

# Factors Affecting Consumer Preferences for Shrimp in Taiwan

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**Abstract.** Survey data of food consumption were analyzed utilizing stepwise logistic regression to investigate factors affecting consumer choice of shrimp as the most frequently consumed non-fish seafood in Taiwan. Demographic factors, consumer attention to food attributes, and consumer preferences for fish were considered in modeling. Results showed more people preferring shrimp than actually choosing shrimp. Those choosing shrimp as the most often consumed seafood tended to have higher personal income, lived in southern Taiwan, and/or chose shrimp as their favorite seafood, while those who chose shrimp less often were married and/or lived in Middle Taiwan. Those who chose shrimp as the favorite consumed seafood tended to be married, white collar workers, liked to eat fish, had higher personal income, lived in middle Taiwan, and/or chose shrimp as the most often consumed, while those who disfavored shrimp tended to be believers in the religions of Yi-Guan-Daoism or of Daoism.

**Keywords:** consumer preferences, consumer choice, shrimp, demographic factors, stepwise logistic regression, Taiwan.

## 1. INTRODUCTION

An island with abundant of aquacultural and fishery products, seafood traditionally has been popular on Taiwan. The annual per capita seafood supply increased from 32.55 kilograms in 1984 to a record of 48.71 kilograms in 1993. However, the per capita amounts remained stagnant around 38 kilograms from 1994 to 1996 (Council of Agriculture, 1999a). There were 1332.4 thousand tonnes of seafood, with 53.6 thousand tonnes of shrimp and crabs, production in 1997. The annual per capita consumption of shrimp and crabs was 3.47 kg, while per capita seafood consumption was 42.35kg. Comparing to other animal products, such as pork and poultry consumption being 39.05 kg and 33.4 kg per capita, respectively (Council of Agriculture, 1999b), seafood was a very important source of animal products.

Shrimp provide fresh and delicious tastes for consumption. Although high in price, shrimp are good for preparation of food with other ingredients. This study focuses on the exploration of factors affecting consumer behavior and preference for shrimp. As consumer choice of goods is affected by consumer preferences, endowments, prices and other factors, the objective here is to examine those factors most influential in decisions on actual and potential consumption of shrimp.

Using the greatest possible amount information to explore the relationship of a dependent variable and explanatory variables may best illuminate the possible implications for the studied events. However, in a regression model, using too many independent variables pooled together may cause one to encounter the problem of multicollinearity and generate many insignificant coefficients. To use subjective judgment or to select variables based on references may not include those that were not considered

in a traditional approach. With the development of social research, socio-demographic variables have been included in economic analysis to enrich analytical models with not only the variables of price, quantity, and income, but also of gender, age and other socio-demographic variables. To further explore the consumer characteristics, consumer preference for or paying attention to food attributes have been considered in this study. The theoretical inference is that consumers choose the attributes of foods to meet their demand for food. As food is consumed to maintain the healthy condition of life, food attributes may affect consumers' decisions for choice of food products. The preference for food attributes, or the degree of attention to food attributes, may affect consumers' preferences of food and then the actual choices in consumption.

Among the choice of goods, consumers may choose one product instead of others based on the constraints of income. Goods may be considered substitutes or complements as consumers choose them in the circumstance of changes in prices. However, among the list of preferred goods, consumers may show a preference ordering without consideration of income constraints. The preferences for some goods may be positively related to the preferences for other goods, although they may be substitutes in actual consumption. Under almost no consideration of endowment constraints, consumer preferences for goods may be greatly affected by socio-demographic factors and only slightly affected by income, price and quantity, which are included in traditional economic models. The preference for shrimp may be affected by consumer preference for product attributes. The current study used the most possible variables derived from the survey data and employed a stepwise process to identify those factors significantly affecting the preference for or the consumptive choice of shrimp.

## 2. DATA AND METHODOLOGY

### 2.1 Data

The Food Industry Research and Development Institute (FIRDI) conducted a nationwide survey of food consumption in Taiwan from January to February 1999. A sample of 1200 consumers was collected, based on the distributions of age and gender among 23 counties and cities in Taiwan. The interviewer searched the visiting interviewee through going along the street or road, past three houses, and visited the fourth house to find a consumer with age and gender within the quota of sampling as interviewees. Then the interviewer went past three houses again and selected the next fourth house to find out a second consumer as interviewee, who was fitted to the designed sample qualification. After the sampling, each interviewee was asked to fill out the questionnaire within a mutually agreeable period. Then the interviewer returned to check the questionnaire and collect it.

The questionnaire included questions of whether there was a use/buy experience in the past year for each of 188 kinds of processed foods, for each 130 kinds of fresh agricultural foods, and for each of 18 kinds of food channels. There were also 50 questions about the degree to which one paid attention to some kinds of life style characteristic, to some kinds of food attributes, to some kind of food tastes, and how one liked to eat some kinds of foods. There were 14 demographic variable questions. Responses to questions relating which non-fish seafood did you most often consume last year and which seafood did you favor to serve are used as dependent variables in this research. The dependent variable choice of shrimp was defined as whether one chose shrimp as the most often consumed seafood. The variable preference for shrimp was defined as whether one chose shrimp as the favorite seafood.

Possible explanatory variables included consumer preference for food attributes and socio-demographic variables, including gender, age, education, occupation, religion, residing area, family size, family monthly food expenditure, family monthly income, personal monthly food expenditure and personal monthly income (Table 1). Family size, education, income, and food expenditure were ordinal and categorical. Gender, marital status, religion, and occupation were nominal and categorical. This study used the age variable with continuous response. Each nominal and categorical variable was defined as one for true and zero otherwise. For example, the female gender variable was set equal to 1 for female and 0 for male. For education, it was 1 for those having education of primary school or under, 2 for those having high school education, 3 for those having college or university education, 4 for those having education beyond

**Table 1. Variable Statistics**

Variables	Mean	Mn	Mx	Std	Miss
Gender (female=1)	0.505	0	1	0.500	0
Age	36.938	14	71	14.511	0
Education	2.020	1	4	0.653	0
Marital status					
Unmarried	0.327	0	1	0.469	0
Married	0.651	0	1	0.477	0
Divorced/widowed	0.023	0	1	0.148	0
Personal income	2.865	1	9	2.084	0
Personal food exp	3.740	1	7	1.936	2
Family income	6.192	1	14	3.073	11
Family food exp	6.883	1	14	3.059	12
Family size	4.832	1	10	1.706	1
Residing area					
Northern	0.424	0	1	0.494	0
Middle	0.249	0	1	0.433	0
Southern	0.298	0	1	0.458	0
Eastern	0.028	0	1	0.166	0
Occupation					
Housewife	0.250	0	1	0.433	0
Chief	0.157	0	1	0.364	0
White collar	0.168	0	1	0.374	0
Manual labor	0.200	0	1	0.400	0
Unemployment	0.048	0	1	0.215	0
Student	0.147	0	1	0.354	0
Religion					
Christian	0.029	0	1	0.168	0
Buddhist	0.476	0	1	0.500	0
Yi-Guan-Daoism	0.023	0	1	0.148	0
Daoism	0.210	0	1	0.407	0
Other/none	0.262	0	1	0.440	0
Food attribute					
Food sanitation	4.861	1	6	1.028	0
Food nutrition	4.626	1	6	1.057	0
Food package	3.970	1	6	1.122	0
Food quality	4.617	1	6	1.082	0
Food price	4.377	1	6	1.081	0
Functionality of food	4.417	1	6	1.073	0
Content & ingredient	4.450	1	6	1.060	0
Food taste	4.622	1	6	1.046	1
Organic food	3.625	1	6	1.234	0
Preference for fish	4.475	1	6	1.144	0
Preference for shrimp	0.425	0	1	0.495	0
Choice of shrimp	0.343	0	1	0.475	0

Note: Sample=1200.

university, such as master and Ph.D. For religion, there were Christian, Buddhist, Yi-Guan-Daoism, Muslim, Daoism, and others, including those with no religion. Each one was defined as a variable with level equal to 1 when it was true and 0 otherwise. The survey did not interview a Muslim. For the family monthly food expenditure, there were 14 ranges -- the lowest level at NT\$ 2.5 thousand or under, and the highest level at NT\$ 32.5 thousand or more. For family monthly income, the lowest level was below 20 thousand dollars and the highest level was more than 140 thousand dollars. For personal monthly food expenditure, there were seven ranges, with the lowest level being less than 1 thousand dollars and the highest level being more than 6 thousand dollars. For personal monthly income, there were nine ranges: the lowest level was no income and the highest level was more than 80 thousand dollars. Family size ranged from 1 person to ten or more. Likert scale preferences for fish covered six categories: the highest level, 6, denoted extreme fondness to eat fish; 5 denoted very much liking to eat fish; 4 denoted slight favor to eat fish; 3 slightly disliking to eat fish; 2 very much disliking; and 1 denoted intensely disliking to eat fish.

## 2.1 Methodology

Using the choice and preference for shrimp as dependent variables defined above, the study examined all possible variables of demographic factors and consumer preference to food attributes as shown in Table 1. In addition to the preference for fish, for shrimp, and for choice of shrimp, there were nine kinds of food attributes and 12 types of demographic factors, or totally 35 defined variables, considered. Stepwise regression was employed to identify the significantly explanatory variables.

Since data were collected through randomly stratified sampling, it was assumed that the data were at least conceptually representative of a stratified population. The data had likelihood with the models posited:

$$\log\left(\frac{\pi_{hi}}{1 - \pi_{hi}}\right) = \alpha_i + X'_{hik} \beta_{ik} \quad (1)$$

where  $X$  denoted the vector of explanatory variables;  $\beta$  denoted the vector of coefficients,  $\alpha$  denoted the intercept parameter;  $i=1$  for the choice of shrimp as the most frequently consumed seafood model,  $i=2$  for the preference for shrimp model;  $k=1, 2, 3, \dots$  denoted the explanatory variables included;  $\pi$  denoted the probability that the event happened, while  $1-\pi$  denoted the probability that the event did not happen.

To identify the models, a stepwise process was employed. Score Chi-square was used as the entry criterion to include a new explanatory variable in the model (Stockes

et al. 1995). A 0.05 significance level was used to select the entry variable. The model fitting information and testing global null hypothesis of  $\beta=0$ , such as Chi-square for covariates in the criterion of likelihood  $-2 \log L$ , Chi-square for covariates of score, and residual Chi-square, were used. For a valid model fitting, the Chi-square for covariates in the criterion of likelihood  $-2 \log L$  and in the criterion of score should be significant, while residual Chi-square should not be rejected at 5% significance level (Stockes et al. 1995). Hosmer and Lemeshow goodness-fit test should be insignificant.

## 3. EMPIRICAL RESULTS

### 3.1 Basic Sample Statistics

We found that 34.3% of surveyed consumers chose shrimp as the non-fish seafood most frequently consumed, while 42.5% of those surveyed chose shrimp as the favorite seafood in Taiwan (Table 2).

**Table 2. Consumer Response to Non-fish Seafood**

Non-fish Items	Most often Consumed		Favorite	
	Count	Percent	Count	Percent
Shrimp	412	34.3	510	42.5
Crab	74	6.2	146	12.2
Oyster	78	6.5	64	5.3
Clam	319	26.6	175	14.6
Sea cucumber	10	0.8	24	2.0
Cuttlefish	145	12.1	130	10.8
Common cuttlefish	12	1.0	10	0.8
Squid	28	2.3	30	2.5
Small squid	47	3.9	33	2.8
Octopus	7	0.6	4	0.3
Others	0	0	4	0.3
Non-users	68	5.7	70	5.8
Sample: 1200				

Results of independence tests are shown in Table 3. We found that personal monthly income, white collar workers, students, those who believed in Yi-Guan-Daoism, and preference for fish were significant at the 0.01 level to explain the dependent variable of choosing shrimp as the favorite seafood. For the variable of choosing shrimp as the most frequently consumed seafood, gender, education, residing in the middle or the south, and occupation housewife were significant.

**Table 3. Independence test of response variables with respect to socio-demographic variables**

Dependent Variables:	Preference for Shrimp		Choice of Shrimp	
Independent Variables	Prob.	Sig.	Prob.	Sig.
Gender (female=1)	0.177		0.015	**
Age	0.665		0.331	
Education	0.267		0.010	***
Marital status				
Unmarried	0.149		0.177	
Married	0.175		0.071	
Divorced/widowed	0.836		0.126	
Personal income	0.003	***	0.109	
Personal food exp	0.342		0.608	
Family income	0.436		0.842	
Family food exp	0.085		0.062	
Family size	0.895		0.450	
Residing area				
Northern	0.752		0.783	
Middle	0.885		0.001	***
Southern	0.985		0.001	***
Eastern	0.610		0.327	
Occupation				
Housewife	0.458		0.008	***
Chief	0.413		0.564	
White collar	0.002	***	0.074	
Manual labor	1.002		0.927	
Unemployment	0.205		0.554	
Student	0.023	**	0.942	
Religion				
Christian	0.278		0.474	
Buddhist	0.392		0.328	
Yi-Guan-Daoism	0.011	**	0.912	
Daoism	0.192		0.504	
Other/none	0.461		0.762	
Food attribute				
Food sanitation	0.195		0.338	
Food nutrition	0.138		0.668	
Food package	0.241		0.586	
Food quality	0.825		0.350	
Food price	0.075		0.530	
Functionality of food	0.507		0.431	
Content & ingredient	0.083		0.307	
Food taste	0.450		0.844	
Organic food	0.215		0.982	
Preference for fish	0.001	***	0.173	

Note: \*\*\*: 1% significance level. \*\*: 5% significance level.

### 3.2 Choice of Shrimp Model

#### 3.2.1 Without Consideration of the Preference for Shrimp Variable

Through stepwise regression, four significant variables were identified (Table 4). In step 4, the model fitting information and testing global null hypothesis  $\beta=0$  with Chi-Square for covariates in criterion of score being 29.370 with 4 df ( $p=0.0001$ ), and with residual Chi-Square=21.2339 with 33 df ( $p=0.94310$ ) support the adequacy of the model (Table 4). The identified model is shown in Table 5.

**Table 4. Summary of Stepwise Procedure for Choice of Shrimp Model – Without Consideration of the Variable ‘Preference for Shrimp’**

Step	Variable entered	Score	Chi-Square	Pr>Chi-Square
1	Middle		11.7168	0.0006
2	Personal income		7.0018	0.0081
3	Southern		5.5789	0.0182
4	Married		4.8650	0.0274

**Table 5. Maximum Likelihood Estimates for Choice of Shrimp – Without Consideration of the Variable ‘Preference for Shrimp’**

Variable	Parameter Estimate	Stand. Error	Wald Chi-Square	Pr > Chi-Square	Odds Ratio
Intercept	-0.7673	0.1456	27.7747	0.0001	.
Married	-0.2896	0.1315	4.8517	0.0276	0.749
Personal income	0.0959	0.0299	10.2559	0.0014	1.101
Middle	-0.3665	0.1611	5.1750	0.0229	0.693
Southern	0.3440	0.1434	5.7507	0.0165	1.411

The odds ratio shows that those who had higher personal monthly income had 1.101 times higher odds of choosing shrimp as the most frequently consumed non-fish seafood. Those who lived in the south had 1.411 times higher odds of choosing. However, it was found that those married and those who lived in middle Taiwan had only 0.749 and 0.693 times higher odds of choosing shrimp as the most often consumed seafood.

### 3.2.2 With Consideration of the Preference for Shrimp Variable

If we include the variable ‘preference for shrimp’, the stepwise process identifies five variables significantly influencing choice of shrimp (Table 6). In step 5, the model fitting information and testing global null hypothesis  $\beta=0$  with Chi-Square for covariates in criterion of score being 269.190 with 5 df ( $p=0.0001$ ), with residual Chi-Square = 28.2064 with 39 df ( $p=0.8997$ ), and with the Hosmer and Lemeshow goodness-of-fit test statistic = 1.3243 with 8 df ( $p=0.9953$ ) support the adequacy of the model. The identified model is shown in Table 7.

**Table 6. Summary of Stepwise Procedure for Choice of Shrimp Model – with Consideration of the Variable ‘Preference for Shrimp’**

Step	Variable entered	Score	Chi-Square	Pr>Chi-Square
1	Preference for shrimp	244.0000	0.0001	
2	Middle	14.4700	0.0001	
3	Married	6.9664	0.0083	
4	Southern	6.0316	0.0141	
5	Personal income	4.5200	0.0335	

**Table 7. Maximum Likelihood Estimates for Choice of Shrimp Model – with Consideration of the Variable ‘Preference for Shrimp’**

Variable	Parameter Estimate	Stand. Error	Wald Chi-Square	Pr>Chi-Square	Odds Ratio
Intercept	-1.6578	0.1789	85.9122	0.0001	.
Married	-0.4392	0.1493	8.6490	0.0033	0.645
Personal income	0.0722	0.0340	4.4981	0.0339	1.075
Middle	-0.4596	0.1798	6.5322	0.0106	0.632
Southern	0.4284	0.1630	6.9079	0.0086	1.535
Preference for shrimp	2.1148	0.1435	217.1762	0.0001	8.288

With the inclusion of the variable ‘preference for shrimp’, there were no changes of direction of influence for the identified significant independent variables, but the newly included variable showed a significant effect on the dependent variable. The model illuminated that those who selected the shrimp as the favorite non-fish seafood had 8.288 times higher odds of choosing shrimp as the most frequently consuming seafood (Table 7).

### 3.3 Preference for Shrimp Model

#### 3.3.1 Without Consideration of the Choice of Shrimp Variable

The stepwise process identified four variables that significantly influence expressed preference for shrimp among survey respondents (Table 8). In step 4, the model fitting information and testing global null hypothesis  $\beta=0$ , with Chi-Square for covariates in criterion of score being 33.689 with 4 df ( $p=0.0001$ ), with residual Chi-Square being 36.2741 with 39 df ( $p=0.5949$ ), and with Hosmer and Lemeshow goodness-of-fit test statistic = 3.0866 with 7 df ( $p=0.8769$ ), support the adequacy of the model.

**Table 8. Summary of Stepwise Procedure for Preference for Shrimp Model – without Consideration of the Variable ‘Choice of Shrimp’**

Step	Variable entered	Score	Chi-Square	Pr>Chi-Square
1	Preference for fish	14.7949	0.0001	
2	Personal income	9.3017	0.0023	
3	White collar	5.0061	0.0253	
4	Yi-Guan-Daoism	5.2893	0.0215	

Factors that affected consumer choice of shrimp as the favorite non-fish seafood (Table 9) were identified to be personal monthly income, white-collar workers, and those who preferred to eat fish, which each had a positive effect on choosing shrimp. Those who believed in the religion of Yi-Guan-Daoism, however, tended to be averse to choosing shrimp as the favorite (Table 9).

**Table 9. Maximum Likelihood Estimates for Preference for Shrimp Model – without Consideration of the Variable ‘Choice of Shrimp’**

Variable	Parameter Estimate	Standard Error	Wald Chi-Square	Pr>Chi-Square	Odds Ratio
Intercept	-1.3472	0.2686	25.1589	0.0001	.
Personal income	0.0661	0.0298	4.9321	0.0264	1.068
White collar	0.3790	0.1646	5.3025	0.0213	1.461
Yi-Guan-Daoism	-1.2120	0.5559	4.7531	0.0292	0.298
Preference for fish	0.1793	0.0549	10.6618	0.0011	1.196

### 3.3.2 With Consideration of the Variable ‘Choice of Shrimp’

With consideration of the variable ‘choice of shrimp’, the stepwise process identified eight factors that significantly influenced preferences for shrimp (Table 10). In step 8, the model fitting information and testing global null hypothesis  $\beta=0$ , with Chi-Square for covariates in criterion of score being 276.813 with 8 df ( $p=0.0001$ ), with residual Chi-Square being 34.0607 with 36 df ( $p=0.5611$ ), and with Hosmer and Lemeshow goodness-of-fit test statistic = 11.723 with 8 df ( $p=0.1640$ ), support the adequacy of the model (Table 10).

**Table 10. Summary of Stepwise Procedure for Preference for Shrimp Model – with Consideration of the Variable ‘Choice of Shrimp’**

Step	Variable entered	Score	Chi-Square	Pr>Chi-Square
1	Choice of shrimp	244.0000	0.0001	
2	Preference for fish	10.5290	0.0012	
3	Yi-Guan-Daoism	6.8863	0.0087	
4	White collar	6.5123	0.0107	
5	Married	4.9020	0.0268	
6	Daoism	5.2989	0.0213	
7	Middle	4.7680	0.0290	
8	Organic food	3.9430	0.0471	

With the inclusion of the variable ‘choice of shrimp’ (as the most frequently consumed seafood), the number of variables identified as significant increased substantially. While retaining the effective direction of the identified significant variables of white-collar workers, believers in Yi-Guan-Daoism, and those with expressed preferences for fish, the personal monthly income variable was dropped from the model. Four new variables were included. Those who selected shrimp as the most often consumed seafood had 8.682 times higher odds of choosing shrimp as the favorite non-fish seafood. The variable ‘preference for fish’ and the variable of Yi-Guan-Daoism had the same direction of effect on the dependent variable (Tables 9 and 11). Organic food, married respondents, residents of middle Taiwan, and believers in Daoism newly emerged as significant (Table 9 and Table 11). The married, white-collar workers, those who liked to eat fish, those who paid more attention to organic food, and those who lived in middle Taiwan tended to have higher odds of choosing shrimp as the favorite seafood, ceteris paribus. On the contrary, those who believed in the religion of Yi-Guan-Daoism, and those who believed in the religion of Daoism had lower odds of choosing shrimp as the favorite seafood (Table 11).

**Table 11. Maximum Likelihood Estimates for Preference for Shrimp Model – with Consideration of the Variable ‘Choice of Shrimp’**

Variable	Parameter Estimate	Stand. Error	Wald Chi-Square	Pr>Chi-Square	Odds Ratio
Intercept	-2.4746	0.3640	46.2090	0.0001	.
Married	0.3480	0.1450	5.7594	0.0164	1.416
Middle	0.3343	0.1587	4.4398	0.0351	1.397
White collar	0.4506	0.1783	6.3870	0.0115	1.569
Yi-Guan-Daoism	-1.6249	0.6036	7.2459	0.0071	0.197
Daoism	-0.4446	0.1723	6.6605	0.0099	0.641
Organic food	0.1105	0.0557	3.9298	0.0474	1.117
Preference for fish	0.1621	0.0623	6.7619	0.0093	1.176
Choice of shrimp	2.1613	0.1464	218.0437	0.0001	8.682

## 4. CONCLUSION

This study used survey data and stepwise logistic regression to explore factors affecting the consumer choice of shrimp as the favorite, and also as the most frequently consumed, non-fish seafood in Taiwan. Demographic factors and consumers’ attention to food attributes and consumer preferences for fish were considered in modeling. We found that 34.3% of consumer respondents chose shrimp as the most often consumed seafood. Those who had higher personal monthly incomes, those who lived in southern Taiwan, and those who chose shrimp as their favorite had higher odds of choosing shrimp as the most frequently consumed seafood. On the contrary, married respondents and those who lived in middle Taiwan had lower odds of consuming shrimp frequently.

Some 42.5% of consumers selected shrimp as their favorite among seafood products. The married, white collar workers, those liking to eat fish, those who paid attention to organic foods, those who had higher personal monthly incomes, those who lived in middle Taiwan, and those who chose shrimp as the most often consumed seafood had higher odds of preferring shrimp as their favorite non-fish seafood. On the contrary, those who believed in the religion of Yi-Guan-Daoism and those who believed in the religion of Daoism had lower odds of choosing shrimp as the favorite.

Comparing the factors affecting choosing shrimp as their favorite and those affecting choosing shrimp as the most

often consumed seafood, it was found that the variables of personal monthly income, white collar workers, and preference for fish had common and positive effects on the both. Those who believed in the religion of Yi-Guan-Daoism had negative perceived effects on both choices of shrimp, as the favorite and as the most often consumed.

Married respondents and those who lived in middle Taiwan were identified to have higher odds of choosing shrimp as the favorite one but lower odds of consuming shrimp often. They were the groups who expressed a liking to eat shrimp but either could not afford to consume it or did not consume it for other, unspecified reasons. The variable representing those who paid attention to organic foods had a positive effect on the preference for shrimp, but did not significantly affect on the actual choice of shrimp. Consumer preferences for food attributes might affect on the choice of preference for shrimp, but did not affect on the real consumption of shrimp. Thus, preferences for food attributes might affect preference for shrimp, while real consumption was more affected by the demographic factors and less affected by consumer preference for food attributes.

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## 7. APPENDICES

**Table 3a. Independent test of Preference for Shrimp with respect to socio-demographic variables**

Variable	Chi-Square	df	Prob.	Sig.
Gender (female=1)	1.820	1	0.177	
Age	51.927	57	0.665	
Education	3.951	3	0.267	
Marital status				
Unmarried	2.086	1	0.149	
Married	1.841	1	0.175	
Divorce/widowed	0.043	1	0.836	
Personal income	23.765	8	0.003	***
Personal food exp	6.776	6	0.342	
Family income	12.126	12	0.436	
Family food exp	30.430	13	0.085	
Family size	4.244	9	0.895	
Residing area				
Northern	0.100	1	0.752	
Middle	0.021	1	0.885	
Southern	0.000	1	0.985	
Eastern	0.260	1	0.610	
Occupation				
Housewife	0.550	1	0.458	
Chief	0.671	1	0.413	
White collar	9.371	1	0.002	***
Manual labor	0.000	1	1.002	
Unemployment	1.603	1	0.205	
Student	5.189	1	0.023	**
Religion				
Christian	1.176	1	0.278	
Buddhist	0.734	1	0.392	
Yi-Guan-Daoism	6.500	1	0.011	**
Daoism	1.702	1	0.192	
Other/none	0.544	1	0.461	
Food attribute				
Food sanitation	7.363	5	0.195	
Food nutrition	8.359	5	0.138	
Food package	6.733	5	0.241	
Food quality	2.172	5	0.825	
Food price	10.014	5	0.075	
Functionality of food	4.300	5	0.507	
Content & ingredient	9.742	5	0.083	
Food taste	4.725	5	0.450	
Organic food	7.071	5	0.215	
Preference for fish	26.530	5	0.001	***

Note: \*\*\*: 1% significance level. \*\*: 5% significance level.

**Table 3b. Independent test of Choice of Shrimp with respect to socio-demographic variables**

Variable	Chi-Square	df	Prob.	Sig.
Gender (female=1)	5.950	1	0.015	**
Age	61.098	57	0.331	
Education	11.246	3	0.010	***
Marital status				
Unmarried	1.822	1	0.177	
Married	3.254	1	0.071	
Divorce/widowed	2.338	1	0.126	
Personal income	13.072	8	0.109	
Personal food exp	4.507	6	0.608	
Family income	7.236	12	0.842	
Family food exp	21.594	13	0.062	
Family size	8.867	9	0.450	
Residing area				
Northern	0.076	1	0.783	
Middle	12.011	1	0.001	***
Southern	11.112	1	0.001	***
Eastern	0.960	1	0.327	
Occupation				
Housewife	7.116	1	0.008	***
Chief	0.334	1	0.564	
White collar	3.202	1	0.074	
Manual labor	0.008	1	0.927	
Unemployment	0.350	1	0.554	
Student	0.005	1	0.942	
Religion				
Christian	0.513	1	0.474	
Buddhist	0.959	1	0.328	
Yi-Guan-Daoism	0.012	1	0.912	
Daoism	0.447	1	0.504	
Other/none	0.092	1	0.762	
Food attribute				
Food sanitation	5.689	5	0.338	
Food nutrition	3.208	5	0.668	
Food package	3.750	5	0.586	
Food quality	5.561	5	0.350	
Food price	4.135	5	0.530	
Functionality of food	4.875	5	0.431	
Content & ingredient	5.993	5	0.307	
Food taste	2.038	5	0.844	
Organic food	0.716	5	0.982	
Preference for fish	7.706	5	0.173	

Note: \*\*\*: 1% significance level. \*\*: 5% significance level.

**Table 4a. Variable Selection of the Stepwise Procedure at the 0.05 Significance Level for Entry for Choice of Shrimp Model– Without Consideration of the Variable of Preference for Shrimp**

		Step 1	Step 2	Step 3	Step 4
Chi-square for covariates ( $-2\log L$ )	Chi-square	12.084	18.980	24.537	29.370
	df	1	2	3	4
	p	0.0005	0.0001	0.0001	0.0001
Chi-square for covariates (Score)	Chi-square	11.717	18.649	24.321	29.001
	df	1	2	3	4
	p	0.0006	0.0001	0.0001	0.0001
Residual Chi-square	Chi-square	38.4770	31.6120	26.0825	21.2339
	df	36	35	34	33
	p	0.3580	0.6324	0.8325	0.9434
R-square		0.0102	0.0159	0.0205	0.0245
Max-rescaled R-square		0.0140	0.0220	0.0284	0.0339

Note: No (additional) variables met the 0.05 significance level for entry into the model after step 4.

**Table 6a. Variable Selection of the Stepwise Procedure at the 0.05 Significance Level for Entry for Choice of Shrimp Model – With Consideration of the Variable of Preference for Shrimp**

		Step 1	Step 2	Step 3	Step 4	Step 5
Chi-sq. for covar. ( $-2\log L$ )	Chi-sq.	249.35 1	264.19 1	271.13 6	277.1 58	281.64 6
	Df	1	2	3	4	5
	P	0.0001	0.0001	0.0001	0.000 1	0.0001
Chi-sq. for covar. (Score)	Chi-sq.	244.04 5	255.51 2	260.67 7	265.5 60	269.19 0
	Df	1	2	3	4	5
	P	0.0001	0.0001	0.0001	0.000 1	0.0001
Resid. Chi-sq.	Chi-sq.	59.244 1	45.064 3	38.498 7	32.65 20	28.206 4
	Df	44	42	41	40	39
	P	0.0621	0.3450	0.5824	0.788 8	0.8997
R-Sq.		0.1902	0.2003	0.2050	0.209 0	0.2120
Max-rescaled R-sq.		0.263	0.277	0.283	0.289	0.293

Note: No (additional) variables met the 0.05 significance level for entry into the model after step 5.