

## CONSUMER PREFERENCES FOR ECO-LABELED SEAFOOD IN JAPAN AND THE INFLUENCE OF INFORMATION ON THE PREFERENCES

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### ABSTRACT

In the market development of sustainable seafood, such as MSC-certified products, the Japanese market is one of the most important markets if measured by size: it is the largest seafood importer and the second largest consumer in the world, after China. However, little research has been done on Japanese consumer preferences for ecolabeled seafood. This study investigated potential consumer preferences for MSC products using experimental auctions, a method to create a realistic but controlled purchasing environment, to measure the willingness to pay (WTP) for eco-labels. In our experiment we also added several patterns of information treatments. This was motivated by findings from a previous study showing that Japanese consumers are less aware of the state of world fisheries, and consequently the relevance of eco-labels such as the MSC label. We investigated if and how the provision of information might alter the consumers preferences by providing participants with: 1. no information, 2. information on the MSC program, 3. information on the state of world fisheries, and 4. the combined information. Our analysis found significant differences in bids between labeled and non-labeled products dependent upon information provided. WTP for eco-labeled products given MSC information were not so different from the no information case, but were significantly different when given fishery information and both. Therefore, consumers have a potential to demand MSC products on the condition that they are aware of the necessity for fishery certification together with the meaning of the MSC label.

**Keywords:** eco-label, auction, information treatment, Japanese seafood market, marketing, willingness to pay

### INTRODUCTION

Overfishing has been a serious problem in the global fisheries. At present, 52% of fish species under FAO surveillance are fully exploited and additional catches would become over exploitation. 17% are on the edge of extinction, and 7% are depleted (FAO, 2009). The overfishing has diminished the stock of these species, as a result, Worm et al. (2006) predict that these species will be completely exploited in 2048 if appropriate authority does not take any action. Increasing efforts for fish stock preservation is decreasing over exploitation rates, but 63% of the assessed fish stock still need to be rebuilt (Worm et al., 2009).

Eco-labeling is one method to reduce overfishing, because in order to qualify as eco-labeled seafood, the product must have originated from a sustainable fishery. A sustainable fishery is defined as one that minimizes the environmental impacts from its harvest and has a sustainable level of harvest which is set by the code of conduct for responsible fisheries by FAO (1995). Generally, yields are lower--more conservative--than Maximum Sustainable Yield (MSY) with sufficient stock, and the resource is more effectively managed, as defined by the Marine Stewardship Council (MSC).

If eco-labels lead to a price premium between labeled and non-labeled products, this may create an incentive to fish in a more sustainable way (Gudmundsson and Wessells, 2000). If consumers can reveal their preferences for seafood eco-labels by their purchase of eco-labeled seafood, it will enhance the firm's profit seeking behavior and help the reduction of over fishing toward sustainable markets and management. Therefore, it is critical to know consumers' preferences because consumers will determine the demand in the market, which will in turn influence the sustainability of global seafood supply.

Under the circumstances, the Japanese seafood market has the potential to be influential in solving this problem since it is the largest seafood importing and the second largest seafood consuming country in the world following China, and 30% of the flow of the world's seafood is destined for Japan (FAO, 2006). The MSC has introduced eco-label seafood products to the Japanese seafood market since 2006. However, eco-labeled seafood products are currently not promoted or widely available, and much uncertainty exists about Japanese consumers' preference for eco-labeled seafood products. This study has three main objectives to investigate Japanese consumers' preferences for eco-labeled seafood products;

- (i) To estimate Japanese consumers willingness to pay (WTP) for the eco-label of a certain seafood product

(ii) To test the difference of the WTPs between labeled and non-labeled products at each level of consumers'

awareness of eco-labeling and knowledge around the world fisheries

(iii) To test the difference of WTPs for the eco-label across product types of the same species

The elicitation of the willingness to pay (WTP) for eco-labeled seafood has been studied in different countries including USA, Norway and Japan (Wessells et al. 1999; Johnston et al. 2001; Roheim et al. 2004; Johnston and Roheim 2006; Onozaka et al. 2010). These studies used contingent valuation (CV) methods to measure stated preferences with mail, telephone, and web survey in the hypothetical settings. While the CV method is the most popular tool for the measurement of non-use value, they have some disadvantages to measure the WTP regarding the feature of the sustainable seafood. Eco-labeled seafood consists of both private and public goods attribute. When public goods attribute is combined with private goods, consumers have cognitive difficulty to measure each value and may perceive public goods attribute as private attribute. For instance, seafood eco-label stands only for the improvement of sustainability but consumers may also understand this improvement as the improvement of product's quality. It may lead to an overestimation of the value of eco-labeled seafood (Bougherara and Combris 2009). Although many actions may have been taken to alleviate hypothetical bias the CV method would generate substantial bias, especially when the respondents are not familiar with the value and the products, and when they are not obligated to pay the price they stated (List and Shogren 1999; Murphy et al. 2005). For such goods with novelty and public goods attribute, this study enables us to obtain less biased revealed preferences because the method created an experimental market and obligates people to pay for the goods. Therefore, the first objective is to obtain the WTP for eco-labels in the non-hypothetical setting by the demand revealing method.

Complementary information about seafood eco-labeling is necessary when they are not aware of the necessity of eco-labeling. Lack of Japanese consumers' knowledge of eco-labeling and/or the status of the world fisheries was found by Onozaka et al (2010). Based on their findings, this study created four information treatment sets; (1) consumers are not given any information, (2) consumers are all given the information of seafood eco-labeling, (3) consumers are all given the information of the present status of the world fishery problems, and (4) consumers are all given both information of seafood eco-labeling and the present status of the world fishery. These information treatments reveal not only present WTP but also potential WTP for eco-labels in the future, which is indispensable information for the future eco-labeled seafood market in Japan. Since these information treatments were given to the people separately in different orders, the order effects and the separation of the information treatments may influence consumers' willingness to pay. Thus, the order effects and the separation effects of the information were tested, respectively.

Johnston et al. (2001) have elicited WTP for seafood eco-labels across countries and species, but not across different product forms (e.g. fillets and roe). Different parts are completely different commodities in the market because its prices, availability and tastes are very different from each other. If the public good value of sustainability is added to the private goods value of commodities, the portion of the value of sustainability is the same across the different types of products because each part comes from one fish. However, the cognitive difficulty, as mentioned above, may change consumers' valuation for the sustainability. In order to test the difference of the value of sustainability across product types, our study uses three different salmon products for comparison. The third objective clarifies this point.

To meet the objectives, we employed an experimental auction method and evaluated consumers' WTP for eco-labels across three different types of salmon products, giving different types of information treatment sets.

## EXPERIMENT

In order to mitigate hypothetical bias, an incentive compatible auction method was employed. This study selected the second price sealed bid auction because this mechanism has a weakly dominant strategy for bidders to reveal truthful bids (Mas-Colell, 1995). In addition, this auction is less biased to elicit the WTP for private goods than other incentive compatible mechanisms (Noussair, et al., 2004; Mas-Colell et al, 1995). A variety of literature has employed this method to measure the product attributes such as food-irradiated products, genetically modified products, and organic products (Fox, et al., 1998; Lusk, et al., 2001; Loureiro, et al., 2002).

### Participants

In this research, the primary seafood shoppers who mainly take charge of their household food

shopping were recruited. This is because the primary seafood shoppers are familiar with food shopping in their daily lives and have experience with the food prices in the supermarket. Thus, it is expected that more realistic evaluation for the products will be realized.

Ten people for each auction, 160 in total, were necessary to obtain results for statistical significance.

Co-op Tokyo<sup>1</sup> assisted recruitment and informed 1700 Co-op members about this research in a Co-op meeting. The advertisement did not mention that this is about eco-labeled seafood research, however mentioned that this is about “seafood shopping research” in order to collect not only people who are interested in environmental problems but also those who may not be as interested. Also for their economic incentive, 5,000 yen was paid for a participation fee combined with round trip transportation fee. As a result, 160 people were recruited. The experiments were implemented in the conference room at the WWF Japan office. One of the biggest differences is the portions of female; 96% are female in the experiment while 50% are in Tokyo. Hence, we showed female statistics in Tokyo except gender and household income. Another substantial disparity between the two statistics is the number of full time workers. Only 1.9% of full time workers are in the experiment while 29% are in Tokyo. One of the reasons is that recruitment was done in Co-op member meetings, but there are few full time workers who attend member meetings. In addition, twelve of the experiments were implemented on weekdays. The housewives, however, enable our auction bids to be more accurate because they are familiar with food shopping in their daily life. In that sense, they are suitable for this research. The other notable difference is that 40% of respondents in total have seen MSC certified eco-label before this experiment, and 26% have seen and bought MSC certified products. This is contrary to our assumption that few consumers would recognize eco-labels. The reason is that Co-op Tokyo, which recruited participants, gave a speech about MSC eco-labeling the year before this research, and some of our participants who often join the activities by Co-op, attended the speech.

### **Products**

There are three products used in the experiments, (1) a piece of vacuum-packed coho salmon fillet (around 150g/ 550 yen at market), (2) a piece of vacuum-packed marinated coho salmon fillet (around 150g/ 428 yen at market), (3) Pink salmon roe (35g / 298 yen at market.) Since eco-labeled products need to be at least the same quality to compete with the other products, it was necessary to ensure that all non-label products are the same in each of the experiments (Roheim and Johnston 2006). The eco-label appeared on one product but not on the other products in order to measure the difference in value between eco-labeled and non-labeled products by letting participants bid on those products. A wholesaler in Tsukiji seafood market with MSC chain of custody certification cooperated with this research and modified their MSC eco-labeled products (salted and marinated salmon fillets) so that the appearance would be exactly the same except for the eco-label. For salmon roe, one supermarket dealing with the MSC eco-labeled salmon roe provided the products. We purchased and processed them so that their appearance would be the exact same except the eco-label. Then we measured the value of the eco-label based on the difference between bids for eco-labeled and non eco-labeled products.

### **Experimental Procedure**

The experiment started by explaining the auction and how to bid in the auction. When the participants bid, they write down their bid in the bidding sheet which was distributed to each participant in advance. The facilitator of this auction collects every participant's sheet and notifies the winner of the auction. After participants learned the flow of the experiment, they joined practice auctions by using candy bars, which allowed participants to become familiar with auctions. To control wealth effects, one binding round was randomly selected after the practice rounds were completed, to decide who would bring the candy bar home. Participants were informed ahead of time that only one out of three in the practice auctions and two out of twelve in the seafood auctions would be selected, and that every round would have an equal probability to be selected. Participants then joined the seafood auctions. Each experiment contained twelve auctions with information provided to respondents at some point during the experiment. Note that both labeled and non-labeled products were auctioned respectively in every round in both auctions with and without information. In order to deal with order effects, the order of products to auction was randomized with all possible combinations

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<sup>1</sup>Co-op Tokyo is a non-profit organization composed by more than one million members and provides various mutual aid services including retailing, joint food purchase and delivery.

both before and after the information treatment sets. Non labeled products are paired with the eco-labeled products in the same product type. The order of paired products was also randomized. After all the auctions were done, we randomly selected two binding auctions and decided the winners who would take the product home<sup>2</sup>. Participants were then asked to fill in the survey, and were paid for their participation.

### Information treatment

There were two different types of information treatments provided to respondents. One information treatment was an explanation about MSC eco-label certification (MSC Information); the other information treatment was the current state of fishery resources, including information on overfishing, stock depletion and illegal fishing (Fishery Information). To test whether the separation of these pieces of information mattered, the approaches to presenting these information treatments to the respondents were twofold: the *simultaneous* treatment and the *sequential* treatment. The former provides MSC Information and Fishery Information simultaneously. This was done in four of the sixteen experiments and the information was given after the sixth auction. The latter provides one of the two information treatments first after the fourth auction, followed by the other information after the eighth auction.

### MSC Information

Producers apply eco-labels to products to tell consumers the specific environmental feature of their products, such as recycle marks.

Seafood eco-labels are applied when the products originate from sustainable fisheries. Sustainable fisheries

use eco-friendly management in order to minimize the impact on the ecosystem and maintain the stock of their target species within the legal framework. The Marine Stewardship Council (MSC) is an international non-profit organization that certifies the eco-labels. MSC was founded in 1997 by a British retailer and the World Wildlife Fund. MSC became independent from any stakeholders in 1999.

MSC has three principles to certify eco-labels: maintenance of sustainable fish stock, minimization of environmental impact and effective management (Marine Stewardship Council 2002).

The certification assessment is not done by MSC, but by the third party which is not related to MSC or any other stakeholders. The assessment is scientific and the results are made publically available to all stakeholders.

An MSC eco-label does not necessarily means products are of good qualities, but just show that the products are sustainable. The purchases of MSC products support the sustainable fisheries, and encourage our seafood consumption in future generations.

A secure system of product distribution prevents not certified and/or illegally caught products from mixing with certified products.

### Fishery Information

FAO reported around 9% of fishery resources in the world are endangered, 18% are overfished, 50% are fully utilized and 27% have abundant stocks in 2006.

Nevertheless, we hardly see seafood shortages at the supermarkets. This is because when there is a shortage of a species in a region, producers substitute the same species from another region or when a species became endangered, producers substitute to abundant species that tastes similar. For example, the stock of pink salmon was low due to overfishing, but supermarkets did not experience a shortage because producers substitute farmed imported pink salmon.

The big obstacles including malfunction of management system, illegal fishing and black market have blocked

proper fishery management. As a result, FAO estimates 30% of fish in the world are illegally caught and some of which enter into Japanese markets.

Japan is the largest seafood importer and the second largest seafood consumer in the world. This market size has

substantial influence on world legal and illegal fisheries.

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<sup>2</sup>If the binding rounds bound the same winner twice, the winner can choose only one product to control wealth effects.

Among the seafood imports to Japan, the third largest import is salmon. The salmon products illegally imported to Japan are estimated at 4 to 7.6 billion yen. When we consider the size of Japanese seafood market, we consume a considerable amount of illegally caught fish.

### Summary Statistics of the Bids

Overall, the bids without information become a sort of base price for each product. The bids with information are categorized into three types. 1) No change 2) Increase 3) Decrease. 1) and 2) mainly happen to eco-labeled products and 1) and 3) mainly happened to non-labeled products. It follows that participants are prone to value labeled products and devalue non-labeled products. The paired t-test and Wilcoxon signed rank test were used to compare the difference of the bids for each information treatment across product types. There is a significant difference at the 10 percent level for every product and information stage except marinated salmon and salmon roe without information. All the labeled products at the stages of “Fishery Information”, “Fishery Information, followed by MSC Information”, and “Both Information” are statistically different from non-labeled products at the 1% significance level.

The average premium without information is 6.4 yen for salted salmon, 2.6 yen for marinated salmon and 5.6 for salmon roe, while the average premium with information: 23.5 yen for salted salmon, 14.5 yen for marinated salmon and 37.9 yen for salmon roe, respectively. When the average price of the bids on non-labeled products is regarded as the base price of each product, the percentages of each premium is 14%, 15% and 16% respectively. Premiums of marinated salmon and salmon roe tend to be higher than that for salted salmon. It is worth testing whether the premium difference between salted salmon and salmon roe is more fundamental, and a function of environmental issues.

### Conceptual Frame work

#### ESTIMATION OF WTP FOR THE ECO-LABEL

In order to model the consumer preference for eco-labeled products, we consider the primary seafood shoppers' utility. Let the individual shopper  $i$ 's indirect utility function be  $v(p, y, q)$  which is gained by  $i$ 's rational utility-maximizing decision (Lusk et al., 2007). The utility  $v$ , consists of the market price  $p$ ,  $i$ 's income  $y$ , and the environmental attribute  $q$ . Two variables,  $I$  and  $X$ , are added to this function where  $I$  is a vector of types of information about fisheries and seafood eco-labeling where  $j = 1, \dots, J$  is the number of types of information and  $X$  is a vector of types of salmon products and  $k = 1, \dots, K$  is the number of types of products. This function can be

expressed by  $v(p, y, q_l, I_j, X_k)$ . This function is composed of a dummy variable of sustainability  $q_l$ , ( $q_l = 1$  if the product is sustainable,  $q_l = 0$  if not).. The utility with sustainable attribute will be indifferent from the utility without sustainable attribute when the WTP for eco-labels is subtracted from the income of the individual  $i$ .

$$v(p, y - WTP_{jk}, q_0, I_j, X_k) = v(p, y, q_1, I_j, X_k)$$

Willingness to pay for eco-labels is derived from the derivative of the utility with respect to  $q$ .

A bid obtained from the second price sealed bid auction elicits participants truthful maximum WTP for

products. Let  $b_{ijk}^l$  be participants  $i$ 's bid for product  $k$ , with information  $j$ , with label attribute  $l$ . The difference in the bids with and without the eco-label in the following equations is the willingness to pay for the eco-label.

$$b_{ijk}^l = f(q_l, I_j, X_k)$$

Assuming the participant  $i$ 's bid function as a linear function, the following equation will allow necessary regression for our model.

$$b_{ijk}^l = \alpha_0 + \alpha_1 q_l + \beta_{1k} X_k + \gamma_{1j} I_j + \gamma_{2j} q_l I_j + \beta_{2k} q_l X_k + \beta_{3jk} I_j X_k + \beta_{4jk} q_l I_j X_k + \varepsilon$$

$\alpha$ s,  $\gamma$ s, and  $\beta$ s are coefficients of each independent variable.  $\varepsilon$  is an error term subject to normal distribution. Each coefficient shows the price premium (yen) for each dummy variable.  $\alpha_1$  shows the price premium for the eco-label without information.  $\beta_2$  is the product  $k$ 's price premium for the eco-label without information.  $\gamma_2$  is the price premium for the eco-label given type  $j$  information.  $\beta_{4jk}$  shows the product  $k$ 's price premium for the eco-label with information  $j$ .  $R_m$  is dummy variables of auction number, which remove the influence

of the order between rounds.

### Variable for Regressions

The random and fixed effects model with robust standard error were employed in this study (Fox et al. 1998; Stock et al. 2006). The model adopted 36 independent variables including 17 interactions terms among the dummy variables for label, product types, and information.

This study regards participants as homogeneous representative agents of Japanese seafood consumers. Thus, we did not include demographic variables and focused in stead on measuring the effects of information on seafood eco-labeling and the present status of world fisheries. Since one participant submitted multiple bids on multiple types of products in one experiment, the bids have heterogeneous characteristics of the individual. Therefore, the data should be dealt with as the panel data, which takes into account heterogeneity of the individual characteristics (Lusk and Shogren 2007). Robust standard error was estimated to treat the heteroscedasticity due to cross sectional characteristics of the data.

**Table 1.**

Model	OLS		Random Effects		R.E. Tobit	
	Coef.	Robust Std.Err.	Coef.	Robust Std.Err.	Coef.	Std.Err.
<b>Variables</b>						
<b>Main Effects</b>						
Constant	***171.89	9.43	***171.94	9.09	***171.86	7.28
Eco-label	5.68	8.36	5.67	5.59	5.86	5.39
MSC Info	*33.62	19.76	-3.68	14.62	-2.81	12.10
Fishery Info	-7.64	20.16	-17.13	14.39	-17.53	12.10
Both Info	-12.53	23.33	-12.52	15.41	-11.42	13.83
Salted salmon	***-19.07	5.25	***-18.73	3.27	***-17.84	4.05
Salmon roe	***45.68	6.71	***45.66	4.46	***45.33	4.06
<b>Label Interactions</b>						
Label with MSC Info	11.17	15.05	11.16	10.39	11.30	10.80
Label with Fishery Info	*27.80	16.45	***27.80	10.41	***30.11	10.69
Label with Both Info	**26.69	11.60	***26.69	7.54	***27.65	7.69
r2	2.02	11.51	1.72	8.08	1.52	8.07
r3	**24.85	11.97	***24.99	8.12	***24.57	8.05
r4	***36.05	12.18	***35.57	8.24	***35.19	8.08
r5	3.65	19.58	21.29	14.28	*20.03	11.13
r6	12.99	19.05	**30.02	13.35	***29.71	11.13
r7	4.12	21.36	21.46	15.01	20.58	12.93
r8	7.92	21.31	*25.26	14.95	*24.07	12.93
r9	35.94	25.39	**35.74	17.06	**34.25	15.55
r10	36.33	25.18	**36.14	16.80	**34.76	15.55
r11	20.15	25.40	19.98	16.83	17.99	15.57
r12	16.12	25.46	15.95	16.77	13.31	15.58

One asterisk, \*, stands for 10% level of significance, two, \*\*, for 5% and three, \*\*\*, for 1% ,

Due to 39 left-censored panel data (i.e. 0 yen bids), the Random Effects Tobit (R.E. Tobit) model was also employed to compare across the models (Wooldridge, 2002).

The bids increased not only with the information treatment, but also with the learning effects over rounds. To illustrate, not only did eco-labeled bids increase as rounds proceeded, but non-labeled bids also increased. Non-labeled bids after the information treatment were expected to be the same or less than the bid at the beginning without information if consumers may be fond of or indifferent to eco-labeled seafood. Twelve dummy variables for respective rounds were introduced to exclude the effect over rounds in order to factor out the learning effects. We also tried other dummy variables for round number, including quadratic function, piecewise linear function and round constants. Although there seems multicollinearity between MSC Information and the learning effects, we obtained consistent results over these models in the information dummies, which is the main focus of

this study. Two participants, having detected in the coefficients and the variances, were removed from the data due to irrelevant bidding.<sup>3</sup>

## RESULTS

In this section, we will show the results of second level interaction models between information and the label dummies, and expand them to third level interaction models by adding product type interaction. Table 1 compares the results of the regressions: ordinary least square (OLS) model, random effects regression model (R.E. Regression), and random effects Tobit model (R.E. Tobit). Two participants are removed from this analysis due to irrelevant bidding.<sup>4</sup> 159 participants (1908 bids) are used for the analyses. We adopted the result of R.E. Tobit model because the data is panel with four percent censored bids<sup>5</sup>. The result of the R.E. Tobit<sup>6</sup> is relatively similar to that of the R.E. Regression.

### WTPs for the products with and without the label at each Information

The first objectives of this research is to estimate Japanese consumers willingness to pay (WTP) for the eco-label of a certain seafood product, shown in Table 2.

**Table 2. WTPs for products at each information level and its price premium for the eco-label**

		marinated	premium
No Info	No Label	172	5.9
	Label	178	
MSC Info	No Label	169	17.2
	Label	186	
Fishery Info	No Label	154	36.0
	Label	190	
Both Info	No Label	160	33.5
	Label	194	

### Hypotheses tests

Graph 1 shows the WTPs for non-labeled marinated salmon and price premiums for eco-labels.

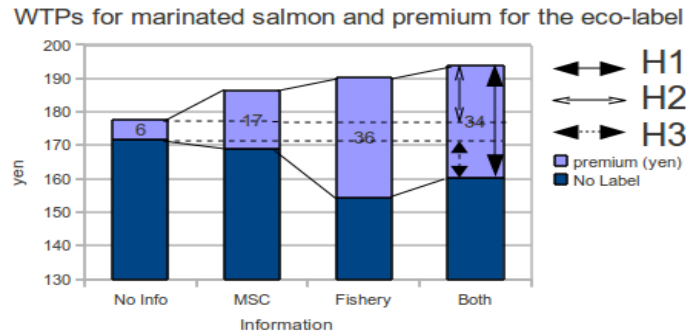
<sup>3</sup>We tested outliers with the outlier diagnosis technique (Belsley 1980). The partial-regression leverage plots method was employed to check if a small group of outliers skewed the regression. Also, outliers might skew the coefficients and/or the variances of the estimates. Two types of the single raw deletion method were employed to test outliers in addition to leverage plots.

<sup>4</sup>ID 21 and ID 126 were removed. ID 21 was removed because she sometime bid and sometime didn't bid on the same types of products, which contradicts the rational behavior of an individual. ID 126 won the auction at the first round, and did not participate in the rest of auction.

<sup>5</sup>We conducted quadrature check since the percentage contribution of variance of the panel level variance component might be large for the panel size (n=159) (Rabe-Hesketh 2002). R.E. tobit model is sensitive to the number of quadrature points in approximation between 6 and 30 points, but become stable after 40 points. Standard error is compared with bootstrapped one, and there is inconsistency between them in the labeled bid with MSC Information as well as r5 through r8 dummies. Since MSC Information treatment is implemented before round 5, there should be confusion between information effect and learning effect. However, all the other standard errors are consistent, we showed the result of normal standard error.

<sup>6</sup>We conducted Hausman test for the difference between the fixed effects and the random effects models. Since the Hausman test shows the difference between the fixed and the random effects is insignificant, the result in the random effects is more efficient than either the fixed effects model or the ordinary least square model. This is based on the assumption that the random effects model is more efficient than fixed effects model when there is no difference in their results (Greene, 2003).

Graph 1.



In order to test the difference of the WTPs between labeled and non-labeled products at each level of information, which is the second objective, we test the following hypotheses H1, H2 and H3 in the Graph 1. H1 tests the difference of the WTPs with and without the label within each information. H2 tests the difference of WTPs for eco-labeled products between the control group (no information) and the treatment groups (with information). H3 test the difference of WTPs for non-labeled products between the control group and the treatment group. The results of these hypotheses are shown in Table 3. The price premiums between labeled and non-labeled products at each information shown in H1 column are compared to the base premium (6 yen) without information treatment. The percentages shown in H2 column is the portions of price premiums between labeled bid with and without information. The percentages shown in H3 column is the portion of price premiums between non labeled bids with and without information.

Table 3. Statistical Test Results in H1, H2 and H3

		H1	H2	H3
No Info	No Label	Base (6 yen)	Base	Base
	Label			
MSC Info	No Label	17 yen	5%	-2%
	Label			
Fishery Info	No Label	**36 yen	7%	-10%
	Label			
Both Info	No Label	** 34 yen	9%	-7%
	Label			

Table 3 shows in significant differences Fishery Information and Both Information in H1 but no significance in H2 and H3. This means the Fishery Information and Both Information significantly influence on the price premium for the eco-label, but premiums are uncertain to increase in labeled bids or decrease in non-labeled bids. When supportive groups for MSC certification advertise Fishery Information or Both Information to consumers, the consumers' WTPs for eco-labels will increase by nineteen to twenty one percents, but it is uncertain that the consumers pay more premium for labeled products, or pay less for non-labeled products. Also since test in H1 did not reject the difference of WTPs of labeled and non-labeled products with MSC Information, MSC Information does not significantly influence on the consumers' WTP for eco-labels.

### Premiums across Product Types

The third objective of this research is to test the difference of WTPs for the eco-labels across product types of the same species. We expand the previous model with second level interaction (label and information) to that with third level interaction (label, information and product types). The test of differences between those two models rejected the null hypothesis that both models equally explain the model. So we examine the results with product interaction in this paragraph. The results are shown in Table 4.

Table 4. The Result of Random Effects Tobit Model



Model		R.E. Tobit			
Variables	Coeff.	Std. Err.	Variables	Coeff.	Std. Err.
<b>Main Effects</b>					
Constant	***166.81	8.59			
Eco-label	4.44	9.27	Label Roe with MSC Info	1.96	26.15
MSC Info	5.03	15.95	Roe with MSC Info	-5.80	18.77
Fishery Info	-25.35	16.15	Label Roe with Fishery Info	-14.83	26.21
Both Info	1.49	15.71	Roe with Fishery Info	1.78	18.91
Salted salmon	-14.72	9.38	Label Roe with Both Info	16.75	18.88
Salmon roe	***56.02	9.52	Roe with Both Info	***-34.91	13.57
<b>Label Interactions</b>					
Label with MSC Info	10.22	18.46	<b>Round Number Dummies</b>		
Label with Fishery Info	*36.32	18.59	r2	1.52	8.14
Label with Both Info	**26.78	13.28	r3	***25.05	8.08
Labeled Salted	3.33	13.10	r4	***35.66	8.05
Labeled Roe	0.93	13.40	r5	**22.26	11.15
<b>Product type interactions</b>					
Label salted with MSC Info	1.44	26.51	r6	***32.03	11.11
Salted with MSC Info	-26.60	19.11	r7	*23.66	12.90
Label Salted with Fishery Info	-3.57	26.10	r8	**26.34	12.91
Salted with Fishery Info	14.42	18.91	r9	**33.14	15.52
Label Salted with Both Info	-12.83	18.66	r10	**34.66	15.52
Salted with Both Info	-2.44	13.39	r11	15.63	15.55
			r12	14.29	15.55

### WTPs for each type of products at each Information

In the result obtained, we estimated the WTPs for each product were shown in Table 5, which is the first objective. The differences of the WTPs between labeled and non-labeled products at each information level are shown in Table 6, which also tests the differences of the WTPs between labeled and non-labeled products at each information level. Every WTP for eco-labeled product at Fishery Information and Both Information is significantly different from that for non-labeled. This is consistent with the result of second level interaction. The differences of the price premiums across the product types are not significant in MSC and Fishery Information. In Both Information, however, premiums across the product types are significantly different except salted and marinated salmon. Some price premiums in Fishery Information are higher than those in Both Information, but they have no statistical differences.

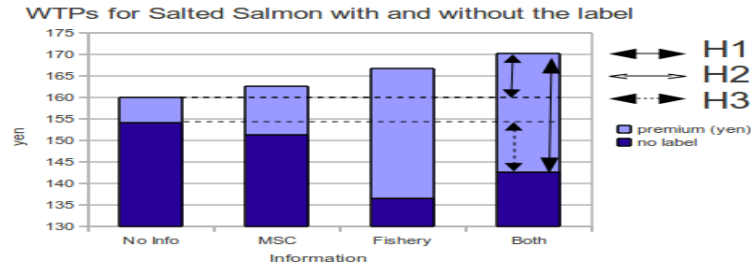
**Table 5. The WTPs for Each Product**

	salted	marinated	roe
No info	7.8	4.4	5.4
MSC	19.4	14.7	17.6
Fishery	**40.5	**40.8	*26.9
Both	**21.7	***31.2	***48.9

**Table 6. Price Premiums with and without Label**

		salted	marinate	roe
No info	no label	152.1	166.8	222.8
	label	159.9	171.3	228.2
msc	no label	130.5	171.8	222.1
	label	150.0	186.5	239.6
fishery	no label	141.2	141.5	199.3
	label	181.7	182.2	226.1
both	no label	151.1	168.3	189.4
	label	172.9	199.5	238.3

**The differences of the WTPs between labeled and non-labeled products at each level of information treatment**  
 Graph 2. WTP for Salted Salmon with and without the label



Graph 2 shows the WTP for non-labeled marinated salmon with price premium for eco-labels. The arrows H1, H2, and H3 show the same hypotheses as those in the second level interaction but product interaction.

**Table 7. Price Premiums for the Eco-labels between Control and Treatment Group (H1)**

	salted	marinated	roe
noinfo	(Base) 7.8	(Base) 4.4	(Base) 5.4
msc	19.4	14.7	17.6
fishery	40.5	**40.8	26.9
both	21.7	31.2	***48.9

Table 7 shows the test results of H1, the difference of the WTPs with and without the label within each information. Unlike two level interaction model, only a price premium of marinated salmon with Fishery Information and a price premium of salmon roe with Both Information are significantly different from base premiums. There is no significant difference between Fishery Information and Both Information. For the product type difference, there is no significant difference among products in Fishery Information, but in Both Information, the premiums of all types of products are significantly different except salted and marinated salmon. Unlike the results in the second level interaction model, not all the premiums in Fishery and Both Information are significant in this product interaction model. It follows that some of the products would not create significant price premiums even if Fishery or Both Information was given. The differences of the premiums between Fishery Information and Both Information are not significant for each product type as well as the differences between No Information and MSC Information. However, there are some significant differences between No / MSC Information and Fishery / Both Information. A price premium of labeled marinated salmon with Fishery Information is significantly different from that with MSC Information. Also Price premium of salmon roe with Both Information is significantly different from that of MSC and No Information. These results showed that No Information is not significantly different from MSC Information and Fishery Information is not significantly different from Both Information. On the other hands, there are some significant differences between upper two information treatments and lower two treatments.

**Table 8. Percentage Changes in Labeled Bid with and without Information (H2)**

		salted	marinated	roe
No info	no label	Base	Base	Base
msc	no label	-7%	9%	5%
fishery	no label	14%	6%	-1%
both	no label	9%	*17%	5%

**Table 9. Percentage Changes in Unlabeled Bid with and without Information (H3)**

		salted	marinated	roe
No info	no label	Base	Base	Base
msc	no label	-14%	3%	0%
fishery	no label	-7%	-15%	-11%
both	no label	-1%	1%	** -15%

In Table 8, the price premium of marinated salmon with Both Information is significantly different from that without information. The difference between salted salmon and salmon roe is significant, but any other combination has no significant difference from each other. In Table 9, a negative price premium for non-labeled salmon roe with Both Info is significantly different from that without information. For the product type difference, the negative premium of non-labeled salmon roe is significantly different from that of salted salmon. The other combinations are not significant. These results are not consistent with the result in the second level interaction model. Since the third level interaction model splits the products into three types, certain types of products become significant in the third level interaction model. This is because the significant variables in the third level interaction were canceled out by other insignificant variables in the second level interaction. This model ascertains the vectors

of information effects on some products. Since Both Information positively influences on the premium for labeled marinated products, producers with MSC certification will enjoy the profit when consumers became aware of both MSC and Fishery Information. On the contrary, Both Information negatively influence on a premium for non-labeled salmon roe products, producers without MSC certification will have disadvantage when consumers became aware of both MSC and Fishery Information.

### **CONCLUSION**

This study investigated Japanese consumers' preferences for eco-labeled seafood products and found that Tokyo consumers are not as aware of the fishery resource problems. This is not because they are not interested in the problems around fishery management, but because they lack the information. They are not aware of the necessity of eco-labeling. They did not differentiate eco-labeled products from non-labeled products without any information or with information only pertaining to what the MSC program was about. In other words, if consumers did not understand that global fish stocks were either overfished to some extent, or were otherwise in danger, then knowing what the MSC program was about did not affect their willingness to pay a premium for eco-labeled products. On the contrary, if consumers became aware of the present status of the world fisheries, then consumers valued the eco-labeled products and devaluated non-labeled products. If consumers were aware of MSC program as well as present status of world fisheries, then consumers differentiate eco-labeled products from non-labeled products. This result is consistent with the result by Fox et al. (2002) and Hayes et al. (2002) that negative information dominates positive information. Also the results are endorsed by economics theories such as reference risk, loss aversion, status quo bias, ambiguity aversion and alarmist reactions. The types of products lead consumers to ascertain the direction. However, the influences of information on the premiums depend on the types products. The participants given Fishery Information became to pay positive premiums for eco-labeled marinated salmon product and the participants given Both Information became to pay negative premiums for non-labeled salmon roe products. Forty percents of participants who are aware of what the MSC certification was about could choose MSC labeled products even when they were given only Fishery Information, but others who were not aware of the detail of certification tended to devalue non-labeled products as a solution to the overfishing and illegal fishing problems.

Information regarding what the MSC label actually conveys (MSC Information) was not significantly related to the eco-labeled product's bid. It follows that information regarding fisheries status (Fishery Information) is the most influential information for respondents positively and negatively.

Some price premiums for eco-labels vary across the types of product even within the same species. This contradicts that the value of sustainability is public goods and should retain the same value for each product within the same species. Thus, the public goods value of sustainability may be confused with private goods value among consumers. This fact motivates fisheries to qualify species with higher values to obtain higher price premium for eco-labels.

The strategy to promote eco-labeling is to educate people how the present fishery resources are in a serious situation and need immediate treatment rather than promoting the existence of eco-label. If people are not aware of eco-labeling, they may not look for (or be able to interpret) eco-labels when they are making seafood purchases. In this case, Fishery Information would lead them to devalue overfished or illegally caught fish. However, consumers have to collect the information about endangered species and where overfishing happens by their own efforts, which is strenuous work for them. The most efficient way of promotion is to let the people know the minimum amount of information regarding eco-labels and focus primarily on information about fishery problems. If people are aware of the major problems facing fisheries, just the existence of eco-labels is enough for them to pay a premium for eco-labeled products versus non-labeled products.

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