CONSUMER RESPONSE TO GMO FOODS: BRANDING VERSUS GOVERNMENT CERTIFICATION

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Gregory A. Baker
Food and Agribusiness Institute
Santa Clara University
500 El Camino Real
Santa Clara, CA 95053-0396
gbaker@scu.edu

Michael A. Mazzocco
Food and Agribusiness Management Program
University of Illinois
305 Mumford Hall - MC 170
1301 West Gregory Drive
Urbana, IL 61801
mmazzocc@uiuc.edu

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INTRODUCTION

The debate over the safety of genetically modified organisms (GMO's) has varied greatly in intensity. In Europe, the debate has been vigorous and European consumers have, in general, been extremely skeptical of the technology and unwilling to assume the risks associated with GMOs. Many retailers in Europe have promised that they will not sell food products that contain GMOs. In the U.S., consumer reaction to GMOs has been more muted. While some surveys have shown that a majority of Americans support the use of biotechnology, others have found that many Americans have reservations about the technology. Incidents such as the Taco Debacle, in which the genetically modified StarLink corn was inadvertently introduced into taco shells which were subsequently sold in U.S. retail supermarkets nationwide, have served to heighten consumer awareness regarding GMO foods.

Most of the research published to date has focused on consumer opinions regarding GMOs (Hoban: The Pew Initiative on Food and Biotechnology; International Food Information Council Foundation). Relatively little research has focused on understanding the basis of consumer opinion or developing or evaluating strategies targeted at gaining consumer acceptance of GMO products. Baker and Burnham studied consumer preferences for GMO foods and concluded that those consumers who were least risk averse, most likely to believe that GMOs improved the quality or safety of food, and least knowledgeable about biotechnology were the most likely to be accepting of GMO foods. Lusk et al. found that 70 percent of the participants, in a small sample, were unwilling to pay a premium to avoid food with GMO content.

The purpose of this research is to evaluate the effect of two potential strategies to gain consumer acceptance of GMO foods. Specifically, we examine the effectiveness of using a familiar brand or federal government certification on consumer acceptance of GMOs. This research is timely because the rapid pace of GMO development and adoption will soon make it difficult, if not impossible, to maintain separate products based on the presence or absence of GMO content (Barboza).

MODEL AND METHODS

The conceptual basis for the model used in this paper is Lancaster's theory of consumer demand. Lancaster argued that consumers value products because of the characteristics they possess. Ladd and Zober extended this model by distinguishing between a product's characteristics and the consumption services provided by a product. They argued that consumers' utility depends on the consumption services, which are, in turn, dependent on the characteristics of the product. The general form of the model used in this paper is expressed as:

(1) $$P_i = \beta_{i1} + \beta_{i2}PRICE + \beta_{ij}ATTRIBUTE_j + \epsilon_i, \quad i = 1,\ldots I, j = 3, \ldots J,$$

where P is the preference rating of the hypothetical product for the ith individual; $PRICE$ is the price of the chosen product; $ATTRIBUTE$ represents the jth product characteristic; and ϵ is a random error term.

In order to test the hypotheses that a familiar brand or government certification may offset the negative perceptions associated with GMOs, two conjoint analysis experiments were designed. In both experiments the attributes were chosen to present consumers with a realistic choice while achieving the research objectives. The first experiment was designed to test whether the use of a familiar brand could offset the negative perceptions associated with GMOs. The second experiment was designed to evaluate whether government certification could offset the negative perceptions associated with GMOs.

In the both designs consumers were told that they would be asked to evaluate banana products. The bananas were described as being yellow, firm, and of medium size. They were also told that the bananas were produced either “conventionally,” using traditional breeding techniques, or “genetically engineered,” using the tools of modern biotechnology. The bananas were priced at either 39¢ or 59¢ per pound.

In the first design the banana products were described as being either the “Chiquita brand,” indicating that they were produced by Chiquita, or “unbranded,” indicating that they were grown by an unidentfied grower. This model will be referred to as the “brand model” and was specified as:

(2) $$P_i = \beta_{i1} + \beta_{i2}PRICE + \beta_{i3}TECH + \beta_{i4}BRAND + \epsilon_i, \quad i = 1,...I,$$

where *TECH* is a binary variable representing the technology used to produce the bananas (0 if conventionally produced, 1 if genetically engineered) and *BRAND* is a binary variable (0 if unbranded, 1 if Chiquita brand).

In the second design, the bananas were described as being either “FDA certified,” indicating that the product had undergone special testing by the Food and Drug Administration to ensure that it was safe for human consumption, or having “No certification,” indicating that no special testing had been conducted to ensure that the product was safe for human consumption. This model will be referred to as the "certification model" and was specified as:

(3) $$P_i = \beta_{i1} + \beta_{i2}PRICE + \beta_{i3}TECH + \beta_{i4}CERT + \epsilon_i, \quad i = 1,...I,$$

where *CERT* is a binary variable representing certification (0 if no certification, 1 if FDA certified).

A full factorial design was used with both versions of the conjoint analysis experiment; consumers were asked to rate all eight possible combinations of attributes. Both versions of the survey were pretested with a small group to ensure that the questions were clear and that the surveys could be quickly completed.

In the final version of the survey, recipients were asked to evaluate the eight banana products. Narrative descriptions of the banana products were given, including the basic product (yellow, firm, and of medium size) and the three attributes (price, technology, and brand or certification). In the second design the bananas were also described as unbranded. Survey recipients were then asked to rate each of the eight banana products on a scale of 1 to 10, with 10 representing the most preferred item and 1 representing the least preferred.

The conjoint analysis surveys were mailed in November 2001. One thousand surveys were mailed to a random sample of U.S. households. One-half of the sample received each version of the survey. In addition to the conjoint analysis survey, additional questions were included regarding risk perceptions, opinions about biotechnology, and sociodemographic factors. A $3 incentive payment was promised and subsequently mailed to those respondents who completed and returned the survey. Additionally, a reminder card was mailed approximately one month after the initial mailing.

A total of 116 usable surveys were returned, with 58 usable surveys returned for both the brand and certification models. After accounting for the 400 bad addresses the net response rate was 19.3 percent.

RESULTS AND DISCUSSION

The conjoint analysis results were analyzed with OLS. For each respondent, the preference ratings were regressed on the independent variables *PRICE*, *TECH*, and either *BRAND* or *CERT*. This resulted in separate coefficients for the three product attributes for every individual. The results for the two models are presented in tables 1 and 2.

A common goodness of fit measure for conjoint analysis models is the average R^2. The average R^2 is calculated as the average of the R^2 statistics for the equations which were estimated for every individual. The average R^2 for the brand and certification models was 0.86 and 0.87, respectively, indicating that both models were a good fit.

In addition to the raw coefficients for each variable, relative factor importance scores are also reported. The relative factor importance score is an indication of the importance of each attribute, relative to other attributes, in determining a consumer's preference for the hypothetical products. The score is calculated by dividing the variation in the preference rating due to each individual attribute by the total variation in the preference ratings due to all attributes. All scores are reported as absolute values and in percentage terms; therefore the sum of the relative factor importance scores for all attributes is 100 percent.

For example, for the brand model (table 1), the variation due to the *PRICE* attribute is calculated by multiplying the absolute value of the *PRICE* coefficient (-7.65) by the variable's range (0.20) for a variation of 1.53. For binary variables the variation is equal to the coefficient for the variable. Therefore, the variation due to the two binary variables, *TECH* and *BRAND* is 1.77 and 1.45, respectively. The total variation for this model is 4.75. Therefore, the relative factor importance score for the price variable is calculated to be 32 percent (1.53 divided by 4.75)..

The results of the brand model show that, over all consumers, the three variables had roughly the same impact on consumer preferences for the product with the relative factor importance scores ranging from 30.55 to 37.26 percent. The impact of the *TECH* variable was roughly equal to that of the 20¢ price differential used in this study. The *BRAND* attribute had a somewhat smaller impact on consumer preferences than did the *TECH* attribute. In other words, the positive impact of the brand variable was not quite enough to offset the negative perception associated with genetically engineered produce.

The certification model indicates that one attribute dominated the aggregate preference function – the certification variable. Approximately one-half of the potential variation in preference scores was accounted for by the *CERT* attribute. The positive influence of certification on consumer preferences was more than double the negative impact associated with genetically-engineered produce as indicated by the relative factor importance scores of 49.26 percent and 22.62 percent, respectively. However, relative to the importance of the price variable, the impact of the *TECH* variable was similar to that of the first model, that is, it was roughly equivalent to the impact of the 20¢ price differential.

The results of the analysis of this relatively small sample are clear. The positive influence of marketing a GMO product under a well-known brand, Chiquita in this case, is not sufficient to allay consumer fears associated with genetic engineering. On the other hand, this analysis supports the idea that a government certification program may be an effective means to assure consumers of the safety of GMO products.

If this result holds true for products other than bananas, and brands other than Chiquita, this analysis indicates that the use of a familiar brand by itself cannot be effectively used to offer consumers assurances regarding the safety of GMOs. This is supported by a separate analysis in which the same respondents were asked to rate the strength of their trust in various agents to disclose information regarding GMO products (table 3). The results indicate that consumers placed the highest level of trust in a government certification guarantee (6.98 on a scale of 1 to 9, with 1 indicating the lowest level of trust and 9 indicating the highest level of trust) This was higher than the level of trust placed in either a familiar brand or a company (brand) certification guarantee (5.34 and 6.01, respectively). Both of these differences were statistically significant at the 0.01 level of probability.

We hypothesize that consumers place such a high level of trust in the government for several reasons. First, the federal government is perceived positively in the U.S. in its role as protector of the food supply. In the past, it has reacted quickly to threats to the food supply, whether it be from tainted produce or unsafe products requiring a recall. Second, unlike food companies, the federal government is not perceived as having an interest in promoting a particular type of product. Food companies, on the other hand, are likely perceived as having a vested interest in promoting their own products. For this reason, consumers may regard a company's label as a guarantor of product safety with a degree of skepticism. This is particularly true for products where the technology to produce them cannot be readily ascertained by consumers and whose potential harmful effects cannot be immediately seen nor directly linked to the use of the product. A risk for companies that choose to sell GMO products under a brand name is that the negative perception may have the unintended result of eroding brand equity.

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Table 1. Aggregate Preference Function for Brand Model

Variable	Coefficient	Relative Factor Importance Score[a]
Intercept	9.61	-
PRICE	-7.65	32.18%
TECH	-1.77	37.26%
BRAND	1.45	30.55%

Note: Sample size = 58.

[a]The sum of the relative factor importance scores does not equal 100% due to rounding error.

Table 2. Aggregate Preference Function for Certification Model

Variable	Coefficient	Relative Factor Importance Score
Intercept	8.98	-
PRICE	-7.46	28.12%
TECH	-1.20	22.62%
CERT	2.61	49.26%

Note: Sample size = 58.

Table 3. Trustworthiness of Various Methods of Disclosing Biotechnology Information

Method	Level of Trustworthiness[a]
An identification stamp of seal	5.81
Written text on the package	6.06
A familiar brand	5.34
A colored sticker	4.41
An address or origin or production	4.75
A government certification guarantee	6.98
A company (brand) certification guarantee	6.01
An industry-level certification guarantee	6.02
A store-level certification guarantee	4.63

Note: Sample size = 113.

[a]The level of trustworthiness was rated on a scale of 1 to 9 with 1 indicating “Less trustworty” and 9 indicating “More trustworthy.”