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Food Safety Satisfaction in China and Its Influencing Factors: Empirical Study with a Hierarchical Linear Model

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Abstract: Food safety is one of the residents' initial demands in daily life, and the negative perception of food safety potentially leads to public panic and dissatisfaction with government performance. Existing literature only focused on certain regions in China by using different indicators, and their results varied and lacked comparability. This paper explores influencing factors of the public's satisfaction with food safety by conducting a nationwide survey in China. Factors cover several demographic variables while considering the nature of governments to reveal the difference among provinces. The results show that demographic factors such as gender, age, type of residence, education, and census register are positively correlated with food safety satisfaction, while annual income is not significant. Evaluation of government regulation efforts has a positive correlation with food safety satisfaction. People with higher trust in the government show higher satisfaction with the food safety situation. On the province level, per capita GDP, per capita food safety fiscal expenditure, and food safety fiscal expenditure level are positively correlated with food safety satisfaction. The empirical findings are helpful for government regulations; we thereby discuss our analytical results and suggest some governmental policies.

Keywords: food safety; public satisfaction; influencing factors; hierarchical analysis

1. Introduction

Food safety has been raising the public's concerns during the past few decades, and public regulators all around the world are facing significant challenges to ensure food safety and public health. For instance, food safety issues such as BSE disease, bacterial outbreaks, and GMOs have forced the UK government and food industry to take steps to rebuild public confidence [1]. In China, food safety has become a salient issue in the last 10 years along with the fast-growing economy and environmental problems. More food safety scandals have been exposed to public view such as poisonous ginger, gutter cooking oil, and so forth. In particular, the melamine milk scandal in September 2008 [2] revealed the ineffective regulation by the government. The Chinese people were shocked to learn that melamine, a chemical used in plastics, had been found in domestic infant formulas. Young children were experiencing adverse health impacts including death, and more than 290,000 people (mostly infants and young children) had been poisoned. Public trust in domestic food safety has been challenged consistently through these repeated food safety risks. During the 21st Meeting of the Standing Committee of the 11th National People's Congress on June 29, 2011, the inclusion of food safety was proposed in the "national security" system, which indicated that the issue of food safety was becoming one of the most important focuses in China and was considered to

be a threat to national security [3]. However, according to the 2015 Pew Global Survey, food safety was still a primary problem in China [4].

Public perception of food safety is closely related to the current situation of food safety regulation and also the satisfaction of government efforts. While food safety remains one of the prominent social problems, food safety incidents are more likely to be perceived by the mass as a failure of public policy and administration inspection [5]. Therefore, it is crucial to understand public food safety satisfaction for the government. In China, due to the authoritarianism control of the government and the lack of social actors' participation, the government is the main agent of food safety regulation. Especially, local governments take the main responsibilities of food safety inspection and implementation of relevant regulations [6]. With the very frequent occurrence of food safety incidents in China, the public's food safety satisfaction is declining, and the government is losing credibility. Understanding what factors drive citizen satisfaction regarding food safety is essential to public policy and to effectively deal with food safety issues [7].

Therefore, food safety satisfaction, which reflects public perception of the status quo of food safety regulation, becomes a vital window for the Chinese government to grasp and improve the status quo of food safety policy and regulation. To enhance people's food safety satisfaction is not only the purpose of government food safety regulation but also a necessary measure to improve its credibility [8]. Our research is attempting to explore which factors influence the public's food safety satisfaction and to what extent they are determinant in the whole country.

In previous research, many residents' demographic factors such as age, gender, education, income, and so on have been confirmed to have significant impacts on food safety satisfaction. However, their research areas are limited to specific regions, especially provinces. If we expand the scope to the whole country, are the effects of these influencing factors still significant? Furthermore, in this article, we intend to examine the effect of individual factors while taking governments as agents into account. Our motivation derived from existing literature on food safety satisfaction in China; we suppose that some factors from the governmental perspective could partly explain why their results differed. The differences caused by the level of economic development and government resources between provinces could be a reasonable explanation, which has been long neglected in research. Thence, we take provinces as a higher level to explore whether provincial factors could affect public food safety satisfaction. This article attempts to answer the above questions with nationwide ABS (Asian Barometer Survey) survey data in China, finding out factors from both resident and province levels.

2. Food Safety and Public Satisfaction

Food safety, as a widespread issue, has raised the attention of the regulators and researchers all around the world. For the government, it is about how people perceive the government and even the country [9]. It is important to assess public perception of the status quo of food safety for the governments in order to cope with the emergence of increasing food safety risks in such a context. Therefore, governments should attach importance to public food safety satisfaction when they are promoting fast economic growth.

Public service satisfaction has been used and practiced as the indicator of public service quality by many countries. The concept of public service satisfaction stems from "customer satisfaction", which is a measure of how well a product or service provided by a company or organization can satisfy a customer's expectations [10–12]. Since the 1970s, customer satisfaction has gradually been introduced into the public management field as the public's evaluation of government services, including the SERVQUAL in Sweden and the ACSI (American Customer Satisfaction Index) in the US [13–15]. For instance, the ACSI model was applied to examine the drivers of overall satisfaction with local government services in New York City. It was found that the perceived quality of certain public services, such as public schools, the police, and transportation, are the most salient drivers of satisfaction, and the significance of each service varies across income, race, and geography [16]. In the case of food safety, customer satisfaction is used more in the analysis of business and customer

behavior where the "customer" means the real customer in commercial activities [17–19] rather than citizens to the public services. In China, such a tendency of introducing customer satisfaction has attracted attention. Building a service-oriented government is placed at the center of the 12th Five-Year Plan, which demands challenging the governance philosophies, capacities, and competencies of the Chinese government at every level [20].

Public satisfaction on certain public services, such as public health, public transportation, and public housing, has been studied [21–23]; they emphasized the application of satisfaction in measuring public perception of government services. Scholars have commenced to address the importance of food safety issues and investigate the status quo of public food safety satisfaction. However, the results are not satisfied by all means, demonstrating that the general public's satisfaction with food safety was at a low level in the main cities of China, including Beijing, Hangzhou, and Chongqing. A study of Beijing residents' food safety satisfaction examined the effect of several factors, including trust in government, scientists and food producers, experiences related to food safety risks, risk perception, and demographics, such as gender, age, income, and so on [8]. By using the GLM (General Linear Model), the researchers found that trust in government and scientists was positively related to food safety satisfaction, food safety incidents had a negative relationship with residents' satisfaction, and individuals with higher educational background tended to have lower food safety satisfaction. Other researchers analyzed residents' food safety satisfaction and influencing factors in urban Hangzhou by using SEM (Structural Equation Modeling), and it was found that the overall satisfaction degree was 63.89 (out of 100), and the satisfaction of residents on the use of additives, pesticide residues, heavy metals, law enforcement, and regulatory system was low [24]. Based on a survey in Chongqing, the results showed that factors including production and processing, harmful substances, safety supervision, product certification, and food quality were five key factors that affected food safety satisfaction [25]. However, the sample size was only 400, which could have led to biased results. Existing literature on public food safety in China is insufficient. Research used different indicators on public food safety satisfaction in China and were focused on specific regions, which led to varied results and lack of comparability. Additionally, there were few studies that covered the whole country. Further, the differences between regions were long neglected by researchers in China, and scholars only stayed in the simple distinctions such as the difference between the east and the west, urban and rural areas [26]. Fisher [27] found that regions with higher Medicare spending achieve more satisfaction. Kunimitsu [28] also verified that regional factors such as economic revitalization, social capital, public facilities for basic human needs, and reputation could affect the satisfaction of residents in Japan. Thus, we suppose that factors from the governmental perspective could be explanations for these differences.

This article aims to analyze public food safety satisfaction in China with national survey data and try to compare satisfaction degrees of different regions. We expect to acquire a more in-depth understanding on differences among regions in the effect of influencing factors from the resident level and the province level.

2.1. Resident Level

Individual factors of how people perceive the current situation, including gender, age, and other demographic characteristics, are examined by various studies [29–33]. Previous studies have proven that individual differences in food safety perception are related to many demographic characteristics, including age, regional, socio-economic, or gender distinctions [34]. First, gender is an important determinant of risk perception across a variety of health and environmental risks and concerns [35,36]. Dosman [19] found that women tend to perceive more risk than men and this could be interpreted as women being responsible for household food preparation and purchases. Compared to males, who are not responsible for household food procurement and preparation, females perceive higher risks in food safety issues and have lower satisfaction.

Secondly, it is found that people's perceived personal responsibility for food-related safety increases with age [37], and there is also a positive relationship between the perception of food safety risks and age [38,39]. Therefore, we propose that there is a relationship between age and food safety satisfaction as the more risks people perceive, the lower the satisfaction they would have.

Thirdly, according to many food consumption studies, it is expected that people with higher income are more likely to purchase food with safety labels, thus they are more aware of potential risks, as well as education, which enriches people with knowledge and abilities to acquire related information on food safety [17,40–42]. However, in a study of citizens' food safety concerns across Chinese cities, the researchers also found that family income was not significantly related to food safety concerns [43].

Fourthly, type of residence has been often considered in research on food safety perceptions which examines the differences that are caused by residence [40,44,45]. However, the distinctions of residence are urban and rural in most of the cases. In China, this distinction can be measured by a "census register" which is divided into agricultural and nonagricultural [46]. In a rural area, residents with agricultural census register are self-sufficient because they do their own farming and are less dependent on food sold in the market which could have potential risks. We also wondered whether the size of residence (i.e., dividing the type of residence into city, town, and village) could affect public food safety satisfaction as food safety risks increase with the size of residence. Based on the results of previous research, we choose to include the following demographic variables in our resident-level analysis: gender, age, income, education, type of residence, and census register. The hypotheses are as follows:

Hypothesis 1. *All else being equal, females, people who are older with higher IE (income and good education experience) tend to have lower satisfaction than males, who are younger with lower IE.*

Hypothesis 2. *Those living in larger communities and are registered in cities tend to have lower satisfaction than the people who live in smaller communities and are registered in the countryside.*

Trust is an essential indicator regarding public administration, especially for public satisfaction with governments and their policies. It is believed that there is a positive relationship between public service performance and trust in government, that is, better-performing public services will lead to increased satisfaction among their users, and this, in turn, will lead to more trust in government [47]. Similar to food safety satisfaction, if people hold higher trust in the government, they may perceive higher satisfaction. Through various studies on evaluation of public services, citizen (or user) satisfaction is one of the critical indicators of government performance [33,48,49]. Citizen evaluation on government performance could have a significant impact on attitudes towards administration affairs and also their trust in government. With regards to food safety in China, as the government is the main responsible actor of food safety supervision, the evaluation of government regulation efforts may affect public food safety satisfaction. The better evaluation a person gives to the government, the higher the possibility he or she has to be satisfied with the current food safety situation. Therefore, we propose two hypotheses:

Hypothesis 3. *People who trust the government more tend to have higher satisfaction with food safety than those who trust the government less.*

Hypothesis 4. *People who have a more positive attitude on the government's regulation performance tend to have higher satisfaction on food safety than those who negatively evaluate the government's regulation performance.*

2.2. Province Level

Previous research paid some attention to the impacts of macro factors on food safety satisfaction. Some Chinese scholars tried to examine this kind of impact by focusing on divided regions such as the east and west. For instance, it was found that the food safety satisfaction of the eastern residents is lower than that of the centre residents, and the satisfaction of the residents of the central region is lower than that of the residents of the western region in a nationwide survey [26]. However, which are the real factors behind the division of the east and the west? There may be differences in resources and the level of economic development in different regions which are influencing factors from a higher level rather than individual differences.

Thus, we intend to examine the effect by taking provinces as our research objects to see whether the province-level factors could have a significant effect on public food safety satisfaction. As for the level of economic development, our analysis includes per capita GDP as there are disputes over the impact of a nation's income on life satisfaction [50], because it is expected that the relationship is positive, while in many types of research, it is negative [51]. In the case of Chinese food safety satisfaction, per capita GDP of each province could be a proper indicator to examine the relationship between the level of economic development and public food safety satisfaction in different provinces. Likewise, the relationship between government resources and public service quality has been studied. Boyne [52] found that a positive relationship between financial resources and service performance was more supported through a meta-analysis of existing research. With higher financial inputs, government performance will be better and public satisfaction will be higher. We measured government resources with two variables, per capita food safety fiscal expenditure and food safety fiscal expenditure level, to examine whether an increase in government resources will lead to the increase of public food safety satisfaction.

Hypothesis 5. *Government efforts of investment in food safety positively affects the public's satisfaction over food safety.*

3. Relations between Two-Level Factors and Public's Satisfaction of Food Safety

3.1. Data and Measures

First, we used the Chinese dataset of the fourth round of the Asian Barometer Survey (ABS) (Data analyzed in this article were collected by the Asian Barometer Project (2013–2016), which was codirected by Professors Fu Hu and Yun-han Chu. The Asian Barometer Project Office (www.asianbarometer.org) is solely responsible for the data distribution. The authors appreciate the assistance in providing data by the institutes and individuals aforementioned. The views expressed herein are the authors' own.) through July 2015 to March 2016 (The ABS survey in mainland China was conducted by 12 universities. After interviewer training, the field interviewing was launched in full scale on July 1, 2014. There must be at least five more call-backs before declaring the particular respondent as nonresponse. The quality of data was strictly controlled through three rounds of review. Entry of raw data was performed by specialists, beginning on December of 2015, and data cleansing began on March 15, 2016. The final database and coding manual were completed on 20 June2016.). In the selection of samples, 125 primary sampling units (PSU) in total were drawn across the whole nation as the Census Yearbook from the National Statistics Bureau served as the primary source. The respondents were randomly selected by a representative sampling method of probability proportional to size (PPS) and only residents aged 18 and above who have resided in the surveyed community for no less than one month were recruited. A total of 7500 samples were drawn in the field; among them, 6013 were eligible, and the response rate was 67.65%. In mainland China, 4068 valid samples of respondents were obtained. The reliability and validity have been tested. Second, considering the respondents' perceptions were based on previous situations, especially the most recent year i.e., 2014, and taking the time lag of governmental resources

(fiscal expenditures) into account, the data for the province level were from the 2015 China Statistical Yearbook and final accounts of fiscal expenditures of general public services in the provinces in 2015. The yearbook is annually published by the National Bureau of Statistics of China and is a collection of statistics comprehensively reflecting the economic and social development of China. Data in the 2015 China Statistical Yearbook comprise a series of indicators from 2014, covering the nation and its provinces, autonomous regions, and municipalities. Table 1 summarizes demographic characteristics of the sample.

Table 1. Demographic statistics of the samples.

Demographic Characteristics	Percentages	Demographic Characteristics	Percentages
Gender		*Education (years of education)*	
Male	48.90	Primary school (0–6)	43.13
Female	51.10	Middle school (7–9)	29.77
Age		High school (10–12)	15.67
18–29	16.74	College and above (over 13)	11.43
30–39	14.07	*Type of residence*	
40–49	21.22	Major city	9
50–59	19.81	Main city	9.6
Over 60	28.15	Town	15.3
Census register		Village	66.1
Agricultural	75.5		
Nonagricultural	24.2		

The dependent variable of public food safety satisfaction was measured on a scale from 1 (very bad) to 10 (very good) by the question "What score would you use to evaluate your satisfaction of the current food safety situation?" Level-1 variables include demographic variables, trust in local government, and evaluation of government regulation efforts. Demographic variables such as gender, age, education, census register, and type of residence were measured in different ways. Gender was measured as either 0 (female) or 1 (male). Census register was also measured as either 0 (agricultural) or 1 (nonagricultural). Age was measured on a scale from 1 (18–29 years) to 5 (over 60 years). Education was measured by the years of education. Type of residence was measured on a scale from 1 (Village) to 4 (Major city) sorted by resident population. We measured trust in local government by the question "What score would you use to evaluate your trust in local government on a scale from 1 (very low) to 10 (very high)?" The evaluation of government regulation efforts was measured by asking respondents to answer the question "What score would you use to evaluate the efforts of government regulation from 1 (very low) to 10 (very high)?" Level-2 variables include per capita GDP, food safety fiscal expenditure level, and per capita food safety fiscal expenditure; food safety fiscal expenditure level indicates the proportion of provincial food safety fiscal expenditure to total fiscal expenditure.

3.2. Descriptive Statistics

We observed from Table 1 that there were slightly more female than male respondents; according to the sixth national census, the ratios of male and female were 51.27% and 48.73%, respectively. We observed that people over 60 years old accounted for 28.15%, which was higher than the national ratio of 16.83%. At the same time, the sample resided mainly in the countryside; 75.5% of respondents held agricultural census register which accounted for 70.86% in the sixth national census. The proportion of people with different education attainments took up 43.13% (primary school), 29.77% (middle school), 15.67% (high school), and 11.43% (college and above); the samples' educational level basically reflected the general situation of the national populations (the number of citizens with college and postgraduate education accounted for 8.92% of the whole population). As Table 2 shows, there was a huge standard deviation of the sample's annual income, and the averages of trust in local government and evaluation of government regulation efforts were 5.912 and 5.967, respectively, which are at a medium level.

Table 2. Descriptive statistics of variables.

	Min.	Max.	Mean	SD.
Annual income	0	2,500,000	20,450.866	46,392.773
Trust in local government	1	10	5.912	1.721
Evaluation of government regulation efforts	1	10	5.967	2.316

We found that the mean of overall food safety satisfaction was 5.509 and the average satisfaction degree of each province is shown in the following table (Table 3). The five provinces with the highest satisfaction with public food safety were Yunan, Guizhou, Gansu, Guangxi, and Shanxi, while the lowest five provinces were Hebei, Inner Mongolia, Shanghai, Shaanxi, Jiangsu.

Table 3. Average satisfaction degree in different provinces.

Province	Satisfaction	Province	Satisfaction
Anhui	5.383	Jilin	5.5
Beijing	5.176	Jiangsu	4.96
Fujian	5.421	Jiangxi	5.552
Gansu	6.222	Liaoning	5.162
Guangdong	5.364	Inner Mongolia	4.655
Guangxi	5.735	Shandong	5.923
Guizhou	6.547	Shanxi	5.673
Hainan	5.18	Shaanxi	4.94
Hebei	4.196	Shanghai	4.875
Henan	5.144	Sichuan	5.585
Heilongjiang	5.648	Yunnan	6.888
Hubei	5.598	Zhejiang	5.071
Hunan	5.568	Chongqing	5.421
Variance	0.314	SD	0.549

3.3. Empirical Analysis and Results

Our dataset includes 4068 respondents from 26 provinces on the resident level who are clustered within provinces; individuals within the same province are correlated with each other. If we apply the traditional regression model, the underlying assumption of OLS will be violated. Thus, we analyze the influencing factors by using HLM (Hierarchical Linear Model). With regards to HLM, it is a tool for appropriately analyzing such clustered data [53] and can obtain statistically efficient and unbiased regression result estimates [54]. In our case, we observed significant provincial differences in satisfaction from Table 3, and there could be effects from provincial variables. Hence, our study applied HLM analysis to study public food safety satisfaction. We began the analysis by observing that there was a significant difference between the individual and the individual's group (i.e., province level) through the null model (Model I). The null model was used to measure the contribution rate of the two levels for our dependent variable which excludes any explanatory variables on two levels.

$$\text{Resident level: } Y_{ij} = B_{0j} + r_{ij}$$

$$\text{Province level: } B_{0j} = G_{00} + U_{0j},$$

where Y_{ij} is the dependent variable representing food safety satisfaction of the *i*th respondents in the *j*th province. B_{0j} is the mean of food safety satisfaction in the *j*th province. The variance of r_{ij} denotes the change between groups. G_{00} shows the total mean of our dependent variable and U_{0j} represents the change in a group. The estimates of the variances on the resident and province levels were 4.394

and 0.232, respectively. We determined the level of overall variation caused by province-level variables by the intraclass correlation coefficient (ICC), which is the proportion of province-level variance in the total variance. The ICC value was 0.050, demonstrating that provincial variables contributed 5% difference to the dependent variable. The result was significant ($p < 0.01$), denoting that both resident- and province-level variables could explain food safety satisfaction and should be further analyzed by HLM. Thus, H_1 and H_2 have been tested and accepted.

Model II included all resident-level variables but not province-level variables to build the random parameter regression model. Table 4 shows the result of Model II. The random effects of gender, age, annual income, and education were insignificant, and all resident-level variables had a significant fixed effect on the dependent variable.

Table 4. Fixed effect and the random effect of resident-level variables.

	Fixed Effect	**Random Effect**
Gender	3.626 ***	
Age	10.921 ***	
Annual income	−3.624 **	
Education years	−15.416 ***	
Type of residence	−10.052 ***	38.413 *
Census register	−6.761 ***	49.364 ***
Trust in local government	6.590 ***	37.585 **
Evaluation of government regulation efforts	10.242 ***	41.372 **

Note: *** $p \leq 0.01$; ** $p \leq 0.05$; * $p \leq 0.1$; two-tailed test.

Thus, we added province-level variables including per capita GDP (GDP), food safety fiscal expenditure level (EL), and per capita food safety fiscal expenditure (FE) into the model to construct the complete model (Model III) and also resident-level variables. As Model II has shown, we only added random items to the four resident-level variables (i.e., type of residence, census register, trust in local government, and evaluation of government regulation efforts). Finally, we obtained the complete model as follows:

Resident level:
$Y_{ij} = B_{0j} + B_{1j}(Gender)_{ij} + B_{2j}(Age)_{ij} + B_{3j}(Income)_{ij} + B_{4j}(Education)_{ij} + B_{5j}(TR)_{ij} + B_{6j}(CR)_{ij} + B_{7j}(TG)_{ij} + B_{8j}(EG)_{ij} + r_{ij}$
Province level:
$B_{0j} = G_{00} + G_{01}(GDP)_{ij} + G_{02}(FE)_{ij} + G_{03}(EL)_{ij} + U_{0j}$
$B_{1j} = G_{10}$
$B_{2j} = G_{20}$
$B_{3j} = G_{30}$
$B_{4j} = G_{40}$
$B_{5j} = G_{50} + U_{5j}$
$B_{6j} = G_{60} + U_{6j}$
$B_{7j} = G_{70} + U_{7j}$
$B_{8j} = G_{80} + U_{8j}$

The results (Table 5) indicated that males had higher food safety satisfaction than females. As the age increased by 1 unit, their food safety satisfaction raised by 0.249 units. However, the influence of annual income on food safety satisfaction was not significant ($p > 0.1$) after adding province-level variables into the model. People's satisfaction with food safety decreased by 0.298 units when education years rose 1 unit. Thus, Hypothesis 1 is partly supported. Compared with citizens who lived in the village, those who lived in higher levels of residence were more likely to hold a pessimistic view on food safety situations. Similar to the type of residence, people who held nonagricultural census register had lower satisfaction. Therefore, Hypothesis 2 is supported by our survey data. Trust in

government and evaluation of government regulation efforts had a positive correlation with food safety satisfaction. As they scored higher, their satisfaction degree increased. Therefore, our empirical study supports Hypothesis 3. Model III tested the effects of province-level variables. Per capita GDP owned a negative correlation with food safety satisfaction. Hypothesis 4 was rejected. Both per capita food safety fiscal expenditure and the level of food safety expenditure were positively correlated with food safety satisfaction. More expenditure could lead to higher satisfaction degree. Thus, Hypothesis 5 is accepted. The results were partially consistent with findings in previous research.

Table 5. Regression results of the complete model.

	Coefficient	s.e.	d.f.	*p*-Value
Per capita GDP	−0.00001	0.000005	25	0.077 *
Per capita food safety fiscal expenditure	0.249	0.076	25	0.004 **
Food safety fiscal expenditure level	392.925	103.977	15	0.029 *
Gender	0.312	0.071	4067	0.000 ***
Age	0.155	0.028	4067	0.000 ***
Annual income	−0.033	0.035	4067	0.349
Education years	−0.298	0.045	4067	0.000 ***
Type of residence	−0.333	0.046	25	0.000 ***
Census register	−0.457	0.137	25	0.003 ***
Trust in local government	0.403	0.089	25	0.000 ***
Evaluation of government regulation efforts	0.362	0.041	25	0.000 ***

Note: *** $p \leq 0.01$; ** $p \leq 0.05$; * $p \leq 0.1$; two-tailed test.

4. Discussion and Conclusions

This article explored how resident- and province-level variables impacted public food safety satisfaction and added theoretical and empirical knowledge on public food safety perception. We used HLM to verify the relationship between variables and found direct impacts from both resident and province levels. Several significant results have been found through our empirical analysis. Public food safety satisfaction in China was 5.509 (out of 10), which is not a satisfactory result, and more data is needed to explore how the satisfaction status varied before and after the year 2015. We found a significant gap between provinces. For instance, the 10 provinces with the highest satisfaction concentrated in the midwest of China, while 8 out of the 10 lowest provinces concentrated in the more developed region alongside the eastern coast, which revealed the imbalance between provinces. The results were consistent with Wang's [26] findings that public food safety satisfaction was declining from the east to the middle to the west. According to our result, those provinces with higher per capita GDP had lower food safety satisfaction, which supports that regional income increases led to satisfaction decreases [51]. On the one hand, it is vital to enhance food safety satisfaction in eastern provinces; on the other hand, the economic development in western provinces is essential to the whole country but, accompanied by the decrease of public satisfaction on food safety and other public services, it will be a dilemma for the government to solve.

Our results proved the significant but neglected influencing factors from the province level, especially food safety fiscal expenditure. Consistent with Boyne [52], the allocation of government resources had a positive relationship with government performance on public service. In turn, public satisfaction was improved. As the government increases expenditure on food safety, the public perceive more efforts and have a higher evaluation of the government, which is consistent with our individual variables. In addition, higher per capita GDP leads to lower satisfaction because the economic development will bring more food safety risks and also higher requirements for food safety. Demographic variables had substantial effects. Because of the traditional family division of responsibility, females undertake the responsibility of food procurement and processing, which leads to more attention to food safety from females than from males. It will be interesting to explore food satisfaction of urban and rural females in further studies because rural females assume heavier

"food responsibility" than those from an urban area. We also found that elderly people have higher food safety satisfaction than younger people; the result was contrary to our expectations and other research [38,39], which could be explained by most of our elderly respondents living in a rural area where there are lower risks and lack of information.

Another important finding is that after adding province-level variables, the effect of annual income declined to an insignificant level. This finding indicates that previous models eliminated the differences between provinces and transferred the provincial effect into individual factors. Our empirical evidence shows that type of residence was correlated to food safety satisfaction. It is primarily because of the aggregation effect of the city and the information access of urban residents. The aggregation effect of the city makes the food industry more complicated. It is difficult for ordinary consumers to access all aspects of food production, processing, and circulation, which increases the consumer's distrust and food safety risks. Moreover, food safety incidents are more likely to occur and lead to wide-ranging impacts in cities. The information access also allows urban residents to know more about potential food safety risks and raise their requirements for food safety. This result denotes that the government should focus on regulation in cities to lower the risks. Our model has limitations in identifying urban and rural differences, to grasp the general situation across the country. It should be noticed that there is a huge disparity between urban and rural development, such as education, income, and other demographics, as well as government resources [55–57], and the disparity has a profound impact on food safety satisfaction. These gaps require the government to respond separately to each. Future research should focus on the comparison between urban and rural samples.

We also confirmed that trust in local government and citizens' evaluation of government regulation efforts are positively correlated with their satisfaction, as other research has proven. In the context of China, the government is the main provider in charge of every public service. It is essential for the government to enhance its credibility and ability to cope with public affairs. The effect of resident-level variables has been verified through our empirical analysis, and it should be noted that public food safety satisfaction is a kind of dynamic, changing cognition. Further research should be carried out to explore the variation of public food satisfaction in different years. It is necessary for the government to understand the public's food safety demands in a timely and targeted manner, and to use satisfaction as a vital window to understand public opinion and eliminate possible problems.

Author Contributions: Conceptualization, Y.L. and G.H.; Methodology, C.H. and G.H.; Validation, G.H. and C.H.; Formal Analysis, C.H. and Y.L.; Data Curation, G.H. and C.H.; Writing—Original Draft Preparation, C.H. and G.H.; Writing—Review & Editing, Y.L. and G.H.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Yeung, R.M.; Morris, J. Food safety risk: Consumer perception and purchase behavior. *Br. Food J.* **2001**, *103*, 170–187. [CrossRef]
2. Pei, X.; Tandon, A.; Alldrick, A.; Giorgi, L.; Huang, W.; Yang, R. The China melamine milk scandal and its implications for food safety regulation. *Food Policy* **2011**, *36*, 412–420. [CrossRef]
3. Wu, L.; Zhu, D. *Food Safety in China: A Comprehensive Review*; CRC Press: Boca Raton, FL, USA, 2014.
4. Wike, R.; Parker, B. Corruption, Pollution, Inequality are Top Concerns in China. Pew Research Center, 2015. Available online: http://pewglobal.org/files/2015/09/Pew-Research-Center-China-Report-FINAL-September-24-2015.pdf (accessed on 9 October 2018).
5. Lei, Y.W.; Zhou, D.X. Contesting legality in authoritarian contexts: Food safety, rule of law and China's networked public sphere. *Law Soc. Rev.* **2015**, *49*, 557–593. [CrossRef]

6. Jia, C.; Jukes, D. The national food safety control system of China—A systematic review. *Food Control* **2013**, *32*, 236–245. [CrossRef]

7. Kornelis, M.; Jonge, J.; Frewer, L.; Dagevos, H. Consumer selection of food-safety information sources. *Risk Anal.* **2007**, *27*, 327–335. [CrossRef] [PubMed]

8. Ma, Y.; Zhao, Y. Analysis of Beijing Residents' Satisfaction to Food Safety. *Soc. Sci. Beijing* **2009**, *3*, 003.

9. Rohr, A.; Luddecke, K.; Drusch, S.; Muller, M.J.; von Alvensleben, R. Food quality and safety consumer perception and public health concern. *Food Control* **2005**, *16*, 649–655. [CrossRef]

10. Suchánek, P.; Richter, J.; Králová, M. Customer satisfaction, product quality, and performance of companies. *Rev. Econ. Perspect.* **2014**, *14*, 329–344. [CrossRef]

11. Rhee, S.K.; Rha, J.Y. Public service quality and customer satisfaction: Exploring the attributes of service quality in the public sector. *Serv. Ind. J.* **2009**, *29*, 1491–1512. [CrossRef]

12. Aberbach, J.D.; Christensen, T. Citizens and consumers: An NPM dilemma. *Public Manag. Rev.* **2005**, *7*, 225–246. [CrossRef]

13. Fornell, C. A national customer satisfaction barometer: The Swedish experience. *J. Mark.* **1992**, *56*, 6–21. [CrossRef]

14. Fornell, C.; Johnson, M.D.; Anderson, E.W.; Cha, J.; Bryant, B.E. The American customer satisfaction index: Nature, purpose, and findings. *J. Mark.* **1996**, *60*, 7–18. [CrossRef]

15. Anderson, E.W.; Fornell, C.; Lehmann, D.R. Customer satisfaction, market share, and profitability: Findings from Sweden. *J. Mark.* **1994**, *58*, 53–66. [CrossRef]

16. Van Ryzin, G.G.; Muzzio, D.; Immerwahr, S.; Gulick, L.; Martinez, E. Drivers and consequences of citizen satisfaction: An application of the American customer satisfaction index model to New York City. *Public Adm. Rev.* **2004**, *64*, 331–341. [CrossRef]

17. Grunert, K.G. Food quality and safety: Consumer perception and demand. *Eur. Rev. Agric. Econ.* **2005**, *32*, 369–391. [CrossRef]

18. Bourn, D.; Prescott, J. A comparison of the nutritional value, sensory qualities, and food safety of organically and conventionally produced foods. *Crit. Rev. Food Sci. Nutr.* **2002**, *42*, 1–34. [CrossRef]

19. Dosman, D.M.; Adamowicz, W.L.; Hrudey, S.E. Socioeconomic determinants of health-and food safety-related risk perceptions. *Risk Anal.* **2001**, *21*, 307–318. [CrossRef]

20. Wei, W. (Ed.) *Building Service-Oriented Government: Lessons, Challenges and Prospects*; World Scientific: Singapore, 2012; Volume 1.

21. Luo, X.J.; Dong, J.C.; Zhang, Z.M.; Chen, D.F.; Chen, Y.; Qian, Q.; Dai, T. Utilization of community health services and its satisfaction among residents in China. *Chin. Gen. Pract.* **2010**, *13*, 2790–2793.

22. Ji, J.; Gao, X. Analysis of people's satisfaction with public transportation in Beijing. *Habitat Int.* **2010**, *34*, 464–470. [CrossRef]

23. Huang, Z.; Du, X. Assessment and determinants of residential satisfaction with public housing in Hangzhou, China. *Habitat Int.* **2015**, *47*, 218–230. [CrossRef]

24. Liang, Y.; Zhang, Y.; Dong, X. Statistical Evaluation to the Satisfaction of Urban Residents in Hangzhou to Food Safety based on Structural Equation. *Stat. Educ.* **2010**, *5*, 006.

25. Ji, J. Research on the factors of food safety satisfaction and supervision path choice-based on questionnaires in Chongqing. *Chin. Public Adm.* **2014**, *7*, 97–100.

26. Wang, J.X. Chinese resident food safety satisfaction survey. *Jiangsu Soc. Sci.* **2012**, *5*, 66–71.

27. Fisher, E.S.; Wennberg, D.E.; Stukel, T.A.; Gottlieb, D.J.; Lucas, F.L.; Pinder, E.L. The implications of regional variations in Medicare spending. Part 2: Health outcomes and satisfaction with care. *Ann. Intern. Med.* **2003**, *138*, 288–298. [CrossRef] [PubMed]

28. Kunimitsu, Y. Regional factors affecting the satisfaction of residents: Evidence from a structural equation model in Japan. *Soc. Indic. Res.* **2015**, *120*, 483–497. [CrossRef]

29. Davidson, D.J.; Freudenburg, W.R. Gender and environmental risk concerns: A review and analysis of available research. *Environ. Behav.* **1996**, *28*, 302–339. [CrossRef]

30. Lin, C.-T.J. Demographic and socioeconomic influences on the importance of food safety in food shopping. *Agric. Resour. Econ. Rev.* **1995**, *24*, 190–198. [CrossRef]

31. Dimitriades, Z.S.; Maroudas, T.S. Demographic predictors of service satisfaction in Greek public organizations. *Meas. Bus. Excell.* **2007**, *11*, 32–43. [CrossRef]

32. Lobb, A.E.; Mazzocchi, M.; Traill, W.B. Modeling risk perception and trust in food safety information within the theory of planned behavior. *Food Qual. Prefer.* **2007**, *18*, 384–395. [CrossRef]

33. Christensen, T.; Lægreid, P. Trust in government: The relative importance of service satisfaction, political factors, and demography. *Public Perform. Manag. Rev.* **2005**, *28*, 487–511.

34. Frewer, L. Risk perception and risk communication about food safety issues. *Nutr. Bull.* **2000**, *25*, 31–33. [CrossRef]

35. Flynn, J.; Slovic, P.; Mertz, C.K. Gender, race, and perception of environmental health risks. *Risk Anal.* **1994**, *14*, 1101–1107. [CrossRef] [PubMed]

36. Slovic, P. Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. In *Psychological Perspective of Environment and Ethics in Management*; Bazerman, M., Messick, D., Tanbrunsel, A., Wad-Benzoni, K., Eds.; Jossey Bass: San Francisco, CA, USA, 1997; pp. 277–313.

37. Redmond, E.C.; Griffith, C.J. Consumer perceptions of food safety risk, control, and responsibility. *Appetite* **2004**, *43*, 309–313. [CrossRef]

38. Jordan, J.L.; Elnagheeb, A. Public perception of food safety. *J. Food Distrib. Res.* **1991**, *22*, 13–22.

39. Verbeke, W.; Viaene, J. Beliefs, attitude and behavior towards fresh meat consumption in Belgium: Empirical evidence from a consumer survey. *Food Qual. Prefer.* **1999**, *10*, 437–445. [CrossRef]

40. Rimal, A.; Fletcher, S.M.; McWatters, K.H.; Misra, S.K.; Deodhar, S. Perception of food safety and changes in food consumption habits: A consumer analysis. *Int. J. Consum. Stud.* **2001**, *25*, 43–52. [CrossRef]

41. Tonsor, G.T.; Schroeder, T.C.; Pennings, J.M. Factors impacting food safety risk perceptions. *J. Agric. Econ.* **2009**, *60*, 625–644. [CrossRef]

42. Haapala, I.; Probart, C. Food safety knowledge, perceptions, and behaviors among middle school students. *J. Nutr. Educ. Behav.* **2004**, *36*, 71–76. [CrossRef]

43. Liu, P.; Ma, L. Food scandals, media exposure, and citizens' safety concerns: A multilevel analysis across Chinese cities. *Food Policy* **2016**, *63*, 102–111. [CrossRef]

44. Nayga, R.M., Jr. Sociodemographic influences on consumer concern for food safety: The case of irradiation, antibiotics, hormones, and pesticides. *Rev. Agric. Econ.* **1996**, *18*, 467–475. [CrossRef]

45. Bernués, A.; Olaizola, A.; Corcoran, K. Labeling information demanded by European consumers and relationships with purchasing motives, quality, and safety of meat. *Meat Sci.* **2003**, *65*, 1095–1106. [CrossRef]

46. Shi, L.I.; Chu-liang, L.U.O. Re-estimating the income gap between urban and rural households in China. *J. Peking Univ. (Philos. Soc. Sci.)* **2007**, *2*, 111–120. [CrossRef]

47. Van de Walle, S.; Bouckaert, G. Public service performance and trust in government: The problem of causality. *Int. J. Public Adm.* **2003**, *26*, 891–913. [CrossRef]

48. Kelly, J.M.; Swindell, D. A multiple–indicator approach to municipal service evaluation: Correlating performance measurement and citizen satisfaction across jurisdictions. *Public Adm. Rev.* **2002**, *62*, 610–621. [CrossRef]

49. Stipak, B. Citizen satisfaction with urban services: Potential misuse as a performance indicator. *Public Adm. Rev.* **1979**, *39*, 46–52. [CrossRef]

50. Bjørnskov, C.; Dreher, A.; Fischer, J.A. The bigger the better? Evidence of the effect of government size on life satisfaction around the world. *Public Choice* **2007**, *130*, 267–292. [CrossRef]

51. Hagerty, M.R.; Veenhoven, R. Wealth and happiness revisited–growing national income does go with greater happiness. *Soc. Indic. Res.* **2003**, *64*, 1–27. [CrossRef]

52. Boyne, G.A. Sources of public service improvement: A critical review and research agenda. *J. Public Adm. Res. Theory* **2003**, *13*, 367–394. [CrossRef]

53. Bryk, A.S.; Raudenbush, S.W. *Hierarchical Linear Models: Applications and Data Analysis Methods*; Sage Publications: Newbury Park, CA, USA, 1992.

54. Leung, K.M.; Elashoff, R.M.; Rees, K.S.; Hasan, M.M.; Legorreta, A.P. Hospital- and patient-related characteristics determining maternity length of stay: A hierarchical linear model approach. *Am. J. Public Health* **1998**, *88*, 377–381. [CrossRef]

55. Qian, X.; Smyth, R. Measuring regional inequality of education in China: Widening coast–inland gap or widening rural–urban gap? *J. Int. Dev. J. Dev. Stud. Assoc.* **2008**, *20*, 132–144. [CrossRef]

56. Sicular, T.; Ximing, Y.; Gustafsson, B.; Shi, L. The urban–rural income gap and inequality in China. *Rev. Income Wealth* **2007**, *53*, 93–126. [CrossRef]
57. Parish, W.L. *Chinese Rural Development: The Great Transformation: The Great Transformation*; Routledge: London, UK, 2016.