Chinese Urban Consumer's Perception of Food-Safety Indicators

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ABSTRACT

Households in 10 Chinese cities were asked to rank six food-safety indicators (venue, appearance, brand, certification, expiration date, and price) in importance for five food groups including meat, milk, vegetables, fruit, and juice. The results suggest that different food-safety factors are important for different commodities. Consistent patterns are found in terms of which factor had the first and second highest probabilities of being chosen as the most important food-safety indicator within food categories. Venue and expiration date are the most important factors for meat, expiration date and brand for milk and juice, and price and venue for vegetables and fruits. Certification was not ranked as the number one or number two indicator of food safety for any of the five goods suggesting that either the household consumers do not trust the certifications or are not aware of the meanings of the certification labels.

Introduction

Food safety incidents in China have ignited demand for safer food and increased regulation of food products by the Chinese government [1,2]. In Chinese news are reports of sales of pork adulterated with the drug clenbuterol; pork sold as beef after being soaked in borax; rice contaminated with cadmium; arsenic-laced soy sauce; popcorn and mushrooms treated with fluorescent bleach; bean sprouts tainted with an animal antibiotic; and wine diluted with sugared water and chemicals. Even eggs have turned out not to be eggs at all but man-made concoctions of chemicals, gelatin and paraffin [3]. In the first half of 2012, China's State Administration for Industry and Commerce detected over 15,000 cases of inferior foods and closed over 5,700 unlicensed food businesses [4]. In response to these incidents as well as others, the Chinese government revised the 2009 food safety law to impose stricter controls and supervision of food production and management [5]. However, while some progress had been made, the head of China's Food and Drug Administration reported there were over 500,000 food safety violations during the first 9 months of 2016 [6].

Given the prevalence of food safety incidents and violations as well as consumer's increasing concern over the safety of their

food, what do consumers perceive as indicators of safe foods? Do consumers perceive that food purchased at large supermarkets is safer than that from traditional wet markets? Do they trust their ability to evaluate the appearance of products? Does government certification of food safety matter? Do certain brands elicit trust in the safety of their products? Does an expiration date on the product matter?

In this paper, how consumers perceive indicators of safety for meat, milk, fruit, vegetables, and juice products and how the importance of these indicators vary with economic and demographic variables are analyzed. The analysis uses a unique data set developed from a series of household surveys conducted in 10 cities in China. As part of the surveys, respondents were asked to rank in order of importance their perceived top indicators of food safety among purchase venue, certification, brand, price, appearance, and expiration date for meat, milk, fruit, vegetable and juice.

The results suggest that the top indicator of food safety as perceived by the Chinese consumers varies by food product. Venue is the top indicator of safety for meat, date milk. Price for vegetables and fruit, and both brand and date for juices. The results also suggest

that economic growth, as well as demographic and education trends, will likely increase the extent to which consumers use these indicators to determine the safety of these five foods in the future.

Perceived indicators of food safety

The general production process for safe food as described in Notermans et al. [7] suggests that the production of acceptable, safe food products is the result of Good Manufacturing Processes (GMP), HACCP and regulations as well as consumer education. If food products are produced using good practices and following HACCP and regulatory guidelines, then consumers could be confident that these food products are safe. However, China has experienced many incidents where apparently some portion of the GMP, HACCP, or regulatory processes were not effective [3].

The production process can be categorized as having search, experience, or credence dimensions. Search dimensions are those that consumers can determine at time of purchase (e.g., the appearance of an apple or meat). Experience dimensions are those that can be determined only after purchase such as the taste or illness that results from consuming a pear. And credence dimensions are those that consumers cannot easily determine such as chemical or microbiological hazards unless they directly cause illness, such as long-term health effects from pesticides or chemicals applied to pears. Credence dimensions may also reinforce perceptions of quality based upon place of purchase or branding such as certain stores providing consistently better quality or safer products [8].

Many studies have examined consumer's willingness to pay for higher quality or safer foods [9-12]. In general, these studies find that consumers are willing to pay a premium for higher quality or safer food. Bai et al. [13] assess food safety accidents in China in

2003 and 2004, and they find that most of these accidents could be attributed to either contaminated raw materials or insufficient sanitation control during processing. They also examine government mandated compulsory food safety admittance systems and voluntary food safety assurance systems such as Green Food and organic foods. They find that the compulsory system is inefficient and perhaps ineffective particularly for small food processors. The use of voluntary food safety assurance systems is found to be rapidly increasing and to be used by food companies as a means to compete in the marketplace in terms of the safety of their products. However, it is not clear how consumers perceive these systems. Zhang et al. [14] find that consumers evaluate extrinsic factors to assess the safety of food products. They find that brand and purchase venue are ranked as the two most important safety indicators for fluid milk purchases.

Data

The data in the present study were collected by surveying 2,027 urban households in 10 cities from 2009 to 2012. These cities and number of Households (HH) surveyed for this analysis are Nanjing (246HH) in Jiangsu province, Chengdu (208HH) in Sichuan province, Xi'an (215HH) in Shaanxi province, Shenyang (207HH) in Liaoning province, Xiamen (149HH) in Fujian province, Taiyuan (202HH) in Shanxi province, Harbin (212HH) in Heilongjiang province, Taiyuan (202HH) in Shanxi province, Nanning (190HH) in Guangxi province, Taizhou (197HH) in Zhejiang province, and Lanzhou (201HH) in Gansu province. For the sake of regional comparison, the surveys were conducted between July and September. These cities were chosen to be geographically dispersed and representative of the upper tier cities in China (Figure 1).

Figure 1: Geographic distribution of sampled cities.

Our survey participants are a stratified random sample of the households participating in the Urban Household Income and Expenditure (UHIE) survey conducted by the National Bureau of Statistics of China (NBSC). The UHIE is a national survey, which provides the primary official information on urban consumers' income and expenditures. The data from the UHIE survey have been widely used by scholars for food consumption and expenditure research but do not include any information of consumer attitudes towards or perceptions of food safety.

Questions pertaining to food safety were asked with in-house and face-to-face interviews with the person most familiar with the food shopping and food preparation in each household. Respondents were asked to rank among six indicators (i.e., purchase venue, appearance, brand, certification, expiration date and price) which of these they perceived to be most important, next most important, and third most important (1,2,3) as indicating food safety for meat, milk, vegetables, fruits, and juice. Additionally, detailed information on demographics and socioeconomics of the household and its members were also collected during the survey

which of these characteristics were associated with the consumers' ranking behavior.

The raw number of respondents that rank each factor as most important is presented in Table 1. For example, of the 246 households surveyed in Chengdu, venue is ranked as the most important perceived indicator of safety for meat, milk, vegetables, and fruit by 59 (28%), 54 (26%), 75 (36%) and 64 (31%), respectively. More than 25% of Chengdu households rank certification as most important for juice. Overall, venue or price are ranked as most important perceived indicators for meat, vegetables and fruit. Certification and price are ranked as the most important perceived indicators for milk. There is less consensus for juice with venue, certification, or price being ranked as important perceived indicators of juice safety. When looking across the cities for each commodity, venue or price were generally perceived as the most important indicator for meat, vegetables, and fruit. Brand, certification, or price were generally ranked as the most important perceived indicators of safety for milk and juice.

Table 1: Number ranking each factor as most important by survey participants.

		Nanjing	Chengdu	Xian	Shenyang	Xiamen	Harbin	Taiyuan	Taizhou	Nanning	Lanzhou
Meat	Venue	47	59	29	36	20	27	34	48	46	32
	Appear	32	24	26	24	17	27	34	27	21	32
	Brand	34	7	32	33	26	34	17	8	9	7
	Cert	41	48	49	33	33	32	41	41	31	47
	Date	48	34	31	14	16	29	31	20	29	29
	Price	44	36	48	67	37	63	44	46	60	54
Milk	Venue	55	54	37	40	21	40	45	35	25	29
	Appear	12	8	11	6	7	10	8	6	13	8
	Brand	41	49	37	40	29	43	25	51	31	43
	Cert	62	42	49	32	42	28	37	51	52	42
	Date	34	22	42	35	27	30	31	17	30	34
	Price	40	33	39	51	23	61	55	30	46	45
Veg.	Venue	71	75	78	53	30	74	66	49	42	55
	Appear	15	16	10	19	13	22	14	17	23	19
	Brand	11	5	10	15	6	11	5	7	11	12
	Cert	26	34	45	36	33	21	26	21	36	36
	Date	35	31	21	17	12	26	21	33	26	36
	Price	88	47	51	67	55	58	70	63	59	43
Fruit	Venue	66	64	59	49	36	72	70	45	45	53
	Appear	17	16	13	15	11	24	16	17	23	17
	Brand	22	11	20	9	11	9	8	15	9	9
	Cert	23	33	25	30	36	21	23	24	39	43
	Date	34	31	47	22	11	26	14	32	29	31
	Price	80	53	51	81	44	60	71	57	52	48
Juice	Venue	54	49	32	45	25	54	62	36	33	32
	Appear	16	12	13	14	7	20	11	12	13	17
	Brand	45	36	42	41	31	32	30	31	27	32
	Cert	44	52	29	30	40	29	29	49	31	36
	Date	45	29	52	30	18	28	27	20	34	38
	Price	35	29	45	35	28	49	43	41	59	45

Methodology

Following Zhang et al. [14], a Rank Ordered Logit Model (ROLM) is used, which is a generalization of the conditional logit model for ranked data [15]. The ROLM model can also be used when individuals do not rank some of the least-preferred items [14,15]. As shown in Zhang et al. [14], the ROLM can be derived from an underlying random utility model [15,16] where each respondent, i , ranks the most important, next most important and the third most important perceived indicator in determining food safety. Let U_{ij} , $j = 1, \dots, J$ be the unobserved utility that respondent i derives from the j th factor where i is assumed to rank factor j higher than factor k whenever $U_{ij} > U_{ik}$. Each U_{ij} is composed of the sum of two parts, the systematic component part, μ_{ij} , and a random component, ϵ_{ij} . The μ_{ij} are numerical quantities that indicate the degree that respondent i prefers item j over other items [16]. When the choice is between item j and item k , the odds of choosing j over k is $\exp\{\mu_{ij} - \mu_{ik}\}$.

Following Zhang et al. [14], μ_{ij} is expressed as

$$\mu_{ij} = \alpha_j + \sum_{l=1}^L \beta_{jl} X_{il}$$

where α_j is interpreted as the differences in log odds of ranking factor j over the reference factor, and β_{jl} can be interpreted as the effect of a one-unit change in the l th explanatory variable on the log odds. The X_{il} ($l = 1, \dots, L$) are the individual's l th characteristics that

Table 3: Estimation Results¹.

Factor	X	interaction	Meat		Milk		Veg.		Fruit		Juice	
Venue			0.333	*	0.097		-0.564	ss	-0.877	***	0.421	**
Appearance			0.379	**	-1.502	***	-0.514	***	-0.445	***	-0.767	***
Brand			-0.211		0.9	***	-2.886	***	-2.167	***	0.7	***
Certification			-0.172		0.161		-2.397	***	-2.23	***	0.016	
Date			0.338	*	1.02	***	-1.796	***	-1.549	***	0.937	***
Venue	x	Kids	0.368		-0.069		-0.209		0.248		0.53	**
Venue	x	Adolescents	0.243	**	0.07		0.142		0.271	***	0.225	**
Venue	x	Seniors	-0.152		0.03		-0.002		0.018		0.014	
Venue	x	Income	0.199	***	0.208	***	0.035		0.041		0.113	**
Venue	x	Education	0.257	**	0.269	**	0.23	**	0.194	**	0.265	**
Venue	x	Chengdu	-0.467	**	0.395	*	0.468	***	0.671	***	-0.282	
Venue	x	Xi'an	-0.626	***	-0.243		-0.107		0.02		-0.845	***
Venue	x	Shenyang	-0.458	**	-0.477	**	-0.08		0.022		-0.413	*
Venue	x	Xiamen	-0.708	***	-0.606	**	-0.157		0.115		-1.126	***
Venue	x	Harbin	-0.624	***	-0.665	***	-0.019		0.149		-0.869	***
Venue	x	Taiyuan	-0.238		-0.429	**	-0.244		0.104		-0.481	**
Venue	x	Taizhou	-0.467	**	-0.51	**	0.018		-0.047		-0.964	***
Venue	x	Nanning	-0.649	***	-0.615	***	-0.066		0.158		-1.043	***
Venue	x	Lanzhou	-0.89	***	-1.042	***	-0.253		-0.081		-1.258	***
Appearance	x	Kids	0.404	*	-0.388		-0.222		-0.083		0.114	
Appearance	x	Adolescents	0.094		0.16		0.05		0.072		0.082	
Appearance	x	Seniors	0.088		0.233		0.081		-0.02		0.122	
Appearance	x	Income	0.154	***	0.081		0.057		0.031		0.033	

vary across respondents but are fixed across factors and include presence of children, adolescents, or seniors as well as income and education level (Table 2). Note that one factor is dropped due to identification issues so that all estimates for α_j and β_{jl} are relative to the reference factor. Predicted probabilities for each alternative are calculated using the StataCorp [17] routine `aspr` value.

Table 2: NVariable Description.

Variable	Description	Range
Child	Age ≤ 2 years old	0-1
Adolescents	Age > 2 & ≤ 16 years old	0-1
Seniors	Age ≥ 60 years old	0-1
Income	Per Capita HH income	1,000 Yuan
Education	Education level > High School	0-1

Results

For identification, the indicator price is omitted from the ROLM, and the model is estimated with maximum likelihood. Accordingly, all coefficient estimates are relative to choosing price as the number one indicator of food safety (Table 3). For example, the coefficients on venue for meat, vegetables, fruit, and juice are significant with two being positive and two being negative. These coefficients indicate that, for meat and juice, venue is more likely to be chosen than price as the most important perceived indicator of food safety while price is more likely to be chosen than venue is for vegetables and fruit.

Appearance	x	Education	0.014		-0.012		0.013		0.067		0.052	
Appearance	x	Chengdu	-0.36	*	-0.299		0.3	*	0.233		-0.464	
Appearance	x	Xi'an	-0.766	***	-0.095		-0.092		0.054		-0.706	**
Appearance	x	Shenyang	-0.867	***	-0.316		0.015		-0.106		-0.252	
Appearance	x	Xiamen	-0.506	**	0.505		-0.026		0.123		-0.085	
Appearance	x	Harbin	-1.312	***	-0.61	*	-0.15		-0.146		-0.626	**
Appearance	x	Taiyuan	-0.488	**	-0.665	*	-0.222		-0.278	*	-0.431	
Appearance	x	Taizhou	-0.321		0.183		0.235		0.264		-0.009	
Appearance	x	Nanning	-0.872	***	0.224		0.173		0.166		-0.247	
Appearance	x	Lanzhou	-1.065	***	-0.73	**	-0.08		-0.149		-0.623	**
Brand	x	Kids	0.285		-0.131		-0.436		-0.148		0.761	***
Brand	x	Adolescents	0.219	*	0.12		-0.164		-0.114		0.331	***
Brand	x	Seniors	0.017		-0.019		0.325		0.153		0.061	
Brand	x	Income	0.204	***	0.188	***	0.027		0.07		0.085	**
Brand	x	Education	0.328	***	0.213	**	-0.171		-0.094		0.161	
Brand	x	Chengdu	-2.216	***	-0.132		-0.245		0.231		-0.309	
Brand	x	Xi'an	-0.85	***	-0.463	**	-0.288		-0.414		-0.704	***
Brand	x	Shenyang	-0.619	***	-0.798	***	0.137		-1.07	***	-0.459	**
Brand	x	Xiamen	-0.692	***	-0.174		0.056		-0.022		-0.621	***
Brand	x	Harbin	-0.8	***	-1.009	***	0.186		-0.874	***	-0.857	***
Brand	x	Taiyuan	-1.447	***	-1.111	***	-0.594		-1.164	***	-1.026	***
Brand	x	Taizhou	-2.546	***	-0.224		-0.395		0.108		-0.899	***
Brand	x	Nanning	-2.369	***	-0.601	***	-0.018		-0.346		-1.235	***
Brand	x	Lanzhou	-2.372	***	-1.308	***	-0.164		-1.059	***	-1.262	***
Certification	x	Kids	0.165		-0.686	***	-0.192		-0.078		0.308	
Certification	x	Adolescents	0.168		0.088		-0.077		-0.087		0.242	**
Certification	x	Seniors	-0.138		0.087		0.121		-0.013		0.004	
Certification	x	Income	0.196	***	0.162	***	0.104	**	0.067		0.03	
Certification	x	Education	0.217	**	0.168		-0.036		0.063		0.233	**
Certification	x	Chengdu	-0.221		0.219		0.984	***	1.025	***	0.04	
Certification	x	Xi'an	-0.194		-0.205		0.551	**	0.227		-0.713	***
Certification	x	Shenyang	-0.543	**	-0.774	***	0.726	***	0.351		-0.181	
Certification	x	Xiamen	-0.06		0.26		0.894	***	1.104	***	0.042	
Certification	x	Harbin	-0.498	**	-0.767	***	0.33		0.083		-0.574	***
Certification	x	Taiyuan	0.177		-0.816	***	0.034		-0.133		-0.451	**
Certification	x	Taizhou	0.023		0.618	**	0.88	***	1.003	***	0.349	
Certification	x	Nanning	-0.515	**	0.004		1.15	***	1.158	***	-0.538	**
Certification	x	Lanzhou	-0.481	**	-0.726	***	0.658	***	0.563	**	-0.764	***
Date	x	Kids	0.577	**	-0.088		-0.223		-0.498	*	0.37	
Date	x	Adolescents	0.153		0.138		0.128		0.035		0.246	**
Date	x	Seniors	-0.315	***	0.034		0.02		-0.115		-0.035	
Date	x	Income	0.215	***	0.166	***	0.128	***	0.049		0.085	**
Date	x	Education	0.144		0.215	**	0.275	**	0.262	**	0.237	**
Date	x	Chengdu	-1.159	***	-0.043		0.271		0.327		-0.451	**
Date	x	Xi'an	-0.665	***	-0.233		-0.466	**	-0.033		-0.551	***
Date	x	Shenyang	-0.873	***	-0.795	***	-0.48	**	-0.486	**	-0.404	**
Date	x	Xiamen	-0.913	***	-0.151		-0.426	*	-0.255		-0.735	***
Date	x	Harbin	-0.903	***	-0.91	***	-0.487	**	-0.504	**	-0.815	***
Date	x	Taiyuan	-0.186		-0.751	***	-0.629	***	-0.764	***	-0.696	***
Date	x	Taizhou	-0.705	***	-0.107		0.245		0.523	**	-0.496	**

Date	x	Nanning	-1.09	***	-0.454	**	0.109		0.366	*	-0.942	***
Date	x	Lanzhou	-0.929	***	-1.087	***	-0.198		-0.342		-1.129	***

Note: *Significance levels: * $p < .1$; ** $p < .05$; *** $p < .01$;

For meat venue, appearance and expiration date are more likely to be chosen relative to price as the most important indicator of meat safety while brand and certification are less likely to be chosen relative to price. For milk, the indicators appearance, brand, and expiration date are more likely to be chosen relative to price while venue and certification are less likely to be chosen relative to price. For vegetables and fruit, the indicators venue, appearance, brand, certification, and expiration date are less likely to be chosen than price as the perceived most important indicator. Venue, brand, and expiration date are more likely to be perceived as most important for juice relative to price while the indicator appearance is less likely.

The coefficients of the interactive terms of the food-safety factors with kids, adolescents, seniors, income and education are also relative to price as the most important indicator. Of the interactive terms with these variables, those with income and education are most often significantly different than zero. Households with higher income are more likely to perceive venue or date over price as the most important indicator of food safety for meat. Income also positively affects the choice of venue over price for milk and juice; appearance for meat; brand for meat, milk, and juice; certification for meat, milk, and vegetables; and date for meat, milk, vegetables, and juice. Education also positively affects the choice of consumer's perceived most important indicator of food safety relative to price. Education positively affects the choice of venue over price for all five goods; brand for meat and milk; certification for meat and juice; and date for milk, vegetables, fruit,

and juice. Kids, adolescents, and seniors have sometimes significant but varying roles in the consumer choosing an indicator other than price as the perceived most important indicator of food safety.

Children in the household positively affect the choice of venue and brand over price for juice, appearance and date over price for meat but negatively affect the choice of certification and date over price for vegetables and fruit, respectively. The presence of an adolescents in the household positively affects the choice of venue and brand over price for meat, venue over price for fruit, and venue, brand, certification, and date over price for juice. The only significant effect of a senior in the household is to negatively affect the choice of date over price for meat.

City effects also have a significant effect on choice of a factor over price in many instances as indicated by the interactive terms including cities¹. Generally, in comparison to Nanjing, the interaction terms for cities are significantly negative for choosing venue and brand over price for meat, milk, and juice; appearance over price for meat; and expiration date over price for meat, milk, vegetables, fruit, and juice. The ROLM with socioeconomic and city-effect variables has a large number of interactive terms and that makes it difficult to access the quantitative importance of the six food-safety indicators from a quick examination of the coefficients reported in Table 3 [15]. To access the importance of these factors, probability estimates of each factor being chosen first are calculated and reported in Table 4 with these probabilities being calculated taking into account the effects of the significant interactive terms.

Table 4: Probabilities.

		Nanjing	Chengdu	Xian	Shenyang	Xiamen	Harbin	Taiyuan	Taizhou	Nanning	Lanzhou
Meat	Venue	0.244	0.29	0.235	0.285	0.209	0.277	0.265	0.258	0.3	0.252
	Appear	0.209	0.275	0.174	0.162	0.219	0.119	0.176	0.255	0.205	0.181
	Brand	0.164	0.034	0.126	0.163	0.143	0.156	0.053	0.022	0.036	0.038
	Cert	0.108	0.164	0.16	0.116	0.178	0.14	0.178	0.187	0.152	0.168
	Date	0.217	0.129	0.201	0.167	0.152	0.186	0.248	0.181	0.172	0.216
	Price	0.058	0.109	0.104	0.106	0.1	0.122	0.079	0.097	0.135	0.145
	Venue	0.164	0.23	0.169	0.192	0.104	0.181	0.214	0.108	0.134	0.15
	Appear	0.014	0.011	0.017	0.019	0.027	0.017	0.015	0.019	0.027	0.018
	Brand	0.312	0.263	0.258	0.266	0.305	0.245	0.206	0.275	0.259	0.219
Milk	Cert	0.078	0.091	0.083	0.068	0.117	0.078	0.069	0.159	0.118	0.098
	Date	0.352	0.325	0.367	0.302	0.353	0.306	0.334	0.35	0.34	0.308
	Price	0.08	0.08	0.106	0.152	0.094	0.173	0.162	0.089	0.122	0.208
	Venue	0.266	0.319	0.254	0.248	0.233	0.277	0.247	0.237	0.222	0.22
	Appear	0.235	0.239	0.228	0.242	0.235	0.215	0.223	0.261	0.25	0.232
	Brand	0.017	0.01	0.014	0.02	0.019	0.022	0.011	0.01	0.015	0.016

Vegs	Cert	0.037	0.075	0.069	0.078	0.094	0.055	0.046	0.079	0.106	0.077
	Date	0.098	0.096	0.065	0.061	0.065	0.064	0.062	0.109	0.097	0.086
	Price	0.347	0.261	0.369	0.351	0.355	0.368	0.411	0.304	0.31	0.37
	Venue	0.252	0.348	0.254	0.272	0.25	0.304	0.31	0.203	0.246	0.249
	Appear	0.241	0.215	0.251	0.228	0.24	0.216	0.202	0.265	0.237	0.222
	Brand	0.037	0.033	0.024	0.013	0.032	0.016	0.013	0.035	0.022	0.014
Fruit	Cert	0.043	0.085	0.054	0.065	0.116	0.049	0.042	0.1	0.115	0.081
	Date	0.066	0.065	0.063	0.043	0.045	0.042	0.034	0.095	0.08	0.05
	Price	0.359	0.254	0.354	0.378	0.317	0.373	0.398	0.303	0.299	0.384
	Venue	0.214	0.216	0.175	0.206	0.126	0.192	0.257	0.137	0.188	0.175
	Appear	0.026	0.022	0.024	0.029	0.043	0.029	0.032	0.043	0.05	0.04
	Brand	0.337	0.331	0.318	0.311	0.329	0.306	0.235	0.231	0.244	0.275
Juice	Cert	0.095	0.133	0.089	0.116	0.18	0.115	0.118	0.228	0.139	0.128
	Date	0.287	0.244	0.315	0.279	0.249	0.271	0.278	0.294	0.278	0.267
	Price	0.04	0.054	0.077	0.059	0.073	0.086	0.079	0.068	0.101	0.116

Of the households surveyed, venue, except in Xiamen, was estimated to have the highest probability of being chosen as the most important food-safety indicator for meat with appearance and expiration date having the second highest probability of being chosen for meat. For milk, expiration date has the highest estimated probability of being chosen first in all cities and brand has the second highest probability level, except in Taiyuan. For vegetables and fruit, price has a higher probability of being chosen first as a perceived indicator of food safety in all cities except Chengdu where venue was ranked highest and price ranked second. Venue or appearance was consistently ranked second for the other cities. For juice, brand and expiration date have the highest and second highest probability, respectively, of being chosen as the perceived most important indicator of food safety with three exceptions, Taiyuan, Taizhou, and Nanning, where expiration date has the highest probability of being chosen first and with brand or venue second.

Conclusions and Implications

In 10 Chinese cities, 2027 households were asked to rank six food-safety indicators in importance for five food groups. A ROLM that included socioeconomic and city-effect terms is fit to the household data. The results suggest that different food-safety indicators are perceived by Chinese consumers as important for different commodities. That being said, consistent patterns are found in terms of which factor had the first and second highest probabilities of being chosen as the perceived most important food-safety indicator within food categories. Venue and expiration date are perceived as the most important indicators for meat safety, expiration date and brand for milk and juice safety, and price and venue for vegetable and fruit safety. In no case is certification predicted to be ranked as the number one or number two indicator of food safety for any of the five goods. The Chinese government is highly supportive of the certification program, but these findings

suggest that either the household consumers do not trust the certifications or are not aware of the meanings of the certification labels. This does not mean that certification cannot play an important part as a reliable food-safety indicator, but that it may take more time for consumers to trust the system or more education of consumers as to the meanings of the certification labels.

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