DISCLAIMER NOTICE

Due to the condition of the original material, there are unavoidable flaws in this reproduction. We have made every effort possible to provide you with the best copy available.

Thank you.

The images contained in this document are of the best quality available.
Food Safety Supply and Demand Across the Agricultural Value Chain in China

by

Wenjia Wang

Submitted to the Department of Institute of Data, Systems, and Society on August 16, 2018 in Partial Fulfillment of the Requirements for the Degree of Master of Science in Technology and Policy

ABSTRACT

This thesis studies the food safety supply and demand in China with the focus on the producing entities and the end consumers.

The first chapter concerns different farmers’ organizational models and their implications for food safety issues. We conducted three research trips to China and interviewed key personnel from 25 agricultural cooperatives and one agricultural enterprise about the way they organize production activities with farmers. Our findings show that agricultural cooperatives employ a mix of models to mobilize farmers that exert different levels of direct controls over the production activities. We concluded that the choice of model is likely to be based on the difficulty of cultivating certain types of crops. Also, the motivation of agricultural cooperatives in obtaining quality certifications varies based on their position in the value chain: cooperatives that sell directly to end consumers are more motivated to obtain quality certifications than cooperatives selling to downstream processors or distributors. In the case of agricultural enterprise who employs large area of land employ, the contracting farming model is usually adopted. Despite low cost in acquiring land and labor for production, the enterprise has to compromise with a lower level of control over the production activities in the contract farming model.

The second chapter studies consumers’ response towards different food safety transparency information with respect to different demographic and socio-economical characteristics. The findings suggest that consumers are most likely to respond to seeing organic certificates and the use of organic ingredients in processed products with higher level of purchase intention and a higher willingness to pay. We also found out that respondents who are either male or have children are more likely to respond to food safety information than the other demographic groups.

Thesis Supervisor: Yanchong Karen Zheng
Title: Associate Professor of Operations Management, MIT Sloan School of Management
Acknowledgement

I would like to thank my thesis supervisor Professor Karen for giving me the opportunity to work along with her for the past two years. It has truly been a wonderful and fruitful learning experience to contribute to something that I truly care about in my home country.

I would like to thank our sponsor Syngenta Foundation and Ms. Yuan Zhou for sponsoring the research and my studies for the past two years. I would not have done this without their generous support.

Mom and dad, thank you for your support and love.

I cannot thank my TPP family enough. I am so lucky to have met every one of you and be able to call you all friends. I would not trade these two years full of beautiful friendship and adventures for anything else.

Ethan, thank you for your unconditional support and love during the hardest time. You meant a world to me.
Preface

The rapid pace of industrialization in China has propelled the growth of the Chinese economy at an unprecedented speed, and has improved the livelihood for the majority of the population. Agriculture, as the first pillar of the Chinese economy and the means of living for 300 million of farmers across China (National Bureau of Statistics of China, 2008), is also undergoing profound changes that aim to integrate more industrial- and technological-driven approaches in the production and distribution stages of agricultural products with rigorous quality and safety standards. Despite the governmental efforts in overhauling the food system, food safety is still an omnipresent issue in China and shows no signs of declining. A series of high-profile food scares, including the melamine-adulterated baby formula and the cadmium-contaminated rice, have heightened Chinese consumers’ awareness in food safety issues and challenged their trust in the food system in China. Moreover, a series of rejections towards the export of Chinese agricultural products also tarnished the reputation and credence of China in the international market.

Food safety issues can arise from any links within the agricultural value chain, from the upstream production and processing of the raw materials, to the downstream distribution and consumption at consumers’, as shown in Figure 1. The highly distributed network of stakeholders across the agricultural value chain indicates that closer studies on the organizational models and behaviors of the participants at each link will generate insightful implications for food safety issues.

![Figure 1. Possible sources of contamination in the food supply chain (Lam et al., 2013)](image)

The purpose of this thesis is to understand the supply-and-demand relation for food safety across the Chinese agricultural value chain, with a focus on the upstream producing and processing entities (farmers, cooperatives and agribusinesses) and the downstream consumers at the end of the chain. The thesis is structured into two chapters: in Chapter one, we documented findings from three field trips that we conducted in China with the purpose to investigate two farmers’ organizational models (the farmers’ cooperative model and “enterprise-led” model) and their implications for food safety; in Chapter two, we studied consumers’ preferences for different types of food safety transparency information with respect to their purchase intention and willingness to pay. Our studies will provide policy makers, agribusinesses and retailers with insights in the risk factors that are likely to arise during the production and process stages, as well as in the motivations behind consumers’ purchasing decisions.
Chapter I – Farmers’ Organizational Model and its Implications for Food Safety

Introduction
In this chapter, the supply side of food safety and quality is studied. We focused on different organizational structures and their ways of coordinating the production, processing and sourcing activities between farmers, processors, and dealers in the upstream of the agricultural supply chain, in order to uncover the implications of different farmers’ organizational models for food quality and safety.

As Calvin et al. pointed out (2006), the majority of China’s food safety problems can be traced back to the farm level. One of the most prominent food safety risks that originates from farmlands is the intensive and unstandardized application of chemicals, including fertilizer and pesticides. There are multiple factors that contributed to this issue, such as the lack of quality monitoring system from the government, inadequate awareness from the farmers, as well as the suboptimal management and labeling of the chemicals (Calvin et al., 2006). As a response, governmental authorities and researchers promoted the standardization of the production practices (Jin and Zhou, 2011). For example, the Chinese government has promulgated three food quality and safety certification standards since 1992 with increasing level of stringency, including hazardous-free food standard, green food standard and organic food standard (specification shown in Error! Reference source not found.) (Liu, Pieniak and Verbeke, 2013). The Chinese government also overhauled the then Food Safety Law that was published in 1995 and passed a new draft that proposed a national framework to enforce a stricter control and monitoring of the production and distribution activities in 2006.

<table>
<thead>
<tr>
<th>Table 1. Description of hazard free food, green food and organic food (Liu, Pieniak and Verbeke, 2013).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hazard free food</strong></td>
</tr>
<tr>
<td>Food certificated label</td>
</tr>
<tr>
<td>Certificate authority</td>
</tr>
<tr>
<td>Validity of certificated label</td>
</tr>
<tr>
<td>Operation year</td>
</tr>
<tr>
<td>Main difference</td>
</tr>
</tbody>
</table>
However, the standardization efforts of the agricultural sector are still likely to face great challenges due to the distinctive characteristics of the Chinese agricultural sector. First of all, the majority of the Chinese agricultural sector is consisted with around 200 million small-scale farm households who typically have one to two acres of land divided into four to six noncontiguous plots (Calvin et al., 2006). Not just farmers, but the downstream processors and distributors are also in the number of millions and operate in a family-run model (Xu, 2002; Hu, Gale and Reardon, 2006). The fragmented yet dense nature of the Chinese agricultural sector makes it very difficult for the penetration of standardized practices. Additionally, according to the Law on Land Contracts in Rural Areas (The National People’s Congress of the People’s Republic of China, 2002), farmers only have usage rights to their land and usually suffer from the lowest profit margin across the agricultural value chain, thus they lack incentives and motivation to make costly investments and adopt better cultivation techniques. Last but not the least, the lack of formal contractual relationship between farmers, processors and distributors makes it very difficult to hold participants accountable when food safety issues arise (Huang et al., 2008).

Acknowledging the multi-faceted challenges that the standardization efforts are facing, the Chinese government has been accelerating the industrialization of the agricultural sector since 1990s. Agro-industrialization is defined by Reardon and Barrett (2000) as three related sets of changes in the agricultural sector: “(a) the growth of agro-processing, distribution, and farm-input provision activities off-farm, undertaken by agribusiness; (b) institutional and organizational change in the relation between agro-industrial firms and farms, such as increasing vertical coordination; (3) concomitant changes in the farm sector, such as changes in product composition, technology, and sectoral and market structures.”. Huang (2008) also pointed out that the goal of agro-industrialization is to facilitate the vertical coordination between upstream and downstream participants in the agricultural value chain to lower the transaction cost, improve the profit margins of all participants, and gain higher market control (Huang, 2008). Over the course of two decades of agro-industrialization in China, several organizational models have emerged with heightened level of vertical coordination between upstream producers and downstream processors and distributions. Despite the nuances, these models could be summarized into three categories: “enterprise-led” model, “intermediate-led” model, and “vertically-integrated farmers’ cooperative” model (Guo, Liao and Fu, 2007). The three models are illustrated below.
Figure 2 depicts the “enterprise-led” model. In this model, an agricultural enterprise who is specialized in producing certain agricultural products, signs contracts with farmers to produce and provide the raw materials that the enterprise then processes and further distributes. This model shows great potential to mediate the food safety risks in the supply chain: firstly, the enterprise is able to manage and control the production practices of farmers by the effects of the contract, so that the production activities can be standardized to a certain degree; secondly, the enterprise could control the quality of agricultural inputs, especially the use of chemicals, by centrally purchasing and distributing them among farmers; lastly, the enterprise could provide technical support and educate the farmers with modern cultivation techniques to increase the overall production efficiency (Hu, Gale and Reardon, 2006).

However, the “enterprise-led” model is not without limitations. The nationally famous “melamine baby formula” food scare drew unprecedented level of public’s attention and rage towards food safety issues, and the company Sanlu (三鹿) involved in this scandal followed the “enterprise-led” model and sourced melamine-adulterated milk from the cow farmers. This example suggests that, as the size of the enterprise grows, it is increasing costly and non-trivial for the enterprise to enforce effective monitoring systems on its farmers. Additionally, the contracts between enterprises and farmers are usually short-term and volatile, as these contracts usually last for only one harvest season and subject to the market changes.
Figure 3 illustrate the “intermediate-led” model, with the “intermediate” being different types of agricultural cooperatives, and Figure 4 depicts the vertically-integrated farmers’ cooperative model. These two models are similar in a way that the farmers’ cooperative plays a central role in both models. Farmers’ cooperative, as defined by Zhang, Wang and Awokuse (2012), “is a mutual-aid economic organization, which is voluntarily formed by production and business operators of similar agricultural products, or by providers or users of similar agricultural production and business operation service”. However, a key difference lies in that the “intermediate-led” model is usually founded by business service providers, such as processors and distributors, independently of or together with the farmers; while the vertically-integrated model is founded by farmers who also have in-house processing and distribution capacities (Yuan, 2013). Although the “vertically-integrated” farmers’ cooperative model has been a mature and well-implemented model in Europe and North America, this model is still rare and mostly concentrated in the eastern region of China where the agro-industrialization is much developed (Garnevska, Liu and Shadbolt, 2011). In contrast, the “intermediate-led” model is
distinctively more common in China, where the cooperative format is more flexible and diverse than the original concept.

These two farmers' organizational models involving agricultural cooperatives also have potential for food safety and quality improvement. Jin and Zhou (2011) stated that agricultural cooperatives are the main adopters of food quality and safety standards in China. They further argued that encouraging the adoption of quality and safety standards by agricultural cooperatives is more effective and practical than enforcing regulations targeted at farmers, as the cost of compliance could be shared among the cooperative members and the production activities will be better coordinated by the cooperative. However, the low participation rate among farmers to join agricultural cooperatives limits the scope of impact of this model (Shen et al., 2006).

In terms of the contract model between the farmers and enterprise or cooperatives, two models emerge with different trade-offs between food safety and cost of implementation: the first contract model is to lease lands from farmers and controls production directly; the second one is to sign production contracts with farmers that specify chemical use and production methods. The former contract model arguably gives the renter of the lands the most control over the production. However, leasing land and hiring labor could be prohibitively expensive (Calvin et al., 2006). Sometimes, it is also technically difficult to join the leased plots of land into a continuous large-scale production base (Hu, Gale and Reardon, 2006). With the latter contract model, despite less stringent requirements of capital for land and labor, the company will need to afford a non-trivial amount of efforts to monitor farmers' compliance with production contracts, especially when farmers are growing unfamiliar species. Thus, it is a challenge for entities that source with a contract model with farmers to strike a balance between the cost of implementation against the risk of food safety (Calvin et al., 2006).

In this chapter, we will document and qualitatively analyze the three field trips that we conducted in Shaanxi, Shandong and Henan provinces in China over the course of 6 months. During these trips, we focused on the agricultural cooperative model and the “enterprise + farmers” model respectively. The goal of these field trips is to investigate the production and distribution activities under both models, as well as the contract models that are implemented to ensure the quality and safety attributes of the agricultural products.
Field Study on the Agricultural Cooperative Model: Ziyang, Shaanxi

In January 2018, we conducted a field trip to investigate the agricultural cooperative model in Ziyang (紫阳) county, which is located in the city of Ankang (安康) of Shaanxi province. The trip took place between January 14th and January 24th, 2018. During this time period, we visited 16 agricultural cooperatives in 9 towns that specialize in a range of agricultural products and conducted in-person interviews with the cooperative founders or key personnel within the organization.

Ziyang is located in the southern part of Shaanxi and borders Chongqing district. The landscape of Ziyang is mainly mountainous, and the Han River passing through the county serves as the main water resource for the region. The abundance of water resources together with a mild climate renders Ziyang an ideal place for growing a variety of agricultural products, among which tea is the most historically well-known product. Ziyang is also famous for its selenium-rich soil, and the local agricultural products are usually promoted as selenium-enriched and having health benefits.

Ziyang is also among the list of state-level poverty counties, together with 49 other counties in Shaanxi province (The State Council Leading Group Office of Poverty Alleviation and Development, 2012), which are the targets for the government’s poverty-reduction actions. According to the national standard, a household is categorized as being in poverty if the annual household income is below 2300 yuan (at year 2010 level) (People’s Daily, 2011). Each province also has the freedom to promulgate their own poverty standard, which is below 2500 yuan (at year 2010 level) in Shaanxi Province (The People’s Government of Shaanxi Province, 2015). The local government in Shaanxi province has established a multitude of poverty-reduction policies for its farmers and agribusinesses to reduce poverty at the province level. As a result, a great number of agricultural cooperatives started to emerge. Additionally, many e-commerce service centers are also set up in each village to facilitate the distribution of agricultural products.

In general, the great variety of agricultural products and the emergence of agricultural cooperatives and e-commerce service centers highlights Ziyang as a valuable case-in-point for us to study the interplay between the farmers’ organizational model and food safety issues, particularly regarding the farmers’ cooperative model.

Types of agricultural products
Among the agricultural cooperatives that we interviewed, most of the them are relatively new: 13 out of the 16 cooperatives started operating within the last five years, while the other three were founded between 2010 and 2012. There are in total nine different kinds of agricultural product that these cooperatives are specialized in producing, and the breakdown of the crops is shown in Figure 5.
The nine agricultural products can be further divided into low-effort crops and high-effort crops based on farmers’ experiences in cultivating them and their seasonality of their yields. Low-effort crops are the ones that farmers are used to growing or take at most one year from the planting stage to the yielding stage. The level of uncertainty for farmers to cultivate low-effort crops are relatively low, as farmers normally already have a clear understanding of or can soon find out about the yield of the crop. Conversely, high-effort crops would either take longer time to mature or belong to a new type of crop that farmers do not have experiences in cultivating. To grow these crops, farmers are taking on more risks as there are far more uncertainties for the crop yield. Based on this notion, we made the distinction between the low-effort and high-effort crops as below:

<table>
<thead>
<tr>
<th>Low-effort crops</th>
<th>High-effort crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tea</td>
<td>Medicinal herbs</td>
</tr>
<tr>
<td>Konjac</td>
<td>Peach</td>
</tr>
<tr>
<td>Cabbage</td>
<td>Peony</td>
</tr>
<tr>
<td>Rice</td>
<td>Pepper cone</td>
</tr>
<tr>
<td>Mushroom</td>
<td>Mushroom</td>
</tr>
</tbody>
</table>

Types of cooperatives
From our interview, we learnt that the range of activities that agricultural cooperatives generally carry out include the following:

- Land consolidation or production base construction
- Distribution of agricultural inputs
- Land management activities such as trimming, de-weeding...
- Hiring and organization of labor
- Providing training and technical support
- Crop procurement from farmers
- Primary processing of sourced crops
- Sales of sourced crops, processed or unprocessed

Although some activities are prevalent in all cooperatives, such as labor organization and providing training and technical support, the decision whether to participate in some activities or not depends largely on the type of agricultural product and the organizational structure of the cooperative, which leads us to categorize the cooperatives into the following three categories:

- **Intermediate cooperatives**: an intermediate cooperative acts as an intermediate player between farmers and buyers. These cooperatives usually involve in activities including the distribution of agricultural inputs, organization of labor for land management activities, procurement of the harvested products from farmers, and the sales of procured products to buyers. Most of the intermediate cooperatives possess zero or limited processing capabilities (the mushroom cooperative is the only one that has primary processing facilities). Intermediate cooperatives have to seek out external buyers, and they tend to have a diverse sales channels, including wholesalers, online and brick-and-mortar retail stores and downstream processors. These cooperatives are usually founded by individuals who have either a technical or business background in agriculture and capital to establish the cooperative.

- **Integrated cooperatives**: integrated cooperatives are the most common type of cooperatives that we encountered during the interview. These cooperatives engage in the similar activities as the intermediate cooperatives, except for a key distinction that these cooperatives are founded in affiliation to an agribusiness that possesses downstream processing facilities and developed sales networks. Thus, integrated cooperatives merely perform as an upstream sourcing organization that supplies raw materials sourced from the farmers to the downstream processing facilities within the companies. The affiliation between the cooperative and the company displaces the necessity for the cooperative to find external sales channels for their products. The integrated cooperatives are the most common model among the production of tea and konjac. These cooperatives are generally founded by established agribusinesses.

- **Informational cooperatives**: informational cooperatives only provide training and technical support for farmers, and sometimes serve as the distribution center for agricultural inputs. The cooperative model helps to establish sales channels by connecting farmers to potential buyers, but the cooperative does not directly engage in the procurement and sales with the farmers or the buyers. Sometimes, the cooperatives will attend to the land for farmers who are incapable of doing it themselves with a management fee. There is only one cooperative that we interviewed operates within this model, which was founded by a village official.

The sizes of the interviewed cooperatives are vastly different. The number of farmer households that each cooperative mobilizes ranges from 20 to 500. The registered capital of the interviewed cooperatives ranges from half a million to 10 million. Several funding avenues were presented: most intermediate and integrated cooperatives are funded with the founders' personal capital or with the capital from the parent company. Additionally, local policies allow cooperatives to receive capital investment from farmers in extreme poverty, to whom a local bank loaned the
money. The cooperatives will then pay back the farmers with a fixed-rate interest. This policy is regarded as a method by the local government to provide some basic income for farmers in extreme poverty.

Table 2. Summary of activities carried out by three different types of cooperatives (Y = yes; N = no; D = depends).

<table>
<thead>
<tr>
<th>Cooperative activities</th>
<th>Intermediate cooperative</th>
<th>Integrated cooperative</th>
<th>Informational cooperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land consolidation and production base construction</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>Distribution of agricultural inputs</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Land management activities</td>
<td>Y</td>
<td>Y</td>
<td>D</td>
</tr>
<tr>
<td>Hiring and organization of labor</td>
<td>Y</td>
<td>Y</td>
<td>D</td>
</tr>
<tr>
<td>Providing training and technical support</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Procure harvested crops from farmers</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Primary processing of sourced crops</td>
<td>D</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Sales of procured crops</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

Agricultural practices
In this section, we will discuss a range of activities that agricultural cooperatives perform based on our learnings from the interview.

Land acquisition
Cooperatives normally have four ways to obtain the land:

- **Direct rental (land transfer) model**: in this model, cooperatives directly lease the land from farmers with a contract that specifies an annual rate and varying durations (ranging from 3 years to 30 years, based on different agricultural products). In Ziyang, the annual land lease ranges from 100 to 500 yuan per acre, based on the geographical location and the yielding power of the land. Once the land is leased from farmers to cooperatives, the right of use for the land is hereby transferred to the cooperatives, who are entitled to farming and owning the crops harvested from the land. Cooperatives usually prefer to rent adjoining lands that could be merged into a large production base, which is easier to manage than lands that are sparsely distributed.

- **Land-pooling model**: in this model, farmers will keep farming on their own land, while the land is pooled into cooperatives as shares owned by farmers. The value of land will be priced based on the area and the conversion rate established by the local government. In Ziyang, the land is usually priced at around 200 yuan per acre per year. In some land-pooling contracts, as soon as the cooperatives start generating profits from sales of agricultural products, the cooperatives and farmers will split the cash profits of product sales based on a pre-determined rate. In most contracts, however, cooperatives will provide farmers with dividends in the form of agricultural inputs during the production stage, such as seeds and fertilizers. When farmers’ lands are sparsely distributed, cooperatives prefer to use this mode of operation.

- **Business-as-usual model**: in this model, cooperatives are not trying to acquire the land or interfere with farmers’ production activities. Cooperatives are only establishing the procurement relationship with the farmers, which is not bounded by any commitments from either farmers or cooperatives.
• **Publicly-owned land**: in this model, cooperatives will farm on lands that are abandoned and not claimed by any farmers. In this model, cooperative do not need to pay to use these lands.

**Agricultural input**
The agricultural inputs that are used in the field include seed or seedlings, specialized fertilizer, manure fertilizer, specialized pesticide, bactericide and equipment. These inputs are either provided by cooperatives and the local government, or purchased by farmers themselves.

• **Seeds and seedlings**: farmers usually obtain seeds and seedlings through cooperatives, as cooperatives would like to control for the quality of the seeds. The ways that the cost of seeds is recouped is different between cooperatives. So far, we have observed three models in how farmers obtain the seeds:
  - Model 1: farmers need to put down a certain amount of down payment for the seeds, while the rest of the cost is subsidized by the local government (in the case of purchasing tea tree seedlings, farmers will pay for the down payment of 15 percent of the total cost, while the rest is subsidized by the local government). In this model, cooperative only acts as a distribution center for the seedlings.
  - Model 2: farmers receive seeds from the cooperative as a form of dividends from pooling their lands into cooperatives’ lands;
  - Model 3: farmers obtain seeds from cooperatives at the beginning of the production season, and the seed cost is later deducted from farmers’ sales of harvested crops to cooperatives.

• **Fertilizers**: Since Han River serves as one of the drinking waters sources for China’s South-North Water Transfer Project, the Drinking Water Protection and Pollution Prevention Regulation strictly regulates the use inorganic fertilizer that are prone to causing water pollution. Sometimes, the use of specialized fertilizer is allowed, such as specialized fertilizer for tea trees. In this case, the fertilizer is distributed in a similar fashion as the seeds, where the fertilizer is partially or fully subsidized by the government, or given to the farmers by cooperatives at a cost or as a form of dividends. The use of manure fertilizer is not regulated, and farmers are usually responsible for sourcing the manure fertilizer.

• **Pesticide and bactericide**: For the same reason aforementioned, the use of pesticide and bactericide are strictly regulated in Ziyang. As with crops that require certain pesticide and bactericide, the distribution method is again very similar to the distribution of the fertilizer: cooperatives would collectively purchase and distribute the specialized and safe-to-use pesticide and bactericide to farmers either at a cost or for free. In some occasions, government would also subsidize farmers for the cost of specialized pesticide and bactericide. Farmers are generally highly aware of the food safety issues in relation to the use of pesticide and bactericide, and they would supervise each other’s production activities, according to our interview with local farmers.

• **Equipment**: Every farmer household is usually equipped with basic farming equipment, such as plows and sickle. More expensive farming equipment are usually purchased by cooperatives, sometimes with governmental subsidies, and then are lent to the farmers for free. Some cooperatives require their members to purchase certain farming equipment under governmental subsidies.
Labor acquisition
The workers who work for cooperatives usually include the following four types:

- **Landlords:** for farmers who lease their land to cooperatives, they do not have the right of use for their land anymore. But they usually are hired back by cooperatives to provide labor input to manage the land. Two models are observed in hiring back the land owners:
  - Model 1: farmers are hired back as daily workers to work on the production base of the cooperatives. These farmers will follow a fixed working schedule set by the cooperative and get paid daily.
  - Model 2: some farmers are offered to work on their own land and receive annual wages. These land-owners will have the autonomy in terms of scheduling their own production and land management activities and hiring workers during busy seasons.

- **Landowners:** for farmers who pooled the land into cooperatives or just simply farm their own land and sell to cooperatives later, they are usually not paid for their labor. They would also be responsible for the cost of hiring extra workers during the high season. Landowners also have the autonomy of organizing and planning their own production activities.

- **Daily workers:** these workers are usually recruited by cooperatives or individual farmers during the busy seasons. They are usually hired without any contracts, and their salary are normally paid on a daily basis. In Ziyang, daily worker’s salary ranges from 70 yuan to 120 yuan per day, and they will be asked to follow the working schedule specified by either land owners or cooperatives.

- **Contracted workers:** these workers usually have technical expertise in cultivating and managing crops, hence they are hired by cooperatives to instruct the production activities for their farmer members. Their income is normally paid monthly, ranging from 3000 yuan to 5000 yuan.

Production contracts
9 out of the 16 cooperatives sign production contracts with farmers who produce on their own land. The purpose of the contract is to give cooperatives a certain level of control over farmers’ production practices and the use of agricultural inputs, thus ensuring the quality and safety of the agricultural product produced by a distributed network of farmers. Despite nuanced differences, production contracts commonly specify the scale of production, farmers’ and cooperatives’ liability in terms of agricultural inputs and production activities, the quality standard for procurement, the procurement price, the profit sharing model, and the terms on default.

- **The scale of production:** the scale is normally specified in either the area of the land or the number of seeds or seedlings that the cooperative provides the farmer with.

- **Farmers’ liability:** 1) to manage the land by performing activities that include de-weeding, plowing, applying manure fertilizer, and harvesting; 2) to ensure that the quality of the harvested product is up to cooperative’s standard; 3) to agree not to use herbicide and fertilizer that are banned by the government.

- **Cooperatives’ liability:** 1) to provide farmers with trainings in cultivation techniques throughout the whole production season; 2) if farmers do not have the capacity to grow crops on their own, cooperatives have the option to lease the land from farmer and pay farmers for rentals; 3) if needed, to construct the necessary facilities such as the
greenhouse and the installment of water pipes on farm land; 4) if the cooperative also has a processing facility, it should prioritize the hiring of family members of the contracted farmer for job allocations; 5) if farmers do not have sufficient financial capital to purchase seeds, cooperatives will pay for the seeds as a form of advance, which will later be deducted from the farmer’s earnings from the crop sales or as dividends paid to the farmers; 6) to supervise farmers’ production activities.

- **Procurement model:** cooperatives usually purchase the harvested crops from the contracted farmer at either the market rate or a pre-determined rate higher than the market price. Not every cooperative specifies the purchasing price, for when the market price varies greatly throughout the year, it is in cooperatives’ interest not to establish a purchasing price on the contract. Some cooperatives also offer farmers a protection price per acre in case the market price falls below the cost.

- **Profit sharing model:** in some production contracts, a crop-sharing scheme is proposed, where the cooperative would claim a certain percentage of the harvested crops then purchase the remaining shares of the crops from the farmer at a pre-determined price or at the market price. In another model, cooperatives would purchase all the crops from farmers, and then deduct the cost of agricultural input that the cooperatives provided, such as seeds, fertilizers and pesticides.

- **Service fee:** in some production contracts, the technical service and the provision of specialized fertilizer and pesticide from cooperatives is free until the farmer starts making profit. Then the farmer will need to pay the cooperative a fee to receive continuous technical support service and agricultural inputs.

Many cooperatives think that the advantages of signing the production contracts are three-fold: first of all, the contracts facilitate the management of the farming practices and the use of agricultural inputs on farmers’ land and ensure the quality of the agricultural outputs. This is particularly emphasized by integrated cooperatives who source the raw materials for their own processing facilities. Secondly, by signing production contracts at the beginning of the production season, cooperatives can preempt the crops for procurement at the end of the production season, which in turn gives cooperatives an estimate of the amount of crops that they can procure by the end of the season. Thirdly, by knowing how much crops they can procure, cooperatives can better plan and develop their sales network.

However, not every cooperative signs a production contract with their farmers. For example, in remote regions where farmers do not have any other sales channels to sell their product, they would unanimously sell their products to local cooperatives. Thus, these cooperatives are not motivated to sign production contracts with the farmers to secure the procurement quantity. Conversely, in regions where there are many potential buyers, farmers would have more than one sales channel to sell their products, and they would prefer the freedom of selling to the buyer with the highest price than being locked into a contract with a pre-determined price. Last but not the least, some cooperatives are not willing to sign production contracts with farmers, because they want to have the freedom to purchase the products with the highest quality from any farmers who are willing to sell their products.
Sales channels and contracts
There are some drastic differences between how cooperatives sell their procured products in terms of their sales channels. For informational cooperatives that solely serve as a distribution center for agricultural inputs and training center, these cooperatives do not directly engage in any sales activities. For integrated cooperatives that have in-house processing facilities, which is very common in tea and konjac production, the crops sourced by cooperatives will be directly supplied to the in-house processing facility, and the processed products are then sold through the company’s sales channels. Intermediate cooperatives are the ones that do need to solicit external buyers for their products, and the sales channels which tend to explore are very diverse:

- Online retail stores on Taobao.com and JD.com
- E-commerce trading center in the village (essentially a wholesaler)
- External downstream processing facilities
- Wholesalers
- Brick-and-mortar retailers
- Individual customers or organizations

Signing sales contracts with buyers is less common among the interviewed cooperatives. The reason is two-fold: first, many cooperatives have not reached the expected production scale; second, integrated cooperatives do not need a sales contract with their in-house downstream distributors or processors. The sales contracts are more prevalent among intermediate cooperatives, especially the ones that have reached a steady level of production. Normally, the sales contracts will specify the following clauses:

- **Purchasing quantity and price:** usually, buyers procure agricultural products from cooperatives at the market price. However, there are also cooperatives who have signed sales contracts with a fixed purchasing price. Additionally, some sales contracts will specify a minimum purchasing quantity that the cooperatives should supply to the buyer, while a cap on quantity is rare.
- **Quality requirement:** while some sales contracts specify special quality requirements, most contracts use the national standards as quality requirements.

As with the advantages of signing sales contracts, the managers of cooperatives expressed that the sales contract is a way to boost farmers’ confidence in growing high-effort crops (in this case, pepper corn and medicinal herbs) and in continuing the partnership with the cooperatives. For cooperatives that have not signed any sales contracts, they often claimed that they had always had more demand for their products than they can supply, and they would like to sell to the buyer with the best price. Thus, sales contracts are not necessary for them.

Quality standard and traceability program
From our interview, we found out that not many cooperatives have obtained the quality standard certificate (hazard-free food, green food, and organic food), as most of the interviewed cooperatives are still very new in their operations. However, most cooperatives expressed interests in obtaining certain quality certifications in the near future, as they believed that the certificates will solicit a higher level of trust form consumers in their products. However, some cooperatives also claimed that there are no incentives for them to obtain quality certifications,
since they sell to downstream distributors and processors, not to consumers who are more sensitive to food quality and safety information.

None of the interviewed cooperatives has yet to adopt a traceability program to cover the links of the agricultural chain that they are responsible for, since almost all the interviewed cooperatives are still relatively new. However, most cooperatives have heard of the traceability program through workshops organized by the local government. And it is unanimously agreed among the cooperative managers that the implementation of traceability programs is necessary to build consumers’ confidence and trust in their products, which could further provide them with a higher margin opportunity.

Findings
Based on our observation of three types of farmers’ cooperative models and the way of coordinating the production, processing and distribution activities under each model, we conclude our findings as below.

First of all, we observed that cooperatives specialized in high-effort crops tend to have a higher level of control over farmers’ production activities. For example, the cooperatives that are specialized in peony, medicinal herbs and peaches acquire most of the land through the leasing model. These lands are then merged to form a production base, which the cooperatives can hire workers and centrally manage the production activities. Conversely, cooperatives that specialize in low-effort crops take a much less central approach. In the majority of the tea cooperatives, the majority of the land is directly farmed by the landowners with a production contract, and the cooperatives will only provide farmers with agricultural input and technical support. At the end of the production season, cooperatives would procure tea leaves from farmers. The rationale behind this divide is intuitive: the complexities in growing high-effort crops and the uncertainty of the yield in novelty crops pose high risks for farmers, thus the cooperatives would have to take on such risks to demonstrate the practicality of growing the high-effort crops to farmers. As for the low-effort crops, farmers are either already familiarized with the cultivation techniques, or the production cycle is short, so the risk of growing the low-effort crops are very low for farmers.

Secondly, we found that different profit sharing model will result in different level of motivation among farmers. When cooperatives claim a certain percentage of the harvested crops from farmers as a way to recoup the cost of the provided agricultural inputs, it is reported that farmers are usually less motivated to be productive. However, when farmers retain the full ownership of the harvest and sell to cooperatives at a rate that takes the cost of agricultural inputs into consideration, farmers are more productive and motivated to attend to their lands.

Lastly, we found that in general, both the farmers and the cooperatives that we interviewed are highly aware of the importance of the food safety issues. However, their motivation of obtaining certain food quality and safety certification varies. For example, integrated cooperatives are most like to obtain food safety certification, as their parent company usually deals with a large and more competitive sales network than the intermediate cooperatives. Also, cooperatives that sell to downstream processing facility or distributors reported that it is not necessary for them to obtain any quality certifications, since their products are not packaged and consumer-facing. For
cooperatives that have already obtained certain certifications, they unanimously agree that the certification symbols on the product’s packaging could convey the message of better quality and safety attributes to their customers, which could translate to a price premium on their products.
We conducted a second field trip to the city of Weifang (潍坊) in Shandong province between July 22nd to July 31st, 2018 with the goal to uncover additional cooperative model besides the ones we had observed in Ziyang.

Weifang is located in the eastern part of Shandong province along the coast of Yellow Sea. The flat landscape and mild climate of Weifang deem the city to be an ideal region to develop agriculture. In fact, Weifang was chosen as the second subject of study because the city plays an important role in China’s agricultural sector, as it is responsible for one tenth of China’s annual export of vegetables and fruits, as well as one eighth of the livestock export. Shouguang (寿光), a county-level city located within the north-central part of Weifang, is the cradle to the invention of using winter greenhouse to cultivate vegetables year-round. The widespread application of such technique quickly propelled the city to become one of largest industrialized production bases for vegetables and home to the biggest vegetables and fruits distribution center in China.

Since Weifang has a long history of agriculture cultivation, the local farmers are very familiar with various advanced cultivation techniques and invest heavily in advanced farming infrastructure on farmlands. For example, despite the high cost of investment, the use of greenhouse is very prevalent for the year-round production of vegetables. Additionally, local governments have shown support towards farmers and agricultural organizations with practices that could promote the standardization of the agricultural production. For example, in Anqiu (安丘), a county-level city in south Weifang, the local government has set up multiple quality inspection stations at the village level to perform rapid quality checks of the products harvested locally for free or with a very low price point. Last but not the least, the production models adopted by agricultural organizations in Weifang are more diverse and have been in longer operations, compared with the agricultural cooperatives that we interviewed in Ziyang.

Types of agricultural products
During this trip, we interviewed nine agricultural cooperatives and one agricultural business in total. Six of the cooperatives have been operating for more than five years, while the other three cooperatives were recently founded. The varieties of agricultural products produced by these cooperatives include radish, watermelon, grape, ginger, garlic, tomato and peach. One common practice that we observed frequently is the rotation of growing radish and watermelon over the course of a year to maximize the use of lands, for these two varieties of crops have similar requirements for land qualities. However, the choices of crop varieties to cultivate are not permanently fixed in these cooperatives, as the decision is usually strongly influenced by the market demand. The flexibility of cooperatives’ decisions on the varieties to cultivate shows farmers’ adept capabilities in farming and the advanced development of Weifang’s agricultural industry. While radish is regarded as a difficult crop to cultivate, all the other crop varieties are thought as easy to cultivate by the interviewees.

Types of cooperatives
The range of activities observed among these cooperatives bears many similarities to those in Ziyang. In addition to the activities that we observed in Ziyang, we did observe two more activities from the cooperatives in Weifang:
• Connecting farmers to external buyers
• Distribution of welfare among cooperative members

The categorization scheme from the previous section is no longer applicable, for despite most of the cooperatives operate in a model that is similar to the intermediate cooperative model, there are nuances in the range of activities conducted among the cooperatives. Thereby we propose another characterization scheme for the agricultural cooperatives in Weifang based on the differences in their production model, as shown in the following section.

Production model
Among the nine cooperatives, we observed four different models in terms of the organization of production activities: 1) the production-base model; 2) the sourcing model; 3) the coordinating model; and 4) a hybrid model.

Production-base model
This is a model that we had observed in Ziyang. Only one among the nine cooperatives interviewed follows this production model. In this model, the cooperative pools lands from farmers with an annual rental fee and consolidates the pooled lands into a production base. In this particular case, the annual land rental fee is the market price of 500 kilograms of wheat, which totals to around 1200 yuan in 2017. The lands of the production base are leased for 30 years, from 2000 to 2029. The production activities are centrally organized by the cooperative, which encompasses purchasing and applying agricultural inputs, as well as hiring workers to work on the production base. Based on the types of tasks, the workers could be divided between daily workers and long-term workers. Daily workers are paid from 100 to 300 yuan per day, while long-term workers are paid around 2000 to 5000 yuan per month. The cooperative owns all the crops from the production base and looks for buyers for the harvested crops at the end of the crop season. In this model, the cooperative is in complete control of the production activities and directly exerts impacts on the quality of the harvested crops, and its relationship with farmers are purely based on the employment. It should be noted that this cooperative is affiliated to an agricultural company co-owned by the cooperative founder.

Sourcing model
This is also a model that we had previously encountered in Ziyang. In this model, the cooperative does not directly engage in the production activities but only sources harvested crops from farmers, while farmers are fully responsible for acquiring land and labor for their own production activities. In the case of Ziyang, the use of production contracts is prevalent among cooperatives to bound farmers’ production activities. However, in the case of Weifang, the production contract is used to a lesser extent. Among three cooperatives that adopt the sourcing model, only one cooperative uses production contracts to source harvested crops with the motivation to encourage good farming practices among farmers. In this specific case, the cooperative specifies within the production contract a sourcing price that is 15 percent higher than the market price for high-quality products. According to the cooperative manager, the price is also subject to changes in the future to reflect market fluctuations. The same cooperative also centrally purchases the agricultural inputs with advanced payment from farmers. This allows the cooperative to control the quality of the agricultural inputs and lower the cost to farmers with a large order quantity. The other two cooperatives claim that not signing production contracts with farmers allows them
to selectively source the crops with the best quality. Within these two cooperatives, one cooperative also has a sourcing price that is up to 20 percent higher than market price for garlics, while the other cooperative sources at the market price. In these two cooperatives, farmers are responsible for choosing and buying their own agricultural inputs.

**Coordinating model**

This model is similar to the informational cooperative model that we observed in Ziyang, where the cooperative does not directly engage in the sales of the crops. However, there are differences in the level of engagement of the cooperative in farmers’ production activities. In the case of Weifang, three cooperatives follow this model, where these cooperatives orchestrate the distribution of land and agricultural inputs as well as coordinating the sales channels for the farmer members with the goal to maximize farmers’ earnings. These cooperatives are usually initiated by village officials or self-organized by a group of farmers. Among the three cooperatives that adopt this model, there are also nuances in terms of how the land, labor and agricultural inputs are allocated:

1) One cooperative among the three has the least level of engagement with its farmers, as the land and labor are acquired and organized by farmers themselves. The cooperative, however, centrally provides farmers with prescribed agricultural inputs as a way to control the quality of inputs. The cost of the inputs will later be deducted from farmers’ sales of the harvested crops. At the end of the harvest season, the cooperative will bring external buyers to its farmer members and charges farmers 1 yuan for every kilogram of crops sold as the commission fee. The collected commission fee is then distributed among the founding cooperative members who pooled in cash and helped launch the cooperative.

2) Another cooperative follows the model where the cooperative coordinates the allocation of land and labor. To acquire land, the cooperative pools land from farmers at 800 yuan per year for each acre. As for farmers who do not own land, they have the option to farm on the aggregated lands without paying for any land cost. However, these farmers are responsible for the labor cost required for the production activities on these lands. To control for the quality and quantity of the applied agricultural inputs, the cooperative centrally purchases the seeds, fertilizer and chemicals and distributes them to farmers for free. Once the products are harvested at the end of the season, the cooperative will also connect farmers to external buyers. Once sales are made on the harvested crops, 50 percent of the revenue belongs to the farmers and the remainder is reserved by the cooperative, which will be used for purchasing agricultural inputs in the coming year. This particular cooperative was founded by a village official with help from a state-owned agricultural company as an exploration into testing different cooperative models.

3) Last but not the least, the third cooperative follows a similar pattern as the model above, however, with differences in its revenue-sharing model. The cooperative also pools land from the farmers, but the farmers will not receive any rental fee. To farm the land, farmers will pay the cooperative an annual rental fee, which ranges from 30 to 500 yuan per acre per year, based on the land quality. Farmers are also responsible
for hiring workers and paying for agricultural inputs, while the cooperative does help order the agricultural inputs for farmers in large quantity at a discounted price, which is later paid back by farmers. At the end of the harvest season, the cooperative will connect farmers with external buyers. To benefit the farmer members, the cooperative distributes all the land rental fee that it has collected evenly to each farmer member at the end of the year. According to the village official who founded this cooperative, each farmer could receive around 360 yuan at the end of each year. Despite that in this model farmers have to bear more cost items than the previous model, the village official claimed that this model could efficiently consolidate the fragmented lands of farmers, which are usually of the size of 1 to 2 acres. This cooperative was founded in 2005, and this model has since been accepted by local farmers, according to the village official.

**Hybrid model**

Two cooperatives use a hybrid model: one of them combines the production-base model and the sourcing model, where it establishes a production base and sources from farmers with production contracts at the same time. For the production base, the annual land lease fee for this cooperative is at 1000 yuan per acre, and the lease is renewed every 10 years, with the lease initially started in 2013. The workers on the production base are paid a daily salary based on the market rate, which fluctuates between 110 and 170 yuan. For farmers who signed production contracts with the cooperatives, although they need to be responsible for land and labor acquisition and cost, the agricultural inputs are centrally procured and distributed by the cooperative with the cost to be deducted from the future sales of harvested crops. These production contracts are renewed at the beginning of every growing season and specify certain requirements for both production and procurement. For example, the contract asks that the minimum yield rate of a land should be no less than 55 percent, and the farmers shall sell all the harvested products to the cooperative without any reserve. The contract also specifies a procurement price that is above 10 percent of the market price together with a protection price. The procurement price ranges from 2000 to 6000 yuan for each acre of radish.

The other cooperative combines the coordinating model and the sourcing model, where the cooperative coordinates farmers’ production activities by centrally distributing agricultural inputs with farmers’ advance payment, inspecting the quality of the farmers’ produce and hosting workshops to improve farmers’ cultivation techniques. The cooperative also sources crops from farmers and sells the sourced crops with the brand registered by the cooperative. This cooperative does not use production contracts to source crops from farmers, as the manager suggested that farmers prefer to have the freedom to sell to any buyers who are offering a high price. This cooperative only sources products at the market price.

Based on the discussions above, we can summarize the types of cooperatives based on the production models in Table 3.
Table 3. Summary of activities carried out by three different types of cooperatives (Y = yes; N = no; D = depends).

<table>
<thead>
<tr>
<th>Cooperative activities</th>
<th>Production-base model</th>
<th>Sourcing model</th>
<th>Coordinating model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land consolidation and/or production base construction</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Procurement and distribution of agricultural inputs</td>
<td>Y</td>
<td>D</td>
<td>Y</td>
</tr>
<tr>
<td>Land management activities</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Hiring and organization of labor</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Providing training and technical support</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Procure harvested crops from farmers</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Sales of procured crops</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Connecting farmers to external buyers</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Distribute of welfare among farmer members</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
</tbody>
</table>

Quality testing
Among the nine cooperatives, four cooperatives are equipped with their own quality testing facilities to test for the chemical residues on the produce. These cooperatives reported that the cost for setting up these facilities are not significant, which is usually within the range of 10,000 yuan. Three other cooperatives rely on the routine testing performed by local governmental administrations. As mentioned above, some local governments have set up rapid quality inspection stations within farmer communities that could carry out quality testing quickly and inexpensively for farmers. The remaining two cooperatives use services from third-party quality testing agencies. Within these two cooperatives, one quoted a testing price of 1600 yuan per test for each sample, while the other cooperative claimed that it enjoys free testing services from the local governmental quality testing administration thanks to governmental subsidies.

According to the cooperatives, quality testing is performed routinely during the growth period of the crops and before any procurement processes. One cooperative also reported that additional quality testing is also conducted on produce that are stored in storage. Additional quality testing will also be performed when requested by buyers.
Sales channels
Four sales channels are observed for the interviewed agricultural cooperatives in Weifang:
- Downstream wholesalers
- Supermarkets
- Downstream processing facilities
- Individual consumers or organizations

We observed that the downstream wholesaler is the most common sales channel among the interviewed cooperatives and the sales channel with the highest sales volume. Among the nine cooperatives, six cooperatives sell more than half of their sourced produce to downstream wholesalers. This could be explained by the highly developed and distributed agricultural industry in Weifang with ample players in each tier of the market. One cooperative sells to supermarkets, where the cooperative has set up their own branded shelf. Another cooperative also sells low-quality produce to downstream processing facilities. Last but not the least, individual consumers and organizations that the cooperatives have personal relationships with are sales channels for cooperatives to sell very high-quality products.

The sales price is normally dictated by the market and the quality grade of the products. However, one cooperative adopts a strategy to charge 15 percent above its procurement price regardless of the market fluctuation. Another cooperative procures produce with a price that is 15 percent higher than the market rates and sells at a price that is 20 percent higher than the market rate for produce with high quality.
Quality standard and traceability program
Among the nine interviewed cooperatives, six of them have obtained or in the process of obtaining the green food quality certification, with the motivation to receive a wider range of acceptance from buyers and consumers. As for one of the cooperatives that did not apply for the green food quality certification, the manager explained that once the green food certification is obtained, the certified product will solicit stricter inspection from the government. To avoid the possibility of failing the inspection, the cooperative might as well not apply for the quality certification.

Compared with Ziyang, traceability programs are far more prevalently adopted in Weifang. Among the nine interviewed cooperatives, eight have adopted a traceability program. They both use QR codes as the format to document information including the types of agricultural activities performed, the dates when the agricultural activities were performed, the types of fertilizers and chemicals used on the crops, the quality check reports showing that the products are safe for consumption, and the names of the farmers who grew the crops. These codes are printed on the packaging of their products. It is commonly agreed among the cooperative managers that the implementation of traceability programs is imperative for their products to compete in a highly competitive market and under an increasingly strict monitoring system for food safety issues.

Figure 7. The traceable QR code sticker on the packaging of the product (left); the documented production information shown on the phone once scanning the code (right).
Findings

There are a few key differences that distinguish the cooperatives in Weifang from the ones in Ziyang. Firstly, as the agricultural industry in Weifang is far more developed and scaled, the farmers in Weifang are predominately industrialized or commercial farmers. These farmers usually have a longer history of cultivating crops and a progressive mindset to invest in infrastructure and equipment to increase yields, such as the construction of greenhouses and the use of farming machines. The combination of thorough knowledge and ample farming resources sets these farmers apart from the farmers in Ziyang, who are less financially established, less knowledgeable about the most advanced farming techniques, and mostly transitioning from growing for self-consumption to growing for income. This key difference explains the lack of use of production contracts to bound farmers’ production activities in Weifang, as farmers here are regarded as reliable by cooperatives for producing quality produce. The only quality-controlling measure implemented by most cooperatives is the quality inspection before the procurement stage.

Another difference is the higher level of governmental support and supervision in Weifang, compared with Ziyang. As previously mentioned, the quality inspection stations built by local governments in the city of Anqiu make the quality testing much more convenient and less costly for cooperatives and farmers. Also, the majority of the cooperatives have implemented traceability programs under the instructions of the government to hold individual producers or organizations accountable in case of any food safety events. However, in Ziyang, the implementation of traceability program was sparse, and the cooperatives complained about the lack of governmental support in building such systems.

Thirdly, there are also differences to the sales channels for cooperatives’ sourced crops in Weifang. Since the agricultural industry is highly developed in Weifang, the distribution channels are with more tiers of distributors and are more consolidated than those in Ziyang. In general, the cooperatives in Weifang use fewer sales channels than the cooperatives in Ziyang. Also, the majority of the sourced produce from the cooperatives in Weifang are sold to the next level wholesalers, whereas e-commerce retailing and sales to friends or families are still significant sales channels for cooperatives in Ziyang.

Last but not the least, we also observed several new revenue-sharing models among the cooperatives that follow the coordinating model. These cooperatives aim to maximize earnings for farmer members rather than for the cooperative itself or for the affiliated parent company. Regarding the coordinating model that distributes agricultural inputs for free or distributes earnings to farmer members, this model clearly provides farmers with immediate benefits that lowers their production cost. However, the initialization of this type of cooperative relies heavily on leaders who are influential among the local farmer community. These leaders are normally village governmental officials or appointed managers from large agricultural companies. As far as we know, this model is still very rare among the cooperatives in China.
Field Study on the “Enterprise-Led” Model

In March 2018, we conducted a field trip to visit Baohetang (保和堂) Pharmaceutical Co., which is located in the city of Jiaozuo of Henan province, to investigate how large-scale enterprise monitors and manages the quality of the agricultural product that are produced under a contract farming model with local farmers. Over the course of two days, we visited the company’s production base and processing facilities, and we conducted three in-person interviews with the production base manager and two farmers working for Baohetang.

Baohetang Pharmaceutical Co., Ltd was founded in 2002 and has now become a local leading enterprise with a registered capital totaling 100 million yuan. The company is specialized in the production and processing of Chinese medicinal herbs, including Chinese yam, achyranthes, chrysanthemum and rehmannia, as well as the manufacturing of Chinese herbal medicines. The company’s 6000-acre production base is located in Wen county in Jiaozuo, which is within the Central China Yellow River Valley and renowned for its rich soil, flat landscape and a long history of agriculture. The production base is used for not only production but also experimental purposes to develop new crop variants and innovative farming techniques. Besides the production base, the company also employs land from local farmers for production activities under the farming contracts. Among the four crops, the company dedicates the most cropland to produce Chinese yam. Hence, our following discussion will be base off of yam production.

Yam production
The company sources fresh yam and processes them into dried yam slices, which are either sold directly to wholesalers, or further processed into Chinese herbal medicine at the medicine manufacturing facilities owned by the company.

The planting season of yam normally starts in March, and the harvest starts around November and lasts until March the next year. Yams can grow in both clay- and sandy-textured soil. However, yams grown from the sandy-textured soil are of a straighter shape than the yams grown from clay-texture – the straight shape is preferred for the ease of processing in the processing facility. Thus, the company only sources yam from lands with sandy-textured soil.

Production contract
Baohetang sources almost all of the yams for further processing through a contract farming model, where farmers or cooperatives sign an annual production contract with the company and grows yam on their own or leased farmland with processes and inputs prescribed by the company. After the yam is harvested, the company would procure the harvested yam at a pre-determined price. In 2017, the company signed 996 production contracts with either farmers or cooperatives, with the contracted lands totaling 60,000 acres. To be eligible for signing the contrast, farmers need to have at least 50 acres of sandy-textured farmland. However, the manager said that the company has also signed on farmers with only 20 to 30 acres of land.

The contract also specifies the liabilities for both farmers and the company. For example, the farmers and cooperatives signees are responsible for the procurement of the agricultural input, including seedlings, fertilizer and pesticide, according to the company’s standard. Also, farmers and cooperatives are responsible for maintaining the farmland and routinely performing activities.
including de-weeding, irrigation, and the application of fertilizer and pesticide, with prescribed processes for the company. If additional labor is needed, farmers and cooperatives are responsible for the hiring and the cost of the labor. The company, instead, is responsible for providing the farmers and cooperatives signees with ongoing technical support and training opportunities for free. On average, the company hosts two training workshops during the planting and the growing periods annually.

The yam procurement price, quality criteria and the procurement process are also stated in the contract. The farmers and cooperatives are required to sell around 800 to 1,000 kilograms of yam for each acre of contracted land. The procurement price stays at 12 yuan with slight variation each year. For farmers, the contract price could serve as a protection mechanism when the market is underperforming and the price for yam dips. However, when the market price is higher than the contract price, sometimes farmers tend to default on the contract and sell to other buyers. In the contract, defaulting on the contract and selling elsewhere will result in the termination of the contracts. In reality, however, the manager explained that it is normal and understandable for farmers to sell to other buyers who offered a higher price, and the company would still continue working with the farmer since the company is looking to increase the supply of yam to its processing facilities.

As for the quality criteria, the company only buys yams that are longer than 50 centimeters and are of a diameter bigger than 1.8 centimeters. Additional, the yams should be straight with no visible bent, which is a consideration for the ease of processing. Most importantly, the chemical and heavy metal residual on yams should not exceed the national legal standard. To ensure that the quality of the yams sourced from a distributed network of farmers and cooperatives is satisfactory, the company perform quality check on yam samples delivered by farmers and cooperatives before the final procurement. The transportation cost from the land to the procurement facility is also borne by farmers and cooperatives.

Considering the advantages of using a contract farming model, the manager at Baohetang expressed that signing the contract would give the company an estimation of how much yam it can procure before the planting season even starts, which can facilitate the planning of the downstream processing capacities and sales contracts. Also, the guaranteed procurement price in the contract could boost farmers' confidence in growing yam and promote the overall quality of local yam production, which will also strengthen the yam market in the Huaiqing region and help the farmers secure more profits as the price of yam grows. Last but not the least, the production contract can guarantee the satisfaction of the place-of-origin quality metric. However, the manager also acknowledged that the production contract cannot guarantee the stability of the procurement quantity. For farmers, an immediate benefit of signing the production contract is that, according to local policies, the contract with Baohetang enables them to take the one-year interest-free guarantor loan from the local bank with up to 300,000 yuan, depending on the area of their land.

Land Acquisition
When acquiring land for yam production, two criteria have to be met to guarantee the quality of the yam product. First of all, as with Chinese medicinal herbs, an important quality metric is the place of origin, as in the place where the herbs are grown. Practitioners of traditional Chinese
medicine believe that herbs grown outside the place of origin have fewer active ingredients, thus less effective during treatments. The yam that originated from the Huaiqing (怀庆) region (which includes Wen county) is also called “Huai” yam. Hence, when selecting land for growing medicinal-grade yam, the company exclusively employs land within the Huaiqing region. Addition to the place-of-origin requirement, high-quality yam can only be grown on lands that has been fallow for at least 5 to 8 years, so that the soil is restored with the nutrition lost to the growth of yams. Yam is harvested annually, so each year farmers have to scout for new lands that have never been used for yam before or already finished the fallow period. Currently, there is no official historical record documenting the use of lands for crop production. Regarding how to locate the right land, the company and the farmers replied that they either rely on informal information from other farmers, or they would use some techniques and rule-of-thumb to decide the suitability of the land for growing yam.

Besides the aforementioned 60,000-acre contracted farmlands, there are additional lands that the company uses for yam farming. Among the 6,000 acres of land in the production base, 100 acres of land are dedicated to the research and development of yam, specifically the continuous farming of yam. Additional to the yam sourced from the production base and contracted farmland, the company source from another 40,000 of lands outside the contracts. These lands do not qualify for the production contracts because they either are of undesirable soil texture (clay instead of sandy) or outside of the Huaiqing region (not meet the place-of-origin quality metric). The yam sourced from these lands are not processed into medicines, but sold as fresh produce to wholesalers.

As for the scale of the farmers who work under the contract, 60% of the contracted lands are farmed by small-scale farmers (smaller than 50 acres), while the remaining 40% of the contracted lands are farmed by either large-scale farmers or cooperatives (bigger than 200 acres). Since yam requires new farmland each year, farmers have to scout for and lease new land every year. We interviewed a small-scale farmer (230 acres of land) and a small-scale farmer (25 acres), and they reported that the average annual rental for the land is around 1500 to 1600 yuan.

Labor Acquisition
Similar to the case for agricultural cooperative, the labor demand for yam production is very seasonal. In the production base, the company on average hires 40 person-day equivalent of labor per acre for production activities including seeding, fertilizers and pesticide application. These workers are paid daily with around 60 yuan per day. Additionally, the company also hires equipment operators during the yam planting season at a cost of around 500 yuan per acre of land.

As with the labor acquisition for the contracted farmlands, farmers also hire additional labors and are fully responsible for the labor cost. For the small-scale farmer whom we interviewed, during the planting season, he will outsource the planting work to a group of workers, usually around 8 to 9 workers, who usually can finish the planning over a duration of four days on 20 acres of land. These workers are paid based on the number of meters they traveled while planting, with one yuan per meter. To finish off with planting, he will also hire around five workers to close off the ridges in the land, which would normally take around two days. These workers are paid daily, with 60 yuan per day. After the planting period is over, if needed, he will hire extra labor
to manage the land to de-weed. According to the large-scale farmer, out of nine months of a year, he on average hires 8 to 9 workers to work on the land. He on average pays male workers 100 yuan per day, and female workers 65 to 70 yuan per day, as male workers’ work is normally more labor intensive.

Agricultural inputs
The agricultural inputs to yam farming includes seedlings, fertilizers, pesticides, and farming equipment. The estimated cost of agricultural input per acre of yam farming is estimated to be around 5,000 yuan.

On average, one acre of yam farming requires 400 kilograms of seedlings, around 120 kilograms of sulfur-based fertilizer, one ton of organic fertilizer, around 150-yuan worth of pesticide and insecticide. The required farming equipment include cultivator and grooving machine. As for the seedlings, farmers either buy from seedling vendors or cultivate their own seedlings. And the fertilizer, pesticide and insecticide are bought from local agricultural supply stores. According to the manager at Baohetang, the company will sometimes supply farmers with fertilizers, but farmers still prefer to use their own blend of fertilizer as they believe their own fertilizer is more effective. The company is currently conducting experiments to determine the effectiveness of different fertilizers and pest-prevention techniques.

Quality control
The manager at Baohetang candidly admitted that with the contract farming model, it is very difficult to impose control on the use of fertilizer and chemicals with their scale of production. But he has few concern over the quality and food safety of the sourced yam because he is confident that the downstream processing procedures are adequate at removing the chemical residuals on the skin of yam after the yam goes through the cleaning and peeling stations. After the procurement stage is concluded, the in-house testing team will also sample test the quality of the procured yam. Thus, besides banning the use of nationally-restricted chemicals, the company does not impose additional quality regulations for contracted farmers and cooperatives. Thus, the only standard for procurement is about the appearance of the yam, which is mentioned earlier.

The Henan Province Food and Drug Administration also performs both routine and sporadic quality checks on the final product of yam, which mostly tests the quantity of active ingredients in the yam. If the product does not pass the quality standard, both the manufacturer and the distributor of the product will be penalized. The production manager also claimed that the yam product is of the hazard-free quality despite the company has not obtained the certificate for it.

Traceability program
The company has several informational systems to manage and supervise the production activities across all the contracted farmland. The company started a pilot program in 2017, where all the farmers and cooperatives are required to download a mobile application named “Nongshibao” (农事宝). Once the farmers and cooperatives signed the production contract, they were asked to use the application to upload their name and the land information, including land area and GPS coordinates. Each parcel of land is given a code and a number to show both the region and the contract number. The application then visualizes all the farmlands on a map to the manager. Farmers and cooperatives are also required to document their production activities by
taking and uploading photos of the fertilizer and chemicals that are used and the time of the application on their farmland. However, according to our interviews with the farmers, they are not familiar with this mobile application. According to the manager at Baohetang, the company plans to roll out the program in 2018 on a larger scale.

As for the traceability of the products inside the procurement and processing facilities, the manager said that their plan is to assign a RFID-tagged steel basket to every farmer in the procurement storage facility during the procurement period. Similarly, the company also plans to tag the plastic basket used in the processing facilities with RFID tags. In this way, the company will be able to trace the origin of the yam product throughout the whole procurement and processing chain.

Yam Processing
Once the growing season has concluded and the harvest season has started in December, the company will start procuring yams from the contracted farmers and cooperatives to process the yams. To process fresh yams into the dried yam slices, there are five steps: cleaning (to remove the dirt on the yam), peeling (to use a peeler machine to remove the majority of the skin), manual peeling (to manually remove all the remaining skin on yam), slicing (to use a cutting machine to slicing), and drying (to load the sliced yam into an oven). Each step has its dedicated working station at the processing facility.
(2) Peeling

(3) Manual peeling
Labor acquisition
According to the production base manager, there are in total 350 workers who are stationed at the facility throughout the 6-month processing season. These workers sign a working contract with the company and enjoy social benefits and weekly salary. These workers are divided into two groups and work on two consecutive shifts, with each group working for 12 hours per day. The manual peeling station calls for the most workers due to the use of manual labor, while other stations are more labor efficient with the use of machines. During the high season of processing, the company hires an addition of 400 workers through to work on the manual peeling station. These workers do not have a fixed working schedule, but their salary is commission-based and depends on the number of pieces they peel on daily basis.
Quality concern and traceability
According to the manager, because the only material input during the processing is water and most processes are subtractive, the majority, if not all of the chemical residuals on the yam skins will be removed through the processing. However, one quality concern does exist during the drying process: sometimes the sulfur from burning coal in the drying machine will deposit on the product, causing the sulfur content of the final product exceeding the national legal standard. To counteract this, the company adopts the sulfur-free equipment that burns natural gas instead of coal, which prevent the generation of sulfur inside the drying oven.

Currently, there is no traceability implemented at the processing line inside the facility. However, the manager said that it is still possible to trace down to the individual farmer or the co-operative by looking up the daily production record and the time stamp, since now the processing capacity is still relatively low. As previously mentioned, to improve the traceability of yam inside the processing facility, the company plans to use RFID-tagged baskets that stores information about the farmer or the co-operative who produce the yam inside the basket.

Findings
For large agro-enterprise, the rationale behind using the contract farming model is obvious: firstly, the land-leasing model would be otherwise very costly for companies that employ a large area of lands for raw material supply; secondly, the complexity of managing thousands of acres of land would also be non-trivial and requires a huge amount of capital input. However, from our conversation with the manager, it is also evident that contract farming on a large scale poses several quality and safety concerns, which is due to the difficulty of managing and supervising the production activities of a highly distributed network consisted with hundreds of farmers and cooperatives. This finding is consistent with Calvin’s (2006) finding about the difficult trade-offs that companies have to make between cost and safety.

Additionally, the in-house processing and testing capacity of large enterprise can reduce the cost of quality inspection, as the production-procurement-processing procedures are much more streamlined than those in farmers’ cooperative that lack these internal capabilities. The lower transaction cost and higher level of coordination between these functions could facilitate both the certification and the implementation of quality standards. Last but not the least, as the company sell the finished products directly to consumers, the company is likely to face fierce competition in the market. Thus, in order to gain more trust from consumers, large-scale companies are more motivated to implement more quality- and safety-control strategies to ensure their products are competitive in the market.
Chapter II – Food Transparency Information: Effects on Consumers’ Purchasing Behaviors

Introduction
In this chapter, we studied the demand for food quality and safety, as in consumers’ perception about various types of food safety and transparency information as well as their corresponding purchasing behaviors. This is an important topic that merits much discussion: as with the food producers and retailers, understanding how consumers’ psychological motivations correlate to their purchasing behaviors is highly relevant to product development and marketing strategies (Liu, Pieniak and Verbeke, 2013); as for government authorities and policy makers, understanding consumers’ response to various food safety issues is of crucial importance to the development and the implementation of food safety policy and risk communication with the public (Frewer, Jonge and Kleef, 2008).

Due to the historic high occurrence rate of food safety incidents and the recent high-profile “food scares” in the news media, Chinese consumers are highly concerned with food safety issues. Chinese Ministry of Commerce has carried out an annual investigation on food-safety conditions and issued yearly reports since 2004. The reports showed that the rate of concern among urban consumers has risen from 79 percent in 2005 to 96 percent in 2008; among rural consumers, the rate of concern has increased from 58 percent to 94 percent (Yan, 2012). As food safety concerns cover a spectrum of issues, consumers may display different levels of interest towards different types of issues. Brewer, Sprouls and Russon (1994) proposed that food safety concerns could be categorized into six types, and they found out that chemical, health and spoilage issues were significantly more relevant to respondents in Illinois than issues such as regulatory, deceptive or ideal situations. Although similar studies that measure consumer’s food safety concerns at such a granular level in China are still lacking, several studies pointed out that pesticide residue has been a primary concern of Chinese consumers (Yin et al., 2010; Yan, 2012), while Calvin et al. (2006) suggested that Chinese consumers are still primarily concerned about appearance, taste and freshness when it comes to food purchasing.

Similarly, the high-level awareness of the general food safety topic does not necessarily translate to the same level of knowledge about specific quality and safety certification. Since 1990s, the Chinese government has established three different safe food categories that carry certification and increasing level of safety attributes: hazard-free food, green food and organic food (Paull, 2008). More details about the certification program are shown in Table 1. Despite the fact that the certification program has been in effect for over two decades, Chinese consumers’ knowledge about the certification program still remains heterogeneous and sparse. A study showed that more than 80 percent of the respondents in the provinces of Shandong (East of China), Hubei (Central), Sichuan (West) had heard of green food; about half of the respondents were aware of hazard-free food, while only one-quarter knew about organic food (Li, 2007). Beyond the awareness of the certification program, consumers’ knowledge of the certification program in terms of the concept, identification, safety ranking and label recognition is still quite low (Liu, Pieniak and Verbeke, 2013). Multiple studies showed that, on average, more than 50 percent of the respondents from various major cities in China do not understand the food safety implications of different food safety certifications (Meng, 2007; Zhang, 2007; Zhang, 2008).
Despite a relatively low level of knowledge of food safety concepts, Chinese consumers have very positive attitude towards food safety issues and have displayed high demand for food safety. Such demand can be demonstrated by the tripling of the size of the organic food market over a ten-year period and the steady growth of imported food market, to which Chinese consumers attach higher safety and quality attributes (ConnectAmericas, no date; Wright, 2015). According to economic theory, the demand for food safety can be determined by consumer’s willingness to pay (WTP) for additional safety (Wilcock et al., 2004). There is a large volume of literature on consumers’ WTP for food safety, which can be divided into two types based on the interpretation of additional food safety: the improvement of the intrinsic product quality, e.g. pesticide-free and pathogens-free food; or the provision of additional food quality and safety information, e.g. the place-of-origin labels, quality certification or product traceability. While the former interpretation directly addresses the food safety issue by reducing the safety risks and improving the overall quality of the product, the latter interpretation mitigates the issue of information asymmetry between consumers and producers about product-specific attributes or characteristics (Ortega et al., 2011).

There is a large body of literature in Europe and North America that study consumers’ WTP for food safety. Generally, the findings showed that consumers were willing to pay for a premium for food that came with quality and safety certification (Misra, Huang and Ott, 1991; Shin et al., 1992; Yu, Gao and Zeng, 2014). As with food products that provided higher level of transparency, research showed that consumers displayed different WTP responses. Loureiro and Umberger (2003) found out that consumers in Colorado were willing to pay an average of 38 percent to 58 percent more for beef products with the U.S.-origin labels; while Angulo, Gil and Tamburo (2005) reported that most consumers from Spain were not willing to pay a price premium for traceable beef despite their concern of food safety issues. Similar studies on Chinese consumers showed similar findings where consumers displayed higher WTP for products with improved food safety attributes. However, the increases in WTP were usually much lower than the premiums of the safe products currently on the market. Yin et al. (2010) found out that Chinese consumers were willing to pay a price premium of 35 percent for organic food, which was far lower than the 130 percent price premium of the organic food in the market. Similar results were also found for other certification types (Jin and Zhao, 2008; Zhang and Wang, 2009). Ortega et al. (2011) compared consumers’ WTP with respect to different food safety attributes and found out that Chinese consumers displayed the highest WTP for governmental certification programs, followed by third party certifications, traceability programs and product-specific labels.

Additionally, as many literature has pointed out, consumers’ attitude towards food safety varies based on different socioeconomic status, including age, gender, income level, educational level, marital status and types of households (Liu, Pieniak and Verbeke, 2013). As with the gender difference, there is a divide among literatures about whether males or females care more about food safety. In terms of the educational and income levels, multiple studies have showed that respondents who are more educated (Zeng, Xia and Huang, 2007; Ma and Qin, 2009; Zhang and Wu, 2010; Zhang, 2011) or have a higher income level (Ma and Qin, 2009; Zhang and Han, 2009; Zhang and Wu, 2010; Xu et al., 2012) displayed the highest WTP for food safety. Xia and Zeng (2011) found out that young consumers have the highest WTP for food safety, followed by
older consumers, with middle-aged consumers have the lowest WTP. Married consumers also display higher WTP for food safety than respondents who are single (Zhang and Han, 2009; Zhang, 2011).

Research Contribution
Chinese consumers’ perception of food safety and their corresponding purchasing behaviors have not been as well studied as the consumers from the North America or Europe. Thus, the first and foremost purpose of our study is to expand the knowledge of Chinese consumers with respect to their perception of different types of food safety information and their purchasing decisions.

Additionally, while most researchers in the past had focused on consumers’ responses (willingness to pay or purchase intention) towards specific safety certification (hazard-free food, green food and organic food), our research seeks to understand Chinese consumers’ response to food safety information at a more granular level that considers multiple types of information, different product categories, as well as demographic and socioeconomic characteristics of the consumers. In our research, we examine six hypotheses about consumers’ purchasing behaviors in response to different types of transparency information of food products. These hypotheses are summarized as follows:

**Hypothesis 1:** For organic products, consumers demonstrate higher levels of purchase intention and WTP if the definition of what qualifies as organic is explained to the consumer.

**Hypothesis 2:** For organic products, consumers demonstrate higher levels of purchase intention and WTP if the organic certificate is shown (both Chinese and European organic certificates are tested).

**Hypothesis 3:** For products that have been tested in the lab for chemical residues, preservatives, or food additives, consumers demonstrate higher levels of purchase intention and WTP if the lab testing report is shown.

**Hypothesis 4:** For products with different perishability (fresh produce versus processed food), consumers demonstrate higher levels of purchase intention and WTP if the fresh produce is certified organic than if the processed food is made of organic ingredients.

**Hypothesis 5:** For processed food, consumers care more about the manufacturing practices (e.g. the use of chemicals such as preservatives and additives) than the farming practices (the use of organic ingredients). Thus, for processed food, consumers demonstrate higher levels of purchase intention and WTP when the lab testing report for chemicals is shown than when the organic certificate of its ingredient is shown.

**Hypothesis 6:** Consumers demonstrate higher levels of purchase intention and WTP toward European organic certificate than toward Chinese organic certificate.

Another key contribution of our research is that we also employ mediation and path analyses to investigate the underlying behavioral mechanisms driving Chinese consumers’ demand for food.
safety. The findings from our study could provide food producers and retailers with valuable insights regarding what kind of food safety information resonates with different groups of consumers and why.

Experiment Design
We conducted a series of online consumer surveys using Qualtrics’ Panel Service. In these surveys, we simulated a real-life online grocery shopping scenario by showing the respondents screenshots of grocery products that are actually available on JD.com, which is one of the two biggest online grocery retailers for Chinese consumers (the other big online grocery retailer is Tmall.com). The reason that we chose to simulate an online grocery shopping scenario is threefold: first, Chinese consumers are becoming increasingly familiar with shopping for fresh groceries online. In fact, China has the highest internet penetration of the fresh grocery market and the biggest e-grocery market in the world (Agriculture and Agri-Food Canada, 2017); second, the setup of online shops allows retailers to have more “real estate” to display the product’s quality and safety information than traditional grocery stores or supermarkets; third, compared with conducting in-person surveys at supermarkets or grocery stores, simulating online grocery shopping scenarios allows us to collect data with a larger sample size in a short period of time.

To test the hypotheses, we took the screenshots of 13 products that were listed on JD.com at the time. The products were selected based on if there was any quality- or safety-related information on their product pages that we could conduct an experiment on. Each hypothesis is tested on two different products, so that we could tell whether the observed treatment effect is product-specific. The screenshot includes pictures of the product, a short description of the product, the price, and some other miscellaneous information, e.g. shipping cost and the number of reviews left by consumers. To prevent respondents from being influenced by the number of reviews, we changed the review numbers of all products to over 100 thousand. For each hypothesis, we designed a control group and a treatment group, where the difference between the control and the treatment group is the amount of food safety information presented to the respondents. For example, the product screenshot in the control group only indicates in text that the product is organic, while the screenshot in the treatment group in addition includes a Chinese organic certificate. Within each pair of control and treatment products, everything else (including the product itself) except the above information is identical. A sample design of a control and a treatment product is shown in Figure 8. In total, we designed 29 conditions, with 13 of them corresponding to the control group and 16 corresponding to the treatment group.
Respondents
Since the scope of this study is on Chinese consumers, we were targeting at respondents who are currently living in mainland China. Initially, we launched the survey on Amazon Mechanical Turk with the hope to reach HIIT workers from mainland China. But we did not receive any responses as there were no longer any active HIIT workers in China. We then re-launched the survey on Qualtrics Panels and collected 1,885 responses (55.1% male, mean age (M_{age}) = 31.45, standard deviation of age (SD) = 5.89). We used a between-subject design. That is, each respondent was randomly assigned to one of the 29 conditions. We have on average 65 respondents for each condition (M_{respondent} = 64.97, SD = 1.53). The demographic information of the respondents was also collected, including gender, income level, educational level, household types, and their shopping habits (frequency of buying fresh groceries online). We exclusively targeted at respondents between the age of 25 to 60 years old, who would most likely to make independent grocery purchase decisions regularly. In terms of the household type, we aimed to survey three types of household: single, couples without children, and couples with children, in the proportions of 25 percent, 25 percent and 50 percent. However, in the following analysis section, we grouped the single and the couples without children household types into one to ensure statistical power. Table 4 summarizes the demographic statistics of the respondents.

Table 4. Summary of the socioeconomic statistics of the participants: the number in parenthesis indicates the percentage over all respondents.

<table>
<thead>
<tr>
<th>Description</th>
<th>Sample size (after attention check)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All respondents</td>
<td>1464 (77.7)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>754 (40.0)</td>
</tr>
<tr>
<td>Female</td>
<td>700 (37.2)</td>
</tr>
</tbody>
</table>
### Dependent measures

The respondents were asked to answer a Likert-scale questionnaire, in which there were two questions that directly measured the variables of interest: purchase intention (7 = will definitely purchase; 1 = definitely will not purchase), and WTP (a number within a predefined, product-specific price range specified by the respondent). Additionally, in order to understand the underlying psychological mechanisms that affected respondents’ purchase decisions, they were also asked a series of questions regarding the perceived product quality, price fairness, trust in the company, perceived reputation of the company, perceived company’s attitude towards food quality and food safety issues, as well as the overall satisfaction with the company. Last but not the least, we included one attention check question in a random position of the survey to ensure the quality of the collected data.

### Results and Analysis

All of our analyses are done only using the data from the respondents who passes our attention checks (78% of the total sample). For hypotheses 1, 2, 3, 5 and 6, Wilcoxon rank sum tests were performed to determine if there were any statistically significant differences between the purchase intention and WTP between the control and treatment groups. For hypotheses 4, a linear regression model with an interaction effect was used. The specification of the linear regression model is as below:

**Hypothesis 4:**

\[
\text{Purchase Intention / WTP} = a_0 + a_1 D_p + a_2 D_{\text{org}} + a_3 D_p D_{\text{org}}
\]

- \(D_p = 0\) – fresh produce (fresh blueberries or cabbage in this case)
- \(D_p = 1\) – processed product (blueberry juice or pickled cabbage in this case)
- \(D_{\text{org}} = 0\) – not stating that the product is organic
- \(D_{\text{org}} = 1\) – stating that the product is organic

---

<table>
<thead>
<tr>
<th>Income level</th>
<th>Annual income less than 120,000 yuan</th>
<th>Annual income higher than 120,000 yuan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower income</td>
<td>884 (46.9)</td>
<td>641 (34.0)</td>
</tr>
<tr>
<td>Higher income</td>
<td>1000 (53.1)</td>
<td>823 (43.7)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Household type</th>
<th>Single</th>
<th>Either do not have children or do not live with their children</th>
<th>472 (25.1)</th>
<th>332 (17.6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Couple w/o children</td>
<td></td>
<td></td>
<td>469 (24.9)</td>
<td>344 (18.3)</td>
</tr>
<tr>
<td>Family w/ children</td>
<td></td>
<td></td>
<td>943 (50.0)</td>
<td>788 (41.8)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Educational level</th>
<th>College degree</th>
<th>Highest degree is college or lower</th>
<th>1407 (74.7)</th>
<th>1065 (56.5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher education</td>
<td>Highest degree is Masters’ or PhD</td>
<td>477 (25.3)</td>
<td>399 (21.2)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shopping habits</th>
<th>Less than once a month</th>
<th>Higher than once a month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower freq.</td>
<td>1195 (63.4)</td>
<td>890 (47.2)</td>
</tr>
<tr>
<td>High freq.</td>
<td>689 (36.6)</td>
<td>574 (30.5)</td>
</tr>
</tbody>
</table>
\( a_3 \) – the coefficient of the interaction effect of interest; if significant, \( a_3 \) being negative means consumers attach more value of the use of organic ingredients to fresh foods; \( a_3 \) being positive means consumers attach more value of the use of organic ingredients to processed food. Hypothesis 4 assumes that consumers attach more value of the use of organic ingredients to fresh foods than processed food, hence the alternative hypothesis is: \( a_3 < 0 \).

We first performed the hypotheses testing on all the respondents. Figure 9 (a) shows the average purchase intention of the control and treatment groups for all the hypotheses except for Hypothesis 4, which was not tested using Wilcoxon sum rank test. As the results suggest, the differences of purchase intention turned out to be statistically significant in Hypotheses 1, 2, 3, and 5, but with different signs. Some of our proposed hypotheses are confirmed. For example, the increased level of purchase intention in the treatment groups under Hypotheses 2 proved that respondents do value seeing the organic certificate. However, some hypotheses were rebutted. For example, the decreased level of purchase intention in the treatment groups under Hypothesis 1 indicates that explaining the organic concept actually deters respondents from purchasing the product. Similar response is observed for Hypothesis 5, which indicates that respondents do care more about the farming practices (the use of organic ingredients) than the processing practices (no additives, such as preservatives and artificial food coloring). As with Hypothesis 3, the treatment on two products (orange and pickles) solicited opposite responses, suggesting that the effect of showing lab testing reports may be product-specific. As with Hypothesis 4, no statistically significant \( a_3 \) coefficient was observed.

![Average Purchase Intention](image-url)
As for the testing results on WTP, much fewer statistically significant differences between the control and the treatment groups were observed. Again, respondents showed higher WTP for the tomato product that shows the organic certificate under Hypothesis 2, which is consistent with the increase in purchase intention that we observed earlier. Similarly, the decreased WTP in the treatment group under Hypothesis 5 is consistent with the decreased purchase intention level, showing that respondents valued the use of organic ingredients in processed products more than the additives used during food processing. Respondents also showed higher WTP for the bok choy product with European organic certificate than the same product with Chinese organic certificate, suggesting that consumers are willing to pay for a price premium for European organic certificate over Chinese organic certificate. However, similar increase in WTP as not observed for the tomato product that was tested under the same hypothesis, which suggests that the treatment effect may be also product-specific.

To understand how the socioeconomic backgrounds of the respondents would also affect their purchasing intention and WTP under each hypothesis, we segmented the respondents into several sub-groups based on their gender, income level, educational level, household types (with or without children), and their online shopping habits. Wilcoxon sum rank tests were performed in each sub-group, and the results are shown in Table 5.
Table 5. Summary of Wilcoxon Sum Rank tests results across different demographic segmentation; the plus sign denotes that the treatment group has higher purchase intention or WTP than the control group; the minus sign denotes otherwise; ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

<table>
<thead>
<tr>
<th>Purchase intention</th>
<th>Gender</th>
<th>Income level</th>
<th>Household type</th>
<th>Educational level</th>
<th>Freq. of shopping</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Lower income</td>
<td>Higher income</td>
<td>No Children</td>
</tr>
<tr>
<td>H1</td>
<td>Corn</td>
<td>_ - **</td>
<td>- **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td></td>
<td>Tomato</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H2 (CN)</td>
<td>Apple</td>
<td>_ + *</td>
<td></td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td></td>
<td>Cucumber</td>
<td>_ + *</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td></td>
<td>Tomato</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td></td>
<td>Buk choy</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>+ **</td>
</tr>
<tr>
<td></td>
<td>Dried berries</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>+ **</td>
</tr>
<tr>
<td>H2 (EU)</td>
<td>Buk choy</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>+ **</td>
</tr>
<tr>
<td></td>
<td>Tomato</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td>H3</td>
<td>Orange</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td></td>
<td>Pickles</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td>H4</td>
<td>Fresh berries v. berry juice</td>
<td>_ * * *</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td></td>
<td>Fresh cabbages v. pickles</td>
<td>_ * * *</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td>H5</td>
<td>Pickles</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td>H6</td>
<td>Buk choy</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>+ **</td>
</tr>
<tr>
<td></td>
<td>Tomato</td>
<td>_ - *</td>
<td>_ - *</td>
<td>_ - *</td>
<td>_ - *</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WTP</th>
<th>Gender</th>
<th>Income level</th>
<th>Household type</th>
<th>Educational level</th>
<th>Freq. of shopping</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Lower income</td>
<td>Higher income</td>
<td>No Children</td>
</tr>
<tr>
<td>H1</td>
<td>Corn</td>
<td>_ - *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tomato</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H2 (CN)</td>
<td>Apple</td>
<td>_ + *</td>
<td></td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td></td>
<td>Cucumber</td>
<td>_ + *</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td></td>
<td>Buk choy</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>+ **</td>
</tr>
<tr>
<td></td>
<td>Dried berries</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>+ **</td>
</tr>
<tr>
<td>H2 (EU)</td>
<td>Buk choy</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>+ **</td>
</tr>
<tr>
<td></td>
<td>Tomato</td>
<td>_ - *</td>
<td>_ - *</td>
<td>_ - *</td>
<td>_ - *</td>
</tr>
<tr>
<td>H3</td>
<td>Orange</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td></td>
<td>Pickles</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td>H4</td>
<td>Fresh berries v. berry juice</td>
<td>_ * * *</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td></td>
<td>Fresh cabbages v. pickles</td>
<td>_ * * *</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td>H5</td>
<td>Pickles</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>_ **</td>
</tr>
<tr>
<td>H6</td>
<td>Buk choy</td>
<td>_ + **</td>
<td>_ **</td>
<td>_ **</td>
<td>+ **</td>
</tr>
<tr>
<td></td>
<td>Tomato</td>
<td>_ - *</td>
<td>_ - *</td>
<td>_ - *</td>
<td>_ - *</td>
</tr>
</tbody>
</table>
By comparing the number of statistically significant results between sub-groups under each hypothesis, we can infer the differences in the purchase intention and WTP between sub-groups with different socioeconomic backgrounds. With this metric, we can conclude the findings as below:

i. When it comes to gender differences, male respondents more frequently show higher level of purchase intention and WTP than female respondents for products that come with organic certificates, and for products that come with lab testing reports.

ii. As with the income level, respondents who have lower income more frequently showed higher purchase intention and WTP for products that come with organic certificates than respondents with higher income; respondents with high income instead showed higher purchase intention for processed products that come with lab testing reports and higher WTP for European organic certificate than the Chinese ones.

iii. Respondents with children more frequently displayed higher purchase intention and WTP for products with organic certificate, especially for products that show European organic certificate rather than Chinese organic certificates. They also value the use of organic ingredients more in the processed food than in fresh produce, while the opposite is shown among respondents without children. Respondents without children showed higher WTP for products that include additional information that explains the concept of organic.

iv. As with the educational differences, respondents with college degrees displayed higher purchase intention and WTP for organic certificate, especially European organic certificate, than respondents with higher educational degree. While respondents with higher education degree also showed higher purchase intention for processed food with lab testing reports, they did not show higher WTP for any additional transparency information.

v. Low-frequency online shoppers more frequently displayed higher purchase intention and WTP for products that come with organic certificates than high-frequency online shoppers, and have higher WTP for European organic certificate. High-frequency online shoppers also displayed higher purchase intention and WTP for processed products that showed lab testing reports.

As Table 5 shows, the most consistent significant results were observed under Hypothesis 2. Although this result could be partially explained by the bigger data size collected under the hypothesis, it could also be interpreted as that respondents with different socioeconomic statuses consistently value the additional informational transparency provided by the organic certificate.

As with Hypothesis 1 that tests respondents' reaction towards more information about the concept of organic, decreased level of purchase intention is consistently observed, which is opposite to our assumption. Unfortunately, we do not have a good explanation for why this occurred, since it is very counter-intuitive that consumers' purchase intentions are discouraged by the provision of more transparency information. We expect that additional data collection might remedy this issue and provide us with an explanation. As for Hypothesis 3 that tests respondents' reaction towards lab testing reports of chemicals used in processing phase, increased purchase intention and WTP were observed for bok choy but the opposite was observed for orange. Same contrasting result was observed for Hypothesis 6 that tests respondents' reaction towards European organic certificate versus Chinese organic certificate, where the treatment solicited higher WTP for bok choy but lower WTP for tomato. This might be due to the fact that respondents were more conscious about food safety issues towards leaf...
greens, which are shown to be most prone to pesticide problems (Calvin et al., 2006). Very few significant responses were observed for Hypothesis 4 that tests respondents’ reactions towards the use of organic ingredients in fresh produce versus processed products. As for Hypothesis 5 that tests whether respondents value the use of chemical additives more than the use of organic ingredients, the results are opposite to our expectation, which indicates that respondents cared more about the use of organic ingredients than the use of chemical additives for processed products.

Mediation and path analysis
To better understand the underlying mechanisms that lead to the differences in respondents’ purchase intention and WTP in response to different transparency and food safety information, mediation and path analyses were conducted. In total, seven mediators were incorporated within the list of Likert-scale questions, which relates to consumers’ perceptions of both the product and the company. The mediators and the related questions are show below

Product-related mediators:
- **Perceived quality of the product** – “How would you rate the quality of this product?” (1 = very bad; 7 = very good)
- **Price fairness of the product** - “How reasonable do you is the price of this product?” (1= not reasonable at all; 7 = very reasonable)

Company-related mediators:
- **Perceived reputation of the company** – “Compared with other brands, how would you rate the reputation of this company?” (1 = the worst; 7 = the best)
- **Trust in the company** – “How much trust do you have in this company?” (1 = no trust at all; 7 = complete trust) & “Please indicate that to which degree do you agree with the following statement: compared with other brands that I have shopped from, I think this company is more trustful.” (1 = completely disagree; 7 = completely agree)
- **Perceived company’s attitude towards food quality** – “Please indicate that to which degree do you agree with the following statement: compared with other brands that I have shopped from, I think this company pays more attention to food quality issues.” (1 = completely disagree; 7 = completely agree)
- **Perceived company’s attitude towards food safety** – “Please indicate that to which degree do you agree with the following statement: compared with other brands that I have shopped from, I think this company pays more attention to food safety issues.” (1 = completely disagree; 7 = completely agree)
- **Satisfaction with the company** – “Which option below can best indicate your overall attitude towards this brand?” (1 = very disappointed; 7 = very satisfactory)

For this section of the research, we limited the scope of the mediation and path analyses to include the purchase intention as the only dependent variable without segmentation of the respondents to make full use of the dataset. From Figure 9 (a), we can see that the statistically significant results were observed for Hypotheses 1,2,3 and 5 for all respondents. Hence, we will only conduct the mediation and path analyses under these hypotheses. We perform this analysis through two steps. In step 1, we perform exploratory mediation analysis in which we examine each potential mediator independently. In step 2, we perform a confirmatory analysis by taking
the significant mediators in step 1 and analyzing their joint effect on behavior through structural equation modeling. All analyses are done using the mediation and lavaan packages in R. The path analysis diagrams for Hypotheses 1, 2, 3, 5 are shown below.

Hypothesis 1 tests respondents' response towards the provision of additional transparency information on the definition of what qualifies as “organic”, and we observed a lower level of purchase intention. As we can see from the path analysis diagram, the treatment is negatively associated with consumers’ perception of the product quality ($\beta = -0.411, p = 0.003$), price fairness ($\beta = -0.287, p = 0.083$), and consumers’ trust in the company ($\beta = -0.239, p = 0.077$). The mediators completely mediated the effects of the treatment on respondents’ purchase intention, since the direct effect of the treatment on purchase intention is statistically insignificant. However, the fit of the model is less than ideal (CFI = 0.481, RMSEA = 0.579), which suggests that more improvements could be made by collecting more data points or identifying more mediating mechanisms. As previously mentioned, we cannot explain this counter-intuitive result that the provision of more transparency information actually hurts consumers’ purchase intention. Thus, collecting more data to test this hypothesis will help us better understand consumers’ behaviors with respect to this particular hypothesis.
Hypothesis 2 tests respondents' response towards seeing the organic certificate of organic products, and we observed a higher level of purchase intention. As the path analysis diagram suggests, the treatment is positively associated with respondents' perception of the price fairness of the product ($\beta = 0.321, p = 0.017$), trust in the company ($\beta = 0.396, p < 0.001$), and respondents' perception of the company's reputation ($\beta = 0.315, p = 0.001$). Again, these mediators completely mediated the treatment effect on respondents' purchase intention, as suggested by the statistical insignificance of the coefficient of the direct effect. The model has a relatively good fit (CFI = 0.810, RMSEA = 0.444), since the size of dataset used for testing this hypothesis is the biggest.
Hypothesis 3 tests respondents’ response towards seeing the lab testing report that shows the pesticide residues are within the legal standards, or there are no additives such as preservatives or artificial food coloring during food processing, and an increased level of purchase intention for processed product (pickles in this case) is observed. As the path analysis diagram suggests, the treatment is positively associated with respondents’ perception of the product quality ($\beta = 0.446, p = 0.045$), their trust in the company ($\beta = 0.535, p = 0.007$), and their overall satisfaction with the company ($\beta = 0.397, p = 0.076$). At the same time, the treatment also has a statistically significant direct effect on respondents’ purchase intention ($\beta = -0.277, p = 0.093$), which suggests that the identified mediators have a partial effect on respondents’ purchase intention. However, the negative sign of the direct effect is counter-intuitive. This result might be partially explained by the high correlation between the mediators, which caused the occurrence of multicollinearity in the model. (CFI = 0.789, RMSEA = 0.827).
Hypothesis 5 tests respondents’ response towards the statement that shows that there are no added preservatives or artificial food coloring against the statement that shows the use of organic fresh ingredients for processed products (pickles in this case). As a result, respondents in the treatment group who are shown screenshots of processed products with no use of preservatives displayed a lower level of purchase intention. From the path analysis diagram, we can see that the treatment effect is negatively associated with respondents’ perceived product quality (β = -0.498, p = 0.024), respondents’ trust in the company (β = -0.399, p = 0.040), and their overall satisfaction with the company (β = 0.435, p = 0.013). These mediators completely mediated the treatment effect on respondents’ purchase intention. The fit of the model is also relatively satisfactory (CFI = 0.748, RMSEA = 0.577).

The results of the mediation and path analyses suggest that the provision of additional transparency and food safety information can boost consumers’ trust in company and increase the perceived quality of the product, which consequently solicits higher purchase intention from the consumers. These findings are consistent with studies that identifies consumers’ trust and the perception of product quality as important considerations that influence consumers’ purchasing behaviors (Engel, Miniard and Blackwell, 1995; Zeng, Xia and Huang, 2007; Yin et al., 2010).
Conclusion and future work

In this chapter, we sought to understand how consumers respond to different transparency and food safety information in terms of their purchase intention and WTP with a series of online randomized controlled experiments. By dividing the respondents into various control and treatment groups, we confirmed our hypothesis that showing consumers the organic certificate (both Chinese and European ones) of organic products is more likely to solicit higher purchase intention and WTP. However, we also observed findings that are contrary to our hypotheses: we observed lower level of purchase intention and WTP for organic products that provide a description of the organic concept; also, as with processed products, consumers attach higher value to the farming practices (the use of organic ingredients) than the processing practices (no use of preservatives or artificial food coloring).

We also observed differences in respondents’ attitude towards transparency and food safety information in relation to their socioeconomic backgrounds. For example, respondents who are male or have children more frequently displayed higher purchase intention and WTP than those who are female or do not have children in response to food safety information. Also, respondents with college degrees more frequently displayed higher WTP for food safety information than respondents with higher education level. In contrast, respondents with different income level and shopping habits displayed similar responses in purchase intention and WTP towards additional foods safety and transparency information. The mediation and path analyses also uncovered the mechanisms that caused the changes in consumers’ purchase intention. We found out the additional transparency and food safety information will have an effect on consumers’ trust in the company as well as their perceived quality of the product, hence influencing consumer’s purchasing behaviors.

This study serves as a pilot study that aims to test a series of hypotheses regarding consumers’ perception of food safety information and their corresponding purchasing behaviors. Although we did observe some statistically significant results under several hypotheses, the less-than-ideal fits of the path analysis models suggest opportunities to further improve the model quality by either collecting more data under each hypothesis or identifying more potential mediators. Last but not the least, to eliminate the cognitive bias of the respondents that are resulted from an experimental environment, it would be ideal to replicate the experiment in a real-life setting, e.g. conducting hypothesis testing on major online grocery retailing websites and measuring and comparing consumers’ purchasing behaviors and willingness to pay between the control and the treatment groups.
Bibliography


ConnectAmericas (no date) Demand for imported food is growing among China’s middle class | ConnectAmericas. Available at: https://connectamericas.com/content/demand-imported-food-growing-among-china’s-middle-class (Accessed: 13 May 2018).


54