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Amount of information and the willingness of consumers to pay for food traceability in China

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ABSTRACT

There is no consensus about whether the food traceability system planned for construction in China or other countries should record detailed information like the beef traceability system in Japan, or simple abbreviated information similar to that provided in the USA. Using apple as a research subject, we adopted random *n*th price experimental auction to investigate the willingness to pay (WTP) for traceability based on abbreviated and detailed information among consumers in China. Totally 88 participants attended the experimental auction. The results showed that consumers had a positive WTP for both types of food traceability system, but the average premium that consumers were prepared to pay for traceability with detailed information was 10% higher than that with abbreviated information. Males, married subjects, and those with a relatively low educational level placed a higher premium on traceability with detailed information, but consumers with good self-reported health did not want to pay a high premium for traceability with detailed information. The results also showed that consumers were most interested in a food traceability system that provides quality certificates and details of the chemical fertilizers/pesticides used in food production. We discuss the implications of these results for the implementation of a food traceability system.

1. Introduction

Information asymmetry often leads to increased anxiety, uncertainty, and rapidly declining confidence among consumers (Hobbs, 2004; Houghton et al., 2008). To restore consumer confidence, it is essential and effective to provide them with more food-related information (Golan et al., 2004; van Rijswijk & Frewer, 2012), which can be achieved via traditional food labels (e.g., Kehagia, Chrysochou, Chryssochoidis, Krystallis, & Linardakis, 2007) and food traceability systems using modern technology (e.g., Golan et al., 2004; Hobbs, Bailey, Dickinson, & Haghiri, 2005; Liao, Chang, & Chang, 2011). Labeling is a conventional method for food information provision and it still plays an important role in communicating with consumers (Kehagia et al., 2007). However, the space limitations of simple paper labels restrict the amount of information that can be conveyed (Jin & Zhou, 2014; Verbeke & Ward, 2006). Due to continuous improvements in technology and devices, barcodes, radio frequency identification, wireless sensor networks, an electronic nose coupled with mass spectrometry, and optical systems are now used widely in food traceability systems (Aung & Chang, 2014; Chrysochou, Chryssochoidis, & Kehagia, 2009; Peres, Barlet, Loiseau, & Montet, 2007). Thus, the capacity to provide food safety and quality information via food traceability systems is much greater (Jin & Zhou, 2014).

In terms of the amount of information conveyed, there are two types of food traceability system, which provide abbreviated information or detailed information. For example, a beef traceability system may provide abbreviated information, such as the beef traceability system employed in the USA,[1] which is simply a record-keeping system for controlling the supply chain, facilitating food safety control, differentiating the attributes of foods, and monitoring animal diseases (Golan et al., 2004; Schulz & Tonsor, 2010). This is a voluntary traceability system, which is motivated mainly by economic incentives (Souza-Monteiro & Caswell, 2004). The second type of system provides detailed information, e.g., the

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[1] The National Animal Identification System is a voluntary program and it is the most comprehensive system in the USA for implementing food traceability (Schroeder et al., 2009).

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Japanese beef traceability system. According to Jin and Zhou (2014), the *Japanese Beef Traceability Law* requires much more detailed information,[2] and thus the mandatory Japanese beef traceability system has more depth and breadth than the EU[3] traceability system (Souza-Monteiro & Caswell, 2004). Therefore, the beef traceability systems used in the USA lag far behind those in Japan in terms of the amount of information provided (Smith et al., 2005).

In practice, there are many barriers to the implementation of a food traceability system with detailed information, including liability among the participating producers (Breiner, 2007; Schulz & Tonsor, 2010), the reliability of technology (Schroeder et al., 2009; Schulz & Tonsor, 2010), standard limitations (Bosona & Gebresenbet, 2013), and the willingness to provide information (Golan et al., 2004). Another major concern is the expense of providing information (Golan et al., 2003). Food traceability systems are expensive and complex, which could lead to financial problems (Bosona & Gebresenbet, 2013) because greater amounts of information and a more detailed traceability system will incur higher costs (Souza-Monteiro & Caswell, 2004). For food producers, the critical issue is who will pay the cost (Breiner, 2007; Souza-Monteiro & Caswell, 2004). Thus, producers do not want to provide detailed information if they have to bear the additional cost.

Similar to many other developing countries, China is in the preliminary stages of implementing a food traceability system, but there is no consensus regarding the amount of information that should be recorded in the food traceability system. Information comes at a cost, so it is very important to identify the attitudes of consumers and their preferences regarding food traceability systems containing different amounts of traceability information. However, previous studies of food traceability have focused mainly on the willingness to pay (WTP) for traceability *per se* among consumers (e.g. Dickinson & Bailey, 2002; Hobbs et al., 2005; Lee, Han, Nayga, & Lim, 2011; Loureiro & Umberger, 2007; Lu, Wu, Wang, Xu, & Xu, 2016; Ortega, Wang, Wu, & Olynk, 2011; Ubilava & Foster, 2009; Wu, Xu, Zhu, & Wang, 2012; Zhang, Bai, & Wahl, 2012) and the results of these studies suggest that consumers from different countries or regions are willing to pay a premium for food with traceability attribute (Jin & Zhou, 2014).

Meanwhile, attention has also been paid to food traceability systems. From the perspective of food industry, some studies analyzed the economic incentives/motives/benefit (e.g., Aung & Chang, 2014; Bosona & Gebresenbet, 2013; Hobbs et al., 2005; Menozzi, Halawany-Darson, Mora, & Giraud, 2015) and barriers to establish food traceability systems (Bosona & Gebresenbet, 2013). Also there are some other studies focusing on how to develop food traceability systems (e.g., Feng, Fu, Wang, Xu, & Zhang, 2013; Hu, Zhang, Moga, & Neculita, 2013). From the perspective of consumers, van Rijswijk, Frewer, Menozzi, and Faioli (2008) investigated consumers' perception of food traceability systems. As food traceability systems represent a good means of information provision, several recent studies investigated the types of traceability information that consumers were interested in. For example, Wu, Wang, Zhu, Hu, and Wang (2016) investigated consumers' WTP and preference rankings for different kinds of traceability information, including specific information related to farming, slaughter and processing, distribution and marketing, and government certification. Based on a national representative sample of 6243 Japanese consumers, Jin and Zhou (2014) reported that harvest date, production method, and production method certification are the items of most interest to Japanese consumers. Generally, the existing literature shows that easy-to-understand, quick-to-process information (van Rijswijk et al., 2008) and information of quality assurances (Hobbs et al., 2005) are more preferred than technical information of traceability (Gellynck & Verbeke, 2011).

Despite above valuable contributions, prior researches have not assessed the premiums that might be paid for traceability with different amounts of information recorded by a food traceability system. This paper seeks to fill this gap with the following goals:

1) To compare the WTP among Chinese consumers for traceability with abbreviated and detailed information.
2) To investigate the factors that affect the WTP premiums among consumers for traceability with abbreviated and detailed information, and
3) To identify the specific types of food safety and quality information that interest Chinese consumers.

The remainder of this paper is organized as follows. In the next section, we describe the background and details of the food traceability system in China. Section 3 explains the methods employed and the data. The results and discussion are presented in Section 4. In Section 5, we give our conclusions and discuss the implications of this study.

2. Background regarding the food traceability system in China

China began to explore the implementation of a food traceability system in the early 2000s, when the *Management Regulations for Animal Vaccination Identification Tag* were released in 2002, which stipulate that livestock must wear immunity ear tags and that an immunity archives management system should be established. However, progress in the construction of a traceability system has been driven mainly by food safety issues. In particular, the EU imposed mandatory traceability on imported beef, aquatic products, and vegetables in 2004 due to BSE, which prompted the Chinese government to enact tracing and tracking guidelines for exit aquatic products, beef, vegetables, and fruits in order to promote the export of agricultural products. In addition, two important laws, i.e., the *Agricultural Product Quality Safety Law* and *Food Safety Law*, both require that food enterprises establish records regarding procurement, production, processing, packaging, and circulation for the food supply chain. However, due to high costs and technical constraints, only a limited number of food categories were covered and the development of the food traceability system was slow before 2006 (Bai, Zhang, & Jiang, 2013; Wu et al., 2012).

The development of a food traceability system in China has progressed rapidly since 2007. The production of a *Certificate and Invoice Asking System* and *Purchase and Sale Ledger System* were encouraged by the State Administration for Industry and Commerce to improve the management of food circulation, where nine categories for 69 types of major products (45 types are food products) had to be implemented for mandatory electronic

[2] The full name of the Japanese Beef Traceability Law is "Law for Special Measures Concerning the Management and Relay of Information for Individual Identification of Cattle," which was implemented to allow full traceability from farm to fork in 2004 by the National Livestock Breeding Center with the support of the Ministry of Agriculture, Forestry, and Fisheries. The following information is required: individual identification number, date of birth or country of origin, sex, individual identification number of the maternal parent, location (prefecture name) of the raising facilities, start and end of breeding in the breeding facilities, date of slaughter, breed of cattle, name of the exporting country (for imported cattle), title and location of the abattoir where the cattle were slaughtered, and the country of origin (for imported cattle) (Clemens, 2003; Jin & Zhou, 2014). Excluding the information required by law, beef retailers can provide additional information voluntarily to facilitate better assurance of food safety and quality, e.g., Jusco Supermarkets (Aeon Company, Ltd) provide consumers with the story of how the meat was produced, photographs and the name of the producer on the packaging, BSE testing details, an official stamp from Aeon, etc. (Clemens, 2003).

[3] The EU is a major driver in establishing global standards that are leading to the introduction of a traceability system worldwide (Souza-Monteiro & Caswell, 2004).