CONSUMERS WILLINGNESS TO PAY FOR IRRADIATED SEAFOOD PRODUCT IN THE UNITED STATES

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ABSTRACT

Food processors are interested not only to increase the safety of their products but also to reduce losses associated with foodborne illness problems. Irradiating food products provides one means of addressing the foodborne illness issue by significantly reducing the presence of foodborne bacteria and diseases. The objective of the study is to develop an empirical model to estimate the likelihood of consumer acceptance of irradiated seafood products and, more specifically, their willingness to pay for irradiated oysters within a two-step decision-making framework. An empirical model is formulated based on the assumption of a two-step decision-making process, in which consumers decide first whether or not to buy irradiated seafood products. If so, the consumers then decides how much that they are willing to pay, specifically for irradiated oysters. The study will identify important socio-demographic variables and other qualitative and attitudinal factors that may affect consumer acceptance and willingness to pay for irradiated seafood products. Results will help producers to develop strategies targeting the market segment that is receptive to using irradiation in the production process to enhance food safety and reduce incidents of foodborne illness. The study is based on the data collected from telephone interviews with a randomly selected sample of 303 adults, 18 years of age and older in the state of Georgia during May 2003.

Keywords: food safety; irradiation; oysters; seafood; selectivity bias; willingness to pay

INTRODUCTION

Food safety is a growing concern to consumers. According the Centers for Disease Control and Prevention (CDC), foodborne illnesses are responsible for causing 76 million people to become sick, hospitalizing 300,000 people and 5,000 deaths annually (Mead et al.). These statistics suggest that additional protections are needed to reduce foodborne illnesses and address this public health issue. While most Americans generally believe that the food supply is safe, public awareness of food safety and risks associated with foodborne illnesses have increased over the past decade. Consumers attitudes about the safety of the food supply and their concern about the specific food safety issue may be temporarily affected by certain events occurred at the time that may not continue over time (Brewer and Prestat). A recent study shows that consumers' ranking of food safety concerns has virtually unchanged between 1993 and 2003 (Johnson et al.). Consumers in both of the 1993 and 2003 studies expressed more concern for pesticide and animal residues, growth hormones, bacteria and food additives than irradiation.

Food processors are interested in increasing the safety of their food products not only to provide a safer product but to reduce losses associated with a foodborne illness problem. Recalling food products can have dire direct and indirect financial consequences for food processors and retailers alike. Irradiating food products provides one means of addressing the food safety issue by significantly reducing the presence of foodborne bacteria and diseases. The USDA's Food and Safety and Inspection Service has approved the use of irradiation to control bacteria in frozen and refrigerated seafood products. However, the seafood industry is hesitant to adopt irradiation technology despite its benefits because of perceived consumer resistance to irradiated products (Misra et al.). The problem is further exacerbated because irradiated food products have to include this information on their label. Irradiated food products have to include the irradiated food symbol as well as a phrase indicated the product has been treated by or with irradiation. Given the seafood industries concern over perceive risk, having to include the irradiation symbol and phrase on their product's label could have dire effects.

Over the past decades, there have been a number of studies focused on consumer acceptability of irradiated food products. In 1992, Senauer reported that 71% of survey respondents list irradiated foods as either a serious or moderate hazard. Consumer acceptability of irradiated food products ranges from a low of 15% (Gaynor et al.) to as high as 50% (Frenzen et al.). Malone found that only one-third of consumers in the United States were willing to purchase beef, pork, chicken, and fish irradiated to control microbial pathogens. He suggested that the success of the food irradiation process is dependant on consumer acceptability. A nationwide survey conducted by Gallup found that 20% of consumers were very likely and 25% likely to buy irradiated seafood products (Gallup Organization). A 1997 survey found 40% of respondents were likely and 20% very likely to purchase irradiated products (FMI).

Consumer interest in food irradiation may be attributed in part to the Food and Drug Administration (FDA) approval of irradiation of red meat and poultry to control pathogenic microorganisms in December 1997 (FAO). Recent studies have shown that consumers are becoming more interested in irradiated foods. Fingerhut et al. found that over 75% of consumers surveyed from two Kansas cities preferred irradiation to hot-water pasteurization as a pathogen-reducing technology for ground beef. Similarly, Johnson et al. suggested that more than twice as many consumers in 2003 (69%) are willing to buy irradiated products compared to ten years ago (29%) to decrease the probability of foodborne illness.

The capital cost of irradiated food processing equipment requires a substantial level of consumer acceptance and willingness to purchase to be economically feasible. The wide range in the level of consumer acceptability for irradiated products relays uncertainty to food processors making them hesitant to invest resources in irradiation technology (Frenzen et al.). Given the uncertainty associated with consumer acceptability, research in the area of consumer willingness to pay for irradiated food products comes into question. However, a review of existing research into consumer acceptability indicates that the significant variations in acceptability may be more a function of questionnaire design, familiarity with and/or knowledge of the process.

Fox and Olson conducted store trials and found that irradiated chicken breasts captured 40% of the market when priced equal to non-irradiated chicken breasts. The study found that irradiated chicken breasts captured 30% of the market when priced 10% above non-irradiated products. In addition, the study found that after reading USDA material on the benefits of irradiation, 77% of the shoppers purchased irradiated chicken breasts. The authors concluded that the percentage would have been higher if more consumers read the USDA material or were knowledgeable about the irradiation process. In general, previous studies have shown that consumers will pay only a small percentage above the traditional purchase price to avoid some perceived risks (Busby et al.). More consumers in 2003 than in 1993 indicated that they would buy irradiated food products such as produce, meats and fish if the price remained the same or if there was a 1-5% difference (Johnson et al.). Very few consumers were willing to pay a higher price greater than 6-10% or more.

Previous research has examined the relationship between attitudes toward various food processing methods and consumer behavior. Research has been undertaken to investigate the relationships between socioeconomic and demographic factors and their impact on consumer behavior and awareness. The objective of this study is to determine the likelihood that consumers are willing to buy and how much they are willing to pay for irradiated seafood products using socio-demographic and attitudinal factors. In addition, the study evaluates consumers' level of knowledge about the food irradiation process and their level of concern with the food irradiation process as well as other food safety procedures.

EMPIRICAL MODEL

The approach taken in this study recognizes explicitly the importance of consumer perceptions and attitudes as they relate to behavioral intention in the decision-making process. Specifically, it is assumed that consumers formulate their perception or attitudes from available information, knowledge, experiences, and given environmental factors, which may include personal characteristics, social and cultural background. Previous studies suggest that information acquisition, and consequently behavior, is affected by various demographic factors such as age and gender, educational attainment, as well as region and urbanization (Hinson et al.; Nayga; Steger and Witte). Thus, these factors are hypothesized to be important determinants that influence consumers' decision to buy irradiated seafood products, if available and the amount of premium that they are willing to pay.

In order to analyze the interdependent relationships of behavioral intentions, i.e., purchase intention and willingness to pay, in the consumer decision-making process, a two-equation structural model is formulated and specified as follows:

$$LTB = f(Z_1, SE) + \varepsilon_1, \qquad \text{(Eq. 1)}$$

$$WTP = g(LTB, Z_2, SE) + \varepsilon_2, \qquad \text{(Eq. 2)}$$

where LTB represents the likelihood of a consumer's intention to buy irradiated seafood products; WTP denotes a consumer's willingness to pay for irradiated oysters; Z_is are sets of independent variables measuring consumers' beliefs, knowledge, experiences, and attitudes toward irradiation technology; SE represents socioeconomic and demographic characteristics; and ε_is are vectors of random errors.

Specifically, the Z_i variables are assumed to include issues related to food safety, respondents' knowledge about irradiation technology and other technology such as using genetically modified (GM) organisms in food production. Consumers' attitudes toward the application of food irradiation and GMO are also considered relevant variables. In addition, the Z_i variables also include how much confidence that consumers have about the sources of their information acquisition, such as U.S. Food and Drug Administration (FDA) or American Medical Association (AMA). The SE variable is specified to include some of the variables representing age, race and gender, educational attainment, marital status, employment status, household composition and income. Thus, equations (1) and (2) can be rewritten as:

LTB = f(ADCH, Know Irradiation, Irradiation Necessary, Support Irradiation, Know GM Foods, FDA, USDA, AMA, Black, Hispanics, Female, Children < 18 Years, Married, Adults, Age, College Education, Employment Status, Household Income) + ε_1, (Eq. 3)

WTP = g(LTB, Know Irradiation, Support Irradiation, Consume GM Foods, Black, Hispanics, Female, Children < 18 Years, Married, Adults, Age, College Education, Employment Status, Household Income) + ε_2. (Eq. 4)

The definitions of variables included in equations (3) and (4) are presented in Table I.

Table I: Variable Definition and Sample Characteristics

Variable	Definition	Mean (Std. Dev.)
Likely to Buy (LTB) Irradiated Seafood Products	= 1 if respondent indicated at least somewhat likely to buy irradiated seafood products if it was treated with approved doses and properly labeled, 0 otherwise.	.5613 (.4974)

Willingness to Pay (WTP)	Amount of price premium $/pt that respondent is willing to pay for irradiated oysters.	2.4121 (4.2302)
ADCH	= 1 if additive/chemicals are a food safety concern, 0 otherwise.	.1887 (.3922)
Know Irradiation	= 1 if at least know something about the food irradiation process, 0 otherwise.	.2123 (.4099)
Irradiation Necessary	= 1 if irradiation is considered at least somewhat necessary for seafood products, 0 otherwise.	.7311 (.4444)
Support Irradiation	= 1 if respondent indicated at least somewhat support the use of food irradiation, 0 otherwise.	.5566 (.4980)
Know GM Foods	= 1 if respondent is at least somewhat informed about genetically modified (GM) foods or organisms, 0 otherwise.	.4057 (.4922)
Consume GM Foods	= 1 if respondent is at least somewhat willing to consume food produced with GM ingredients, 0 otherwise.	.8019 (.3995)
FDA	= 1 if confidence in the safety of irradiated food increased because it is endorsed by the U.S. Food and Drug Administration (FDA), 0 otherwise.	.5236 (.5006)
USDA	= 1 if confidence in the safety of irradiated food increased because it is endorsed by the U.S. Department of Agriculture (USDA), 0 otherwise.	.5187 (.5008)
AMA	= 1 if confidence in the safety of irradiated food increased because it is endorsed by the American Medical Association (AMA), 0 otherwise.	.5802 (.4947)
Black	= 1 if the race of household is black, 0 otherwise.	.2123 (.4099)
Hispanics	= 1 if the race of household is black, 0 otherwise.	.0425 (.2021)
Female	= 1 if respondent is female, 0 otherwise.	.6398 (.4821)
Children < 18 Years	= 1 if there are children under 18 years of age living in the household, 0 otherwise.	.4245 (.4954)
Married	= 1 if married, 0 otherwise.	.6651 (.4731)
Adults	Number of adults in the household	2.1792 (.7945)
Age	Age of the respondent in years.	45.3868 (15.3469)
College Education	= 1 if respondent attended or graduated from college, 0 otherwise.	.6038 (.4903)
Employment Status	=1 if respondent is full-time employed.	.3915 (.4892)
Household Income	Annual income classes before taxes, ranking from 1 being under $15,000 to 9 being $75,000 and over.	6.3066 (2.6690)

It is hypothesized that the probability of a Georgian consumer purchasing an irradiated seafood product increases if they are concerned about food safety issues such as use of additives and chemical processes in food processing and production. Following Frenzen et al. (2001), it is hypothesized that the more Georgian's know about irradiation technology, believe that irradiation is necessary and support irradiation the higher the probability that they will purchase irradiated seafood products and are willing to pay a price premium for them. The reason for this hypothesis is the more educated people are regarding the benefits of irradiation seafood products, the more likely they are to understand the benefit to risk ratio associated with the process and how safe the process is. Terry and Tabor suggested that people with formal education at high school level and above are more likely to purchase irradiated apples.

The effects of knowing about GM foods cannot be hypothesized prior to the analysis. The reason is it is not clear whether people who have a good understanding of GM foods support the use of technology in the food supply. However, a positive relationship is expected between willingness to pay and people who are willing to consume FM foods. Similarly, the study also hypothesizes that Georgian's who are confident in the endorsements of highly recognized institutions, such as FDA, USDA, or AMA, would increase the probability of them purchasing irradiated seafood products.

The effect of an individual's race on the probability of purchasing and willingness to pay for irradiated food product is discusses in Nayga. He suggests that non-white races have a lower readership of newspapers and magazines which may lead to a lesser understanding of the irradiation process than their white counterparts. Therefore, negative relationships are expected between the race variables (Black and Hispanics) and the probability of purchasing irradiated seafood products and willingness to pay a higher price.

Previous research has found that females are typically more concerned about food safety and are more concerned with food safety issues when they shop (Nayga). Malone found that 62% of the females were not willing to purchase irradiated food products, while 53% of males were not willing to make such purchases. Steger and Witte offer an explanation in that women often are the primary food shopper as well as being responsible for family health issues, especially when children reside at home. Thus, gender (Female) and having children under 18 years of age in the household are expected to have negative effects on both purchase intention and willingness to pay. The marital status (Married) and number of adults in the household (Adults) on the probability of purchasing irradiated seafood and willingness to pay are unclear.

Previous studies have shown mixed results regarding the effect of the respondent's age on the probability to purchase irradiated foods and willingness to pay for food safety. Nayga reported that younger meal planners are less likely to consider purchasing meat from animals that have been given antibiotics and foods that have been grown with pesticides than older meal planners. In contrast, Hinson et al. found that older respondents were more likely to buy and eat irradiated foods. Education attainment is expected to increase the probability of purchasing and willingness to pay for irradiated food products (Frenzen; Malone). An individual's level of education may suggest their ability to digest, comprehend and make decisions based on available information. More educated individuals may have more inclination and have a greater likelihood of being exposed to information associated with new technology. Similarly, affluence is hypothesized to increase the probability of purchasing irradiated food products and also the willingness to pay. Assuming that education and affluence are positively related, the more affluent a person is the higher level of education they have achieved.

SURVEY DESIGN AND METHODOLOGY

In May 2003, the University of Georgia's Center for Survey Research interviewed 303 primary food shoppers from a randomly generated sample of Georgians using a computer assisted telephone interview

(CATI) system. The questions were designed to eliminate leading the respondents or introducing bias. The questionnaire began with measuring respondents' level of knowledge with the irradiation process, their attitude toward food irradiation and its effectiveness in increasing food safety.

The respondents were asked a series of questions to measure their perceptions of nine specific possible food safety issues ranging from terrorism to bacterial contamination. Respondents were also queried a series of questions to gauge their level of concern with seven frequently used food safety processes. In addition, the survey contained a number of questions designed to gather information on primary food shopper's willing to purchase and the additional amount they are willing to pay for irradiated foods. Finally, demographic information including gender, age, household income, education, as well as other information was collected from each respondent to complete the survey.

When asked about their intention to purchase irradiated foods, respondents were first told that food irradiation process kills insects, parasites, and bacteria such as *Salmonella*, *E. Coli* and Staph and also extends the shelf life of the food by preserving freshness and then were asked if they would be very likely, somewhat likely, not too likely or not at all likely to buy irradiated seafood products. If a respondent answered "very likely" or "somewhat likely," then the respondent is considered likely to buy irradiated foods and the dependent variable of LTB is assigned a value of 1, otherwise 0.

With respect to willingness to pay for a specific irradiated seafood product such as oysters, the double-bounded bidding procedure was used. It was assumed that each respondent has an unobserved (latent) true value of food safety provided by the irradiation technology. Each respondent was provided with an initial offer price that is $1/pint above the market price and asked if they would be willing to pay the additional amount for oysters with bacteria levels greatly reduced by irradiation. The follow-up offer was made which is either higher or lower than the first price depending on the response to the first bid value. If the first response was "yes," then a randomly assigned higher price (ranging from 5%, 10%, 25%, 75%, to 100% above the first value) would be offered. If the first response was "no," then a lower price would be offered. Unlike the single-bounded procedure, where the latent value could be any value more or less than the given single threshold, the double-bounded method provides a follow-up threshold amount which captures the latent value within a certain boundary (Hanemann).

Due to some refusals and missing information, a sample of 212 observations with complete information was selected for the analysis. The variables constructed from the survey data and sample characteristics are presented in Table I. Overall, respondents tended to be demographically upscale, with older, better educated, and higher income consumers slightly over-represented. The average household size was about 3 persons. Female, black, and people of Hispanic origin represent 64%, 21%, and 4% of survey respondents, respectively.

The result shows that about 56% of Georgia consumers surveyed were at least somewhat likely to buy irradiated seafood products and they were willing to pay an average of $2.41/pt in additional amount for irradiated oysters. A vast majority of the respondents, or 73%, considered that irradiation process is somewhat necessary for seafood products and more than 55% of the respondents indicated they would support the use of food irradiation. It was somewhat surprising to find that more than 80% of the respondents indicated they were at least somewhat willing to consume GM foods, while only about one half of them considered themselves at least somewhat informed about GM foods or organisms (Table I).

To implement the empirical model, the typical application is to apply Heckman's two-step sample selection procedure in which equation (3) is to be estimated by the probit procedure and equation (4) is to be estimated by ordinary least squares (OLS) procedure based on a subsample of positive observations with the inclusion of inverse Mills ratio obtained from equation (3) as an additional regressor. In this study, the dependent variables of likely to buy (LTB) and willingness to pay (WTP) are constructed based on the survey data collected. The survey question that related to WTP was not structured sequentially following the question of LTB and the observation of zero amounts on WTP is considered a valid answer. Hence, it is necessary to use the entirely sample for WTP instead of a subsample of positive willingness to pay.

The problem of estimating equation (4) with OLS based on the observed data is the correlation between the endogenous binary variable (LTB) and the error term, ε_2. A solution to the inconsistent estimates of OLS is to use the two stage least squares procedure (Greene). Huang also used the two stage estimation procedure to investigate interrelationships among consumers' risk perceptions, attitudes, and willingness to pay for residue-free produce. In this case, equation (3), as before, is estimated by probit and the predicted probabilities are used as the instrumental variable for LTB in equation (4) in the second stage of the estimation process.

This econometric procedure is easy to implement and it provides unbiased and consistent estimates for the parameters of equations (3) and (4). Two approaches are used to test the presence of simultaneity and particularly the hypotheses about the interplays between LTB and WTP posited in the model. First, a direct test of the statistical significance of the structural parameters can be made using the *t*-statistic of the estimated coefficients for LTB in equation (4). Alternatively, the overall fit of the equation (4) in the system is compared by excluding the endogenous LTB term from estimation. The appropriate statistical procedures are the χ^2-statistic using the log-likelihood ratio or the *F*-test for testing the hypothesized simultaneity effects. The joint parameter estimation of equations (3) and (4) was carried out by LIMDEP program (Greene).

RESULTS

The estimation results of equation (3) on the likelihood of a Georgia consumer buying irradiated seafood products are presented in Table II. In probit analysis, the estimated coefficient by itself does not have any economic meanings. The estimated coefficients for the explanatory variables should be interpreted in the sense that they affect the probability of a certain event would occur. This interpretation can be obtained by computing the marginal probability or marginal effect, which is defined as a product of the estimated parameter and the standard density function evaluated the sample means. Thus, in addition to estimated coefficients and corresponding standard errors, estimates of the marginal effect associated with each independent variable are reported in Table II. Two goodness-of-fit measures are also reported. One is the log-likelihood ratio. The log-likelihood ratio test statistic indicates that the estimated probit model is statistically significant at less than 1% significance level. The computed Efron's pseudo R^2 of .407 also indicates a good fit for the data to model.

Table II: Estimated Probit Results of Purchasing Irradiated Seafood Products

Variable	Estimated Coefficient	Standard Error	Marginal Effect[a]
Constant	-2.1352***	.7602	
ADCH	-.7843***	.2910	-.3033***
Know Irradiation	.2812	.2936	.1093
Irradiation Necessary	1.5363***	.2899	.5467***
Support Irradiation	.5950**	.2503	.2327***
Know GM Foods	-.1422	.2359	-.05625

FDA	.4135	.3317	.1625
USDA	.0292	.3275	.0115
AMA	.4604	.3076	.1812
Black	-.4663*	.2784	-.1843*
Hispanics	.0668	.5714	.0263
Female	.0312	.2306	.0123
Children < 18 Years	-.2515	.2619	-.0994
Married	-.2432	.2680	-.0953
Adults	.0450	.1436	.0178
Age	.0151*	.0091	.0060*
College Education	.2241	.2506	.0780
Employment Status	.1533	.2443	.0604
Household Income	-.0286	.0477	-.0113
-2 x Log-likelihood ratio		103.967***	
Efron's pseudo R^2		.407	
Sample size		212	

*, **, and *** indicate the estimated coefficients are statistically significant at the 10%, 5%, and 1% significance level, respectively.

[a] Marginal effect is defined as the change in the probability given a change in the explanatory variable. For binary variables, the marginal effect is calculated as the difference in probability for a discrete change of the value of the binary variable from 0 to 1.

The estimated coefficient on ADCH is negative as expected and significantly different from zero at the less than 1% significance level. The result suggests that respondents who are concerned about food safety issues related to additives and chemicals are less likely to buy irradiated seafood products than those who do not have a concern with additives and chemicals. The estimated marginal effect suggests the probability of those concerned respondents buying irradiated seafood products is about 30% smaller than their counterparts, *ceteris paribus*. Respondents who believe that irradiation is necessary to produce safer seafood products and respondents who support the use of irradiation to combat foodborne illnesses and bacteria significantly impacts a respondents likelihood of purchasing irradiated seafood products. The estimated coefficients for Irradiation Necessary and Support Irradiation are both positive and highly significant at the less than 1% and 5% significance level, respectively. Irradiation Necessary has the largest marginal effects that increase the probability of respondents purchasing irradiated seafood by 55%.

The estimated coefficients for FDA, USDA and AMA are all positive, but not statistically significantly different from zero. This result suggests that the respondents are not likely to buy irradiated seafood products even if the process is endorsed by government regulatory agents or medical associations like the FDA or AMA. Among the socio-demographic characteristics, only two variables are found to have statistical significant impacts on the likelihood of purchasing irradiated seafood products. The result shows that black households are less likely to purchase irradiated seafood products than their counterparts. Being a black household decreases the probability a respondent will purchase irradiated seafood products by 18%. Older people are found to be more likely to purchase irradiated seafood than younger respondents. The change in probability is about 0.6% for every additional year, *ceteris paribus*. The positive and significant Age effect obtained in this study is consistent with previous study by Hinson et al. They estimated that, with respect to age, the marginal probabilities of willingness to buy and willingness to pay more for irradiated foods were 0.2% and 0.6%, respectively. A plausible explanation is that older consumers are less concerned with issues, such as potential long-term effects on children, but might be more concerned about avoiding potential sources of illness (Hinson et al.).

The estimation results of equation (4) on the Georgians willingness to pay extra for irradiated oysters are presented in Table III. In general, most of the estimated coefficients for the explanatory variables are not statistically significant. However, the overall goodness-of-fit statistics indicate that the model performed satisfactory. The log-likelihood ratio test shows that the estimated model is statistically significant at less than 1% significance level. Although the adjusted R^2 of .122 appears low, it is considered satisfactory and acceptable for the model given that the data are cross sectional in nature and collected from the survey.

Table III: Estimated Regression Results of Willingness to Pay for Irradiated Oysters

Variable	Estimated Coefficient	Standard Error
Constant	-2.2870	1.8268
LTB	2.0576*	1.1778
Know Irradiation	1.3728**	.6808
Support Irradiation	1.2843*	.7366
Consume GM Foods	1.3849**	.7211
Black	.5235	.7339
Hispanics	-.0463	1.3635
Female	-.5097	.5744
Children < 18 Years	.4993	.6564
Married	.3271	.6515
Adults	.1969	.3605
Age	.0151	.0219
College Education	-.1832	.6157
Employment Status	.2777	.6001
Household Income	-.0157	.1211
-2 x Log-likelihood ratio	57.665***	
Adjusted R^2	.122	
Sample size	212	

*, **, and *** indicate the estimated coefficients are statistically significant at the 10%, 5%, and 1% significance level, respectively.

As to be expected, one of the important variables that affect a respondent's willingness to pay for irradiated oysters is the likelihood of purchasing irradiated seafood products. Thus, if a respondent is willing or likely to buy irradiated seafood products, then those respondents would be willing to pay a higher price for irradiated oysters for an average of about $2.06/pt. The results show that those respondents who had some knowledge about food irradiation were willing to pay $1.37/pt extra for irradiated oysters. The finding supports similar results reported in other studies (Frenzen et al.; Misra et al.; Hinson et al.). For example, Hinson et al. suggested that consumers who were somewhat familiar with irradiation process as a food preservation technique were significantly more likely to buy and eat irradiated food. Similarly, those respondents who were likely to support irradiation process and willing to consume GM foods would be willingness to pay about $1.28/pt and $1.38/pt extra for irradiated oysters, respectively.

With respect to the demographic variables, it is disappointing to point out that none is found to be statistically significant in determining consumers' willingness to pay extra for irradiated oysters. The positive effect of households with young children ran contrary to *a priori* expectation that having children less than 18 years of age was hypothesized to negatively related to willingness to pay extra. Perhaps, those respondents who have young children at home believed irradiation enhances food safety attribute of seafood products by reducing the risks of bacterial contamination and thus would be willing to pay extra for irradiated oysters.

IMPLICATIONS AND CONCLUSIONS

The results suggest that the probability of a consumer purchasing irradiated seafood products is influenced by their perceptions of the necessity for irradiating these products as well as their support for the products. Consumers concerned with additives and chemicals were significantly less likely to purchase irradiated seafood products. Two demographic variables, Black and Age of the respondent were found to have exerted significant impacts on the probabilities of purchasing irradiated seafood products among Georgian consumers. While black respondents were found to have a lower the probability of purchasing irradiated seafood products, the opposite is true for older people. The influence of the demographic variables is important in that for the food irradiation process to gain wide-spread acceptability and become successful in the marketplace, consumers will have to be convinced that the process is safe, wholesomeness and beneficial.

The second component of the model found that the likelihood of purchasing irradiated seafood products is an important and significant predictor of a consumer's willingness to pay extra for a specific product such as irradiated oysters. Therefore, this finding emphasizes the need to develop effective marketing and educational material to convince consumers that irradiation is necessary for safer food and to gain their support for the process. If the industry can convince consumers that the process is safe, will provide a safer food product with no to minimal side-effects, they will purchase irradiated seafood products and most likely will be willing to pay extra for the increased level of food safety.

Overall, the results suggest that educating consumers about the benefits of irradiating seafood products has the potential to create a positive perception about the process and increase the probability a consumer will purchase and pay a higher price for these products. Food processors and retailers will market irradiated food products if they are convinced that consumer perception of their products will not be compromised by the use of irradiation technique. Therefore, an effective educational campaign should relay the benefits of irradiating seafood products while addressing common misconceptions associated with food irradiation.

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