

## **Do Grocery Store Personnel's Perceptions, Attitudes, and Knowledge Determine Availability of Organic Food Products?**

Yunhee Chang<sup>ⓐ</sup>, Rachel Adams<sup>ᵇ</sup>, Teresa C. Carithers<sup>ᶜ</sup>, and Tanya Ruetzler<sup>ᵈ</sup>

<sup>ⓐ</sup>*Associate Professor, Department of Nutrition and Hospitality Management, University of Mississippi, 108 Lenoir Hall, P.O. Box 1848, University, Mississippi, 38677-1848, USA. Email: chang@olemiss.edu.*

<sup>ᵇ</sup>*Nutritional Educator, Department of Health, Mississippi State University, 532 S. Church St., Tupelo, Mississippi 38802, USA.*

<sup>ᶜ</sup>*Professor, Department of Nutrition and Hospitality Management, University of Mississippi, 108 Lenoir Hall, P.O. Box 1848, University, Mississippi, 38677-1848, USA. carither@olemiss.edu*

<sup>ᵈ</sup>*Associate Professor, Department of Nutrition and Hospitality Management, University of Mississippi, 108 Lenoir Hall, P.O. Box 1848, University, Mississippi, 38677-1848, USA. ruetzler@olemiss.edu*

---

---

### **Abstract**

This study uses a survey of grocery store personnel nationwide and a series of weighted least square regressions with hierarchically-structured sets of covariates to explore how retail personnel's perception, attitude, and knowledge regarding organic foods are related to availability of organic foods. We find that, while store types remain an important determinant of store personnel's attitudes as well as availability of organic food products, store personnel's perceptions of lower barriers and higher customer demand have strong separate associations with greater availability of organic foods. Implications for retail personnel's potential role in framing consumer choice and overall health disparity are discussed.

**Keywords:** Organic food, grocery stores, availability, perceptions, attitude, knowledge

<sup>ⓐ</sup>Corresponding author

## Introduction

Organic food is one of the fastest-growing segments of agriculture and retail. In the United States alone, organic food sales rose from \$1 billion in 1990 to \$25 billion in 2011, which accounted for more than 3.5% of total food sales in 2011 (Osteen, Gottlieb, and Vasavada 2012). This increase is largely driven by growing consumer demand (Crinnion 2010; Osteen, Gottlieb, and Vasavada 2012). Similar increases have been observed in the UK and other European nations (Aertsens, Mondelaers, and Van Huylenbroeck 2009; Hamm and Gronefeld 2004; Jones, Clarke-Hill, Shears, and Hillier 2001). Organic food products may generate social benefits because they contain lower levels of pesticides and possibly higher levels of certain nutrients, and involve more sustainable farming practices to protect environments compared to non-organic products (Crinnion 2010).

Despite increasing availability and perceived benefits, the growth of organic markets may have been uneven across the population and some consumer groups may have been excluded from the market expansion either geographically or economically (Lawrence 2010; Wadsworth and Coyle 2007; Webber and Dollahite 2008; Zepeda, Chang, and Leviten-Reid 2006). While numerous studies have attempted to explain such disparity by analyzing consumer preferences and attitudes toward organic foods, little is known about the role of grocery store personnel in determining the availability of organic products (Dahm, Samonte, and Shows 2009; Gotschi, Vogel, Lindenthal, and Larcher 2010).

This study seeks to understand how the grocery store personnel's individual characteristics, store characteristics, and local market characteristics are related to their attitudes and knowledge toward organic food products, and how their attitudes and knowledge in turn affect availability of these products in their stores. Although explorative, this study expands knowledge by surveying grocery store personnel nationwide, using multi-item scales of perception, attitude, knowledge, and availability and incorporating individual-, store-, and local-level determinants into regression models. As decision-makers in the retail grocery industry, these individuals may influence availability of organic foods for consumers and could provide important insights into recent trends.

## Background Literature

The United States Organic Foods Production Act and the USDA's National Organic Program (NOP) require that products labeled as organic come from certified farms. Crops must be raised without conventional pesticides or petroleum-based or sewage sludge-based fertilizers. Animals must be fed organic feed, given access to the outdoors, and cannot be given antibiotics or growth hormones. The NOP also prohibits genetic engineering. For a product to display the USDA Organic Seal, it must be made from at least 95% organic ingredients (USDA 2008).

Despite the ongoing debate on whether organic food products have higher nutritional value (Crinnion 2010; Dangour, Allen, Lock, and Uauy 2010; Ojha, Amanatidis, Petocz, and Samman 2007), organic foods are considered healthy and safe as they have been consistently shown to contain about one-third of the pesticide residues found in conventionally grown foods (Baker, Benbrook, Groth, and Lutz Benbrook 2002). In addition, organic farming was found to be more

environmentally friendly because, depending on the size of the farm and management methods, it may encourage biodiversity, use resources more efficiently, and manage soil, water, and air quality (Mondelaers, Aertsens, and Van Huylenbroeck 2009; Shepherd et al. 2003).

As consumers are willing to pay price premiums for the added value, organic products may create greater profit opportunity for farmers and retailers. A number of studies support consumers' willingness to pay is greater for organic food products than conventional food products (Batte, Hooker, Haab, and Beaverson 2007; Gifford and Bernard 2008; Krystallis and Chryssohoidis 2005; Ureña, Bernabéu, and Olmeda 2008).

### *Attitudes Toward Organic Foods*

Various studies have found consumer attitudes toward organics to be favorable overall. A survey of university students found that younger students who were more knowledgeable about organics were more likely to have favorable opinions. The study found that positive attitudes significantly increased purchases of organic products (Dahm, Samonte, and Shows 2009).

Another study found that family influence and cultural perspectives were important in shaping attitudes and purchasing decisions. Women had more positive attitudes toward organic products than men (Gotschi, Vogel, Lindenthal, and Larcher 2010). In addition, consumers who were politically liberal and moderately religious were more favorable to organic foods (Onyango, Hallman, and Bellows 2007). Another study argued that, contrary to the myth that organic foods are mainly purchased by "rich, educated, Caucasian" women, people of all races and genders are purchasing organics (Scholten 2006). In focus groups involving African-American and Caucasian shoppers, the African-American groups had less knowledge of organics, but their attitudes tended to be more positive (Zepeda, Chang, and Leviten-Reid 2006).

Negative attitudes regarding organic foods generally stem from their relatively high price. One study also discovered there is a mistrust of organic foods specifically in supermarkets, because consumers are concerned about food miles and lack of fair trade practices (Padel and Foster 2005).

### *Availability of Organic Foods*

Accessibility is a crucial predictor of organic purchasing habits. One study found that purchases of organic foods are more of a matter of search costs and availability than of demographics (Jinghan, Zepeda, and Gould 2007). An increase in the availability of shopping venues or the availability of organic foods in existing stores could decrease search costs and increase purchasing habits.

Traditionally, organic foods were mainly offered through small-scale "alternative" specialty retailers such as farmers markets, local grocers, and natural foods stores, which are still gaining popularity (Dimitri and Greene 2002; Jones et al. 2001). Organic farmers are more likely to market their foods directly to consumers through farmers markets or community-supported agriculture programs (Dimitri and Greene 2002). Limited operating hours and locations and the perceptions of higher prices that are characteristic of farmers markets may unfavorably affect

equitable availability of organic products (Grace, Grace, Becker, and Lyden 2007). Community-supported agriculture programs are often advertised by word of mouth and come with high up-front fees, which also excludes lower socioeconomic populations (Macias 2008). Most farmers markets and community-supported agriculture programs are located in population centers, which may limit access for individuals living outside of urban areas (Lawrence 2010).

Organic products are also sold at specialty stores in affluent neighborhoods, which limits availability for low-income shoppers (Webber and Dollahite 2008; Zepeda, Chang, and Leviten-Reid 2006). Economic availability is a key factor given that consumers often pay price premiums for organic foods. A study found that an all-organic diet could cost up to 49% more per week for a family of four (Brown and Sperow 2005).

Recently organic foods have entered mainstream grocery retailing (Dimitri and Greene 2002; Jones et al. 2001); however, qualitative evidence still suggests that limited access to appropriate retail outlets leaves out consumers in some areas with unmet demand for organics. Focus group participants reported there were not enough stores in their area selling organic products, and there was a lack of variety in the stores that did sell them (Wadsworth and Coyle 2007). These findings suggest that accessibility is an important predictor of organic purchasing habits, and consumers living in areas where organics are not widely sold have reported that they might purchase them, if they were available.

### *Influence of Grocery Stores*

Stores may influence consumers' purchasing habits through decisions to offer organic products as well as their marketing efforts. The quality and variety of products available at a grocery store can significantly impact the store's image. Display size and placement are also crucial to purchase decisions (Durham, Johnson, and McFetridge 2007). In recent years, many food retailers have increased their strategic marketing of organic foods. Offering organics is believed to help improve a store's image in terms of being more environmentally friendly, socially responsible, and offering higher quality products (Aertsens, Mondelaers, and Van Huylenbroeck 2009). However, lack of availability or insufficient marketing was identified as a cause for the discrepancy between consumer attitudes toward organic foods and actual purchasing behavior (Hughner et al. 2007). Supermarkets can have a significant impact on the dietary habits of communities based on location, price, and products offered.

Little is known as to how retail personnel's perceptions, knowledge, and attitude toward organic products can determine product choice at their stores. Ireland and Falk (1990) were the only exception to our knowledge. After surveying grocery store managers in New Mexico they found that in stores where organic products were available, managers perceived customer demand to be high and believed offering organics was a good marketing strategy. At stores where organics were not available, managers perceived customer demand to be low and did not believe offering organic products was an effective marketing strategy (Ireland and Falk 1990). However, the Ireland and Falk (1990) study had several limitations. First, it was conducted more than two decades ago, which was prior to the sizeable growth of the market for organic foods in the United States. That only 11% of the stores in their sample actually carried organic food products clearly suggests that their findings may not apply to today's market situation. Second, the

conclusions about the grocery store managers' perceptions on organics were derived from a one-question measure of attitudes. Third, their analysis relied primarily on descriptive statistics and simple group comparisons, which did not provide statistical support for the findings. Since little else is known about the influence of grocery store personnel on organic product availability and marketing, research to further investigate the topic seemed justified. Though similar to the previous study by Ireland and Falk (1990), this study provides stronger evidence with a nationwide sample, multi-item scales, and individual, store, and county characteristics as control variables.

## Methodology

Online questionnaires were used to survey a nationwide sample of grocery store personnel who may influence marketing and product selection. County-level market characteristics were obtained from the USDA's Food Environment Atlas Data.

### Survey

The "Supermarket, Grocery, and Convenience Store" database available through MarketResearch.com (Rockville, MD, United States) provided 16,079 valid personal e-mail contacts of supermarkets, grocery stores, and convenience store personnel nationwide. Roughly 38% of these contacts were owners or other executives, 34% were managers, 5% were marketing personnel, and 9% were buyers or procurement personnel. It was possible that more than one individual from the same retailer were contacted if they were at different locations. Although the database did not specify classification of stores, the trade names suggested that the database covered a wide range of store types and sizes including chain superstores, supermarkets, specialty stores, and convenience stores.

In June 2011, the contacts were sent an e-mail containing a link to an on-line survey. The body of the e-mail included a brief description of the purpose of the study, an explanation of informed consent, and a request for their participation. A follow-up e-mail was sent several days later to remind them to complete the survey. No incentives were offered. After discarding incomplete attempts (i.e., surveys with more than 20% of the questions left blank in the Attitude, Knowledge, and Availability scales), 172 surveys were deemed useable. Although the response rate may be low, we believe these are still valuable observations considering that the initial contacts were not a random sample but the actual population of grocery store personnel. Our final sample slightly over-represented independent retailers and gourmet/natural stores, but otherwise was comparable to the industry in terms of composition of store types (The Reinvestment Fund 2011).<sup>1</sup> Some of these surveys contained missing values, which were filled

---

<sup>1</sup> A  $\chi^2$  goodness-of-fit test was performed to check whether the types of stores represented in the sample were comparable to the distribution in the population. According to the Census Bureau's 2011 County Business Patterns data (<http://censtats.census.gov/cgi-bin/cbpnaic/cbpdetl.pl>), supermarkets and grocery stores account for 55.1% of grocery and food retail establishments, specialty food stores account for 24.7%, and convenience stores account for 20.2%. No distinction was made between large and small grocery stores. Comparing these percentages to our sample distribution using  $\sum[(O_j - E_j)^2/E_j]$ , where  $O_j$  is the observed percentage for the  $j$ -th category, and  $E_j$  is the expected percentage for the  $j$ -th category in the population, yielded  $P(\chi^2 > 1.81) = 0.6$ , which showed no statistically significant difference between sample and population distributions of store types.

using the multiple imputation method. Imputation can help avoid biases from dropping the variable or the individuals that contain missing data (Royston 2004; Rubin 1987).

### *Questionnaire*

The survey asked about individual characteristics such as the respondent's position title at the store, gender, age, ethnicity, and education. It also contained questions about the store such as type of the store, ownership status and scope of business, and questions regarding availability of organic products at the store.

For attitude and knowledge about organic foods, respondents were asked to rate their agreement on a five-point scale to determine their perceptions of barriers to offering organic food products, their attitudes toward organic products, and their knowledge of organic products. The questionnaire was developed based on components from several existing instruments in the literature (Brown 2003; Dahm, Samonte, and Shows 2009; Ireland and Falk 1990), and revised to apply to organics in the retail grocery industry and the attitudes of store personnel. It was reviewed for content validity by qualified experts, including two university professors in food and retail marketing and an experienced industry expert at a large-scale grocery retailer. Statistical reliability was estimated after data collection.

For the measure of perceived barriers to offering organic products, respondents' ratings for five possible barriers ranging from 1 (not a barrier at all) to 5 (strong barrier) were averaged. Attitudes toward organic food products were measured in three conceptual categories: attitudes regarding the quality, attitudes regarding the environmental impact, and attitudes regarding customer demand. For each of the categories, respondents' ratings ranging from 1 (strongly disagree) to 5 (strongly agree) were averaged over four to five statements, resulting in all three scales ranging from 1 to 5. Respondents also reported agreements to two statements about their knowledge and awareness of organic foods on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). In addition, they were asked to identify the criteria they recognize for a product to display the USDA Organic Seal. Respondents were regarded more knowledgeable about organic food products, the more criteria they recognized. As there were six criteria in the last question, the average of the three knowledge questions may range from 0.67 to 5.33, with higher numbers indicating greater knowledge and awareness about organic foods.

Two variables represented availability of organic food products. First, "percent type organic" was constructed based on two questions: "what types of food products are available at your store?" and "what types of organic food products are available at your store?" Respondents were given a list of food product categories, including fruits, vegetables, dairy/milk products, eggs, meat/poultry/seafood, dry goods, baked goods, canned goods, frozen foods, beverages, snack foods, ready-to-eat items, pet foods, and baby food, and "other" category, and were instructed to select all that applied. The variable "percent type organic" was constructed as a ratio of the number of categories for which organics were offered divided by the number of categories offered at all at each store. Second, "percent products organic" was measured with one question: "about what percentage of products at your store are organic?" Both measures are continuous variables ranging between 0 and 100.

### *Market Characteristics*

The survey also included questions about the store location, based on which county-level variables from the USDA's Food Environment Atlas data were merged. The Food Environment Atlas data provide information on food access, food prices, and local food systems as county, state, and regional food environment indicators (USDA 2003). They also list socioeconomic characteristics of the communities. For this study, we used the number of grocery stores per 1,000 residents, percentage Caucasian/white, median income, poverty rate, metro indicators (defined as urbanized areas containing cities with 50,000 or more residents), relative price of milk (defined as the local average price of low-fat milk relative to the national average price), and number of farms with direct sales in the county.

The number of grocery stores per 1,000 residents represents local food access. Percent white, median income, poverty rate, and metro indicators portray socioeconomic characteristics of the county. The price of low-fat milk in the local market relative to the national average proxies the local cost of healthy foods for at least two reasons. First, due to the highly perishable nature of milk products, milk markets are more localized and more influenced by regional marketing orders and farmer-owned cooperatives than other agricultural sectors in the US (Wilde 2013). Second, analyses of Quarterly Food-at-Home Price Database have found substantial geographic variations as to whether low-fat milk is more expensive than nonalcoholic carbonated beverages (Todd, Leibtag, and Penberthy 2011). The number of farms with direct sales in each county represents the local food systems.

### *Sample*

Table 1 reports descriptive statistics of the sample. The final sample represented various types of store personnel, including owner/chief officer (12.8%), manager/department manager (37.8%), marketing personnel (20.9%), buyer/procurement specialist (13.4%), and other personnel (15.1%). Other personnel included employees in accounting, human resources, information technology, and real estate. Whereas these other personnel may not be directly involved in product selection and marketing, they are likely to be guided by core values of the business and reflect the company culture and attitudes.

The sample included various age groups, including 39 or younger (12.8%), 40-49 (39.0%), 50-59 (38.4%), and 60 and up (9.9%), and different education levels, including 2-year degree or less (32.0%), 4-year degree (50.6%), and post-graduate degree (17.4%). The majority of the respondents were male (76.2%) and Caucasian/white (94.2%). According to the 2000 Census 1% Public Use Microdata Sample (PUMS), grocery store personnel who held managerial or marketing positions similar to the job descriptions of our sample were 82% white, 48% male, and had the median age of 38. The Census sample shows that the majority of these managers had not completed four-year colleges (67%), and only 7% had postgraduate degrees. Although the Census PUMS sample is ten years older than our data, our sample may somewhat over-represent older, more educated Caucasian white male employees of this industry.

Many respondents worked for large supermarkets/superstores (50.0%), with other store types including small grocery stores (11.6%), natural/gourmet food stores (20.3%), and convenience stores (18.0%). The stores were also grouped by type of ownership, including independently owned (26.7%), a chain operating within a single state, (18.0%), and regional or national chain (55.2%).

**Table 1.** Sample Characteristics

<b>Individual Characteristics</b>	<b>%</b>	<b>Store Characteristics</b>	<b>%</b>
<b>Job title:</b>		<b>Type of store:</b>	
Owner/chief officer	12.8	Large supermarket/super store	50.0
Manager/department manager	37.8	Small grocery store	11.6
Marketing personnel	20.9	Natural/gourmet foods store	20.3
Buyer/procurement specialist	13.4	Convenience store	18.0
Other personnel	15.1		
<b>Gender:</b>		<b>Ownership category:</b>	
Female	23.8	Independently owned	26.7
Male	76.2	State chain	18.0
		Regional or national chain	55.2
<b>Age:</b>		<b>County Characteristics</b>	
29-39	12.8	Stores per 1,000 persons	Mean (SD) 0.2 (0.1)
40-49	39.0	Percent white	67.9 (19.2)
50-59	38.4	Median income (in 1,000s)	51.6 (12.8)
60 and up	9.9	Poverty rate	14.8 (5.2)
		Metropolitan county <sup>A</sup>	0.8 (0.4)
<b>Race</b>		Relative price of milk	1.0 (0.1)
White	94.2	# Direct sales farms	105.1 (108.6)
Non-white	5.8		
<b>Education:</b>		<b>Region:</b>	
2-year college or less	32.0	Northeast	25.0
4-year college degree	50.6	Midwest	31.4
Post-graduate degree	17.4	South	20.3
		West	23.3
		<b>Dependent Variables</b>	
		Percent types organic	Mean (SD) 60.5 (35.3)
		Percent products organic	17.7 (16.1)

**Note:** N=172. Percentages are reported for categorical variables. Mean and standard deviations are reported for continuous variables. <sup>A</sup>Dummy variable.

On average, the counties in which the stores in the sample were located had 0.2 grocery stores per 1,000 residents, had 67.9% of its population non-Hispanic white, had median household income of \$51,600, and had 14.8% of the population poor. Eighty percent of the stores in the sample were in metro counties. The relative price of milk was averaged at 1, indicating a geographic balance in terms of cost of healthy food. On average there were 105 farms with direct sales within a county. The sample represented all four US regions fairly.

### Analysis

The first objective of this study was to identify the determinants of grocery store personnel's perceived barriers, attitudes, and knowledge toward organic foods. Regressions were estimated for the five dependent variables of perceived barriers, knowledge, and attitudes related to the



quality, environmental impact, and customer demand for organic products to determine which individual, store, and county characteristics are important predictors. That is, perceived barriers for the respondent  $i$  in store  $j$  located in county  $k$  can be written in a linear model as

$$(1) \text{ Perceived Barrier}_{ijk} = \beta_0 + \beta_1 \mathbf{X}_{ijk} + \beta_2 \mathbf{W}_{jk} + \beta_3 \mathbf{Z}_k + \varepsilon_{ijk}$$

where  $X$ ,  $W$ ,  $Z$  are vectors of individual, store, and market characteristics, respectively,  $\varepsilon$  is the regression residual, and  $\beta_{0,1,2,3}$  are vectors of regression coefficients. Similar regressions were estimated for the three attitude scales and the knowledge scale as dependent variables.

The second research question was to determine whether perceived barriers, attitudes, and knowledge of grocery store personnel are associated with availability of organic foods at their stores. Regressions were estimated for the dependent variable of organic availability, using perceived barriers, the three attitude scales, and knowledge scales as the independent variables. That is, availability reported by respondent  $i$  in store  $j$  located in county  $k$  can be written in a linear model as

$$(2) \text{ Availability}_{ijk} = \gamma_0 + \gamma_1 \text{ Perceived Barrier}_{ijk} + \gamma_2 \text{ Attitude}_{ijk} + \gamma_3 \text{ Knowledge}_{ijk} + \alpha_1 \mathbf{X}_{ijk} + \alpha_2 \mathbf{W}_{jk} + \alpha_3 \mathbf{Z}_k + \omega_{ijk}$$

For availability regressions, models were estimated with hierarchically-nested sets of covariates at individual, store, and market levels. That is, the baseline regression of availability was specified with the five attitudinal scales as explanatory variables and no controls. Subsequently, individual-, store-, and county-level controls were added to the baseline model. This enabled us to distinguish the relative importance of each set of explanatory variables in explaining availability. Given the small sample size, there was a concern that the data may violate one or more fundamental assumptions in Ordinary Least Square (OLS) models resulting in potential heteroscedasticity or contamination with outliers. Therefore we estimated weighted least squares estimators as well as robust regressions of the above linear models in addition to OLS. For the weighted least squares, we used store types, regions and no constant term in the weighting equation. Weights were given in proportion to the absolute value of residuals.

## Results

On average, respondents reported that their stores offered organic options for 60.5% of the product categories they carried. A relatively high standard deviation indicates wide variation in availability of organic foods. Whereas about 10% of the respondents reported that their store offered no organic food options, another 10% said their stores offered organic options for 100% of the product types/categories. The portion of organic products as a percent of all products available at the store averaged around 17.7%.

### *Descriptive Statistics for Perceived Barriers, Attitude, and Knowledge*

Table 2 lists specific items in each measure, descriptive statistics, and reliability measures. Cronbach's  $\alpha$  statistics were greater than generally accepted thresholds for all five scales,

indicating strong internal consistency within each scale. Item-test correlations were fairly even across items within a scale, justifying our use of unweighted averages as scale scores.

**Table 2.** Reliability and Mean Values of Perceived Barrier, Attitudes, and Knowledge Scales

Scale	Mean	S.D.	Scale Reliability	Item-Test Correlation
<b>Perceived barriers</b>	2.59	(0.92)	0.775	
Higher prices	2.81	(1.31)		0.71
Limited availability from suppliers	2.66	(1.22)		0.68
Lack of demand from customers	2.67	(1.40)		0.77
Not enough space in store	2.47	(1.28)		0.71
Shorter shelf life of products	2.33	(1.11)		0.76
<b>Attitude about quality</b>	3.27	(0.93)	0.927	
Higher quality in general	3.19	(1.11)		0.91
Taste better	3.06	(1.04)		0.87
Healthier	3.57	(1.08)		0.88
More nutrients	3.24	(1.04)		0.88
Worth higher price	3.27	(1.02)		0.86
<b>Attitude about environmental impact</b>	3.73	(0.92)	0.925	
Better for environment	3.70	(1.99)		0.83
Humane treatment of animals	3.40	(1.08)		0.91
Sustainable farming	3.59	(1.09)		0.94
Lower levels of pesticides	4.21	(0.87)		0.84
<b>Attitude about customer demand</b>	3.47	(0.96)	0.915	
Popular	3.24	(1.14)		0.90
Draw customers	3.25	(1.19)		0.93
Use advertising to market	3.27	(1.34)		0.87
Improve image	3.83	(0.92)		0.86
Growing market	3.76	(0.90)		0.81
<b>Knowledge</b>	3.90	(0.84)	0.683	
Consider myself knowledgeable	3.61	(1.00)		0.83
Stay up to date	3.64	(0.96)		0.86
Recognize organic seal criteria <sup>A</sup>	4.45	(1.24)		0.70

**Notes:** N=172. Each individual item was measured on a 5-point Likert scale with 1=strongly disagree, 5=strongly agree except <sup>A</sup>, which ranged between 0 and 6 with 6 being the greatest knowledge. Scales were constructed as averages of item scores. Scale reliability was measured by Cronbach's alpha.

Overall, respondents reported a moderate level of perceived barriers (2.59/5.00), with "higher prices" being the greatest reported barrier to offering organic foods and "shorter shelf life of products" being the lowest. Average respondents reported positive attitudes toward organic foods based on the measures of quality (3.27/5.00), environmental impact (3.73/5.00), and customer demand (3.47/5.00). Within the quality measure, the statement agreed with most was that organic foods are healthier, while the statement with the lowest agreement was that organic foods taste better. Within the environmental impact measure, the statement agreed with most was that organic foods have lower levels of pesticides, while the statement with the lowest agreement was that organic foods promote more humane treatment of animals. Within the customer demand

measure, the statement agreed with most was that offering organic foods improves a store's image, while the statement with the lowest agreement was that organic foods are popular among customers. The respondents reported moderate-to-high levels of knowledge (3.90/6.00).

Table 3 presents Pearson's  $r$  correlation coefficients between the five scales, suggesting one's perceived barriers were significantly correlated with his or her attitudes and knowledge, vice versa. Perceived barriers were negatively correlated with attitudes and knowledge, while all attitude scales and knowledge were positively correlated. This supports findings from previous studies which have found that attitudes toward organic foods are generally favorable and that knowledge is positively correlated with opinion (Dahm, Samonte, and Shows 2009).

**Table 3.** Correlations among the Perceived Barriers, Attitude, and Knowledge Scales

	Perceived barriers	Attitude about quality	Attitude about environmental impact	Attitude about customer demand	Knowledge
<b>Perceived barriers</b>	1.00				
<b>Attitude about quality</b>	-0.24**	1.00			
<b>Attitude about environmental impact</b>	-0.25***	0.72***	1.00		
<b>Attitude about customer demand</b>	-0.58***	0.46***	0.49***	1.00	
<b>Knowledge</b>	-0.38***	0.30***	0.36***	0.58***	1.00

Notes: N=172. Pearson  $r$  is reported. \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$

#### *Determinants of Perceived Barriers*

Table 4 (see Appendix) presents weighted least square estimates from regressions of retail personnel's perceived barriers, attitudes, and knowledge regarding organic products. Robust regression estimates were also obtained but are not presented in tables because they were highly comparable. Perception of barriers to offering organic foods was significantly higher for marketing personnel than for store managers, controlling for other individual-, store-, and local-level factors. Perceived barriers were also higher for racial/ethnic minorities. Gender, age, and education of the respondent had no significant relevance to perceived barriers.

Store types were a strong predictor of perceived barriers. Compared to the personnel at large supermarkets and superstores, those who worked at natural/gourmet stores reported significantly lower barriers and personnel at convenience stores reported considerably higher barriers. The scope of store ownership was also somewhat related to barrier perception, with those at state chains perceiving slightly higher barriers than those at independently owned outlets.

Local markets that had greater concentration of grocery outlets, or those that had higher median household income but were also characterized by greater incidence of poverty were associated with lower perceived barriers. These seemingly contradictory findings suggest a lower retail barrier to organic sales in areas with higher income inequality. Controlling for those, perception of barriers was neither higher nor lower in metro counties than rural counties. Local racial composition, relative price of low-fat milk, number of direct sales farms, and regions were not correlated with the retail personnel's perceived barriers.

### *Determinants of Attitudes*

Personnel who were not directly involved in marketing or product selection showed slightly more positive attitudes about the quality of organic food products than store managers. Controlling for position titles, ethnicity, and store characteristics, women and younger personnel (39 or less) were associated with more positive attitudes about quality. Personnel at natural/gourmet food stores and convenience stores showed significantly more positive attitudes about quality than those at large supermarkets and superstores. Personnel from state-wide chains and regional/national chains were slightly less positive toward quality than personnel from independently owned stores. Interestingly, local market characteristics had little to do with store personnel's attitudes about the quality of organic products.

Female gender and older age (60 or higher) were associated with a slightly more positive attitude toward the environmental impact of organic foods. Among store characteristics, personnel at small grocery stores or convenience stores displayed significantly less positive attitudes toward the environmental impact of organic foods than those at large supermarkets and superstores. No significant county-level determinants were found for personnel's attitude about the environmental impact of organic foods.

Personnel's attitude toward customer demand for organic foods was slightly higher among female personnel and slightly lower among racial/ethnic minority. Store and county characteristics were both strong predictors. Personnel at natural/gourmet food stores were significantly more positive toward customer demand than those at large supermarkets and superstores, whereas personnel at convenience stores were considerably less positive about customer demand for organics. This is not surprising given that a sizeable share of natural/gourmet food stores in this country are consumer-owned food co-operatives, which were formed specifically by consumer demand (Deller, Hoyt, Hueth, and Sundaram-Stukel 2009). In contrast, small grocers or convenience stores typically cater to convenience-driven demand and only carry limited stocks of food products. Personnel at state-wide chain stores were slightly more positive regarding customer demand. Also, the more stores per population a county had, more positive attitudes toward consumer demand for organic foods were reported. The store personnel in counties with relatively high price of low-fat milk, a proxy for the high cost of healthy foods, were less positive regarding customer demand for organic foods. This indicates that retailers in the areas where healthy eating is costlier than in other places may believe that consumers would be less willing to pay price premiums for organics.

### *Determinants of Knowledge*

The store personnel's individual characteristics had very little to do with their knowledge about organic foods, which is consistent with the relatively small standard deviation presented in Table 2. This suggests knowledge about organic foods may be more uniform across the respondents than their attitudes and perceptions. The only exception was store personnel's education, which was positively correlated with their organic product knowledge.

Personnel at convenience stores reported significantly less knowledge than personnel at large supermarkets and superstores. Personnel at regional and national chains also reported slightly less knowledge than independently owned stores.

Personnel in counties with relatively higher prices of milk or with a higher percentage of white residents were found to be significantly less knowledgeable about organic food products. Personnel in Northeast and West regions were more knowledgeable about organic products than those in Midwest.

### *Determinants of Availability*

Weighted least square estimates from regressions of availability of organic products are reported in Table 5. For full regression estimates, see Appendix Tables A and B. For each of the two availability measures – percent type organic and percent products organic, four regressions of organic food availability with different sets of control variables were estimated. The baseline regression only included perception, attitude, and knowledge as explanatory variables. Other models included individual, store, and county characteristics as additional controls to examine whether the coefficients for attitudinal variables were robust. Due to small cell sizes, hierarchical linear modeling was not possible.

Attitude toward customer demand was found to be the most consistent positive predictor of organic availability, which remained significant when control variables were added to the model. A one-point increase in attitude toward customer demand was associated with 11.1-16.2 percentage-point increase in the types of food products that offered organic options, or 2.5-3.3 percentage-point increase in the percent of organic products out of all food product offerings. Perceived barriers were negatively associated with the percent of food product types that had organic options, which remained significant throughout different model specifications. Perceived barriers were also negatively associated with organic offerings as a percent of all food products, but the association became weaker as store characteristics were accounted for and the association eventually disappeared when regression included local market characteristics. The latter is not surprising given that the earlier regression showed variations in perceived barriers were explained largely by store types and county characteristics. Attitude toward the quality of organic foods was negatively correlated with percent type organic when controlling for individual variables, but not when store and county characteristics were controlled for. With the second dependent variable – percent products organic, attitude toward quality was a positive predictor of availability but the association diminished as market characteristics were controlled for. On the other hand, retail personnel's knowledge hardly had anything to do with availability.

Although retailer perception and attitude were consistently important predictors of availability, some store characteristics and local market factors remained to matter. Organic availability was lower in small stores and convenience stores, and higher in areas with a greater number of grocery stores per population even after retailer attitude and perception were accounted for.

**Table 5.** Determinants of Availability of Organic Foods

	<b>With No Controls</b>	<b>Individual Controls Only</b>	<b>Individual and Store Controls Only</b>	<b>Individual, Store, and County Controls</b>
<i>Percent Type Organic</i>				
<b>Perceived barriers</b>	-11.5 (2.4)***	-12.9 (2.4)***	-5.6 (2.2)**	-7.3 (2.4)***
<b>Attitude about quality</b>	-8.2 (2.9)***	-12.1 (3.0)***	-4.7 (3.1)	-5.0 (3.0)
<b>Attitude about environmental impact</b>	5.3 (3.0)*	6.8 (3.0)**	2.8 (2.9)	3.5 (2.9)
<b>Attitude about customer demand</b>	15.4 (2.9)***	16.2 (2.9)***	13.4 (2.9)***	11.1 (2.9)***
<b>Knowledge</b>	1.9 (2.7)	4.0 (2.8)	-2.0 (2.4)	-1.9 (2.6)
Constant	37.8(14.9)**	32.6 (15.3)**	46.0 (13.4)***	80.6 (38.2)**
Adjusted R <sup>2</sup>	0.461	0.543	0.809	0.797
N	172	172	172	172
<i>Percent Products Organic</i>				
<b>Perceived barriers</b>	-1.8 (0.7)**	-2.5 (0.8)***	-1.9 (0.8)**	-1.2 (0.9)
<b>Attitude about quality</b>	3.5 (1.0)***	3.8 (1.1)***	2.2 (1.1)**	1.9 (1.0)*
<b>Attitude about environmental impact</b>	-1.9 (1.1)*	-2.2 (1.1)*	-1.1 (1.1)	-1.1 (1.0)
<b>Attitude about customer demand</b>	3.3 (0.9)***	2.8 (1.0)***	3.3 (1.0)***	2.7 (1.0)***
<b>Knowledge</b>	.7 (0.8)	1.4 (0.9)	.4 (0.9)	1.5 (0.9)
Constant	0.8 (4.7)	2.9 (5.5)	7.0 (5.4)	-14.8 (14.4)
Adjusted R <sup>2</sup>	0.270	0.291	0.476	0.511
N	172	172	172	172

**Notes:** Weighted Least Squares regression coefficients are reported with standard errors in parentheses. Coefficients for individual characteristics (job title, gender, age, race, and education), store characteristics (type of store and ownership category), and county characteristics (number of grocery stores per 1,000 persons, percent white, median income, poverty rate, metropolitan county, price of milk, number of farms with direct sales, and region dummies) are suppressed but can be made available upon request.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.10

Comparison of the adjusted R<sup>2</sup> across regression models provides additional information regarding the importance of different sets of variables. In the regressions of percent type organic, store personnel's perception, attitude, and knowledge alone explained as much as 46.1% of the variability of organic availability. Individual characteristics explained additional 9.2%, and store characteristics further explained additional 26.6%, raising the R<sup>2</sup> to the highest model fit. Adding county-level characteristics contributed little to the model fit. In the regressions of percent products organic, store personnel's perception, attitudes, and knowledge accounted for 27.0% of

the variability in organic availability. Individual characteristics explained additional 2.1%, and store characteristics further explained additional 18.5%. Adding county-level characteristics contributed additional 3.5% to the model fit.

## Conclusion

Despite growing popularity of organic foods, the grocery retail environment may influence consumers' access to organic products (Hughner et al. 2007; Lawrence 2010; Wadsworth and Coyle 2007; Webber and Dollahite 2008; Zepeda, Chang, and Leviten-Reid 2006). Using surveys of grocery retail personnel nationwide, this study provides exploratory evidence that retailers may play a role as potential sources of disparate availability of organic foods.

This study finds that the single most important determinant of availability of organic food offerings is retail personnel's attitude toward customer demand for organic products. A change of retail personnel's attitude toward customer demand from neutral to somewhat positive on a five-point scale would correspond to three percentage-point increase in organic food products and 11-16 percentage-point increase in organic product types available at their stores. Although this relationship is correlational and not causal, it can illustrate a potential role of retail personnel in shaping organic food environment if personnel's attitude toward customer demand is not an accurate assessment of actual demand.

Perceived barriers and attitude regarding quality also were significantly correlated with availability, which is consistent with previous descriptive reports that organic products are more likely to be offered if store managers perceive barriers to be low and customer demand to be high (Ireland and Falk 1990). However, we find that retailers' attitudes toward demand were far more important and robust than attitudes about quality or perception of barriers.

Besides store personnel's perception, attitude, and knowledge, store characteristics explained most of the variability of organic availability, while individual demographics and local market variables only added modest explanations. Store type in particular was a strong and consistent predictor of attitudes and perception towards organic products. Respondents from natural/gourmet food stores perceived significantly lower barriers and more positive attitudes about quality and customer demand, whereas personnel from small grocery stores or convenience stores perceived significantly higher barriers and showed more negative attitudes towards customer demand and environmental impact of organic products. Furthermore, availability of organic products was significantly lower in small stores and convenience stores than in other types of stores even after we controlled for perception and attitudes, which suggests presence of other factors that negatively affects organic availability in these stores.

We found female personnel had more positive attitudes about organic products' quality, environmental impact, and customer demand, which is analogous to existing knowledge from studies of consumers (Gotschi, Vogel, Lindenthal, and Larcher 2010; Onyango, Hallman, and Bellows 2007). Also, personnel that were racial/ethnic minorities perceived greater barriers and were less optimistic about customer demand, and white personnel were associated with greater organic availability, which aligns with existing knowledge from consumer research (Dahm, Samonte, and Shows 2009). On the other hand, we found personnel in locations with higher

percentages of white residents knew less about organics, and the areas characterized by greater income inequality were associated with lower perceived barriers to offering organic foods. This may indicate white individuals are simply more likely to work in stores where more organics are available, and that organic preferences no longer fit stereotypical demographic profiles. This is consistent with previous discussions in the literature (Scholten 2006; Zepeda, Chang, and Leviten-Reid 2006). Alternatively, these findings may imply demographic and economic diversity is a positive determinant of organic food consumption, which is worthwhile to verify in future research.

For the most part, local market characteristics do not directly explain differences in organic availability. But they are linked to store personnel's perceptions and attitudes, and hence are indirectly related to availability. Greater concentration of grocery outlets and a lower cost of healthy diet proved to be consistent correlates for store personnel's perception of lower barriers and more positive attitudes toward customer demand. In the areas where low-fat milk was relatively more expensive, retail personnel were less knowledgeable and less optimistic about customer demand for organics. This suggests that poor access to foods in general also means poor access to organic foods as well. This finding is consistent with the claim in the literature that product offerings may be based on a supermarket's desire to compete with other nearby stores, meaning that where there is less competition, there also tends to be less variety (Hawkes 2008).

Although greater knowledge of organic food products was reported among personnel in Northeast and West regions, where availability of organic foods are significantly higher, there was no evidence suggesting grocery personnel's knowledge about organic foods directly influenced organic availability. Instead, greater availability of organic products in the Northeast and West regions may imply prevailing food consumption culture not entirely recognized by grocery retailers in those regions that favors local foods over commercially distributed organic products (Padel and Foster 2005). However, whether the regional disparity in organic availability also reflects regional food supply, climate-related farming zones, and other unobserved market circumstances remains undetermined.

### *Limitations*

Some of the limitations in this study include the low response rate and sample representativeness. It could have strengthened the research if a larger sample had responded. Although mailing out paper-surveys in addition to the online survey would have been cost prohibitive, other strategies could have been implemented to increase the response rate such as increasing the number of follow-up emails or offering some type of incentives. Sample representativeness may also have been an issue, given that grocery store personnel, especially those at small local stores, may have demanding schedules and limited access to computers during work day. However, whether such respondent self-selection resulted in an upward or downward bias in observed inclination for organic offerings is ambiguous. Another potential weakness of this study may be that the survey respondents included those who identified themselves as 'other personnel.' Although these employees might reflect the corporate culture and core values to some extent, they do not have as much influence in product selection and marketing. Because of these limitations, findings presented here may remain preliminary. Lastly,



the relationships identified in this study are correlations, and we were unable to isolate causal effect of retailer attitudes and knowledge.

### *Implications*

Grocery retailers can be a key player in framing consumers' food choices in local communities and can contribute to disparity of social benefits of healthy lifestyles, which may include the consumption of organic foods. There is limited literature on this topic, and more should be learned about retailers' roles in the market for organic foods. At least two important implications for research and policy can be drawn from our findings.

First, given that grocery store personnel's perceived barriers to offering organic foods and their perceptions of customer demand are strongly associated with availability, whether their perceptions of barriers and demand are accurate reflections of reality or whether their beliefs alone influence availability of organic options in their stores remains to be further investigated. Our findings claim that retail personnel's correct assessment of the market is the single most important stipulation in order for the organic consumers' needs to be met, and the grocery retail personnel may need to be better informed about their customers.

Second, our finding that lower concentration of grocery stores in the area is associated with less organic offerings regardless of the type of stores adds to the explanation as to why the problem of hunger frequently coincides with problems in nutrition and health. This, coupled with the strong significance of store types as determinants of organic availability, raises concerns of health disparity especially in the locales that are poorly served by supermarkets and quality grocery stores. Previous studies found that a neighborhood's demographic and socioeconomic composition is strongly associated with the types of food stores available locally (Moore and Diez Roux 2006; Powell et al. 2007). We add to this finding by showing that organic food availability also follows similar neighborhood-to-neighborhood inequality, and consumers in the areas where convenience stores or small grocery stores are the predominant food source face disadvantages in organic choices. Limited availability of organic foods at convenience stores and small grocers makes them an appropriate target for future policy interventions. The choices that store personnel make in those stores would be crucial in promoting the health and nutritional status of the community.

### **References**

- Aertsens, J., K. Mondelaers, and G. Van Huylenbroeck. 2009. "Differences in Retail Strategies on the Emerging Organic Market." *British Food Journal* 111(2): 138-154. doi:10.1108/00070700910931968.
- Baker, B. P., C. M. Benbrook, E. Groth III, and K. Lutz Benbrook. 2002. "Pesticide Residues in Conventional, Integrated Pest Management (IPM)-Grown, and Organic Foods: Insights from Three United States Data Sets." *Food Additives & Contaminants* 19(5): 427-446. doi:10.1080/02652030110113799.

- Batte, M. T., N. H. Hooker, T. C. Haab, and J. Beaverson. 2007. "Putting Their Money Where Their Mouths Are: Consumer Willingness to Pay for Multi-Ingredient, Processed Organic Food Products." *Food Policy* 32(2): 145-159. doi: 10.1016/j.foodpol.2006.05.003.
- Brown, C. 2003. "Consumers' Preferences for Locally Produced Food: A Study in Southeast Missouri." *American Journal of Alternative Agriculture* 18(4): 213-224. doi:10.1079/AJAA200353.
- Brown, C. and M. Sperow. 2005. "Examining the Cost of an All-Organic Diet." *Journal of Food Distribution Research* 36(1): 20-26.
- Crinnion, W. J. 2010. "Organic Foods Contain Higher Levels of Certain Nutrients, Lower Levels of Pesticides, and May Provide Health Benefits for the Consumer." *Alternative Medicine Review* 15(1): 4-12.
- Dahm, M. J., A. V. Samonte, and A. R. Shows. 2009. "Organic Foods: Do Eco-Friendly Attitudes Predict Eco-Friendly Behaviors?" *Journal of American College Health* 58(3): 195-202.
- Dangour, A. D., E. Allen, K. Lock, and R. Uauy. 2010. "Nutritional Composition and Health Benefits of Organic Foods: Using Systematic Reviews to Question the Available Evidence." *Indian Journal of Medical Research* 131: 478-480.
- Deller, S., A. Hoyt, B. Hueth, and R. Sundaram-Stukel. 2009. Research on the Economic Impact of Cooperatives. University of Wisconsin Center for Cooperatives: Madison, WI. [http://reic.uwcc.wisc.edu/sites/all/REIC\\_FINAL.pdf](http://reic.uwcc.wisc.edu/sites/all/REIC_FINAL.pdf).
- Dimitri, C. and C. Greene. 2002. "Recent Growth Patterns in the United States Organic Foods Market." *Agriculture Information Bulletin*, 777, U.S. Department of Agriculture, Economic Research Service, Washington, D.C.
- Durham, C. A., A. Johnson, and M. McFetridge. 2007. "Marketing-Management Impacts on Produce Sales." *Journal of Food Distribution Research* 38(2): 22-38.
- Gifford, K. and J. C. Bernard. 2008. "Factor and Cluster Analysis of Willingness to Pay for Organic and Non-GM Food." *Journal of Food Distribution Research* 39(2): 26-39.
- Gotschi, E., S. Vogel, T. Lindenthal, and M. Larcher. 2010. "The Role of Knowledge, Social Norms, and Attitudes Toward Organic Products and Shopping Behavior: Survey Results from High School Students in Vienna." *Journal of Environmental Education* 41(2): 88. doi: 10.1080/00958960903295225.
- Grace, C., T. Grace, N. Becker, and J. Lyden. 2007. "Barriers to Using Urban Farmers' Markets: An Investigation of Food Stamp Clients' Perceptions." *Journal of Hunger & Environmental Nutrition* 2(1): 55-75. doi:10.1080/19320240802080916.

- Hawkes, C. 2008. "Dietary Implications of Supermarket Development: A Global Perspective." *Development Policy Review* 26(6): 657-692. doi:10.1111/j.1467-7679.2008.00428.x.
- Hughner, R. S., P. McDonagh, A. Prothero, C. J. Shultz II., and J. Stanton. 2007. "Who Are Organic Food Consumers? A Compilation and Review of Why People Purchase Organic Food." *Journal of Consumer Behaviour* 6(2/3): 94-110. Doi: 10.1002/cb.210.
- Ireland, P. E. and C. L. Falk. 1990. "Organic Food Adoption Decisions by New Mexico Groceries." *Journal of Food Distribution Research* 21(3): 45-54.
- Jones, P., C. Clarke-Hill, P. Shears, and D. Hillier. 2001. "Retailing Organic Foods." *British Food Journal* 103(5): 358-365. doi:10.1108/00070700110396358.
- Krystallis, A. and G. Chryssohoidis. 2005. "Consumers' Willingness to Pay for Organic Food: Factors that Affect It and Variation per Organic Product Type." *British Food Journal* 107(5): 320-343. doi: 10.1108/00070700510596901.
- Lawrence, M. 2010. "Different Horizons: Food Miles and First Nations in the Minnesota North Country." *International Journal of Diversity in Organizations, Communities, and Nations* 9(6): 131-153.
- Li, J., L. Zepeda, and B. W. Gould. 2007. "The Demand for Organic Food in the United States: An Empirical Assessment." *Journal of Food Distribution Research* 38(3): 54-69.
- Macias, T. 2008. "Working Toward a Just, Equitable, and Local Food System: The Social Impact of Community-Based Agriculture." *Social Science Quarterly* 89(5): 1086-1101. doi:10.1111/j.1540-6237.2008.00566.x.
- Mondelaers, K., J. Aertsens, and G. Van Huylenbroeck. 2009. "A Meta-Analysis of the Differences in Environmental Impacts Between Organic and Conventional Farming." *British Food Journal* 111(10): 1098-1119. doi:10.1108/00070700910992925.
- Moore, L.V., and A.V. Diez Roux. 2006. "Associations of Neighborhood Characteristics with the Location and Type of Food Stores." *American Journal of Public Health* 96(2): 325-331. doi: 10.2105/AJPH.2004.058040.
- Ojha, R., S. Amanatidis, P. Petocz, and S. Samman. 2007. "Dietitians and Naturopaths Require Evidence-Based Nutrition Information on Organic Food." *Nutrition & Dietetics* 64(1): 31-36. doi: 10.1111/j.1747-0080.2007.00123.x.
- Onyango, B. M., W. K. Hallman, and A. C. Bellows. 2007. "Purchasing Organic Food in U.S. Food Systems: A Study of Attitudes and Practice." *British Food Journal* 109(5): 399-411. doi:10.1108/00070700710746803.
- Osteen, C., J. Gottlieb, and U. Vasavada (eds.). 2012. *Agricultural Resources and Environmental Indicators*. EIB-98, U.S. Department of Agriculture, Economic Research Service.

- Padel, S. and C. Foster. 2005. "Exploring the Gap Between Attitudes and Behaviour: Understanding Why Consumers Buy or Do Not Buy Organic Food." *British Food Journal* 107(8): 606-625. doi:10.1108/00070700510611002.
- Powell, L.M., S. Slater, D. Mirtcheva, Y. Bao, F.J. Chaloupka. 2007. "Food Store Availability and Neighborhood Characteristics in the United States." *Preventive Medicine* 44(3): 189-195. doi: 10.1016/j.ypmed.2006.08.008.
- Royston, P. 2004. "Multiple Imputation of Missing Values." *The Stata Journal* 4(3): 227-241.
- Rubin, D.B. 1987. *Multiple Imputation for Nonresponse in Surveys*. J. Wiley and Sons: New York.
- Shepherd, M., B. Pearce, W. Cormack, L. Philipps, S. Cuttle, A. Bhogal, P. Costigan, and R. Unwin. 2003. "An Assessment of the Environmental Impacts of Organic Farming." ADAS Report to the Department for Environment, Food and Rural Affairs, Contract No. OF0405. <http://www.defra.gov.uk/foodfarm/growing/organic/policy/research/pdf/env-impacts2.pdf>
- The Reinvestment Fund. 2011. *Understanding the Grocery Industry*. [http://www.cdfifund.gov/what\\_we\\_do/resources/Understanding%20Grocery%20Industry\\_for%20fund\\_102411.pdf](http://www.cdfifund.gov/what_we_do/resources/Understanding%20Grocery%20Industry_for%20fund_102411.pdf).
- Todd, J. E., L. Ephraim, and C. Penberthy. 2011. *Geographic Differences in the Relative Price of Healthy Foods*. EIB-78, U.S. Department of Agriculture, Economic Research Service.
- United States Department of Agriculture, Agricultural Marketing Service. 2008. *National Organic Program background information*. <http://www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELDEV3004443&acct=nopgeninfo>.
- United States Department of Agriculture, Agricultural Marketing Service. 2010. *National Organic Standards Board Policy and Procedures Manual*. <http://www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELDEV3013893>
- United States Department of Agriculture, Economic Research Service. 2003. *Measuring Rurality: New Definitions in 2003*. <http://www.ers.usda.gov/Briefing/Rurality/NewDefinitions/>.
- Ureña, F., R. Bernabéu, and M. Olmeda. 2008. "Women, Men and Organic Food: Differences in Their Attitudes and Willingness to Pay: A Spanish Case Study." *International Journal of Consumer Studies* 32: 18-26. doi: 10.1111/j.1470-6431.2007.00637.
- Wadsworth, L. A. and L. A. Coyle. 2007. "Organic Food Availability in Antigonish County, NS: Perspectives Along the Supply Chain." *Journal of Hunger & Environmental Nutrition* 2(1): 77-95. doi:10.1080/19320240802081013.

Webber, C. B. and J. S. Dollahite. 2008. "Attitudes and Behaviors of Low-Income Food Heads of Households Toward Sustainable Food Systems Concepts." *Journal of Hunger & Environmental Nutrition* 3(2/3): 186-205. doi:10.1080/19320240802243266.

Wilde, P. 2013. *Food Policy in the United States: An Introduction*. Routledge: New York.

Zepeda, L., H. S. Chang, and C. Leviten-Reid. 2006. "Organic Food Demand: A Focus Group Study Involving Caucasian and African-American Shoppers." *Agriculture & Human Values* 23(3): 385-394. doi:10.1007/s10460-006-9001-9.

## Appendix

**Table 4.** Determinants of Perceived Barriers, Attitudes, and Knowledge Regarding Organic Food Products

	Dependent Variables				
	Perceived barriers	Attitude about quality	Attitude about environmental impact	Attitude about customer demand	Knowledge
<i>Individual characteristics</i>					
<b>Job title:</b>					
Owner/chief officer	.199 (.201)	.169 (.189)	-.020 (.214)	.109 (.179)	-.205 (.193)
Manager/dept. manager (omitted)					
Marketing personnel	-.331 (.150)**	.032 (.123)	.042 (.149)	.037 (.131)	.111 (.145)
Buyer/procurement	.200 (.175)	.074 (.151)	.156 (.191)	-.159 (.157)	-.162 (.178)
Other personnel	-.215 (.175)	.305 (.173)*	.202 (.198)	.069 (.164)	.129 (.173)
<b>Gender:</b>					
Female	.156 (.139)	.282 (.160)*	.303 (.175)*	.348 (.137)**	-.016 (.143)
Male (omitted)					
<b>Age:</b>					
29-39	.011 (.187)	.442 (.220)**	.389 (.238)	-.250 (.177)	-.299 (.194)
40-49	-.109 (.130)	.177 (.127)	.114 (.145)	-.138 (.120)	-.008 (.129)
50-59 (omitted)					
60 and up	-.020 (.193)	.229 (.200)	.485 (.227)**	-.049 (.185)	.202 (.195)
<b>Race:</b>					
White (omitted)					
Non-white	.452 (.254)*	-.396 (.335)	-.295 (.342)	-.479 (.252)*	-.147 (.259)
<b>Education:</b>					
2-year college or less (omitted)					
4-year college degree	-.03 (.140)	.105 (.124)	-.104 (.152)	.147 (.130)	.242 (.141)*
Post-graduate degree	-.207 (.171)	.221 (.173)	-.022 (.198)	.185 (.160)	.512 (.170)***
<i>Store characteristics</i>					
<b>Type of store:</b>					
Large supermarket/super store (omitted)					
Small grocery store	.410 (.198)**	-.133 (.223)	-.579 (.236)**	.011 (.166)	-.101 (.198)
Natural/gourmet foods store	-.501 (.177)***	.598 (.238)**	.346 (.245)	.565 (.194)***	.298 (.187)
Convenience store	1.076 (.161)***	.227 (.122)*	-.337 (.137)**	-1.166 (.116)***	-.929 (.135)***

**Table 4. Continued**

	Dependent Variables				
	Perceived barriers	Attitude about quality	Attitude about environmental impact	Attitude about customer demand	Knowledge
<b>Ownership category:</b>					
Independently owned (omitted)					
State chain	.283 (.164)*	-.301 (.142)**	-.052 (.170)	.271 (.148)*	.102 (.163)
Regional or national chain	.191 (.150)	-.162 (.147)	.099 (.168)	.067 (.145)	-.385 (.150)**
<i>County characteristics</i>					
# Stores per 1,000 persons	-1.262 (.759)*	.250 (.749)	-.489 (.870)	1.287 (.735)*	-1.293 (.761)*
Percent white	-.006 (.005)	-.004 (.004)	.000 (.005)	-.006 (.004)	-.007 (.005)
Median income (in 1,000s)	-.031 (.009)***	-.002 (.007)	.000 (.009)	-.003 (.008)	.003 (.008)
Poverty rate	-.058 (.023)**	-.012 (.017)	.001 (.021)	-.023 (.020)	.006 (.022)
Metropolitan county <sup>A</sup>	-.135 (.178)	-.025 (.119)	.006 (.155)	.181 (.143)	.175 (.165)
Relative price of milk	.546 (.673)	-.664 (.520)	-.265 (.665)	-1.150 (.565)**	-1.605 (.641)**
# Direct sales farms	-.001 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	-.002 (.001)***
<b>Region:</b>					
Northeast	.182 (.198)	.182 (.145)	.081 (.192)	.163 (.175)	.501 (.197)**
Midwest (omitted)					
South	.041 (.213)	.207 (.168)	.196 (.204)	.076 (.187)	.335 (.206)
West	-.124 (.221)	.094 (.195)	.212 (.226)	.195 (.176)	.395 (.219)*
Constant	5.089(1.175)***	3.893 (.976)***	3.771(1.188)***	4.934(1.069)***	5.853(1.139)***
Adjusted R <sup>2</sup>	0.487	0.124	0.147	0.612	0.428
N	172	172	172	172	172

**Notes:** Weighted Least Squares regression coefficients are reported with standard errors in parentheses.

\*\*\* p<0.01, \*\* p<0.05, \*p<0.10

**Table A.** Determinants of Percent Type Organic (Full Regression Estimates)

	With No Controls	Individual Controls Only	Individual and Store Controls Only	Individual, Store, and County Controls
Perceived barriers	-11.5	-12.9 (2.4)***	-5.6 (2.2)**	-7.3 (2.4)***
Attitude about quality	-8.2 (2.9)***	-12.1 (3.0)***	-4.7 (3.1)	-5.0 (3.0)
Attitude about environmental	5.3 (3.0)*	6.8 (3.0)**	2.8 (2.9)	3.5 (2.9)
Attitude about customer	15.4 (2.9)***	16.2 (2.9)***	13.4 (2.9)***	11.1 (2.9)***
Knowledge	1.9 (2.7)	4.0 (2.8)	-2.0 (2.4)	-1.9 (2.6)
Job title: Owner/chief officer		-2.8 (6.5)	4.7 (5.1)	8.4 (5.4)
Job title: Manager (omitted)				
Job title: Marketing personnel		-6.3 (5.1)	2.2 (3.9)	-.2 (4.1)
Job title: Buyer/procurement		12.6 (5.9)**	10.0 (4.6)**	8.4 (5.2)
Job title: Other personnel		-1.1 (5.7)	3.7 (4.8)	5.8 (4.9)
Gender: Female		0.1 (4.8)	-2.9 (4.2)	-1.0 (4.2)
Age: 29-39		17.9 (6.5)***	16.5 (5.5)***	15.6 (5.7)***
Age: 40-49		3.5 (4.4)	2.0 (3.6)	3.8 (3.7)
Age: 50-59 (omitted)				
Age: 60 and up		-4.0 (6.5)	-4.3 (5.6)	-5.3 (5.7)
Race: Non-white		-12.8 (7.7)*	-18.5 (7.4)**	-13.9 (7.6)*
Education: 2-year college or				
Education: 4-year college		1.7 (4.2)	-2.6 (3.9)	-2.6 (4.1)
Education: Post-graduate		5.2 (5.5)	5.1 (5.0)	1.9 (5.0)
Store type: Large supermarket/super store				
Store type: Small grocery store			-10.2 (5.9)*	-7.5 (5.9)
Store type: Natural/gourmet			-1.0 (5.2)	-4.9 (5.5)
Store type: Convenience store			-44.7 (5.5)***	-43.9 (5.5)***
Ownership: Independently owned (omitted)				
Ownership: State chain			-2.9 (4.6)	-4.2 (4.7)
Ownership: Regional or			3.9 (4.4)	5.3 (4.5)
# Stores per 1,000 persons				-1.15 (21.98)
Percent white				-.03 (.13)
Median income (in 1,000s)				-.12 (.23)
Poverty rate				-.60 (.60)
Metropolitan county <sup>A</sup>				8.61 (4.58)*
Relative price of milk				-24.02 (17.87)
# Direct sales farms				.01 (.02)
Region: Northeast				9.37 (5.85)
Region: Midwest (omitted)				
Region: South				10.75 (5.95)*
Region: West				11.73 (6.21)*
Constant	37.8(14.9)**	6.25 (2.66)**	46.0 (13.4)***	80.6 (38.2)**
Adjusted R <sup>2</sup>	0.461	0.543	0.809	0.797
N	172	172	172	172



**Table B.** Determinants of Percent Products Organic (Full Regression Estimates)

	With No Controls	Individual Controls Only	Individual and Store Controls Only	Individual, Store, and County Controls
Perceived barriers	-1.8 (0.7)**	-2.5 (.8)***	-1.9 (.8)**	-1.2 (.9)
Attitude about quality	3.5 (1.0)***	3.8	2.2 (1.1)**	1.9 (1.0)*
Attitude about environmental	-1.9 (1.1)*	-2.2 (1.1)*	-1.1 (1.1)	-1.1 (1.0)
Attitude about customer demand	3.3 (.9)***	2.8 (1.0)***	3.3 (1.0)***	2.7 (1.0)***
Knowledge	.7 (.8)	1.4 (.9)	.4 (.9)	1.5 (.9)
Job title: Owner/chief officer		3.9 (1.9)	2.5 (1.8)	1.9 (2.1)
Job title: Manager (omitted)				
Job title: Marketing personnel		.3 (1.6)	2.2 (3.9)	.2 (1.6)
Job title: Buyer/procurement		2.2 (2.1)	.4 (1.5)	2.3 (1.9)
Job title: Other personnel		1.6 (1.9)	3.0 (1.8)	1.3 (1.9)
Gender: Female		2.6 (1.9)	1.6 (1.7)	1.0 (1.7)
Age: 29-39		.3 (2.6)	-.2 (2.2)	-.1 (2.1)
Age: 40-49		.3 (1.5)	-.3 (1.3)	-.5 (1.4)
Age: 50-59 (omitted)				
Age: 60 and up		-2.6 (2.2)	-2.8 (1.9)	-2.2 (2.0)
Race: Non-white		-.9 (3.3)	-1.6 (2.8)	-3.9 (2.9)
Education: 2-year college or less				
Education: 4-year college		-3.0 (1.4)**	-.5 (1.6)	-.6 (1.6)
Education: Post-graduate degree		-3.2 (1.9)*	.9 (1.9)	.6 (1.9)
Store type: Large supermarket/super				
Store type: Small grocery store			-3.6 (2.1)*	-5.9 (2.0)***
Store type: Natural/gourmet			18.4 (3.5)***	16.4 (3.2)***
Store type: Convenience store			1.1 (1.8)	.5 (2.1)
Ownership: Independently owned (omitted)				
Ownership: State chain			-5.7 (1.7)***	-6.5 (2.0)***
Ownership: Regional or national chain			-6.3 (1.6)***	-6.1 (1.7)***
# Stores per 1,000 persons				21.20 (8.95)**
Percent white				.08 (.05)
Median income (in 1,000s)				-.03 (.10)
Poverty rate				-.03 (.23)
Metropolitan county <sup>A</sup>				-1.45 (1.72)
Relative price of milk				13.67 (7.02)*
# Direct sales farms				.00 (.01)
Region: Northeast				-3.49 (2.20)
Region: Midwest (omitted)				
Region: South				-1.79 (2.25)
Region: West				4.84 (2.48)*
Constant	.8 (4.7)	2.9 (5.5)	7.0 (5.4)	-14.8 (14.4)
Adjusted R <sup>2</sup>	0.270	0.291	0.476	0.511
N	172	172	172	172