The Impact of Message Framing on Organic Food Purchase Likelihood

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A consumer survey and Tobit analysis were used to determine the effect of message framing and other factors on self-reported organic food purchase likelihood. Negative framing, which emphasizes the possible negative consequences of conventional agricultural techniques, led to a "boomerang effect" that resulted in lowered purchase likelihood of organic food by consumers with high trust in food safety. Consumers with significantly higher purchase likelihood had high perceived risk from pesticides and high prior knowledge about organic methods. African-Americans and those with less than a high school education had lower purchase likelihood.

The market for organic food has been growing five times faster than food sales in general over the past decade (Dimitri and Greene 2002). The decision to purchase organic food is often a function of the desire to avoid certain conventional technologies such as pesticides, hormones and antibiotics, and biotechnology (Williams and Hammit 2001; Du-Puis 2000). A complication is that, given current scientific knowledge, the potential ill effects of conventional agriculture are difficult to quantify; subsequently, so are possible benefits from choosing organic food (see for example Bourn and Prescott 2002). Consumers may realize that the risks and benefits are uncertain. Economic theory such as prospect theory can guide advertising strategy under these conditions. Kahneman and Tversky (1979) developed prospect theory to address the gaps in expected utility theory for modeling choice under uncertainty and risk.

The chief outcome of prospect theory that is interesting from a marketing standpoint is the effect of message framing. When the same choice is presented as a potential loss (negative framing) or a potential gain (positive framing), people can react very differently. With positive framing, the message explains benefits of buying a certain product. Organic food packages present both positive and negative framing examples. Some packages have messages describing the product as "safer and healthier" while others say the food was grown without "dangerous" pesticides (Gifford and Bernard 2004). Both positive and negative framing are intended to persuade consumers to buy the product, but in ways that are processed differently by the consumer. This paper tests a model of future purchase likelihood as a function of variables including message framing, knowledge, attitude, and demographic variables; and makes recommendations for marketing campaigns as well as future research based on the analysis of the model.

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Related Literature

Kahneman and Tversky's original experiments in prospect theory found that negative frames were more effective, but in further research, results differed by type of product or service. For instance, Berger and Smith (1998) showed that positive framing was the most effective in promoting durable consumer goods such as video cameras. Positive information was also more effective than negatively framed information to encourage healthy behaviors including intentions to exercise and the use of infant car seats, sunscreen, and condoms (Rothman and Salovey 1997). However, in studies comparing the effect of negative media attention about BSE or saturated fat in beef against positive advertising of the product, the negative information was found to dominate, as evidenced by decreased sales (see for example Kaabia and Angulo 2001; Verbeke and Ward 2001).

An important consideration is that the presence of a warning or negative message can boomerang, i.e., increase the desire to purchase the product that the warning is attempting to discourage. This phenomenon is called reactance, or more simply, the "Boomerang Effect" (Ringold 2002). Ringold reviewed literature showing, for instance, that alcohol consumption may increase in response to warning labels or the raising of the drinking age, especially among certain individuals who highly value their autonomy or especially enjoy the behavior. Clee

and Wicklund (1980) cautioned that "fear appeals in advertisement, if perceived as manipulative, could lead to reactance effects in consumers." (Clee and Wicklund 1980, p.403). These findings should be considered when developing a marketing strategy.

As interest in organic foods has grown, many researchers have attempted to characterize the typical consumer. Few patterns are in evidence for demographic variables, as the findings often differ from one study to the next. A common thread is that women are more likely than men to purchase organic (Harris, Burress, and Eicher 2000; Wolf et al. 2002; Loureiro, McCluskey, and Mittelhammer 2002; Connor and Christy 2002). The review of literature on organic food purchase by Harris, Burress, and Eicher (2000), primarily of articles published in 1994 or earlier, reports that the significance of age, education, and income as predictors of purchase likelihood or willingness to pay (WTP) varies widely between studies. Williams and Hammitt (2000, 2001) also note that demographic variables are not as significant as are attitudinal variables such as trust in food safety or perceived risk from conventional techniques when predicting purchase likelihood.

Survey Procedures and Data

Three survey forms were designed to test the effects of positive and negative message framing compared to a control message[1]. All three survey forms began with a short introduction to the USDA organic standards, including five bullet points of defining characteristics of organic production and an opportunity to indicate familiarity with these five points by circling "Yes" or "No" for each[2]. The control form of the survey had the USDA message alone, followed immediately by survey questions dealing with perceived risk, trust in food safety, experience with organic food, and demographic information. The two other survey forms had the control message followed by either a paragraph about possible benefits from organic farming (the positive framing condition[3]) or possible negative consequences from conventional agriculture (the negative framing condition[4]).

Six questions on the survey probed perceived risk from conventional agricultural methods and four inquired about trust in food safety. One question focused on frequency of organic food purchase and one on enjoyment of organic food. Demographic questions and an opportunity to write a comment were included at the end of the survey. The key question of interest regarded future purchase likelihood of organic food.

The two-page survey was presented in a self-addressed stamped envelope to consumers in the entranceway of five food stores: two locations of an international supermarket chain, two locations of a locally-owned chain, and one natural foods store. All the stores were in New Castle County, Delaware. According to Salant and Dillman (1994), 374 surveys is a sufficient sample for the population of New Castle County, which registered just over 500,000 residents according to the 2000 Census. Of the 935 surveys distributed, 401 were returned usable, for a 47% response rate. A drop-off method was employed to distribute the surveys in order to maximize response rate while keeping costs low (Salant and Dillman 1994). Shoppers were solicited as they exited the store, and asked if they

[1] Survey materials are available upon request.

[2] The five points were the omission of synthetic pesticides, antibiotics or growth hormones, genetically modified ingredients, irradiation, and petroleum- or sewage-sludge-based fertilizers.

[3] The positive framing was the following message. Citations are present here for reference, but were not included on the survey form. "Studies show that soil fertility is increased and water contamination is decreased when organic farming practices are used (Cowley 2002; Clark et al. 1998). Animals grown according to the organic standards must receive access to the outdoors and are not overcrowded (USDA 2002). Studies have also found that organic foods can have significantly higher levels of vitamins and other beneficial nutrients than conventional products (Baxter et al. 2001; Sanders, Mossey, and Clark 2002). Improved taste is also reported by many consumers and in taste tests (Johansson et al. 1999; Cowley 2002)."

[4] The negative framing was the following message. Citations are present here for reference, but were not included on the survey form. "Conventional farming is a widely recognized source of land and water pollution from pesticide and fertilizer runoff (Cowley 2002; Pollan 2002). Pesticide byproducts are detectable in the bodies of children who eat conventionally grown food, while there is disagreement between scientists over whether this is harmful (Lyman 2002; Curl, Fenske, and Elgethun 2003). Over half of all antibiotics used in this country are consumed by farm animals, and this is suspected to contribute to the growing resistance of many bacteria to antibiotics (Grady 2001; McNamara and Miller 2002; Pollan 2002)."

would take a survey at home and return it using the stamped envelope. The following sections discuss the responses to the survey questions, analytical procedures, and the results of regression analysis.

Summary Statistics

Demographics

The mean respondent age was 46 years, slightly higher than the average age of 44 years old shown in the New Castle County Census. The average income, calculated using the midpoint of income categories provided on the survey, was $41,400; choices ranged from less than $15,000 to more than $90,000. A slight majority of the respondents, 59%, were female. Racial composition was 86% white, 9% African-American, and 4.5% other races. This was less diverse than New Castle County's population. A slight majority of respondents, 56.6%, indicated that they had no children under 18 at home, while 37% had one or two children. Education levels were higher than seen in the county census. Among the survey respondents, 15.4% had a high school education or less. In the county population, by contrast, 44% had a high school education or less.

Experience with Organic

Fewer than 5% of survey respondents reported purchasing organic food every time they shop (Table 1). The largest percentage of respondents reported "occasionally" purchasing organic, and nearly a quarter said that they "never" buy organic. In response to the enjoyment of organic food compared to conventional food, 57.9% claimed to enjoy the products equally. Nearly a third claimed to enjoy organic foods more, and 12.5% say that they enjoyed organic food less than conventional counterparts. A strong majority indicated prior knowledge that synthetic pesticides, hormones, and antibiotics must be excluded from food to be labeled organic (Table 2). A slight majority of the respondents knew that genetically modified ingredients cannot be used. Fewer than 50% indicated knowledge that irradiation and petroleum-based or sewage-sludge fertilizers cannot be used.

Table 1. Frequency of Organic Food Purchase.

How often do you buy organic (%)	
Every time	4.6
Most times	16.5
Occasionally	55.7
Never	23.2
How do you enjoy organic compared to conventional? (%)	
Less	12.5
Equally	57.9
More	29.6

Table 2. Prior Knowledge about Organic Methods.

Organic food must be produced **without**	Percentage who knew
Synthetic pesticides	80
Antibiotics or growth hormones	78
Genetically modified ingredients	62
Irradiation	47
Petroleum or sewage sludge based fertilizers	46

Risk and Trust

Two questions each were asked about three potential sources of risk—pesticides, biotechnology, and the use of antibiotics and growth hormones. Respondents were instructed to rate the risk on a scale from 0 to 4, where 0 was "No Risk" and 4 was "High Risk." Mean risk ratings were highest for pesticides and for antibiotics and growth hormones, with perceived risk from biotechnology lowest (Table 3). This likely reflects the uncertainty or lack of knowledge that many consumers still have about biotechnology.

To respond to trust issues, respondents had four choices after each statement ranging from "Strongly Disagree" (0) to "Strongly Agree" (3); a value of 1.5 was the midpoint of the scale. The strongest agreement was with the statement that the U.S. government can ensure a safe food supply (Table 4). Conventional farming inspired the next-highest trust, with a mean value at the center of the scale. Respondents tended to disagree that any food in the grocery store was safe, and that food companies value health and safety over profits. For each respondent, a trust-index variable was computed. The sum of the answers to the trust questions was divided by the maximum possible and normalized from zero to one, yielding a continuous variable TRUST for use in regression analysis.

Analytical Procedures

The Tobit model, also referred to as the censored regression model, is an extension of the Probit model that differs by allowing for censored or truncated data (for more background, see Long 1997 or Greene 1993). In the case of this survey, the response variable FUTURE is censored because of the limited response options to the questions. Specifically, there were five possible responses to the question "How likely is it that you will purchase an organic product?" which determined the observed dependent variable FUTURE. The options were "Definitely Not," "Probably Not," "Maybe," "Probably," and "Definitely." At each end of the scale the responses are censored because someone may have an even stronger inclination than can be captured with "Definitely Not" or "Definitely." For instance, "Definitely" could mean that the person will definitely buy organic one time in the future, or that they exclusively purchase organic food; the intensity or scope of their plans cannot be captured. Respondents who chose "Definitely" created right-censored data and those who chose "Definitely Not"

Table 3. Perceived-Risk Ratings.

Question	Mean perceived risk	Standard deviation
Synthetic pesticides to the environment	3.00	0.994
Antibiotics and growth hormones to human health	2.96	1.043
Synthetic pesticides to human health	2.93	1.001
Antibiotics and growth hormones to farm animal health	2.91	1.032
Genetically modified food to human health	2.39	1.234
Genetically modified food to the environment	2.29	1.226

Table 4. Trust in Food Safety.

Statement	Mean agreement	Standard deviation
The U.S. government is capable of ensuring a safe food supply	1.86	0.761
Modern conventional farming methods are safe	1.55	0.735
Any product in the grocery store is safe to eat	1.16	0.831
Food companies care about the health and safety of consumers more than profits	0.94	0.881

created left-censored data. The distribution of answers is shown in Table 5.

A standard regression model can be expressed as

(1) $y = X\beta + \varepsilon$,

where y is the vector of response variables, X is a matrix of independent variables (including an intercept term), β is the vector of unknown regression parameters to be estimated, and ε is a vector of errors assumed to come from the standard normal distribution. To account for both upper and lower censoring, the regression model is modified and the two-limit Tobit model developed by Rosett and Nelson is used (Long 1997). Equation 2 shows that two new variables are created to capture the censoring:

$$(2)\quad y = \begin{cases} L_i & \text{if} \quad y^* \le L_i \\ y^* = x\beta + \varepsilon_i & \text{if} \quad L_i < y^* < R_i \\ R_i & \text{if} \quad y^* \ge R_i \end{cases} .$$

In equation 2, y is the observed dependent variable, y* is the latent variable, L_i is the censored variable for left-censored data, and R_i is the censored variable for right-censored data. The standard errors of the parameter estimates are estimated from the inverse of the observed information matrix. The log-likelihood function for this model with both upper and lower censoring can be written as

$$(3)\quad \ln L = \sum_{\text{Uncensored}} \frac{\ln\phi\left(\frac{y_i - X_i'\beta}{\sigma}\right)}{\sigma} + \sum_{\text{Lower}} \ln\Phi\left(\frac{-R_i - X_i'\beta}{\sigma}\right) + \sum_{\text{Upper}} \ln\Phi\left(\frac{-L_i - X_i'\beta}{\sigma}\right).$$

where ϕ is the normal probability-density function, Φ is the cumulative-distribution function, *L* is the likelihood of each response outcome, and σ is the standard deviation of ε.

Equation 4 shows how the general Equation 2 is applied to the specific case of this data set. Numerical values were assigned to the answers for FUTURE, with 1 representing the low end of the scale (1="Definitely Not") and 5 the high end of the scale ("Definitely"). Finally, Equation 5 is the econometric model proposed for this data set. The variables are described in Table 6.

$$(4)\quad FUTURE = \begin{cases} 1 & \text{if} \quad FUTURE^* \le 1 \\ FUTURE^* = x\beta + \varepsilon_i & \text{if} \quad 1 < FUTURE^* < 5 \\ 5 & \text{if} \quad FUTURE^* \ge 5 \end{cases} .$$

(5) FUTURE* = β_0 + β_1 FORMNEG + β_2 FORMPOS + β_3 PREKNOW + β_4 TRUST + β_5 PESTRISK + β_6 GMRISK + β_7 ANIMRISK + β_8 FORMNEG*TRUST + β_9MALE + β_{10} BLACK + β_{11} LOWEDUC + β_{12} AGE + β_{13} HIGHINC + β_{14} KIDS + ε .

Hypotheses

The variables FORMNEG and FORMPOS are dummy variables for the negative and positive framing, respectively. Based on prospect theory and the literature reviewed about framing effects, it is hypothesized that both types of framing will increase FUTURE since they both offer new incentives to try organic. However, it is also hypothesized that there will be a boomerang effect from the negative framing. FORMNEG*TRUST is an interaction term that examines the combination of the trust index and the negative framing. A negative sign for the parameter estimate will indicate a boomerang effect, wherein high-trust individuals react defensively to a negative message, becoming less likely to purchase organic.

It is hypothesized that someone with higher PREKNOW will have higher FUTURE, because more knowledge about organic food would lead to more value being placed on it, translating to higher future purchase likelihood. It is hypothesized that higher trust in food safety, calculated in the index variable TRUST, will result in lower FUTURE since a high-trust individual is not likely to see the need for organic food. The three variables PESTRISK, GMRISK, and ANIMRISK represent the average of the risk ratings from pesticides, genetic modification, and hormone/antibiotic use in animal husbandry, respectively. It is hypothesized that all three risks will increase FUTURE, since purchasing organic helps to avoid those practices.

The demographic variables include gender, race, high income, low education, and the number of children in the household (Table 6). Past literature has been mixed in its findings with regard to the effect of income and education. We hypothesized that the extreme levels of income and education may have some effect; dummy variables therefore were created to represent the lowest levels of education

Table 5. Distribution of Response Variable.

Level of FUTURE	Percentage of respondents
Definitely not	2.3%
Probably not	11.7%
Maybe	32.9%
Probably	26.8%
Definitely	26.3%

Table 6. Names of the Variables and Their Descriptions.

Variable	Description of variable
FUTURE	Response Variable, purchase likelihood of organic food: Ordered categorical variable taking values from 1 to 5.
FORMNEG	Dummy Variable for the negative framing condition: 1 if present, 0 if not.
FORMPOS	Dummy Variable for the positive framing condition: 1 if present, 0 if not.
PREKNOW	Prior knowledge of organic methods: Ordered categorical variable taking values from 0 to 5.
TRUST	Trust index: Mean value of answers to the 4 trust questions on the survey, scaled to take any value from 0 to 1. 0="Strongly Disagree," 1="Strongly Agree."
PESTRISK	Pesticide Risk: Mean value of answers to 2 questions about pesticide risk, scaled to take any value from 0 to 1. 0="No Risk," 1="High Risk."
GMRISK	Risk from genetically modified foods: Mean value of answers to 2 questions about biotechnology, scaled to take any value from 0 to 1. 0="No Risk," 1="High Risk."
ANIMRISK	Risk from animal technologies including hormones and antibiotic use: Mean value of answers to 2 questions, scaled to take any value from 0 to 1. 0="No Risk," 1="High Risk."
FORMNEG*TRUST	The boomerang effect, represented by the interaction of negative framing and trust in food safety. Takes any value from 0 to 1.
MALE	Dummy variable for gender: 1 if male, 0 if female.
BLACK	Dummy variable for race: 1 if Black, 0 if other race.
LOWEDUC	Dummy variable for education level: 1 if high school or less, 0 if some college or more.
AGE	Age of survey respondent: Midpoint of age category selected.
HIGHINC	Dummy variable for high income: 1 if income > $90,000, 0 otherwise
KIDS	Number of kids in the household: Ordered categorical variable taking any value from 0 to 4.

and the highest income group. It was hypothesized that males, people with less education, and older people will have lower FUTURE. It was hypothesized that high-income individuals and those with kids at home will have higher FUTURE. Race is seldom mentioned in past literature on organic food WTP or purchase likelihood but was included in this model. It was hypothesized that race may have an effect, but the direction was unclear.

Tobit Regression Results

The response variable modeled was FUTURE, the future purchase likelihood of organic food, using the model shown in Equation 5. Only 2.3% of respondents said that they would "Definitely Not" purchase organic food at any time in the future (Table 5). The largest portion of respondents, 32.9%, said that they would "Maybe" purchase organic food; more than 50% chose either "Probably" or "Definitely."

The LIFEREG procedure in SAS was used to estimate the parameters by maximum likelihood, using a Newton-Raphson algorithm (SAS Institute Inc. 2002). Surprisingly, neither framing effect was statistically significant by itself (Table 7). However, the boomerang effect represented by the interaction of the negative framing with a high-trust individual (FORMNEG*TRUST) was statistically significant and large in magnitude. The negative framing created the risk of a boomerang effect, which lowers the predicted value of FUTURE by 1.33 points when a person with strong agreement that conventional food is safe is exposed to negative framing.

The trust-index variable TRUST was significant in the model of FUTURE, with the anticipated result that a person with higher trust in food safety is less likely to purchase organic. However, due to the presence of the interaction effect FORMNEG*TRUST in the model, the result can only be interpreted where FORMNEG=0; that is, where the positive or control framing was presented. For respondents who had either the control form or the positive framing, a change from strong disagreement to strong agreement in food safety significantly lowered the predicted value of FUTURE by 1.08 points. Perceived risk from pesticides, PESTRISK, significantly increased future purchase likelihood. The predicted value of FUTURE is higher by 1.83 points for a person who reports "high risk" rather than "no risk." The parameter estimate for PESTRISK was

Table 7. Tobit Regression Results for FUTURE.

		95% Confidence limits		
Covariates	Estimate	Lower	Upper	Pr > Chi Sq
Intercept	2.7065***	1.8518	3.6754	<0.0001
FORMPOS	0.1214	-0.2101	0.4529	0.4730
FORMNEG	0.4544	-0.3511	1.2600	0.2689
FORMNEG*TRUST	-1.3346*	-2.8835	0.2142	0.0912
TRUST	-1.0808**	-2.0691	-0.0924	0.0321
PESTRISK	1.8327***	1.1174	2.5479	<0.0001
GMRISK	-0.0496	-0.6514	0.5522	0.8716
ANIMRISK	0.3224	-0.3917	1.0366	0.3762
PREKNOW	0.1357***	0.0468	0.2247	0.0028
BLACK	-0.4261*	-0.9231	0.0708	0.0928
MALE	-0.0067	-0.3722	0.1908	0.5277
AGE	-0.0067	-0.0174	0.0039	0.2145
LOWEDUC	-0.3978**	-0.7790	-0.0166	0.0408
HIGHINC	0.1712	-0.1393	0.4816	0.2799
KIDS	0.0704	-0.0633	0.2041	0.3021

* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level.

larger than for any other variable. The other two risk variables were insignificant. This suggests, interestingly, that consumer risk concerns over GM foods may not be as important to organic food purchase likelihood as some have expected.

As hypothesized, increased prior knowledge of organic methods raised the future purchase likelihood of organic. For each 1-point increase in PREKNOW, the predicted value of future increased by 0.14 points. A change in knowledge from 0 to the maximum 5 points on the survey therefore increased FUTURE by 0.7 points. The only demographic variables with statistical significance were BLACK and LOWEDUC. This suggested that African-Americans are less likely by 0.43 points to purchase organic food. However, significance at the 10% level was relatively weak compared to the impact of prior knowledge and perceived risk from pesticides. As hypothesized, people with less education had predicted values of FUTURE that were slightly lower, a difference that was significant at the 5% level. None of the other demographic variables were significant, which is somewhat unsurprising since prior literature demonstrated that attitudinal variables are often more significant.

Conclusions and Implications

From the results of the survey questions, it appears that consumer perceived risk is highest for those technologies of which they are most aware. Both pesticides and antibiotics/growth hormones had high awareness on the prior-knowledge questions, and the mean risk rating was high for both. A slight majority of consumers knew about GM foods, and the risk ratings were near the midpoint of the perceived-risk scale. An educational opportunity still remains for GM foods, and the uncertainty consumers feel about these products is not necessarily a negative for biotechnology companies since survey respondents did not automatically select a high-risk rating for GM foods.

Of the three risk variables in the model, only the perceived risk from pesticides was statistically significant in the Tobit regression results. It is unclear why perceived risk from hormones/antibiotics was not significant. The survey did not specifically ask about purchase likelihood of a certain type of organic food. Possibly if meat or dairy products were specifically mentioned, risk from animal technologies would have been significant in the model. Two factors that increased the purchase likelihood were perceived risk from pesticides and prior knowledge about organic production methods. There were also several variables that decreased future purchase likelihood, including the "boomerang effect" that occurred when a high-trust individual was exposed to negative framing, higher trust in food safety for respondents with the control or positive framing, having less education, or being African-American. The reasons for a racial difference, ceteris paribus, are unclear; further research could investigate this apparent difference.

Due to the findings from the model, the following recommendations are made. Advertising campaigns should include positive framing or a message about the USDA standards, talking about the benefits and characteristics of organic rather than the drawbacks of conventional food. The "boomerang effect" cautions against using scare tactics. However, mentioning the benefits of avoiding pesticides might increase the likelihood of organic food purchase, since perceived risk from pesticides increased the predicted value of FUTURE.

There is a clear opportunity for future research looking at the effect of prior knowledge. Not surprisingly, people who knew more about organic methods said they were more likely to purchase organic. Initial education about organic may present a unique one-time opportunity to increase future purchase likelihood. Research into whether the source of the information (TV or print media, family and friends) or the way the information was found (sought it out, came across it by accident) could yield further insight into the design of marketing campaigns to educate consumers about organic products.

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