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CONSUMER WILLINGNESS TO PAY FOR ORGANIC SEA BASS IN TURKEY

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Abstract

This study analyzes the willingness of Turkish consumers to pay for organically farmed sea bass (*Dicentrarchus labrax*). A contingent valuation survey was conducted during 2004 in six supermarkets in Adana, Turkey. An ordered probit analysis with a sample selection model was used to determine the probability of consumers' willingness to pay for organically farmed sea bass by considering related explanatory variables. Results indicate that 91.5% of the respondents would be willing to pay a premium for organically farmed sea bass. Econometric results suggest that willingness to pay is mainly related to household income, education, food safety concerns, whether the respondent is the primary food shopper in household, and whether there are children under the age of 10 in the household.

Introduction

Worldwide aquaculture production has increased from 17.8 million tons in 1993 to 42.3 million tons, one-third of the world's fisheries production, in 2003 (FAO, 2003). The increasing world population, changing consumer preferences, and high level of health concerns are the main causes of this rapid growth (Frankic and Hershner, 2003). As in many parts of the world, aquaculture is a very important activity in the Mediterranean region and has been growing tremendously. Aquaculture production in the region (1.4 million tons) represents 3.41% of the world production (FAO, 2003).

Greece, Turkey, Egypt, Spain, France, and Italy are the main aquaculture producers in the Mediterranean area. The total aquaculture production in Turkey was 79,943 tons, 5.54% of the total Mediterranean aquaculture production, in 2003. Turkey was the second

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leading country (after Greece) in the production of sea bass, with 20,982 tons in 2003 (FAO, 2003). As in other parts of the world, the aquaculture sector in the Mediterranean is facing a series of problems related to market constraints and environmental concerns such as fluctuation of market prices, food safety, quality control, product image, location of farms, and the impact of farms on the surrounding environment (Basurco and Lovatelli, 2003). On the other hand, in September 2002, the importance of aquaculture was recognized by the European Commission which presented a strategy for the sustainable development of European aquaculture (CEC, 2002). The strategy was designed to strengthen the role of aquaculture in providing jobs and supplying seafood with environmentally friendly practices (Basurco and Lovatelli, 2003).

During the past decade, rising consumer concerns about food safety has resulted in an increase in demand for organic foods and there is substantial interest in the marketing of more environmentally friendly seafood. Organic salmon is a pioneer in this market innovation in Europe (Aarset et al., 2001). According to FAO (2002), the global production of certified organic aquaculture products was only about 5,000 tons in 2000, mainly from European countries. At the time of our study, the legal status of organic fish farming was newly established and an organically farmed seafood market did not exist in Turkey. However, there is growing concern for safe seafood products in Turkey and sea bass is one of the most preferred marine aquaculture species.

The aim of this study was to identify and analyze variables that affect the willingness of Turkish consumers to pay for organically farmed sea bass using contingent valuation methodology.

Materials and Methods

Data came from a pre-tested consumer survey conducted by a research team in late summer 2004 in supermarkets in Adana, the largest province on the Mediterranean coast of Turkey. Consumers were randomly selected for interviews. The survey was conducted on weekdays and weekends in six supermarkets of three supermarket chains with a fresh seafood section. Two hundred and fifty-three consumers were interviewed.

The first part of the questionnaire asked for information regarding purchasing behavior, seafood consumption habits and frequency, and environmental and food safety concerns. The second part examined consumers' willingness to pay for organically farmed sea bass. After providing information on organic aquaculture, respondents were asked to indicate how much more than the regular price of farmed sea bass, if any, they would pay for organically farmed sea bass. Respondents indicated their answers by choosing an answer from a payment card containing an ordered set of five classes of price premiums expressed as percentages of the regular price of farmed sea bass. Socioeconomic and demographic characteristics were obtained in the last part of the questionnaire.

The majority of the respondents (75.5%) were the primary food shoppers in their households. Respondents consisted of 53% men and 47% women. The average age was about 36. The average household consisted of 3.6 persons and 46.6% had at least one child under the age of 10. Ninety-eight percent of the respondents generally bought fresh seafood and 56.1% consumed seafood at least once in two weeks (Table 1).

Since the 1960s, several non-market valuation methods have been developed to estimate the value of non-market commodities. Among these methods, the most commonly used non-market valuation technique for environmental goods is contingent valuation (CV) because of its flexibility (Carson et al., 2001). It has also been extensively applied for valuation of organic food products (Lin and Milon, 1995; Boccaletti and Nardella, 2000; Gil et al., 2000; Grannis and Thilmany, 2000; Loureiro et al., 2001; Cranfield and Magnusson, 2003; Loureiro, 2003;) and food safety (Buzby et al., 1998; Fu et al., 1999; Huang et al., 1999).

We used the CV method to examine the determinants of consumers' willingness to pay for organically farmed sea bass. A payment

Table 1. Summary statistics and variable description.

Variable	*Code*	*Definition*	*Mean± SD*
INCOME	1	≤12,000 YTL*	1.9841±1.0195
	2	12,001-24,000 YTL	
	3	24,001-36,000 YTL	
	4	>36,000 YTL	
EDU	1	At least high school graduated	0.8498±0.3579
	0	Other	
AGE	1	≤30	1.8181±0.7116
	2	31-45	
	3	>46	
MARRIED	1	Married	0.7509±0.4332
	0	Not married	
GENDER	1	Female	0.4703±0.5001
	0	Male	
CHILD	1	≥1 household member under age 10	0.4664±0.4998
	0	None under 10	
SHOPPER	1	Main household shopper	0.7549±0.4309
	0	Not main shopper	
CONSUMPTION	1	Above average seafood consumption	0.3122±0.4643
	0	Other	
FOODSAFETY	1	Food price all important	8.5375±1.7558
(Scale 1 to 10)	10	Food safety all important	
ENVIRONMENT	1	Economic growth all important	7.3201±2.4825
(Scale 1 to 10)	10	Environment all important	

* 1 YTL = 1.50 US$ and 1.81 € (August 31, 2004)

card format was used to elicit consumers' willingness to pay (Table 2). Responses were ordered by the level of willingness to pay a premium as a percentage of the regular price of farmed sea bass. However, 9.49% of the respondents indicated they would not pay a premium for organically farmed sea bass. These respondents may have had a different set of characteristics than those who were willing to pay. Combining these two sets of consumers could have produced a sample selection bias, well documented in earlier CV stud-

Table 2. Frequency of respondents' willingness to pay (WTP) for organically farmed sea bass (n = 253).

Dependent variable	*WTP*	*%*
	None	9.49
y_0	≤10%	18.57
y_1	11-20%	34.39
y_2	21-30%	29.25
y_3	>30%	8.30

ies (Messonier et al., 2000; Yoo and Yang, 2001; Yoo et al., 2001). Therefore, an ordered probit with a sample selection model was used to correct the potential sample selection bias, following the methodology used by Huang et al. (1999) and Nayga et al. (2004).

The ordered probit model is suited for a dependent variable that has categories in an ordinal nature (Greene, 1997). The ordered probit model is built on the assumption that the consumer's response to the willingness to pay question depends on a set of underlying explanatory variables, that is, $y* = \beta' x_i + \varepsilon_i,\ \varepsilon_i \sim N\ [0,1]$, where $y*$ is an unobserved willingness to pay, χ_i is a matrix of independent variables, β is a vector of parameters, and ε is a vector of random error terms. The relationship between $y*$ and the observed variable y is as follows:

$$y_i = \begin{cases} 0 & \text{if} \quad y* \le 0, \\ 1 & \text{if} \quad 0 < y* \le \mu_1, \\ 2 & \text{if} \quad \mu_1 < y* \le \mu_2, \\ 3 & \text{if} \quad y* > \mu_2, \end{cases}$$

where, y_i is the observed willingness to pay category presented in Table 2 that varies from 0 to 3. The μ_j are unknown threshold parameters estimated along with the other parameters in the model. The probabilities of a consumer's willingness to pay response in a specific category can be expressed as follows:

$$\text{Prob } [y = 0] = \Phi(-\beta' x),$$
$$\text{Prob } [y = 1] = \Phi(\mu_1 - \beta' x) - \Phi(-\beta' x),$$
$$\text{Prob } [y = 2] = \Phi(\mu_2 - \beta' x) - \Phi(\mu_1 - \beta' x),$$
$$\text{Prob } [y = 3] = 1 - \Phi(\mu_2 - \beta' x),$$

where ϕ (.) is the standardized cumulative distribution function. The parameters μ_j and β are estimated jointly. Based on these probabilities, the likelihood function can be written as:

$$\begin{aligned} L = & \pi_{y=0}\ \Phi(-\beta' x) \\ & \pi_{y=1}\ [\Phi(\mu_1 - \beta' x) - \Phi(-\beta' x)] \\ & \pi_{y=2}\ [\Phi(\mu_2 - \beta' x) - \Phi(\mu_1 - \beta' x)] \\ & \pi_{y=3}\ [1 - \Phi(\mu_2 - \beta' x)] \end{aligned}$$

The log form of the function is:

$$\begin{aligned} \ln L = & \Sigma_{y=0} \log[\Phi(-\beta' x)] + \\ & \Sigma_{y=1} \log[\Phi(\mu_1 - \beta' x) - \Phi(-\beta' x)] + \\ & \Sigma_{y=2} \log[\Phi(\mu_2 - \beta' x) - \Phi(\mu_1 - \beta' x)] + \\ & \Sigma_{y=3} \log[1 - \Phi(\mu_2 - \beta' x)] \end{aligned}$$

where ϕ(.) is the standard normal cumulative distribution function. The parameter μ_j identifies the threshold and β describes the shift in distribution as a function of the independent variables. The marginal effects of the variables are calculated for each of the probabilities according to:

$$\partial \text{Prob } [\text{cell j}] / \partial x_i = [f(\mu_{j-1} - \beta' x_i) - f(\mu_i - \beta' x_i)] * \beta,$$

where f(.) is the standard normal density. The model is extended to handle sample selection bias with the following selection mechanism (Greene, 1995):

$$d = \alpha' z_i + u_i,$$
$$u_i, \varepsilon_i \sim N_2 [0, 0, 1, 1, \rho\ ],$$
$$d_i = 1 \text{ if} > 0 \quad \text{and} \quad 0 \text{ otherwise},$$
$$[y_i, x_i] \text{observed if and only if } d_i = 1.$$

The selection model requires two passes to estimate. In the first, we fitted a probit model for the selection variable, d_i (1 if respondent is willing to pay a premium and 0 if otherwise), then passed these values to the ordered probit model where the amount of premium that a consumer was willing to pay was the dependent variable. In the second step, α was re-estimated from the probit model along with β and μ, obtaining a FIML set of estimates for all parameters including ρ. The ordered probit model results in two full rounds of estimation. In the first round, the model is estimated as if there were no selection to provide the remaining starting values. The starting value for ρ is 0. In the second round, the FIML estimates are computed (Greene, 1995). *LIMDEP* econometric software was used for all estimations.

Results

Table 3 presents the empirical results for the ordered probit with a sample selection. The estimation of ρ is significantly different from

Table 3. Ordered probit with sample selection results.

Variable	Ordered probit with sample selection			
	Selection equation (probit; n = 253)		Ordered probit (n = 229)	
	Coefficient	P value	Coefficient	P value
Constant	-1.880	0.152	-1.720***	0.000
INCOME	0.872	0.799	0.408***	0.000
EDU	1.597***	0.002	0.739***	0.003
AGE	-0.315	0.444	-0.301**	0.018
MARRIED	1.603*	0.081	0.474**	0.031
GENDER	0.541	0.141	0.259	0.110
CHILD	-1.082**	0.036	-0.485***	0.007
SHOPPER	0.897**	0.037	0.647***	0.001
CONSUMPTION	-0.266	0.445	0.491***	0.003
SAFETY	0.249**	0.025	0.131***	0.007
ENVIRONMENT	-0.113	0.149	-0.579*	0.057
μ_1			1.166***	0.000
μ_2			2.574***	0.000
ρ (1, 2)	0.985***	0.001		
Log likelihood	-299.455			
χ^2	3.889**			
Correct prediction	50.59%			

*, **, *** Indicates statistical significance at the 0.10, 0.05 and 0.01 levels, respectively.

zero at the 0.001 significance level, suggesting that the unexplained residuals of the probit (selection equation) and ordered probit equations are correlated. This indicates that the sample selection model used for correcting the sample bias is appropriate. Model significance is verified by a χ^2 test of the difference between the restricted and unrestricted log likelihood values. The χ^2 statistic was significant at the 0.05 level. The overall ability of the model to predict the respondent's actual choice of willingness to pay correctly is 50.6%.

The estimated parameters of the variables EDU, SAFETY, SHOPPER, and MARRIED were positive and statistically significant, while CHILD was negative and significantly different from zero. The results indicate that respondents with at least a high school degree and who were the main shopper of their households would be more likely to be willing to pay a premium for organically farmed sea bass. Surprisingly, respondents with children under the age of 10 in their households were less likely to pay a premium than those without children in their households. The presence of children in the household increases the total food expenditure, and this may put a strain on the budget.

The ordered probit model shows that all variables except GENDER have a significant effect on the magnitude of the premium that the consumer is willing to pay for organically farmed sea bass. The parameter estimate for the INCOME variable was positive and significant, indicating that respondents with a higher household income level are willing to pay more. Similarly, the food safety concerns of the respondent (SAFETY) had a positive impact on the amount of the premium. The CONSUMPTION parameter was negative and not significant in the probit model while it had positive signs and was strongly significant in the ordered probit model. In many instances the same variable may have different effects in each model (Huang at al., 1999). On the other hand, the ages of the respondents (AGE) were negatively associated with the level of the premium. The variables CHILD and ENVIRONMENT also had a negative effect on the amount of the premium that the consumer was willing to pay for organically farmed sea bass.

Table 4 presents the estimated marginal effects of the ordered probit with the sample selection model. The variables INCOME, EDU, MARRIED, CHILD, SHOPPER, and CONSUMPTION had the greatest marginal effects. The probability that the respondent who is willing to pay less than a 10% premium for organically farmed sea bass will increase by 11% if the respondent's household income increases by one income class. Likewise, as education levels rise, consumers will shift from category 21-30% to >30% with a 21% increase in probability of the respondent's willingness to pay. However, the effect of having children under the age of 10 in the household shifts the probability of the respondent's willingness to pay from a higher category to lower one.

Discussion

According to the European Commission (CEC, 2002), the rapid increase in marine aquaculture production after the 1990s was caused by market constraints and price drops in Mediterranean aquaculture. Marine aquaculture production, in terms of both quantity and value, is dominated by salmon. Lately, sea bass and sea bream farming in the Mediterranean has grown rapidly. Whereas the sector has potential for further development, aquaculture in the Mediterranean region still has to deal with problems, particularly in the context of health protection requirements, negative environmental impact, and market instability. The promising sector of organic aquaculture may contribute to expansion of the industry by providing healthy, safe, and good quality products, produced by environmentally sound production techniques. However, as Aarset et al. (2001) pointed out, very little attention has been paid to consumer attitudes toward organic aquaculture.

Table 4. Estimated marginal probabilities.

Variable	y_0 ≤10%	y_1 11-20%	y_2 21-30%	y_3 >30%
INCOME	-0.112	-0.043	0.117	0.038
EDU	-0.203	-0.078	0.213	0.068
AGE	0.082	0.031	-0.086	-0.027
MARRIED	-0.130	-0.050	0.136	0.043
GENDER	-0.017	-0.027	0.074	0.023
CHILD	0.133	0.051	-0.140	-0.047
SHOPPER	-0.177	-0.068	0.186	0.059
CONSUMPTION	-0.135	-0.052	0.141	0.045
SAFETY	-0.036	-0.013	0.037	0.012
ENVIRONMENT	0.015	0.006	-0.016	-0.005

In this study consumer willingness to pay for organically farmed sea bass was measured and modeled. A contingent valuation survey of randomly selected respondents indicated that 91.5% of the respondents would be willing to pay a premium for organically farmed sea bass. The findings of this study profile consumers who are more likely to pay the highest premium as young, married without children under the age of 10, and educated. They have a high household income, are concerned about food safety, are the primary shopper for their household, and consume more seafood than average.

Our findings provide new insights for identifying market strategies and policy implications for the marine aquaculture sector in Turkey. Efforts towards product differentiation and the creation of added value products will produce increasing competitiveness in Mediterranean aquaculture.

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