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Factors Influencing Consumer Willingness to Consume Genetically Modified Soybean Oil and Rice in China

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The objective of this paper is to study the factors influencing consumer willingness to consume (WTC) the genetically modified (GM) foods in the case of the GM soybean oil and the insect–resistant GM rice. The seemingly unrelated regression model was adopted and consumers in Shanghai city were surveyed.

The results show that consumer WTC GM soybean oil and GM rice is influenced by some factors that cannot be observed, however the observable factors make an obvious difference. The positive information has positive impact on consumers' WTC the GM soybean oil. The negative information predominates when the positive and negative information are simultaneously presented. The consumers' inherent awareness and safety evaluation of GM soybean oil has a significantly positive impact on the WTC. The impact of the negative publicity and consumers' attitude to compulsory labeling system is negative. Other factors significantly affect the WTC: gender, kid, professional status, income, reading of label information, evaluation of government regulation and purchasing frequency.

Key words: GM Soybean Oil, GM Rice, Information, Seemingly Unrelated Regression, WTC

INTRODUCTION

The introduction, research and application of transgenic technology have gone on for over 30 years in China, and during this period there have been both positive and negative views about the genetically modified foods. Supporters believe that GM foods are safe and more nutritious. GM crops produce a higher yield and an insect–resistant transgenic crop needs less agro–chemical (Zhang, 2013; Huang, 2004). The Biotechnology Information Committee believes that GM crops are good for the environment by reducing the use of pesticides and herbicides, are conductive to social development by increasing yields and are good for farmers' health because of reduced exposure to the toxic substances.

However, many people question and even deny the safety of the GM foods (Lang, 2010; Gu, 2011). Several studies have shown that some mice's organs, immune system and nervous system are abnormal after eating the GM foods. GM crops are likely to pose potential threats to the land, water and biodiversity. In addition, the transgenic technology has been thought to be the way that the patent owners "seek the global food market position, permanently control human rations", and "promote food hegemony, trying to control other countries and even humankind" (Gu, 2011).

In China's edible oil market, soybean oil accounts for the largest portion. Over 85 percent of soybeans consumed in China are imported, and most are GM. China is the largest producer and consumer of rice in the world, and rice is the staple food of more than 65% of the people. Therefore, the production of rice is extremely important for China's food security and safety. In 2009, the insect–resistant transgenic rice, developed by Huazhong Agricultural University, obtained a security certificate to plant, and for human and animal consumption. The safety certificate expired and was reissued at the end of 2014. So far, commercial production has not been approved. However, a large quantity of GM rice has been reportedly to circulate on the market. In addition, rice products exported to EU were detected repeatedly to contain GM rice.

Many prior researches have engaged in studying the GM foods. Kikulwe *et al.* (2011), Qi and Zhou (2010), and Ghasemi *et al.* (2013) mainly focused on consumer perception of GM foods. Bukenya and Wright (2007), Depositario *et al.* (2009), Steur *et al.* (2012) studied the Willingness to Pay (WTP) of GM foods. Some other researchers analyzed the factors influencing consumers' awareness and WTP through econometric model. The main study objects include GM vegetables (McComas *et al.*, 2014; Curtis and Moeltner, 2007), GM fruits (Ma and Gu, 2011; Kikulwe *et al.*, 2011), GM grains and other agricultural products (Depositario *et al.*, 2009; Steur *et al.*, 2012) and the processed food containing GM raw materials (Curtis and Moeltner, 2007; Zhong and Chen, 2008; Chen *et al.*, 2013).

Based on the above reviews, this paper chooses the transgenic soybean oil and genetically modified rice as the research objects, adopting the seemingly unrelated regression (SUR) model to comparatively analyze the factors influencing consumer WTC different kinds of GM foods. Particularly, this paper focuses on the role of

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information as the impact factor, discusses whether the impact factors unobserved for different GM foods are in the same performance or not. In the following sections, the second part is the analytical framework, hypothesis and method; the third part is the data sources and variable description; the fourth part is an analysis of the factors impacting consumers' willingness to consume the GM soybean oil and the GM rice, and the last part is conclusions and recommendations.

ANALYTICAL FRAMEWORK, HYPOTHESIS AND METHOD

Analytical Framework

Consumer behavior is decided by both external and internal factors. External factors mainly include culture, subculture, population, environment, social status, reference groups, family and marketing activities. Internal factors include perception, learning, memory, motivation, personality, mood and attitude (Hawkins and Mothersbaugh, 2011). Information has been regarded as one of the most important variable in the consumer purchase behavior model and different researchers have different answers about information's influence. However, researchers have reached a consensus on the path of forming consumer attitude toward foods or services, namely the information comes into being awareness then awareness forms attitude. At the same time, the information may also form attitude directly (Luo, 2010). Therefore, the relationship between awareness, attitude and information may be described as "consumers' awareness comes from learning relative knowledge (information) and then forming their own attitude". Consumer attitude is shaped by their knowledge and new information from various sources. Attitude is the important factor affecting people's behavior in theory of planned behavior (TPB).

Involvement mainly refers degree of correlation between consumers and the products. Consumer product involvement is defined as "The product's level of concern and attention for consumers" (Laurent and Kapferer, 1985). Involvement can be regarded as the motivation to process the information. The stronger the link between the individuals' need, goals, values and product knowledge, the higher the consumers' attention to the product information is. According to Brady and Brady (2003), consumers' familiarity with the product often represents how they master information, and the familiarity can often be measured by purchase frequency. Accordingly, consumers' concern and previous purchase frequency will affect their processing of information and ultimately their WTC.

In addition, Nayga (1996) found that social–demographic factors would affect consumers' information acquisition and ultimately influence consumers' attitude and behavior. Therefore, consumers' demographic characteristics such as gender, age, education, family characteristics such as family members, and economic characteristics such as income are introduced in this paper as the control variables affecting consumer WTC GM foods. Based on the above analysis, the framework of this paper is shown in Fig. 1.

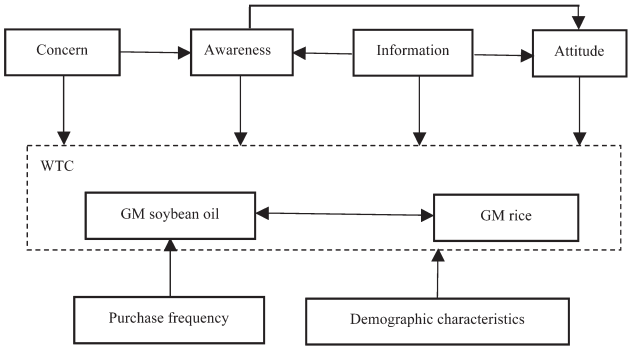

Fig. 1. Analytical framework of consumers' WTC GM foods.

Hypothesis

From Fig. 1, we can see that information not only can affect the WTC through awareness and attitude, but can also affect the WTC directly. Zhong and Ding (2004) pointed out that consumers are more sensitive to negative information than positive information. Robin *et al.* (2011) surveyed the adult consumers in the mid–Atlantic of the U.S. by experimental method to study the impact of media information on consumer behavior. The results showed that the positive and negative information have influence on consumer WTP, and the effect of negative information is greater. Ma and Gu (2011), taking the transgenic and non–GM apple for example, applied the method of experimental economics to get the results: consumers preferred the non–GM foods when they got information, but they prefer GM foods when without information. Depositario *et al.* (2009) analyzed the influence of information on the students' WTP for the golden rice in the University of the Philippines by a uniform–price auction and OLS regression. The findings showed that the mean WTP bids are highest under positive information, followed by no information, negative information, and unexpectedly lowest with two–side information. Furthermore, there is a minor difference in WTP with respect to the reference price between positive information and no information and the marginal effect on WTP of positive information is minimal. According to the above discussion the following hypothesis is put forward:

Hypothesis 1: The information affects the consumers' WTC. The positive information has a positive influence, the negative information has a negative influence and makes a greater degree of influence.

A lot of literature has shown that consumers' knowledge or awareness affects significantly their WTC GM foods. The study of McComas *et al.* (2014) found that the consumers' objective knowledge negatively affects their support for GM foods, but the influence of subjective information is positive. Steur *et al.* (2012) found that consumers' objective GM knowledge has a positive influence on the choice of nutritional GM foods. Ghasemi *et al.* (2013) selected ten statements about GM crops, GM foods and transgenic technology to measure

consumer awareness of GM foods. The result revealed that high awareness does not lead to high probability of purchasing GM foods. This paper chooses "whether the consumers have the relevant knowledge on agriculture, food or medical treatment (*kno*)" (namely, the inherent awareness) and "their cognizance of the questions in the questionnaire (*kno1*, *kno2*, *kno3* and *kno4*)" (namely, the consumers' knowledge on some related regulation or the food safety incidents) as the variables for measuring the awareness. The intrinsic awareness forms after accumulation over a long period of time and becomes solidified into the consumers' inner attributes. The behavior of the consumers with higher inherent awareness is more rational or autonomous. However, the WTC of the consumers is affected by not only the inherent awareness but also the current events. If the awareness is neutral and limited, then the different awareness forms a different attitude or intention. Based on the above discussion the following hypothesis is put forward:
Hypothesis 2: The consumer awareness has an effect on the WTC, but the influence is different because of the differences in knowledge of GM foods and the uncertainty of transgenic technology risk.

Luo (2010) takes "the necessity of using safety food labeling" as the variable measuring "attitude". The consumers are willing to buy the non–GM foods under the compulsory identification policy, but prefer GM foods under voluntary labeling policy (Ma and Gu, 2011). Although China implements compulsory labeling system of GM foods, there are still some questions such as small and inconspicuous logo and font, as well as unlabeled genetic ingredients, so that many consumers have no idea whether the foods are GM or not. The consumers who think the compulsory labeling system is necessary want the right to know and choose autonomously. They are not satisfied with the labeling and are not willing to buy the GM foods.

Ma and Gu (2011) have also shown that the safer consumers think GM foods are, the more they prefer them. Guo *et al.* (2013) found that the perceived risk directly reduces consumer purchase intention of GM foods. McComas *et al.* (2014) found that the more consumers perceive the risk of GM foods for humans and the environment, the less they are willing to buy GM foods. The consumers who think transgenic soybean oil is safe believe that the GM foods pose no safety risk or health threat, namely their perceived risk is low, so that their WTC is high. This paper uses "consumers' attitude towards implementing compulsory labeling system of GM foods (*label*)" and "the safety evaluation of GM soybean oil (*segmoil*)" as the variables measuring attitude. Based on the above discussion the following hypothesis is put forward:
Hypothesis 3: The consumers' attitude toward labeling affects the WTC negatively, and the impact on the safety evaluation of GM soybean oil is positive.

More than 90% of the corns and soybeans in the United States are reportedly GM crop. About 20% of the corn and 40% of the soybeans are exported. More than 90% of the soybean oil in China is made from the imported GM soybeans. The insect–resistant transgenic rice still isn't allowed to be commercially produced even though the safety certificate has been issued several times. However, the GM ingredients were reportedly detected in the rice products. Soybean oil and rice are indispensable foods in China. Both GM soybean oil and GM rice are classified as GM foods, so the consumer WTC these two kinds of foods may be a positive correlation. However, they are also different types of foods. The GM soybean oil has already been marketed for more than ten years, but the commercial production of the GM rice is still in dispute. So the influence factors may be different (Zhong and Ding, 2004; Bukenya and Wright, 2007, Depositario *et al.*, 2009, Kikulwe *et al.*, 2011). Based on the above discussion the following hypothesis is put forward:
Hypothesis 4: The consumers' WTC the GM soybean oil and GM rice is positively correlated, but the factors and degree of influence are significantly different.

Method

Logistic model (Bukenya and Wright, 2007; Ma and Gu, 2011; Chen *et al.*, 2013; Qi and Zhou, 2010) and structural Equation model (Ghasemi *et al.*, 2013; Guo *et al.*, 2013; Amin *et al.*, 2014) are most used to study the factors impacting the consumers' WTC the GM foods. Furthermore, Generalized Linear model (McComas *et al.*, 2014); Probit model (Curtis and Moeltner, 2007); Double–hurdle model (Steur *et al.*, 2012) and Double–Factors Probability Selection model (Chen *et al.*, 2004) are also adopted.

Based on the Fig. 1 and the above analysis, we assume that the WTC GM foods and the explanatory variables are linear. So the WTC can be described as:

$$wtcgmoil = \alpha X_i + \varepsilon_{1i} \quad (1)$$

$$wtcgmrice = \beta Z_i + \varepsilon_{2i} \quad (2)$$

The *wtcgmoil* in Eq. (1) and the wtcgmrice in Eq. (2) represent the consumers' WTC the GM soybean oil and GM rice respectively. Accordingly to the Fig. 1, the *wtcgmoil* and the *wtcgmrice* are affected by most of the common factors. The GM soybean oil has already been marketed, so it may be affected by some other factors. The X_i includes the information we provided in the questionnaire, the consumers' awareness, attitudes, concern, demographic characteristics, consumers' purchase of soybean oil and GM soybean oil. The Z_i includes the information we provided in the questionnaire, the consumers' awareness, attitudes, concern and demographic characteristics. The α and β are parameters to be estimated, and the symbol of ε_1 and ε_2 are random error terms.

We assume the mean of ε_1 and ε_2 is zero, that is to say:

$$E(\varepsilon \mid X, Z) = 0 \quad (3)$$

In Eq. (3), $\varepsilon = [\varepsilon_1', \varepsilon_2']'$, the consumers' WTC the GM soybean oil and GM rice is affected by most of the common factors and their analytical structures are simi-

lar, so the error terms in Equations (1) and (2) are correlated. Then we can get:

$$E(\varepsilon_1 \varepsilon_2' \mid X, Z) = \Omega \neq 0 \quad (4)$$

Based on the assumption in Equations (3) and (4), Equations (1) and (2) are correlated because their error terms are correlated, and the independent variables in the equations are not exactly the same. This means that the results will be biased and inconsistent when we estimate the each equation separately.

Based on the above analysis, this paper will apply the SUR model to estimate the factors impacting consumers' WTC the GM soybean oil and GM rice at the same time. The specific method is the generalized least square method. According to the strength and significance of the correlation of the error terms in the estimated results, we can know whether Eq. (4) is right. We can determine further the correlation of the variables in each equation through the sign of the correlation coefficient (Quan *et al.*, 2011).

DATA AND VARIABLES

Data Sources and Sample Characteristics

The data was collected by a survey in Shanghai, China from May to June, 2014. The respondents are the urban consumers in Shanghai. On one hand, Shanghai is the center of China's economy and finance and is the most international city in China, so it is easier for the consumers to access cutting–edge technology and information such as the GM technology. On the other hand, rice is the staple food of the citizens in Shanghai, so its safety is related to everyone's vital interests. Therefore, choosing the consumers in Shanghai as the respondents is rational and necessary. We randomly selected the trained students in Shanghai from Shanghai Ocean University as investigators and each student was asked to survey less than ten respondents from their parents, relatives or their parents' colleagues. Altogether 473 questionnaires were issued and 403 were valid, with an effective rate of 85%.

There are more female respondents than the male respondents, over 86% of the people are 20 to 59 years old, and nearly 70% are married. Almost two–thirds of the respondents have attended college and half of them work in the enterprises. The monthly income (RMB) in most of the households is under 14999 yuan, and less than 6% of household is above 20000 yuan. Overall, the distribution of the samples is reasonable and representative.

In addition, the main cooking oil used in more than half (52%) of the families is the soybean oil, and a third choose blended oil as their main cooking oil. Most of the respondents (82%) are familiar with GM soybean, and a third is familiar with GM rice. Over half of the respondents are the main decision makers to buy food.

Variable Definition

Due to the fact that GM rice hasn't been permitted for commercial production, we cannot get the market price. Therefore, we selected "the level of the consumers' agreement to the commercial production of the GM rice" as the variable measuring the consumers' WTC the GM rice. The values are 1, 2 and 3 from low to high in accordance with the level of the agreement. The questionnaires were set as A, B, C and D, which represented four types of different information on the GM rice. There is the positive information in A, the negative information in B, the both positive and negative information in C, and no information in D. Among the valid questionnaires, 101 are A; 89 are B; 106 are C and 107 are D. The representative information comes from the comments of some authoritative experts and scholars in the field whose published work can be found in books, magazines or news. The variable definition and summary statistics are shown in Table1.

FACTORS AFFECTING THE CONSUMERS' WTC

Purchase Intention and Purchase Behavior

Sometimes, the customer's WTC and their behavior are in conflict (Chen *et al.*, 2013). Therefore, it is necessary to analyze the relationship between the purchase intention and the purchase behavior. This paper analyzes the consumers' WTC the GM soybean oil and the previous purchase frequency of the GM soybean oil, without the samples that choose "unaware". Table 2 and Table 3 show the relationship of the purchase intention and the purchase behavior. Both of the Chi–square tests ($P<0.01$) are effective in the two tables. Among the consumers who are willing to buy the non–GM soybean oil, less than 6.5% frequently buy the GM soybean oil and more than half never buy the GM soybean oil (Table 2). 80% of the consumers who are willing to buy the GM soybean oil have previously bought the GM soybean oil, and over one fifth chose "frequently buying the GM soybean oil", much higher than the overall level. At the same time, the proportion of the consumers who chose "sometimes buying the GM soybean oil" increases as their WTC the GM soybean oil increasing. More than half of the respondents choosing "not sure" have previously bought the GM soybean oil.

In the table 3, nearly 90% of the consumers willing to buy the non–GM soybean oil have previously purchased non–GM soybean oil, in which 43.7% chose "buy often the non–GM soybean oil". However, the proportion only accounts for 28% among the consumers who are willing to buy the GM soybean oil, lower than the overall level. As a whole, the purchase intention and the purchase behavior are basically consistent. Therefore, it is meaningful to study the factors affecting the consumers' purchase intention.

Factors Affecting WTC

Based on the variables listed in Table 1 and the model in Equations (1) and (2), we apply the SUR to estimate the factors affecting WTC. The results are shown in Table 4. The overall fitting effect of the model is good. The two equations are significant at the 1% statistics level, which indicates, as a whole, the selected

Table 1. Variable definition (n=403)

Variable Definition	Variable Value	Mean	Std. D.
Explained Variable			
WTC GM soybean oil (wtcgmoil)	buy non–gm oil=1, don't care=2, buy gm oil =3	1.50	0.73
Consumer agreement to the commercial production of the GM rice (wtcgmrice)	1, 2 and 3 in accordance with the agreement	2.16	0.67
Explanatory Variable			
Positive information (inf1)	no=0, yes=1	0.25	0.44
Negative information (inf2)	no=0, yes=1	0.22	0.42
Both positive and negative information (inf3)	no=0, yes=1	0.26	0.44
No information (inf4)	no=0, yes=1	0.27	0.44
Knowledge of agriculture, food or medical (kno)	unknown=0, known=1	0.20	0.40
The use of GM technology is prohibited in organic production (kno1)	unknown=0, known=1	0.39	0.49
Only the GM cotton and papaya are allowed commercial production in China (kno2)	unknown=0, known=1	0.19	0.40
The survey on the GM foods done by YongyuanCui in December 2013 in USA (kno3)	unknown=0, known=1	0.43	0.50
The debate about the GM foods on the "two session" in 2014 (kno4)	unknown=0, known=1	0.42	0.49
Consumers' attitude towards compulsory labeling system of the GM foods(label)	others=0, necessary=1	0.90	0.30
Safety evaluation of the GM soybean oil (segmoil)	unsafe=1, hard to say=2, safe=3	1.80	0.83
Concern about the GM foods (concerngmf)	totally unconcerned=1, unconcerned=2, concerned=3, very concerned=4	2.85	0.92
Seeking food information before buying (infs)	never=1, sometimes=2, often=3, always=4	2.17	0.72
Reading the information on the food packaging (infr)	never=1, sometimes=2, often=3, always=4	2.70	0.77
Evaluation of the governmental regulation (evagr)	very bad=1, bad=2, good=3, very good=4	2.04	0.68
Main cooking oil is soybean oil (soybean oil)	no=0, yes=1	0.54	0.50
Never bought GM soybean oil (ppgmoil)	others=0, never=1	0.42	0.49
Sometimes bought GM soybean oil (ppgmoil2)	others=0, sometimes=1	0.38	0.49
Often bought GM soybean oil (ppgmoil3)	others=0, often=1	0.07	0.26
Unaware whether bought GM soybean oil (unaware)	others=0, unaware=1	0.13	0.34
Gender	female=0, male=1	0.43	0.50
Age (age0)	others=0, under 20 years old=1	0.06	0.24
age1	others=0, 20–39 years old=1	0.49	0.50
age2	others=0, 40–59 years old=1	0.37	0.48
age3	others=0, 60 years old or above=1	0.08	0.27
If there are kids below 12 years old (kid)	no=0, yes=1	0.33	0.47
If there are adults over 60 years old (old)	no=0, yes=1	0.56	0.50
Education (edu0)	others=0, middle school or below=1	0.14	0.35
edu1	others=0, high school =1	0.23	0.42
edu2	others=0, college or above=1	0.63	0.48
Work in a government agency, university, or research institution (work0)	no=0, yes=1	0.14	0.35
Work in the private sector (work1)	no=0, yes=1	0.51	0.50
Self–employed entrepreneur (work2)	no=0, yes=1	0.09	0.29
Student (work3)	no=0, yes=1	0.16	0.36
Unemployed (work4)	no=0, yes=1	0.10	0.30
Monthly household income (inc0)	others=0, <5000 yuan=1	0.29	0.45
inc1	others=0, 5000–9999 yuan=1	0.35	0.48
inc2	others=0, 10000–14999 yuan=1	0.22	0.42
inc3	others=0, ≥15000 yuan=1	0.14	0.34

Table 2. Consumer purchase intention and purchase behavior for the GM soybean oil

Previous purchase frequency for the GM soybean oil	Item	WTC the GM soybean oil			
		Buy non–GM oil	Do not care	Buy GM oil	Total
Never	Count	126	32	10	168
	Percentage	54.31%	46.38%	20.83%	48.14%
Sometimes	Count	91	33	28	152
	Percentage	39.22%	47.83%	58.33%	43.55%
Often	Count	15	4	10	29
	Percentage	6.47%	5.80%	20.83%	8.31%
Total	Count	232	69	48	349
	Percentage	100%	100%	100%	100%

Note: Chi–square test p value =0.000

Table 3. Purchase intention and purchase behavior for the non–GM soybean oil

Previous purchase frequency for the non–GM soybean oil	Item	WTC the GM soybean oil			
		Buy non–GM oil	Do not care	Buy GM oil	Total
Never	Count	26	15	8	49
	Percentage	10.92%	20.27%	16%	13.54%
Sometimes	Count	108	44	28	180
	Percentage	45.38%	59.46%	56%	49.72%
Often	Count	104	15	14	133
	Percentage	43.70%	20.27%	28%	36.74%
Total	Count	238	74	50	36
	Percentage	100%	100%	100%	2100%

Note: Chi–square test p value =0.003

variables have significant influence on consumers' WTC.

Compared to no information, the positive information (*inf1*) affects significantly the consumers' WTC the GM soybean oil. When the positive and negative information are provided, the influence is negative. The possible reason is that the consumers will believe or focus on the negative information when they get both the positive and negative information. Although the influence of the negative information is not significant, the sign is negative. However, the information doesn't affect significantly the WTC the GM rice. The probable reason is that the GM rice has not been sold on the market, the consumers' perception about it is low and they selectively accept the information provided. Hypothesis 1 is verified to some extent.

"Whether or not the consumers have relevant knowledge on agriculture, food or medicine (*kno*)" (namely, the inherent awareness) affects positively the WTC the two types of GM foods. It shows that the consumers whose inherent awareness is high do not reject the GM foods. Therefore, it is important for the developing GM industry to improve the consumers' inherent awareness. The impact of kno1 and kno2 is not significant. Since their signs are opposite, we can see the influence of some regulations about the GM foods has no obvious regularity. "The survey on the GM foods done by YongyuanCui December 2013 in the United States (*kno3*)" negatively impacts the consumers' WTC the GM foods. YongyuanCui is an opponent of the GM foods, so his survey has a negative effect. Hypothesis 2 is verified to some extent.

"The consumers' attitude towards implementing compulsory labeling system of GM foods (*label*)" affects the WTC negatively and the influence of "the safety evaluation of GM soybean oil (*segmoil*)" is positive with 1% significance. So Hypothesis 3 is verified.

The greater the consumers' concern about the GM foods (*concerngmf*), the less they are willing to consume the GM soybean oil. It may be caused by the accidents or reports about GM foods. The negative coefficient of "reading the information in the food packaging (*infr*)" shows that the more the consumers read the information in the food packaging, the less they consume the GM rice. It illustrates the importance of the consumers' right to know. The higher the consumers' evaluation of the effect of the government regulation is, the more they trust the safety of the GM rice, and the stronger their WTC is.

In the factors of the demographic characteristic, the impact of gender, kid, work and income is significant. Except for kid and work0, there is a remarkable difference in the effect of other independent variables on the two dependent variables. Men show positive WTC, and the families whose children are younger than the age of 12 aren't willing to consume the GM foods. Compared to the unemployed consumers, the consumers who work in a government agency, university or research institution (*work0*) are not willing to buy the GM foods. The students are unwilling to eat the GM soybean oil. The high–income groups show more negative WTC than the low–income consumers, which may be because the high–income consumers do not care about the price advan-

Table 4. Regression results of the SUR model (n=403)

Factor	Independent variable	WTC the GM soybean oil (wtcgmoil)		WTC the GM rice (wtcgmrice)	
		Coefficient	Std. Error	Coefficient	Std. Error
Information	inf1	0.231***	0.089	0.117	0.079
	inf2	–0.014	0.093	0.063	0.082
	inf3	–0.153*	0.089	–0.02	0.078
Awareness	Kno	0.211***	0.082	0.161**	0.072
	kno1	–0.052	0.069	0.057	0.061
	kno2	0.070	0.084	–0.023	0.075
	kno3	–0.161***	0.072	–0.167***	0.063
	kno4	0.103	0.071	0.038	0.062
Attitude	Label	–0.517***	0.110	–0.259***	0.098
	segmoil1	0.165***	0.043	0.287***	0.037
Concern	Concerngmf	–0.100***	0.038	0	0.034
Information seeking and reading	Infs	0.054	0.050	–0.062	0.044
	Infr	0.054	0.047	–0.096**	0.042
Evaluation of regulation	Evagr	–0.003	0.049	0.101**	0.043
Consumption of the soybean oil	Soybean oil	–0.164**	0.066	—	—
Purchase frequency	ppgmoil1	–0.287***	0.103	—	—
	ppgmoil2	–0.154	0.102	—	—
	ppgmoil3	0.041	0.147	—	—
Demographic characteristics	Gender	0.044	0.065	0.101*	0.057
	age1	0.144	0.151	0.106	0.134
	age2	0.051	0.166	0.197	0.147
	age3	0.247	0.208	0.168	0.184
	Kid	–0.136*	0.074	–0.110*	0.065
	Old	–0.085	0.067	0.053	0.059
	edu1	–0.097	0.111	–0.014	0.098
	edu2	0.005	0.112	–0.002	0.099
	work0	–0.329*	0.155	–0.226*	0.137
	work1	–0.199	0.131	–0.153	0.115
	work2	0.003	0.156	–0.131	0.138
	work3	–0.288*	0.166	–0.15	0.147
	inc1	0.010	0.084	–0.104	0.075
	inc2	0.146	0.096	0.014	0.085
	inc3	0.029	0.111	–0.169*	0.098
Constant term	_cons	2.079***	0.303	2.068***	0.259
Chi–square statistics		186.8		224.31	
Chi–square p value		0.000		0.000	
Correlation coefficient of error terms		ρ_{12} = 0.099**			
Joint significance of correlation coefficient		Chi–square statistics=3.942, Chi–square p value=0.047			

Note: *, **, *** denote 10%, 5%, and 1% significance, respectively.

tage of the GM rice. The consumers whose main cooking oil is the soybean oil are willing to choose the non–GM soybean oil.

The correlation coefficient of the error terms in Table 4 shows that the consumers' WTC the GM soybean oil and the GM rice is significantly positively correlated. Overall, the unobservable error factors influence the consumers' WTC the GM soybean oil and the GM rice in the same direction. This indicates that the consumers want neither GM soybean oil nor GM rice. Therefore the study shows that consumers don't want GM food at all. According to the above analysis, we can see that the impact of the awareness, attitude, if there being kids younger than 12 years old and working in the govern-

ment agency, university or research institution on the WTC the GM soybean oil and the GM rice is the same. However, the effect of information, reading the food packaging, the safety evaluation of the GM soybean oil, gender and income has significant difference. It verifies Hypothesis 4.

CONCLUSIONS AND RECOMMENDATIONS

The paper uses the examples of GM soybean oil and the GM rice to study the consumer WTC GM foods and analyze the factors affecting Shanghai consumers' WTC the two kinds of GM foods with the Seemingly Unrelated Regression model. The conclusions are as follows: Firstly, the consumer's WTC the GM soybean oil and the GM rice are significantly and positively correlated, but the influencing factors differ significantly. Secondly, the positive information has a positive impact on consumers' WTC the GM soybean oil, and the negative information predominates when both positive and negative information are simultaneously presented. Thirdly, the consumers' inherent awareness has remarkable positive effect on their WTC and the influence of negative events is negative. Fourthly, the impact of the attitude toward compulsory labeling system is negative, and the safety evaluation of the GM soybean oil positively affects the WTC. Finally, gender, kid, professional status, income, reading of label information, evaluation of government regulation and purchasing frequency significantly affect the WTC.

According to the above conclusions, we make the following recommendations: Firstly, the information providers should diffuse in a timely manner the real and reliable food information and objective publicity to improve consumers' inherent awareness, so that they may make a rational and right choice according to their own judgment when the food safety events happen. Secondly, government departments should continue strengthening to standardize the market of the GM foods, define the labeling system and ensure it to be carried out according to the standards, because the consumers have the right to know and the freedom to choose. The regulation directly affects the consumers' trust and then impacts the consumer behavior. Finally, since the consumer WTC the GM soybean oil and the GM rice is significantly positively correlated and the rice (as the staple food) is universal, the enterprises which produce the GM foods should work to change firstly the consumers' attitude and formulate the corresponding marketing strategies according to the differences between the factors influencing the consumers' WTC the different types of the GM foods.

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