinese mainland away from domestic dairy products. Foreign branded dairy products, especially baby formulas have become increasingly popular in China since they are perceived more reliable with higher safety standards and better supervision and inspection systems. However, even though the price of foreign branded baby formula is twice as much as domestic brands (The Boston Consulting Group 2008). Thus, like traceability system and direct sourcing, country-of-origins is increasingly important for consumers to select milk powders.

2.4.4 Organic Milk Powder

The USDA is responsible for establishing organic standards; assure the development of organic agriculture. According to their definitions, organic agriculture is a system which promotes and enhances agro-ecosystem health and avoids using synthetic materials, such as genetically modified seeds and breeds, antibiotics, synthetic fertilizers and pesticides and additives. Organic practices aim to make food, human and ecological systems healthier and more productive. Organic farmers, ranchers, and food processors have to follow standards which covered products from farm to table to produce "organic" products. The Chinese Minister of Agriculture follows similar definitions. Agriculture and Agriculture Food Canada found that organic food sales enjoyed an annual growth rate of 20% and consumers are willing to pay 15% to 20% extra for organic food. Compared with products

derived from industrial agriculture, the organic products are generally 25% more minerals and vitamins (Organic Consumer Association 2012). In China, organic milk is certified by the Chinese Organic Food Certification Center. In Canada and the United States, the organic milk is certified by Canadian Organic Regime and the United States department of Agriculture.

Some Chinese consumers may buy organic milk because they believe it to be superior to conventional milk. More specifically, Chinese consumers believe that the organic milk is free of antibiotic and Bovine Growth Hormone. They also believe that organic milk contains higher levels of beta carotene, vitamin E,D and essential mineral (Ustunol 2011). It worth noting that the administration of growth hormones to dairy cows is allowed in the United States but are not permitted to use in Canada. As for antibiotic, all milk products produced in Canada do not contain antibiotic.

Glaser and Thompon (2000) utilized nation-wide supermarket scanner data to examine sales of conventional and organic milk. Their study measured the demand for organic milk back to1970, when organic milk is first introduced. Dimitri and Venezia (2007) account for more recent organic milk analysis, they found that more affluent ,white, well-educated consumers are more likely to purchase organic milk frequently. Those who purchase organic milk are more likely to fall into the average age ranged of 18-29 and 45-49 years old. In addition, parents having young are more likely than those without kids to purchase organic milk. Choi, Wohlgenant and Zheng (2013) examined purchasers' demand for various dairy products with household scanner data and estimated the distribution of welfare effects of introducing organic milk. They found the price effect of introducing

organic milk is greater for lower income consumers than for higher income consumers. This result implies that consumers with lower income are more sensitive to price change. He also suggests that organic milk should market at less educated group for product flourish.

Chinese organic agriculture developed rapidly in response to consumer demand for organic products for nearly 10 years, and has gained consumers' recognition during the same time. Meanwhile, organic dairy products belong to organic products also increased dramatically in China and competitions changed greatly form price to quality. Farmers have to follow the Chinese National Organic Product Standard to become organic agriculture (Research report on organic dairy industry in China, 2013).

2.4.5 Hazard Analysis and Critical Control Point (HACCP)

The current global market conditions and worldwide consumer food safety have led companies to look for ways to improve product quality. HACCP, namely "Hazard Analysis Critical Control Point" is widely recognized as an effective management tool or food safety insurance system to ensure food safety through 7 principles: "conduct a hazard analysis, determine the Critical Control Points (CCPs), establish the critical limits, establish a monitoring system for each CCP, establish corrective actions to be taken when a CCP is breached, establish verification procedures to confirm the HACCP is working effectively in practice, and establish documentation and records" (EI-Hofi, Tanboly and Zsmail 2010; Canadian Food Inspection Agency 2012). Also it is internationally recognized and widely used in developed countries in Europe and in the United States (Ming 2010). According to

the Canadian Food Inspection Agency, HACCP was used as early as the 1960s. It is a systematic preventive method to food safety and this approach can be applied to all different stages of a food chain to improve food safety in every step of the process.

HACCP certification means production systems can be directly impacted to improve food safety by finding, correcting and preventing hazards. Therefore, a possible toxic substance can be identified before reaching consumers. China Quality Certification Center give our HACCP certification in China. Dairy products with HACCP stamp are required to identify critical control point, set critical limits, establish monitoring requirements, take corrective action, review whether the system is operating correctly and keep record (Ming 2010).

The Chinese Inspection and Quarantine Authority has adopted HACCP certification in 2002, and one of the national dairy companies, Yili Group, attained HACCP certification for a host of their dairy products sooner after. According to Pei, Tandon, Alldrick, Giorgi, Huang and Yang (2011), HACCP requirement for dairies were introduced in 2009 including regulations and guidelines in terms of packaging, storage and transportation. There are 5,094 certified labs with 50,000 specialized personnel in China. In the dairy sector, there are about 447 laboratories employing 1000 chemists for testing dairy products for melamine. They also found large dairy companies with fully controlled farming of cows which do not rely on milk stations or dairy farmers for raw milk also tend to adopt the HACCP system for processing and checking.

Wang, Mao and Gale (2007) examined consumer acceptance of price premiums for

dairy products under HACCP procedures. They found that a majority of the respondents were not aware of HACCP management. However, after being educated about HACCP, almost all respondents were willing to pay extra for HACCP-certified dairy products.

Chapter 3: Survey Design and Data Collection

3.1 Introduction

Upon examination of previous studies related to consumer preference for quality and food safety information, there are a number of studies that have focused on food safety and consumer concern about other food categories. Little research has been dedicated to analyzing Chinese consumers' concern over milk powder. More specifically, there appeared to be two areas where little studies had been dedicated to analyze. The first area is the analyses of Chinese consumer preference for quality and food safety information attributes. The second part is the influence of these attributes on consumer decision-making process when purchasing milk powders. The previous studies lack systematically analysis of the recent emergency in the Chinese milk powder industry and up-to-date information highlighting important attributes that consumers' value. For example, do Chinese consumers consider imported milk powders safer than domestic milk powders? Will consumers believe one milk powder with certain safety attributes is safer than another? What market segment is willing to pay premiums for milk powder with certain safety attributes? What premiums are they willing to pay? What role do the socio-demographics characteristics play in the purchase behavior of milk powder? Who is more likely to be concerned food safety attributes? We expected to answer the aforementioned important questions in this study.

3.2 Survey Mode Choice

This section describes various potential survey methods, including the use of online,

telephone, in-person and mail surveys and the advantages and disadvantages of each method. The best instrument for the current study, in-person surveys, is then determined.

In face-to-face surveys, the researcher is physically presents to ask questions. This method remains a popular information collection method. The advantages of face-to-face surveys include (Sincero 2008): a higher response rate and better quality control than mail surveys because researchers can give instructions if needed. Visible responses, allowing the inclusion of graphs, logos and scales, longer and more complicated questions can be included because the respondents can read questions on their own. The disadvantages of face-to-face surveys include: very time-consuming for researchers compared with other methods. Also, sample selection maybe influenced by researchers' bias.

Online surveys are a relatively recent research method, but they have been commonly used in the last two decades. Some researchers have serious doubt about implementing online surveys in China because of the potential lack of sample representativeness (some respondents in rural area do not have access to computers) (Schonlau, Fricker and Elliott 2002). The advantages of online surveys include: Shorter data collection periods compared with person-to-person surveys. Flexible responses, allowing the survey to be tailored to specific situations and allowing respondents to save a partially completed form. A broader audience can be obtained at relatively lower cost.

The disadvantages of online surveys include: lower response rate compared with other survey methods. Lack of sample representativeness because some demographic groups may be more likely to participate in the network.

The popularity of telephone surveys has decreased recently. Statistics, however, show that it is still a prevalent survey method, particularly for business-to-business research in China (Deren 2013). The advantages of telephone surveys include: preferable geographical coverage using area codes. It may also provide more random results than either person-to-person or online surveys. The disadvantages of telephone surveys include: Generally time-limited. The longer the survey the more respondents will drop out and may not fully answer predetermined questions. Hard for respondents to focus without visual cues so the questions have to be simple and straight-forward.

Mail surveys are a traditional method for collecting information and have the following advantages (Deren 2013, Ho 2009): Less time-consuming for researchers compared to person-to-person surveys. Respondents might be more willing to share their ideas and thoughts without the interviewers. Respondents can fill out the surveys at their convenience compared with the time constraint of person-to-person surveys. Good for collecting large quantity of information because cost-effective than person-to-person surveys. The disadvantages of mail surveys include: The results may suffer and differ a lot if certain groups of customers are left out of the survey. Long wait times for the returned surveys. Not typically used for complex issues due to the limitation of envelopes' weight. Having considered the advantages and disadvantages, face-to-face surveys are chosen because the advantages of higher response rate, better quality control and adaptability of complex and longer questions. In addition, researchers have more free time than other resources. In order to better control the quality of data, at the end of each survey, the researcher evaluates the overall quality of the responses in terms of carefulness and

seriousness. If respondents fail to follow survey directions related to skipping questions, their responses are evaluated as not careful; If respondents take considerably less than 10 minutes to complete the survey, their responses are evaluated to be not serious because the average time for completing the surveys is 15 minutes and some of their responses are incompletes or unthoughtful. Furthermore, geographical limitations are avoided through increasing the number of respondents from various locations. Specifically, respondents are selected from 12 different locations across Beijing and Zhengzhou.

3.3 Survey Questions

The survey questionnaire of the current study includes both close-ended and open-ended questions. Close-ended questions are primarily used in this study to reveal quantitative data. Respondents can choose from a limited and predetermined number of options. Five types of close-ended questions (categorical, multiple-choice, likert-scale numerical and ordinal questions) are used in this study. Open ended questions are used to elicit responses through qualitative data. Some questions such as “how much milk powder do you purchase each year?” and “how far is the closest food store to your home?” are included in this survey.

3.3.1 Categorical Questions

Categorical questions, as the most basic type of survey questions, are used when the possible answers are categories and every single respondent must fall into one of the categories. An example in the current survey is:

Q23. What is your marital status?

①Married

②Single

③Others

3.3.2 Multiple-Choice Questions

Multiple-choice questions allow respondents to pick the best possible answer among predetermined options. An example in the current survey is:

Q8. Which of the following milk powders have you ever purchased?

1) Enfamil
2) Dumex
3) Nestle
4) Wyeth
5) Abott Laboratories
6) Ausnutria
7) Seyala
8) Yili Group
9) Mengniu Dairy

3.3.3 Likert-Type Scale Questions

Likert-type scales are commonly used to reveal respondents' feeling or attitudes. An example in the current survey is:

Q16. What do you think about the trustworthness of the certification in the milk powder industry? Please indicate your rating by using a scale of 1-5, where "1" means trustworthy and "5" means untrustworthy. Please indicate the rating by using ✓

Untrustworthy 1 2 3 4 5 Trustworthy

3.3.4 Ordinal Questions

Ordinal questions are used when researchers need respondents to rank their responses. A ranking can indicate importance of predetermined options. An example in the current survey is:

11. Please rank the importance of the following safety attributes using a scale of ①-⑧.

Determinant factors	Rate ①the most important ; ②very important ; ③important ….⑧the least important
Brand name	
Price	
Best before date	
Traceability	
Ownership of farms by producer	
Country-of-origin	
Farming method(organic vs. conventional)	

Safety production standards (Hazard Analysis and Critical Control Point)	

3.3.5 Numerical Questions

Numerical questions are used when the answer must be a number. An example in the current survey is:

25. How many people are there in your household? _____

How many of them are under 18? _____

How many of them are over 60 years old? _____

The survey questionnaire (shown in Appendix A) consists of four parts:

The first part includes basic questions about respondents' consumption and knowledge about milk powders. Questions about milk powder characteristics are used to collect information about respondents' awareness of milk powders are included in part two. Part three includes the choice experiment question which are used to reveal the influence of milk powder attributes on the consumer decision-making process when purchasing milk powders. Optional questions are used to identify reasons behind the choices made. The last part focus on demographic questions.

3.4 Questionnaire Design

The questionnaire of this study includes 4 sections. Section 1 covers some basic questions

about respondents' consumption and knowledge. Section 2 focus on questions about milk powder characteristics. Section 3 aims to discover which milk powder with certain milk powder atributes consumers believed are most important. The last section of the current survey focuses on gathering information about demographics of survey participants.

3.4.1 Basic Questions about Respondents' Consumption and Knowledge

The first section includes nine questions focusing on consumption and purchasing frequencies, reasons and places for purchasing dairy powders, and the milk powders they have ever purchased. Some questions designed to test respondents' countries of origin knowledge about milk powders are also included. Questions in part one are very important because those questions give a general idea about the consumption and purchasing frequency of Chinese consumers and their perceptions about the safest and highest quality milk powder.

3.4.2 Questions about Milk Powder Attributes

The second section of questions in the survey invites respondents to evaluate the importance they place on the attributes of milk powder in order to estimate their awareness about milk powder attributes. Because there are few studies that have focused on the eight aforementioned attributes at once, it is essential to ask simple and understandable questions like this current study so that Chinese consumers can clearly indicate their awareness about those eight milk powder attributes. The question of percentage of organic milk in total milk powder purchase (total weight, not total dollar value) is also included in this study allowing the researchers to compare the organic milk powder versus conventional milk powder. In

addition, a question asking if their household and extended family encountered milk safety problems is included in this section in order to evaluate the negative effects of tainted milk powder. The last question in this part seeks to determine if the certification in the milk powder industry is trustworthy among Chinese consumers. The definitions of QS certificate, ISO9001 and HACCP are given before the Likert-scale survey question in avoiding some uncertainty for those certifications. This is an essential question as it gave an idea of how Chinese consumers value the current certification, and this question can also aid policy makers in establishing more effective regulations.

3.4.3 Choice Experiment Design

The third parts of questioning in the current survey aim to discover which milk powder with certain milk powder attributes consumers believed are most important and the different levels of the selected attributes are exhibited in Table 1.

Table 1. Attributes and levels used in the choice experiment

Attributes	Levels	Definitions
Price (RMB)	170,128,86,45	Price in RMB per 500g milk powder
Traceability	Yes, No	If present “yes”, the product carries traceability
Direct Ownership of farms	Yes, No	If present “yes”, the product manufacturer own the dairy farms that supply their milk
Country-of-origin	The United States, Switzerland, New Zealand, China	4 country-of-origin selected based on popularity among milk powders
Organic milk powder	Yes, No	If present “yes”, the product

		is organic
HACCP	Yes, No	If present “yes”, the product carries a HACCP certificate

A price attribute was varied on four levels between 45RMB /500g to 170RMB/500g at the time of the survey is selected as the first attribute because it can be used to calculate the willingness to pay. The highest and lowest levels correspond to the maximum and minimum price for that could be found in the Chinese market at the time of the survey. The other five attributes were selected based on either previous studies or issues related to current Chinese dairy production. Each choice task required respondents to pick one among three possible options consisting of two alternative milk powders and a “None of them” option. “None of them” is included in the choice set to ensure that subjects were never forced to select a milk powder, because in a real shopping situation, respondents always have the option of not purchasing if none of the milk powders meet their needs. The choice sets were created using cyclical design with aforementioned milk powder attributes. Example of a choice set is represents in Table 2. In this study, there are six attributes, of which “Price” and “Country-of-origin” had four levels and the rest had two levels each. Based on full factorial design, there would be 128 (4*2*2*4*2) possible product profiles. One hundred and twenty-eight profiles would be difficult for respondents to evaluate and make decision. Therefore, a fractional factorial design was utilized where samples of profile combinations are selected from full factorial design in order to efficiently evaluate the main effects of the attributes on respondents’ preference (Chan-Halbrendt et al. 2007). In this study, eleven profile combinations were selected from full factorial design. This was

done to efficiently evaluate the main effects of the attributes on respondents' preference. Two version of survey were conducted and each of the survey versions included six profile combinations.

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Table 2. Example of a choice set

Milk powder	Milk powder 1	Milk powder 2	None of them
price	45 RMB/500g	170RMB/500g	
Traceability	No	Yes	
Direct ownership of farms	No	Yes	
Country-of-origin	Switzerland	China	

Farming method	Conventional milk	Organic milk	
HACCP	No	Yes	
My decision	◯	◯	◯

3.4.4 Demographic Questions

The last section of the current survey focuses on gathering information about demographics of survey participants. These characteristics include: such as whether they are primary decision makers for household purchases, whether they drink milk, education, occupation, gender, age, income, nationality, marital status, number of people in their families, modes of transportation for grocery purchases and number of vehicles per household. In current study, the researcher needs to determine who to survey and how to use the information gathered in order to make key decision.

3.5 Information Sheet

At the beginning of the survey, respondents are informed with the purpose of this study. The participants are also told they will receive a gift in return, approximately 10 RMB upon completion of the survey. The exact wordings are:

"Hello, my name is Chu Wang; I am a graduate student at the University of Manitoba doing a research. This survey is about Chinese consumers and their preference for milk powders with selected attributes. This survey will take 10-15 minutes and you will receive a gift in return worth 10 RMB after this survey. This study will not involve any personal questions and the data I get will only be used for scientific research. Do you agree to

participate in this study?”

3.6 Pre-Testing

Pre-testing was conducted in the early stages of survey development in an attempt to obtain the highest quality of responses possible. Pre-testing a survey plays an essential role in evaluating how participants respond to questions, estimate response rates, ensuring the wording of the questions are clear and concise, the length of time to complete. In order to ensure pre-testing locations were as similar as possible to the actual data collection location, and a city with a similar population size was selected. Pre-testing was conducted in Zhengzhou at four locations from September 10 to September 14, 2014, one of the cities where actual data will be collected. There were 50 respondents from the population with different ages, level of education and income groups who participated in the pre-testing sample questionnaires. 12 of them dropped out in the early stage, resulting in a response rate of 76%. In each questionnaire, the length of time to complete was estimated and each respondent was asked to give some suggestions on how the questionnaire can be improved at the end of the survey. The research found that the average length of time to complete was about 10 minutes. A number of suggestions were provided and were carefully considered in order to craft the highest quality of survey version possible. The suggestions from the thesis committee members also helped improve the quality of the survey and their extensive experiences were particularly helpful in increasing the response rate. Some suggestions were adopted to increase the validity and usefulness of the responses. For example, respondents were told that the survey was completely voluntary and would remain anonymous and a gift worth 10RMB was offered in return for completion.

As recommended, the survey was structured to be clear and attractive and the questions posed were concise and understandable. The survey was reader-friendly with words of appreciation at the end.

3.7 Creation and Carry Out of Surveys

Ethical approval is required for all research undertaking. The University of Manitoba Joint-Faculty Research Board ensure the study is conducted using ethical standards. This includes requesting consent to use responses in research, responses are kept confidential, and that participants have the right to refuse providing a response. The current study has been approved by the University of Manitoba Joint-Faculty Research Board on May 2, 2014, as illustrate in Appendix E. In-person mall intercept interviews were conducted between 9:00 am to 7:00 pm from September 15 to November 13, 2014. The researcher set the table in front of the major grocery stores in both Zhengzhou and Beijing. The grocery stores were selected using a well-known Chinese site "Baidu." And the grocery stores that were rated the highest were selected. The grocery chains selected in Zhengzhou were: Beijinghualian, Dannisi , Jialefu and Shijilianhua. The grocery chains selected in Beijing were: Beijinghualian, Meilianmei , Jialefu and Shijilianhua. In most cases, the grocery stores selected were the same across districts, except for Meilianmei and Dannisi, both were selected because they were the most popular in their districts. More specifically, the stores selected in Zhengzhou were Beijinghualian Erqi, Beijinghualian Zhongfu, Dannisi Jingguang, Dannisi Renmin, Dannisi Zhongyuan, Jialefu Beihuan, Jiashijie Jingsan, Shijilianhua Jingsan and Shijilianhua Ruhe. The stores selected in Beijing are Beijinghualian Wanliu, Beijinghualian Chaoyangmen, Meilianmei Beitaipingzhuang,

Meilianmei Tiancun, Meilianmei Changing, Jialefu Zhongguancun, Jialefu Chengshousi, Shijilianhua Shuangjingqiao and Shijilianhua Changpingqu. Figure 2 and Figure 3 below also illustrate the locations of those 18 stores on the Zhengzhou and Beijing map. Every 10^{th} consumer who attend the store and over 18 were asked to fill out the survey. 10,000 were asked to participate; only 1,404 usable responses.

Figure 2. Stores selected in Zhengzhou

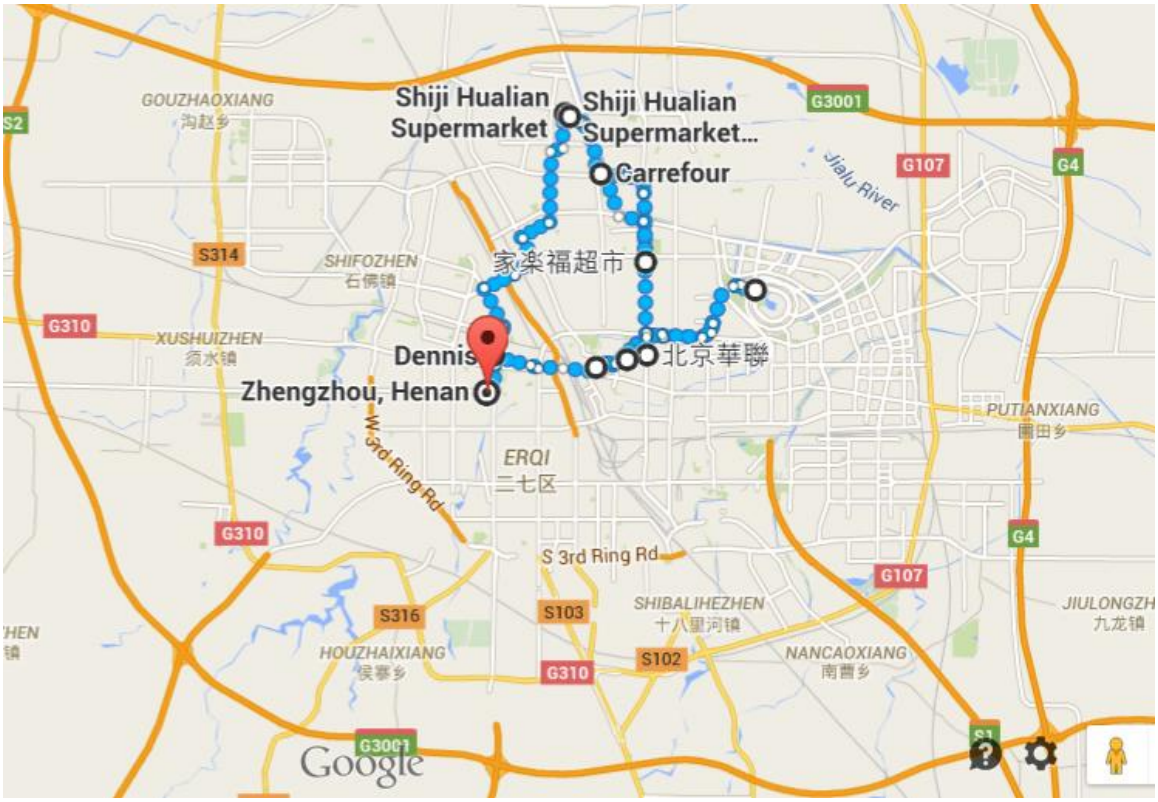
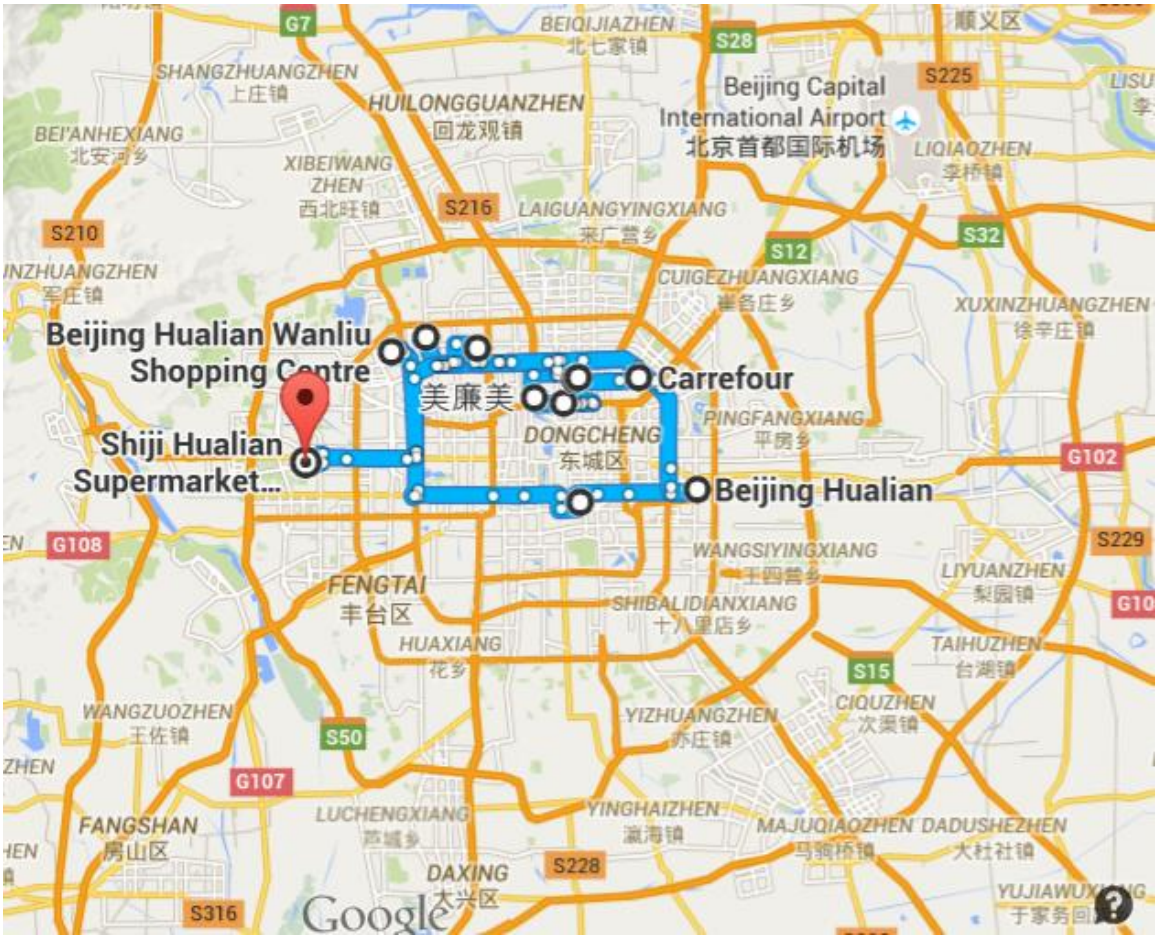


Figure 3. Stores selected in Beijing



Chapter 4: Model Specification and Theory

4.1 Introduction

This section begins by discussing the theories developed to measure consumers' preference and then discuss how these are related to milk powder industry yet had little research done on to evaluate Chinese consumer preference. The empirical model and the data summary will also be discussed later in this chapter.

4.2 Economic Model Selection

The attribute-based choice modeling is selected in this study to elicit consumers' preferences from choice experiment data, because it permits value estimation for different products sharing a common set of attributes. In a choice experiment, consumers can select a product from a set of options that contain various attributes at different levels, which closely simulate real world purchasing decisions. In this study, respondents were asked to select a milk powder from 2 options that contain various milk powder attributes at different levels.

The attribute-based choice modeling is consistent with both Lancaster's consumer theory and random utility theory. The major contribution of Lancaster's consumer theory is the ability to reject the relevance of intrinsic, measure the difference between the subjective (extrinsic) and objective (intrinsic) choice and the difference between the consumer choices and consumer demands. According to Lancaster's consumer theory, the value of a

product can be broken down into the composite value of all its attributes (Adamowicz, Louviere and Swait 1998). In the case of milk powder, the value of a particular milk powder can be broken down into the composite value of all its intrinsic and extrinsic attributes such as “Price”, “Name”, “Best before date”, “Traceability”, “Direct ownership of farm”, “Country- of-origin”, “Farming method (conventional vs. organic), and “HACCP.” The “Traceability” attribute is chosen in this study because previous milk safety crises have shown the special significance of being able to swiftly identify and isolate contaminated milk powders in order to prevent them from reaching consumers. Hence, the traceability system plays an important role in identifying a potential risk that can arise in milk and tracing it back to its source. The “Direct sourcing” attribute is chosen in this study because the indirect milk stations seems the likeliest or the most culpable for the milk scandals. The companies that develop their own direct sourcing centers may have a better control of the milk quality, thus avoid the potential safety issues associated with the indirect milk stations. “Country-of-origin” attribute is included in this study because Elliontt and Cameron (1994) showed that the image associated with country-of-origin can influence consumers’ perception of products. In addition, the milk scandal scared many consumers in the Chinese mainland away from domestic dairy products. Thus, like “traceability system” and “direct sourcing”, “country-of-origin” is increasingly important for consumers to select milk powders. “Farming method (conventional vs. organic)” is also an important milk powder attribute because some consumers may buy organic milk because they believe it to be superior to conventional milk. They might also believe that organic milk contains higher levels of beta carotene, vitamin E, D and essential minerals (Ustunol 2011). “Hazard Analysis and Critical Control Point (HACCP)” is widely

recognized as an effective management tool or food safety insurance system to ensure food safety through monitoring production chains (EI-Hofi, Tanboly and Zsmail 2010).

Random utility theory is based on the assumption that consumers act rationally and can maximize their utility. The choice modeling is also influenced by concepts in psychology, especially related to how people make decisions, process information and judge products (Ladd and Martin 1976).

Let $\cup_{in}$represent the utility of the nth alternative for the ith respondent. Because the true utility is unobservable, each utility can be included two components (Hole 2013):

1) V_{in} is the representative utility that researchers can model

2) ε_{in} is a random component

$$\cup_{in=V_{in}+\varepsilon_{in}} \quad (4.1)$$

The basic assumption of utility maximization is that the respondent will choose an alternative that yield the highest utility. Respondent i will choose A over B if and only if (Hole 2013):

$$\cup_{iA}>\cup_{iB}, \text{ all } A\neq B \quad (4.2)$$

From equation (4.1) and (4.2), alternative is chose if and only if (Loureiro and Umberger 2007):

$$(V_{iA}+\varepsilon_{iA}) > (V_{iB}+\varepsilon_{iA}) \quad (4.3)$$

By placing the observables and unobservable together yields (Loureiro and Umberger 2007):

$$(V_{iA} - V_{iB}) > (\varepsilon_{iA} - \varepsilon_{iB}) \quad (4.4)$$

Because the analyst cannot observe the random component $(\varepsilon_{iA} - \varepsilon_{iB})$, they usually state the corresponding probability of occurrence. Therefore, the statistic model of the probability P_{in} is (Ortega et al. 2010):

$$P_{in} = Prob\ (\cup_{in} > \cup_{ib}; B = 1,2, \dots, N;\ \ B \neq N) \quad (4.5)$$

$$\mathrm{P_{in}}\left(\varepsilon_{\mathrm{in}}\text{-}\varepsilon_{\mathrm{ib}} > \widehat{U_{ib}} - \widehat{U_{in}}\ ;\ \mathrm{B}=1,2,\ldots,\mathrm{N};\ \mathrm{B}\neq\mathrm{N}\right) \quad (4.6)$$

Where $\widehat{U_{in}} = X_{in}\beta$. If the random terms are independently and identically distributed type 1 extreme value, then the Conditional Logit Model is (Loureiro and Umberger 2007):

$$P_{in} = \frac{\exp(\sigma_n V_{in})}{\sum_{j=1}^{J} \exp(\sigma_n V_{jn})} \quad (4.7)$$

The restrictive property of the conditional choice model is the independence of irrelevance alternatives (IIA) (Roberts 2007):

$$\frac{P_{in}}{P_{ib}} = \frac{\exp\ (V_{in}) / \sum_{j=1}^{J} \exp(V_{nj})}{exp\ (V_{ib}) / \sum_{j=1}^{J} exp(V_{nj})} = \frac{exp(V_{in})}{\exp(V_{ib})} \quad (4.8)$$

From the equation 4.7, the odd depends only on the observable alternative (n and b), not the characteristics of other irrelevant alternatives, which may be too restrictive. In recent years, some innovative models have been developed in order to relax IIA. Perhaps the mixed logit

model is the most notable model (Domanski and Haefen 2010). Mixed logit models overcome the limitations of the conditional logit model by allowing the coefficients to vary; therefore, the preference heterogeneity can then be taken into account. The probabilities of Mixed Logit can be expressed in the form:

$$P_{in} = \int L_{ni}(\beta) f(\beta) d\beta \qquad (4.9)$$

Where $L_{in}(\beta)=\frac{e^{V_{in}(\beta)}}{\sum_{j=1}^{J} e^{V_{ij}(\beta)}}$, $f(\beta)$is the density function, $V_{in}\beta$ is the observable and depends on the parameters β.

If utility is liner in β, and $V_{in}\beta = \beta' \mathcal{X}_{in}$, then the Mixed Logit probability can be written as: $P_{in} = \int (\frac{e^{\beta' \mathcal{X}_{in}}}{\sum_{j} e^{\beta' \chi_{ij}}}) f(\beta) d\beta$ (4.10)

The simulated likelihood can be used to estimate β.

$$SLL = \sum_{n=1}^{N} ln \left\{ \frac{1}{R} \prod_{r=1}^{R} \prod_{t=1}^{T} \prod_{j=1}^{J} \left[\frac{exp(X'_{in} \beta_i^{[r]})}{\sum_{j=1}^{J} exp(X'_{in} \beta_i^{[r]})} \right]^{y_{inm}} \right\} \qquad (4.11)$$

The probability of Mixed Logit can be derived from Utility function. The respondents choose among N alternatives. The utility of respondent I from alternative n can be written as:

$$U_{in} = \beta'_i \chi_{in} + \varepsilon_{in} \qquad (4.12)$$

Where χ_{in} are observable variables, β'_i is the vector of coefficients of those variables and various over different respondents, $\varepsilon_{in}$is a random error term.

Because price is assumed to be a fix parameter, the willingness-to-pay (WTP) can be obtained by

$$E(WTP^k) = -\frac{E(\beta^k)}{\beta^{price}} \quad (4.13)$$

4.3 Empirical Specification

The empirical specification of the utility function was formulated as:

$$U_{in} = Price_{in}\beta_1 + Traceability_{in}\beta_2 + Ownership\ of\ farm_{in}\beta_3 + The\ U.S._{in}\beta_4 + China_{in}\beta_5 + NewZealand_{in}\beta_6 + Switzerland_{in}\beta_7 + Organic_{in}\beta_8 + HACCP_{in}\beta_9 + \varepsilon_{in}$$

Where U_{in} is the unobservable utility level that the ith respondent gains from selecting nth powder type. "Prices", "Traceability", "Ownership of farm", "Country-of-origin (The U.S, China, NewZealand and Switzerland) ", " Organic" and "HACCP" are observable milk powder attributes considered in the choice set. $\beta_1, \beta_2, \beta_3, , \beta_4, , \beta_5, \beta_6, \beta_7, \beta_8, \beta_9$ are coefficients of those variables and various over different respondents, $\varepsilon_{in}$is a random error term. This conditional multinomial logit model was formulated by given the attribute level of the choice experiment and was estimated within a maximum likelihood frame-work. This model aims to elicit consumers' preferences under the condition that different milk powder choices had various attributes.

4.4 Data Summary

In-person mall intercept interviews were conducted between 9:00 am to 7:00 pm by randomly stopping shoppers in front of major grocery stores in Zhengzhou and Beijing,

China from September 15 to November 13, 2014, which results in 1404 usable responses. To qualify for the interview, respondents must be adults 18 year and older. To ensure the validity of the data, it was checked for duplication, accuracy and the logic of questionnaire. Results show minimal faulty cases and incomplete and inappropriate entries were removed. Consumer demographics such as age, household size and income were collected and summarized in Table 3.

Table 3. Statistics of 1404 survey respondents demographics

Demographic Variable	**Description**	**Total/Average**	**Beijing**	**Zhengzhou**
City	City of residence	1404	702	702
Age	Age of respondent	44 (SD=12.35)	44 (SD=12.38)	44 (SD=12.31)
Gender	Percent male respondents	33.50%	33%	34%
Household Size	Number of people living in household	3.725 (SD=1.53)	2.88 (SD=1.21)	4.57(SD=1.84)
	Number of children under 18 in home	1.08 (SD=0.81)	1 (SD=0.70)	1.16 (SD=0.91)
	Number of adults over 60 in home	0.56 (SD=0.72)	0.56 (SD=0.64)	0.56 (SD=0.79)
Household Income	under 2000 RMB	2.56%	4.70%	0.43%
	2001~4000RMB	14.17%	26.50%	1.85%
	4001~6000RMB	18.30%	27.92%	8.69%
	6001~8000RMB	12.75%	16.24%	9.26%
	8001~10000RMB	21.30%	16.67%	25.93%
	10001~12000RMB	6.62%	2.71%	10.54%
	12001~14000RMB	3.49%	1.14%	5.84%
	14001~16000RMB	2.14%	1.42%	2.85%
	16001~18000RMB	5.41%	1.14%	9.69%
	18001~20000RMB	3.21%	0.00%	6.41%
	Over 20001RMB	2.04%	0.28%	4.01%
Marital Status	Married	61.04%	59.40%	62.68%
	Single and others	35.39%	36.32%	34.147%
Education	Elementary school or	14.96%	14.10%	15.81%

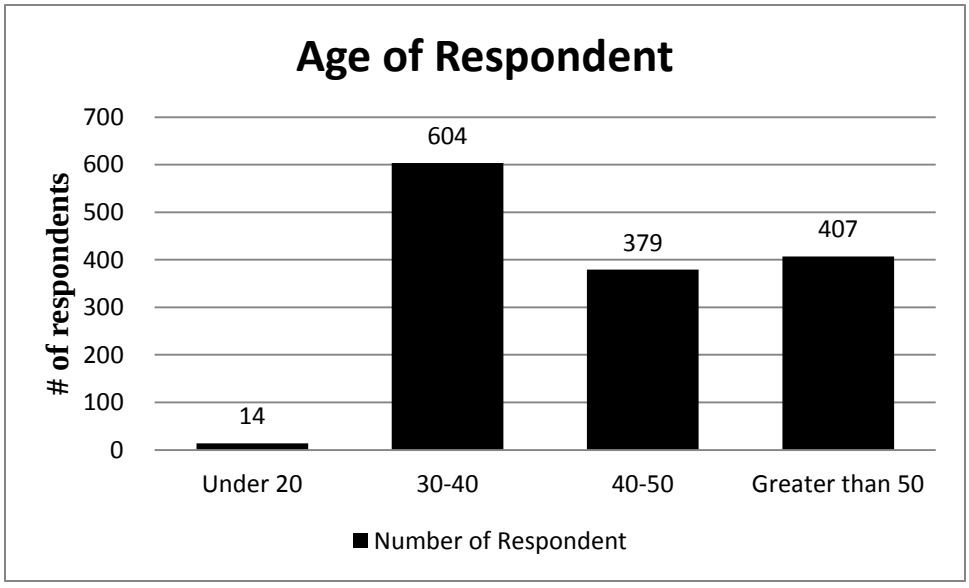
	lower			
	Junior high school	32.12%	28.49%	35.75%
	Senior high school	17.81%	15.81%	19.80%
	2-4years technical school or university	9.69%	12.25%	7.12%
	University	11.61%	14.39%	8.83%
	Master degree or higher	7.91%	6.98%	8.83%
Employment	Employment, full time	47.72%	43.30%	52.14%
	Employment, part time	15.60%	16.10%	15.10%
	Homemaker	19.66%	19.52%	19.80%
	Student	0.78%	1.00%	0.57%
	Retired	15.38%	18.38%	12.39%
	Other	0.21%	0.43%	0.00%
Transportation to supermarkets	on foot	67.17%	66.24%	68.09%
	bicycle	14.89%	16.95%	12.82%
	motorcycle	5.70%	7.41%	3.99%
	car	3.06%	1.99%	4.13%
	public transport	7.76%	5.84%	9.69%
Distance to supermarket (Meters)		553.85(SD=270.09)	558.20(SD=298.42)	549.50(SD=241.75)

4.4.1 Age of respondent

The first question asks respondents to indicate their birth year. The bar chart above indicates that the majority of respondents (43%) belong to the age group of 30-40 years.

Respondents aged 40 to 50 make up 27% of respondents and respondents aged greater than 50 occupy 29%. Only 1% of respondents were under 20 years old. The average age of respondents was 44 years. However, the national statistics in China (China Statistical Yearbook, 2013) showed that the average age of the population was 35 years. There are several possible explanations for the higher age of respondents. For example, the average age of consumers might be higher than the average age of the population. Or, because infants and babies were not included in the age count, the average age of respondents was statistically lower.

Figure 4. Age of respondent

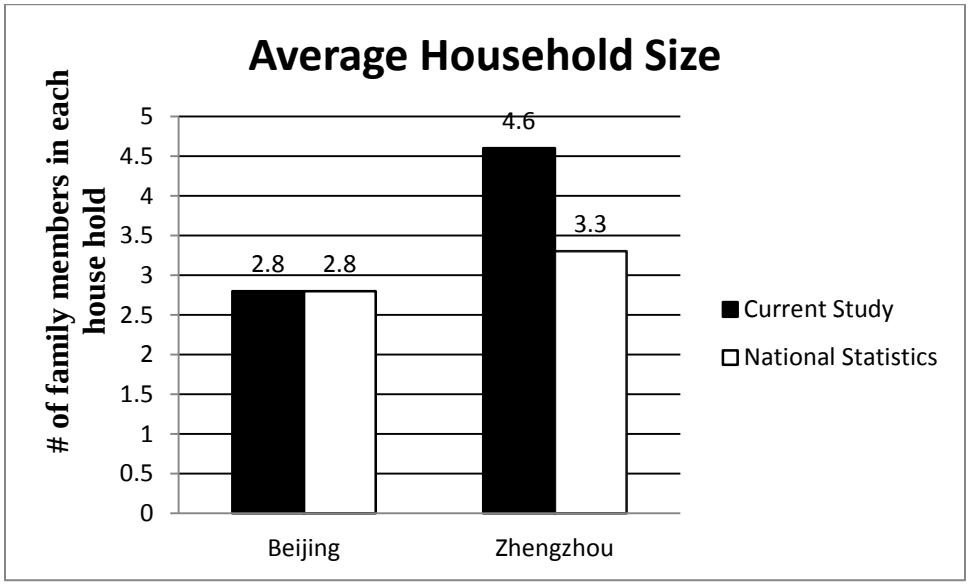


4.4.2 Household Size

The average household size of the current study in Beijing is 2.8, which is consistent with the national level census data of Beijing in China. But, the average household size in Zhengzhou is 4.6, while national level census data showed the average household size of

Zhengzhou was 3.3. There larger number of household size in Zhengzhou may be a result of that Zhengzhou is a second tier city, so that family structure are more similar to a traditional family where child are more likely to live with their parent even after they get married. The higher household size in Zhengzhou might also reflect recent changes in population demographics resulting from job growth in this area.

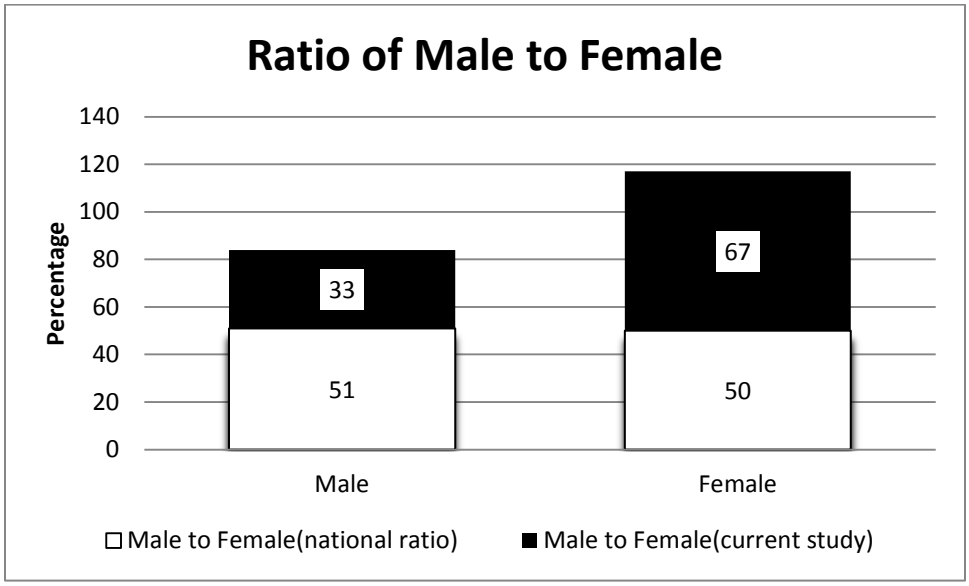
Figure 5. Average household size



4.4.3 Gender

Taking a closer look at these demographic results, it was interesting to find that a large majority of the respondents in the current study were female, the national ratio of male to female is 51to 50. The higher number of females respondents may be partially explained by a tendency of female to do more of the routine grocery shopping in most households. In fact, a Plma Consumer Research study found that 75% of females did more than half of the shopping for their households (Plma Consumer Research 2013).

Figure 6. Ratio of male to female

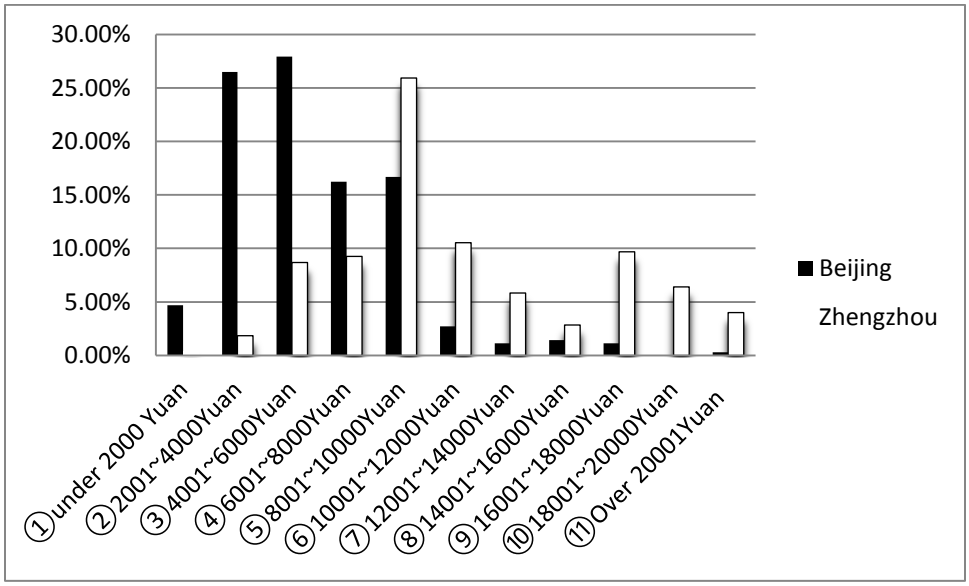


4.4.4 Income

The average monthly income of the current study respondents was 3,166 RMB and 7,000 RMB in Zhengzhou and Beijing respectively, which is consistent with the national statistics in China (China Statistical Yearbook, 2014). There is a big difference in the monthly household income in Zhengzhou and Beijing. In Zhengzhou there are 26.51% in the 2,001 RMB to 4,000 RMB range; and 27.92% in the 4,001 RMB to 6,000RMB range. In Beijing, however, there are 1.85% in the 2,001 RMB to 4,000 RMB range; and 8.69% in the 4,001 RMB to 6,000 RMB range. Also, in Zhengzhou there is 16.67% in the 8,001 RMB to 10,000 RMB range; and 2.71% in the 10,0001 RMB to 12,000 RMB range. In Beijing, however, there are 25.93% in the 8,001 RMB to 10,000 RMB range; and 10.54% in the 10,0001 RMB to 12,000 RMB range. The higher monthly household income in Beijing as opposed to Zhengzhou may explain the differences in the different milk powder

preferences between the two cities.

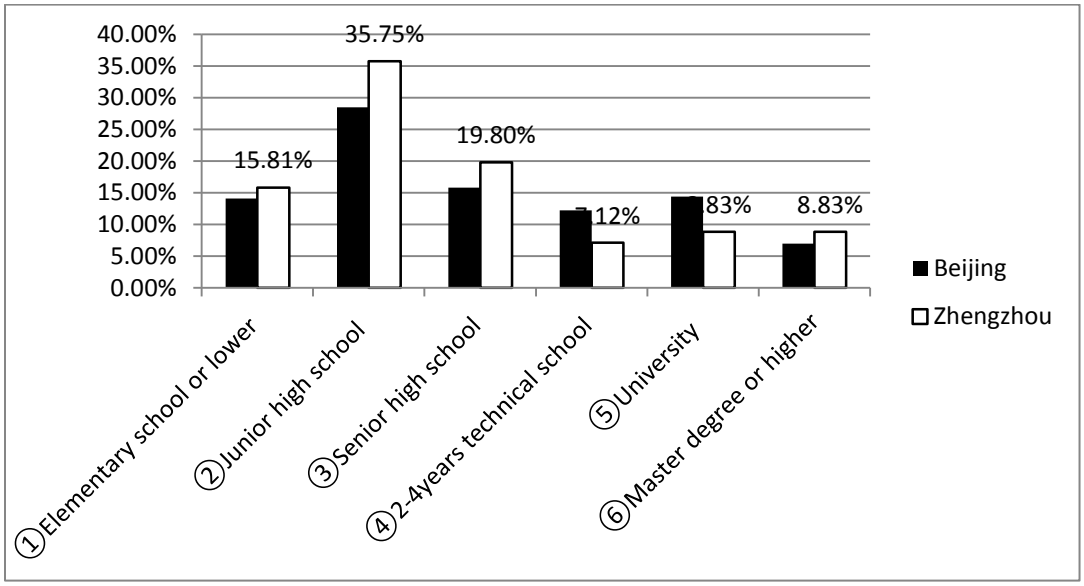
Figure 7. Distribution of monthly income



4.4.5 Education Level

The respondents' education levels are consistent with the national statistics of China (China Statistical Yearbook, 2014). In the current study, only about 14% of the respondents in Beijing and 16% of the respondents in Zhengzhou belong to the category of "elementary school or lower", meaning that the majority of respondents in this study had completed some form of education. Those who had completed education lower than senior high schools made up 43% of the respondents in Zhengzhou and 52% of the respondents in Beijing. Those who had completed education of senior high school and 2-4 years technical schools made up 28% of the respondents in Zhengzhou and 27% of the respondents in Beijing. There are 21% in Zhengzhou and 18% in Beijing of the total respondents who had complete university and master degree or higher.

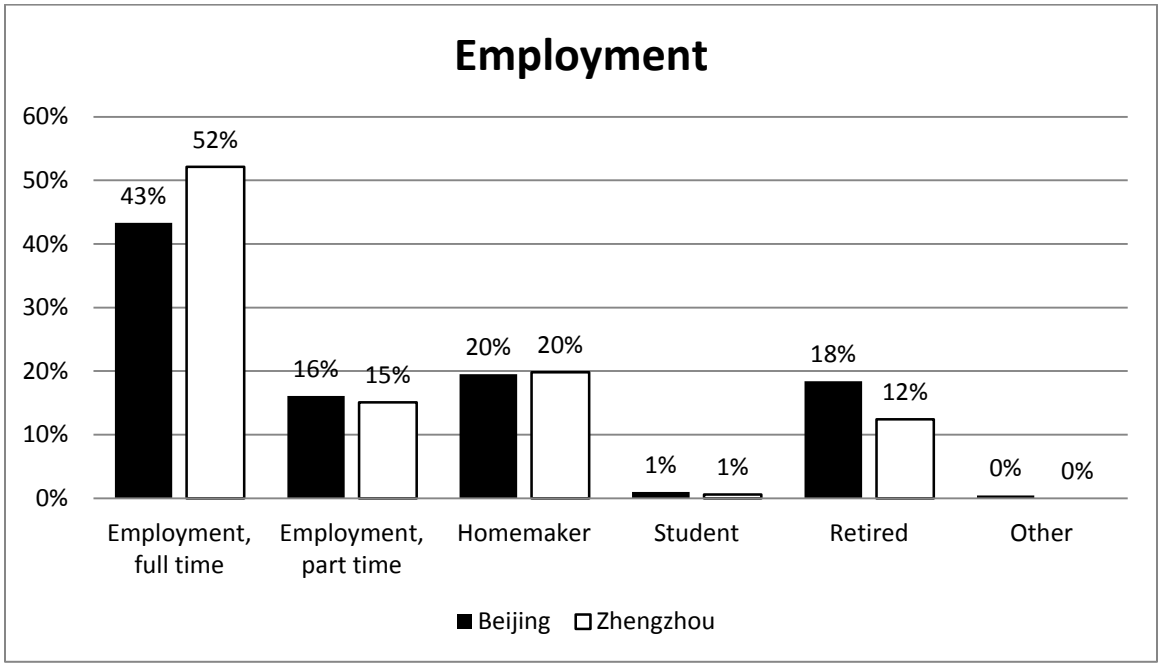
Figure 8. Education level



4.4.6 Employment

In this study, the respondents' employment statuses are consistent with the national statistics (China Statistical Yearbook, 2014). Some categories such as "Employment-full time", "Homemaker", and "Retired" occupy 81% of respondents in Beijing and 85% respondents in Zhengzhou respectively. More specifically, full-time employees account for 43% of the respondents in Beijing and 52% of the respondents in Zhengzhou. Homemakers make up 19.5% of the respondents in Beijing and 19.8% of the respondents in Zhengzhou. Retired respondents account for 18.4% of the respondents in Beijing and 12.4% of the respondents in Zhengzhou.

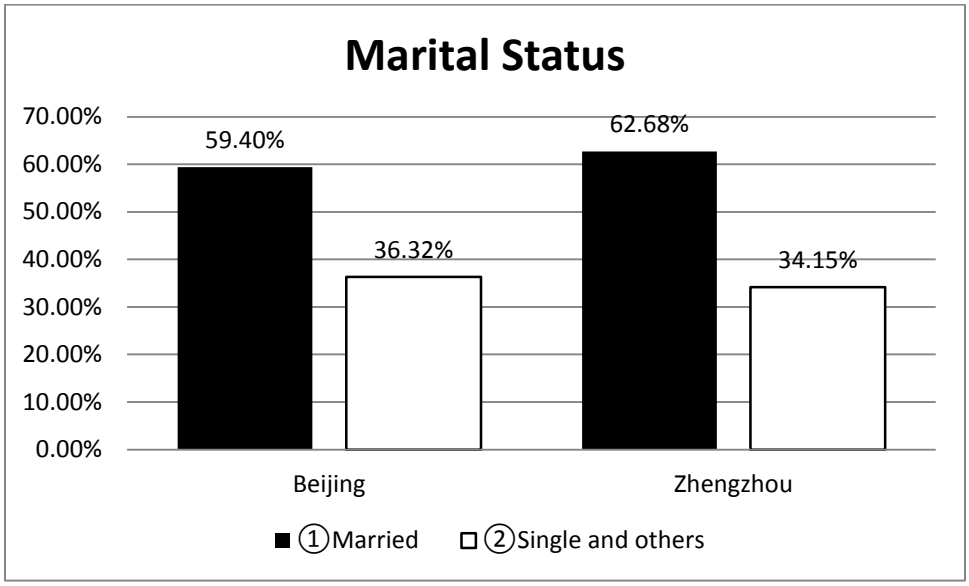
Figure 9. Employment



4.4.7 Marital Status

The married status of respondents in Beijing and Zhengzhou are 59.4% and 62.7% respectively, while the married statuses in the national statistics are 66% and 73% respectively. There are several possible explanations for the lower married status among respondents in this study. For example, the married status of consumers might be lower than the married status of the population. Or the higher percentage of women respondents lowers the overall married status. China statistical yearbook showed that more married men than married woman while more divorced and widowed women than men (China Statistical Yearbook, 2014).

Figure 10. Marital status



Chapter 5: Results

5.1 Basic Information Analysis

This chapter demonstrates the results of the survey and subsequent statistical analyses. The first section of questions in the survey analyzed respondents' consumption and knowledge about milk powders. This section gathered information about frequency, amount, type, and location of milk purchases. These questions also collected data about the popularity of different brands, and respondents' perceptions of milk powder safety and quality.

In China, the most popular package size of milk powders comes in 400g, 500g and 900g size. The majority of respondents (79.5%) purchased 900g package size and purchased conventional milk powders. The frequency which they bought packages varies. Those who bought less frequent did not buy large package size. The more frequent buyers drink more milk.

The results showed that 69.4% of the respondents purchased milk powders online, 5.9% and 18.4% of the respondents purchased milk powders from convenience stores and supermarkets. It is interesting to note that 6.2% of the respondents purchased milk powders from "other" places (primarily baby shops). The survey showed that most respondents close to home, and "on food" and "bicycle" were selected as the most popular transportation; therefore, respondents were not buying bulk or large size of milk powder packaging, but were buying only to suit their needs (900g).

Most respondents (75%) ranked the United States and Switzerland as having produced the safest and highest quality milk powders, although it is important to know that many of the respondents were not aware that Nestle is produced in the United States.

5.2 Family Consumptions

Milk powders are consumed at least once per week by 37% of the families surveyed. Families which consumed milk powders 3 to 4 times per week (6.6%), 1 to 2 times per week (7.4%), once per week (9%) and once per month (7.1%) shared similar percentages. Families consuming milk powders less than once per month had a percentage of 32%. When the respondents were asked about the main reason for purchasing dairy powders, the reason "for their infants" shared the highest percentage (24%), followed by "for adults" (26%).

5.3 Awareness of Milk powders

Respondents were asked if they "have ever heard about" or "rank" "Country-of-origin", "Direct ownership of farm", "Farming method (conventional vs. organic)", "Traceability", and "HACCP" attributes. The results showed that consumers, in general, do not trust certifications but they care about "Country-of-origin", "Direct ownership of farm" and "Traceability", and they consider "Country-of-origin" as the best indicators of safety. They already had more awareness and familiarity with "Country-of-origin", "Direct ownership of farm" and "Traceability" compared with "Farming method (conventional vs. organic)", and "HACCP." In most categories, there was a clear majority with "Country-of-origin" ranked first (58%), "Direct ownership of farm" ranked second (60%),

"Traceability" ranked third (60%), "Farming method (conventional vs. organic)", and "HACCP" are clearly ranked lower in fifth and sixth place.

5.4 Cluster Analysis

Researchers group customers with similar attitudes and needs when they analyze data. In this study, a cluster analysis was used to identify homogenous groups based on ranking of milk powder attributes. Using cluster analysis, dairy companies can then target each of these groups by positioning themselves in a unique niche or launch competitive marketing strategies for a unique group.

Questions related to consumers' preference for milk powder attributes are used to cluster because the main purpose of current study is to analyze Chinese consumer preference for milk powder attributes.

5.4.1 Two-Step Clustering

SPSS offers three methods for the cluster analysis: K-Means Cluster, Hierarchical Cluster, and Two-Step Cluster. There are 3 different methods that can be used to cluster data: K-Means Cluster, Hierarchical Cluster, and Two-Step Cluster. K-means cluster method can be used to quickly cluster large data sets, which would be more complex with the hierarchical cluster method. The numbers of clusters are needed to be defined in advance. This method is commonly used to test various models with various assumed number of clusters. Hierarchical cluster can generate different models with cluster solutions from 1 (all cases in one cluster) to n (all cases are an individual cluster) Hierarchical cluster can handle categorical and continuous variables, but it cannot be used to measure a

combination of categorical and continuous variables. Same as the K-means cluster method, the researchers have to identify clusters in advance. Different than Hierarchical cluster, this method can be used to measure a combination of categorical and continuous variables. Two-step cluster analysis can also automatically obtain the most feasible numbers of clusters, a task normally done by researchers when use the other two methods (Bacher, Wenzing and Vogler, 2005).

Via clustering, the 1,404 subjects were grouped into four clusters. As shown in Table 12, there are 354 respondents in cluster 1,256 respondents in cluster 2,657 respondents in cluster 3, and 135 respondents in cluster 4. The percentage indicates how many respondents in this cluster selected that specific attribute. For example, there were 93.4% of respondents in cluster 3 selected “Ownership of farms” as the most important milk attribute; “Country-of-origin” as the second most important milk attribute; “Farming method (organic vs.conventional)” and “Name” as the 3rd and 4th important milk attributes; “Price” and “Best before date” as the least and second least important milk attribute.

Table 4. Four clusters

cluster	1	2	3	4
size	25.2% (354)	46.8% (657)	18.4% (258)	9.6% (135)
Input	Best before date 6 (28.8%)	Best before date 2 (72.5%)	Best before date 2 (90.3%)	Best before date 1 (100%)
	Country-of-origin 3 (33.1%)	Country-of-origin (96.5%)	Country-of-origin 7 (87.2%)	Country-of-origin 8 (98.5%)

	Name 4 (30.5%)	Name 6 (52.4%)	Name 5 (50.4%)	Name 2 (100%)
	Price 8 (67.6%)	Price 1 (76.7%)	Price 1 (83.7%)	Price 3 (98.5%)
	Q121 17 (24.9%)	Q121 22 (88.7%)	Q121 21 (50.4%)	Q121 20 (51.9%)
	Traceability 2 (32.8%)	Traceability 3 (96.3%)	Traceability 3 (100%)	Traceability 4 (100%)
	HACCP 7 (34.2%)	HACCP 4 (100%)	HACCP 4 (50.4%)	HACCP 5 (53.3%)
	Ownership of farms 3 (22%)	Ownership of farms 7 (98.8%)	Ownership of farms 8 (93.4%)	Ownership of farms 7 (100%)
	Farming method(organic vs.conventional) 1 (21.4%)	Farming method(organic vs.conventional) 5 (52.8%)	Farming method(organic vs.conventional) 6 (84.5%)	Farming method(organic vs.conventional) 6 (53.3%)

Cluster 1 contains the fewest number of respondents. This is the most price sensitive group. Respondents in this cluster emphasized how much the price of milk powders influenced their purchasing behavior.

Cluster 2 and cluster 4 placed very high importance on “Country-of-origin” and the “Direct ownership of farm.” Furthermore, both clusters place low importance on “Best before date.” This implies that respondents in these two clusters value “Country-of-origin” more than other attributes when purchasing milk powder. In contrast to respondents in cluster 1, respondents in these two clusters care much less about the

“Price” level of milk powders. One major difference that separates cluster 2 and cluster 4 is the factor of “Name.” Respondents in cluster 2 place relatively high importance on “Name.” Cluster 4, however, place “Name” as the second least important attributes. This implies that respondents in cluster 2, compared to those in cluster four, are more likely to purchase the milk powder with a reliable name.

The final cluster includes the remaining respondents, who rate “Direct ownership of farm” as most important factor. Along with cluster 2 and cluster 4, this cluster also places lower importance on the “Price.” Respondents in this cluster emphasize that “Direct ownership of farm” by milk powder companies positive influences their purchasing behavior.

Table 5. Group numbers and quality of cluster analysis

Algorithm	Two Step
Inputs	13
Clusters	4
Cluster quality	Fairy good

5.4.2 One-Way ANOVA

Cluster analysis cannot test for significance and goodness of fit measures. Analysis Of Variance (ANOVA), however, can test the statistical significance and goodness of fit of the groups. Because there is only one factor variable in this analysis (clusters), the one way analysis of variance is used to compare clusters, to find significant difference with respect to “Price”, “Name”, “Best before date”, “Traceability”, “Direct ownership of farm”, “Country- of-origin”, “Farming method (conventional vs. organic), and “HACCP.”

The Table 14 below shows that the p-value of all dependent variables is smaller than 0.05, which indicate that there are significant difference among clusters with respect to “Price”, “Name”, “Best before date”, “Traceability”, “Direct ownership of farm”, “Country-of-origin”, “Farming method (conventional vs. organic), and “HACCP.”

Table 6. One-way ANOVA

		Sum of Square	df	Mean Square	F	Sig.
Price	Between groups Within groups Total	3417.905 4890.633 8308.538	3 1400 1403	1139.302 3.493	326.138	<0.00
Ownership of farms	Between groups Within groups Total	1687.648 2497.238 4184.886	3 1400 1403	562.549 1.784	315.376	<0.00
Best before date	Between groups Within groups Total	2887.786 2163.624 5051.410	3 1400 1403	962.595 1.545	622.859	<0.00
HACCP	Between groups Within groups Total	360.328 2024.820 2385.147	3 1400 1403	120.109 1.446	83.046	<0.00
Name	Between groups Within groups Total	1239.439 2325.081 2564.521	3 1400 1403	413.146 1.661	248.769	<0.00
Country-of-origin	Between groups Within groups Total	4124.849 2469.689 6594.538	3 1400 1403	1374.950 1.764	779.422	<0.00
Traceability	Between groups	230.026 1324.968	3 1400	76.675 0.946	81.017	<0.00

	Within groups Total	1554.994	1403			
Farming method	Between groups Within groups Total	735.821 3518.272 4254.093	3 1400 1403	245.274 2.513	97.600	<0.00
Agreement level of organic milk powders	Between groups Within groups Total	12915.510 11011.484 23926.994	3 1400 1403	4305.170 7.865	547.359	<0.00
Agreement level of milk powders with "Traceability" attribute	Between groups Within groups Total	6800.389 11074.497 17874.886	3 1400 1403	2266.796 7.910	286.561	<0.00
Agreement level of milk powders with "Ownership of farms" attribute	Between groups Within groups Total	37.239 13015.754 13052.994	3 1400 1403	12.413 9.297	1.335	=0.02
Agreement level of milk powders with "HACCP" attribute	Between groups Within groups Total	397.228 11103.612 11500.840	3 1400 1403	132.409 7.931	16.695	<0.00
Overall safety concerns	Between groups Within groups Total	26.830 1894.142 1920.972	3 1400 1403	8.943 1.353	6.610	<0.00

5.4.3 Chi-Square Test for Association

The Chi-Square Test for Association, also called Pearson's Chi-Square, is used to determine if there is a relationship between two variables. The Chi-Square Test for Association was used in this study because this test allows for the analysis of associations

among categorical variables. The Chi-Square test analyses show the statistical significance because the p-value of education, current working condition and age are less than 0.05. Therefore, there are distinctive differences between education, current working condition and age within clusters, suggesting that there are noticeable differences among the 4 clusters with respect to education, employment status, and age.

5.5 Analyses of Four Clusters

Some basic information about respondents in each of the four clusters is examined in this step in order to investigate if respondents in the same cluster have similar choices. The survey includes 6 questions related to shopping consumption habits and existing knowledge of milk powders in terms of "country-of-origin" knowledge. The mean values of each of these questions are listed in Table 18. These results show a significant difference among the four clusters in terms of the purpose for purchasing milk powder (for children, adults or infants), familiarity of milk powders with respect to "country-of-origin" and annually purchasing amount.

The purposes for purchasing milk powder vary significantly among the 4 clusters. Clusters 2, 3 and 4 tend to include more purchases for infants. In contrast, cluster 1 includes more purchases for adults but lower purchases for infants and children see Table 18 for more details.

Compared to the overall mean number of mistakes respondents made, which is 3.8, respondents in cluster 1 made more mistakes. In contrast, clusters 2, 3 and 4 are around the mean. This suggests that respondents in cluster 1 have less knowledge about the country-of-origin of different milk powders. Demographic data reveals that

respondents in cluster 1 are the most price sensitive group and respondents in this cluster emphasized how much the price of milk powders influenced their purchasing behavior. In the “annual purchasing amount” category, cluster 2 shared a much higher purchasing amount (51026 kg) per family, which was over two times of cluster 3 and 4.

5.6 Summary of 4 clusters

Respondents in cluster 1 have low level of knowledge about milk powders in terms of “country-of-origin”and low levels of education (less than elementary). Most respondents (95% of the respondents) in this cluster are 30-40 or older than 50 years of age. They are part-time workers or retired. Respondents in this cluster emphasized how much the price of milk powders influenced their purchasing behavior, had more purchases for adults but lower purchases for infants and children.

Clusters 2 and 4 shared many characteristics. Respondents in clusters 2 and 4 reported that “Country-of-origin” and “Name” attributes of milk powders influenced their purchasing behavior. These respondents have much more knowledge about milk powders, and have university and post-secondary education. They are 20-40 years of age, and are full-time workers. Respondents in cluster 2 had the highest purchasing amount.

Respondents in cluster 3 emphasized how “Direct ownership of farm” influenced their milk powder purchasing behavior. Respondents in this cluster have 2-4 years professional training and junior high school education. Most of the respondents in this cluster are 30-40 years of age, while some are retired.

5.7 Willingness to Pay

Willingness to pay (WTP) is the amount of money that consumers would be willing to give up or accept to get a good, service or something desirable. It is a reflection of the maximum amount of money that an individual consider the value of a good and it does not call for an actual payment. The WTP function measures the price consumers are willing to pay for a given level of quality, q, given a particular price p and utility U (Luck and Hudson, 2004).

Munene (1998) also defines WTP as a relationship between the amounts a buyer would pay or give up acquiring a product service or something desirable and the value of the product or service. The amount a consumer will pay indicates how much the buyer values the product or service.

Table 7. Coefficients of four cluster

Attribute	Coefficient	Std. Err.	Z	P > |Z|
Price	-0.0026887	0.004936	-5.45	0.000
Traceability	0.144545	0.424188	3.41	0.001
Ownership of Farms	0.7685008	0.04426	17.36	0.000
China	-1.366179	0.1654919	-8.26	0.000
The U.S.	2.010701	0.963027	20.88	0.000
New Zealand	1.243752	0.944511	13.17	0.000
Switzerland	1.949815	0.987455	19.75	0.000
Organic	-0.3399347	0.0466373	-7.29	0.000

HACCP	-0.9656302	0.0529294	-18.24	0.000

Table 8. Mean willingness to pay

Attribute	Mean willingness-to-pay	Attribute	Mean willingness-to-pay
Traceability	53.76 RMB	Ownership of farms	285.82 RMB
China	-508.12 RMB	U.S.	747.84 RMB
New Zealand	465.59 RMB	Switzerland	725.19 RMB
Organic	-126.43 RMB	HACCP	-359.15 RMB

The mean willingness-to-pay estimates were obtained using the coefficients in Table 20. Mean WTP for "Traceability" for a 900g milk powder was 53.76 RMB. The mean WTP for "Direct ownership of farm" was 285.82 RMB. Consumers, on average, are willing to pay 285.82 RMB extra per 500g for milk powder with the "Direct ownership of farm" attribute.

The "Country-of -origin" attribute included China, U.S., New Zealand and Switzerland. The mean WTP for "China" was -508.12 RMB. This number implied that, on average, consumers were WTP -508.12 RMB less per 900g for milk powder produced in China. The mean WTP for "U.S." was 747.84 RMB, "New Zealand" was 462.59 RMB and "Switzerland" was 725.19 RMB. The Table 20 shows that milk powders produced in Switzerland carried the largest premium among the four"Country- of-origin"attributes, followed by milk powders produced in U.S. and New Zealand. Milk powders produced in

China, however, had the lowest mean WTP. Previous analyses shows that, 85% consumers rate “Direct ownership of farm”, “Country- of-origin” and “Traceability” as their top three most important attributes. So, “Direct ownership of farm”, “Country-of-origin” and “Traceability” attributes are most significant requirements for consumers in order to select milk powders.

Both the “Organic” and “HACCP” attributes are associated with a negative mean WTP. More specifically, the mean WTP for “Organic” and “HACCP” were -126.43RMB and -359.15RMB. These results imply that, on average, consumers are willing to pay 126.43 RMB less per 900g for the organic milk powders and 359.15RMB less per 900g for milk powder with “HACCP” certification. The negative effect of “Organic” and “HACCP” attributes was a surprising result that is inconsistent with expectations. The inconsistency between the expectations and results is fairly common in research studies (examples include Faulder 2014 and Yooyen, Pirani and Mujtaba 2011). There are some possible explanations for this inconsistency; in particular, the negative effect of “Organic” and “HACCP” attributes might reflect consumers’ prior perceptions of these variables. In other words, despite the definitions given to them in the questionnaire, they already came with some knowledge and perceptions. For example, in question 10, consumers are asked if they have ever heard about “Traceability”, “Direct ownership of farm”, “Country-of-origin”, “Organic” and “HACCP” attributes. While 88% of respondents had heard about “Country-of-origin” attribute, 80% and 78% of respondents had heard about “Traceability”, “Direct ownership of farm”, 77% and 66% of respondents had heard about “Organic” and “HACCP” attributes. These results showed that consumers, in general, already had more awareness and familiarity with the “Country-of-origin”

attribute compared with “Organic” and “HACCP” attributes. The impact of prior knowledge or familiarity on survey results has been well established in the literature. For example, Goode, Dahl and Moreau (2009) focused on subjective product experience, finding that analogical thinking provides an effective link to consumer preferences. Gregan-Paxton, Hibbard, Brunel and Azar (2002) and Roehm and Stemthal (2001) discussed the influences of previous knowledge on consumer learning process; they found that analogy has a big impact on consumer preference for innovative products.

Another possible explanation for the negative effect of “Organic” and “HACCP” attributes might be explained by consumers’ extreme focus on the “Country-of-origin” attribute; in comparison with “Country-of-origin”, the other attributes may become less important. Brand (2014) found that “Country-of-origin” is a more powerful driver of consumer choice compared with other factors such as price, safety and availability. Beattle (2013) also found that Chinese consumers’ distrust of milk powder produced in China is so strong that they actively seek milk powders abroad and occasionally empty store shelves in overseas countries because they think the foreign milk powders offer better quality. The negative effect of “Organic” and “HACCP” attributes might also be explained by the inclusion of multiple variables in the survey, which may in some way dilute the significance of some variables in comparisons to others. For example, in question 11, respondents were asked to rank the importance of eight attributes: “Country-of-origin”, “Direct ownership of farm”, “Price”, “Farming method (conventional vs. organic)”, “Best before date”, “Traceability”, “Name” and “HACCP.” The challenges of analyzing survey data involving multiple predictor variables and multiple response variables is well documented in market research literature, example include: RMB,

Joseph and Lin (2007),Tinbergen (2012) and Gujarati (2003).

In addition to the negative effect of "Organic" and "HACCP", the results also showed that the majority of respondents (58%) ranked "Country-of- origin" as the most important attribute. And, 60% of the respondents ranked whether milk powder manufacturers have their own farm as the second most important attribute, while 39% of the respondents considered price as the least important attribute. A large majority of respondents (66%) chose "Traceability" as the sixth most important attribute. "Farming method (conventional vs. organic)" was rated as the third (47%) and fourth (32%) most important attribute by most respondents. Most respondents ranked "Best before date" as the least important attribute overall (51% as seventh and 37% as eighth). In question 12, respondents were asked to identify their agreement with some statements related to five pre-mentioned attributes in terms of safety, quality, health and environment. Results showed that consumers gave the lowest overall average scores to the"Organic" and "HACCP" attributes, and that they gave higher scores to "Traceability" and "Direct ownership of farm." The reason why they gave the lowest overall scores to "Organic" and "HACCP" might not be because they thought those two variables were not important, but because the complexity of this question, including multiple variables dilutes the significance of those two (Gujarati 2003).

Familiarity, as opposed to deep knowledge and understanding, might also explain the negative effect of "Organic" and "HACCP." More simply, the researcher's expectations are significantly different from the average responses because of her well-educated knowledge and understanding about milk powders and the corresponding milk powder attributes. Xu and Wu (2010) found that 63% of Chinese consumers have never heard of

"Traceability." The researcher, however, is well educated with knowledge and understanding about "Traceability." Wang, Mao and Gale (2008) also found similar results, as they concluded that less than 20% Chinese consumers were aware of HACCP (Wang, Mao and Gale 2008).The customer outside the grocery store in China is unlikely to know as much about milk powders and the corresponding attributes compared with the researcher. The inconsistencies between hypotheses and results may reflect the researcher's subconscious comparison of her answers to those of the average respondent.

Finally, the negative effect of "Organic" and "HACCP" attributes might be because consumers just do not trust the "Organic "and "HACCP" labels because there have been so many milk safety scandals in China. For example, milk powder produced by Yili Group, a company attained HACCP certification, was determined to contain "an unusual" level of mercury (BBC News, 2012). Also, milk powders produced by Holle labeled "Organic" were rejected by China because the quality did not meet the national milk powder standard. The Hero baby formula, a company producing high-quality organic products and with "HACCP" labels, was involved in the milk scandal recently (Today's Topics 2012). Arp (2014) stated that organic food scandals or crisis can destroy the confidence of consumers in organic products. Therefore, consumers might have lost their trust in "HACCP" and "Organic." Langley (2013) found that Chinese consumers do not trust "Organic" label and more than half consumers think that "Organic" label is only an excuse for companies to charge price premiums.

Chapter 6: Conclusions

The conclusion includes a summary of the findings, a discussion of the study limitations, and suggestions for further study.

6.1 Summary of Findings

The research measured consumers' preferences for milk powder with selected milk powder attributes. Every 10th consumer who attend the store and over 18 were asked to fill out the survey. 10,000 were asked to participate; only 1,404 usable responses.

The results found that milk powders is an important food product among Chinese consumers. Chinese consumers consider imported milk powders safer than domestic milk powders, which is consistent with Sharma's study (Sharma 2008). The majority of them purchased milk powders for their infant and some brands such as imported brand Wyeth, Mead Johnson and Nestle were their popular choices.

The results demonstrate that Chinese consumers believe "Country-of-origin" was the most important attribute. In fact, 58% of survey respondents ranked "Country-of -origin" as the most important attribute. Consumers, on average, prefer milk powder produced in Switzerland, the U.S., and New Zealand. More specifically, consumers distrust milk powders produced in China while they are willing to pay a price premium for milk powder produced in Switzerland, the U.S., and New Zealand. Most respondents (75%) ranked the United State and Switzerland as having produced the safest and highest quality milk powders, while 64% of respondents ranked China as having produced the

lowest quality milk powder. Milk powders with “Traceability” and “Direct ownership of farm” attributes also increased their associated utility level. However, milk powder with “Organic” and “HACCP” attributes decreased the associated utility level provided by the choice. Price is the least important attribute.

All consumers generally care for “Country-of-origin.” There are some patterns among different demographic groups. Most respondents aged 30-40 or order than 50, low levels of education (less than elementary), part-time or retired are concerned about price. Respondents aged 20-40 years old, and have university and post-secondary education; full-time consumers are more willing to pay premiums for milk powders with “Country-of-origin” attributes. Respondents aged 30-40 years of age have 2-4 years professional training and junior high school education emphasized how “Direct ownership of farm” influence their milk powder purchasing behavior.

6.2 Limitations

One of the limitations of this study is about the locations. Following the studies cited above, the experiment in the current study was only conducted in two cities. It is very difficult and time consuming to conduct choice experiments in a large sample of customers from wide geographic areas. The study could have achieved more representative results through selecting a group of geographical areas to represent a larger area. For example, better representative results could be achieved if respondents from both cities and countryside.

Supermarkets included in the current study are believed to represent the (select same supermarkets) supermarkets in Zhengzhou and Beijing in general. The stores are located in

different areas of the city, attracting different types of customers. In most cases, the grocery stores selected were the same across districts, except for Meilianmei and Dannisi, both were selected because they were the most popular in their districts. Dannisi positions itself as an upscale chain with high quality products, offering a friendly and clean atmosphere to its customers. Meilianmei in Beijing, however, is viewed as a mid-level chain with good quality product offerings and affordable prices. The atmosphere at Meilianmei is not competitive compared with atmosphere at Dannisi. These two chains aim at different customer demographic groups: Dannisi aims at higher-class customers who rate the atmosphere and quality of products as more important than affordability. In contrast, Meilianmei targets middle-class customers who focus on affordable prices. The different customer demographics at Dannisi and Meilianmei might explain differences when comparing the responses in Zhengzhou and Beijing.

Another limitation of the study is related to respondent error. Although the surveys were pre-tested in advance, they were only pre-tested in Zhengzhou because of the cost and time constraints. When the responses from the actual survey were collected, it became clear that some respondents did not fully complete their questionnaires. Unfortunately, the survey method did not allow for follow up contact with respondents. However, the rest of the information from these incomplete surveys was still included in the study and used for analyses. Also, some survey respondents thought that choice experiment part of this survey was quite complex. This may result in respondents not carefully thinking the questions through. Perhaps respondents could think more carefully if there were fewer choice experiment questions.

The survey method used in this study, specifically "person-to-person" survey, was not without weakness. While the "person-to-person" survey worked well enough for this study with many advantages in terms of response rate, quality control, visible responses, this type of survey also includes some challenges that are difficult to overcome. In particular, the survey was very time-consuming for researchers compared with other methods. And follow up contact with respondents were impossible.

A surprising number of respondents indicated that their household or extended family encountered milk safety issues compared with the safety incidence rate in Canada. This question in itself may not have limitations. However, two respondents recalled milk safety issues from 50 years ago. This current study is only focused on recent milk safety issues. Perhaps the question should have asked if their household or extended family encountered milk safety issues recently (within the last ten years).

6.3 Recommendations for Future Research

While the results of this analysis about Chinese consumers' preference about milk powder attributes were valuable, they could also function as a starting point for future studies. This section first identifies some strategies that the current study could be improved and continued by talking about the various directions that future studies can follow.

Based on the points discussed in the limitations section of this study, it is essential that future studies find a way to access a population sample that is more representative of the actual Chinese population. For example, future studies could survey respondents from both cities and countryside, rather than from just 2 cities. In addition, future researchers could

use other survey instruments such as telephone interviews with suitable telephone list.

Future research should also address the limitations of respondent error. In order to ensure pre-testing locations resembling actual data collection locations as closely as possible, pre-testing is recommended to be conducted in all the cities where actual data will be collected. In addition, a shorter and more focused survey would also reduce the workload of respondents and may reduce respondent errors.

Future study could investigate the appropriateness of using latent class model to estimate individual-level coefficients. The current study assumed that the distribution of the coefficients in the model is continuous, alternatively, the coefficient may be discrete, and the latent class model could be used to study the distribution of the coefficient as discrete. In the latent class model, each consumer is assumed to belong to a class; preference within the classes is the same and varies otherwise.

Future research could focus on determining whether it is feasible for milk powder manufacturers to produce milk powder with consumer preferred attributes. In other words, future research could be directed at the question of how milk powder manufacturing could launch some brands with consumer preferred milk powder attributes and get to a point where those products could be marketed commercially. There is an issue as to whether it is possible for milk manufacturers to guarantee a consistent supply of milk powder with consumer preferred attributes that meet their overall standards. Future researchers could study the case of some major popular milk powder manufacturers such as Mead Johnson and Nestle to learn how they first set out and were able to meet the requirements of their

consumers.

An essential future study endeavor would be to determine how much it costs to produce milk powder with consumers' preferred attributes and how many Chinese consumers were willing-to-pay price premium. More specifically, future researchers could have a detailed cost analysis to discuss the costs, break-even points, producing, processing, packaging and shipping to Chinese market.

It would be also interesting to add "Green Label" into the milk powder attributes. Paull (2008) stated that "Green Label" as a Chinese eco-certification innovation for production process and the outcomes, has been recognized as a successful eco-labelling program. This program served as a transitional level between organic and conventional farming. Similar to Yu, Gao, and Zeng (2014) and Lin (2006), the future research could study consumers' perception or willingness-to-pay for "Green Label" in China. This would provide a clearer view on the significance of certification that Chinese consumer placed on milk powder certification.

6.4 Conclusions

This thesis accomplished it objective of discovering Chinese consumers' preferences for specific milk powder attributes. This research revealed that Chinese consumers believe imported milk powders are safer than domestic milk powders, and that consumers prefer milk powder with "Traceability", "Direct ownership of farm" attributes. Consumers with better education and full-time employment are more likely to be concerned about milk powder attributes. Chinese milk manufacturing companies should look for some

opportunities like joint venture or long term strategic partnerships with well established dairy manufacturing from the preferred countries such as the United States, New Zealand or Switzerland in order to gain consumers' confidence. For example, Chinese milk manufacturing companies in partnership with foreign producers could produce milk in preferred countries like the United States, New Zealand or Switzerland and imported to China which would improve consumer confidence and increase sales. Or Chinese milk companies could have partnership with these preferred partners develop manufacturing in China. The dairy manufacturing from United States, New Zealand and Switzerland would enjoy benefits from having a foothold in the growing Chinese market because milk manufacturing in these countries have tremendous growth potential.

The Ministry of Agriculture of the People's Republic of China should educate Chinese people about some milk safety attributes such as "HACCP" and "Organic" labels in order to increase the public awareness. Further they can adopt new technologies and use new information to solve some challenges such as low yield per cow. In order to restore Chinese consumers' confidence in milk powder, Along with the State Administration of Quality Inspection, Supervision and Quarantine, and the Food and Drug Administration, the Ministry of Agriculture of the People's Republic of China should establish, monitor and enforce standards in order to restore Chinese consumers' confidence in domestic milk powder. And China State council should have tighter controls to inspect milk products with melamine content. Ministry of Agriculture of the People's Republic of China should along with the State Administration of Quality Inspection, Supervision and Quarantine, and the Food and Drug Administration to further

ensure the food safety for milk products. And China State council should have tighter controls to inspect milk products with melamine content.

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Appendix A: Survey Version 1 (Chinese)

城市：①北京　　②郑州

样本编号：_____

城区：_____ 超市：_____

地址：_____日期：_____调查员：_____

调查问卷

您好！我叫_____，是一名在读研究生。我们正在帮加拿大曼尼托巴大学做一个研究调查，是关于我国城市居民对奶粉消费行为研究，需要您 10-15 分钟时间，为感谢您的配合与参与，我们将送给您一份礼品（价值约 20 元）。调研将不涉及到任何个人的识别信息，所获得的数据也将严格用于科学研究！请问您是否愿意参加我们的调查？

调查员：如果拒绝接受调查，请在调查记录表上填写相关信息

第一部分：基本状况

1. 您家平时购买奶粉的频率_____？

①每月 3-4 次

②每月 1-2 次

③每个季度 1 次

④每半年 1 次

⑤每年 1 次

⑥少于一年 1 次

如果选 ① 或者 ② ，请回答问题 2，如果选 ③，④，⑤或者⑥请回答问题 3.

2. 您**每个月**大约购买_____以下的奶粉？

包装大小	数量(请自己填写)
450g	
500g	
900g	

3. 您**每年**大约购买_____以下的奶粉？

包装大小	数量(请自己填写)
450g	
500g	
900g	

4. 您家平时消费奶粉的频率_____？

①每天至少一次

②每周 3-4 次

③每周 1-2 次

④每周 1 次

⑤一月 1 次

⑥少于一月 1 次

5. 您买奶粉主要是_____？

①为成年人

②为孩子

③为婴儿

6. 您家主要在哪里购买奶粉_____？

①网购　　②便利店

③超市，请注明超市名称_____

7. 请您指出下列奶粉是来自于哪个国家 **(请连线)**.

品牌
美赞臣
多美滋
雀巢
惠氏
蒙牛
雅培
澳优
诗幼乐
伊利
明治

国家
新西兰
美国
中国
瑞士
日本
澳大利亚
德国
加拿大
爱尔兰

8. 您家主要购买过的品牌奶粉有哪些（可多选）？

①美赞臣
②多美滋
③雀巢

④惠氏
⑤雅培
⑥澳优

⑦诗幼乐	⑩其它品牌，请注明 _____
⑧伊利	⑪都没有
⑨蒙牛	

9.在您家购买的奶粉中，你觉得哪个国家的奶粉质量你最信得过**(请排序： 1 最信得过， 2 第二信得过， 3 第三信得过， … 6 第六信得过)**?

国家	排序
新西兰	
美国	
中国	
瑞士	
日本	
澳大利亚	

第二部分：对奶粉的认知

10. 您是否听说过以下和奶粉有关的术语

	是	**否**
奶源可追溯性		
有自己奶源基地		
奶粉原产地		
有机奶粉		
HACCP 质量体系认证		

奶源可追溯性，奶源基地，有机的奶粉生产方式和 HACCP 认证在某种程度上被认为是在某种程度上可以跟奶粉的质量相关.现在, 我将列出一些基本信息

奶源可追溯性的奶粉使记录下商品整个过程的信息变的可能，,当遇到问题时有奶源可追溯的奶粉可以追溯到是哪个具体环节出了问题

有自己奶源基地是指商家拥有自己的奶源基地
HACCP 的标志是 ，它是一个食品安全控制体系.国家认监委统一管理，监督和综合协调全国的 HACCP 食品安全管理体系认证认可
有机奶的标志是 ，有机食品在生产和加工过程中会遵循有机食品生产、采集、加工、包装、贮藏、运输标准，禁止使用化学合成的农药、化肥、激素、抗生素、食品添加剂等，禁止使用基因工程技术及该技术的产物及其衍生物

11. 在您选购奶粉时，下面因素起多大的作用(请用①、②、③…⑧排序)?

决定因素	请排序 ①最重要；②非常重要；③重要 ④一般重要 ….⑧非常不重要
品牌	
价格	
生产日期	
是否有奶源可追溯性	
是否有奶源基地	
原产地	
生产方法(有机 vs.普通)	
是否有 HACCP 质量体系认证	

12.请指出您是否同意以下陈述

	强烈不同意	不同意	中立	同意	强烈同意
有机奶可能会遇到更少的安全问题					
有机奶可能会遇到更少的质量问题					
有机奶对健康更有好处					
有机奶生产对环境污染更小					
	强烈不同意	不同意	中立	同意	强烈同意
有奶源可追溯性的奶粉会遇到更少的安全问题					
有奶源可追溯性的奶粉会遇到更少的质量问题					
有奶源可追溯性的奶粉对健康更有好处					
有奶源可追溯性的奶粉的生产对环境污染更小					
	强烈不同意	不同意	中立	同意	强烈同意

有奶源基地的奶粉可能会遇到更少的安全问题					
有奶源基地的奶粉可能会遇到更少的质量问题					
有奶源基地的奶粉对健康更有好处					
有奶源基地的奶粉的生产对环境污染更小					
	强烈不同意	**不同意**	**中立**	**同意**	**强烈同意**
有 HACCP 的奶粉可能会遇到更少的安全问题					
有 HACCP 的奶粉可能会遇到更少的质量问题					
有 HACCP 的奶粉对健康更有好处					
有 HACCP 的奶粉的生产对环境污染更小					

13.在您家今年购买的奶粉中，有机奶粉占您奶粉整体花费的_____%；普通奶粉占您奶粉整体花费的_____%？

14. 您觉得我国当前的奶粉安全形势如何？用 1-5 来表示严重程度，“1”一点也不严重，“5”非常严重，请选择您认为的比较适合的状况，打“ √ ”。

一点也不严重 1　2　3　4　5　非常严重

15.您本人或身边认识的人是否遭遇过任何奶粉安全事故_____？

①有　　②没有

16..您对我国当前奶粉行业中的各种安全认证的信任程度如何？用 1-5 来表示，“1”为完全不信任，“5”为完全信任，请选择您认为的比较适合的状况，打“√”。

QS 认证：带有 QS 标志的产品代表经过国家的批准，没有食品质量安全市场准入标志的，不得出厂销售。
ISO9001：是一类标准的总称，是由质量管理体系技术委员会制定的国际标准，是独立的第三方质量体系论证其标准得到了广泛的应用。
HACCP: 是一个食品安全控制体系.国家认监委统一管理，监督和综合协调全国的 HACCP 食品安全管理体系认证认可

认证名称	1--完全不信任	2	3	4	5--完全信任	不了解
QS 认证						
ISO 9001						
HACCP						

第三部分：选择试验

奶源可追溯性，奶源基地，有机的奶粉生产方式和 HACCP 认证在某种程度上被认为是在某种程度上可以跟奶粉的质量相关.现在,我将列出一些基本信息

奶源可追溯性的奶粉使记录下商品整个过程的信息变的可能，,当遇到问题时有奶源可追溯的奶粉可以追溯到是哪个具体环节出了问题
有自己奶源基地是指商家拥有自己的奶源基地
HACCP 的标志是 HACCP认证 食品安全管理体系 ，它是一个食品安全控制体系. 国家认监委统一管理，监督和综合协调全国的 HACCP
有机奶的标志是 中国有机产品认证标识 ，有机食品在生产和加工过程中会遵循有机食品生产、采集、加工、包装、贮藏、运输标准，禁止使用化学合成的农药、化肥、激素、抗生素、食品添加剂等，禁止使用基因工程技术及该技术的产物及其衍生物。 有机食品必须通过合法的有机食品认证机构的认证。

17.假设您今天到商店购买**奶粉给（孩子，婴儿，大人）**，看到两种选择：一种是奶粉一；另一种是奶粉二。请问在综合考虑品牌、产地、价钱、是否有自己的奶源基地、原产地、生产方法和是否有 HACCP 的情况下，您会选购哪一种？如果你对两种都不满意也可以都不选，见下面的例子（说明）。除了给出的信息，请假设奶粉的其它方面都完全一致。请在以下的问题中做出您最真实的选择，就像您在商店里真正购买奶粉一样。

第 1 组：

奶粉	**奶粉一**	**奶粉二**	

价格	**128/500g**	**86/500g**	
是否有奶源可追溯性	否	是	两方案都不选
是否有奶源基地	是	否	
原产地	美国	新西兰	
生产方法	普通奶	有机奶	
是否有 **HACCP** 质量	是	否	
我愿意选择的方案	( )	( )	( )

第 2 组：

奶粉	奶粉一	奶粉二	
价格	**45/500g**	**170/500g**	
是否有奶源可追溯性	是	否	两方案都不选
是否有奶源基地	否	是	
原产地	美国	新西兰	
生产方法	普通奶	有机奶	
是否有 **HACCP** 质量认证体系	是	否	
我愿意选择的方案	( )	( )	( )

第 3 组：

奶粉	奶粉一	奶粉二	
价格	**45/500g**	**86/500g**	
是否有奶源可追溯性	否	是	两方案都不选
是否有奶源基地	否	是	
原产地	中国	瑞士	
生产方法	有机奶	普通奶	
是否有 **HACCP** 质量	否	是	
我愿意选择的方案	◯	◯	◯

第 4 组：

奶粉	奶粉一	奶粉二	
价格	**170/500g**	**45/500g**	
是否有奶源可追溯性	否	是	两方案都不选
是否有奶源基地	否	是	
原产地	美国	中国	
生产方法	普通奶	有机奶	
是否有 **HACCP** 质量认证体系	是	否	

我愿意选择的方案	◯	◯	◯

第 5 组：

奶粉	奶粉一	奶粉二	两方案都不选
价格	**128/500g**	**170/500g**	
是否有奶源可追溯性	是	否	
是否有奶源基地	是	否	
原产地	美国	中国	
生产方法	有机奶	普通奶	
是否有 **HACCP** 质量认证体系	否	是	
我愿意选择的方案	◯	◯	◯

第 6 组:

	奶粉一	奶粉二	两方案都不选
价格	**128** 元**/500g**	**170** 元**/500g**	
是否有奶源可追溯性	否	是	
是否有奶源基地	是	否	
原产地	瑞士	新西兰	
生产方法	有机奶	普通奶	
是否有 **HACCP** 质量认证	否	是	
我愿意选择的方案	◯	◯	◯

第四部分：个人/家庭特征

18. 您是家里主要负责购买食物的人吗？

①是　　②不是

19. 您是否喝奶粉？

①喝　　②不喝

20.您的最高受教育水平？

①小学及以下　　②初中　　③高中

④ 2-4 年专科教育或同等学历　⑤大学 ⑥大学以上

21. 您当前的工作状况？

①全职　　②兼职　　③退休

④ 失业　　⑤家务　　⑥学生　　⑦其他_____

22.您出生于哪年 19_____年；

性别_____ [①男；②女]；

民族 _____；

23.您的婚姻状况 [①已婚；②未婚；③其它]？

24.您的出生省份_____（直辖市/自治区）？

25.您家里常住（一年 6 个月以上）的有几口_____人？其中_____人低于 18 岁?_____人高于或等于 60 岁？

26.离你家最近的超市有多远_____米？

27.您家里购买食品时最常用的交通工具是？

①步行

②自行车

③ 电动车或摩托车

④ 开车

⑤ 公共交通

⑥购物

28.您家今年月平均收入在下列哪个区间范围内 (由被调查人自己选择)?

①2000 元以下（上含）

②2001~4000 元

③4001~6000 元

④6001~8000 元

⑤8001~10000 元

⑥10001~12000 元

⑦12001~14000 元

⑧14001~16000 元

⑨16001~18000 元

⑩18001~20000 元

⑪20001~22000 元

⑫22001~24000 元

⑬24001~26000 元

⑭26000 元以上

29.您家有私家车吗？

①有　　②没有

非常感谢您的支持与帮助！

以下信息不用问

A1. 身高：

①150cm 以下

②150~159cm

③160~169cm

④170~179cm

⑤180cm 以上

A2. 体重：

①50 公斤以下

②50~59 公斤

③60~69 公斤

④70~79 公斤

⑤80 公斤以上

A3. 调查员总体感觉这份问卷完成的质量如何？

①非常好

②较好

③中等

④较差

⑤ 很差

Appendix B: Survey Version 2 (Chinese)

城市：①北京　②郑州

样本编号：_____

城区：_____ 超市：_____

地址：_____日期：_____调查员：_____

调查问卷

您好！我叫_____，是一名在读研究生。我们正在帮加拿大曼尼托巴大学做一个研究调查，是关于我国城市居民对奶粉消费行为研究，需要您 10-15 分钟时间，为感谢您的配合与参与，我们将送给您一份礼品（价值约 20 元）。调研将不涉及到任何个人的识别信息，所获得的数据也将严格用于科学研究！请问您是否愿意参加我们的调查？

调查员：如果拒绝接受调查，请在调查记录表上填写相关信息

第一部分：基本状况

1. 您家平时购买奶粉的频率_____？

①每月 3-4 次　　⑤每年 1 次

②每月 1-2 次　　⑥少于一年 1 次

③每个季度 1 次

④每半年 1 次

如果选 ① 或者 ② ，请回答问题 2，如果选 ③，④，⑤或者⑥请回答问题 3.

2. 您**每个月**大约购买_____以下的奶粉？

包装大小	数量(请自己填写)
450g	
500g	
900g	

3. 您**每年**大约购买_____以下的奶粉？

包装大小	数量(请自己填写)
450g	
500g	
900g	

4. 您家平时消费奶粉的频率_____？

①每天至少一次　　②每周 3-4 次

③每周 1-2 次　　⑤一月 1 次

④每周 1 次　　⑥少于一月 1 次

5. 您买奶粉主要是_____？

①为成年人

②为孩子

③为婴儿

6. 您家主要在哪里购买奶粉_____？

①网购　　②便利店

③超市，请注明超市名称_____

7. 请您指出下列奶粉是来自于哪个国家 **(请连线)**.

品牌
美赞臣
多美滋
雀巢
惠氏
蒙牛
雅培
澳优
诗幼乐
伊利
明治

国家
新西兰
美国
中国
瑞士
日本
澳大利亚
德国
加拿大
爱尔兰

8. 您家主要购买过的品牌奶粉有哪些（可多选）？

①美赞臣	⑦诗幼乐
②多美滋	⑧伊利
③雀巢	⑨蒙牛
④惠氏	⑩其它品牌，请注明 _____
⑤雅培	⑪都没有
⑥澳优	

9.在您家购买的奶粉中，你觉得哪个国家的奶粉质量你最信得过**(请排序： 1 最信得过， 2 第二信得过， 3 第三信得过， … 6 第六信得过)**？

国家	排序
新西兰	
美国	
中国	
瑞士	
日本	
澳大利亚	

第二部分：对奶粉的认知

10. 您是否听说过以下和奶粉有关的术语

	是	否
奶源可追溯性		
有自己奶源基地		
奶粉原产地		
有机奶粉		
HACCP 质量体系认证		

奶源可追溯性，奶源基地，有机的奶粉生产方式和 HACCP 认证在某种程度上被认为是在某种程度上可以跟奶粉的质量相关.现在，我将列出一些基本信息

奶源可追溯性的奶粉使记录下商品整个过程的信息变的可能，,当遇到问题时有奶源可追溯的奶粉可以追溯到是哪个具体环节出了问题
有自己奶源基地是指商家拥有自己的奶源基地
HACCP 的标志是 ，它是一个食品安全控制体系.国家认监委统一管理，监督和综合协调全国的 HACCP 食品安全管理体系认证认可
有机奶的标志是 中国有机产品认证标识 ，有机食品在生产和加工过程中会遵循有机食品生产、采集、加工、包装、贮藏、运输标准，禁止使用化学合成的农药、化肥、激素、抗生素、食品添加剂等，禁止使用基因工程技术及该技术的产物及其衍生物

11. 在您选购奶粉时，下面因素起多大的作用(请用①、②、③…⑧排序)?

决定因素	请排序 ①最重要；②非常重要；③重要 ④一般重要 ….⑧非常不重要
品牌	
价格	
生产日期	
是否有奶源可追溯性	
是否有奶源基地	
原产地	
生产方法(有机 vs.普通)	
是否有 HACCP 质量体系认证	

12.请指出您是否同意以下陈述

	强烈不同意	**不同意**	**中立**	**同意**	**强烈同意**
有机奶可能会遇到更少的安全问题					
有机奶可能会遇到更少的质量问题					
有机奶对健康更有好处					
有机奶生产对环境污染更小					
	强烈不同意	**不同意**	**中立**	**同意**	**强烈同意**
有奶源可追溯性的奶粉会遇到更少的安全					

问题					
有奶源可追溯性的奶粉会遇到更少的质量问题					
有奶源可追溯性的奶粉对健康更有好处					
有奶源可追溯性的奶粉的生产对环境污染更小					
	强烈不同意	**不同意**	**中立**	**同意**	**强烈同意**
有奶源基地的奶粉可能会遇到更少的安全问题					
有奶源基地的奶粉可能会遇到更少的质量问题					
有奶源基地的奶粉对健康更有好处					
有奶源基地的奶粉的生产对环境污染更小					
	强烈不同意	**不同意**	**中立**	**同意**	**强烈同意**
有 HACCP 的奶粉可能会遇到更少的安全问题					
有 HACCP 的奶粉可能会遇到更少的质量问题					
有 HACCP 的奶粉对健康更有好处					

有 HACCP 的奶粉的生产对环境污染更小					

13.在您家今年购买的奶粉中，有机奶粉占您奶粉整体花费的_____%；普通奶粉占您奶粉整体花费的_____%？

14. 您觉得我国当前的奶粉安全形势如何？用 1-5 来表示严重程度，“1”一点也不严重，“5”非常严重，请选择您认为的比较适合的状况，打“√”。

一点也不严重 1　2　3　4　5　非常严重

15.您本人或身边认识的人是否遭遇过任何奶粉安全事故_____？

①有　　②没有

16..您对我国当前奶粉行业中的各种安全认证的信任程度如何？用 1-5 来表示，“1”为完全不信任，“5”为完全信任，请选择您认为的比较适合的状况，打“√”。

QS 认证：带有 QS 标志的产品代表经过国家的批准，没有食品质量安全市场准入标志的，不得出厂销售。
ISO9001：是一类标准的总称，是由质量管理体系技术委员会制定的国际标准，是独立的第三方质量体系论证其标准得到了广泛的应用。
HACCP: 是一个食品安全控制体系.国家认监委统一管理，监督和综合协调全国的 HACCP 食品安全管理体系认证认可

认证名称	1--完全不信任	2	3	4	5--完全信任	不了解
QS 认证						
ISO 9001						
HACCP						

第三部分：选择试验

奶源可追溯性，奶源基地，有机的奶粉生产方式和 HACCP 认证在某种程度上被认为是在某种程度上可以跟奶粉的质量相关.现在,我将列出一些基本信息

奶源可追溯性的奶粉使记录下商品整个过程的信息变的可能，,当遇到问题时有奶源可追溯的奶粉可以追溯到是哪个具体环节出了问题
有自己奶源基地是指商家拥有自己的奶源基地
HACCP 的标志是 ，它是一个食品安全控制体系. 国家认监委统一管理，监督和综合协调全国的 HACCP
有机奶的标志是 中国有机产品认证标识 ，有机食品在生产和加工过程中会遵循有机食品生产、采集、加工、包装、贮藏、运输标准，禁止使用化学合成的农药、化肥、激素、抗生素、食品添加剂等，禁止使用基因工程技术及该技术的产物及其衍生物。 有机食

品必须通过合法的有机食品认证机构的认证。

17.假设您今天到商店购买**奶粉给（孩子，婴儿，大人）**，看到两种选择：一种是奶粉一；另一种是奶粉二。请问在综合考虑品牌、产地、价钱、是否有自己的奶源基地、原产地、生产方法和是否有 HACCP 的情况下，您会选购哪一种？如果你对两种都不满意也可以都不选，见下面的例子（说明）。除了给出的信息，请假设奶粉的其它方面都完全一致。请在以下的问题中做出您最真实的选择，就像您在商店里真正购买奶粉一样。

第 1 组：

	奶粉一	奶粉二	
价格	**170 元/500g**	**128 元/500g**	
是否有奶源可追溯性	**是**	**否**	
是否有奶源基地	**是**	**否**	
原产地	**美国**	**新西兰**	
生产方法	**有机奶**	**普通奶**	**两方案都不选**
是否有 HACCP 质量认证	**否**	**是**	
我愿意选择的方案	◯	◯	◯

第 2 组：

	奶粉一	奶粉二	
价格	**86 元/500g**	**178 元/500g**	
是否有奶源可追溯性	**否**	**是**	
是否有奶源基地	**是**	**否**	
原产地	**中国**	**瑞士**	
生产方法	**普通奶**	**有机奶**	**两方案都不选**
是否有 HACCP 质量认证	**否**	**是**	
我愿意选择的方案	◯	◯	◯

第 3 组：

	奶粉一	奶粉二	
价格	**86 元/500g**	**45 元/500g**	
是否有奶源可追溯性	否	是	
是否有奶源基地	否	是	
原产地	美国	新西兰	
生产方法	有机奶	普通奶	两方案都不选
是否有 **HACCP** 质量认证	否	是	
我愿意选择的方案	◯	◯	◯

第 4 组：

	奶粉一	奶粉二	
价格	**45 元/500g**	**170 元/500g**	
是否有奶源可追溯性	否	是	
是否有奶源基地	否	是	两方案都不选
原产地	瑞士	中国	
生产方法	普通奶	有机奶	
是否有 **HACCP** 质量认证	否	是	
我愿意选择的方案	◯	◯	◯

第 5 组：

	奶粉一	奶粉二	
价格	**170 元/500g**	**45 元/500g**	
是否有奶源可追溯性	是	否	
是否有奶源基地	否	是	
原产地	瑞士	新西兰	
生产方法	普通奶	有机奶	

是否有 HACCP 质量认证	**否**	**是**	**两方案都不选**
我愿意选择的方案	◯	◯	◯

第 6 组:

	奶粉一	**奶粉二**	
价格	**128 元/500g**	**86 元/500g**	
是否有奶源可追溯性	**是**	**否**	
是否有奶源基地	**否**	**是**	
原产地	**新西兰**	**瑞士**	
生产方法	**普通奶**	**有机奶**	**两方案都不选**
是否有 HACCP 质量认证	**否**	**是**	
我愿意选择的方案	◯	◯	◯

第四部分：个人/家庭特征

18. 您是家里主要负责购买食物的人吗？

①是 ②不是

19. 您是否喝奶粉？

①喝 ②不喝

20.您的最高受教育水平？

①小学及以下 ②初中 ③高中

④2-4 年专科教育或同等学历 ⑤大学 ⑥大学以上

21. 您当前的工作状况？

①全职　　②兼职　　③退休

④失业　　⑤家务　　⑥学生　　⑦其他_____

22.您出生于哪年 19_____年；

性别_____ [①男；②女]；

民族 _____；

23.您的婚姻状况 [①已婚；②未婚；③其它]？

24.您的出生省份_____（直辖市/自治区）？

25.您家里常住（一年 6 个月以上）的有几口_____人？其中_____人低于 18 岁？_____人高于或等于 60 岁？

26.离你家最近的超市有多远_____米？

27.您家里购买食品时最常用的交通工具是？

①步行

②自行车

③电动车或摩托车

④开车

⑤公共交通

⑥购物班车

28.您家今年月平均收入在下列哪个区间范围内 (由被调查人自己选择)?

①2000 元以下（上含）　　⑧14001~16000 元

②2001~4000 元　　⑨16001~18000 元

③4001~6000 元　　⑩18001~20000 元

④6001~8000 元　　⑪20001~22000 元

⑤8001~10000 元　　⑫22001~24000 元

⑥10001~12000 元　　⑬24001~26000 元

⑦12001~14000 元　　⑭26000 元以上

29.您家有私家车吗?

①有　　②没有

非常感谢您的支持与帮助

以下信息不用问

A1. 身高：

①150cm 以下

②150~159cm

③160~169cm

④170~179cm

⑤180cm 以上

A2. 体重：

①50 公斤以下

②50~59 公斤

③60~69 公斤

④70~79 公斤

⑤80 公斤以上

A3. 调查员总体感觉这份问卷完成的质量如何？

①非常好

②较好

③中等

④较差

⑤很差

Appendix C: Survey Version 1(English)

Cities：①Beijing ②Zhengzhou

Survey Number：_____

District：_____ The name of the supermarket：_____

Address：_____

Date：_____ Researcher：_____

Survey Questionnaire

Hello, my name is Chu Wang. I am a master student at University of Manitoba doing a research study. This survey is about Chinese consumers' preference for selected food safety attributes in milk powders. This survey will take 10-15 minutes and you will get a gift as thanks for completing it, which is worth 10 RMB. This study will not involve any personal information and the data I get will only be used for scientific research. Do you agree to participate in this study?

Part 1: Basic Information

1. How often does your family purchase dairy powder?

   ①1 to 2 times per month

   ②3 to 4 times per month

   ③each quarter

   ④once 6 months

   ⑤once per year

   ⑥less than 1 time per year

Please answer Q2 if you chose ① or ②; otherwise, answer question ③

2. How much milk powder do you purchase each month?

Package size	amount(please identify)
450g	
500g	
900g	

3. How much milk powder do you purchase each year?

Package size	amount(please identify)
450g	
500g	
900g	

4. How often does your family consume dairy powder?

    ①at least once per day

    ②3 to 4 times per week

    ③1 to 2 times per week

    ④once per week

    ⑤once per month

    ⑥less than once per month

5. What is the main reason for purchasing dairy powder?

    ①for adults

    ②for children

    ③for infants

6. Where is the main place for purchasing dairy powder?

    ①online

②convenience store

③supermarket

please identify the name of the supermarket_____

7. Please identify the country-of-origin of the following milk powders (connect with lines)

Enfamil	New Zealand
Dumex	USA
Nestle	China
Wyeth	Switzerland
Abott Laboratories	Japan
Ausnutria	Australia
Seyala	Canada
Yili Group	
Mengniu Dairy	

8. Which country do you think produces the safest and highest quality milk powder?

(please select three of them)

Country	Selection
①New Zealand (Seyala)	
②USA(Wyeth, Abbott, Mead Johnson)	
③China (Yili, Mengniu)	
④Switzerland (Dumex Nestle)	
⑤Japan (Meiji)	
⑥Australia (Ausnutria)	
⑦ others	

9. Which country do you think produces the safest and highest quality milk powder?

(please select three of them)

Country	Selection
①New Zealand (Seyala)	
②USA(Wyeth, Abbott, Mead Johnson)	
③China (Yili, Mengniu)	

④Switzerland (Dumex Nestle)	
⑤Japan (Meiji)	
⑥Australia (Ausnutria)	
⑦ others	

Part 2: Awareness of milk powders

10. Have you ever heard about the following terms?

	Yes	No
Traceability System		
Direct ownership of farms		
Country-of-origin		
Organic Farming method		
Safety production standards (Hazard Analysis and Critical Control Point		

11. Please rank the importance of the following safety attributes using ①-⑧.

Determinant factors	Rate ①the most important; ②very important; ③important ….⑧the least important
Brand name	

Price	
Best before date	
Traceability	
Ownership of farms by producer	
Country-of-origin	
Farming method (organic vs. conventional)	
Safety production standards (Hazard Analysis and Critical Control Point)	

12. Please identify your agreement with the following statements.

	Strongly disagree	disagree	neutral	agree	Strongly agree
Organic milk is safer					
Organic milk contains higher quality					
Organic milk is good for health					
Organic milk is better for the environment					
	Strongly disagree	disagree	neutral	agree	Strongly agree
Milk powder with traceability system is safer					
Milk powder with traceability system contains higher quality					
Milk powder with traceability system is good					

for health					
Milk powder with traceability system is better for the environment					
	Strongly disagree	disagree	neutral	agree	Strongly agree
Milk powders that are directly sourced from dairy companies that own their own cows and collect their own milk is safer					
Milk powders that are directly sourced from dairy companies that own their own cows and collect their own milk contains higher quality					
Milk powders that are directly sourced from dairy companies that own their own cows and collect their own milk is good for health					
Milk powders that are directly sourced from dairy companies that own their own cows and collect their own milk is better for the environment					
	Strongly disagree	disagree	neutral	agree	Strongly agree
Milk powder with HACCP is safer					
Milk powder with HACCP contains higher quality					
Milk powder with HACCP is good for health					
Milk powder with HACCP is better for the environment					

have					

13. What percentage of your total milk powder purchases is organic milk _____? What percentage of your total milk powder purchases is conventional milk (non organic) _____? (use total weight, not total dollar value)

14. How safe do you think milk powder is currently? Please rate the safety using a scale of 1-5, where "1" means not safe and "5" means very safe. Please indicate the rating by using ✓

Not safe 1 2 3 4 5 Very safe

15. Have you and your household and extended family encountered milk safety issues?

①Yes

②No

16. What do you think about the trustworthness of the certification in the milk powder industry? Please indicate your rating by using a scale of 1-5, where "1" means trustworthy and "5" means untrustworthy. Please indicate the rating by using ✓

QS Certificate：Managed by the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ). A license is required for many product categories if they are both manufactured and sold in China.
ISO9001：Third-party certification bodies provide independent confirmation that organizations meet the requirements.

HACCP: “Hazard Analysis and Critical Control Point” (HACCP) is an effective management tool or food safety insurance system to ensure food safety through monitoring production chains, which may improve safety.

Untrustworthy 1 2 3 4 5 Trustworthy

Part 3：Choice Experiment

Traceability Systems, direct sourcing, Hazard Analysis and Critical Control Points standard and organic farming method are all believed to be related to the quality of milk powders to some extent. Now, I will give you some general information about these terms.

Definition
Traceability System: Economists define traceability as “the information system necessary to provide the history of a product or a process from origin to point of final sale” (Karippacheri, Rios and Srivastava, 2011). A traceability system plays an important role in identifying a potential risk that can arise in milk and tracing it back to its source
Direct Sourcing: Milk powders that are directly sourced from dairy companies that own their own cows and collect their own milk are safer than the milk powders

from indirect milk stations, because direct sourcing decreases the possibility that milk safety may be compromised. The producers have more control over quality.
HACCP: "Hazard Analysis and Critical Control Point" (HACCP) is an effective management tool or food safety insurance system to ensure food safety through monitoring production chains which may give consumer a sense of safety The HACCP symbol is widely recognized
Organic Milk: The organic milk logo is widely recognized. Some consumers may buy organic milk because they believe it to be superior to conventional milk. More specifically, they might believe that organic milk is free of antibiotics and Bovine Growth Hormone. They might also believe that organic milk is more nutritious.

17. Assume you saw two kinds of milk powder while shopping for milk, milk powder 1 and milk powder 2. Please make a decision in terms of the following factors:

Group 1：

Milk powder	Milk powder 1	Milk powder 2	

price	128 yuan/500g	86yuan/500g	None of them
Traceability	No	Yes	
Directing ownership of farms	Yes	No	
Country-of-origin	U.S	New Zealand	
Farming method	Conventional milk	Organic milk	
HACCP	Yes	No	
My decision	⬭	⬭	⬭

Group 2：

Milk powder	Milk powder 1	Milk powder 2	None of them
price	45 yuan/500g	170 yuan/500g	
Traceability	Yes	No	
Directing ownership of farms	No	Yes	
Country-of-origin	U.S.	New Zealand	
Farming method	Conventional milk	Organic milk	

HACCP	Yes	No	
My decision			

Group 3：

Milk powder	Milk powder 1	Milk powder 2	None of them
price	45 yuan/500g	86 yuan/500g	
Traceability	No	Yes	
Directing ownership of farms	No	Yes	
Country-of-origin	China	Switzerland	
Farming method	Organic milk	Conventional milk	
HACCP	No	Yes	
My decision			

Group 4：

Milk powder	Milk powder 1	Milk powder 2	
price	170 yuan/500g	45 yuan/500g	

Traceability	No	Yes	None of them
Directing ownership of farms	No	Yes	
Country-of-origin	U.S.	China	
Farming method	Conventional milk	Organic milk	
HACCP	Yes	No	
My decision	⬭	⬭	⬭

Group 5：

Milk powder	Milk powder 1	Milk powder 2	None of them
price	128 yuan/500g	170 yuan/500g	
Traceability	Yes	No	
Directing ownership of farms	Yes	No	
Country-of-origin	U.S.	China	
Farming method	Organic milk	Conventional milk	
HACCP	No	Yes	

My decision	⬭	⬭	⬭

Group 6：

Milk powder	Milk powder 1	Milk powder 2	None of them
price	125 yuan/500g	170yuan/500g	
Traceability	No	Yes	
Directing ownership of farms	Yes	No	
Country-of-origin	Switzerland	New Zealand	
Farming method	Organic milk	Conventional milk	
HACCP	No	Yes	
My decision	⬭	⬭	⬭

Part 4: The characteristics of survey participants and families

18. Are you the primary decision maker for food purchases in your family?

①Yes

②No

19. Do you drink milk_____?

①Yes, I do

②No, I do not

20. What is your highest educational level?

① Less than elementary

② Junior high school

③ Senior high school

④ College or university

⑤ Post-secondary

21. What is your current working condition?

①full-time ②part-time ③retired

④unemployed ⑤homemaker

22. Year of birth _____

Gender: Male Female Other

Nationality _____

23. What is your marriage status?

① Married

② Single

③ Other

24. Which province do you live in _____?

25. How many people are there in your household? _____

How many of them are under 18? _____

How many of them are over 60 years old? _____

26. How far is the closest food store to your home? _____

27. What kind of transportation do you use most often when purchasing food for your home?

①on foot ②bicycle ③motorcycle

④car ⑤public transport

28. What is the average monthly income of your household?

①under 2000 Yuan

②2001~4000Yuan

③4001~6000Yuan

④6001~8000Yuan

⑤8001~10000Yuan

⑥10001~12000Yuan

⑦12001~14000Yuan

⑧14001~16000Yuan

⑨16001~18000Yuan

⑩18001~20000Yuan

⑪20001~22000Yuan

⑫22001~24000Yuan

⑬ 24001~26000Yuan

⑭over26000Yuan

29. Does your family have a private car?

①yes, it does ②no, it does not

I really appreciate your time and assistance.

The researcher completes the following questions:

A1. Height：

①below 150cm

②150~159cm

③160~169cm

④170~179cm

⑤above180cm

A2. Weight：

①below50kg

②50~59kg

③60~69kg

④70~79kg

⑤above 80kg

A3. The quality of the survey:

①excellent

②very good

③good

④below average

⑤very bad

Appendix D: survey version 2 (English)

Cities：①Beijing ②Zhengzhou

Survey Number：_____

District：_____ The name of the supermarket：_____

Address：_____

Date：_____ Researcher：_____

Survey Questionnaire

Hello, my name is Chu Wang. I am a master student at University of Manitoba doing a research study. This survey is about Chinese consumers' preference for selected food safety attributes in milk powders. This survey will take 10-15 minutes and you will get a gift as thanks for completing it, which is worth 10 RMB. This study will not involve any personal information and the data I get will only be used for scientific research. Do you agree to participate in this study?

Part 1: Basic Information

1. How often does your family purchase dairy powder?

①1 to 2 times per month

②3 to 4 times per month

③each quarter

④once 6 months

⑤once per year

⑥less than 1 time per year

Please answer Q2 if you chose ① or ②; otherwise, answer question ③

2. How much milk powder do you purchase each month?

Package size	amount(please identify)
450g	
500g	
900g	

3. How much milk powder do you purchase each year?

Package size	amount(please identify)
450g	
500g	
900g	

4. How often does your family consume dairy powder?

    ①at least once per day

    ②3 to 4 times per week

    ③1 to 2 times per week

    ④once per week

    ⑤once per month

    ⑥less than once per month

5. What is the main reason for purchasing dairy powder?

    ①for adults

    ②for children

    ③for infants

6. Where is the main place for purchasing dairy powder?

①online

②convenience store

③supermarket

please identify the name of the supermarket_____

7. Please identify the country-of-origin of the following milk powders (connect with lines).

Enfamil	New Zealand
Dumex	USA
Nestle	China
Wyeth	Switzerland
Abott Laboratories	Japan
Ausnutria	Australia
Seyala	Canada
Yili Group	
Mengniu Dairy	

8. Which of the following milk powders have you ever purchased?

10) Enfamil

11) Dumex

12) Nestle

13) Wyeth

14) Abott Laboratories

15) Ausnutria

16) Seyala

17) Yili Group

18) Mengniu Dairy

9. Which country do you think produces the safest and highest quality milk powder?

(please select three of them)

Country	Selection
①New Zealand (Seyala)	
②USA(Wyeth, Abbott, Mead Johnson)	
③China (Yili, Mengniu)	
④Switzerland (Dumex Nestle)	
⑤Japan (Meiji)	

⑥Australia (Ausnutria)	
⑦ others	

Part 2: Awareness of milk powders

10. Have you ever heard about the following terms?

	Yes	No
Traceability System		
Direct ownership of farms		
Country-of-origin		
Organic Farming method		
Safety production standards (Hazard Analysis and Critical Control Point		

11. Please rank the importance of the following safety attributes using ①-⑧.

Determinant factors	Rate

	①the most important；②very important；③important ….⑧the least important
Brand name	
Price	
Best before date	
Traceability	
Ownership of farms by producer	
Country-of-origin	
Farming method (organic vs. conventional)	
Safety production standards (Hazard Analysis and Critical Control Point)	

12. Please identify your agreement with the following statements.

	Strongly disagree	disagree	neutral	agree	Strongly agree
Organic milk is safer					
Organic milk contains higher quality					
Organic milk is good for health					
Organic milk is better for the					

environment					
	Strongly disagree	disagree	neutral	agree	Strongly agree
Milk powder with traceability system is safer					
Milk powder with traceability system contains higher quality					
Milk powder with traceability system is good for health					
Milk powder with traceability system is better for the environment					
	Strongly disagree	disagree	neutral	agree	Strongly agree
Milk powders that are directly sourced from dairy companies that own their own cows and collect their own milk is safer					
Milk powders that are directly sourced from dairy companies that own their own cows and collect their own milk contains higher quality					
Milk powders that are directly sourced from dairy companies that own their own cows and collect their own milk is good for health					
Milk powders that are directly sourced from dairy companies that own their own cows and collect their own milk is better for the environment					

	Strongly disagree	disagree	neutral	agree	Strongly agree
Milk powder with HACCP is safer					
Milk powder with HACCP contains higher quality					
Milk powder with HACCP is good for health					
Milk powder with HACCP is better for the environment have					

13. What percentage of your total milk powder purchases is organic milk _____? What percentage of your total milk powder purchases is conventional milk (non organic) _____? (use total weight, not total dollar value)

14. How safe do you think milk powder is currently? Please rate the safety using a scale of 1-5, where "1" means not safe and "5" means very safe. Please indicate the rating by using ✓

Not safe 1 2 3 4 5 Very safe

15. Have you and your household and extended family encountered milk safety issues?

①Yes

②No

16. What do you think about the trustworthness of the certification in the milk powder industry? Please indicate your rating by using a scale of 1-5, where "1" means trustworthy and "5" means untrustworthy. Please indicate the rating by using ✓

QS Certificate：Managed by the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ). A license is required for many product categories if they are both manufactured and sold in China.
ISO9001：Third-party certification bodies provide independent confirmation that organizations meet the requirements.
HACCP: “Hazard Analysis and Critical Control Point” (HACCP) is an effective management tool or food safety insurance system to ensure food safety through monitoring production chains, which may improve safety.

Untrustworthy 1 2 3 4 5 Trustworthy

Part 3：Choice Experiment

Traceability Systems, direct sourcing, Hazard Analysis and Critical Control Points standard and organic farming method are all believed to be related to the quality of milk powders to some extent. Now, I will give you some general information about these terms.

Definition
Traceability System: Economists define traceability as “the information system

necessary to provide the history of a product or a process from origin to point of final sale" (Karippacheri, Rios and Srivastava, 2011). A traceability system plays an important role in identifying a potential risk that can arise in milk and tracing it back to its source
Direct Sourcing: Milk powders that are directly sourced from dairy companies that own their own cows and collect their own milk are safer than the milk powders from indirect milk stations, because direct sourcing decreases the possibility that milk safety may be compromised. The producers have more control over quality.
HACCP: "Hazard Analysis and Critical Control Point" (HACCP) is an effective management tool or food safety insurance system to ensure food safety through monitoring production chains which may give consumer a sense of safety The HACCP symbol is widely recognized
Organic Milk: The organic milk logo is widely recognized. 中国有机产品认证标识 Some consumers may buy organic milk because they believe it to be superior to conventional milk. More specifically, they might believe that organic milk is free of antibiotics and Bovine Growth Hormone. They might also believe that organic milk is more nutritious.

17. Assume you saw two kinds of milk powder while shopping for milk, milk powder 1 and milk powder 2. Please make a decision in terms of the following factors:

Group 1：

Milk powder	Milk powder 1	Milk powder 2	
price	170 yuan/500g	128yuan/500g	
Traceability	Yes	No	
Directing ownership of farms	Yes	No	None of them
Country-of-origin	U.S	New Zealand	
Farming method	Organic milk	Conventional milk	
HACCP	No	Yes	
My decision	○	○	○

Group 2：

Milk powder	Milk powder 1	Milk powder 2	
price	86 yuan/500g	178 yuan/500g	
Traceability	No	Yes	

Directing ownership of farms	Yes	No	None of them
Country-of-origin	China	Switzerland	
Farming method	Conventional milk	Organic milk	
HACCP	No	Yes	
My decision	⬭	⬭	⬭

Group 3：

Milk powder	Milk powder 1	Milk powder 2	None of them
price	86 yuan/500g	45 yuan/500g	
Traceability	No	Yes	
Directing ownership of farms	No	Yes	
Country-of-origin	U.S	New Zealand	
Farming method	Organic milk	Conventional milk	
HACCP	No	Yes	
My decision	⬭	⬭	⬭

Group 4：

Milk powder	Milk powder 1	Milk powder 2	
price	45 yuan/500g	170 yuan/500g	
Traceability	No	Yes	
Directing ownership of farms	No	Yes	None of them
Countr-of-origin	Switzerland	China	
Farming method	Conventional milk	Organic milk	
HACCP	Yes	No	
My decision	○	○	○

Group 5：

Milk powder	Milk powder 1	Milk powder 2	
price	170 yuan/500g	45 yuan/500g	
Traceability	Yes	No	
Directing ownership of farms	No	Yes	None of them

Country-of-origin	Switzerland	New Zealand	
Farming method	Conventional milk	Organic milk	
HACCP	No	Yes	
My decision	○	○	○

Group 6：

Milk powder	Milk powder 1	Milk powder 2	None of them
price	128 yuan/500g	86yuan/500g	
Traceability	Yes	No	
Directing ownership of farms	No	Yes	
Country-of-origin	New Zealand	Switzerland	
Farming method	Conventional milk	Organic milk	
HACCP	No	Yes	
My decision	○	○	○

Part 4: The characteristics of survey participants and families

18. Are you the primary decision maker for food purchases in your family?

①Yes

②No

19. Do you drink milk_____?

①Yes, I do

②No, I do not

20. What is your highest educational level?

① Less than elementary

② Junior high school

③ Senior high school

④ College or university

⑤ Post-secondary

21. What is your current working condition?

①full-time ②part-time ③retired

④unemployed ⑤homemaker

22. Year of birth _____

Gender: Male Female Other

Nationality _____

23. What is your marriage status?

① Married

② Single

③ Other

24. Which province do you live in _____?

25. How many people are there in your household? _____

How many of them are under 18? _____

How many of them are over 60 years old? _____

26. How far is the closest food store to your home? _____

27. What kind of transportation do you use most often when purchasing food for your home?

①on foot ②bicycle ③motorcycle

④car ⑤public transport

28. What is the average monthly income of your household?

①under 2000 Yuan

②2001~4000Yuan

③4001~6000Yuan

④6001~8000Yuan

⑤8001~10000Yuan

⑥10001~12000Yuan

⑦12001~14000Yuan

⑧14001~16000Yuan

⑨16001~18000Yuan

⑩18001~20000Yuan

⑪20001~22000Yuan

⑫22001~24000Yuan

⑬ 24001~26000Yuan

⑭over26000Yuan

29. Does your family have a private car?

①yes, it does ②no, it does not

I really appreciate your time and assistance

The researcher completes the following questions:

A1. Height：

①below 150cm

②150~159cm

③160~169cm

④170~179cm

⑤above180cm

A2. Weight：

①below50kg

②50~59kg

③60~69kg

④70~79kg

⑤above 80kg

A3. The quality of the survey:

①excellent

②very good

③good

④below average

⑤very bad

Appendix E: Ethical Approval from the University of Manitoba Joint-Faculty Research Board

UNIVERSITY of MANITOBA | Research Ethics and Compliance
Office of the Vice-President (Research and International)

Human Ethics
208-194 Dafoe Road
Winnipeg, MB
Canada R3T 2N2
Phone +204-474-7122
Fax +204-269-7173

APPROVAL CERTIFICATE

May 1, 2014

TO: **Chu (Cindy) Wang** (Advisor J. Carlberg)
Principal Investigator

FROM: **Susan Frohlick, Chair**
Joint-Faculty Research Ethics Board (JFREB)

Re: **Protocol #J2014:051**
"Chinese consumers' preference for selected food safety attributes in milk powders"

Please be advised that your above-referenced protocol has received human ethics approval by the **Joint-Faculty Research Ethics Board**, which is organized and operates according to the Tri-Council Policy Statement (2). **This approval is valid for one year only.**

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

Please note:

- **If you have funds pending human ethics approval, please mail/e-mail/fax (261-0325) a copy of this Approval (identifying the related UM Project Number) to the Research Grants Officer in ORS in order to initiate fund setup. (How to find your UM Project Number: http://umanitoba.ca/research/ors/mrt-faq.html#pr0)**

- **If you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.**

The Research Quality Management Office may request to review research documentation from this project to demonstrate compliance with this approved protocol and the University of Manitoba *Ethics of Research Involving Humans.*

The Research Ethics Board requests a final report for your study (available at: http://umanitoba.ca/research/orec/ethics/human_ethics_REB_forms_guidelines.html) **in order to be in compliance with Tri-Council Guidelines.**

umanitoba.ca/research