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In-Store Evaluation of Consumer Willingness to Pay for “Farm-Raised” Pre-Cooked Roast Beef: A Case Study

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A choice-based conjoint experiment was used to examine consumer willingness to pay for a farm-raised pre-cooked roast beef product. Consumers were contacted in a grocery store and provided a sample of the pre-cooked product. Findings indicate there is a small, but statistically significant willingness-to-pay premium for the farm-raised product, suggesting that some product differentiation may result in higher prices for these products. The study outlines an approach to marketing research.

Key Words: beef, conjoint, convenience foods, experiments, in-store tests, surveys

Food markets continue to evolve to include more differentiated products. Some producer groups and food companies are attempting to move from a commodity-based market, characterized by high volume and low margins, to differentiated markets, characterized by products that are similar, but contain some degree of differentiation. An example of such differentiation in beef markets is increased availability of pre-cooked convenience foods such as pre-cooked roast beef products offered by Hormel and other companies. These products attempt to tap into the convenience demand by consumers. Consumers are often willing to pay a premium above costs of production for such services. This fact, coupled with the fact that many consumers are also willing to pay for products perceived as natural, organic, or grown by small farmers (Loureiro and Hine, 2002) may open the door for products offering both a convenience as well as these other “natural” attributes.

Lancaster’s consumer theory holds that individuals derive utility from a product with utility-bearing characteristics or attributes. It is the attributes which provide consumer utility, not the product itself. There is rich empirical literature relating to the marginal value of product attributes on market price and consumer utility. For example, a recent study by Lusk, Roosen, and Fox (2003) found that attributes such

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as guaranteed tenderness, feeding characteristics (fed or not fed genetically modified corn), and the location of residence of the consumer all affected willingness to pay for steaks. Other studies, such as Loureiro and Hine (2002), have focused on the production attributes of the products.

To effectively assess the niche market potential for a novel product with specific attributes, knowledge of the underlying marginal values consumers place on those attributes is necessary. Specifically, the ability to segment the market depends on differing elasticities of demand for the novel product/attribute relative to existing market alternatives.

A pre-cooked roast beef product from “farm-raised” beef has been developed by food scientists. “Farm-raised,” in this context, means that cattle have been fed on grass and forage (no grain supplements), but have not been fed in a feedlot. The existing products (other pre-cooked products) have already established a niche market for consumers demanding convenience. The new product is designed to further segment the market into those who prefer “farm-raised” products and those who choose products derived from animals fed in commercial feedlots. To the extent that consumers value the “farm-raised” characteristic, they will express a positive willingness to pay for such a product. As is often the case in practice, the new product being developed is not “identical” to existing products. Thus, examining differences in willingness to pay relative to characteristics such as “farm-raised” may be confounded with differences in other product characteristics. However, as long as products are substantially similar, the analyst can still engage in marketing research, given the potential confounded elements are recognized.

Companies are obviously interested in values for new products. Focus groups are a popular method of gathering primary data on consumer response, but often lack quantitative data sufficient to make predictions. In this study, we outline an approach using in-store intercepts to gather data from likely consumers. We also outline some pitfalls of this approach and provide suggestions for executing this procedure in practice.

Product Background

Farm-raised cattle were finished to final weight in open pastures by consuming only grass and forage (no grain). After slaughter (at approximately 1,250 pounds), muscles were marinated, pre-cooked, and packaged in a translucent white, re-sealable package. The label displayed the common nutritional information and preparation instructions. In addition, the words “farm-raised” were added to each label to inform the consumer of the origin of the product they were going to purchase. Consumers were provided information about the meaning of “farm-raised.”¹

¹ Consumers were told the following: “‘Farm-raised’ is defined as animals that have been produced on a farm in open pastures with no supplemental grain as feed. Animals were fed to final weight using only grass and forage. ‘Farm-raised’ makes no assurances that animals were or were not given antibiotics or hormones, but only assures that animals were not fed in a confined feedlot or given grain for feed. All meat presented here is USDA inspected.”

The purpose of the labeling was to signal to the consumer that the product was not produced in commercial feedlots or fed grain. Nutritional characteristics were similar, but not identical, to existing products. Nutritional differences stem from differences in marinade contents and fat content of the farm-raised beef, but were not appreciably different.

Methods

Data were collected from 75 shoppers on a Thursday in June at a national chain grocery store in the southeastern United States. The grocery store was located in a middle-income area. The experiment involved three steps, two in the store and one at home, and the experiment was conducted all within the same day and the same store.

- *STEP 1.* Shoppers who visited the meat counter were approached and asked if they would be willing to participate in a survey in which they would receive a 16-ounce pre-cooked roast beef for their time. The interviewers identified themselves as representatives of the Department of Agricultural Economics at Mississippi State University. If the shopper agreed to participate, the experiment continued to step two. If the consumer refused participation, a turndown was recorded. The survey booth was situated near the meat counter to target shoppers interested in purchasing meat products. However, as with most grocery stores, the meat counter is located in a high traffic area. Policies of the grocery store (as well as logistic constraints of handling the product) did not allow interviewers to roam randomly through the store.
- *STEP 2.* Participants were informed about the product characteristics and the requirements of their participation. They were asked to write their name and telephone number on a sheet of paper and then were given a packet which included the take-home survey, a self-addressed prepaid envelope, and a coupon to present to the cashier for the free roast beef.
- *STEP 3.* After tasting the product at home, the participants filled out the survey instrument.² Consumers were initially asked if they had ever previously purchased pre-cooked roast beef. They were then asked to provide basic demographic information including age, education, income, ethnicity, and gender. Respondents also completed a portion of the survey asking them to respond to questions pertaining to the beef product they had just consumed by rating taste, aroma, texture, and visual appeal of the product on a 5-point Likert scale. The participants were given three options of descriptors—"forage-fed," "farm-raised," and "grass-fed"—from which they were to choose the one that was most appealing to them. Next, they were asked to rate how different attributes, such as price, visual appeal, convenience (pre-cut or pre-cooked), packaging or labels, location of origin, and special characteristics (organic, no hormones), affected their purchasing decisions when looking at a beef product.

² A copy of the instrument is available from the authors upon request.

Table 1. Example Choice Sets

SCENARIO 1			
Attribute	Hormel	Farm-Raised	None
Price/pound	\$3.90	\$3.90	\$0.00
<i>I would choose . . .</i>			

SCENARIO 2			
Attribute	Hormel	Farm-Raised	None
Price/pound	\$3.90	\$4.50	\$0.00
<i>I would choose . . .</i>			

SCENARIO 6			
Attribute	Hormel	Farm-Raised	None
Price/pound	\$5.10	\$3.90	\$0.00
<i>I would choose . . .</i>			

Participant willingness to pay (WTP) was elicited using a choice-based response model varying the price of the existing Hormel product and the farm-raised product. The advantage of the choice-based conjoint (CBC) technique is that it allows for manipulation of attributes across scenarios to test specific hypotheses (Hudson and Lusk, 2003; Lusk and Hudson, 2004; Unterschultz et al., 1998; Lusk, Roosen, and Fox, 2003; Beggs, Cardell, and Hausman, 1981; Adamowicz et al., 1998). Three prices were applied to both the Hormel and farm-raised items and were varied in each scenario. Each scenario contained two possible prices plus an option to choose “none” and pay nothing. Three price levels—\$3.90, \$4.50, and \$5.10 per pound—for each product were varied according to a full factorial design (the actual price of the Hormel product ranged from \$4.20 to \$4.70, with an average of \$4.50, across the grocery stores in the sample community). Each respondent was presented seven scenarios (see choice set examples in table 1). For each scenario, the respondent would make a choice of the preferred product. For example, in scenario 1 of table 1, the price of both the Hormel and farm-raised beef was \$3.90/lb. The respondent would choose either product or “none.” After that choice was made, the prices were altered in scenario 2 and the respondent would choose again. This process continued until all seven scenarios had been evaluated, resulting in seven observations on choice for each individual.

These data allow us to estimate the probability of choice at different price levels, which can then be used to estimate the mean WTP for each product. The model is based on a model of random utility (Louviere, Hensher, and Swait, 2000):

$$(1) \quad U_{ij} = V_{ij} + \epsilon_{ij}$$

where U_{ij} is the utility consumer i receives from consuming product j , V_{ij} is the deterministic portion of utility, and g_j is the stochastic component of utility. As shown by table 1, there are three options—Hormel, farm-raised, and none—from which the consumer has to choose. The probability of choosing any of these j pre-cooked roast beef products (or none) is specified as:

$$(2) \quad \Pr(j \text{ is chosen}) = \Pr\{V_{ij} + g_j \geq V_{ik} + g_k, \forall k \in C_i\},$$

where C_i is the choice set for consumer i ($C_i = \{\text{Hormel, farm-raised, none}\}$). Assuming the random errors in equation (1) are independently and identically distributed across the j alternatives and N individuals with a type I extreme value distribution and scale parameter equal to 1, the probability of consumer i choosing product j is given by:

$$(3) \quad \Pr(j \text{ is chosen}) = \frac{e^{V_{ij}}}{\sum_{k \in C_i} e^{V_{ik}}}.$$

Equation (3) was estimated as a conditional logit model composed of the price levels reported above. The issue of interest here is the willingness to pay for the different pre-cooked roast beef products. The model contains two "alternative specific constants," one for each of the two named products (Hormel and farm-raised). The model also generates a parameter estimate for the effect of price on the probability of choice. The WTP is derived by taking the ratio of the parameter estimate of the alternative specific constant for a particular product to the parameter estimate for price. This procedure estimates the mean WTP for each product.

A test for a statistical difference between mean willingness-to-pay values is derived by estimating the 95% confidence interval on each mean WTP value. The confidence interval is developed by estimating the bivariate normal distribution between the parameter estimates of the alternative specific constants and the price estimated parameters (Krinsky and Robb, 1986). The resulting distribution provides a standard deviation of the distribution of WTP, which is then used to calculate the 95% confidence intervals. If the 95% confidence intervals of the two WTP values—one for Hormel and one for farm-raised—overlap, they are not statistically different and vice versa.

Data and Results

Eighty-eight grocery store shoppers were approached and asked to participate in this experiment. A total of 75 individuals agreed to participate in the actual survey (a turndown rate of 14.8%). Of the 75 survey instruments that went home with the participants, 39 were returned—resulting in a final response rate of 52%.³ The completed

³ Follow-up phone calls were made to nonrespondents to encourage participation.

Table 2. Definitions of Variables and Summary Statistics for Survey Respondents (N = 39)

Variable	Definition	Treatment Average
<i>Gender</i>	1 if male; 0 if female	0.28 (0.45)
<i>Age</i>	Age of respondent in years	56.56 (15.52)
<i>Education</i>	Education level of the respondent: 1 = high school graduate 2 = some college 3 = college graduate (B.S., B.A. completed) 4 = post-graduate (M.S., M.A., Ph.D., M.D., D.D.S., J.D.)	2.94 (1.05)
<i>Income</i>	Annual income of household: 1 = less than \$25,000 2 = \$25,000 to \$49,999 3 = \$50,000 to \$74,999 4 = \$75,000 to \$100,000 5 = more than \$100,000	2.55 (1.08)

Note: Values in parentheses are standard deviations.

surveys were returned over a 21-day period. Table 2 provides definitions of variables and summary statistics for the participants in the experiment. The majority of the participants were female, and the average age was slightly over 56. On average, the participants had some college education and reported an average income of \$50,328. Although based in a college town, the participants ranged greatly in age, from 20 to 80; education ranged from no college experience to Ph.D.; income ranged from under \$25,000 to over \$100,000; and average times eating beef a week ranged from 0 to 6.⁴ Almost one-fourth of those who participated (23%) had tried a pre-cooked roast beef product previously.

Table 3 reports results of consumers' ratings of the farm-raised beef product. Analysis of the participants' responses after they had consumed the product reveals that visual appeal and aroma were the two highest rated attributes (both scoring 1.97 on a scale from 1 to 5, where 1 = very favorable and 5 = very unfavorable). Taste received the lowest rating, with an overall score of 2.10. Despite showing the least desirability, taste was still viewed as acceptable, on average. Of the three label

⁴ Based on statistics from the 2000 *Census of the Population*, participants in our experiment were more educated and had higher incomes compared to the general population of the locality sampled. According to the U.S. Census Bureau (U.S. Department of Commerce), the median household income in the locality was \$39,557, and 46% of the population had graduated from college in 2000. In our sample, the average household income was \$50,328, and 64.11% had graduated from college. The average age in our sample was 56 compared to the locality median age of 25.2 years. A larger percentage of women participated in the survey, but this was expected because women are generally the members of the household who shop for groceries. While the differences between our sample and the general population limits generalizability, it does not negate the hypothesis tests.

Table 3. Consumer Response to Farm-Raised Beef

Variable	Definition	Average
<i>Prior Purchase</i>	Previously purchased pre-cooked roast beef: 1 = yes 0 = no	0.23 (0.42)
<i>Taste</i>	Taste of farm-raised beef: 1 = very favorable 5 = very unfavorable	2.10 (1.25)
<i>Aroma</i>	Smell/aroma of farm-raised beef: 1 = very favorable 5 = very unfavorable	1.97 (0.93)
<i>Texture</i>	Feel/texture of farm-raised beef: 1 = very favorable 5 = very unfavorable	2.02 (1.13)
<i>Visual Appeal</i>	Looks/appearance of farm-raised beef: 1 = very favorable 5 = very unfavorable	1.97 (1.15)
<i>Label</i>	Options for preference of descriptor on label: 0 = “Farm-Raised” 1 = “Forage-Fed” 2 = “Grass-Fed”	0.6154 0.1026 0.2821

Note: Values in parentheses are standard deviations.

Table 4. Importance of Attributes in Beef Purchasing Decision Making

Attribute	[1] Very Important	[2]	[3] Neutral	[4]	[5] Very Unimportant
	<!!!!!!!!!!!!!! Percent (%) !!!!!!!!!!!!!!! >				
Price	48.72	25.64	17.95	5.13	2.56
Visual Appeal	51.28	38.46	5.13	2.60	2.53
Convenience	25.64	23.08	28.21	20.51	2.56
Label	12.82	41.03	25.64	12.82	7.69
Origin	25.64	28.21	15.38	15.38	15.38
Special Characteristics	33.33	15.38	23.08	15.38	12.82

Note: Bold italics denote the highest percentage response within each ranking category.

choices, “farm-raised” was selected by 61.54 % of respondents, “forage-fed” was selected by 10.26%, and “grass-fed” was chosen by 28.21% of those surveyed.

When asked to rank the importance of product attributes in their beef purchasing decisions (again using a 1–5 scale, where 1 = very important and 5 = very unimportant), about 51% of the shoppers surveyed responded that visual appeal of the beef product was very important in their purchase decision (table 4). The price associated

Table 5. Conditional Logit Model Results

Variable	Parameter Estimate	Standard Error	t-Value
Constant (<i>Hormel</i>)	13.21322	1.3556	9.747*
Constant (<i>Farm-Raised</i>)	15.7796	1.5802	9.986*
<i>Price</i>	! 2.9914	0.3199	! 9.348*
Log-Likelihood Statistic	! 204.8473		
R^2	0.3170		
Willingness to Pay	Mean WTP	95% Confidence Interval	
< Hormel	\$4.41/lb.	[\$4.27, \$4.55]	
< Farm-Raised	\$5.28/lb.	[\$5.08, \$5.48]	

Note: An asterisk (*) denotes statistical significance at the 5% level.

with a particular beef product was ranked very important by over 48% of respondents. Less important were special characteristics (i.e., hormone-free, organic, etc.), with 33% of participants indicating these traits were very important in their decision making. Examining the niche market of convenience and labeling issues, table 4 shows convenience was perceived as very important by 25% of the respondents, and labeling was selected by only 12%.

Results of the estimated conditional logit model are presented in table 5. Both parameter estimates for the alternative specific constants are statistically significant and positive, indicating, on average, there is a higher probability of choosing either beef product than choosing none. This result is supported by the fact that “none” was chosen only 24% of the time in the sample. The coefficient on price is negative and statistically significant, suggesting that increases in price lead to decreases in probability of choosing a beef product. As observed from figure 1, the predicted probability of purchasing either product declined as price increased.

The mean WTP (table 5) for the Hormel product is determined by taking the ratio of the estimated coefficient for the constant for Hormel to the estimated coefficient for price (in absolute value), yielding a mean WTP for Hormel of \$4.41 per pound. The mean WTP for the farm-raised product is \$5.28, revealing that consumers were willing to pay a premium of \$0.87 per pound for the farm-raised product. An examination of the 95% confidence intervals for the two products (table 5) shows that the WTP for farm-raised beef was statistically greater than for the Hormel product, other things equal—suggesting consumers did express a positive premium for the “farm-raised” product.

Conclusions and Recommendations

A growing number of firms are attempting to segment markets by providing differentiated products. Increasing demand for convenience foods, as well as goods having

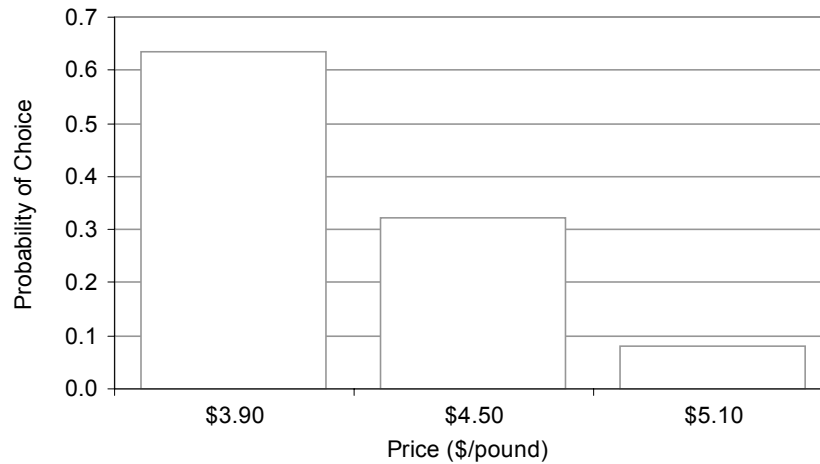


Figure 1. Predicted probability of purchasing a pre-cooked roast beef product at different price levels

such attributes as “organic,” “hormone-free,” or “farm-raised,” are increasingly entering the market. The premise behind this approach is that consumers are willing to pay premiums for goods with such attributes.

In this analysis, we have examined the potential premium available for a “farm-raised” pre-cooked roast beef product relative to its nearest competitor which did not have the “farm-raised” attribute. Using a choice-based approach of consumers within a grocery store, we found consumers were willing to pay a statistically significant premium for the farm-raised product. These results therefore suggest an opportunity exists for firms to provide a product that will generate more revenue. It should be noted, however, that three of the six attributes rated by respondents for this product—“label,” “origin,” and “special characteristics” such as hormone-free—all were deemed as relatively unimportant by the consumer (table 4), which points to limited marketability of the product on these traits. Moreover, the results of this study were generated with a small sample of only 39 respondents. Thus, the significant potential premiums observed here suggest that a more comprehensive examination of potential market premiums is warranted.

The results do not, however, indicate whether this decision is profitable. As illustrated in figure 1, potential acceptance of the product declines substantially (from 64% to 8%) when the price increases from \$3.90 per pound to \$5.10 per pound. Consequently, while consumers appear willing to purchase these products, on average, they do appear sensitive to price. Taken with the lack of importance of labels in purchasing decisions, our findings imply that the niche market for this product is likely small, especially at higher prices.

These results demonstrate an alternative method for use by focus groups in gathering primary data on consumer WTP for new products. There are several advantages of this approach over the traditional focus group method of gathering data. First, the

choice-based approach allows gathering of large amounts of choice data from relatively small samples of people, thereby cutting down on cost, but increasing predictive accuracy. Second, this approach is based on random utility theory, which incorporates a degree of scientific rigor into the analysis. Finally, combining the in-store intercepts with the choice-based survey: (a) increases response rates over typical mail surveys, (b) allows the researcher to target likely shoppers more easily than random mail surveys, and (c) places the shopper in a more realistic purchasing scenario as compared to a sterile laboratory or random mail survey.

While this paper presents a case study, with requisite caveats applying, there are a few pitfalls or shortcomings of this approach to consider as well when implementing a full-scale study. First, as was the case in this analysis, sample sizes tend to be small, especially by academic standards. Although businesses using focus groups tend to work with small sample sizes (10–12 per group), larger sample sizes are preferred. This deficiency can be remedied through additional sampling, longer sample periods, and multiple locations, but at a cost. In this analysis, access to a sufficient supply of the product limited the potential sample size. In most cases, additional product can be secured, but the cost of the market research increases.

Second, this analysis was conducted at one location. The preference is to sample multiple locations to mitigate sampling biases arising from socio-demographic characteristics of shoppers at particular stores. For example, sampling in stores in affluent areas may bias results upward for higher priced products or downward for lower priced products. Depending on the type of product and/or the target audience of the product, sampling in multiple locations will increase the reliability and generalizability of the results.

Finally, sampling in multiple time periods may have some effect on results. Specifically, sampling during normal business hours is likely to draw respondents who are either retired (older) or single-income households, where one member of the household is free to shop during the day. Thus, sampling during different times of the day will likely increase diversity in sample characteristics. Also, sampling on different days of the week will likely generate different samples—i.e., weekend shoppers may be different types of respondents than weekday shoppers.

Consideration of all these elements will enhance the reliability of market research. Although more time-consuming and costly than a standard focus group analysis of a new product, this approach adds reliability and predictive power while still collecting essential qualitative information needed by companies. In addition, for scientific practitioners, this approach allows one to satisfy the needs of companies while maintaining hypothesis testing capacity and publishability of results.

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