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Product Differentiation and Market Segmentation in Applesauce: Using a Choice Experiment to Assess the Value of Organic, Local, and Nutrition Attributes

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Product Differentiation and Market Segmentation in Applesauce:
Using a Choice Experiment to Assess the Value of Organic, Local, and Nutrition Attributes

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Abstract

Recently there is much interest among horticultural producers concerning the marketing of organically- and locally- produced food. Here we developed a consumer survey that asked respondents to choose an applesauce product from a list of products differentiated by price and four attributes. The products were differentiated by labels that described fat content, nutrition content, and whether the product was grown organically and/or locally. The survey was distributed to 3,000 residents in rural Pennsylvania and over 1,500 responses were collected yielding a response rate of 56%. Survey results were used to assess consumers' willingness to pay for the product attributes in applesauce, and we found that consumers were willing to pay more for locally-grown applesauce compared to applesauce that was labeled organic or low fat and low sugar. Furthermore, the analysis incorporated the effects of consumer characteristics on the demand for applesauce attributes and we find evidence that increased knowledge of agriculture decreases the willingness to pay for organically- and locally-grown applesauce.

Keywords: Applesauce; Choice experiment; Consumer demand; Fruit and vegetable markets; Locally grown; Multinomial logit model; Organic; Pennsylvania; Willingness to pay.

JEL Classification: Q13

Introduction

Labels continue to be a key strategy for differentiating products in food markets. In recent years, label usage that promotes product attributes has expanded and become increasingly important for many foods including fruit and vegetables. Products sold in grocery stores are often differentiated by labels that make reference to health claims, nutrient content, information describing production methods, and geographical indicators. Organic labels are commonly used for both fresh and processed fruits and vegetables. Products that are differentiated as locally-produced are more likely to be fresh fruits and vegetables whereas nutrition information is often found on processed fruits and vegetables. However, in some cases there may be opportunities to market processed fruits and vegetables that are locally-produced or to include nutrition information on fresh fruits and vegetables. Geographical indicators are traditionally important for wine, meat, and in some cases dairy products. However, given the expansion of buy local promotional efforts by many states, geographical information that describes where food is produced appears to be increasingly important for marketing fruit and vegetable products.

Given the variety of labeling options, consumer response to label information may have important implications for product differentiation strategies. We developed a choice experiment to examine consumers' willingness to pay for selected attributes in a processed fruit product, namely applesauce. Applesauce is an interesting product to examine here because it can include a variety of labels. Furthermore, the per capita consumption levels of processed fruit products have fallen between 1998 and 2007 (USDA-NASS, 2008) and there is much interest in ways to increase sales in this category. As part of a larger survey, respondents were presented with four hypothetical purchasing situations; in each situation respondents were given four product options with different combinations of price and attributes. The four attributes were "USDA Organic",

"Pennsylvania Preferred", "No Sugar Added", and "Low-Fat". This study examines consumer preferences for these applesauce attributes as a way of evaluating strategies for differentiating products made from Pennsylvania apples.

Previous work has examined consumer demand for food products in niche markets, and several studies have assessed consumers' willingness to pay (WTP) for product attributes including organically-produced, locally-grown, and various nutritional claims. This paper extends the line of research related to consumer demand for differentiated products in three ways. First, much work has been completed that examines consumer demand for organic and local attributes in fresh produce, milk, and meat products; yet relatively little research has examined these issues for processed fruit and vegetable products. Second, we include choices that allow consumers to consider organic, local, and nutritious food in one choice experiment so that these attributes can be compared directly. Loureiro and Hine (2002), among others included various product attributes in consumer surveys, however, the consumer purchase decision between organic, local, and nutrition attributes has not been closely examined for processed fruit and vegetable products. Third, our survey collected detailed demographic information for the respondents which was incorporated into the analysis. As a result, estimates of consumer WTP for applesauce attributes are reported for each of four consumer market segments, and the differences among those segments are examined.

Consumer Demand for Organic Products

Sales of organic foods grew by approximately 20% per year during the 1990s (Dimitri and Greene, 2002); there is some discussion that more recent growth in organic markets has slowed but evidence suggests that it continued to increase in the range of 10 to 20% per year between 2000 and 2005 (Klonsky and Richter, 2007). In 1990, U.S. organic food sales were

estimated at $1 billion (Dimitri and Greene, 2002) and by 2005 U.S. organic food sales reached $14 billion (Salisbury, 2007). Several studies have examined individual-level choices driving the increase in consumption of organic foods in the United States and elsewhere. Most research conducted on consumers' organic food choices uses information collected through mail, telephone, or intercept surveys. The results from these studies rely on self-reporting of purchase behavior and attitudes, and therefore reflect consumers' stated preferences.

Loureiro, McCluskey, and Mittelhammer (2001) conducted an intercept survey of grocery store shoppers to examine consumer preferences for organic, eco-labeled, and conventionally-produced apples. Apples from the three groups were offered at equal prices, sizes, colors, and varieties; the purpose of the research was to examine the relationship between socio-demographic characteristics and apple purchasing behavior. The authors found that organic and eco-labeled apples attracted consumers with children, higher income, and a concern for the environment while conventional apples were preferred by consumers in a large household, without children, and with less food safety and environmental concerns. Overall, eco-labeled apples were determined to be an intermediate choice between organic and conventional apples; "green" consumers, those with the characteristics shared by buyers in the organic and eco-labeled market, were found to be more likely to purchase organic apples. This study highlights the need to consider the relationship between consumer characteristics and niche marketing efforts for food products.

McEachern and Willock (2004) measured stated preferences in a mail survey of organic producers and consumers in the United Kingdom to determine the purchase patterns of organic meat. This study collected demographic characteristics and attitudinal data about organics. Over half of consumer respondents had farm experience or family in farming, which was positively

correlated with purchasing organic meat. The main drivers of organic meat purchasing activity were higher perceived standards of animal welfare and health benefits. The major barriers to not purchasing organic meat were price (reported by 56%), a perceived difference in flavor and taste (reported by 18%) and the fact that most organic meat in the U.K. was imported (reported by 7%). Hill and Lynchehaun (2002) examined organic milk consumption patterns in the U.K. because milk was considered to be a product that was purchased by an experienced consumer of organics. That is, consumers that purchased organic milk had previously purchased organic produce or meat. Hill and Lynchehaun (2002) found that organic purchases of milk were statistically related to income but not age or lifestyle choices.

Thompson (1998) examined several studies published between 1987 and 1997 on the characteristics of consumers who purchased organic products, and found substantial variation across the results. Overall, both young and older consumers with higher household incomes were more likely to purchase organic products. However, a study by the Hartman Group (1996) found that households with an income under $25,000 or over $50,000 were most likely to purchase organic products. Age was a statically significant variable in only three of the twelve studies reviewed. Misra, Huang, and Ott (1991) found that consumers between 36 and 60 years of age were less likely to pay for organic produce; Krystallis and Chryssohidis (2005) also found that younger consumers were more likely to be organic purchasers. Anecdotal evidence suggests a positive correlation between education and organic purchases, yet this relationship varied in the regional studies reviewed by Thompson (1998).

Markets for Local Food

While consumer demand for organic food products is significant, the cost of making the transition to organic production is substantial. Furthermore, there is some indication that growth

in organic sales has reached a peak in key markets while sales of locally-produced foods are expected to increase over the next decade (Cloud, 2007). The growth in local food is highlighted by the recent increase in the number of farmers markets and Community Supported Agriculture (CSA) programs in the United States. The number of farmers markets increased from 1,775 in 1994 to 4,385 in 2006 (USDA-AMS, 2007) and the number of CSA programs increased from 50 in 1990 to over 1,900 in 2008 (Hartman Group, 2008). Some industry experts have argued that a "locally-grown" designation would be an equally lucrative differentiation strategy compared to "organically-grown" with much lower up-front costs. Others question if potential consumers of local fruit and vegetable products share the same characteristics as those that purchase organic products.

In the United States locally-grown food is often defined as being produced within 100 miles of where it is marketed; in other cases locally-grown food is associated with production in a specific state. Darby, Batte, Ernst, and Roe (2008) found that strawberry consumers in Ohio associate the term "local" with products that are grown in the state; Giraud, Bond, and Bond (2005) found evidence that consumers in northern New England consider "local" to include products from Maine, New Hampshire, and Vermont. In a large state like California, the term "local" may be used to describe production at a more regional level. In an effort to capture a greater share of the "local" market segment, many states have developed branding programs to differentiate their products from those grown or produced outside the state. Some of these programs were funded by state grants under the Emergency Agricultural Assistance Act of 2001. As of 2006, 43 states had branding programs for agricultural products, up from 23 in 1995 (Patterson, 2006). The budgets for the promotional programs ranged from $8,300 in Montana to $25 million in California; the "Pennsylvania Preferred" program had a budget of $295,000 in

2002 (Patterson, 2006). The Pennsylvania Department of Agriculture's "Pennsylvania Preferred" program assists growers and processors to market their goods and encourages consumers to purchase Pennsylvania products.

The agricultural economics literature includes several papers that examine the impact of state-level promotional campaigns (*e.g*., Brooker and Eastwood, 1989; Govindasamy et al., 2004; Giraud, Bond, and Bond, 2005; Patterson, 2006) and results indicate that they generate positive returns for agricultural producers. However, locally-produced food products have only recently gained momentum in grocery stores and research examining the value of the "local" attribute in specific food items is still being developed. Some recent work has explored the competition between "local" products and other related market segments that attract consumers interested in public good attributes associated with food production. As one example of this, Thilmany, Bond, and Bond (2008) present an analysis of the WTP for the "local" attribute in fresh produce. Here they separate perceived or private attributes (such as cleanliness) from quasi-public attributes (such as locally-produced) and found evidence that consumers interested in less pesticide use and brand names were more likely to purchase locally-produced food; conversely, consumers who were interested in packaging, convenient purchasing locations, and good value were less likely to purchase local products.

Loureiro and Hine (2002) conducted a survey in the produce department of Colorado grocery stores to determine consumers' willingness to pay for locally grown, organic and genetically modified organism (GMO) free potatoes. The survey also included data that described respondents' age, income, education, sex, family size, and value placed on fresh and nutritious food. Here the analysis provided baseline WTP estimates for the product attributes and also marginal WTP estimates for specific consumer characteristics. Results showed that

consumers were willing to pay an additional $0.09 per pound for the Colorado-grown potatoes, $0.07 for the organic potatoes, and $0.06 for GMO-free potatoes. Consumers concerned about nutrition were willing to pay an extra premium of between $0.005 and $0.01 per pound for organic, GMO-free, and locally-produced potatoes. Respondents with higher education and income were willing to pay an extra premium of approximately $0.02 per pound for organic and GMO-free potatoes. The estimated coefficient for age was negative and statistically significant in the organic model. Local, organic, and GMO-free attributes (and nutrition information) may be even more important for processed potato products; extending this work to look at consumers' WTP for processed potato might shed additional light on product differentiation and market segmentation.

Patterson *et al.* (1999) surveyed 571 Arizona shoppers to determine whether the origin of food products was an attribute important to Arizona consumers. Survey data were collected from grocery shoppers and product sales data were collected from retailers; 74% of all respondents said they preferred Arizona products to those grown elsewhere. Over half (57 percent) of respondents perceived Arizona products were to be of better quality than those grown out of state. However, only 23% of respondents were aware of the Arizona Grown program and the study followed up by examining the effect of consumer characteristics on awareness of the Arizona Grown program. The three characteristics that had a statistically significant impact on consumers' awareness of the program were the frequency of purchasing produce, cognizance level of the 5-A-Day fruit and vegetable program, and residency.

Nutrition Information and Food Consumption

Nutritional food labels became mandatory in the United States as part of the Nutritional Labeling and Education Act (NLEA) in 1990. The law requires food manufacturers to list the

nutritional content of each product for a standardized serving size. It also defined nutrition content claims and provided a mechanism for evaluating health claims that are placed on food products. Since the Act was introduced a number of studies have examined the link between nutrition labels, health claims and consumer choice for various food products. Research has shown that nutrition and health claim labels have had a positive but relatively limited impact on consumer choices and overall dietary quality. However, in certain cases, labels on food products that included a health claim have had significant effects on sales volume (Nayga, 2002). Given the health benefits associated with consumption of processed fruit and vegetable products, products like applesauce stood to gain from the NLEA. However, much of the research in this arena has primarily focused on how consumers respond to nutrition labels and health claims for processed and packaged food items derived from animals (including meat, dairy, and eggs), grains, and oilseeds.

Ippolito and Mathios (1990) studied the impact of nutrition information in the market for breakfast cereals during a period when health claims about fiber were developed. Here the results highlighted strong relationship between health claim information and consumer behavior, and attributed much of the consumer response to coordinated advertising efforts by key suppliers. Brown and Schrader (1990) found a significant link between cholesterol information and egg consumption in the 1980s. Kinnucan *et al*. (1997) examined health information events and generic advertising expenditures for meat products; results indicated that health-information elasticities were larger than own-price elasticities in the U.S meat sector. Jensen, Kesavan, and Johnson (1992) studied consumer demand for various dairy products following a promotional campaign conducted by the National Dairy Promotion and Research Board on the benefits of calcium intake. Advertising efforts were more effective for cheese and soft milk products rather

than fluid milk, and among those with low initial per capita consumption rates of dairy products. Mathios (1998) used grocery store scanner data and nutrition label information to investigate consumer purchase behavior for cooking oils; the NLEA eliminated use of explicit health claims in this market due to the overall level of fat in cooking oil products. Model estimates show that removal of health claims in the cooking oil market led to an increase in products with higher saturated fat content. This finding again suggests that consumers respond to health claims and in this case, removing health claims steered consumers towards less healthy products.

There appears to be a strong relationship between health claim information on food products and consumer behavior, but the drivers of the results differ across products and the general results may not extend to all food items. Ippolito and Mathios (1990) note the consumer response to health claims for breakfast cereals may be linked to the high level of market concentration in this market. The degree of market power among firms in a sector may enable a more coordinated advertising effort for a health claim; furthermore, effectively communicating health and nutrition information to consumers can be very costly. Generic advertising of health attributes in fruits and vegetables is common, yet this type of information is rarely presented to consumers at the time of purchase. Unlike fresh products, labels can be effectively used to remind consumers about health and nutrition attributes in processed fruit and vegetable products. However, since the dietary benefits of fruit and vegetable products are well known, perhaps there would be little consumer response (or even a negative response) to health claims and additional nutritional information. Overall, a better understanding of the impact of health claims and nutrition information in this market segment would be of great interest to food manufacturers. Axtman (2005) found that a large share of U.S. households regularly purchase apples, and approximately 35% percent purchased apples on a weekly basis. The same survey revealed that

the main purchase reason was the health benefits perceived to accompany apple consumption. Fresh and processed apple products are often associated with health benefits and it seems natural for our analysis to measure how consumers respond to nutrition information and labels in applesauce. Furthermore, our model enables a comparison of the WTP effects for nutrition and health attributes relative to the "organic" and "local" attributes.

Methodology: Stated Choice Models

Our modeling framework adopts the choice experiment technique. The choice experiment in our application follows models that were introduced by Batsell and Lodish (1981) and Louviere and Woodworth (1983). Since their introduction, choice experiments have been widely used in the agricultural economics literature to examine a range of questions that examined consumer demand for attributes in agro-food products, notably beef. For example, choice experiments were employed by Umberger *et al*. (2002), Lusk and Schroeder (2004), and Loureiro and Umberger (2007) to assess consumers' willingness to pay for attributes in beef, Alfnes *et al*. (2006) to investigate salmon consumption in Norway, and Mtimet and Albisu (2006) to examine Spanish wine consumption patterns. Our model builds upon much of the earlier work in this arena and extends the research to include choices about local, organic, and nutrition attributes in a processed fruit product.

A choice experiment is comprised of several choice sets; a choice set presents a purchase situation to a respondent with a menu of product options. Choice sets typically include two or more products each with varying combinations of product attributes and price. Given the set of product options, survey participants choose the product in the choice set that maximizes their expected utility. Stated choice methods are typically used for three reasons. First, this approach allows respondents' preferences to be collected without directly observing actual purchases.

Second, data can be collected using telephone or mail surveys that are less expensive than intercept surveys and interviews. Third, stated choice experiments enable the evaluation of hypothetical scenarios and estimate preferences for products that do not exist in the marketplace.

The analysis used here is based on Lancaster's "New" consumer theory (Lancaster, 1966) and random utility theory. Lancaster (1966) proposed that utility for a good can be decomposed into utilities for attributes found in the product, and random utility theory. Random utility theory states that the utility for the *i*th individual and the *j*th product, denoted as U_{ij}, is the sum of a systematic component, denoted V_{ij}, and a random component, denoted ε_{ij}. Uncertainty enters equation (1) through the random component which contains unobservable influences of individual characteristics or product attributes as well as measurement error.

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

The systematic component includes attributes for product *j* and characteristics about individual *i*; the product attributes and individual characteristics are both observable. We further break down the systematic component of utility, namely V_{ij}, into product specific and consumer specific subcomponents in equation (2). Here $\mathbf{x}_j$ is a vector of attributes for product *j* and $\mathbf{z}_i$ is a vector of characteristics for consumer *i*. The marginal utilities of attributes in product *j* are denoted as β'_j and the additional marginal utilities of the attributes in alternative *j* for individual *i* are denoted as δ'_j. The consumer characteristics only enter the utility function for a subset of product alternatives (Louviere, Henser, and Swait, 2000).

(2) $$U_{ij} = \beta'_j\, \mathbf{x_j} + \delta'_j \mathbf{z_i} + \varepsilon_{ij}$$

Following a standard theoretical framework, consumers choose product quantities to maximize their utility. The probability that consumer *i* will choose product *j* is denoted as P_{ij};

equation (2) shows that individual *i* will choose product *j* if the utility from product *j* is greater than that from an alternative product *k*.

(3) $P_{ij} = \text{Prob}(U_{ij} > U_{ik};\ \text{where } k = 1,2,\dots,J; k \neq j)$

Assuming that the random components are identically and independently distributed type-I extreme values across the individuals and products, we use the multi-nomial logit (MNL) model shown in equation (4) to estimate the choice probabilities.

(4) $P_{ij} = \text{Prob}\left(U_{ij} > U_{ik},\ j \neq k\right) = \frac{e^{\beta'_j x_j + \delta'_j z_i}}{\sum_k e^{\beta'_k x_k + \delta'_k z_i}}$

The calculation used to represent the consumers' WTP for a product attribute is shown in equation (5). The baseline WTP for product attribute *j* by consumer *i*, denoted as $WTP_{ij,}$ is calculated as the negative ratio between the estimated marginal utility for product attribute *j*, denoted as β_j, and the estimated marginal utility for the monetary attribute, denoted as β_{Price}. The numerator in equation (5) also includes an additional measure of the marginal utility for product attribute *j* that is specific to consumer *i*. Here characteristics for consumer *i*, denoted as z_i, are combined with the additional marginal utilities of the attributes in alternative *j* for individual *i*, denoted as δ_j.

(5) $\text{WTP}_{\text{ij}} = -\left(\frac{\beta_j + \delta_j z_i}{\beta_{Price}}\right)$

Results from equation (5) are used to quantify the implicit price changes associated with a unit increase in the selected product attributes; each WTP_{ij} calculation represents the part worth of attribute *j* for consumer characteristic *i*. Earlier work has found that the WTP for organic, local, and nutritional attributes in food products was positive and often important; we examine all of these attributes in applesauce to better understand their relative importance to consumers and to identify market segmentation strategies for processed fruit and vegetable manufacturers.

The Survey

Our 13-page survey was mailed to 3,000 residents in Pennsylvania in 2005 to collect information on a range of issues related to agriculture and food. One question on the mail survey included a choice experiment for differentiated applesauce products. An example of a choice set included in our experiment is shown in Figure 1; here the respondent is asked to select one of four applesauce products differentiated by price and product attributes. Surveys were sent to residents in 65 counties in Pennsylvania; the counties that included Philadelphia and Pittsburgh were excluded because previous survey efforts in these metropolitan centers resulted in extremely low response rates using mail surveys. The first mailing consisted of the questionnaire, a cover letter, a postage-paid return envelope, and a small cash incentive. A postcard reminder and two subsequent follow-up mailings, including duplicate copies of the survey form, were used to increase response rates. Of the 3,000 addresses in the sample, 290 were undeliverable. A total of 1,521 persons from the 2,710 valid addresses returned usable answered questionnaires, resulting in a 56% response rate.

Table 1 summarizes selected respondent characteristics. The first column provides frequency information for the total sample; the next four columns separate the sample into four segments based on their purchasing patterns of organic and local food products. Of the total usable sample of 1,521 cases, 47% were female, 63% had some college education, the average household contained 2.51 people, 31% of households included children, and 34% included at least one person over the age of 65. The purchasing behaviors that define each of the four market segments and the demographic characteristics of each group highlight some interesting results. Approximately half of the respondents are characterized as non-local and non-organic (or conventional) food consumers. Compared to “local” and “conventional” consumers, organic

consumers have higher levels of education, more likely to have children in the household, live in the suburbs, and have less agricultural education or experience. Local consumers have the highest level of agricultural experience and consumers of conventionally-produced food have the lowest agricultural and nutrition scores.

The survey instrument included many questions in addition to the stated choice and demographic questions mentioned above. A large part of the survey was devoted to objectively measuring how much respondents know about agriculture. Sixty questions covered topics related to agricultural production practices; social and economic impacts of agriculture; agriculture and the environment; and food and nutrition. In addition to answering the knowledge-based questions, respondents were asked to score their level of certainty about each response. Scores on the sixty questions were aggregated, and each respondent was assigned a score between –2.5 and 2.5 for all knowledge questions combined and for the food and nutrition knowledge questions. Table 1 shows the average overall knowledge score was 0.31 and 0.10 for their responses to the food and nutrition knowledge questions. Survey results also show that 34% of respondents purchase food items at roadside stands and farmers markets. In addition, 32% of all respondents indicated that they occasionally or frequently purchased foods that were labeled "organic."

Choice Sets

Table 2 provides an overview of the options in each choice set and the percent of respondents who selected attributes within a choice set. The percent of respondents selecting organic options ranged from 33% in the first choice set to 52% in the last choice set. Selection of options with the PA Preferred attribute varied more, from 24% in choice set three to 88% in

the second choice set. Between 40% and 60% of respondents selected the No Sugar Added attribute and the Low-fat option was only selected by 12% to 37% of the respondents.

The number of attributes included on the product description does not appear to have systematically influenced choices. In the first choice set, applesauce with no additional attributes was selected by 43% of respondents. Applesauce with only one attribute was chosen by 47% of respondents in the second choice set. Similar to the first two choice sets, products with two attributes were only selected by 9% of respondents in the third choice set yet 74% of respondents chose the products with only one attribute, the most frequently selected of all the choice sets. In the fourth choice set, products with two attributes were preferred over the other combinations, with 69% of respondents selecting these products. The results in Table 2 suggests that a label with more attributes is not necessarily perceived by consumers as better, particularly if there is a cost tradeoff. In three of the four choice sets, the applesauce with the lowest price was selected by at least 40% of respondents, regardless of its attributes. The one case where the lowest priced option was not selected, the applesauce with PA Preferred and Organic labels was selected by 41% of respondents and had a price of $2.19.

As shown in Table 3, generally a small percentage of respondents chose an applesauce product with the same characteristic in all four choice sets. The most frequently selected attribute in all four choice sets was “No Sugar Added” (31% of respondents) followed by “PA Preferred” (9% of respondents). Only 5% of respondents chose the applesauce with the “Organic” or “Low-Fat” attribute in each of the four choice sets; 8% of respondents chose products with one or no attributes in each of the four choice sets and 5% of respondents consistently selected applesauce products with three or more attributes.

Empirical Results

The choice data were more formally analyzed using two MNL models to estimate coefficients introduced in equation (4). The first model included only the product attributes as explanatory variables; the estimated coefficients and summary statistics are included in the first column of Table 4. Together, the five product characteristics have a statistically significant influence on a product being selected, as indicated by the likelihood ratio of 2,155 (significant at the 1% level of confidence). As an alternative measure of model performance, the percent of correct predictions was calculated as shown at the bottom of Table 4. The product characteristics model correctly predicted 72% of all product choices, 44% of the selected applesauce products, and 81% of the applesauce products not selected. The second model incorporated product attributes and consumer characteristics to better understand the interaction effects in the different market segments. Results for the second model are shown in the right-hand column in Table 4. The likelihood ratio for the expanded model is 2,236 and the model did a slightly better job of predicting respondents' choices.

The estimated coefficients indicate that the presence of Organic, PA Preferred or No Sugar Added attributes increases the likelihood of a product being chosen, while a higher price decreases the likelihood of selection. The Low-Fat attribute was expected to have an insignificant impact on the likelihood of a product being selected, since applesauce is naturally low fat; however, the results show a negative and statistically significant influence on the likelihood of the attribute being selected. One possible explanation is that respondents' identified the Low-Fat applesauce as having less flavor. Of the four non-price attributes, PA Preferred was by far the most important to increasing consumer utility, followed by the No Sugar Added attribute and then Organic.

Previous studies of consumer food choices indicate that preferences for organic and locally produced food varies among consumers. Respondents' self-reported behavior regarding buying local and organic certainly varied, as shown in Table 1. Accordingly, we would expect product selections to vary across consumer segments. Following work by Kallas, Gómez-Limón, and Arriaza (2007) we estimate the effects of consumer characteristics on the marginal utilities of product attributes. Because of the relatively large sample size of the current study, we had sufficient degrees of freedom to incorporate consumer characteristics in the empirical model. We combined information collected in the survey about frequency of organic and local purchases, as well as respondents' knowledge of agriculture and nutrition, with product attributes in the second empirical model. These results help us to understand which consumers might be more or less likely to select particular product attributes, and indicate how consumer WTP for attributes varies across market segments.

In the second model, we added interactions between product attributes and dummy variables for the three market segments who had frequently purchased either locally-grown food, organic food, or both in the last year.[1] In addition, interactions between product attributes and knowledge scores were included. Certain types of knowledge are expected to be more closely related to certain product attributes than others. Therefore, food and nutrition knowledge scores were interacted with the No Sugar Added and Low-Fat characteristics since both attributes reveal information about the nutrient composition of the product. The overall agricultural knowledge score was included with USDA Organic, PA Preferred, and price attributes.

Including respondents' market segment and knowledge scores changes the influence of product characteristics on the likelihood of a product being selected in several non-trivial ways. For instance, for consumers who did not frequently purchase local or organic food in the last

year (the base consumer segment), the presence of the organic attribute actually decreases the likelihood of a product being selected, even more so among those who had purchased local (but not organic) food frequently. To the extent that these consumers receive high knowledge scores, the negative effect is mitigated and perhaps even dominated by the positive influence that knowledge scores have on organic product selection. Another mitigating factor is previous purchases of organic food. Not surprisingly, consumers who reported previously purchasing organic food were more likely to select organic options. Because these estimates control for price effects, the negative coefficients on the organic attribute suggest that organic labels may be perceived negatively by non-organic consumers.

The PA Preferred attribute continued to have a positive, large, and statistically significant effect on the likelihood of a product being selected for all consumers. This effect was even greater among consumers with relatively high agricultural knowledge scores and those who had frequently purchased both local and organic food in the last year. The presence of the "No Sugar Added" attribute increased the likelihood of product selection for all consumers. Consumers who had high knowledge scores in the food and nutrition category were even more likely to choose the No Sugar Added options. Purchasers of local food were only more likely to purchase the No Sugar Added options when they had also frequently purchased organic food.

The Low-Fat attribute continues to have a negative and statistically significant impact on the probability of likelihood of a product being selected; this result was stronger among consumers who had frequently purchased food at roadside stands or farmers' markets in the last year. Those with more knowledge were more likely to ignore this information.

When all non-price attributes were held constant, higher-priced products were less likely to be chosen. One of our motivations for including an evaluation of agricultural knowledge and

a stated-choice experiment in the same survey instrument was to assess whether knowledge about agriculture influenced a consumer's price sensitivity. Our initial hypothesis was that consumers who have a better understanding of the complexities of the food system would make choices less driven by price. The analysis indicates the opposite, that respondents with a high overall knowledge score were even more sensitive to prices in the selection of products. One possible explanation is respondents who have higher overall knowledge scores are less inclined to pay a high price unless they are getting some additional benefits (which they might be better suited to evaluate). Or, they may be less likely to use price as an indicator of quality. The negative effect of price on the likelihood of product selection is mitigated among consumers who had purchased local but not organic food frequently.

Consumers Willingness to Pay for Product Attributes

The coefficient estimates from Table 4 are used to calculate the WTP measures following equation (5). A negative WTP indicates that the respondent would have to be compensated in order to choose a product with the attribute. Because the final model allows consumers in different segments with different amounts of knowledge to have different marginal utilities, the WTP is calculated for each market segment at three alternative levels of knowledge. The WTP measures are shown in Table 5 for the four market segments; within each market segment results are provided for three knowledge levels (25th percentile, Average, and 75th percentile). The four product attributes are listed as columns in Table 5.

Results indicate that WTP estimates vary across product attributes and consumer segments. Because consumers with higher knowledge scores had higher marginal utilities of income, the WTP for product attributes decreases as knowledge increases. This is a somewhat paradoxical result. More knowledgeable consumers are more likely to select each of the four

product attributes but are willing to pay less for them (in most cases, only slightly less). The PA Preferred attribute had the highest WTP for all consumer segments. The lowest WTP was among the segment who had not purchased organic or local food in the last year with relatively high knowledge scores; the estimated WTP was $0.29, a price premium of approximately 15% relative to the range of prices included in the choice sets. The highest WTP was $0.66 for consumers in the fourth market segment (those who had made both local and organic food purchases) with lower knowledge scores. While the consumer segments who had not purchased organic occasionally or frequently in the last year would need to be compensated to accept the organic trait, consumers in the other segments were willing to pay as much as $0.38 for the organic attribute, about a 20% premium.

Implications and Conclusion

This analysis helps to expand our knowledge of consumer demand for differentiated products. While consumer demand for organic and locally grown attributes of fresh produce, milk, and meat products has been the subject of many studies, this project focused on a processed fruit product. Focusing on a processed fruit product allows for the labeling of nutritional traits as well as organic and locally growth attributes. Because all three types of product attributes were included for the same type of product, their relative importance can be compared directly. Of all attributes included in the study, the locally grown designation had the largest positive effect on the likelihood of a product being selected, with the highest WTP estimates. The relatively ranking was consistent across the four market segments considered. The “No Sugar Added” attribute was the second most valuable attributes. All market segments had positive WTP, although there was substantially more variation in the WTP estimates across market segments.

Another contribution of this paper is the insight we are able to gain into the variation of preferences across market segments through the estimation of segment-specific marginal utilities and WTP measures. For several attributes, their presence had statistically significantly different marginal utilities for consumers in different market segments. For instance, if we look only at consumer segments who had not purchased organic food in the last year, the marginal utility of the PA Preferred attribute did not meaningfully differ between consumers who had frequently purchased food at roadside stands or farmers' markets and those who had not. In addition, not all organic consumers were necessarily more likely to select the PA Preferred option relative to other consumers. Only consumers in the last segment (who had made both local and organic purchases in the recent past) were more likely than other consumer groups to choose PA Preferred. While some consumers may think of buying local and buying organic as supporting the same type of agriculture, there definitely seems to be a difference between local and organic in the minds of these survey respondents.

For other product attributes, the choices made by frequent purchasers of local foods vary depending on whether or not they are also frequent purchasers of organic foods (i.e., there are substantial differences between the "No Local No Org" segment and the "Local No Org" segment). In contrast, the preferences revealed by respondents who had purchased organic food recently were much more homogeneous. With the exception of the "PA Preferred" attribute, consumers in the "Org No Local" and "Local and Org" consumer segments were not significantly different.

These results may be useful in developing product differentiation and target market strategies for processed fruit products and perhaps beyond. The negative WTP for the Low-Fat attribute underscores a challenge in product differentiation: the role consumer perceptions play

in product choices. Because all applesauce is naturally low in fat, simply adding "Low-Fat" to the label would be expected to have little effect on product selection. Given the proliferation of nutritional attributes highlighted on food labels, we might expect it to be perceived as a benefit, with a positive influence on the likelihood of selection and a positive WTP. In this case, calling attention to an attribute that is true of the product category but perhaps not widely known by consumers can create a negative perception and reduce the likelihood of a product being chosen. An alternative might be to highlight that applesauce is naturally low in fat, but such information would apply to all applesauce, so it would be an ineffective differentiation strategy.

The overwhelming preference for the locally grown attribute presents another product differentiation challenge. Designating that a product is processed locally from locally grown inputs may boost demand. However, most fruit and vegetable processing is geographically concentrated around areas where the raw product is grown (which also tends to be geographically concentrated). Thus, it could likely be the case that all (or nearly all) products would qualify for the locally grown designation for some product categories, while for other product categories, none (or nearly none) would qualify. In the first case, a locally grown label would not really offer product differentiation. Further, if the locally grown designation is present on all product offerings in a category, it seems possible that the consumer WTP for that label may deteriorate over time. In the second case (very little existing local production), then the high WTP for the local attribute may encourage production in areas where production is less efficient. As a result, a share of the price premium consumers are willing to pay for locally grown will be offset by cost inefficiencies. Decisions regarding labeling a locally grown attribute must consider the short- and long-term net payoff (incorporating cost implications), as

well as the potential importance of the presence of products within a category that do not bear the local designation.

The organic and No Sugar Added attributes provide other dimension for product differentiation. However, the appeal of these attributes is more narrow, with consumers in particular market segments having significantly lower WTP than consumers in the target market segments. For consumers who had purchased organic food in the past year, WTP for both the organic and the No Sugar Added traits are higher than for the other two market segments. This suggests that these attributes should probably be "bundled" (i.e., there should be a No Sugar Added option in an organic line of applesauce). Consumer segments who had not purchased organic foods occasionally or frequently in the past year had to be compensated to accept the organic trait. Because the analysis controls for the effects of prices, the negative WTP suggests some kind of negative perception of the trait among a subset of consumers. This should be taken into consideration by companies considering adding an organic option to their product line. It may be more advantageous to offer the organic option under a new brand name, so the negative perception of organic does not negatively affect demand for existing conventional products.

Consumer choices are influence by a number of factors with complex interactions. In addition, the influences and the ultimate choices vary considerably across consumers. This paper sheds some new light on the effects of product attributes on consumer choices among applesauce products, and how those affects vary among four market segments. While further study would be required to determine if the relationships found here apply to other products or other consumers, several findings reveal issues worth considering in product differentiation and market segmentation strategies.

Table 1. Summary of Respondent Characteristics

Characteristic	Total Sample	No Local No Org	Local No Org	Org No Local	Local and Org
Number of respondents	1,521	706	293	273	206
Percent of sample	100%	48%	20%	18%	14%
Female	47%	41%	53%	48%	57%
Education					
Did not complete high school	8%	9%	8%	6%	6%
Completed high school	29%	31%	35%	22%	21%
Some college	30%	30%	32%	24%	32%
Completed a 4-year college degree	16%	15%	13%	26%	14%
Graduate work or graduate degree	17%	15%	12%	21%	27%
Age					
Less than 45 years	26%	23%	20%	31%	23%
45-59 years	36%	34%	37%	36%	39%
60 years and over	39%	43%	43%	33%	39%
Household Composition					
Average number of people in the household	2.51	2.48	2.56	2.59	2.57
Percent of households with 2 or less people	61%	65%	60%	58%	62%
Children under 18 present	31%	29%	29%	35%	36%
65 and older present	34%	35%	38%	29%	30%
Residency classification					
Rural	41%	41%	51%	33%	42%
Suburban	44%	43%	35%	56%	44%
City	14%	15%	14%	11%	15%
Agricultural experience					
Have lived or worked on a farm	39%	37%	45%	36%	41%
Had some formal agricultural education	21%	20%	27%	21%	30%
Currently grow fruits or vegetables	51%	46%	58%	51%	60%
Agricultural knowledge scores					
Overall	0.31	0.29	0.33	0.30	0.35
Food and nutrition questions only	0.10	0.06	0.10	0.13	0.20
Behavior					
Frequently purchase food at roadside stand or farmers' market	34%	0%	100%	0%	100%
Occasionally or frequently purchase food that was labeled "organic"	32%	0%	0%	100%	100%

Figure 1. An Example of a Choice Set used in the Consumer Survey

a. SITUATION 1: If the following types of applesauce were available, which **one** would you buy?

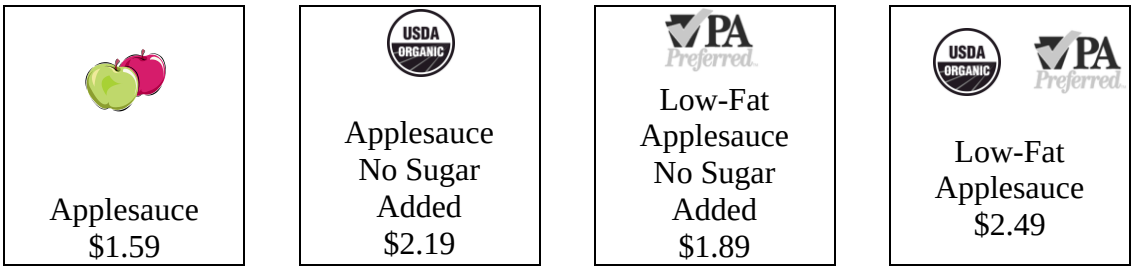

Table 2. Frequency of Attributes Present in Consumers' Product Selections

Choice Set	Attribute				Number of Attributes				
	Organic	Pa Preferred	No Sugar Added	Low-fat	0	1	2	3	4
1	33%	37%	53%	37%	43%	—	19%	37%	—
2	45%	88%	47%	12%	—	47%	12%	40%	—
3	47%	24%	60%	24%	—	74%	9%	—	15%
4	52%	70%	40%	30%	—	19%	69%	11%	—

Table 3. Percent of Consumers Choosing the Same Attribute(s) in All Choice Sets

Attribute	Percent of Consumers	Combinations of Attributes	Percent of Consumers
Low Price	8%	No Sugar Added & Low-Fat	2%
Organic	5%	1 or No Attributes	8%
Pa Preferred	9%	3 or More Attributes	5%
No Sugar Added	31%		
Low-Fat	5%		

Table 4. Coefficient Estimates from Two Multinomial Logit Regressions

Product Attribute and Consumer Characteristic	Product Characteristics		Product & Consumer Characteristics	
Organic	0.0823	**	-0.1028	*
Local, no organic			-0.1627	*
Organic, no local			0.5104	***
Local and Organic			0.5975	***
Knowledge score			0.1718	*
Local	0.6488	***	0.5584	***
Local, no organic			0.1071	
Organic, no local			0.0781	
Local and Organic			0.2934	**
Knowledge score			0.2549	**
No Sugar Added	0.3187	***	0.1232	***
Local, no organic			0.0046	
Organic, no local			0.5003	***
Local and Organic			0.5208	***
Food & nut. knowledge score			0.3782	***
Low-Fat	-0.7383	***	-0.6671	***
Local, no organic			-0.3557	***
Organic, no local			0.0546	
Local and Organic			0.0089	
Food & nut. knowledge score			0.1380	**
Price	-1.7278	***	-1.6232	***
Local, no organic			0.4907	**
Organic, no local			0.3689	
Local and Organic			0.4259	
Knowledge score			-1.4860	***
Log-likelihood ratio	2,155	***	2,236	***
Percent of correct predictions				
Overall	72%		73%	
Selected products	44%		47%	
Non-selected products	81%		82%	

Note: * indicates statistical significance at the 10% level, ** indicates statistical significance at the 5% level, and *** indicates statistical significance at the 1% level of confidence.

Table 5. Willingness to Pay for Product Attributes by Consumer Characteristic

Consumer Characteristic	Product Attribute[a]			
	Organic	Local	No Sugar Added	Low-Fat
No freq. purchases of local or organic with knowledge scores at				
25th percentile	-0.05	0.34	0.01	-0.41
Average	-0.03	0.31	0.07	-0.32
75th percentile	-0.01	0.29	0.11	-0.26
Freq. purchase local not organic with knowledge scores at				
25th percentile	-0.20	0.55	0.02	-0.84
Average	-0.13	0.46	0.10	-0.62
75th percentile	-0.08	0.41	0.15	-0.48
Freq. purchase organic not local with knowledge scores at				
25th percentile	0.31	0.48	0.39	-0.46
Average	0.27	0.42	0.40	-0.35
75th percentile	0.25	0.39	0.40	-0.29
Freq. purchase organic and local with knowledge scores at				
25th percentile	0.38	0.66	0.42	-0.52
Average	0.32	0.55	0.42	-0.37
75th percentile	0.29	0.48	0.41	-0.28

[a] Prices of products presented in choice sets ranged from $1.59 to $2.49.

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Endnotes

[1] Including consumer characteristics that tend to be correlated with local and organic purchases (such as gender, education, presence of children in household, and income) resulted in a smaller number of usable observations due to non-responses and numerous coefficient estimates. Some coefficient estimates violated economic theory or intuition, and some were fragile with respect to specification choices, a likely result of multicollinearity among consumer characteristics. As a result, we opted to include each respondent's presence in one of the four market segments as consumer characteristics, and analyze the relationship between demographic characteristics and market segments separately.

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