A Study on Economic Impacts and Consumer's Perception of HACCP Implementation on Seafood Sector

Abstract

Seafood inspection and certification has become a trend on international trade. Recent incidences of chemical residues were examined in exporting seafood products which hinder the future export to the European Union and Japan particularly. Hence, the perceptions of seafood quality and safety from a consumer point of view and international trade concerns are becoming important. In fact, seafood inspection and certification are set into action on the world gradually. It is clear that international legislation is moving toward to make HACCP as a mandatory requirement for the food industry. In this study, questionnaire was designed to explore the perception of Taiwanese consumers about food safety and issues related to the HACCP system in the industry. An econometric Logit model was applied to estimate relationships between perceptions of food safety and seafood consumption in Taiwan. The empirical results show there are significant differences in perceptions regarding the characteristic of gender, education, income, eating location and buyer. The empirical results indicate that, consumer would like to pay more (average 7.81% of current price) for certified seafood due to safety concerns and time saving, but part of producers worry the increasing cost when apply the HACCP system. It also implies incentives of guidance and assistance provided by government is needed in the initial stage.

Keywords: Seafood, HACCP, Consumer Perception, Willingness to Pay

I. Introduction

Quality and safety regarding seafood become multi-dimensional and consumers have great difficulty in determining and observing actual seafood quality (Anderson & Anderson 1991). Food security is a major global concern today significant to both the public and the regulators as testified by the World Food Summit (WFS) in Rome 1996. Consumers are becoming increasingly concerned with the quality, safety and production attributes of their food (Caswell, 1998). Seafood, once considered pure and free of pollution, is facing more controversies and challenges in Taiwan recently. Furthermore, many seafood-positioning events are related to culture periods (Kuo and Chuang, 2002). Thus, there is urging to push seafood inspection and certification in mandatory, and the trend on international trade is for companies to formally adopt the HACCP (Hazard Analysis and Critical Control Point) system. An announcement for detailed rules and regulations were bulletin by government.

Previous seafood research has shown that one single acute regional contamination event can lead to a collapse in demand of other products from unaffected regions because of insufficient information dispensed to consumers (Swartz & Strand, 1981; Wessells et al., 1995). Due to the uncertainty of seafood supply and its safety, more information must be provided to consumers. Safety is one of many implicit characteristics of seafood that influences the purchasing behavior of the consumer at various prices and quantities. However, people obtain vague information from media and rely on their own knowledge of seafood safety. Hence, the perceptions of seafood quality and safety from a consumer point of view and international trade concerns are becoming important. In fact, seafood inspection and certification are set into action on the world gradually, and it is clear that international legislation is moving toward to make HACCP as a mandatory requirement for the food industry.

Recent seafood incidences in Taiwan of chemical residues were examined in exporting seafood products to the European Union and Japan (China times and the United Daily News, 2003/10/24).   Not only real risks associated with the consumption of selected seafood products but also that perceived risk from seafood consumption has been enhanced by media stories, which hinder the future export. Restoring confidence in seafood now presents a considerable commercial challenge to the seafood industry. Perception of seafood safety is one such psychological interpretation, which influences the attitudes and behavior of consumers with respect to the purchase of seafood products. In this study, we focus on consumers' perception of seafood HACCP and it's willingness to pay (WTP) for seafood safety and quality in Taiwan. In details, the main objectives of the paper are: (1) explore the perception of Taiwanese consumers about seafood safety; (2) analyze the impact of factors influencing consumers' WTP for seafood HACCP; (3) estimate Taiwanese consumers' mean WTP for seafood HACCP; (4) discriminate the info-selected preference induce seafood HACCP from consumers who have different socio-economic characteristic.

II. The Status of HACCP System in Taiwan

HACCP has been world widely acknowledged as one of the most effective method of assuring product safety and its becoming internationally recognized as a tool for controlling food borne safety hazards. The HACCP system of Codex Alimentarius with its seven principles: 1)assess the hazard; 2)determine CCPs; 3)establish critical limits for each CCP; 4)establish procedures to monitor each CCP; 5)establish corrective actions; 6)establish record keeping; 7)establish verification procedures. It can be structured into three elements: hazard analysis (principle 1), measures for hazard control (principles 2-5), verification and documentation of the system (principles 6-7). Hence, CCP management comprises four out of the seven principles. These principles have to be fulfilled for a concept to conform to HACCP requirements. The Codex Alimentarius definition for hazard analysis is "The process of collecting and evaluating information

on hazards and conditions leading to their presence to decide which are significant for food safety and therefore should be addressed in the HACCP plan". As for CCPs are defined as steps "at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level". The "acceptable level" or the acceptable remaining risk, respectively results from the previously performed hazard analysis. Finally, in the Codex Alimentarius document monitoring of CCPs is defined as "the act of conducting a planned sequence of observations or measurements of control parameters to assess whether a CCP is under control", i.e. whether the control measures function correctly and critical limits are not violated. And it is further explained, "if monitoring is not continuous, then the amount or frequency of monitoring must be sufficient to guarantee the CCP is in control"

During the last three decades, HACCP has been progressively introduced and applied for the benefit of the food industry. However, it should be recognizing that HACCP system has not been homogeneously implemented across all food industry sectors. Reasons for not implementing, maintaining and updating HACCP programs cannot be explained purely in terms of unwillingness by manufacturers but rather, maybe by the presence of technical barriers that may impede the application of the system. It is noteworthy that in modern food control systems, especially for raw foods, risk-based scientific evaluation of inspection programs now clearly identifies effective process control as by far the most important element in assuring food safety. The industry traditionally had primary responsibility for GMP-based process control, and now has primary responsibility for HACCP-based process control. The triggers for establishing a formalized and documented food safety program across local food industry match those around the world; the community expects safe food, without compromise.

Nowadays, Taiwan (2002/1/1) is member of the World Trade Organization (WTO), globalization and liberalization in trade that put a premium on fishery industry, and there is urging to push seafood inspection and certification in mandatory. As concerns the outlook for fisheries in view of the Agreement on the Application of Sanitary and Phyto-sanitary Measures (SPS) sets out the basic rules for food safety and animal and plant health standards, and food safety of HACCP, all Taiwan seafood export and import must follow these standards. The trend for companies to adopt the integration of HACCP plans for parts of a food chain with farm-to-table, risk-based safety goals are most likely increasing. Recognition of the urgent need for a framework to judge the equivalence of HACCP-based food control systems in different countries for seafood international trade is prevail in Taiwan (see Figure 1).

While HACCP has been implemented in many food processing plants, there are concerns that incentives may be inadequate to stimulate the adoption of HACCP by particular categories of business (e.g. small and medium-sized enterprises) and in certain sectors (e.g. with low operating margins). Especially the costs and benefits

associated with the implementation and operation of HACCP in seafood processing sector suggested that the major cost of implementing and operating HACCP in seafood processing plants is staff time required to document the system. Record keeping was the cost most frequently incurred. The costs of capital investment and external technical expertise are less important. Also, there are concerns that the costs of implementing HACCP in order to provide appropriate advice and/or assistance to food businesses.
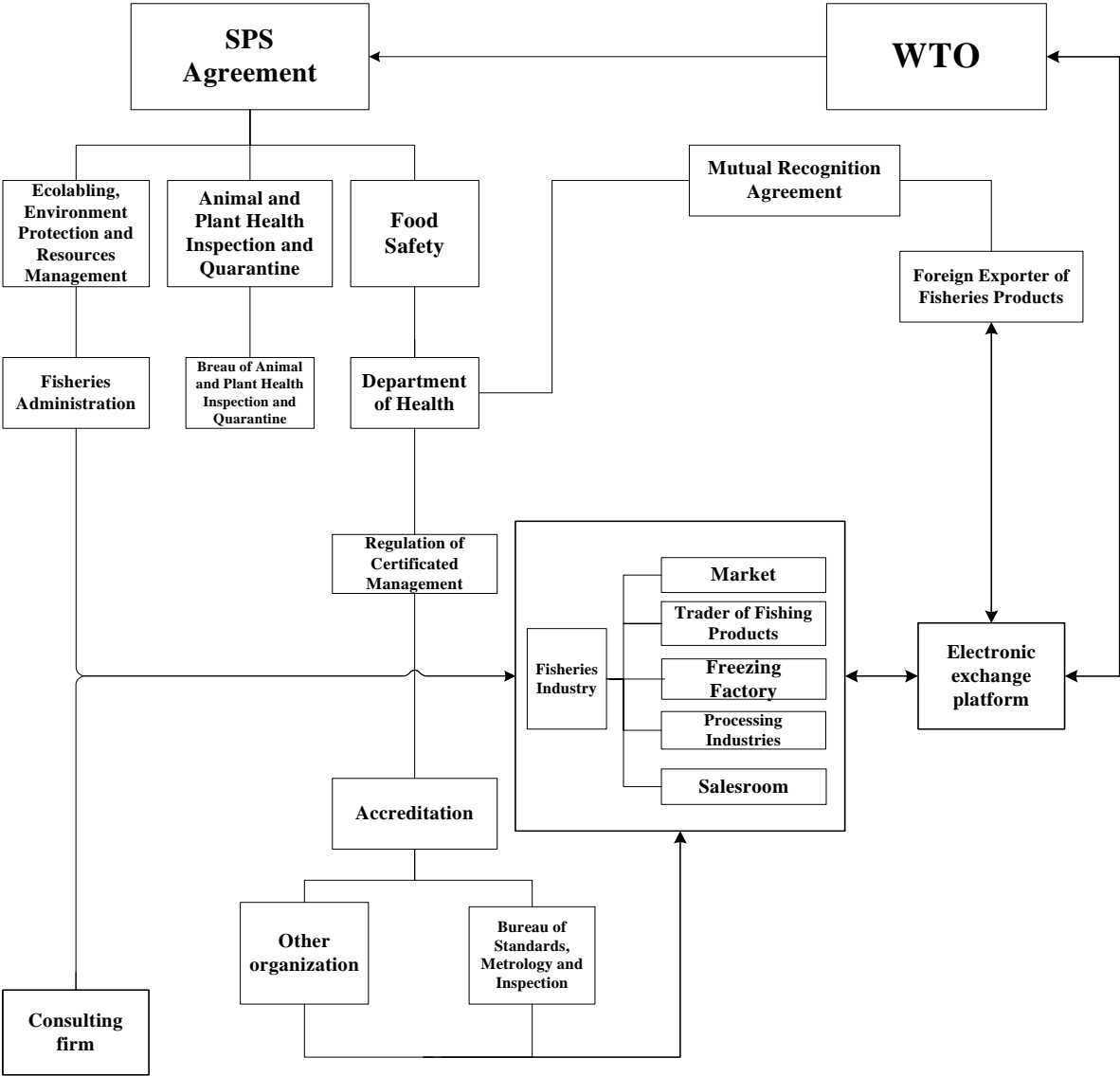

Figure 1.   Seafood safety control system after joining the WTO

III. Seafood Safety Issues and Roles of Government

The most important benefit of applying HACCP is the enhanced ability to retain existing customers. Around 80% of the company estimated that it had taken 12 months or less to fully implement HACCP. However, around 12% estimated that it had taken more than 18 months. Though there is no similar research done in Taiwan, The results may have implications for the adoption of HACCP in the world the food industry as a whole (Chang, 2001). When a food is treated as a heterogeneous good, it becomes a bundle of attributes, including price, taste, food quality, food safety, nutritional characteristics, and environmentally friendly production processes (Lancaster, 1966). Seafood safety and quality affects the choice of consumer. According to Kramer & Twigg (1970) and Henson & Traill (1993), terms of food quality and food safety are difference from the risk consciousness consideration when consumer choice the food. Research has shown that much of the public's reaction to risk could be attributed to sensitivity not only to the technical but also to the social and psychological qualities of hazards (Slovic, 1993).   In general, the notions of food safety could be covered under the scope of food quality.   The seafood buying behavior is same like meat and poultry buying of consumer that is affected by price, price of substitution, income, eating habits and preference (Hanson, Hermann & Dunn, 1995).

Since food safety is generally unobservable, it is easy to be affected by the impressions or images of foods that consumers preserve. According to Griffith (1996) and Kinnucan & Wessells's (1997) researches, consumer behavior was correlated with food safety information acquired, and consumer's perception about pollution and food safety was unsystematic and incompatible (Johnson & Griffith, 1996).   Nevertheless, labeling can be the effect way to solve the problem mentioned above and consumer's cognitive about ocean contaminant affect the demand for certified seafood product indirectly Casswell (1997) and Kuo & Chuang (2002).

Food safety is the "investment of food risk", and must be safe as government's requirement or consumers' demand which push a company to produce safe food business. HACCP requirements are fast becoming an integral part of international trade in food commodities and many governments have responded to this trend by repositioning its approach to HACCP in the food export sector. Although food processors have not fully taken up the implementation of HACCP, legislation is being introduced in many countries. However, industries remain the primary players in the implementation of HACCP while structural changes within the regulatory environment have ensured that overall responsibilities remain with "core government" while introducing flexibility in some aspects of delivery of HACCP programs. Trends emerging internationally have changed scientific, operational and political dynamics, particularly highlighting the value of validating HACCP plans according to food-safety objectives. Negotiation of equivalence between trading partners, of HACCP programs that are genuinely science- and risk-based, continues to be the governments' primary

market access approach (Chang, 2002).

In reality, seafood HACCP applied constrained by the sanitation condition of individual factory. Generally, the poor sanitation practices the awful HACCP function. The hazard derive from the leak of sanitary control have to compensate and monitored by CCP that step up the heavy load of HACCP executed. Condition like that, individual have obey Good Hygienic Practices (GHP) to improve the sanitation of the manufacture environment and to fill in with minimum sanitation requirements. The cause-effect regarding safety risk and sanitation practice can be shown as Figure 2. In Figure 2, safety risk can be reduced by GHP practice. Individual with good hygienic practice conform, nevertheless, there is a safety risk distance from acceptable safety level in end items. Therefore, HACCP management system has to put on the stage then try to eliminate exist hazards. The adequate sanitation condition, the effective HACCP function.
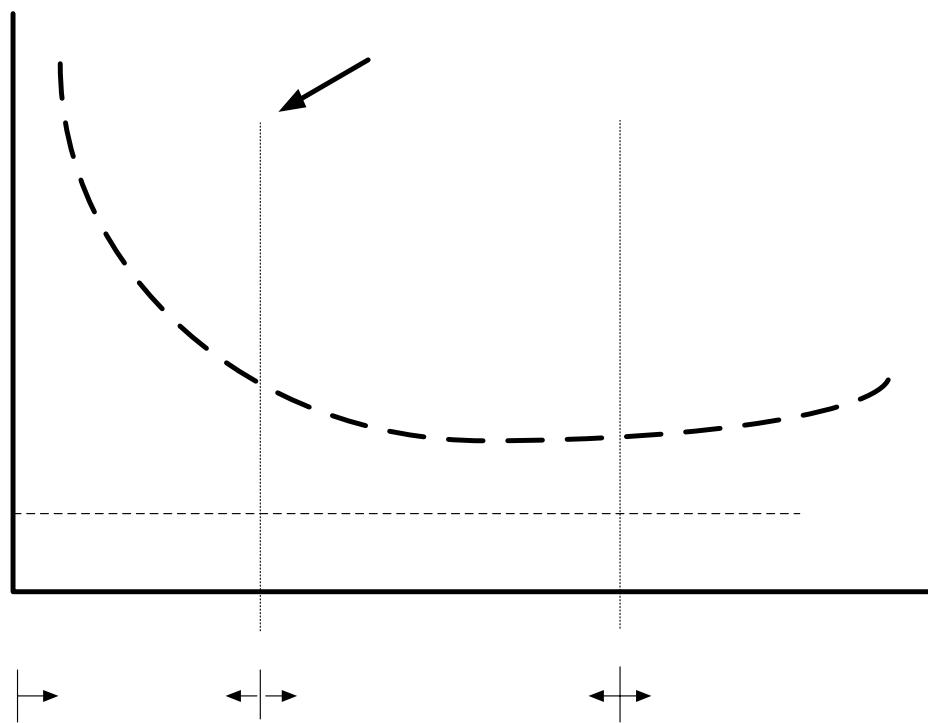

Figure 2.   Safety risk and sanitation practice

IV. Survey Design and Implementation

Based on objectives established for this study, public concerns about seafood safety and consumer willingness to pay for seafood quality can be addressed as followings: 1) characteristics of seafood consumption and preference that are highly likely to influence the seafood purchase intentions and decision of the household; 2) consumer perception and valuation of seafood HACCP concerns; and 3) socio-economic and demographic characteristics of the representative respondent. The essential part in this questionnaire is to detect consumers' choices, which could reveal consumers' preferences. The data was gathered by mail survey conducted over a month in January 2004. Purposive sampling were used in this research. Choosing individuals from the volunteers and members of Taiwan Fisheries Development Association based on characteristics of positive, aggressive and outgoing because they will each have specific insights into the enthusiasm of the ocean. It is best suited to subjective-qualitative measurement where we are interested in the perspectives and experience of particular groups or individuals.

A total of 347 out of 823 respondents returned questionnaire, 331 effective samples representing a response rate of about 40%. The sample size with 95% confidence level of confidence that the results of this study have a statistical precision of plus or minus 5.39 percentage points of what they would be if the entire population had been returned questionnaire with complete accuracy. The mean WTP summary by independent variable can be showed in Table 1. This table indicates that male consumer's mean WTP was higher than female consumer allow for the possibility that man can not to acquired market information as women who tend to bear a large share of the responsibility for household care have careful calculation and strict budgeting in tradition impression. The effect of variable buyer explanatory same like effect of variable gender, consumer who was not familiar with fluctuate in the market willingness to pay more than the consumer who know the market fluctuate well instead. Furthermore, the variable education, family average income was not difference from cognitive impression with positive effect significant differences in perceptions regarding the characteristic of gender, education, income, eating location and buyer.

Table 1.　Mean WTP Summary by Independent Variable

Variable Name	Description	Mean WTP
Gender*	Female	7.3460
	Male	8.3019
Buyer*	Main buyer in household	6.7255
	Not main buyer in household	8.8079
Education	Junior High diploma and below	4.2534
	Senior High and vocational diploma	5.9368
	Junior College and above	8.6168
Children	Children under 15 year old in household	8.5269
	No children under 15 year old in household	6.9535
Senior	Senior above 65 year old in household	7.9035
	No senior above 65 year old in household	7.7311
Occupation*	Agriculture, forest, fishery and husbandry	8.9660
	Industry, business or service industry	7.1282
	Military, public or teaching	9.6763
	Freeman	5.8068
	Professional	7.4192
	Student	4.5645
	otherwise	8.1267
Family Size	Household members ≤4	8.1100
	Household members >4	8.1900
Income*	NT 39,999 and under	5.7244
	NT 40,000 to NT 79,999	7.7253
	NT 80,000 and above	9.5338
Area*	North Taiwan	8.6135
	Middle Taiwan	5.7554
	South Taiwan	8.6863
	Eastern Taiwan	5.8987
	Off-shore island	5.6916
Eating frequency	0-2 times a week	7.2959
	3-5 times a week	8.1952
	More than 6 times	8.2538
Eating place*	Home	7.8897
	Snack bar	6.5232
	Restaurant	9.8445
Buying place	Traditional market	7.8804
	Supermarket	7.3010
	Fishery market	7.4266

Note:* Significant from ANOVA test

V. Econometric Model

Econometric model based on utility paradigm is used to reveal people's preferences and satisfaction that a person receives from their activities (Stern, 1998). Utility maximization is the guiding notion-underlying consumer choices analyzed with consumer demand theory and utility analysis. It makes sense to think that people are generally motivated to do what is best for them, to purchase the most satisfying goods, to make the decisions that do more good than harm, to improve their overall living standards and well-being. Therefore, replacing the concept of consumer preference that we begin economic model structure as:

Seafood HACCP supporter = (Attributes of seafood, Perception of consumer, Demographic characteristics)

Based on utility principle, the regression model follow Spinks & Bose (2002) applied in this study can be expressed as:

$$Y_i^* = \alpha + \sum_{j=1}^{k} \beta_j X_{ij} + \varepsilon_i \qquad (1)$$

where Yi^* is an unobservable dependent variable that representative respondent willing to pay more money for certified seafood product, and the variable X_{ij} represents the different attributes affecting the household's choice to purchase certified seafood. X_{ij} consists of variables such as gender, main buyer, high price accepter, senior and children in household, education, occupation, average monthly income etc. The Logit model for calculate the probability of $Y_i=1$ can be expressed as follows:

$$P_i = F\left(\alpha + \sum_{j=1}^{k} \beta X_i\right) = \left(\frac{Exp\,(I_i)}{1 + Exp\,(I_i)}\right) \qquad (2)$$

where $I_i = F\left(\alpha + \sum_{j=1}^{k} \beta X_i\right)$ called the index function.

To calculate the probability of $Y_i=1$ the Logit model can be expressed as:

$$(1 - P_i) = \left(\frac{1}{1 + Exp\,(I_i)}\right) \qquad (3)$$

The parameters α and β of the Logit model was estimated by maximum likelihood estimation (MLE), then, the likelihood function has the form

$$L = \Pr ob(Y_1 = y_1, Y_2 = y_2 ...... Y_n = y_n)$$

$$= \prod_{y_i=1}\left(\frac{Exp(I_i)}{1 + Exp(I_i)}\right) \prod_{y_i=0}\left(\frac{1}{1 + Exp(I_i)}\right) \quad (4)$$

Log-likelihood function can be derive as

$$\log L = \sum_{i=1}^{n_i} \log\left(\frac{Exp(I_i)}{1 + Exp(I_i)}\right) + \sum_{i=n_1+1}^{N} \log\left(\frac{1}{1 + Exp(I_i)}\right) \quad (5)$$

To obtain the slope estimators $\hat{\alpha}$ and $\hat{\beta}$, we differentiate *log L* with respect to

α and β, then set the results equal to zero.

$$\frac{\partial(\log L)}{\partial \alpha} = 0$$

$$\frac{\partial(\log L)}{\partial \beta} = 0$$

We can obtain the vector of $\hat{\alpha}$ and $\hat{\beta}$, which is the maximum likelihood estimator. The candidates for independent variables in the model are described on Table 2. The most obvious characteristic of the explanatory variables in this study is that are all themselves binary variables. According to the statistical estimation process established in previous section, we intend to analyze the factors that affect consumers' choice of seafood HACCP support. SPSS and SHAZAM statistical programs are used to operate all the computational procedures in this study (White, 1996).

Table 2. Definition of independent variables

Independent variable	Description 1	0	Mean
GEN	If female	If male	0.5106
SHS	If Seafood HACCP supporter	Otherwise	0.9396
HPA	If higher price accepter	Otherwise	0.8248
MBH	If main buyer in household	Otherwise	0.4773
CHI	If under 15 year old children in household	Otherwise	0.5770
SEN	If above 65 year old senior in household	Otherwise	0.4804
GED	If Junior High education level and below	Otherwise	0.0544
MED	If Senior High and vocational education level	Otherwise	0.2326
HED	If Junior College education level and above	Otherwise	0.7221
GAI	If household monthly average income in scope of 0 to NT 39999	Otherwise	0.2779
MAI	If household monthly average income in scope of NT 40000 to NT 79999	Otherwise	0.3656
HAI	If average income monthly in household at range NT 80000 and above	Otherwise	0.3565
NTW	If respondent live in North Taiwan	Otherwise	0.4109
MTW	If respondent live in Middle Taiwan	Otherwise	0.1631
STW	If respondent live in South Taiwan	Otherwise	0.2991
ETW	If respondent live in Eastern Taiwan	Otherwise	0.0755
OST	If respondent live in Off-shore island	Otherwise	0.0514
OCA	If respondent is employed as agriculture, forest, fishery or husbandry	Otherwise	0.2145
OCI	If respondent is employed as industry, business or service industry	Otherwise	0.2628
OCM	If respondent is employed as military, public or teaching	Otherwise	0.2477
OCF	If respondent is employed as a freeman	Otherwise	0.1118
OCP	If respondent is employed as a professional	Otherwise	0.0302
OCS	If respondent is employed as a student	Otherwise	0.0937
EPH	If respondent consider home for first seafood eating place	Otherwise	0.7372
EPR	If respondent consider restaurant for first seafood eating place	Otherwise	0.0967
CAC	If the most care of catch timing when seafood buying	Otherwise	0.0997
CAQ	If the most care of quality when seafood buying	Otherwise	0.6405
BPT	If respondent prefer traditional market when seafood buying	Otherwise	0.5982
BPF	If respondent prefer fishery market when seafood buying	Otherwise	0.1329
BPS	If respondent prefer super market when seafood buying	Otherwise	0.1178
EFV	If respondent eating seafood more than six times a week	Otherwise	0.2810
BFV	If respondent buying seafood more than six times a week	Otherwise	0.0846

V. Model Specification and Results

We used hypothesis tests to determine the combination of explanatory variables that determines the dependent variable with the highest likelihood. The results show that "GEN","MPH" and "EPH" as an attribute, has a statistically significant t-ratio under several different combinations of explanatory variables. It explained that consumers' info-selected preference was different by the characteristic of consumer that fits our expectations. In order to detect further results for useful information, we improve the model by changing dependant variable from "choice of certified seafood" where all attributes are explanatory variables into "Yes for seafood HACCP support". The meaning behind this change is slightly different because choice of certified seafood assumes that consumers who are interested in certified products could have more concerns about health risk perhaps they may not support seafood HACCP, which results from food safety issue. Following this assumption, by observing consumers' characteristic, we can demonstrate that consumers' perceptions about food safety have impacts on their seafood consumption choices.

The theoretical framework illustrated as the formula below:

Seafood HACCP support = (Attributes of Good, Perception of Consumers, Demographic characteristics)

y* = 1 if consumer support seafood HACCP
y* = 0 if consumer did not support seafood HACCP

We also replace each single independent variable by "multiple independent variables" which represent interactive terms by multiplying variables by pair. The meaning of this procedure is to impose and intensify explanatory abilities of variables. The model is improved as:

$$Y^* = \beta_i X_i^{'} + \beta_j V_j + e$$
$$V_j = \sum_i \sum_j X_i X_j$$

Where Y* = consumer support seafood HACCP, X_i represents main effect, and X_j = perception and demographic variables. V_i represent interaction terms. The interactive explanatory variables are showed in table 3. For goodness-of-fit of the model, we tested predictive abilities of variables by hypothesizing:

H_o: $\beta_2 = \beta_3 = \dots\dots = \beta_{35} = 0$

H_a: at least one parameter not equal to zero

Calculate likelihood ratio test: $-2(\ln L_r - \ln L_u) \sim X^2_{df}$, we have $255.834 > X^2_{35,0.95} = 22.4650$. We can say this model effectively explains the factors, which affect support for seafood HACCP.

Table 3. Combination of interactive explanatory variables

Code	Interactive term	Description
I-11	GEN*GAI	Interaction of female consumer and who with lower level average income
I-12	GEN*HAI	Interaction of female consumer and who with higher level average income
I-13	GEN*HED	Interaction of female consumer and who with higher education level
I-14	GEN*GED	Interaction of female consumer and who with general education level
I-15	GEN*NTW	Interaction of female consumer and who live in north Taiwan
I-16	GEN*STW	Interaction of female consumer and who live in south Taiwan
I-17	GEN*BPT	Interaction of female consumer and who prefer buying seafood in traditional market
I-18	GEN*BPS	Interaction of female consumer and who prefer buying seafood in supermarket
I-19	GEN*OCI	Interaction of female consumer and who employed as Industry, business or service industry
I-10	GEN*OCM	Interaction of female consumer and employed as Military, public or teaching
I-21	MBH* GAI	Interaction of main buyer in household and who with lower level average income
I-22	MBH* HAI	Interaction of main buyer in household and who with higher level average income
I-23	MBH* HED	Interaction of main buyer in household and who with higher education level
I-24	MBH* GED	Interaction of main buyer in household and who with lower education level
I-25	MBH* NTW	Interaction of main buyer in household and who live in north Taiwan
I-26	MBH* STW	Interaction of main buyer in household and who live in south Taiwan
I-27	MBH* BPT	Interaction of main buyer in household and who prefer buying seafood in traditional market
I-28	MBH* BPS	Interaction of main buyer in household and who prefer buying seafood in supermarket
I-29	MBH* OCI	Interaction of main buyer in household and who employed as Industry, business or service industry
I-20	MBH* OCM	Interaction of main buyer in household employed as Military, public or teaching
I-41	EPH* GAI	Interaction of prefer seafood eating at home and lower average income
I-42	EPH* HAI	Interaction of prefer seafood eating at home and higher average income
I-43	EPH* HED	Interaction of prefer seafood eating at home and higher educational level
I-44	EPH* GED	Interaction of prefer seafood eating at home and lower educational level
I-45	EPH* NTW	Interaction of prefer seafood eating at home and live in north Taiwan
I-46	EPH* STW	Interaction of prefer seafood eating at home and live in south Taiwan
I-47	EPH* BPT	Interaction of prefer seafood eating at home and prefer seafood buying in traditional market
I-48	EPH* BPS	Interaction of prefer seafood eating at home and prefer seafood buying in supermarket
I-49	EPH* OCI	Interaction of prefer seafood eating at home and employed as Industry, business or service industry
I-40	EPH* OCM	Interaction of prefer seafood eating at home and employed as Military, public or teaching
I-51	EPH*EFV	Interaction of consumer prefer seafood eating at home and who eat seafood very often
I-52	EPH*CHI	Interaction of consumer prefer seafood eating at home and who have under 15 year old children in household
I-53	EPH*CAQ	Interaction of consumer prefer seafood eating at home and who with most quality concern
I-54	EPH*SEN	Interaction of prefer seafood eating at home and have above 65 year old senior in household
I-55	BFV*CAQ	Interaction of consumer buying seafood very often and who with most seafood quality concern

The results of the regression estimation are presented in Table 4. In interaction effect parts, we analyzed interactive terms that affected consumers' support for seafood HACCP, and have the following findings:

Table 4.　Estimation results

| Code | Logit model | | |
	Estimated coefficient	Standard error	t-ratio
I-11	0.162	0.053	2.983**
I-12	0.009	0.055	0.172
I-13	-0.108	0.054	-1.976
I-14	0.026	0.055	0.464
I-15	0.019	0.055	0.348
I-16	-0.034	0.055	-0.610
I-17	0.060	0.055	1.099
I-18	-0.111	0.053	-2.203*
I-19	0.173	0.053	3.181**
I-10	-0.222	0.052	-4.132**
I-21	-0.026	0.055	-0.469
I-22	0.021	0.055	0.383
I-23	-0.042	0.055	-0.756
I-24	0.040	0.055	0.719
I-25	-0.024	0.055	-0.428
I-26	0.049	0.055	0.898
I-27	0.031	0.055	0.557
I-28	0.026	0.055	0.471
I-29	0.020	0.055	0.367
I-20	0.040	0.055	0.727
I-41	-0.074	0.057	-1.343
I-42	0.015	0.055	0.264
I-43	-0.141	0.049	-2.577*
I-44	0.023	0.051	0.421
I-45	0.038	0.054	0.695
I-46	0.015	0.055	0.278
I-47	0.155	0.056	2.838**
I-48	-0.059	0.058	-1.063
I-49	-0.018	0.056	-0.320
I-40	-0.007	0.055	-0.129
I-51	0.204	0.044	3.779**
I-52	0.187	0.054	3.456**
I-53	0.110	0.056	2.016*
I-54	0.121	0.054	2.207*
I-55	-0.142	0.057	-2.600**

Note: * and** represents 1% and 5% significant level respectively.

Variable "GEN*GAI", respondents is female and who with lower level average income, respondents would be more likely to support seafood HACCP. Variable "GEN*BPS"; female consumer and who prefer buying seafood in supermarket, also support seafood HACCP. "GEN*OCI" and "GEN*OCM", female consumer and who employed as Industry, business or service industry and employed as Military, public or teaching, this outcome seems to imply that consumers' support for seafood HACCP with different occupation of consumer. Respondents prefer seafood eating at home and

prefer seafood buying in traditional market would like to support seafood from variables" EPH* BPT". "EPH*EFV", consumer prefer seafood eating at home and eat seafood very often. Moreover, respondent who have children (EPH*CHI) and senior (EPH*SEN) in household would pay more attention about seafood safety. Consumer prefer seafood eating at home and who with most seafood quality concern (EPH*CAQ) then buying seafood very often (BFV*CAQ) would have strong interest with seafood HACCP.

Now we turn into the discussion of variables, which did not affect consumers' support for seafood HACCP. In this model, main buyer in household (MBH) is significant but in the iterative term that does not show a crucial role of consumer's decision for seafood buying. In other words, main buyer mandate the household expenditure in life but not affect by the other consumer characters, that can be said the role of main buyer in household will not directly affect the support for seafood HACCP by different consumer characteristic. Consumer' living experiences, eating habits and individual belief about seafood safety can explain such difference.

. Conclusions

In this paper, we consider factors that induce consumers' willingness to pay for seafood HACCP certificate and the status of HACCP implementation. The empirical results show there are significant differences in perceptions regarding the characteristic of gender, education, income, eating location and buyer. It also implies incentives of guidance and assistance provided by government is needed at initial stage. The most important benefit of applying HACCP is the enhanced ability to retain existing customers. The empirical results indicate that, consumer would like to pay more (average 7.81% of current price) for certified seafood due to safety concerns and time saving, but part of producers worry the increasing cost when apply the HACCP system. A HACCP system that works in practice will depend on the competency of many factors: those who develop it and who operate it, the prerequisite programs that support it, the auditing and verification procedures that assess it and the legislation that support it. Food exporting countries are now inextricable bound to comprehensive HACCP-based food control systems if they are to effectively assure the safety of food in international trade, and the market access requirement of importing countries. Food safety is the "investment of food risk", and must be safe as government's requirement or consumers' demand which push a company to produce safe food business. It remains the primary responsibility of industry to develop, implement of importing and maintain HACCP systems. Furthermore, continuous government effort is need to improve the knowledge base relating to emerging hazards and thereby improve the ability of HACCP plan to meet specific public health goals.

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