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# Willingness to Pay for Multiple Seafood Labels in a Niche Market

Robert Fonner, *The University of New Mexico*; Gil Sylvia, *Oregon State University*

## Abstract

Regulatory requirements and shifts in consumer preferences have resulted in seafood products bearing multiple information labels. Developing successful seafood marketing strategies requires an understanding of how multilabeled products influence consumer choices. This paper analyzes preferences for four classes of seafood information labels including safety, quality, local, and ecolabels using data from a choice experiment for two species of seafood. The data was collected at a grocery chain focused on niche markets in Portland, Oregon. Each label is found to have a significant influence on consumer choice, with local labels and ecolabels yielding the largest estimates of consumer mean willingness to pay. Ecolabels yield a wider range of individual willingness to pay estimates compared to the other labels, and preferences for the local label are not affected by the appearance of additional information labels on the same product. Results of the study suggest opportunities for advancing niche market strategies, including the development of local seafood labeling programs.

**Key words:** Seafood, local labeling, ecolabel, choice experiment, salmon, crab .

**JEL Codes:** Q22, Q51

## **Introduction**

Over the past 20 years, seafood consumers have been provided increasing amounts of product information at the point of purchase. Regulations are partly responsible, as “country of origin” (COOL) and “previously frozen” labeling are now a legal requirement for seafood sold in the United States (Thompson, Sylvia, and Morrissey 2005). Ecolabels that display environmental impact and sustainability information are not mandated but are the subject of growing interest and market use. As of April 2012, the Marine Stewardship Council’s (MSCs) sustainability ecolabel appeared on 14,700 products in 84 countries and now is supported by some of the world’s largest retailers, including Wal-Mart (MSC 2012). Ecolabels offer a means of promoting sustainable fishery practices and increasing the value of sustainable seafood products. Ecolabels also are found on aquaculture products. As of September 2013, the Aquaculture Stewardship Council (ASC) had certified 541 products from 230 suppliers in 24 countries (ASC 2013). Organic labeling for aquaculture products is currently under review by the U.S. Department of Agriculture, representing an additional class of labels that consumers may need to evaluate (Wright 2012). Increasingly, information about geographic harvest location is being provided to seafood consumers. Seafood from a particular region, ocean, river, port, or state can be associated with desirable product characteristics. For example, the producers of Copper River Salmon from Alaska have developed a regional brand for producing high-quality seafood (USNPS 2013). Additionally, seafood harvested in a geographic area considered to be “local” may represent freshness, environmental stewardship, and support for regional maritime economies (Campbell et al. 2014). However, the concept of local seafood is less well defined, posing a challenge for developing local seafood information and branding strategies. With an increasing number of labels describing seafood products, research is needed on consumer preferences for labeling in the presence of multiple labels. Few studies have evaluated consumer preferences for information labels on wild-caught seafood in the context of multiple labels which represent different classes of information. Similarly, few prior studies analyze preferences for local labels on wild-caught seafood products, despite rising consumer

awareness of the origins of their food and increased support of local food systems. Understanding seafood label preferences in a multilabel context is valuable for developing marketing strategies among all market channel members and is of particular value to local fishers, seafood organizations, and seafood businesses looking to increase profits, expand business opportunities, or reduce marketing risks.

This paper evaluates consumer preferences for seafood information labels in the context of multilabeled products using data from a choice experiment conducted at a grocery store chain in the metropolitan Portland, Oregon area of the United States. The experiment asked respondents to make choices between hypothetical, paired seafood products bearing combinations of four distinct information labels. Particular attention is paid to local seafood label preferences in light of growing interest and demand for local food. The econometric analysis tests for label preference homogeneity across seafood species and, for each information label, examines the influence of behavioral and demographic characteristics on preferences. Mean willingness to pay (WTP) in the sample is reported for each label and seafood species. Preference heterogeneity for the local label also is explored with respect to the number of additional information labels appearing on a product.

## **Background**

### *The Role of Seafood in the Local Food Movement*

Popular culture, published literature, and marketplace behavior provide evidence of growing consumer interest in the origin of their food in general (Pollan 2006, Kenner et al. 2009, Kingsolver, Kingsolver, and Hopp 2009, Smith and MacKinnon 2007) and seafood in particular (Greenberg 2010). In 2013, there were 8,144 farmers markets in the United States, up 3.6% from the previous year and 188% since 2000 (USDA 2013). Between 1997 and 2007, direct farm sales increased by 59% in the United States (Timmons and Wang 2010). A 2010 survey of chefs belonging to the American Culinary Federation ranked local meat and seafood as the second hottest food trend next to local produce (Martinez 2010). Interest in local seafood is reflected in the growing popularity of community supported fisheries (CSFs) which was recently listed as

one of the 25 “top food trends” of 2012 (Campbell et al. 2014). CSFs, which are analogous to community-supported agriculture (CSAs) programs, provide consumers with the opportunity to buy a fixed weight share of seafood from fishers. According to one study, CSFs provide a number of benefits to consumers and to fishers. Consumers received access to high-quality products and a connection with the fishers who harvested their seafood. Fishers, in turn, receive a higher ex-vessel price and reduced financial risk through establishment of a steady flow of income (Brinson, Lee, and Rountree 2011). A sample of participants in a North Carolina CSF reported that their primary motivations for participating included access to high-quality seafood (55%), support for local fishers and their communities (22%), and environmental benefits (13%) (Campbell et al. 2014). These results are consistent with findings from the broader food literature which have found that local food purchases are motivated by consumer interest in nutrition, freshness, absence of chemicals, environmental concerns, and support for the local economy (Zepeda and Nie 2012).

Labeling and marketing local seafood products may involve different considerations than for other types of local food. One consideration is that the production of wild-caught seafood may be bounded spatially and temporally in ways that are different than local agriculture due to the location of fishing grounds, impacts of fishery regulation, and movement and migration of wild fish. Given these constraints, the perceived distance definition of local seafood may differ from other types of food. Campbell et al. (2014) report that fish transported 175 miles inland for consumption still is valued by consumers as local seafood, which stands in contrast to the distance definition of local for other foods (Smith and MacKinnon 2007, Adams and Adams 2008). With the continued emergence of local seafood systems, market participants will need to explore an environmentally and socially acceptable distance definition for local seafood.

This discussion suggests that local production may be an attribute of growing importance in seafood markets – especially niche markets. Evaluation of the local attribute, however, must be considered within the broader context of other classes of seafood attributes including safety, quality, and sustainability which

are important to seafood consumers. The next section discusses preferences for these seafood attributes as well as the local attribute.

### *Preferences for Seafood Information Attributes*

Only a few studies have examined consumer preferences for information on the origin of seafood. Jaffry et al. (2004) found that consumers in the United Kingdom preferred domestically caught fish to imported fish. Ropicki, Larkin, and Adams (2010) examined the value of a product integrity label on a restaurant menu guaranteeing “fresh grouper caught in Florida.” Their WTP estimates reflect preferences for locally caught seafood labels confirming species and region. A choice experiment by Rudd, Pelletier, and Tyedmers (2011) examined hypothetical farmed salmon choices. The locally harvested attribute yielded a larger mean WTP than the high omega-3 content and decreased environmental impact attributes. The results also reveal a small segment of consumers who always purchased local regardless of the other attribute levels. Davidson et al. (2012) found that consumers in Hawaii preferred locally grown tilapia and moi aquaculture products compared to equivalent imported products. Similarly, Roheim, Sudhakaran, and Durham (2012) found that 74% of their sample of Rhode Island seafood consumers preferred wild-caught local fish to farmed fish from other states while 48% preferred farmed local shellfish to wild-caught shellfish from other states.

Consumer demand for ecolabels is especially well documented in the economic literature. Teisl, Roe, and Hicks (2002) used market data to show that dolphin-safe labeling influenced consumer purchasing decisions. Specifically, the authors found that implementation of dolphin-safe labeling is associated with increased market share for canned tuna versus substitute meats. Numerous studies analyze ecolabel preferences by providing consumers with choices between alternative hypothetical seafood products that differ according to price, presence of an ecolabel, and other attributes. For example, Wessells, Johnston, and Donath (1999) reported preferences for ecolabels among U.S. consumers based on a survey that differentiated hypothetical seafood choices according to price, ecolabel, and type of certifier. Johnston et al. (2001) examined a similar survey of Norwegian consumers as well as pooled data from the U.S. and

Norwegian studies. Results showed that while preferences differ between Norwegian and US consumers, both sets of consumers were affected by price, species, and certifying agency attributes. A contingent ranking analysis by Johnston and Roheim (2006) evaluated tradeoffs between ecolabels and species. Results indicated that consumers were willing to pay significant amounts for an ecolabel but also suggested that consumers were not willing to sacrifice their most-favored species in order to obtain a less-favored species bearing an ecolabel. Jaffry et al. (2004) investigated consumer preferences for seafood labeling in the United Kingdom, finding that ecolabels had the greatest effect on product choice but that origin and mode of production labels also influenced seafood preferences. A choice experiment conducted by Olesen et al. (2010) evaluated Norwegian choices between hypothetical farmed salmon products differing according to organic production, animal welfare assurances, color, and price. The results showed significant preferences for ecolabels and animal welfare assurances. Using conjoint methods, Roheim, Sudhakaran, and Durham (2012) found that a sample of Rhode Island consumers typically chose wild-caught seafood over farmed seafood, even when the farmed seafood was certified for best agriculture practices. Brécard et al. (2009) found that European consumers supporting ecolabels tended to be young, low-income females. Support for ecolabeling was also found to be associated with other product attributes such as freshness, origin, and production method (i.e., wild-caught versus farmed). A study of French consumers by Salladarre et al. (2010) found that production process attributes such as origin, production method, and the level of natural fish stocks were more strongly associated with demand for ecolabels than product attributes such as freshness and product form. Strong ecolabeling preferences also were found to be associated with younger, more-educated consumers who live in noncoastal areas. Brécard et al. (2012) also studied French consumers and found that strong ecolabel preferences were correlated with young, well-educated males concerned with fishing conditions.

Additional seafood ecolabeling literature investigates actual, rather than hypothetical, seafood consumer behavior. Roheim, Asche, and Insignares Santos (2011) examined whether a price premium actually is being paid for seafood ecolabels using a hedonic pricing model for pollock products constructed

with market data from the United Kingdom. The results showed that a premium of 14.2% was paid for an MSC ecolabel. Hallstein and Villas-Boas (2013) examined how the introduction of an ecolabel and safety advisory program to a San Francisco Bay area supermarket chain influenced sales for various seafood products. The authors found that the introduction of the ecolabeling system led to a statistically significant 15.3% decrease in total seafood sales, driven primarily by a 34.9% decline in sales of products classified as “proceed with caution”. No statistically significant change in sales occurred for the products classified as a “best choice” or “worst choice”. This study highlights the difficulties inherent in developing effective seafood ecolabel systems that benefit consumers, fishers, and the broader public interested in productive and sustainable ecosystems. A detailed review of previous seafood ecolabeling literature is provided by Johnston (2008).

Consumers also are concerned with seafood health risks (for example, mercury, PCBs) and safety assurance labeling is used to satisfy consumers wary of risks while also adding value to products posing no risk. Wessells and Anderson (1995) estimated the value of seafood safety assurances by asking survey respondents to rank a list of various safety assurances and then to specify price premiums beyond a base price for a product carrying their most preferred safety assurance. Results indicated that consumers have clear preferences and will pay a premium for safety assurance. Holland and Wessells (1998) asked respondents to rank fresh salmon product profiles that differ according to production method, safety inspection, certifying agency, and price. Results indicated the strongest preferences were for safety inspection. The importance of seafood product safety is further supported by Rudd, Pelletier, and Tyedmers (2011). Their farmed salmon choice experiment yielded larger mean marginal utility estimates for the reduced PCB concentration attribute compared to the local, low environmental impact and high omega-3 attributes. The study by Brécard et al. (2012) found that seafood health labels are typically found in older, married women with children.

Seafood quality is multidimensional and includes attributes related to safety, freshness, appearance, and taste (Anderson and Anderson 1991). Labels ensuring high quality can serve as a signal of product



quality to seafood consumers. Jaffry et al. (2004) found significant preferences for seafood certified as high quality, though not as strong as preferences for the seafood being caught domestically or sustainability certification. The authors also found stronger preferences for quality labels on canned tuna and cod fillets compared to labels on salmon steaks. In a sample of Belgian consumers, Verbeke, Vermeir, and Brunsø (2007) found that preferences for a quality label were highest among individuals uncertain of their ability to determine seafood quality. Using principal component analysis, Kole et al. (2009) explored which aspects of seafood were of interest to a sample of Dutch consumers in terms of their seafood purchasing decisions. Within the attributes guaranteeing quality, the sample was less interested in quality labels compared to the perceived reliability of the producer and the perceived reliability of the retailer.

## **Experimental Design and Methods**

### *Choice Experiment Design*

Two focus groups were conducted to learn more about seafood labeling preferences for niche market shoppers. Participants were recruited by Oregon State University's Food Innovation Center (FIC) in Portland through the FIC's consumer database and an online Craig's List posting in the Portland miscellaneous jobs section. The FIC consumer database contains information on consumers who had previously participated in FIC events. A cross-section of 12 participants in each focus group was selected based on eating seafood at least three times per month and frequently buying groceries at natural-food stores, specialty shops, or at community co-ops. In an open-group discussion and on a written questionnaire, focus group participants were asked what information they wanted to know about seafood products when making purchasing decisions and how they would prefer to access that information. They also were asked about how they judge seafood product quality. Participants cited sustainability, origin, safety, and quality (as indicated by freshness, smell, and appearance) as the most important determinants of seafood choice, and many participants said they would prefer to receive this information on a label or directly from the vendor. Participants also reported seeking locally harvested seafood because of its quality and as a means of supporting local communities and fishers.

Using the focus-group results as a guide, a choice experiment was developed to investigate consumer preferences for seafood information labels. The information labels, model variables, and label definitions presented to respondents are shown in Table 1.

The choice experiment began by prompting participants to imagine they were shopping for their favorite Northwest seafood (selected in an earlier question) and showing the participant the base market price per pound for that species. Base prices in the experiment approximated the average in-season retail price charged at our survey location. The base prices for Chinook salmon fillets and whole Dungeness crab were \$15/lb. and \$8/lb., respectively. Participants then were asked to make a sequence of choices between paired product profiles. Before making their choices, respondents were told that the two seafood alternatives were identical in appearance, were wild-caught in the United States, and had never been frozen. The two alternative products differed only in price and by the presence or absence of safety, environmental impact, local origin, and quality information labels. Choices, therefore, were made according to the information labels and price. If neither product was satisfactory to participants, they could choose to not make a purchase. The survey presented the experimental design in a random order to avoid ordering bias.

Using the attributes and levels defined in Table 1, a full product profile experiment would include 64 label combinations. To keep the survey brief, a fractional factorial design was used. The experimental design consisted of 16 unique choice treatments. Respondents made eight choices so that two surveys constituted one complete experimental design. A main effects experimental design was generated with the SAS MktEx macro, which searches candidate designs to minimize D-error based on a linear model. A restriction on the search required that all choices contain at least one information attribute. This restriction led to only a small increase in D-error, which was evaluated assuming a main effects model, compared to the unrestricted design. The final design reported D-error equal to .3895. D-efficiency is not reported on a scale of 0-100 due to the multiple restrictions on the design (Kuhfeld 2005).

The label attribute variables were effects-coded so that they equaled 1 if an information label was present and equaled -1 if no information was provided. Effects coding was used in this case because dummy

coding leads to perfect confoundment between label attributes and the opt-out alternative (Ouma, Abdulai, and Drucker 2007).

The niche grocery store chain that participated in the survey served as a particularly good venue since they cater to customers interested in quality products and learning more about the food they eat. Additionally, these stores were willing to participate in the study to support market research and improve their understanding of customer preferences. Site visits to seafood vendors in the sample area revealed that niche market grocery stores charge higher retail prices and offer more labeling information compared to typical supermarkets.

### *Empirical Methods*

Random utility maximization (RUM) provides the standard framework for explaining dominance among paired choices. RUM assumes rationality, implying that individual  $n$  facing choice treatment  $t$  among  $j$  alternatives will choose the alternative yielding the highest utility  $U$ , contingent upon time and budget constraints. The utility that individual  $n$  derives from selecting alternative  $j$  in equation 1 consists of a systematic component associated with product characteristics  $V(\mathbf{x}_{jt}, P_{jt})$  and an unobservable stochastic component  $\varepsilon_{njt}$ . The term  $\mathbf{x}_{jt}$  is a vector of seafood label attributes, and  $P_{jt}$  is seafood price in dollars.

$$U_{njt} = V(\mathbf{x}_{jt}, P_{jt}) + \varepsilon_{njt} ; j = \text{product1, product2, nochoice} ; n = 1, \dots, N ; t = 1, \dots, 16 \quad (1)$$

The parameterized systematic component of seafood choice utility is shown in equation 2. The vector  $\boldsymbol{\beta}_n$  represents the magnitude of utility derived by individual  $n$  from information label attributes. The utility associated with opting out of the choice is represented by the parameter  $\delta$ .

$$V_{njt} = \alpha P_{jt} + \boldsymbol{\beta}_n' \mathbf{x}_{jt} \text{ for } j = \text{product1, product2} ; V_{njt} = \delta \text{ for } j = \text{nochoice}$$

(2)

Conventional multinomial logit models assume that the errors ( $\varepsilon_{njt}$ ) are independently and identically distributed (IID), imposing homogeneous preferences across respondents. This analysis utilizes random

parameter (RP) logit models to accommodate possible IID violations while investigating consumer preference heterogeneity. The RP logit model specifies the utility function in equation 3, allowing utility to differ across the population and maintaining the IID property of  $\varepsilon_{njt}$ .

$$U_{njt} = \alpha P_{jt} + \boldsymbol{\beta}_n' \mathbf{x}_{njt} + \varepsilon_{njt} \quad (3)$$

The elements of random parameter  $\boldsymbol{\beta}_n$  are assumed to be normally distributed. The empirical model produces mean, variance, and covariance estimates for each random parameter which represent estimates of the variation of preferences across the population.

Respondent choices are modeled with two specifications of the RP logit model. The first specification includes only label attributes and prices, and the second specification adds individual respondent information. The price attribute and opt-out parameters ( $\alpha$  and  $\delta$ ) are assumed to be nonrandom in both specifications to focus the analysis on information label preferences. Specifying cost parameters as nonrandom is common in the choice experiment literature because it ensures that the marginal utility of income is positive. This specification also results in WTP distributions that mirror the random parameter distributions (e.g. Hensher and Greene 2003, Revelt and Train 1998). Correlation may exist across choice observations because individual respondents contributed multiple choice observations. Correlation also may exist across the alternatives in a given choice situation. Both model specifications estimate covariance parameters for the random parameters to help address potential correlation in the data. Individual random parameter estimates are given by  $\beta_{kn} = \beta_k + \sum_{j=1}^k \Gamma_{kj} v_{nj}$ ,  $v_{nj} \sim N[0,1]$ , where  $\Gamma$  is the lower triangular matrix that accommodates correlation among the random parameters.

The second specification expands the model to examine relationships between attribute preferences and individual characteristics. Individual random parameters in these models are given by  $\beta_{kn} = \beta_k + \Delta_k' \mathbf{z}_n + \sum_{j=1}^k \Gamma_{kj} v_{nj}$ ,  $v_{nj} \sim N[0,1]$ , where  $\mathbf{z}_n$  is a vector containing individual information for respondent  $n$ . This specification introduces interactions between the mean parameter estimates  $\beta_k$  and respondent characteristics because  $\beta_{kn}$  is multiplied by  $x_{njtk}$  in equation 3. Estimation of these

interaction-term parameters helps evaluate the sources of attribute preference heterogeneity around the mean of a random parameter. The vector  $\mathbf{z}_n$  is defined to include information on respondent age, gender, education, income, seafood consumption, and shopping behavior. For the local label, the vector  $\mathbf{z}_n$  also includes a product-attribute variable equal to the number of additional information labels appearing on a given information label.

Following Hensher, Greene, and Rose (2006), individual WTP estimates are used to derive the distribution of WTP in our sample. Individual WTP estimates are conditional on the choices made by the respondent and are estimated using simulation methods. This Bayesian approach allows information about respondents to serve as input to WTP estimates and helps to mitigate the risk of extreme value estimates.

#### *Data and Variables*

A pre-test of 60 attendees at a seafood and wine festival in Portland allowed for refinements to the survey instrument before the final data was collected. The final surveys were conducted during seventeen, four-hour sessions held at four stores from the same chain across the Portland area. The sessions were spread evenly across the four stores. Three of the stores serve distinct Portland neighborhoods, and the other store is in a nearby suburb. Based on our agreement with the store, shoppers were not approached directly but rather were recruited through visual displays. Surveys were administered at a rate of 7.35 respondents per hour to adult residents from Oregon and southwest Washington. Participants answered questions on laptop computers positioned near the stores' exits. Overall, 500 individuals participated in the survey. Respondents were asked to select their favorite local seafood species from a list and then were asked to make hypothetical purchasing decisions about that species. Choice data was collected for five species: albacore tuna, Chinook salmon, Dover sole, pink shrimp, and Dungeness crab. However, the four Dover sole, 22 pink shrimp, and 32 albacore tuna surveys were dropped from the analysis due to insufficient data. An additional 64 responses were dropped due to incompleteness, leaving 378 surveys that provided useable choice data. The final sample included 282 completed salmon surveys and 96 crab surveys.

The demographic and behavioral characteristic variables constructed to describe respondents in the sample are summarized in Table 2. The indicator variable *DEG* equals one if the respondent earned at least a bachelor's degree and equals zero otherwise. The variable *IN25DN* equals one if a respondent earns under \$25K and equals zero otherwise. The variable *AGE* is reported in years, and the gender variable *FEM* equals one if the respondent is female and equals zero otherwise. Respondent behavioral characteristics were also expected to correlate with preferences for value-added labeling (Zepeda and Li 2006, Zepeda and Nie 2012). The variable *SERVE* equals the number of seafood servings the respondent reported eating per month and represents the consumer's level of seafood consumption and experience with seafood. The variable *NAT* equals one if the respondent selected natural-food stores as the place where they most frequently purchase their seafood from a list of : "at a natural-food store", "at a standard grocery", "at a fish market", and "other". The product attribute variable *NLAB* is equal to the number of additional labels on a product bearing the local label and is included in  $\mathbf{z}_n$  to investigate a possible relationship between local label preferences and the number of information labels on a product.

Participants in the choice experiment represent relatively wealthy, educated, and experienced seafood consumers. The median household income in our sample was approximately \$75,000. This is relatively wealthy compared to the Portland area median household income of \$55,000 (U.S. Census Bureau 2007a). The respondents were also relatively well educated with 72% of participants having obtained a college degree compared to 33% of Portland-area residents (U.S. Census Bureau 2007b). Finally, our sample represents experienced seafood consumers. On average, respondents reported consuming 7.47 6-ounce servings of seafood per month, or approximately 33 pounds per year. This figure was well above the national average of 16.5 pounds of seafood per year (NOAA 2006).

## **Results**

### *Descriptive Analysis of the Choice Data*

Respondent decisions in the choice experiment revealed a segment of consumers with strong local label preferences. A complete choice experiment included 16 specific choice treatments in the specified experimental design. One of these treatments, shown to half of respondents due to the blocked design, compared a product bearing only the local label to a product with the ecolabel and the safety and quality labels. The local-label product was more expensive, with a 7% price premium, compared to a 2% price premium on the multilabeled product. Despite the local-label product being more expensive and bearing fewer labels than the alternative product, 16% (23) of salmon respondents and 19% (9) of crab respondents chose the local-label product. These results suggest that a significant portion of the sample strongly preferred the local label to the other labels. In a similar fashion, other choice treatments in the experiment isolated the safety or quality label on one alternative and offered a less expensive product bearing the other three information labels as the second alternative. No respondent chose the product with the single label in these cases.

#### *Tests for Homogeneity*

In the larger salmon sample, the characteristics of individuals who chose the local product described in the preceding subsection were compared with statistical tests to individuals who chose the cheaper multilabeled product. Specifically, t-tests and chi-squared tests were conducted to compare the two groups according to the individual characteristics in  $\mathbf{z}_n$ . The null hypotheses of mean equivalence and independence (in the t-tests and chi-squared tests respectively) cannot be rejected at the .05 level for all but one test. Respondents who most often purchase their home-prepared seafood at natural-food stores are less likely to hold strong local preferences in the salmon sample.

To test whether label preferences differ across species, the null hypothesis of preference homogeneity between the salmon and crab models was tested using the procedure outlined by Swait and Louviere (1993). The procedure uses a basic log-likelihood ratio test to compare species-specific conditional logit models to pooled models that impose coefficient equality but allow for scale variation

across species. The test statistic is given by  $-2(LL_{pooled} - \sum LL_{species})$  and is chi-squared distributed with degrees of freedom equal to the number of restrictions plus an additional degree of freedom for allowing the scale to vary. The conditional logit salmon and crab models produced log-likelihood values of -2659.78 and -886.60, respectively. The log-likelihood value from the salmon and crab pooled models was -3554.92. The associated chi-squared statistic for the species comparison test was 17.09, and the critical value for the test (d.f.=7) was 14.06 at the .05 significance level. The null hypothesis of preference homogeneity between salmon and crab choices was rejected at the .05 significance level. This result suggests that label preferences differ across seafood species.

### *Choice model results*

Two empirical specifications were estimated separately with the salmon and crab datasets. Estimation was achieved using maximum simulated likelihood with 1,000 random Halton draws. Table 3 contains model results for both specifications and species. Convergence was achieved in all models based on near zero gradients and positive definite estimated hessian matrices at the end of iterations. The variables *ECO*, *LOCAL*, *SAFE*, and *QUAL* are the sustainability, local, safety, and quality labels, respectively. Recall that Specification I includes only the labels and price in its utility specification while Specification II includes labels, price and individual characteristics. Each model explained the choice data reasonably well, given the Pseudo R-squared values above 0.35 across models. No estimated label coefficients were significant in the crab Specification II model. The most likely reason is that the relatively small sample could not support estimation of the 40-plus parameters in Specification II. Specification I is the primary focus for further analysis of the crab choice data.

In the other three models, the estimated mean attribute coefficients were statistically significant at the 95% level across labels, suggesting that each information label had a distinguishable influence on seafood choice. Local and sustainability labels yielded the largest mean marginal utility estimates for both species in Specification I. Safety assurance labels produced the third largest marginal utility estimates in



Specification I for both crab and salmon. Although the quality labels were significant determinants of seafood choice, they produced the lowest label mean marginal utility estimates in both species models. The estimated mean coefficients on the local and ecolabels are about twice the size of those on quality labels in the salmon models.

The Cholesky matrix is a lower triangular matrix constructed so that the Cholesky times its transpose yields the variance covariance matrix. Table 3 includes the estimated Cholesky matrix for the random parameters. The diagonal elements of the estimated Cholesky matrix are significant at the 0.05 level for each random parameter and across specifications, an indication that significant label preference heterogeneity exists in the sampled population. The off-diagonal Cholesky estimates are related to covariance among attribute preferences. The results for Specification I for both species revealed statistically significant relationships between the sustainability and quality attributes but of different signs. The underlying cause of these relationships is unclear, but accommodating for correlation permits a less restrictive model specification.

Specification II assumed that label preferences vary both randomly across the population and according to observed respondent characteristics. Thus, the magnitudes of the estimated label coefficients in these models do not represent estimates of mean marginal utility of labels in the sample. The objective of Specification II was to investigate the sources of label preference heterogeneity. Six variables representing individual respondent characteristics were investigated as potential sources of preference heterogeneity including gender, age, education, household income, seafood consumption, and seafood shopping habits.

Model results from Specification II are summarized in Table 3. Demographic interaction terms in the salmon model reveal patterns between label preferences and respondent demographics. Specifically, the positive and significant interaction between *FEM* and *SAFE* indicates that female respondents are likely to have stronger preferences for safety assurance labeling. The negative and significant *AGE* and *ECO*

interaction indicates that older respondents are likely to have smaller estimated marginal utilities for ecolabels. This result suggests a generational gap related to sustainability preferences in the sample. The salmon demographic model produced a positive and statistically significant term on the interaction between *ECO* and the *DEG*, indicating that respondents with college degrees had stronger preferences for ecolabels. Natural-food store seafood shoppers were associated with stronger preferences for salmon ecolabels. The *ECO* and *SERVE* interaction indicates that higher seafood consumption is associated with weaker ecolabel preferences at the 0.10 significance level.

The insignificance of the *NLAB* interaction with the *LOCAL* parameter indicates a lack of observable *LOCAL* preference heterogeneity associated with the number of information labels appearing on the same product. This result suggests that adding additional information labels to a product did not influence observed preferences for the local label.

#### *Willingness to pay for information labels*

Specification I was used for WTP estimation to facilitate comparison of results across species and labels. Individual WTP was estimated using the Bayesian method of Hensher, Greene, and Rose (2006). This method estimates expected individual WTP, conditional on observed respondent choices. Because the conditional expectation is not of a closed form, individual WTP was estimated using simulation with 1,000 random Halton draws, the same simulation method used for the choice-model estimation.

The individual WTP estimates for each model are presented in Table 4. In the crab and salmon models, respectively, estimated label WTP is highest for ecolabels \$1.88 (26.8%) and \$3.23 (21.6%) and for local labels \$1.91 (27.2%) and \$3.15 (21.0%). There is a wider range in estimated individual WTP for the ecolabel compared to the other information labels. Each model produced some negative individual WTP estimates, as represented by the minimums. Generally, these are outliers, as negative individual WTP values represent less than 5% of the sample for most labels. The exceptions are *ECO* (6.3%) and *QUAL* (7.3%) in

the crab model and *ECO* (5.3%) in the salmon model. Across species models, *ECO* yielded the lowest individual WTP minimums and the highest frequency of negative values of any of the four classes of labels. The ecolabel produced five times the number of negative individual WTP estimates compared to the local label in the salmon models. The minimum and maximum estimated individual WTP values intersect for each attribute within each model, reflecting substantial label preference heterogeneity in the sample. The ecolabel produced the widest range of individual WTP estimates across labels for both crab and salmon.

### **Summary and Discussion**

A choice experiment was conducted at niche market grocery stores in Portland, Oregon, to evaluate consumer preferences for four classes of seafood information labels in situations where products bear multiple labels. The data were tested to evaluate respondent preferences based on demographic and behavioral data. Individual WTP was estimated for each label for each species. In addition, the number of additional labels on a product was examined as a potential source of local-label preference heterogeneity.

The analysis produced findings relevant to developing labeling and marketing strategies. A segment of the sample was found to have strong local-label preferences but these individuals did not tend to purchase the majority of their home-prepared seafood at natural-food stores. In the choice model, the hypothesis of preference homogeneity between species was rejected. Respondent WTP is significant for all four labels but was highest for the local label and the ecolabel across species models. The range of individual WTP estimates for the ecolabel is larger than the range of individual WTP estimates for the other labels. Preferences for ecolabels in the sample were explained by individual characteristics, but that is not true for the local label. Finally, local-labeling preference heterogeneity was not influenced by the appearance of additional information labels across species models.

Figure 1 summarizes sample WTP per pound for a seafood product bearing a single information label. The histogram bars show estimated mean individual WTP in the sample, and the error bars are constructed with the minimum and maximum individual WTP estimates. Interesting patterns emerge from

the results. For example, there is a relatively wider variation in estimated individual WTP for ecolabels compared to the other labels, as evidenced by the higher ratio of standard deviation to mean across models and the wider bounds in the histogram. Estimated WTP for the ecolabel was relatively high for some individuals in the sample but substantially negative for other respondents. The ecolabel had the largest number of individual negative WTP estimates compared to the other information labels. When compared with previous research on the presence of negative WTP for information labels, Zepeda and Leviten-Reid (2004) found only positive attitudes toward local labeling. However, Zepeda (2008) found some cynical attitudes among respondents with respect to organic labeling and suggests it is related to the perceived corporate nature of organic labeling. Our research provides evidence of strong ecolabel preferences in a segment of the sample associated with not purchasing seafood primarily at natural-food stores. Another segment is found to hold negative and possibly cynical attitudes toward seafood ecolabels.

A second pattern in Figure 1 is that the quality label produced the lowest WTP estimates in both species models. This may indicate that quality labeling is a less effective signal of product quality when other indicators are present. In the pre-survey focus groups, consumers consistently reported judging product quality based on appearance, smell, origin, and vendor recommendations. The analysis of Kole et al. (2009) suggests that consumers tend to judge quality based on their perceived reliability of the seafood producer and retailer rather than the presence of quality labels. Jaffry et al. (2004) found stronger preferences for quality labels on less expensive seafood products, perhaps indicating quality labels are more effective when consumers are uncertain about product quality. The products in the choice experiment were all wild-caught and not previously frozen, two signals of product quality (Davidson et al. 2012, Roheim, Sudhakaran, and Durham 2012). In addition, the grocery chain where the surveys were conducted has a strong reputation for food quality. Together, these quality signals may have reduced quality label preferences in the sample. Similarly, the relatively lower WTP for safety assurance labels in our study may reflect that wild-caught salmon and crab are not associated with health risks or consumption advisories on the West Coast.

Label preference heterogeneity was explained by a number of individual characteristics. Stronger ecolabel preferences in the sample were associated with younger, college-educated individuals who eat less seafood than the typical respondent. Unlike local labels, strong ecolabel preferences were associated with respondents who most often purchase their home-prepared seafood at natural-food stores. The associations between ecolabel preferences and demographic characteristics found in this study generally are supported by previous findings in the seafood ecolabeling literature, although the evidence is mixed (see Teisl, Rubin, and Noblet 2008, Johnston et al. 2001, Wessells, Johnston, and Donath 1999, Brécard et al. 2009). This study does suggest that there may be associations between ecolabel preferences, type of seafood vendor, and home consumption patterns that have not been revealed in previous studies. Females in the sample were associated with stronger safety assurance labeling preferences, supporting the findings of Brécard et al. (2009). This result not unexpected given awareness campaigns warning children and pregnant women of potential health risks associated with certain seafood choices.

With seafood products bearing increasing numbers of information labels, a relevant question is whether adding additional information labels to a product significantly reduces the value of existing labels. For example, Barreiro-Hurle, Gracia, and de Magistris (2008) found that multiple competing labels bearing the same or similar information could significantly decrease consumer preferences for a product. This study, which tested labels representing four distinct classes of information, found no evidence that adding additional labels to a product reduced preference for the local label. This result indicates that local seafood labels retain their value in the presence of multiple information labels.

The feasibility of standardized local labeling to support direct marketing or CSF-type fisher-consumer arrangements depends on demand for local seafood attributes. This study represents a step toward understanding the value of multiple seafood labels in general, and locally labeled seafood in particular. The findings indicate that local labels have the potential to add value to seafood, even in the presence of other classes of information labels. Development of local marketing strategies will require collaboration between

fishers and downstream market sectors to effectively convey harvest location, product handling, and other harvesting and fishery information to consumers. There is evidence that local seafood labeling at the regional level can succeed as well as direct marketing strategies including CSFs. Labeling programs for local seafood have been implemented successfully at the county level in North Carolina and Maine (Andreatta, Nash, and Martin 2011), and the website [localcatch.org](http://localcatch.org) now connects consumers to 35 CSFs across the United States ([localcatch.org](http://localcatch.org) 2014).

The species of seafood presented to niche market shoppers in the choice experiment was the species they selected from a list of five species as their favorite type of Northwest seafood. This produced a stratified sample so that respondents made choices between seafood products that were desirable to them. While the general results of this survey are applicable to niche seafood markets, results produced from this sample cannot be applied to the general population.

Additional research is needed to investigate how consumers react when faced with multiple seafood product labels. For example, although our study did not find evidence of reduced WTP in the face of multiple labels, there may be threshold effects when additional labels become redundant, confusing, or tedious for consumers. Additional research should evaluate the formation of consumer decision rules in the face of multiple or overlapping labels. Our findings also suggest that the value of the quality label is tied to consumer perceptions about the seafood vendor. Ecolabel and local-label preferences are also found to be associated with the choice of vendor. Future research could focus on better understanding the relationship between vendor reputation, seafood vendor choice, and label preferences. Additional studies could also expand on the sampled population by comparing niche food market shoppers with shoppers at more traditional food and grocery outlets or comparing populations across wider geographic regions. Prospective research efforts also could focus on county-based, port-based, or body of water-based local labels. The question of how the value of local seafood labels decays with transport distance is another topic of potential interest.

## References

- Adams, D. C., and A. E. Adams. 2008. Availability, Attitudes and Willingness to Pay for Local Foods: Results of a Preliminary Survey. Paper presented at the 2008 American Agricultural Economics Association Annual Meeting, July 27-29, Orlando, Fla.
- Anderson, J. G., and J. L. Anderson. 1991. Seafood Quality: Issues for Consumer Researchers. *Journal of Consumer Affairs* 25(1):144-63.
- Andreatta, S., B. Nash, and G. B. Martin. 2011. Carteret Catch™: Raising Awareness of Local Seafood through Community and Business Partnerships. *Human Organization* 70(3):279-88.
- ASC (Aquaculture Stewardship Council). 2013. Aquaculture Stewardship Council in numbers 2013, <http://www.asc-aqua.org/upload/Dashboard%20September%202013.pdf>.
- Barreiro-Hurle, J., A. Gracia, and T. de Magistris. 2008. When more is less: the effect of multiple health and nutritional labels in food product choice. Paper presented at the 2008 International Congress, August 26-29, Ghent, Belgium.
- Brécard, D., B. Hlaimi, S. Lucas, Y. Perraudeau, and F. Salladarré. 2009. Determinants of Demand for Green Products: An Application to Ecolabel Demand for Fish in Europe. *Ecological Economics* 69(1):115-25.
- Brécard, D., S. Lucas, N. Pichot, and F. Salladarré. 2012. Consumer Preferences for Eco, Health and Fair Trade Labels. An Application to Seafood Product in France. *Journal of Agricultural & Food Industrial Organization* 10(1):1-32.
- Brinson, A., M. Lee, and B. Rountree. 2011. Direct Marketing Strategies: The Rise of Community Supported Fishery Programs. *Marine Policy* 35(4):542-48.
- Campbell, L. M., N. Boucquey, J. Stoll, H. Coppola, and M. D. Smith. 2014. From Vegetable Box to Seafood Cooler: Applying the Community-Supported Agriculture Model to Fisheries. *Society & Natural Resources* (ahead-of-print):1-19.

- Davidson, K., M. Pan, W. Hu, and D. Poerwanto. 2012. Consumers' Willingness to Pay for Aquaculture Fish Products vs. Wild-caught Seafood—A Case Study in Hawaii. *Aquaculture Economics & Management* no. 16(2):136-54.
- Greenberg, P. 2010. *Four Fish: The Future of the Last Wild Food*. New York, NY: Penguin.
- Hallstein, E., and S. B. Villas-Boas. 2013. Can Household Consumers Save the Wild Fish? Lessons from a Sustainable Seafood Advisory. *Journal of Environmental Economics and Management* 66(1):52-71.
- Hensher, D. A., and W. H. Greene. 2003. The Mixed Logit Model: the State of Practice. *Transportation* 30(2):133-76.
- Hensher, D. A., W. H. Greene, and J. M. Rose. 2006. Deriving Willingness-to-Pay estimates of Travel-time Savings from Individual-based Parameters. *Environment and Planning A* 38(12):23-65.
- Holland, D., and C. R. Wessells. 1998. Predicting Consumer Preferences for Fresh Salmon: The Influence of Safety Inspection and Production Method Attributes. *Agricultural and Resource Economics Review* 27:1-14.
- Jaffry, S., H. Pickering, Y. Ghulam, D. Whitmarsh, and P. Wattage. 2004. Consumer Choices for Quality and Sustainability Labelled Seafood Products in the UK. *Food Policy* 29 (3):215-28.
- Johnston, R. 2008. Fish Ecolabels and Consumer Choice: Weighing the Factors. *CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources* 3(26):1-7.
- Johnston, R. J., and C. A. Roheim. 2006. A Battle of Taste and Environmental Convictions for Ecolabeled Seafood: A Contingent Ranking Experiment. *Journal of Agricultural and Resource Economics* 31(2):283-300.
- Johnston, R. J., C. R. Wessells, H. Donath, and F. Asche. 2001. Measuring Consumer Preferences for Ecolabeled Seafood: An International Comparison. *Journal of Agricultural and Resource Economics* 26(1):20-39.



- Kenner, R., R. Pearce, E. Schlosser, M. Robledo, W. Pohlad, J. Skoll, R. Schorr, D. Weyermann, E. Pearlstein, K. Roberts, M. Pollan, G. Hirshberg, J. Salatin, M. Adler. 2009. *Food, Inc.* Los Angeles, CA: Magnolia Home Entertainment.
- Kingsolver, B., C. Kingsolver, and S. L. Hopp. 2009. *Animal, Vegetable, Miracle*. New York, NY: HarperCollins.
- Kole, A. P. W., T. Altintzoglou, R. A. Schelvis-Smit, and J. B. Luten. 2009. The Effects of Different Types of Product Information on the Consumer Product Evaluation for Fresh Cod in Real Life Settings. *Food Quality and Preference* no. 20(3):187-94.
- Kuhfeld, W. F. 2005. *Marketing Research Methods in SAS. Experimental Design, Choice, Conjoint, and Graphical Techniques*. Cary, NC: SAS-Institute TS-722.
- localcatch.org. 2014. Localcatch.org, A network of community supported fisheries, <http://www.localcatch.org/about.html>.
- Martinez, S. 2010. *Local Food Systems; Concepts, Impacts, and Issues*. Washington, DC: DIANE Publishing.
- MSC (Marine Stewardship Council). 2012. Marine Stewardship Council Annual Report 2011/2012. <http://www.msc.org/documents/msc-brochures/annual-report-archive/annual-report-2011-12-english>.
- NOAA (United States National Oceanic and Atmospheric Administration). 2006. Seafood Consumption Increases in 2006. <http://www.publicaffairs.noaa.gov/releases2007/jul07/noaa07-r123.html>.
- Olesen, I., F. Alfnes, M. Røra, and K. Kolstad. 2010. Eliciting Consumers' Willingness to Pay for Organic and Welfare-labeled Salmon in a Non-hypothetical Choice Experiment. *Livestock Science* 127(2-3):218-26.
- Ouma, E., A. Abdulai, and A. Drucker. 2007. Measuring Heterogeneous Preferences for Cattle Traits Among Cattle-keeping Households in East Africa. *American Journal of Agricultural Economics* 89(4):1005-19.

- Pollan, M. 2006. *The Omnivore's Dilemma: A Natural History of Four Meals*, New York, NY: Penguin.
- Revelt, D., and K. Train. 1998. Mixed Logit with Repeated Choices: Households' Choices of Appliance Efficiency Level. *Review of Economics and Statistics* 80(4):647-57.
- Roheim, C.A., F. Asche, and J. Insignares Santos. 2011. The Elusive Price Premium for Ecolabelled Products: Evidence from Seafood in the UK Market. *Journal of Agricultural Economics* 62(3):655-68.
- Roheim, C. A., P. O. Sudhakaran, and C. A. Durham. 2012. Certification of Shrimp and Salmon for Best Aquaculture Practices: Assessing Consumer Preferences in Rhode Island. *Aquaculture Economics & Management* 16(3):266-86.
- Ropicki, A. J., S. L. Larkin, and C. M. Adams. 2010. Seafood Substitution and Mislabeling: WTP for a Locally Caught Grouper Labeling Program in Florida. *Marine Resource Economics* 25(1):77-92.
- Rudd, M. A., N. Pelletier, and P. Tyedmers. 2011. Preferences for Health and Environmental Attributes of Farmed Salmon amongst Southern Ontario Salmon Consumers. *Aquaculture Economics & Management* 15(1):18-45.
- Salladarre, F., P. Guillotreau, Y. Perraudeau, and M. Monfort. 2010. The Demand for Seafood Eco-labels in France. *Journal of Agricultural and Food Industrial Organization* 8 (1). doi: <http://www.bepress.com/jafio/>.
- Smith, A., and J. B. MacKinnon. 2007. *The 100-mile Diet: A Year of Local Eating*. Toronto: Random House Canada.
- Swait, J., and J. Louviere. 1993. The Role of the Scale Parameter in the Estimation and Comparison of Multinomial Logit Models. *Journal of Marketing Research* 30(3):305-14.
- Teisl, M. F., B. Roe, and R. L. Hicks. 2002. Can Eco-labels Tune a Market? Evidence from Dolphin-safe Labeling. *Journal of Environmental Economics and Management* 43(3):339-59.
- Teisl, M. F., J. Rubin, and C. L. Noblet. 2008. Non-dirty Dancing? Interactions between Eco-labels and Consumers. *Journal of Economic Psychology* 29(2):140-59.

- Thompson, M., G. Sylvia, and M. T. Morrissey. 2005. Seafood Traceability in the United States: Current Trends, System Design, and Potential Applications. *Comprehensive Reviews in Food Science and Food Safety* 4(1):1-7.
- Timmons, D., and Q. Wang. 2010. Direct Food Sales in the United States: Evidence from State and County-level Data. *Journal of Sustainable Agriculture* 34(2):229-40.
- United States Census Bureau. 2007a. Portland-Vancouver-Beaverton, OR-WA Metropolitan Statistical Area, S1903. Median Income in the Past 12 Months (In 2007 Inflation-Adjusted Dollars), Data Set: 2007 American Community Survey 1-Year Estimates, Survey: American Community Survey.
- \_\_\_\_\_. 2007b. Portland-Vancouver-Beaverton, OR-WA Metropolitan Statistical Area, DP02. Selected Social Characteristics in the United States, Data Set: 2007 American Community Survey 1-Year Estimates, Survey: American Community Survey.
- USDA (United States Department of Agriculture). 2013. National Count of Farmers Market Directory Listing Graph: 1994-2013.  
<http://www.ams.usda.gov/AMSV1.0/ams.fetchTemplateData.do?template=TemplateS&leftNav=WholesaleandFarmersMarkets&page=WFMFarmersMarketGrowth&description=Farmers%20Market%20Growth>.
- USNPS (United States National Park Service). 2013. Copper River Salmon.  
<http://www.nps.gov/wrst/naturescience/copper-river-salmon.htm>.
- Verbeke, W., I. Vermeir, and K. Brunsø. 2007. Consumer Evaluation of Fish Quality as Basis for Fish Market Segmentation. *Food Quality and Preference* 18(4):651-61.
- Wessells, C. R., R. J. Johnston, and H. Donath. 1999. Assessing Consumer Preferences for Ecolabeled Seafood: The Influence of Species, Certifier, and Household Attributes. *American Journal of Agricultural Economics* 81(5):1084-89.

- Wessells, C. R., and J. G. Anderson. 1995. Consumer Willingness to Pay for Seafood Safety Assurances. *Journal of Consumer Affairs* 29(1):85-107.
- Wright, J. 2013. "U.S. Speeds up Organic Aquaculture Timetable."  
<http://www.seafoodsource.com/en/news/aquaculture/14746-u-s-speeds-up-organic-aquaculture-timetable>.
- Zepeda, L. 2008. The US Organic Food Shopper. The 16th IFOAM Organic World Congress. Modena, Italy.
- Zepeda, L., and C. Leviten-Reid. 2004. Consumers' Views on Local Food. *Journal of Food Distribution Research* 35(3):1-6.
- Zepeda, L., and J. Li. 2006. Who Buys Local Food? *Journal of Food Distribution Research* 37(3):1-11.
- Zepeda, L., and C. Nie. 2012. What are the Odds of Being an Organic or Local Food Shopper? Multivariate Analysis of US Food Shopper Lifestyle Segments. *Agriculture and Human Values* 29(4):467-80.

## Tables and Figures

**Table 1**  
Description and Definition of Label Variables in the Choice Experiment

Variable	Value	Label text	Definition
<i>SAFE</i>	1	Meets USFDA safety guidelines	Seafood is low in mercury and other contaminants compared to higher-risk seafood choices. It is safe to eat twice weekly without significant health risk, according to the U.S. Food and Drug Administration.
	-1	No information	
<i>ECO</i>	1	Sustainable Ecosystem Certification	Ensures the fish population from which the seafood was harvested is healthy and sustainable. Also, it ensures the fishery causes minimal environmental damage.
	-1	No information	
<i>LOCAL</i>	1	Harvested locally by Oregonians	Oregon residents harvested this seafood from an Oregon fishing port. The label also provides information about the fishers, vessel, and the port from which the seafood was harvested.
	-1	No information	
<i>QUAL</i>	1	Premium Quality Certification	The seafood is certified to have received premium handling and is extremely fresh.
	-1	No information	
<i>PRICE</i>	<i>0.14*/0.30</i>	2% price increase	The dollars per pound you pay for the additional information provided about your seafood.
	<i>0.49/1.05</i>	7% price increase	
	<i>0.84/1.80</i>	12% price increase	
	<i>1.19/2.55</i>	17% price increase	

Note: \*= crab price premium /salmon price premium. Base crab base price is \$7/lb. and base salmon base price is \$15/lb. The dollar price observed by participants depended on the base market price of the seafood and the price premium.

**Table 2**  
Mean and Variance of Sample Demographic and Behavioral Characteristics

	Description	Salmon	Crab	Total
<i>AGE</i>	Age of individual in years	45.0# (14.50)	44.3 (16.00)	44.7 (15.00)
<i>FEM</i>	Equals 1 if individual is female and equals 0 otherwise	0.59 (0.49)	0.62 (0.49)	0.6 (0.49)
<i>DEG</i>	Equals 1 if individual has at least a bachelor's degree and equals 0 otherwise	0.73 (0.44)	0.71 (0.46)	0.73 (0.45)
<i>IN25DN</i>	Equals 1 if individual's household income is below \$25K and equals 0 otherwise	0.13 (0.34)	0.08 (0.31)	0.12 (0.32)
<\$50K	Equals 1 if individual's household income is below \$50K and equals 0 otherwise	0.30 (0.46)	0.27 (0.46)	0.29 (0.46)
<\$75K	Equals 1 if individual's household income is below \$75K and equals 0 otherwise	0.46 (0.50)	0.53 (0.50)	0.48 (0.50)
<\$100K	Equals 1 if individual's household income is below \$100K and equals 0 otherwise	0.61 (0.49)	0.73 (0.45)	0.65 (0.48)
<i>SERVE</i>	The number of seafood servings the individual reported eating per month	7.33 (4.95)	8.19 (5.33)	7.55 (5.07)
<i>NAT</i>	Equals 1 if the individual reported buying most of their home prepared seafood from a natural-food store and equals 0 otherwise	0.57 (0.50)	0.55 (0.50)	0.57 (0.50)
Number of respondents:		282	96	378

**Table 3**  
Random Parameter Logit Model Results.

	I		II	
	Crab	Salmon	Crab	Salmon
<i>Random</i>				
<i>LOCAL</i>	1.039***	1.172***	1.043	1.369***
	-0.2483	-0.1442	-0.7420	-0.3317
<i>ECO</i>	1.035***	1.202***	0.7180	1.592***
	-0.2609	-0.1346	-0.7818	-0.3533
<i>SAFE</i>	0.7671***	0.8881***	1.022	0.7908**
	-0.2196	-0.1384	-0.6551	-0.3251
<i>QUAL</i>	0.6554***	0.6165***	0.8612	0.7265***
	-0.2506	-0.1245	-0.7448	-0.2798
<i>Nonrandom</i>				
<i>PRICE</i>	-0.5446**	-0.3573***	-0.5593**	-0.3572***
	-0.2228	-0.0671	-0.3881	-0.0702
<i>OPT OUT</i>	-1.978***	-1.505***	-2.001***	-1.519***
	-0.2176	-0.1081	-0.2441	-0.1142
<i>Diagonal in Cholesky matrix</i>				
<i>LOCAL</i>	0.7041***	0.6928***	0.2944	0.6702***
	-0.1835	-0.1111	-0.6191	-0.116
<i>ECO</i>	1.003***	0.9947***	0.6666***	0.7349***
	-0.3140	-0.1554	-0.1895	-0.1103
<i>SAFE</i>	0.5393***	0.6464***	0.3681	0.6085***
	-0.1641	-0.111	-1.246	-0.1156
<i>QUAL</i>	0.4132**	0.3962***	0.3688	0.4002***
	-0.1855	-0.0998	-0.2830	-0.1512
<i>Below diagonal in Cholesky matrix</i>				
<i>LOCAL:ECO</i>	0.2116	-0.1871	0.0110	-0.1505
	-0.3106	-0.1562	-0.7507	-0.1639
<i>LOCAL:SAFE</i>	-0.1468	-0.0168	-0.2073	0.0214
	-0.2414	-0.1654	-1.383	-0.177
<i>LOCAL:QUAL</i>	0.02468	-0.0245	0.3027	0.0879
	-0.1879	-0.1045	-0.3764	-0.2264
<i>ECO:SAFE</i>	0.3020	-0.2363	0.1648	-0.1307
	-0.3221	-0.1504	-0.5356	-0.1523
<i>ECO:QUAL</i>	0.4448*	-0.2632*	0.4312	0.4981*
	-0.2296	-0.1446	-0.821	-0.2708
<i>SAFE:QUAL</i>	-0.0600	-0.0292	-0.1284	0.1116
	-0.1780	-0.1247	-0.5446	-0.2328

*Heterogeneity around the mean*

<i>LOCAL:AGE</i>	0.0041	-0.0063
	(0.0090)	(0.0064)
<i>LOCAL:FEM</i>	0.0777	-0.026
	(0.3048)	(0.1641)
<i>LOCAL:DEG</i>	-0.2828	0.1566
	(0.3478)	(0.2100)
<i>LOCAL:IN25DN</i>	-0.9967	0.124
	(0.2704)	(0.2348)
<i>LOCAL:SERVE</i>	0.0504	-0.0127
	(0.0339)	(0.0161)
<i>LOCAL:NAT</i>	0.1430	-0.0414
	(0.3591)	(0.1784)
<i>LOCAL:NLAB</i>	-0.4599	0.0429
	(0.3092)	(0.1561)
<i>ECO:AGE</i>	-0.0006	-0.0199***
	(0.0958)	(0.0067)
<i>ECO:FEM</i>	0.0958	0.1454
	(0.3311)	(0.1709)
<i>ECO:DEG</i>	0.2186	0.5401**
	(0.4155)	(0.2272)
<i>ECO:IN25DN</i>	-0.7649	0.0618
	(0.7214)	(0.2372)
<i>ECO:SERVE</i>	0.0035	-0.0337*
	(0.0394)	(0.0181)
<i>ECO:NAT</i>	0.1762	0.3915**
	(0.3418)	(0.1832)
<i>SAFE:AGE</i>	-0.0076	-0.0061
	(0.0089)	(0.0054)
<i>SAFE:FEM</i>	0.1721	0.3174**
	(0.3232)	(0.1613)
<i>SAFE:DEG</i>	0.0916	0.1871
	(0.3585)	(0.2050)
<i>SAFE:IN25DN</i>	-0.5152	-0.0911
	(0.7608)	(0.2066)
<i>SAFE:SERVE</i>	-0.0093	-0.0096
	(0.0324)	(0.0142)
<i>SAFE:NAT</i>	-0.0982	0.1788
	(0.3382)	(0.1700)
<i>QUAL:AGE</i>	0.00003	-0.0067
	(0.0101)	(0.0050)
<i>QUAL:FEM</i>	-0.0155	-0.0414
	(0.3433)	(0.1385)



<i>QUAL:DEG</i>			0.0287	0.2400
			(0.4230)	(0.1707)
<i>QUAL:IN25DN</i>			-0.7756	-0.0284
			(0.4918)	(0.2046)
<i>QUAL:SERVE</i>			-0.0167	0.0012
			(0.0515)	(0.0127)
<i>QUAL:NAT</i>			-0.1250	0.0091
			(0.3020)	(0.1446)
Obs	768	2256	768	2256
LL	-523.5084	-1589.2810	-498.6368	-1566.0250
Chisq	640.4517	1778.3760	690.1949	1824.8890
DOF	16	16	41	41
Pseudo R2	0.3795	0.3588	0.4090	0.3681
AIC	1.4050	1.4231	1.4053	1.4247

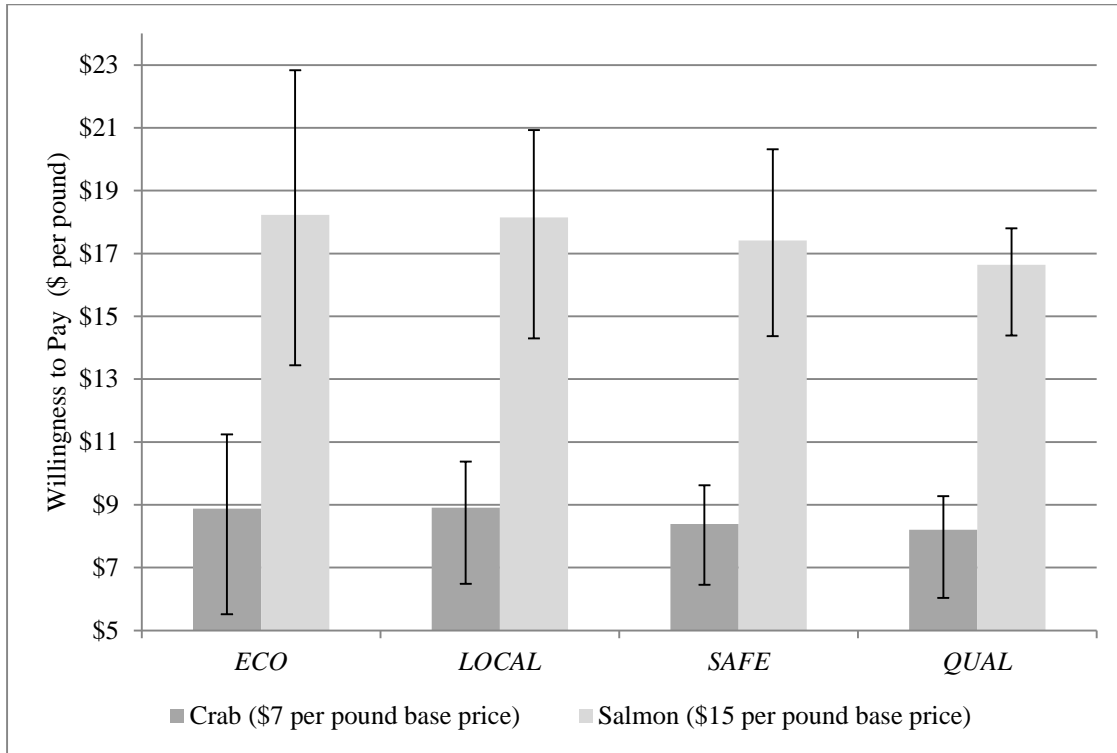
Notes: Standard errors in parentheses; \*=significant at .10 level; \*\*=significant at .05 level; \*\*\*=significant at .01 level.

**Table 4**  
Sample Willingness to Pay for Seafood Information Labels

		Crab	Salmon
<i>ECO</i>	mean WTP/lb.	\$1.88	\$3.23
	Max	\$4.24	\$7.83
	Min	(\$1.48)	(\$1.56)
	stdev	\$1.45	\$2.14
<i>LOCAL</i>	mean WTP/lb.	\$1.91	\$3.15
	max	\$3.37	\$5.93
	min	(\$0.52)	(\$0.70)
	stdev	\$0.91	\$1.30
<i>SAFE</i>	mean WTP/lb.	\$1.39	\$2.41
	max	\$2.62	\$5.32
	min	(\$0.55)	(\$0.63)
	stdev	\$0.75	\$1.31
<i>QUAL</i>	mean WTP/lb.	\$1.20	\$1.64
	max	\$2.27	\$2.80
	min	(\$0.96)	(\$0.61)
	stdev	\$0.75	\$0.66
Base price		\$7.00	\$15.00

Note: In 2007 USD

**Figure 1**  
Mean Willingness to Pay for a Product Bearing a Single Information Label



Note: Error bounds represent the minimum and maximum estimated individual WTP value in the sample