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ScienceDirect
Food Policy 32 (2007) 145–159
FOOD POLICY
www.elsevier.com/locate/foodpol

Putting their money where their mouths are: Consumer willingness to pay for multi-ingredient, processed organic food products

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Received 22 June 2005; received in revised form 8 March 2006; accepted 9 May 2006

Abstract

In response to dramatically increasing adoption in consumer markets, the National Organic Program (NOP) initiated novel labeling standards for food products in the US in 2002. This program is a particularly relevant standardization effort for multi-ingredient processed foods. Rather than a simple binary message (organic or not), gradations of organic content are now codified. No existing published study evaluates consumer willingness to pay or motivation to purchase in response to such a rich organic label. This article presents evidence of the impact of the NOP through analysis of data collected in seven central Ohio, USA grocery stores. Results suggest that consumers are willing to pay premium prices for organic foods, even those with less than 100% organic ingredients. The magnitudes of WTP premia varied significantly among consumer groups, suggesting that targeted marketing may be effective for organic merchandisers.

Keywords: Multi-ingredient processed organic food; National Organic Program; Consumer intercept survey; Willingness to pay; WTP

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doi:10.1016/j.foodpol.2006.05.003

Introduction

Currently the US organic industry is booming with annual increases in consumption of 20% per year (Dimitri and Greene, 2002). Sales of organic foods increased from $5.5 billion in 1998 to an estimated $13 billon in 2003 (Food Marketing Institute, 2003). One recent report suggests the market will grow to over $32 billion by 2009 (Packaged Facts, 2004). The rapid industry growth has led to questions about the regulation of organic marketing. In 1999 more than 30 states had organic laws and more than 40 entities provided third party certification using a variety of standards (Fetter and Caswell, 2002). Though differences between programs may have been subtle, it was very difficult to consistently compare one organic product to another. Consumers were confronted with a diverse array of organic standards at the state, retailer, or product level. In an effort to resolve this confusion, the National Organic Program (2003) (NOP), implemented October 21, 2002, formalized rules for organic production, processing, certification and labeling (Agricultural Marketing Service, 2000).

The NOP initiated novel food labeling standards, particularly relevant for multi-ingredient processed foods. A simple binary message (organic or not) is sufficient to identify the most commonly purchased organic items—produce. More interesting, gradations of organic content are now codified and may (or may not) facilitate marketing of multi-ingredient foods—considered by many to be the most likely vehicle for further growth in the organic sector (Whole Foods, 2003, 2004; Organic Trade Association, 2000). There are four levels of the claim covered by the NOP: "100% organic", "Organic" (at least 95% organic), "Made with Organic Ingredients" (at least 70%) and "Some Organic Ingredients" (less than 70%, the organic items can be listed individually in the ingredients on the side panel). The first two categories can use the NOP seal (Fig. 1, seal is green[1] in color) on the front of the food package, and only the first three categories can use the word *organic* on the front panel of the food package. The NOP seal may be used as a simple "short-cut" or peripheral cue (Petty and Cacioppo, 1986) of product quality if consumers do not engage in significant analysis or argument processing, choosing to use the seal as sufficient evidence of an organic product. In this case, the seal may cause the consumer to "shut down" product analysis and not carefully scrutinize the product's other label information (such as that found on the Nutrition Facts panel, health claims or brand/product marketing communication messages). In addition, a less favorable opinion may be held about organic products which do not exhibit the seal.

The presence of these new categories of partial organic content multi-ingredient foods raises a number of important questions. How will consumers perceive these product categories? Are they willing to pay for higher organic content, all else equal? Will food companies use these categories as an interim measure to address difficult to source organic ingredients and/or to segment markets and offer multiple versions of products thereby serving as a vehicle for price discrimination which captures a larger proportion of consumer surplus?

Literature review

In the past 15 years consumer demand for niche products (including organic, natural, and locally grown) has grown substantially (Dimitri and Greene, 2002). Although

[1] For interpretation of references in color, the reader is referred to the web version of this article.

Fig. 1. National Organic Program seal.

natural/specialty retail stores account for the largest portion of the market (47% of sales in 2003), 44% of organic food sales are made in mainstream grocery stores (Organic Trade Association, 2004). Fifty-seven percent of restaurants with per person dinners priced $25 or more and 29% of restaurants with dinner costs in the $15–$25 dollar range also offer organic options (Organic Trade Association, 2000). While some studies suggest that the motivation to purchase organic and natural products derives from environmental concerns, most conclude that the primary motive relates to health concerns (Huang, 1996).

Thompson (1998) provides an excellent review of the emerging literature on consumer demand for organic foods, and recommends further studies, including those which better document attitudes, motives, and willingness to pay (WTP) for a range of products, populations, and market channels. "Accounting for where foods are purchased is likely to be important in understanding where potential growth in organic foods might occur" (Thompson, p. 1117).

Although the authors are unaware of any published study that considers the specific impact of the NOP labeling regime or WTP for organic processed foods, there have been a number of studies of demand for organic characteristics and other attributes in produce (see for example, Buzby et al., 1995, Dunlap and Beus, 1992, Thompson and Kidwell, 1998, Baker, 1999; Williams and Hammit, 2000, 2001). Loureiro and Hine (2002) suggest that commodities with "locally grown", GMO-free, and organic labels all can command premium prices. Using a contingent valuation survey, they found that Colorado consumers were willing to pay the largest premiums for "Colorado grown" potatoes, followed by organically grown and GMO-free. Suryanta (1999) also found that identification of local product (in this case Hawaii's foodstuffs) allowed capture of a premium price for pineapples and macadamia nuts. Wang and Sun (2003) found that Vermont consumers were willing to pay more for organic apples and milk produced locally and certified by NOFA (Northeast Organic Farming Association). They also concluded that consumers most likely to purchase these products were young, in households with few members, and with higher household income.

The standardized labeling requirements of the NOP should benefit consumers by reducing confusion about the organic character of food products. Hutchins and

Greenhalgh (1995) argue that to effectively promote organic products it is necessary to develop a cohesive marketing strategy that depends on a better and fuller understanding of consumers, considers all parties in the food chain, and is initiated by leaders in the industry. As Fetter and Caswell (2002) observe, "the success of the national standard in supporting the market for organic products will ultimately rest on how well it matches the demands of consumers and other buyers" (p. 72). Often, consumers value organic products not just because they perceive the products to be healthier, but also because they perceive them to be more environmentally friendly, and more supportive of small scale agriculture and local rural communities (Williams and Hammit, 2000, 2001; Underhill and Figueroa, 1996).

Govindasamy and Italia (1999) surveyed consumers at five grocery retail stores in New Jersey in March 1997 to obtain estimates of WTP for organically grown fresh produce. Their analysis showed that females with higher annual incomes, younger individuals, and those who usually or always purchase organic produce were more likely to pay a premium. They also conclude that the likelihood of paying a premium goes down as the number of individuals in the household rises. Thompson and Kidwell, in a 1998 study of conventional and organic produce purchases, concluded that families with children were more likely to buy organic produce than those without children. This result was opposite to that found by Loureiro and Hine (2002) and Wang and Sun (2003) who concluded that consumers with children were less likely to buy organic products. Interestingly, Williams and Hammit (2000, 2001) found few socio-demographic differences between organic and conventional fresh produce shoppers, perhaps indicating that as organic offerings become more pervasive individual market segments become less distinct (Baker, 1999).

Although there have been a number of studies of demand for organic commodities, little has been done to understand the demand for multi-ingredient processed organic foods. There is no reason to presume that consumer motivation to purchase such organic foods or WTP (if present) should match results found in studies of produce. Under the NOP, processed food products with less than 100% organic ingredients may still carry an organic distinction through a variety of label mechanisms. Hence, consumer interpretation and confidence in these labels are important.

This paper provides one of the first assessments of a complex label message (scale of organic content) replacing a simple binary message (organic or not). The research presented here is timely, conducted one year following the implementation of the NOP. The research provides insight into consumer demand for multi-ingredient processed organic foods, and tests the impact of consumer awareness of the NOP on WTP for these products.

Research data and methods

A customer intercept survey was conducted during October and November, 2003. Six stores of a US national grocery chain (*traditional grocery*) were selected for the survey. Two stores were located in the inner city of Columbus, Ohio, USA, two stores were in suburban areas of Columbus, and two in small towns in predominantly rural areas of central Ohio. Customers were identified at random as they entered the store. In order to minimize differences among stores arising solely due to time of survey (and systematic differences in shoppers that might be associated with time), all customer

interviews were conducted between the hours of 1:00 and 6:00 pm, Monday through Thursday.[2]

Participants were asked to complete a short survey in the store that elicited information about organic purchase behavior, knowledge of organic food labels, attitudes toward health and nutrition issues, and household demographic information. Approximately one-third of the shoppers approached agreed to complete the interview and survey. One hundred ninety nine surveys were completed.

While the experiment conducted in traditional grocery stores was designed to study choices made by the general population of Ohio consumers, it is also of interest to identify the characteristics of shoppers that lead them to self-select into the organic market. To provide a comparison to the *traditional* grocery, in March 2004, shoppers at a national natural food store (*specialty grocery*) located in a suburban area of Columbus, Ohio also were surveyed. Because the specialty store was reluctant to allow interviews to be conducted in the store, shoppers were randomly intercepted and asked to complete and return a take-home questionnaire. The questionnaire included identical questions to those asked of the *traditional* grocery shoppers. Three hundred questionnaires were distributed and 102 were returned, a response rate essentially equivalent to the rate of participation by traditional store shoppers. Even though the difference in survey administration creates difficulties in comparing the two store types, the fact that response rates were approximately the same across the two samples suggests the potential bias is negligible.

Table 1 includes descriptive statistics for the sampled consumers identified by *traditional* and *specialty* grocery. There were substantial differences in the characteristics of consumers in the two store formats. *Specialty* grocery shoppers were somewhat younger, less likely to have children in the household, had more formal education, and higher mean household incomes. They also were much less likely to be non-white and were much more likely to be vegetarian or vegan. It should be noted that the selection of *traditional* grocery stores was purposeful-to increase the variability of consumer characteristics. For instance, the inner city, rural, and suburban *traditional* groceries differed substantially by distribution of race, income, education level, and other demographic measures.

Willingness to pay for organic food content

A primary focus of this study is to estimate consumers' willingness to pay for multi-ingredient processed foods, and investigate the willingness to trade-off multi-ingredient foods containing varying levels of organic ingredients. Although a number of studies have estimated WTP for organic produce, no study has considered multi-ingredient processed organic foods. Furthermore, no known studies have considered willingness to pay for multi-ingredient food products differentiated by the four levels of organic content that are allowed under the NOP guidelines.

[2] The reader is cautioned that this method does not comprise a random sample, and thus the results can not be generalized to the population of all consumers. Although consumer selection is random, the store and contact time are not randomly selected. A face-to-face interview of consumers was needed to accomplish all goals of this research project. This method ensures that the questions are completed by someone with food shopping responsibilities in the household and adds realism to the food selection experiment featured during the interview. Although we believe that the sample identified is typical of Ohio food shoppers, results can be generalized only to shoppers of these stores on the days and times sampled.

Table 1
Characteristics of sampled customer households

Characteristic	Traditional grocery	Specialty grocery
Sample size	199	102
Age (years)	43.0	39.8
Percent female	69.7	79.0
Percent primary food shopper	79.8	83.8
Percent vegetarian or vegan	4.1	26.0
Number in household	3.1	2.7
Percent of households with children:	59.5	32.7
Education	Percent	
Less than high school graduate	7.2	1.0
High school graduate (or equivalency)	27.3	6.0
Some college, no degree	27.3	17.0
Associate degree	8.3	5.0
Bachelor's degree	18.0	36.0
Graduate or Professional degree	11.9	35.0
Race/ethnicity	Percent	
Black or African American	31.1	1.0
American Indian or Alaska native	1.5	1.0
Native Hawaiian or other Pacific Islander	0.5	0.0
Hispanic/Latino	0.0	2.0
White	66.8	96.0
Mean Household Income	$65,253	$74,304
Median Household Income	$42,500	$62,500

Certain proprietary data on actual consumer purchases are being collected (e.g., SPINS/AC Nielsen retail scanner data of natural, organic and sustainable products). However, these data cannot be matched to consumer attributes, hence questions of which consumer attributes influence willingness to purchase various organic products cannot be examined. In addition, product strategies followed by food companies and retailers make it more difficult to evaluate consumer choice with scanner data. For instance, most of the major food companies with organic products offer them under a different brand name, the product may vary substantially in product form or primary ingredients from their conventional product, and the company may not offer products in each NOP category. Additionally, retailers often place organic products in separate locations from conventional products, making price comparisons more difficult. The contingent choice approach is a useful alternative research tool for such an environment whereby consumers can be asked to make choices among alternative hypothetical products, allowing for standardization of selected product characteristics (taste, brand, etc.) but manipulating key information provided to the consumer (organic content).

A payment card method was used to estimate consumers' willingness to pay for several food characteristics including level of organic content. Consumers were presented with the purchase of a hypothetical adult orientated breakfast cereal product. Specifically, they were asked: *Assuming breakfast cereal is priced at $3.00 per box at your local grocery store, how much more would you be willing to pay for each of the following characteristics?* The price premium indicated is interpreted as the willingness to pay for that characteristic. Eight characteristics were identified, and seven payment levels were offered, including an option to pay zero additional for the characteristic. The largest premium category

was an open-ended range-more than $1.00 premium per box. A complete listing of the food characteristics (in the same sequence as presented in the survey), price ranges, and the distribution of consumer responses to this question are listed in Table 2.

For initial analysis, consumers are assumed to be willing to pay the lower bound on the range of willingness to pay indicated. For example, if a consumer indicates she is willing to pay an additional $0.25–$0.49 for pesticide-free foods, then we know she is willing to pay at least $0.25. The last two columns of Table 2 report the mean and median premia based on the lower bound assumption.

Both *traditional* and *specialty* grocery shoppers indicated the highest WTP for the same three characteristics—although in a different order. *Traditional* grocery shoppers placed the highest premium on pesticide-free ingredients, followed by 100% organic and locally grown characteristics. *Specialty* grocery shoppers placed the highest premium on 100% organic ingredients, followed by pesticide-free and locally grown characteristics. It is also instructive to note that *specialty* grocery shoppers were willing to pay substantially larger premiums for many food characteristics than were *traditional* shoppers. *Specialty* shoppers indicated a mean WTP that was 100% larger for GMO-free foods, and more than 50% larger for 100% and 95% organic foods, locally grown foods, and pesticide-free foods. However, *specialty* store shoppers displayed a smaller mean willingness to pay for the less than 70% organic content. The larger WTP for high organic content foods combined with the

Table 2
Willingness to pay for selected breakfast cereal characteristics

Characteristic	Cents per box							Mean premium[a]	Median premium[a]
	None	1–9	10–24	25–49	50–74	75–99	>100		
Traditional grocery	Percent								
Pesticide free	18.3	14.2	18.9	15.4	8.9	7.1	17.2	32.8	10.0
Enhanced flavor	32.3	11.8	19.3	14.3	8.1	8.7	5.6	21.8	10.0
Genetically modified free	42.9	16.8	11.8	9.9	5.0	6.2	7.5	18.4	1.0
100% organic ingredients	28.4	16.0	11.8	13.0	10.7	9.5	10.7	27.7	10.0
At least 95% organic ingredients	32.1	19.1	10.5	14.2	9.9	9.3	4.9	21.6	1.0
70–94.9% organic ingredients	39.6	17.0	10.7	14.5	8.2	6.9	3.1	17.3	1.0
Less than 70% organic ingredients	46.0	18.6	13.7	9.3	4.4	5.6	2.5	12.7	1.0
Locally grown	23.8	17.7	18.3	11.6	11.0	9.2	8.5	25.8	10.0
Specialty grocery	Percent								
Pesticide free	5.1	10.2	12.2	14.3	19.4	15.3	23.5	49.5	50.0
Enhanced flavor	40.6	11.5	10.4	15.6	6.3	4.2	11.5	22.8	1.0
Genetically modified free	28.3	12.0	8.7	12.0	7.6	8.7	22.8	37.1	25.0
100% organic ingredients	9.3	6.2	11.3	16.5	10.3	19.6	26.8	52.0	50.0
At least 95% organic ingredients	17.7	9.4	11.5	22.9	14.6	17.7	6.3	33.8	25.0
70–94.9% organic ingredients	26.0	13.5	20.8	19.8	14.6	4.2	1.0	18.6	10.0
Less than 70% organic ingredients	41.9	25.8	18.3	5.4	8.6	0	0	7.7	1.0
Locally grown	14.4	13.4	11.3	12.4	16.5	9.3	22.7	42.2	25.0

[a] Each premium category is valued at its lower bound and is measured in cents per box above $3.00 for a conventional product. These are minimum willingness to pay measures.

lower WTP for the lowest organic content foods may suggest that the *specialty* food shoppers embrace some threshold level of organic content beyond which the product no longer warrants a premium price. For both groups the results clearly indicate a declining WTP for foods as the percent of organic content diminishes.

Regression analysis of WTP responses from the payment card data is used to provide a more complete understanding of these patterns. For any given food product attribute, consumers will differ in their willingness to pay a premium price for that attribute. Some will be willing to pay no additional price. The deterministic and random factors that influence whether the individual will pay any premium for a given food attribute may be different than those that influence the amount of premium that the consumer will pay for that attribute. For this reason, we have implemented a two-stage hurdle model to allow different factors to influence the decision to pay a premium (i.e., zero WTP) and the decision of how much of a premium to pay conditional on paying a premium. This decision model is equivalent to the continuous Cragg model (see Haab and McConnell, 2002 for a description). The only difference between the model estimated here and the Cragg model is the use of an interval censored model in the second stage of estimation to account for the payment card nature of the data instead of a continuous truncated model as in the Cragg.

First, we consider factors which determine whether consumers are willing to pay a premium for various cereal characteristics. Table 3 reports the results of a binary Probit model on whether consumers are willing to pay some premium (versus none) for each of the eight attribute categories. Independent variables include demographic characteristics: respondent age, income per person in the household, presence of children (age 18 or younger) in the household, an indicator for whether the respondent has post-high school education, a health index (scaled 0–100) indicating degree of concern for various health attributes of food, an indicator variable for race (white = 1, non-white = 0) and an indicator variable for gender (female = 1). Indicator variables for the specialty store sub-sample and for whether the respondent has previously seen the NOP organic seal on a food product are also included.

It is expected that consumers in the specialty store and those aware of the NOP seal are more likely to be willing to pay something for foods containing certain attributes (such as no pesticides, no genetic modification and higher organic content). We have no expectations on the relationships between demographics and willingness to pay for such attributes as we do not presume results of previous WTP studies of organic produce directly apply to multi-ingredient organic processed foods.

Table 3 reports the results of the Probit models. Bold entries in the table indicate statistical significance of the parameter estimate at the 90% confidence level. Demographic variables have little influence on willingness to pay a premium for cereal attributes. Consumers with children are less likely to pay a premium for pesticide-free cereal, and consumers with higher education levels are less likely to pay a premium for less than 70% organic ingredients.

It was expected that consumers who are more concerned about health issues would be more likely to pay premium prices for foods perceived to be healthier. Results suggest that consumers with a higher health concern index were more likely to pay premiums for food with lower levels of organic content (70–95% and less than 70%), but were no more likely to pay premium prices for foods with 95% or more organic ingredients (or pesticide-free, GM-free and locally produced foods) than were consumers with lower health concern indices.

Table 3
Probit model to explain willingness to pay a premium for food attributes[a]

	Pesticide free	Enhanced flavor	GM free	100% organic	95% organic	70–95% organic	<70% organic	Locally grown
Constant	0.146	0.280	−0.207	0.434	−0.041	−0.188	−0.333	0.051
Age	0.014	0.003	−0.003	0.004	0.007	0.008	0.003	0.003
Income per person in household	0.003	0.007	0.003	0.001	0.003	−0.001	0.006	0.002
Children present in household (yes = 1)	**−0.397**	−0.103	0.155	−0.080	−0.142	−0.158	0.133	0.104
Post-high school education (yes = 1)	0.435	−0.189	0.065	0.158	0.077	−0.126	**−0.512**	−0.134
Health index (100 is healthiest, 0 least)	0.001	**0.006**	0.004	0.005	0.005	**0.007**	**0.007**	0.003
Race (white = 1)	−0.006	−0.343	−0.135	−0.451	−0.249	−0.260	−0.093	0.409
Gender (female = 1)	−0.214	0.028	0.107	−0.253	−0.080	0.025	0.050	−0.083
Specialty store? (yes = 1)	**0.521**	−0.021	**0.435**	**0.825**	**0.549**	**0.468**	0.257	0.286
Aware of NOP seal? (yes = 1)	**0.431**	0.062	**0.350**	**0.360**	**0.347**	**0.465**	**0.332**	**0.408**
Observations	240	238	232	242	237	236	234	240

Bold entries are significantly different from zero at the 90% confidence level.

[a] The dependent variable is one if WTP > 0, and is zero otherwise.

As expected, shoppers at the specialty store are willing to pay a positive premium for pesticide-free cereal, GM-free cereal and cereals containing more than 70% organic ingredients. As the percentage of organic ingredients increases from less than 70%, to 70–95%, to 95% to 100%, the probability a specialty store customer is willing to pay a premium increases by 10%, 16%, 17% and 21% relative to non-specialty store customers. These are the changes in the probability of willingness to pay a premium for a change in the specialty store indicator from zero to one, holding all other explanatory variables constant at their respective means. Awareness of the NOP seal has a positive and significant effect on the probability of being willing to pay a premium across all categories except for enhanced flavor—an issue not addressed by the organic program. Interestingly, this effect extends to locally grown (ingredients), again not addressed in the NOP. In contrast to the specialty store customers, however, no clear pattern emerges in the magnitude of NOP awareness on likelihood of paying a premium for various levels of organic content.

Consistent with the two-stage Cragg model, conditional on being willing to pay a premium for the various attributes, consumers are asked to indicate the amount of the premium they are willing to pay. As discussed above and reported in Table 2, consumers willing to pay a premium choose from a menu of premium ranges indicating the range in which their maximum willingness to pay for that attribute falls. Because the respondent is choosing a range of willingness to pay, each response provides information on the upper and lower bound of the premium, but not the exact amount. To model the exact willingness to pay premium we use an interval censored regression model.

Suppose willingness to pay for individual i (WTP_i) is strictly positive, as is the case for those willing to pay a premium, such that:

$$\mathrm{WTP}_i = \mathrm{e}^{X_i\beta+\varepsilon_i} \tag{1}$$

where X_i is a vector of individual specific explanatory variables, β is a conforming vector of parameters to be estimated and ε_i is a mean zero constant variance (σ^2) error term that is independently and identically distributed across individuals.

Each respondent must choose the range of willingness to pay from the paired premium sets: $\{[0.01, 0.09], [0.10, 0.24], [0.25, 0.49], [0.50, 0.74], [75, 0.99], [1.00, \infty]\}$. For each response, we obtain an upper bound on the premium (U_i) and a lower bound (L_i). From Eq. (1), the probability that a respondent chooses the range $[L_i, U_i]$ is

$$P(L_i \leqslant \mathrm{WTP}_i \leqslant U_i) = P(L_i \leqslant \mathrm{e}^{X_i\beta+\varepsilon_i} \leqslant U_i) = P(\ln(L_i) - X_i\beta \leqslant \varepsilon_i \leqslant \ln(U_i) - X_i\beta)$$

Assuming the error term is normally distributed with mean zero and constant variance (σ^2), the probability of the true premium falling in the range $[L_i, U_i]$ is

$$P(L_i \leqslant \mathrm{WTP}_i \leqslant U_i) = \Phi\left(\frac{\ln(U_i) - X_i\beta}{\sigma}\right) - \Phi\left(\frac{\ln(L_i) - X_i\beta}{\sigma}\right) \tag{2}$$

where $\Phi(\cdot)$ is the standard normal cumulative distribution function. Eq. (2) represents the contribution to the likelihood function of an interval censored model for individual i. By assuming independent and identically distributed error terms across respondents, the likelihood function for the interval censored model is found by multiplying the individual contributions to the likelihood function (2) across all individuals in the sample. Maximum likelihood estimation is then used to obtain consistent estimates of the

parameter vector β and the error standard deviation σ.[3] From Eq. (1), the resulting parameter estimates for β are the percentage change in the willingness to pay premia for a one unit change in the independent variables (often referred to as semi-elasticities).

Table 4 presents the results of the interval censored data model estimated on the subsample of consumers indicating a non-zero willingness to pay premia for each attribute category. Again, bold entries indicate significance at the 90% confidence level. The independent variables included in the model are the same as those discussed for the Probit model earlier in this section. Demographic variables appear to have more of an impact on the amount of the premium consumers are willing to pay than on whether they are willing to pay a premium at all. Conditional on being willing to pay a premium, older consumers are willing to pay higher premiums across attribute categories with the exception of 95–99% organic and locally grown ingredients. Individuals with a higher per person income in the household are willing to pay larger premiums for higher organic content cereal (100% and 70–95%). Likewise, consumers with children are willing to pay larger premiums for 70–95% and 95–99% organic content cereals than are consumers without children. White consumers state lower premiums for pesticide-free and locally grown ingredients than do non-white consumers. Females are willing to pay higher premiums across attributes, in particular higher organic ingredient content and pesticide- and GM-free ingredients, than are males.

Again, an interesting but predictable pattern emerges for specialty food customers, who are willing to pay higher premiums for pesticide-free, GM-free and higher organic content ingredients than their traditional store counterparts. In addition, the premium that specialty store customers are willing to pay for organic ingredients increases with organic food content.

Surprisingly, consumers who are aware of the NOP seal report no significant differences in willingness to pay premia than those consumers who are unaware of the seal. From the combined results of Tables 3 and 4, it appears that the NOP seal acts to educate some consumers that the ingredients in the product are worthy of a premium, but does not raise the size of that premium conditional on the consumer being willing to pay a premium for those types of ingredients. If consumer A is aware of the NOP seal and an otherwise identical consumer B is not, but both consumers are willing to pay a premium for higher organic content, the amount of the premium will be the same for these two consumers. On the other hand, the earlier Probit analysis indicates that consumers aware of the NOP seal are more likely to be willing to pay a premium than those that are not aware of the seal. The presence of the seal doesn't command an additional premium above that associated with a particular level of organic content. As such it is unlikely that the seal is acting as a peripheral cue for consumers.

Willingness to pay estimates were calculated for the sample using the models reported in Table 4. The mean, median and extreme values for these estimates are reported in Table 5. The mean (median) willingness to pay for 100% organic cereal was \$0.45 (\$0.40) per box. This was followed in decreasing order by pesticide-free, GM-free, and locally grown ingredients. Consumers were only willing to pay \$0.15 additional per box for a cereal with less than 70% organic ingredients—about one-third of the premium commanded by 100% organic cereals.

[3] LIMDEP 8.0 provides a standard routine for estimating interval censored data models with the GROUPEDDATA command.

Table 4
Interval (group) censored model to explain determinants of willingness to pay premia conditional on positive WTP

	Pesticide free	Enhanced flavor	GM free	100% organic	95% organic	70–95% organic	<70% organic	Locally grown
Constant	**2.683**	**2.274**	0.863	**1.806**	**2.403**	**2.002**	**1.384**	**2.845**
Age	**0.017**	**0.013**	**0.023**	**0.012**	0.001	**0.012**	**0.014**	0.008
Income per person in household	0.006	−0.002	0.010	**0.009**	0.005	**0.008**	0.000	0.001
Children present in household (yes = 1)	0.172	0.197	0.028	0.224	**0.446**	**0.299**	0.366	−0.066
Post-high school education (yes = 1)	0.084	0.146	0.275	0.155	−0.199	−0.319	−0.038	0.223
Health index (100 is healthiest, 0 least)	**−0.006**	−0.003	0.002	0.003	**0.007**	0.005	0.002	0.003
Race (white = 1)	**−0.500**	0.007	−0.376	0.017	−0.226	−0.187	−0.006	**−0.726**
Gender (female = 1)	**0.489**	**0.623**	**0.999**	**0.473**	**0.372**	0.293	0.538	0.355
Specialty store? (yes = 1)	**0.517**	0.146	**0.867**	**0.798**	**0.677**	**0.399**	−0.095	**0.596**
Aware of NOP seal? (yes = 1)	0.181	0.089	0.355	0.133	0.095	0.101	0.109	0.225
Standard deviation of error term	**1.198**	**1.064**	**1.421**	**1.173**	**1.044**	**0.962**	**1.107**	**1.220**
Observations	**208**	**157**	**145**	**189**	**174**	**155**	**130**	**192**

Bold entries are significantly different from zero at the 90% confidence level.

Table 5
Willingness to pay estimates for eight food attributes

Attribute	WTP[a]—cents per box of cereal				
	Median	Mean	Std. Dev.	Minimum	Maximum
Pesticide free	39.39	43.15	20.56	13.07	125.40
Enhanced flavor	31.87	30.58	10.25	10.65	63.18
GM free	31.54	38.72	29.06	3.99	147.30
100% organic	39.99	45.43	25.34	8.79	126.94
95% organic	30.09	32.53	13.97	9.15	103.85
70–95% + organic	23.98	25.11	9.46	9.51	74.51
<70% organic	14.71	15.04	5.50	5.64	32.69
Locally grown	33.48	35.70	14.77	11.81	96.83

[a] Willingness to pay is calculated for sample observations using the equations estimated in Table 4.

Summary and implications

This study represents the first research of its kind following the implementation of the National Organic Program in October 2002 and explores consumer choice for a multi-ingredient processed food with varying organic content as provided for by NOP label guidelines. It includes data for both *traditional* grocery shoppers, with consumers from city-centre, suburban, and rural stores, and shoppers of a *specialty* natural foods grocery store.

Estimates suggest that consumers are willing to pay premium prices for organic foods, even those with less than 100% organic ingredients. The magnitudes of the WTP premia varied significantly among consumer groups. Generally, specialty grocery consumers were willing to pay substantially more than traditional grocery shoppers. However, this group was no more (or less) willing to pay a premium for the lowest organic content level (less than 70% organic ingredients). This may suggest that specialty grocery shoppers (perhaps representative of the most knowledgeable and dedicated organic consumers) display a threshold amount of organic content below which they will not pay premium prices.

Health concerns were expected to be important determinants of WTP for selected food attributes. Surprisingly, with all else equal, the level of health concern did not impact the magnitude of premia the consumer was willing to pay (except for the 95% organic content product).

The literature assessing the impact of children in the household on WTP for organic produce is mixed. For multi-ingredient foods, we found that the presence of children in the household had no impact on the probability of being willing to pay a premium for organic foods. However, conditioned on a willingness to pay a premium price, families with children were willing to pay higher premia for foods with 70–95% and 95–99% organic ingredients than were consumers without children.

Finally, we were interested in the impact of the NOP on consumer choice. Our results suggest that the NOP provision for multi-ingredient foods with various levels of organic content does have value to consumers: Consumers can choose from among an array of products with varying organic content and price to select the one that is utility maximal.

One aspect of the NOP is the new organic seal that can appear on foods with 95% or greater organic content. Only 45% of consumers (38% of *traditional* and 60% of *specialty* shoppers) recalled having seen the NOP organic seal on food products in the past.

Specialty food store shoppers were significantly more likely to be aware of the NOP organic seal than were conventional grocery shopping consumers (60% versus 38%). However, an NOP awareness-specialty store interaction term was not statistically significant in any model, suggesting that the differences observed in specialty store shoppers are not due strictly to increased awareness of the NOP by these consumers.

Awareness of the NOP was significant as a positive shifter of the probability that a consumer would be willing to pay a premium for foods with organic ingredients. It is instructive to note that NOP seal awareness increased the likelihood of a non-zero WTP not only for the two products that can bear the NOP seal, but also for the two lower organic content level products that cannot bear the seal. However, awareness of the NOP seal was not significant in explaining the magnitude of premium paid. Though likely not serving as a simple cue, the seal may be used by some consumers as a (government-backed) signal of product quality.

These results also suggest the merits of an increased range of production and pricing strategies for producers of multi-ingredient organic foods. Producing foods with 100 (or even 95) percent organic content may be substantially more costly than foods with lesser organic content due to the high cost of difficult-to-source organic ingredients. Producers may find it more profitable to produce for the lesser organic content categories rather than paying substantially higher prices for selected inputs.

In conclusion, it appears that the NOP has made a significant impact on the organic market even though a majority of consumers appear to have little knowledge of its provisions. The four organic product categories provide options both for consumers and producers. The evidence is that there is a demand for intermediate levels of organic content. As consumer knowledge of organic production methods and potential advantages and disadvantages of these products increases over time, we expect that consumer WTP for alternative level of organic content will change. Likewise, as the organic supply chain becomes more fully developed, allowing greater ease of sourcing a broad range of a product's ingredients, the costs of these higher organic content products will likely decrease relative to lesser organic content alternatives.

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