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

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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

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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).[1] Some of these surveys contained missing values, which were filled

[1] A χ^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

Individual Characteristics	%
Job title:	
Owner/chief officer	12.8
Manager/department manager	37.8
Marketing personnel	20.9
Buyer/procurement specialist	13.4
Other personnel	15.1
Gender:	
Female	23.8
Male	76.2
Age:	
29-39	12.8
40-49	39.0
50-59	38.4
60 and up	9.9
Race	
White	94.2
Non-white	5.8
Education:	
2-year college or less	32.0
4-year college degree	50.6
Post-graduate degree	17.4

Store Characteristics	%
Type of store:	
Large supermarket/super store	50.0
Small grocery store	11.6
Natural/gourmet foods store	20.3
Convenience store	18.0
Ownership category:	
Independently owned	26.7
State chain	18.0
Regional or national chain	55.2

County Characteristics	Mean	(SD)
Stores per 1,000 persons	0.2	(0.1)
Percent white	67.9	(19.2)
Median income (in 1,000s)	51.6	(12.8)
Poverty rate	14.8	(5.2)
Metropolitan county[A]	0.8	(0.4)
Relative price of milk	1.0	(0.1)
# Direct sales farms	105.1	(108.6)
Region:	%	
Northeast	25.0	
Midwest	31.4	
South	20.3	
West	23.3	

Dependent Variables	Mean	(SD)
Percent types organic	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. [A]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 directs 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

$$(1)\ \textit{Perceived Barrier}_{ijk} = \beta_0 + \boldsymbol{\beta_1 X_{ijk} + \beta_2 W_{jk} + \beta_3 Z_k} + \varepsilon_{ijk}$$

where *X*, *W*, *Z* are vectors of individual, store, and market characteristics, respectively, ε 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

$$(2)\ \textit{Availability}_{ijk} = \gamma_0 + \gamma_1 \textit{Perceived Barrier}_{ijk} + \boldsymbol{\gamma_2 Attitude_{ijk}} + \gamma_3\, \textit{Knowledge}_{ijk} + \boldsymbol{\alpha_1 X_{ijk} + \alpha_2 W_{jk} + \alpha_3 Z_k} + \omega_{ijk}$$

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 α 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
Perceived barriers	*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
Attitude about quality	*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
Attitude about environmental impact	*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
Attitude about customer demand	*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
Knowledge	*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[A]	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 [A], 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**
Perceived barriers	1.00				
Attitude about quality	-0.24**	1.00			
Attitude about environmental impact	-0.25***	0.72***	1.00		
Attitude about customer demand	-0.58***	0.46***	0.49***	1.00	
Knowledge	-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

	With No Controls	Individual Controls Only	Individual and Store Controls Only	Individual, Store, and County Controls
		Percent Type Organic		
Perceived barriers	-11.5 (2.4)***	-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 impact	5.3 (3.0)*	6.8 (3.0)**	2.8 (2.9)	3.5 (2.9)
Attitude about customer demand	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)
Constant	37.8(14.9)**	32.6 (15.3)**	46.0 (13.4)***	80.6 (38.2)**
Adjusted R^2	0.461	0.543	0.809	0.797
N	172	172	172	172
		Percent Products Organic		
Perceived barriers	-1.8 (0.7)**	-2.5 (0.8)***	-1.9 (0.8)**	-1.2 (0.9)
Attitude about quality	3.5 (1.0)***	3.8 (1.1)***	2.2 (1.1)**	1.9 (1.0)*
Attitude about environmental impact	-1.9 (1.1)*	-2.2 (1.1)*	-1.1 (1.1)	-1.1 (1.0)
Attitude about customer demand	3.3 (0.9)***	2.8 (1.0)***	3.3 (1.0)***	2.7 (1.0)***
Knowledge	.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^2	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^2 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^2 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.

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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**
Individual characteristics					
Job title:					
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)
Gender:					
Female	.156 (.139)	.282 (.160)*	.303 (.175)*	.348 (.137)**	-.016 (.143)
Male (omitted)					
Age:					
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)
Race:					
White (omitted)					
Non-white	.452 (.254)*	-.396 (.335)	-.295 (.342)	-.479 (.252)*	-.147 (.259)
Education:					
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)***
Store characteristics					
Type of store:					
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**
Ownership category:					
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)**
County characteristics					
# 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[A]	-.135 (.178)	-.025 (.119)	.006 (.155)	.181 (.143)	.17 5 (.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)***
Region:					
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^2	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[A]				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^2	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[A]				-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^2	0.270	0.291	0.476	0.511
N	172	172	172	172

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Consumer Confidence in the Food System, Media Coverage and Stock Prices for the Food Industry

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Abstract

Ongoing food safety incidents have generated a national interest in the significant costs that food recalls impose on stakeholders. This paper examines the impact of media coverage of food safety events on consumer confidence in food safety, and measures the response of stock prices of food companies to changes in consumer confidence. Results show that increases in media coverage have a negative impact on consumer confidence, and that decreases in the levels of consumer confidence regarding food safety have a negative impact on a stock price index for a basket of food companies. These findings suggest that financial performance of food companies is generally and negatively affected by food safety events, even though the event may be company and/or category-specific in nature.

Keywords: Food safety, media coverage, consumer confidence, stock prices.

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Introduction

As Fischler (2001) states, there is a real paradox in advanced societies because while their consumers have today the highest levels of security when they buy food, their fear about what they eat has never been so important. Historically, the U.S. food supply has been considered among the safest in the world, however a series of recent outbreaks and food recalls has eroded consumer trust, and underscore important challenges faced by food industry and government authorities. Some of the most serious incidents, such as the tomato/jalapeno peppers and the peanut butter salmonella outbreaks in 2009, were linked to illness and deaths. Due to their severity and frequency, these events were covered extensively by national media and raised concerns among consumers, industry leaders and policy makers. Previous studies have found evidence of changes in public opinion triggered by the media's focus on particular issues (Jarrell and Peltzman 1985; Hoffer, Pruitt, and Reilly 1988; Bromiley and Marcus 1989; Pruitt and Peterson 1986; Thomsen and McKenzie 2001; Salin and Hooker 2001). Because most consumers acquire their information about food safety issues from mass media, they are also more likely to be influenced by news stories.

Besides the obvious negative impacts of food safety incidents on public health, these events also have financial consequences for implicated firms as well as peripheral effects on the entire food industry. This is not a trivial issue given that the U.S. food industry contributes about 20 percent to U.S. Gross National Product, employs about 14 million individuals, and provides an additional four million jobs in related industries (CFSAN 2010).

Changes in stock prices are associated with the announcement of an economic event. If the event is positive (negative) news about firms, stock prices will increase (decrease), so stock prices reflect the new available information in the market, which is referred to as the efficient market hypothesis (EMH) - for a review of the efficient market hypothesis see chapter 11 of Bodie, Kane, and Marcus (2008). However, the linkages between consumer confidence and the performance of capital markets are a recurrent topic in the finance literature. In this context, it is important to be aware of the so-called herd mentality which occurs during periods of marketing turbulence in which investors become influenced by the crowd's emotional state, which causes them to react and decide irrationally in buying or selling stocks. More specifically, often investors tend to "flock together" and make decisions based on what the rest of the crowd is doing. Sometimes the media tends to perpetuate this style of investing, where sensational headlines often exaggerate the reality of the current market conditions. This investment behavior can cause over-reactions in the markets, in where pieces of good or bad news can cause investors to become overly optimistic or pessimistic, respectively (For a general review of the herding literature, see Devenow and Welch, 1996. Also, for a good discussion on popular theories explaining why institutional investors might trade together, see Wermer 1999).

Even though the literature regarding events that affect stock prices is extensive, we are not aware of a study that empirically assesses how changes in consumer confidence in food safety and media coverage of food safety/defense events affect a stock price index for a basket of food companies. The purpose of this study is to first measure the media "agenda-setting" effect associated with food safety events on consumer confidence in the safety of the food system. Following estimation of media effects on consumer confidence, two different components

affecting consumer confidence in food safety are estimated. The first component measures the "agenda-setting" effect on consumer confidence, and the other component measures unexplained factors that affect consumer confidence. Finally, dynamic OLS (DOLS) is used to estimate the effects of changes in these confidence measures on stock price indices for selected food companies. Our results show clearly that increases in media coverage of food safety events do indeed erode consumer confidence in the safety of food system. We also find a positive, although limited, relationship between consumer confidence in food safety and a stock price index for a basket of food companies.

The remainder of the paper is organized as follows: Sections two and three discuss previous literature on linkages between media coverage, consumer confidence and stock prices and presents the methodology used to construct the stock indices and the theoretical framework. Section four presents the econometric procedures. Sections five and six discuss the empirical results and conclusions respectively.

Literature Review and Theoretical Framework

For the construction of the theoretical framework of this study, concepts from mass communication and finance literature are utilized. In the examination of the relationship between mass media coverage and consumer confidence, it is necessary to understand the role information plays in altering consumers' beliefs, attitudes and choices (Ajzen and Fishbein 1980). According to the "agenda-setting" effect literature, mass media can influence the way people think about certain issues by the media's choice of what stories to consider newsworthy and how much prominence and space are given to them (McCombs and Shaw 1972; Thompson 1995). In addition, the agenda-setting effect will depend on an issue's "obtrusiveness" – that is, the degree to which an individual has direct personal experience and/or knowledge about an issue. The less direct experience and/or knowledge an individual has about a particular issue, the more likely the individual will rely on media for information. Consequently, it is more likely that the individual will be influenced by the agenda-setting effect (Zucker 1978). Because only a small share of the U.S. population is directly involved in food production and food safety protocols, these issues are believed to be relatively unobtrusive. Hence, consumers are expected to acquire most of their information and knowledge about food safety incidents from the news media. Anecdotal evidence suggest that there is a tendency of the news mass media to report negative news stories, which are more likely to capture an audience's attention. Finally, previous research has shown that highly publicized food safety incidents affect consumer perceptions, leading to changes in food purchasing patterns (Buzby 2001).Based on these premises, this study presents the following hypothesis:

> ***Hypothesis 1:*** *Increased media coverage of food safety and defense events will have a negative effect on consumer confidence in food safety.*

Food safety incidents can pose high financial costs to industries and their shareholders. This is because costs associated with food recalls or food safety incidents are borne by the implicated company and the costs represent unanticipated effects on corporate earnings. In particular, the firms will incur direct costs that include lost sales, money spent on advertising to compensate for reputation damage, plant closures and clean-up, and expenses related to recovering, disposing of, or reconditioning contaminated products already placed on the market. Other costs will arise

from the potential loss of future sales associated with a decline in long term consumer confidence. Bad publicity resulting from these events can lead to long term reductions in product demand, and may erode prior investments in reputation and brand equity for the implicated firms. This is a result of highly publicized food recalls that lead to lasting changes in consumers' perceptions about food safety and their food purchasing patterns. Moreover, litigation associated with product liability can also increase costs substantially, especially when there are numerous illnesses and deaths associated with the incident. At the international level, implicated multinational firms are likely to see their exports reduced or banned due to food safety concerns by the importing countries. In summary, all these costs will have negative impacts on the profitability of the affected firms, and investors may anticipate reductions in future dividends to be paid to the shareholders and fear potential negative spillovers across other food firms. Thus, more concerned consumers lead to losses in brand equity and sales, increased costs and greater financial risks, which will reduce the financial returns of those who invested in those firms. The relationship between higher profitability and higher stocks prices has been widely investigated by the finance literature, and many studies have shown that there are some easily observed variables that predict market returns. Fama and French (1988) show that returns on the aggregate stock market are likely to be higher given a high dividend/price ratio. In another study, Campbell and Shiller (1988) find that earnings yield can predict market returns, while Kein and Stambaugh (1986) find that the spread between yields of high grade and low grade corporate bonds help predicts market returns. Yet these results are not to invalidate the EMH, these results show that is not the predictability of risk-adjusted abnormal returns that predicts market returns, but the predictability of the risk premium (Bodie, Kane, and Marcus 2008). Fama and French (1993) used a 3-factor CAPM and find that stocks with higher betas on firm size or book to market ratios have higher average returns and suggest that these are risk premiums associated with each of these factors which may be proxies for other important determinants of risk. In the context of this study, it may be that consumer confidence is associated with some level of risk premium; therefore, we presume that consumer confidence about food products has some effect on firms' stock prices due to the connection between consumer confidence and firms' profitability.

Hypothesis 2: *Positive changes in consumer confidence in the safety of the food system have a positive effect on a stock price index for a basket of food companies.*

There are also a growing number of empirical studies that have investigated the stock market's reaction to product recall announcements for several industries. According to Jarrell and Peltzman (1985), negative abnormal returns associated with recalls can act as a deterrent to a manager knowingly producing substandard products. This is particularly important for the food industry given the direct linkages between food products and public health. Earlier studies have looked at the automobile sector and analyzed the impact of automotive recalls on producers' stock returns. Jarrell and Peltzman (1985) find evidence that automotive recalls are associated with significant and negative abnormal stock returns, while other studies have found statistically insignificant or modest negative returns that proved to be too small to be a sufficient deterrent (Bromiley and Marcus 1989; Hoffer, Pruitt and Reilly 1988). In a seminal study Pruitt and Peterson (1986) examined nonautomotive recalls, and identified significant negative abnormal returns associated with recall announcements. Other empirical studies have evaluated the reaction of the stock market to food products recalls. In terms of sales responses to recalls, Thomsen, Shiptsova and Hamm (2006) found that sales of frankfurter brands declined following

a recall for a food-borne pathogen (*Listeria mnocytogenes*). The same study showed that sales approached the prerecall levels four to five months later. Other studies find significant shareholder losses and increases in volatility when a food company is implicated in a recall involving serious food safety hazards (Thomsem and McKenzie 2001; Salin and Hooker 2001), while others show only a limited impact (Wang et al. 2002). Using the event study approach, McKenzie, Thomsen and Dixon (2004) analyzed the negative reaction of agricultural commodity prices to market-related events.

The finance literature has also explored the time-series relationships between economic news, consumer sentiment, and stock markets with mixed results (Jansen and Nahuis 2003; Lemmon and Portniaguina 2006). Other empirical studies find evidence of stock prices responding to the economic news stories and their content (Pearce and Roley 1985; Dasgupta et al. 2006; Tetlock 2007). Finally Orlitzky, Schmidt and Rynes (2003) conducted a meta-analysis, based on thirty years of research, and concluded that reputation appears to be an important mediator of the relationship between social and financial performance.

The present study differs from past research by examining simultaneously the impact of national and local media coverage of food safety and defense events on consumer confidence in food safety, and the change in stock prices for basket of food companies due to changes in consumer confidence. Finally, the variables accounting for consumer confidence and media coverage are two novel indices that, by design, are national in scope. Because these indices capture the overall consumer sentiment relatively to the safety of the food system, and the national media coverage of any food safety event, this study aggregates stock prices of the overall food industry in a single index rather than analyzing only company-specific events.

Continuous Food Safety Tracking Index (Consumer. Confidence)

To measure the consumer confidence in food safety in the United States, the present study used a continuous food safety tracking index (Consumer.Confidence) developed by the authors in a previous study (Kinsey et al. 2009). This index is constructed based on information from a consumer survey administered by The Food Industry Center with the funding from the National Center for Food Protection and Defense, a Homeland Security Center of Excellence. The survey design follows the same methodology used in computation of the Consumer Sentiment Index from the University of Michigan (Curtain 1973). The two primary components of the Consumer Sentiment index tracks how consumers feel about the general economy and their position in it. One component measures consumers' perception of their current states of well-being and the other component measures their opinions about the future of the economy and their own well-being. In this study, our index focuses on the consumer's confidence in the safety of the U.S. food system, and the surveys asked questions about consumers' attitudes towards food safety and food defense, where food safety was defined as an event (e.g., a food recall) associated with the accidental contamination of a food and food defense defined as an event associated with the deliberate contamination of a food (e.g., a food terrorist event). A six-point Likert scale was used to indicate the strength of positive or negative attitudes for each question used to construct the index. After some debate, the researchers decided to use all six possible responses in the analysis, which resulted in each data point registering the strength of, and change in, consumers' concern for each question. Furthermore, the Consumer.Confidence survey was administered via

the Internet with respondents selected from Taylor Nelson Sofres' (TNS) national on-line panel of more than two million U. S. consumers. Respondents were contacted by TNS and invited to visit a website to complete a survey. In return for their participation, panelists receive points which accumulate and can later be redeemed for prizes. Overall, the sample was selected so that it comprised a nationally representative cross-section of consumers by geographic region, income, market size, household size, and age of respondents. Emails were sent to 175 different primary grocery shoppers each week, 80 percent of which were women. Therefore, this sample over-represents women and in the first 40 weeks is skewed towards an older population with a mean age of 52.6. With the exception of more women, the sample became fully representative over time, and the results of this paper represent the first 87 weeks of data collection.

Results from factor analysis separated attitudinal questions from the previously discussed Consumer.Confidence survey into a set of questions that indicated the respondent's attitude toward food safety and food defense. The questions measures respondents' current level of concern about food safety, or inversely their confidence in the safety of our food. The Consumer.Confidence index is calculated using the following formula:

$$(1) \quad Consumer.Confidence_t = \frac{\sum_{i=1,2}(F_{it} - U_{it} + 100)}{Base} \times 100,$$

where the subscript t denotes the week of the survey and the subscript i denotes one of two questions from the survey used to measure the respondents' confidence in the safety of the food system. F_{it} is the percentage of respondents checking the favorable three boxes for question i during week t, and U_{it} is the percentage of respondents checking the unfavorable three boxes for question i during week t. The selected "*Base*" is the average of the numerator over the first five weeks of the study, which was consider a relatively calm period without any major event. The index is constructed so that larger values imply higher "confidence" in food safety, and an index value of 100 indicates that consumer confidence is equal to the level of confidence over the first five weeks of the study period.

Media Tracking Index (Media.Tracking)

A food safety media tracking index was constructed during the same period as the Consumer.Confidence. The previously cited studies pertaining to media's effect on consumer attitudes measured media exposure based on article counts for specific food safety events from selected newspapers and/or television news programs. A shortcoming of this approach is that the "reach" of media intensity is not fully reflected by article counts from these media outlets. For instance, some media sources reach a larger audience than other sources and some people rely more heavily on television than newspapers or radio for information. Moreover, the amount of media exposure attributed to each media source varies by media type and the nature of a particular event. This study addresses these shortcomings by constructing a media index that incorporates the Consumer.Confidence respondent's use of selected media types and by normalizing article/transcript counts across media types. Media types are normalized using the following formula:

$$(2) \quad Z_{kt} = \frac{x_{kt} - Min(x_k)}{Max(x_k) - Min(x_k)},$$

where Z_{kt} is the standardized score for media source *k* during week *t*, x_{kt} is the article/ transcript count for media source *k* during week *t*, and $Min(x_k)$ and $Max(x_k)$ are the minimum and maximum counts for the *kth* media source over the sample period (Arundel and Hollanders 2002). The x's represent article or television transcript counts of news stories containing at least one of the following keywords: *food safety*, *food defense*, *food terrorism*, *agricultural terrorism* or *agriterrorism*, *food poisoning*, *food contamination*, *food-borne illnesses*, *food-borne diseases*, and *food recall*. Five media sources included in the keyword searches were: (1)*national and local newspapers; (2) network and cable TV; (3) radio; (4) news magazines*; and (5) *the internet*.

The second step in constructing the media tracking index involves aggregating standardized scores (Z_{kt}) for all five media sources using the following formula:

$$(3)\quad \text{Media.Tracking}_t = \sum_{k=1}^{5} w_k Z_{kt},$$

where Media.Tracking_t is the media tracking index value for week *t* and w_k is the weight assigned to the *kth* media source where $\sum_{j=1}^{5} w_k = 1$ and $0 \leq w_k \leq 1$. The weights for each media source were used to estimate the reach of the selected news sources and were estimated using data from the previously described Consumer.Confidence survey. Each subject from the survey was asked to indicate which of the selected media outlets they considered their primary source of news. Frequency counts for each category across all respondents were calculated for each week during the survey. The frequency counts were then averaged across all 87 weeks in the survey and these values were used as estimates for the w_k*'s* in the media tracking index. The responses revealed the following distribution of media outlets considered primary source of news; (1) television (56%); (2) internet (28%); newspapers (15%); magazines (0.6%); and radio (0.4%).

For a more intuitive interpretation of these two indices, Figure 1 shows the evolution of both indices (Media.Tracking and Consumer.Confidence) throughout the entire period of analysis. The figure also highlights major food safety events that took place during these 87 weeks. More specifically, the period of analysis begins on May 5 – May 11 of 2008 and ends on

Dec 8 – Jan 3 of 2010. A simple look at the Media.Tracking confirms the effectiveness of this index in capturing media coverage in the sense that the spikes registered coincide with the major food safety events. Furthermore, the graph also reveals that, in most cases, increases in the Media.Tracking are followed by decreases in Consumer.Confidence. In other words, higher media coverage of food safety events seems to erode the consumer confidence in food safety.

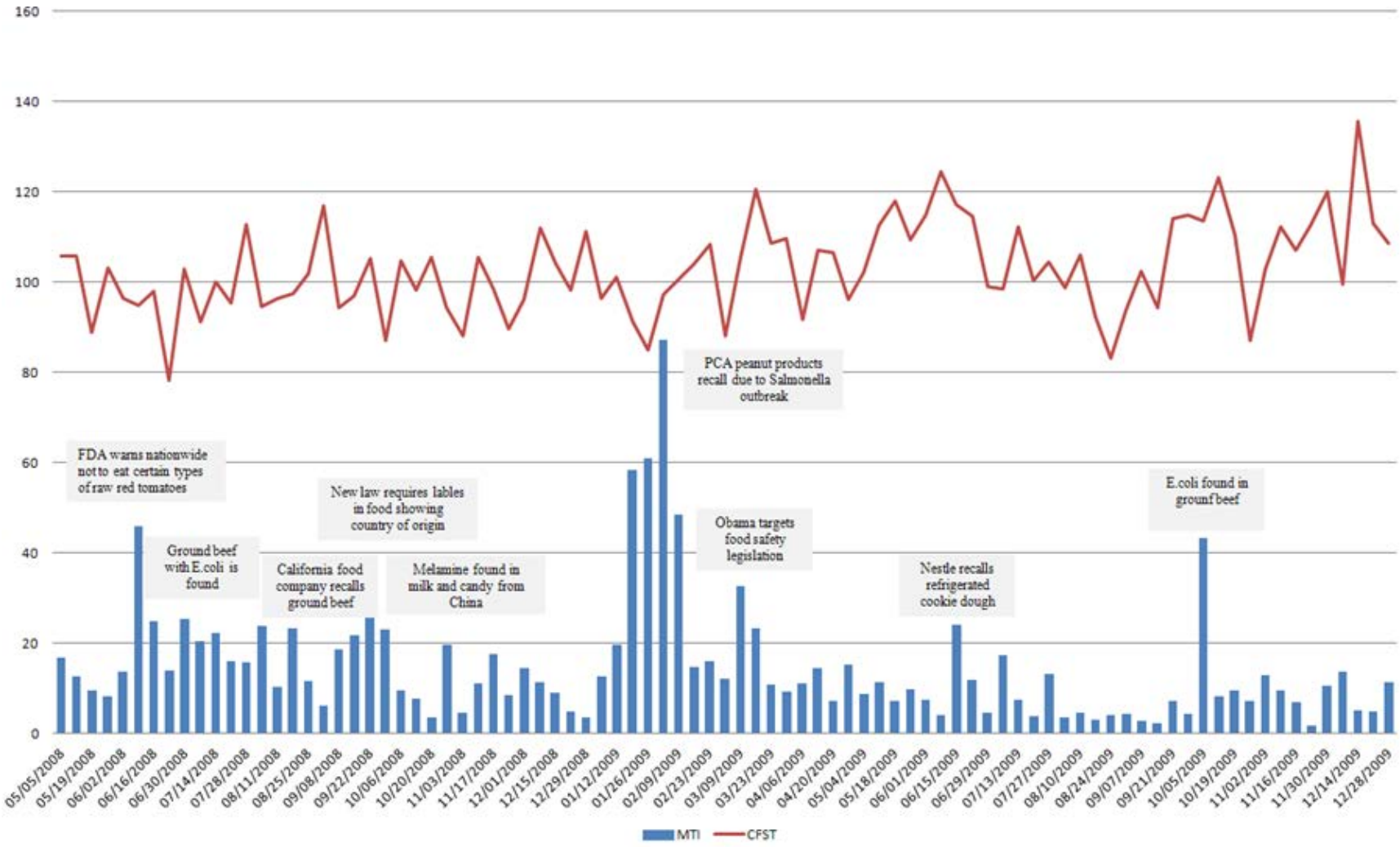

Figure 1. Media.Tracking, Consumer.Confidence and major food safety events (05/05/2008 to 01/03/2010).

Food Industry Stock Price Index (Food.Stock.Price)

The most widely followed stock market indices in the U.S. are the Standard and Poor's (S&P500) and the Dow Jones Industrial Average (DOW). Stock price indices are also commonly used to summarize the historical performance of particular economic sectors. For the present analysis a market-capitalization weighted stock price index for selected U.S. food and beverage companies is constructed by replicating the methodology used in the S&P500. The construction of this index involves two steps. First, following the Industry Classification Benchmark (ICB) definitions of food and beverage producers used by the NYSE, 39 firms are initially selected. Based on data availability at The Center for Research in Security Price's Daily Stock Price dataset, only 31 of the initial 39 firms were included in the Food Industry Stock Price Index (Food.Stock.Price). As shown in Table 1, the index is comprised of 29 food companies and 2 beverage companies (For a complete list of the selected companies see Appendix one).

Table 1. Selected Constituents of Food Companies Stock Index

Industry	Supersector	Sector	Subsector	Number of Companies Selected
Consumer Goods	Food & Beverage	Food Producers	Soft Drinks	29
Consumer Goods	Food & Beverage	Beverages	Food Products	2

The second step consists of calculating and summing the market value of all index constituents. That is, a firm's security price is multiplied by the number of outstanding shares. Next, the final value of the Food.Stock.Price is calculated by dividing the total sum of all firms' market value by a *Divisor*. These operations are expressed by the following formula:

$$(4)\quad \text{Food.Stock.Price}_{it} = \frac{\sum_{i=1}^{n} P_{it} S_{it}}{Divisor},$$

where P_{it} is the closing stock price of firm *i* on day *t*, and S_{it} is the number of outstanding shares of firm *i* on day *t*. All the data for individual firms were obtained from Compustat database, and the selected value of the *Divisor* is the sum of all market values registered in the first day of the sample period. This method takes into account the size of each firm in the index and weights each security accordingly. The $\text{Food.Stock.Price}_{it}$ is initially calculated daily (i.e., the t subscript denotes daily values) and then averaged over the same weekly periods used in the Consumer.Confidence and Media.Tracking indices. The subscript *s* will denote weekly values of the Food.Stock.Price, Consumer.Confidence, and Media.Tracking indices in all subsequent sections of the paper.

Previous literature has shown that market reaction may differ with firm-level characteristics. The most frequently investigated firm characteristic is the size of the company (van Beurden and Goessling, 2008), and Salin and Hooker (2001) confirmed that stock prices react differently to food safety incidents depending on the size of the affected firm. To explore these differences, three additional indices are computed based on the size of the firms in the index. A firm is categorized as large if it is a component of the S&P 500 index (Food.Stock.Price.500), medium

if it is a component of the S&P 1500 index but not of the S&P 500 index (Food.Stock.Price.1500), and small otherwise (Food.Stock.Price.Small). It is important to point out that dividend payments are not included in the index, thus these issues should be regarded as a measure of price appreciation rather than of true investment return. It is reasonable to leave the dividends out of the index because of their constant and predictable nature. Consequently, any changes in the index will account strictly for changes in the stock prices. Finally, the period of analysis descriptive statistics of all variables are shown in Table 2.

Table 2. Descriptive Statistics of All Variables

Variable	Number of observations	Mean	Standard Deviation	Minimum	Maximum
Media.Tracking	87	15.03	13.97	1.68	87.34
Consumer.Confident	87	103.05	10.23	78.37	135.64
Food.Stock.Price	87	83.42	8.87	66.36	99.22
Food.Stock.Price.500	87	84.28	8.34	67.18	98.87
Food.Stock.Price.1500	87	85.70	11.64	62.65	105.25
Food.Stock.Price.Small	87	63.46	17.41	36.57	100.52
S&P500	87	1028.57	184.16	695.19	1412.84

Econometric Methods

To undertake the empirical analysis, the time series properties of all variables need to be examined first. A visual inspection to their individual plots suggests that some variables may be trending, and may not be stationary. An examination of autocorrelation functions (ACF) and the partial autocorrelation functions (PACF) was also carried out to provide further evidence that some series may not be stationary in levels and may contain unit roots. That is, their variances and covariances are not finite or independent over time. As econometric theory suggest, when variables are nonstationary the standard ordinary least squares (OLS) model cannot be applied and there might be a spurious regression[1] (Granger and Newbold, 1974). The stationarity is also investigated by conducting the Augmented Dickey-Fuller test (ADF), the Phillips and Perron (1988) (PP), the Kwiatkowski et al. (1992) (KPSS), and the modified Dickey-Fuller (DFGLS) unit root tests.

The first regression analysis proposed in equation (5) is a simple OLS that estimates both the coefficient of the media impact on consumer confidence and the error term. The model is specified as follows:

$$(5)\quad \text{Consumer.Confidence}_t = \theta + \sum_{i=0}^{n} \pi_i \, Media.Tracking_{t-i} + \varepsilon_t,$$

[1] Spurious regressions are normally characterized by having a high R^2 and statistically significant t-statistics; however, their results have no economic meaning

where Consumer.Confidence$_s$ is the computed weekly index value for consumer confidence in food safety. The lagged values for the weekly values of Media.Tracking are included in the right hand side of equation (5) to account for possible lagged effects of media coverage on the weekly index of consumer confidence. The estimated value of π_1 represents the component of consumer confidence influenced by media (Media.Consumer.Confidence), while the estimated error term represents the component of consumer confidence explained by other factors (Other.Consumer.Confidence). That is, Other.Consumer.Confidence represents factors that affect the variation of Consumer.Confidence, but not explained by the media index. These factors may include differences in demographic characteristics of survey respondents, as well as, variations in individual core beliefs and behavioral characteristics of respondents, and of course, random error.

In a second regression, the DOLS method developed by Saikkonen (1991) and Stock and Watson (1993) is used to estimate the impact of the Consumer.Confidence, Media.Consumer.Confidence and Other.Consumer.Confidence variables on the four different stock price indices. This modeling procedure is selected for several reasons. First, evidence from Monte Carlo simulations shows that DOLS estimators are superior to a number of alternative estimators of long-run parameters, including those proposed by Engle and Granger (1987), Johansen (1988) and Phillips and Hansen (1990). In addition, DOLS allows for estimation of parameters for variables that exhibit different orders of integration, and allows for possible simultaneity bias among the regressors. The model also guarantees valid estimates even in the presence of endogenous independent variables. Finally, DOLS is asymptotically equivalent to Johansen's maximum likelihood estimator, but it tends to perform well with small samples. The DOLS procedure allows for regressing any $I(1)$ variable on other $I(1)$ variables, or on $I(0)$ variables and on the leads and lags of the first differences of any $I(1)$ variables. The final equation of DOLS model is presented in the following section of the paper, and its final specification is based on results from unit root tests for each series.

Results

The results from unit root tests indicate that Media.Tracking, Consumer.Confidence, Media.Consumer.Confidence and Other.Consumer.Confidence variables are stationary variables, while all the stock price indices are integrated of order one[2]. Since Media.Tracking and Consumer.Confidence are both stationary series, we use OLS with robust standard errors to test the effect of media coverage on consumer confidence. Based on the results from the Akaike's information criterion (AIC), the Schwarz's Bayesian criterion (SBIC), and the Hannan and Quinn information criterion (HQIC), up to two week lags for Media.Tracking are included in the estimation to account for dynamic effects of media coverage on Consumer.Confidence. The results in table 3 confirm hypothesis 1 and show how increases in media coverage on food safety recalls have a negative and significant contemporaneous effect on consumer confidence. However, lagged effects do not appear to improve the overall predictive power of the model, reduce the statistical significant to 10 percent, and do not lead to any notable changes in the results. Therefore, and in order to preserve degrees of freedom, subsequent use of the OLS models is confined to the model without lags. According to the results in Table 3, an increase in

[2] All unit root tests were conducted with and without a time trend term, and with different lags structure. However, no qualitative differences were found

the Media.Tracking value of two standard deviations above the mean (an increase of 27.94 points) causes consumer confidence to decrease by 4.6 points. This decrease is non-trivial in the sense that represents a 4.5 percent decrease relative to the mean value of the Consumer.Confidence index.

Table 3. OLS regression of consumer confidence on media coverage.

	Dependent Variables		
Independent Variables	Consumer. Confidence$_t$	Consumer. Confidence$_t$	Consumer. Confidence$_t$
Media.Tracking$_t$	-0.163**	-0.163*	-0.162*
	(0.065)	(0.094)	(0.095)
Media.Tracking$_{t-1}$	-	0.000	0.011
		(0.096)	(0.126)
Media.Tracking$_{t-2}$	-	-	-0.020
			(0.099)
N	87	86	85
R^2	0.049	0.050	0.050

Note: Robust standard errors of estimated coefficients in parenthesis. Asterisks indicate significance at the 10 percent (*), 5 percent (**), and 1 percent (***) level respectively. Values in parenthesis are p-values.

In order to test hypothesis 2, DOLS is now used to estimate the linkage between consumers' confidence in the safety of the food system (i.e. Consumer.Confidence) and stock price indices. First, and as shown in equation (6), all stock price indices are regressed on Consumer.Confidence and the S&P500. The second model (equation 7) uses predicted values of Media.Consumer.Confidence and Other.Consumer.Confidence and error estimates in the first OLS model (equation 5), and the S&P500 as explanatory variables in the stock price model. The DOLS models are as follows:

$$\text{Food.Stock.Price}_{it} = \beta_0 + \beta_1\text{Consumer.Confidence}_t + \beta_2\text{SP500}_t + \sum_{k=-n}^{k=n}\beta_3\Delta SP500_{t-k} + \omega_t \quad (6)$$

$$\text{Food.Stock.Price}_{it} = \alpha_0 + \alpha_1\text{Media.Consumer.Confidence}_t + \alpha_2\text{Other.Consumer.Confidence}_t + \alpha_3\text{SP500}_t + \sum_{k=-n}^{k=n}\alpha_4\Delta SP500_{t-k} + \xi_t, \quad (7)$$

where β_1, β_2, α_1, α_2 and α_3 represent the long-run linkages (in time series terms), β_3 and α_4 are coefficients of weekly leads (n) and lags (-n) of the first differences of the $I(1)$ regressors, and are treated as nuisance parameters to adjust for possible endogeneity, autocorrelation, and nonnormal residuals. Given the theory of efficient markets, all currently available information should be quickly reflected in stock prices, the DOLS regressions are modeled with one order leads and lags. Finally, both equations (6) and (7) are estimated with the Food.Stock.Price, F

Food.Stock.Price.500, Food.Stock.Price.1500, and Food.Stock.Price.Small as dependent variables in order to account for different firm sizes.

Table 4 shows the results from the estimation of equation 6. Overall market performance has a very significant and positive effect on the stock prices of the basket of food firms – regardless of the firm sizes. For example, in model I, an increase of one unit in the S&P500 index increases the FSP by 0.047 units. Moreover, an increase of one standard deviation in the market value of the S&P500 relative to its mean, which is an 18% increase, increases the market value of the portfolio of the firms included in the FSP index in model I by 0.85%. In model II, given the same increase in the market value of the S&P500, the market value of the portfolio of firms included in the FSP500 increases by 0.77%. In model III, given the same increase in the market value of the S&P500, the market value of the portfolio of firms included in the FSP1500 increases by 1.00%. And, in model IV, given the same increase in the market value of the S&P500, the market value of the portfolio of firms included in the FSP1500 increases by 1.66%. Thus, the coefficient on the S&P500 suggests that the portfolios of food firms are sensitive to the changes in the proxy for the macroeconomic factor.

On the other hand, changes in consumer confidence in food safety has a positive and significant effect on stock prices for all firm sizes with the exception of smaller firms. Interestingly, the significance is of five percent for the general index (Food.Stock.Price), increases to one percent in the case of the largest food firms (Food.Stock.Price.500), and decreases to 10 percent with the medium sized firms (Food.Stock.Price.1500).

Table 4. DOLS regression of stock price indices on consumer-investor confidence.

	Dependent Variables			
Independent Variables	(I) Food.Stock. $Price_t$	(II) Food.Stock. $Price500_t$	(III) Food.Stock. $Price.1500_t$	(IV) Food.Stock. $Price.Small_t$
$S\&P500_t$	0.047***	0.043***	0.060***	0.092***
	(0.001)	(0.002)	(0.003)	(0.004)
$Consumer.Confidence_t$	0.058**	0.101***	0.090*	0.078
	(0.026)	(0.036)	(0.053)	(0.062)
N	84	84	84	84
R^2	0.92	0.85	0.84	0.88

Note: Robust standard errors of estimated coefficients in parenthesis. Asterisks indicate significance at the 10 percent (*), 5 percent (**), and 1 percent (***) level respectively. Values in parenthesis are p-values.

These results merit a more detailed discussion, especially in terms of their magnitude. Given the results in Table 4, for model I a decrease in Consumer.Confidence of two standard deviations below the mean (a decrease of 20.46 points) causes a decrease of 1.19 points in the Food.Stock.Price general index. For model II, the same decrease in Consumer.Confidence causes a decrease of 2.07 points (a larger negative effect) in the Food.Stock.Price500 index. This decrease is economically more significant and represents 2.4 percent decrease in the stock price relative to the mean value of the stock price index for large firms. For model III, the decrease in Consumer.Confidence causes a decrease of 1.84 in the Food.Stock.Price1500 index. This

increase is also economically significant and represents 2.2 percent decrease in stock price relative to the mean value of the stock price index for small firms. Thus, reductions in consumer confidence have negative effects on the profitability of food companies of various sizes. Finally, between 84 and 92 of the total variance is explained by the proposed models. In summary, these results lend support to hypothesis 2, which states that there is a positive relationship between how consumers feel about the safety of the food system and the stock price indices comprised of food companies.

The next step involves decomposing the Consumer.Confidence into explained and unexplained by the media components and the estimation of the DOLS model in equation 7. The results in Table 5 show that the component of consumer-investor confidence not influenced by media has a positive and significant impact on overall and larger food companies' stock prices (Food.Stock.Price and Food.Stock.Price.500) at the five percent level. Furthermore, the component of consumer confidence that is shaped by media coverage has a positive and significant effect only for the Food.Stock.Price.500 at the 10 percent level. Once again, the overall market conditions have a very significant and positive effect in the stock prices of all four baskets of food companies and the between 79 and 84 percent of the variance is explained by the different models.

Table 5. DOLS regression stock price indices on media component of consumer-investor confidence and on the other factors affecting consumer-investor confidence.

	Dependent Variables			
Independent Variables	(I) Food.Stock. Price$_t$	(II) Food.Stock. Price.500$_t$	(III) Food.Stock. Price.1500$_t$	(IV) Food.Stock. Price.Small$_t$
S&P500$_t$	0.047***	0.042***	0.059***	0.092***
	(0.001)	(0.002)	(0.003)	(0.005)
Media.Consumer.Confidence$_t$	0.101	0.241*	0.220	0.085
	(0.090)	(0.124)	(0.205)	(0.065)
Other.Consumer.Confidence$_t$	0.056**	0.094**	0.084	-0.076
	(0.027)	(0.037)	(0.056)	(0.243)
n	84	84	84	84
R^2	0.92	0.85	0.84	0.79

Note: Robust standard errors of estimated coefficients in parenthesis. Asterisks indicate significance at the 10 percent (*), 5 percent (**), and 1 percent (***) level respectively. Values in parenthesis are p-values. .

In both regressions, large and statistically significant changes in the consumer confidenceare more evident for larger food producers. This results seem counterintuitive given that larger firms are likely to be more diversified (i.e. holding of nonfood assets), and thus more protected against food safety incidents. Such differences may be the result of smaller firms having lower analyst following or high dispersion of analyst forecasts (Gurun and Butle 2012).

Conclusions and Policy Implications

The empirical results of this paper present strong evidence that media does influence perceptions and beliefs of consumers/investors, thus confirming hypothesis 1. Moreover, these findings indicate the presence of a media "agenda-setting" effect associated with food safety events on consumer confidence in the safety of the food system. Another important contribution of this study is the evidence showing that, as stated inHypothesis 2, consumer confidence (represented by the Consumer.Confidence index) has a positive and significant effect on the stock prices of the selected food companies, with the exception of the smaller firms. Finally, and after the estimation of the two consumer confidence components (one related to media coverage and the second one explained by other factors), it was found that stock prices of the food industry react positively to changes in the latter. In addition, only a marginally significant positive effect was found for the media component and the stock prices of larger food producers. In summary, the empirical results of this study indicate that there is a clear direct effect of media coverage on consumer confidence, and a consistent relationship between consumer confidence and stock prices of the selected firms. Nevertheless, only a weak indirect effect of media coverage on the stock price indices was found. Interestingly, the stock prices of larger firms are most affected by the consumer confidence and its media component (Media. Consumer.Confidence).

In terms of managerial implications, the findings of this study also shed some light on how food companies should weigh the costs and benefits associated with the adoption of additional food safety protocols. With investments in safer production practices, firms may mitigate the risks of a significant drop in stock values. Additionally, vertical integration and/or enhanced traceability may be a strategy to ensure quality and food safety. However, firms may not have the economic incentives to invest in safer production practices because the benefits only accrue in the event of an outbreak. Based on evidence in this study, it may be best for the U.S. food companies to cooperate as sector and with government agencies to prevent individual food safety events that may get extensive coverage from the media and affect the entire industry. Such joint efforts could avert declines in the consumer confidence in the food system and the consequent negative impacts on the firms' wealth. Despite stricter safety standards some events are simply accidental or unavoidable, and in those cases food companies may minimize some of the negative effects through timely public announcements and advertising campaigns after the recall. This may reduce the amount of negative media coverage on the issue and its impact on consumer confidence, which in turn may mitigate negative effects on stock prices. At the policy level, estimating the impacts of food safety incidents on food industry's wealth provides policy makers with additional information on whether or not the costs from these incidents surpass the benefits of regulating and implementing stricter and safer food production practices.

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Appendix

Table A1. List of Food and Beverage Companies in the Stock Indices

Name of Company	Size classification
Archer Daniels Midland Co	S&P 500
ConAgra Foods Inc.	S&P 500
Campbell Soup Company	S&P 500
Dean Foods Company	S&P 500
General Mills, Inc.	S&P 500
H.J. Heinz Company	S&P 500
The Hershey Company	S&P 500
Hormel Foods Corporation	S&P 500
J. M. Smucker Company	S&P 500
Kellogg Company	S&P 500
Kraft Foods Inc.	S&P 500
Tyson Foods Inc.	S&P 500
The Coca-Cola Company	S&P 500
PepsiCo, Inc	S&P 500
Sarah Lee Corp.	S&P 500
Smithfield Foods Inc.	S&P 1500
Tootsie Roll Industries Inc.	S&P 1500
TreeHouse Foods, Inc.	S&P 1500
Ralcorp Holding Inc.	S&P 1500
NBTY, Inc.	S&P 1500
Corn Products International Inc.	S&P 1500
Darling International Inc.	S&P 1500
Flowers Food Inc.	S&P 1500
Schiff Nutrition International, Inc.	SMALL
Nu Skin Enterprises Inc.	SMALL
Omega Protein Corporation	SMALL
Medifast, Inc.	SMALL
B&G Foods, Inc.	SMALL
Bunge Limited	SMALL
Chiquita Brands International Inc.	SMALL
Del Monte Foods Company	SMALL

Source: NYSE

Table A2. List of Variables Used in the Regression Analyses

Acronym	Description
Consumer.Confidence	Continuous food safety tracking index. Used to measure consumer confidence in the food safety.
Media.Consumer.Confidence	Consumer confidence influenced by national media coverage on food safety and food defense events.
Other.Consumer.Confidence	Consumer confidence influenced by other factors other than national media coverage on food safety and food defense events.
Media.Tracking	Media tracking index. Used to measure national media coverage of food safety and food defense events.
S&P500	Standard and Poor's 500. Used to control for general economic and market conditions.
Food.Stock.Price	Food Industry Stock Price Index. Used to measure the performance of this particular economic sector and it includes all selected firms.
Food.Stock.Price.500	Food Industry Stock Price Index 500. It includes all firms in the FISI that are a component of the S&P500, and thus considered large.
Food.Stock.Price.1500	Food Industry Stock Price Index 1500. It includes all firms in the FISI that are a component of the S&P1500 but not the S&P 500.
Food.Stock.Price.Small	Food Industry Stock Price Index small. It includes all firms in the FISI that are not a component of the S&P1500 or the S&P 500.

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Market and Pricing Potential for Extended Season Fresh Produce Sales: An Intermountain West Example

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Abstract

This study assesses the potential for extending the farmers' market season in the Intermountain West by evaluating producer and market manager perceptions regarding product availability, pricing, and marketing realities through web-based surveys conducted in 2011. Potential extended season fresh produce pricing was evaluated through forecasting models using pricing data collected at farmers' markets in the region. Study results show that both producers and market managers perceive potential benefits to extending the market season, but detail potential obstacles, such as location and costs. Produce price premiums in the extended season are likely, but vary by product in magnitude and timing.

Keywords: Direct markets, fresh produce, forecasted pricing, season extension

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Introduction

The growth in direct marketing outlets for fresh produce is evidenced by the increase in the number farmers' markets in the United States, tripling to over 8,000 in the past 15 years (USDA 2014). The surge in direct market popularity can be attributed to a growing consumer interest in fresh, healthy, locally grown foods, as well as concerns regarding food safety and the environmental impacts of the traditional food chain (Curtis and Cowee 2011; Onozaka, Nurse, and Thilmany-McFadden 2010). Farmers' markets provide local producers the opportunity to eliminate the middle man and increase revenues by taking a higher percentage of the product final sales value. Additionally, farmers' markets are relatively easy outlets for small farmers to participate in due to the limited contractual obligations and relatively low vendor fees (LeRoux et al. 2010; Hardesty and Leff 2010). Using direct marketing outlets may reduce producer marketing and sales efforts, especially for those facing additional time constraints due to off farm employment (LeRoux et al. 2010).

The Intermountain West has seen the highest levels of direct market growth, as 38% of direct market outlets have been in existence for fewer than five years (Ragland and Tropp 2009). The region also boasts the second highest average per-capita attendance rate at seasonal farmers' markets (Ragland and Tropp 2009). Although these are positive signs, the long-term sustainability of these markets comes into question when one examines reported producer revenues from farmers' markets. It is estimated that 80% of vendors receive revenues of $5,000 or less and markets are only open on average for four months each year, due to the limited growing season (Ragland and Tropp 2009). Despite recent growth in direct markets, local product availability has been found to be a weakness in multiple studies (Andreatta and Wickliffe 2002; Onozaka, Nurse, and Thilmany-McFadden 2010).

Direct marking presents a new set of complex decision-making choices for producers. The use of season extension techniques in fresh produce production are an important response to low revenues, a short marketing season, and product availability issues. Season extensions allow producers to increase their sales season by lengthening the growing season. For example, techniques such as high tunnels have been shown to lengthen production periods (Gatzke, McCuin, and Nelson 2009), increase yields (Rowley et al. 2010) and improve profitability (Ward, Drost, and Whyte 2011) in the Intermountain West. Studies show that producer revenue increases three-fold when farmers' markets operate seven months or longer as compared to markets operating for five months or less (Ragland and Tropp 2009). Hence, direct markets represent an important source of income, but the availability of direct marketing outlets during extended or nontraditional seasons, as well as the potential for price premiums to support the additional capital investment required for season extension production are equally important concerns.

This study assesses the potential for extending the traditional farmers' market season in the Intermountain West region of the United States through the use of producer and market manager surveys, as well as farmers' market pricing data for eight fresh produce items collected in the 2011 summer season. Study results show that producers and market managers agree there is potential for extending the market season, but detail potential obstacles and challenges. Product pricing premiums in the extended season are likely, but vary by product in magnitude and

timing. Obstacles to market season extension include the costs and availability of indoor space, unknown consumer response, and the cost of season extension production and processing technologies.

Literature Review

The decision to extend the season for fresh and processed produce sales is not made solely by consumers, market managers, or producers. Instead, it represents a mix of the desires, risks, and opportunities available to all three. While there has been a continuum of research relating to consumer motivations for attending farmers' markets, preferences for local foods, as well as season extension techniques on the production side, there is limited research available on the potential for extending the market season. Additionally, there is little information on extended season pricing, or potential price premiums. Pricing represents a particular challenge as direct market prices are not well tracked by current price reporting systems, and hence, data must often be recorded manually (Ward, Drost, and Whyte 2011).

Studies show that consumers purchase fresh produce from direct markets, such as farmers' markets, for similar reasons. Govindasamy, Adelaja, and Italia (2002) showed that 98.5% of consumers expected the quality to be higher at direct markets than at retail outlets and approximately 60% of consumers were motivated by quality and freshness. Curtis (2011) observed that quality, freshness and taste were rated 'very important' or 'extremely important' by consumer supported agriculture (CSA) program customers and farmers' market attendees in Nevada. Pricing and value were also considered 'important' and 'very important' respectively. Similar results were found in California (Wolf, Spittler, and Ahern 2005) and in North Carolina (Andreatta and Wickliffe 2002). The results from these studies show that although consumers expect higher quality from farmers' market outlets, they can be price and value sensitive as well.

The rapid growth in direct markets is convincing evidence that consumers have a preference for the products offered (Govindasamy et al. 2001). Furthermore, it appears that additional growth is possible as a number of studies suggest that the demand for farmers' market products is currently higher than that supplied (Govindasamy, Adelaja, and Italia 2002; Andreatta and Wickliffe 2002; Onozaka, Nurse, and Thilmany McFadden 2010) as the availability of fresh produce is an ongoing consumer concern. In Ragland and Tropp (2009) 44.8% of farmers' market managers in the Intermountain West reported that consumer demand was greater than the supply in the markets they managed.

Previous studies found that many small farms rely solely on farmers' markets as an outlet for their produce (Low and Vogel 2011). Through a case study of producers in New York, LeRoux et al. (2010) concluded that producers should use multiple markets to optimize overall farm performance. Hardesty and Leff (2010) analyzed three organic producers in California and compared their costs and revenue when utilizing direct and wholesale organic produce markets. The study recommended using direct markets as a risk management tool. It should also be noted that the farms in both studies were more than 18 acres and full-time operations. Monson, Kuminoff, and Mainville (2008) confirmed the above findings by analyzing farmer characteristics in Virginia and concluded that the farm size has a considerable impact on the effectiveness of marketing efforts. Brown et al. (2007) estimated that branching out to one

additional farmer's market leads to an estimated $2,681 increase in revenue each month for small farms.

Farmers' markets are not homogenous and the market selected can influence profitability for producers. Low and Vogel (2010) found that a majority of small farms with direct sales were located in metropolitan counties. Ragland and Tropp (2009) similarly concluded that monthly sales in less urban regions were half that of more populated regions, such as the Mid-Atlantic and Far West. Martinez et al. (2010) found that revenues decreased from $10,987 for farms located in metropolitan counties to $6,767 in counties adjacent to metropolitan counties. These findings represent a challenge for direct marketers in the Intermountain West. While cities like Denver and Salt Lake City provide producers some access to metropolitan markets, travel may be prohibitive for producers and larger urban farmers' markets tend to have waiting lists for new vendors. Although the Intermountain West lacks many metropolitan areas for farmers' markets, the higher percentage of consumer attendance may help offset this disadvantage. Bond, Thilmany, and Bond (2009) found that consumers in the Intermountain West are more likely to shop at direct markets rather than retail outlets when compared to the rest of the country.

LeRoux et al. (2010) suggests that part-time farmers with other employment, and thus diverse obligations, face difficult production and marketing decisions. The additional effort to expand production and marketing into other seasons may prove cumbersome. However, the limited studies on market extension show promising results. Brown et al. (2007) predicted that extending the growing season by one week would lead to a $448 increase in sales. Conner et al. (2009) determined that 91% of farmers' market consumers in Michigan would be willing to attend late fall and winter markets, while 69% reported they would be willing to attend markets as early as January or February. The study also found that 91% of consumers were willing to pay premiums for local produce offered at farmers' markets. Therefore, instead of adding increased marketing efforts during the prime growing season, season extension may provide farmers the opportunity to generate revenue in the off-season using familiar distribution strategies, such as farmers' markets.

A common season extension technique, high tunnels, also known as hoop houses or unheated greenhouses, protect crops from adverse weather conditions, and act as a form of temperature and pest control. They allow for both early and late season crop plantings, thus extending the growing season an additional two to three months annually (Gatzke, McCuin, and Nelson 2009). Recent studies show that high tunnels are best suited for use in the production of specialty crops, which are in high demand and commonly sold through direct marketing outlets (Waterer 2003; Black and Drost 2010). The relatively small hoop house size lends itself to the production of labor intensive fruits and vegetables (Rowley at al. 2010). Gent (1991) grew tomato and peppers in high tunnels over a three-year period and found increased yields and extended production for both crops. Waterer (2003) showed that the use of high tunnels increased marketable yield, number of mature fruits, and extended the production season more than other season extension production techniques.

While previous studies such as Gent (1991) focused on the production benefits of high tunnels, only recently have studies addressed the economic impacts of season extension techniques for individual farms. Ward, Drost, and Whyte (2011) conducted a profitability analysis for a one

acre farm in northern Utah using high tunnels and drip irrigation system. The study found that using high tunnels to grow a double crop of tomatoes and summer squash had an 11.49% modified internal rate of return (MIRR) and that investment payback period averaged six years when using typical farmers' market pricing. Rowley et al. (2010) grew strawberries in Utah using both in-ground field and high tunnel systems as a means to compare results. They estimated that high tunnels brought production approximately 4 weeks forward and increased profitability by $\$13/m^2$ when compared to the in-ground field system. The authors stressed the importance of utilizing premium markets to achieve their profitability estimates.

Conner et al. (2011) examined the impact of high tunnels in a multi-year study with nine different producers in Michigan. The results showed that with efficient management skills, the high tunnels had a payback period of two years. Donnell, Biermacher, and Upson (2011) found that breakeven prices for tomatoes, summer squash, strawberries and spinach grown in high tunnels in Oklahoma were highly sensitive to changing yields, percent marketability, and labor costs.

While these studies use farmers' market pricing to project revenues, the pricing is from the normal or summer season. There is very little literature using extended or off season farmers' market prices. Eastwood (1996) provides some qualitative insights into pricing trends and found that 77% of consumers at farmers' markets in Tennessee felt the higher pricing in the early market season was acceptable. From a quantitative perspective, studies in produce pricing using national level data reflect seasonality in prices, and that prices decrease when supply increases. Goodwin et al. (1988) examined factors affecting potato prices in terminal markets and found that prices for a variety of potatoes dropped at harvest time, after which prices increased until the following harvest. Huang and Lin (2006) used a hedonic model to predict prices for tomatoes using information such as region, season, outlet, production method, and packaging. They found that tomato prices were lower in the summer across most of the United States and that prices in general were lower in the Western region.

This study builds on the existing literature by examining the potential for extending the farmers' market season in terms of producer and market manager perceptions/attitudes, potential product offerings and pricing, as well as potential challenges that will need to be addressed. Importantly, this study looks to provide insight into extended season pricing across a variety products. Premium pricing may offset the various producer and market manger costs associated with extended the market season. All data were collected in Utah, Nevada, Colorado, and Idaho, Intermountain West states, and thus, generalizing study results to other regions is not recommended

Survey Data Description

To identify producer capabilities and the marketing realities faced by producers and market managers in an extended season, two online surveys (SurveyMonkey), one to specialty crop producers and one to farmers' market managers were conducted in the fall of 2011. Producers were asked about their farming background, acreage under production, revenues, as well as marketing and production strategies, including usage of and attitudes towards season extension techniques. Farmers' market managers were surveyed on topics related to their current market

season, consumer expectations, and obstacles in extending farmers' market operations, such as location and additional costs.

Producer Survey Results

The producer survey was first tested in-person at farmers' markets and then distributed electronically to producers through the farmers' market managers in Utah, Nevada, and Idaho. All farmers' market managers in Utah, Nevada, and southern Idaho were emailed an invitation to forward the survey request on to their vendors. A total of 57 producers completed the online survey in 2011 with 45 from Utah, four from Idaho, five from Nevada and two with no location given. The majority of the producers in the study, based on the definition provide by the USDA, would be considered small (Low and Vogel 2011), with 71% of producers earning $20,000 or less in annual gross revenues (see Table 1). A high percentage of the respondents (54%) utilized one acre or less for their operation. In line with studies examining farmers' markets, particularly in the Intermountain West (Ragland and Tropp 2009), 60% percent of the survey participants reported having three or more years of direct marketing experience, while 37% reported they had less than three years of direct marketing experience (3% with no response).

Table 1. Producer Reported Producer/Farm Characteristics

Acreage	Percentage	Revenue	Percentage	Experience	Percentage
1: <1/4 Acre	9%	1: <$1000	25%	1: 1 year or less	12%
2: 1/4 to 1 Acre	45%	2: $1,000-$4,999	19%	2: 2 to 3 years	25%
3: 2 to 5 Acres	23%	3: $5,000-$9,999	18%	3: 3 years or more	60%
4: 6 to 10 Acres	4%	4: $10,000-$19,999	9%	4: NA	3%
5: 11 to 50 Acres	5%	5: $20,000-$39,999	5%		
6: 50+ Acres	14%	6: $40,000-$59,999	3%		
		7: $60,000-$99,999	3%		
		8: $100,000-$249,999	2%		
		9: $250,000-$499,999	0%		
		10: $500,00+	9%		
		11: NA	7%		

As the surveys were distributed to farmers' market vendors, an expected 91% of respondents sold at farmers' markets, with 35% of the sample relying on them exclusively. Thirty-nine percent reported using only one market, 19% reported using two markets, and 25% reported using three or more markets (17% did not report this information) (see Table 2). CSA programs, farm stands, wholesale, and grocery store contracts were equally popular direct market avenues for survey respondents. These results are in line with Low and Vogel (2011) finding that small farms rely almost exclusively on direct-to- consumer markets. This may be due to the consistent quantity and quality required by intermediate markets and the relatively low fees and entry costs associated with farmers' markets. Producer familiarity with farmers' markets may make them the most straightforward option to utilize in the extended season.

Table 2. Producer Reported Marketing Efforts and Products Offered

	Description	Percentage		Description	Percentage
Marketing Season Length	1: 3-4 months	10%	Labeling Types	1: Organic	23%
	2: 4-5 months	28%		2: Natural	67%
	3: 5-6 months	14%		3: Local Label	28%
	4: 6-7 months	12%		4: Grass-fed	5%
	5: 7+ months	15%		5: Other	9%
	6: NA	21%		6: None	5%
Number of Market Outlets	1: Farmer's market	91%		7: NA	11%
	2: CSA	23%	Product Types	1: Fruit	65%
	3: Grocery store	21%		2: Vegetables	88%
	4: Farm stand	25%		3: Greens	60%
	5: You pick	11%		4: Flowers	18%
	6: Wholesale	19%		5: Beef	5%
	7: Co-op	5%		6: Lamb	2%
	8: Other	9%		7: Pork	2%
	9: NA	5%		8: Other	12%
Number of Farmers' Markets	1: 1 Market	39%		9: NA	2%
	2: 2 Markets	19%	Processed Products	No:	68%
	3: 3+ Markets	24%		NA:	21%
	4: NA	18%			

The use of labels was common amongst the respondents with 67% using some a natural label, 23% a certified organic label, and 28% a locally-produced label. The length of the marketing season varied among respondents, with 38% of respondents marketing for four months or less, 14% between five and six months, 12% between six and seven months, and 15% at seven months or longer. The produce respondents offered through direct markets included vegetables (88%), fruit (65%), greens (60%), flowers (18%) and other (16%). Only 11% sold processed products. The low supply of fruits, greens, and processed goods was not expected and provides insight into extended season strategies such as the sale of jams, honey, strawberries and spinach (Rowley et al. 2010; Donnell, Biermacher, and Upson 2011). During an extended season, producers considered tomatoes (61%), peppers (48%), herbs, greens (45%) and carrots as viable options. Sweet corn, cherries, berries, apples, pumpkins, potatoes and value-added items were considered less viable (see Figure 1). Thirty-two percent of the producers were already receiving premiums for offering produce when not normally available.

Information about extended season production techniques currently in operation provides insight into the capability of producers for extended season production. Although 33% of producers reported using no techniques, many of the remaining producers used multiple methods to extend their season. Frost cloth was the most popular (35%), while high and low tunnels, raised beds and plastic covers each had similar response rates of about 25%. Considering the potential expense involved (Conner et al. 2011) and the low revenue received by respondents, the 24% adoption rate of high tunnels among the sample was unexpected. When asked why they used season extension techniques, 60% of producers noted extended sales season, 51% increased yields, 39% increased quality, and 14% for other reasons. For those producers who were not using season extension techniques, 39% replied that they would consider it, while 18% were uninterested. Cost was the most notable concern (35%) for producers not interested in extension season techniques, followed by lack of information, lack of previous experience, and unknown access to suppliers (see Table 3).

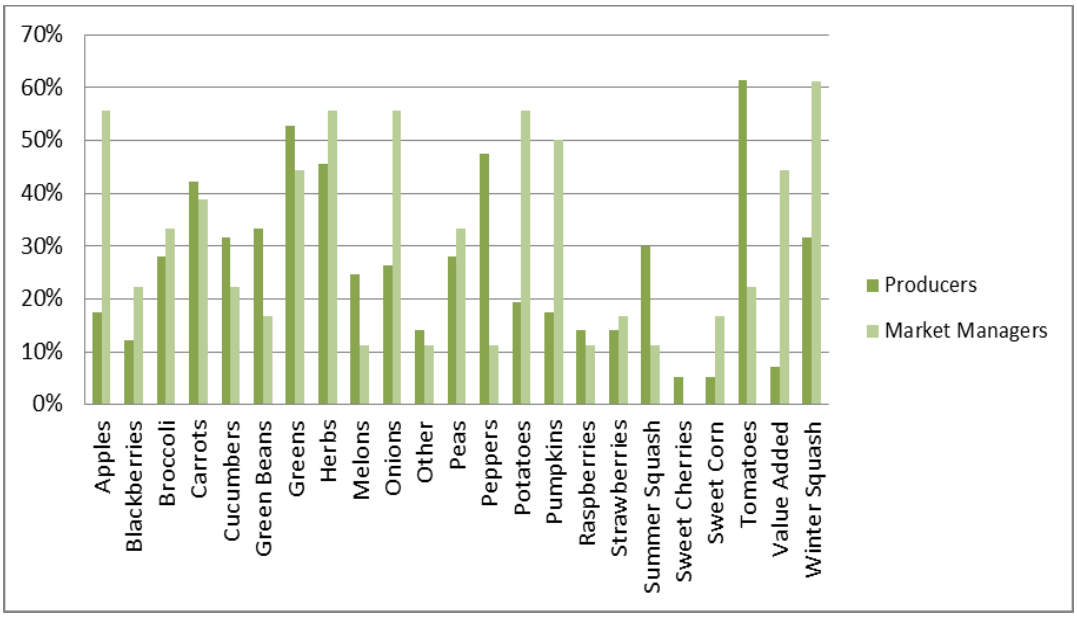

Figure 1. Products Potentially Available in the Extended Season

Table 3. Producer Season Extension Techniques Employed and Motivations

	Description	Percentage
Considering using season extension techniques in the future	1: Yes	39%
	2: NA	44%
Season extension techniques currently used	1: High tunnel	25%
	2: Low tunnel	21%
	3: Raised beds	25%
	4: Plastic cover	26%
	5: Frost cloth	35%
	6: Heating	7%
	7: Other	18%
	8: None	28%
	9: NA	14%
Motivations for using season extension techniques	1: Increased yields	51%
	2: Increased quality	39%
	3: Extended sales season	60%
	4: Other	14%
Motivations for not using season extension techniques	1: Cost	35%
	2: Lack of information	16%
	3: Unknown supplier	16%
	4: Previous experience	16%
	5: Other	7%

The relatively low revenues, direct market experience, and limited acreage of the respondents may provide the motivation to extend direct markets and to invest in season extension production

and/or processing techniques. As previously discussed extending or adding markets can increase farm revenues (Brown et al. 2007). Also, processing or producing value-added products can decrease waste or shrinkage and provide off season income. Incorporating value-added products into small farm offerings has been shown to increase farm profitable (Thistlethwaite 2013).

Manager Survey Results

The farmers' market manager survey was also administered online through SurveyMonkey in the fall of 2011. All farmers' market managers in Utah, Nevada, and southern Idaho were emailed and invitation to complete the survey. Eighteen farmers' market managers responded with 10 from Utah, five from Nevada and three from Idaho. The manager respondents represented markets that were relatively small as 44% had 20 vendors or less and 88% had 50 vendors or less. However, the concentration of fresh produce vendors at the markets was relatively high, as 67% of markets had 40% or more vendors selling fresh produce. As expected, the marketing season results are similar to that of the producer survey as 68% of markets were open for less than six months and 27% were open for six months or longer (see Table 4).

Table 4. Market Manager Reported Farmers' Market Characteristics

	Description	**Percentage**
Market Season Length	1: < 2 months	6%
	2: 2-3 months	6%
	3: 3-4 months	28%
	4: 4-5 months	28%
	5: 5-6 months	0%
	6: 6-7 months	22%
	7: 7+ months	5%
	8: NA	5%
Market Size (Number of Vendors)	1:<20 vendors	44%
	2: 20-50 vendors	44%
	3: 51-100 vendors	0%
	4:101-200 vendors	12%
	5: > 200 Vendors	0%
Concentration of Produce Vendors	1: <20%	11%
	2: 20%-40%	22%
	3: 41%-60%	22%
	4: 61%-80%	11%
	5: >80%	34%
Potential Product Premiums	1: Organic	61%
	2: Local	61%
	3: Natural	56%
	4: Availability	67%
	5: Other	28%
	6: NA	17%

Market managers were interested in extending their market season into the fall/winter or opening earlier in the spring, as 50% of the managers felt their produce vendors would use farmers' markets in an extended season (see Table 5). Thirty-nine percent of the managers were considering extending their market season, while 61% recognized that customers would prefer moving indoors during an extended season. Finding an indoor location could present a challenge as 44% had not yet identified a suitable site and 67% reported an expected cost increase to use indoors facilities. Sixty-seven percent of the managers believed their customers would be willing to pay premiums for produce availability during the extended season.

Table 5. Market Manager Attitudes towards Season Extension

	Percentage	
	Yes	**NA**
Are you considering extending your farmers' market season?	38.9%	5.0%
Would produce vendors want to use your market in an extended season?	50.0%	11.1%
Would customers prefer shopping indoors in the extended season?	61.1%	11.1%
Will extending the market season require moving indoors?	44.4%	12.0%
Do you have a suitable location identified for the extended season market?	27.8%	27.8%
Would there be significant expenses involved in securing a suitable extended season location?	66.7%	27.8%
Are customers willing to pay higher prices in an extended season?	22.2%	16.7%
Have your vendors previously received premiums based on availability?	31.6%	15.8%
Do your vendors process products that may be marketed in the extended season?	10.5%	21.1%

Market managers felt that producers should be able to provide the following products during the extended season: winter squash (61%), greens (55%), apples (55%), onions, potatoes, pumpkins (50%), herbs and carrots, while many berries and warm-season produce such as tomatoes and peppers received a 25% or less response (see Figure 1). Interestingly, 45% of market manager respondents felt producers could provide value-added products in the extended season, but less than 10% of producer respondents felt they could provide value-added products. This may be due to the current lack of value-added production among producer respondents. Also, market managers may have small processed food vendors in mind, rather than fresh produce vendors.

Farmers' market manager are motivated to extend their season due to consumer demand, regardless of season, for fresh, stored and processed local foods. This demand is evidenced by the addition of winter markets in the Salt Lake City and Denver areas on 2013, as well as the addition of winter CSAs, including bread and soup shares, now provided by producers (SLC Downtown Alliance 2014).

Extended Season Pricing

To provide insight into the extended season prices producers might expect to receive for fresh produce, we analyzed fresh produce prices from 14 farmers' markets in the Intermountain West. Data were collected between May and November 2011 through weekly visits to farmers'

markets, in which prices for a number of different produce items were recorded. The average weekly price was determined for eight commonly found goods with similar attributes and used to predict prices in an extended season. The eight items selected were tomatoes, cucumbers, summer squash, potatoes, herbs, greens, carrots, and green peppers as these products were common to all markets. The recorded prices were sorted by week and then averaged across all markets to find a representative price for that week. Each week was numbered based on 52 weeks in a year. Missing data points were filled in using data imputation, the practice of regressing the average weekly price on the week number to estimate a coefficient. The coefficient was then multiplied by the missing week number to provide an estimate for that week's price (Wise and McLaughlin 1980). Consideration also was given to each price as a representative of a varying number of markets, each with their own unique attributes and consumer base. No indicator of quantity supplied was recorded.

Forecasted Pricing Model

Unlike produce sold at the retail level where Nielsen Scanner data and the volume of data allows for complex forecasting models, sales data from farmers' markets often go untracked (Onken, Bernard, and Pesek 2011). The literature on organic produce pricing provides some useful parallels (Darby et al. 2006). For example, Gubanova, Lohr, and Park (2005) found autoregressive-integrated-moving average (ARIMA) models to be the most effective when forecasting produce prices due to their simplicity, which allows for the quick and effective interpretation of results. Also, as farmers tend to market and price their produce based on recent sales prices, ARIMA models make sense from an economic perspective, as they take into consideration changes in past time periods as a means to generate a forecast.

ARIMA models using the EViews software was used to forecast pricing for each produce type into the extended season (see Enders 1995 for general ARIMA specification). A unit root test was used to test for stationarity and then regression was completed taking the first and second difference (when needed) to treat for stationary data. The final model chosen for each produce item was based upon comparison of the Akaike information criterion (AIC) and Schwarz information criterion (SIC) log values (Gujarati 1992). Forecasted pricing model results for each produce item evaluated are provided in Table 6, with sample size noted under product name. Actual and model forecasted prices for all products are provided in Figure 2.

Pricing Results

Tomatoes are commonly found in direct markets and have often been used in both economic and production oriented high tunnel studies (Huang and Lin 2006; Donell, Biermacher, and Upson 2011). The forecast shows early season prices as high as $6.50/pound and then a slow decrease throughout the season to under $3/pound. These results were expected as other studies found that tomato prices decreased when in season (Huang and Lin 2006). Cucumbers, forecasted as high as $2/pound in June, showed a steady decrease as the season progressed. Although cucumbers and tomatoes are both warm season crops, the steep decrease could be attributed to consumer perceptions, increases in supply, and potential decreases in quality.

Table 6. Pricing Model Specifications and Results by Product

Product	Specification	Variable	Coefficient	S.E.	T-stat	Prob	R2	S.E.
Summer Squash	ARMA (0,1,1)	C	0.006101	0.008265	0.738276	0.4725	0.234	0.111
(310)		MA(1)	-0.878383	0.109032	-8.05621	0		
Tomatoes	ARMA (0,1,2)	C	-0.048466	0.047077	-1.02949	0.3162	0.368	0.960
(286)		MA(2)	-0.851589	0.157578	-5.40423	0		
Cucumbers	ARMA (2,1,0)	C	0.071833	0.092307	0.778193	0.4545	0.488	0.416
(290)		AR(1)	-0.711741	0.265099	-2.68481	0.0229		
		AR(2)	-0.528986	0.2365	-2.23673	0.0493		
		MA(1)	0.887108	0.151911	5.839641	0.0002		
Potatoes	ARMA (1,0,0)	C	0.020307	0.042444	0.478429	0.6397	0.361	0.272
(212)		AR(1)	-0.600535	0.213385	-2.81432	0.0138		
Herbs	ARMA (1,0,1)	C	2.223097	0.02478	89.71232	0	0.452	0.181
(189)		AR(1)	0.535974	0.122964	4.358779	0.0008		
		MA(1)	-0.912989	0.107252	-8.51253	0		
Greens	ARMA (2,0,2)	C	3.52361	0.225911	15.59735	0	0.455	0.703
(450)		AR(1)	-0.922431	0.224973	-4.10019	0.0008		
		AR(2)	-0.38816	0.159535	-2.43308	0.0271		
		MA(1)	1.504825	0.097435	15.44441	0		
		MA(2)	0.889717	0.093555	9.51006	0		
Carrots	ARMA (2,0,1)	C	0.071833	0.092307	0.778193	0.4545	0.488	0.416
(195)		AR(1)	-0.711741	0.265099	-2.68481	0.0229		
		AR(2)	-0.528986	0.2365	-2.23673	0.0493		
		MA(1)	0.887108	0.151911	5.839641	0.0002		
Green Peppers	ARMA (0,1,1)	C	2.424277	0.033589	72.17374	0	0.176	0.289
(259)		MA(1)	-0.862393	0.297282	-2.90093	0.0133		

S.E. = Standard errors
(X) = Number of observations
R^2 automatically generated by EViews regression output

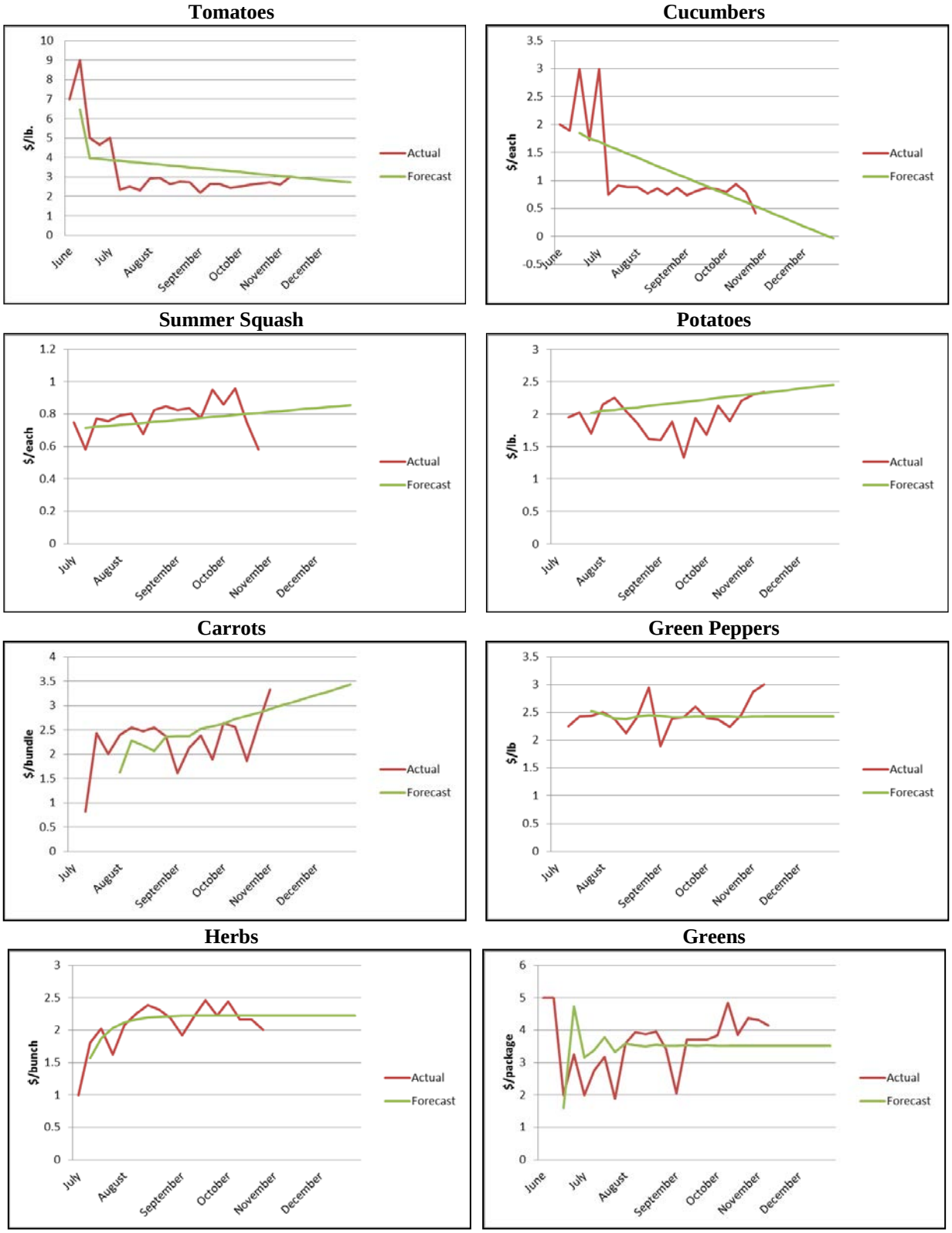

Figure 2. Actual and Forecasted Prices for Produce Items

Summer squash, another warm season crop, was considered for high tunnels in Donell, Biermacher, and Upson (2011). The forecasted price of summer squash increased steadily throughout the season from $.71 to $.85 each. This relatively small change, compared to cucumbers and tomatoes, may suggest a decrease in supply as the season continues, especially considering that summer squash can be harvested continuously and at a range of sizes. In contrast to Goodwin et al. (1988) who found a decrease in potato prices at harvest, the forecast predicted a 25% increase in potato prices per pound from the beginning of the season through the end of December. This result was surprising considering that potatoes can be harvested throughout the later stages of the growing season and can be readily stored.

Carrots are sold almost exclusively per bunch at direct markets leading to differences in package size. This can potentially lead to problems when comparing prices. Furthermore, pricing concerns arise as carrots can be harvested at various sizes throughout the marketing season. Although these attributes can create challenges when providing forecasts, it still provides marketing insight for producers. Typically a late summer and fall crop, price was expected to decrease as the season continued, but the increase may be due to the increase in carrot size and/or bundle size. The forecast for green peppers shows a near constant price throughout the season. Typically considered a warm season crop, seasonality in price was expected.

Due to the number and variety of herbs available in markets, forecasting herb prices presented a challenge. Herbs were found to have an increasing then stable price. Considering herbs are one of the few products available early in the marketing season, the early low prices may be a result of the number of producers offering herbs, as well as a smaller bundle size. The stable prices throughout the rest of the season may suggest similar packaging size amongst producers. Exhibiting the same packaging traits as carrots and herbs, greens represented a difficult product to forecast. Greens include many varieties, such as spinach or cabbage, and are typically sold packaged or by the whole heads. For this analysis, only packaged greens were considered. The forecast shows high variability in the beginning months then stable prices throughout the rest of the season. The variations in price in the early months may be a reflection of the inconsistency in package size and variety.

The forecasts show that these eight items have varying prices. While it was expected that prices would change throughout the season, many of the items changed in an unexpected manner. Potatoes, carrots, and summer squash increased in price as the season continued. Herbs increased for a short time then leveled off for the remainder of season, and greens leveled off in a similar manner, but had early season variability. The forecast for green peppers is unique as the prices are nearly constant throughout the whole of the season. Tomatoes and cucumbers behave as expected, with prices dropping over the course of the season.

Discussion

Likelihood of Extension and Marketing Realities

Producers in the region present themselves as good candidates for market extension as 60% of producer participants had three or more years of experience, had adopted some season extension techniques, and received low revenues under the short marketing season. Obstacles for producers

included narrow marketing efforts, underutilization of high tunnels, and the fear of increased costs. As 91% of producers in the study utilized farmers' markets and 39% relied on a single farmers' market, extending the farmers' market season may be the simplest method for extending the sales season. This is also suggested in Hardesty and Leff (2010), who ask producers to consider using farmers' market season extension as a diversification strategy to supplement other direct market options. However, extending the market season or adding winter markets, for example, exposes both producers and market managers to risk given little information on consumer demand. The incorporation of new marketing and production strategies should be considered to offset this risk, keeping grower production capabilities and time constraints in mind. Producers also may benefit by branching out from fresh produce and including fruit and processed or value-added goods during the extended season.

High tunnels are likely to be a key component of a season extension considering that 25% of producers used high tunnels and 27% of producers were able to market for six months or longer. Lower cost high tunnels (Black et al. 2008) could be a viable option for producers as cost was the main concern in moving towards the use of season extension technology. The adoption of high tunnels has multiple benefits including increased early and total yields, and extended growing and marketing seasons.

As 61% of market managers felt their consumers would prefer an indoor setting for the extended season, and 44% of the manager respondents cited it as requirement, access to facilities could be a significant barrier to season extension. Only 28% had a suitable indoor arena identified and 67% felt that indoor facilities would significantly increase costs. Only 22% of market managers felt their attendees would be willing to pay higher prices. Vendor fees, common in farmer's markets (Brown et al. 2007), may have to be renegotiated to provide revenue to offset market costs such as location rental fees, advertising and other administrative expenses. Both producer and consumer attendance in the extended season would have to be managed.

Produce Offered and Pricing

This study finds mixed results regarding the type of produce that could be offered during the extended season. Items like herbs and greens had relatively high response rates from both market managers and producers. Tomatoes had a low response rate from market managers and a high rate from producers, while green peppers, a crop that requires similar growing conditions, had the exact opposite response.

The pricing model results show expected pricing and potential premiums vary by product throughout the season. First, tomatoes and cucumbers show high premiums in the early season, tomatoes at $3/pound and cucumbers at $1.50/each. Producers looking to take advantage of early season premium pricing should use season extension technologies to harvest and sell products in April and May. Summer squash, potatoes and carrot prices are forecasted to be higher in the late season, with expected premiums at $.50/pound for potatoes, $1.00/bundle for carrots, and $.20/pound for summer squash. Hence, the ability to harvest and provide these products in October and November would be advantageous.

Herbs exhibit low prices in the spring then level off for the remainder of the season and into the winter. Thus, later harvest and sales of herbs would provide higher pricing. The variability in the pricing of greens makes it hard to determine a consistent premium, but producers can expect to receive $3.50/package. The green pepper forecast provides similar insights and producers in the region should base their prices on the $2.48/pound estimate. Green pepper prices are expected to be the same throughout the season. It should be noted that variability in carrot, herb and greens pricing may be related to changes in bundle size. Although these results show optimal times throughout the season to harvest and market certain produce, cost structures, yields, time constraints, and marketing plans should be considered for overall profitability.

Conclusions

This study analyzed the likelihood of extending the farmers' market season in the Intermountain West. The results show that although the producers and market managers in the region could benefit from market season extension, both noted specific difficulties, or challenges in implementing extended season markets. These included increased costs, the potential need to move markets indoors, as well as unknown consumer demand and pricing. Additional educational materials and Cooperative Extension programs may play an important role in educating producers regarding season extension technology use and costs, as well as crop selection and timing.

The pricing model provided forecasted prices for eight produce items in the extended season. These results provide insight to producers regarding production and market timing which could be used to take advantage of potential price premiums in the extended season. Pre-season premiums were more likely for tomatoes and cucumbers, while post-season premiums were likely for summer squash, potatoes, and herbs.

Study results showed some contrast amongst producers and market managers regarding products which could be offered in the extended season. Additionally, diversity in the produce offered was a weakness as few producers utilized certification programs such as local, or organic or sold processed/value-added goods. Improvements in this area could increase offerings at markets, capture premiums, and encourage market attendance.

There are several limitations to this study. First, there were a relatively small number of respondents for both the farmers' market manager and producer surveys, therefore study results are not generalizable. Second, fresh produce pricing was collected at farmers' markets in only two states during one summer season. Hence, the pricing may have been adversely influenced by growing (weather, pest, etc.) or market conditions in the year of data collection. Further studies focusing on fresh produce supply, consumer demand, and pricing at direct markets across seasons and years would offer important insights. Additionally, studies incorporating forecasted extended season pricing in producer profitability (including both revenues and costs) analysis would enhance the discussion.

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Dynamics of Consumer Response to Food Contamination: The 2007 Peanut Butter Recall

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Abstract

We investigate the foodborne illness outbreak affecting a national brand of peanut butter to determine how demand for the product category was affected. The illness outbreak coincided with growth in the quantity demanded for the peanut butter category. The negative impact on the category associated with the initiation of the product recall was significant and dissipated over time. The recovery of the product category after the recall indicates that the information was correctly targeted and actions of the companies in the market overcame the initial food scare.

Keywords: Food safety, food recall, peanut butter, polynomial distributed lag

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Introduction

The release of negative information by federal agencies or individual companies concerning a product that might cause human health problems may entail a lagged response from consumers due to psychological, technological, and institutional reasons (Griliches 1967). The consideration of lagged response by consumers to negative information has important implications for policymakers, who could use the time span resulting from the lagged response to push for timely food safety warnings and recalls. This consideration, in turn, could lead to a decrease in health risks and associated health care costs, which usually are a top priority for policymakers. Also, lagged response by consumers to negative information allows for some time for the affected firms to bounce back and strengthen the reputation of their implicated brands through marketing campaigns. This situation was the case with ConAgra, whose peanut butter brand of Peter Pan was involved in a food safety incident resulting in a recall. From competitors' perspective, the time span resulting from the lagged response to negative information serves as a window of opportunity to possibly increase their market shares by improving the consumer perceptions of safety with respect to their own brands in relation to the implicated brand. With respect to food contamination, the timing is particularly complex because the science of attribution is time consuming and difficult. The difficulties with timely and precise attribution of foodborne illness to a particular product are illustrated in the 2007 peanut butter case.

The 2007 peanut butter recall is an excellent case study to illustrate points related to the importance of incorporating the dynamics of negative information dissemination and the resulting delayed response on part of consumers when dealing with the product category. Reporting by the U.S. Centers for Disease Control and Prevention (CDC) indicated that information on the peanut butter case emerged sporadically as the illness outbreak evolved. Foodborne illness numbers spiked beginning in October 2006. To support this contention, PulseNet showed 30 cases of the outbreak strain of *Salmonella* serotype Tennessee, whereas in a typical month, there were one to five cases per month (CDC 2007). So, in October 2006, public health authorities were on alert. However, there had not yet been a connection made between the illness outbreak and a particular food source. It would take another 3 months to finalize the information and announce a health alert for the brand. The official attribution to the food product source occurred after the case-control study was completed, during February 5-13, 2007 (CDC 2007). On February 13, 2007, CDC reported its data to the Food and Drug Administration (FDA), and the FDA issued its health alert the next day. On that same day, a nationwide recall of a national peanut butter brand (Peter Pan) and a private label brand (Great Value) manufactured by ConAgra took place.

In the retrospective studies, the public health authorities looked at production from as far back in time as August 2006. It turned out that the outbreak event was defined over the period August 1, 2006 to April 23, 2007, the date of the onset of the last case associated with the peanut butter *Salmonella* Tennessee infection. Ultimately, 628 illnesses in 47 states were linked with the contamination (CDC 2007).

ConAgra remedied the contamination source and began a marketing campaign while returning Peter Pan to store shelves on August 22, 2007 (NewsInferno 2007). The brand was absent from the market for about 27 weeks (February 14, 2007, through August 21, 2007). As the brand

returned to stores, the company issued two million coupons for free peanut butter, offered dollar-off coupons, and updated the design of the product labels (Dorfman 2007). Clearly ConAgra was concerned with trying to get its brand to emerge from the food safety crisis unharmed, along with repairing its reputation to the extent and as quickly as possible.

Did these efforts by ConAgra to rejuvenate the brand also mitigate any potential harm to the product category as a whole? In order to answer this question, we need to examine the consumption of peanut butter as a food category. If consumers attribute food scares of a specific product to all of the competitors in that category, then there is an incentive for rivals to invest more in the safety of their brands.

These management incentives for action are contingent on consumers receiving the negative information, absorbing it, and acting upon it. Actions may well vary across consumers. Consumers who are aware of the problem may associate the food safety risk with only the affected brand, and switch to consumption of unaffected rival brands when they restock. According to Figure 1, restocking appears to be a plausible scenario in this outbreak and product recall incident. Households increased average weekly consumption of competing brands during the recall period when Peter Pan was not available for purchase. It does not appear that consumers who became aware of the problem generalized the risk to other brands within the product category and consumed less of the product in total. In addition to the possible brand-specific effects and category effects, some consumers might not become aware of the problem at all. Or, if consumers are aware of the recall, they may choose to consume the product. Given the variety of possible consumer impacts, a detailed study of information dispersion over time and its impact on the product category is needed to understand the market incentives provided to management for undertaking successful counter measures to offset the possible adverse effects of the outbreak.

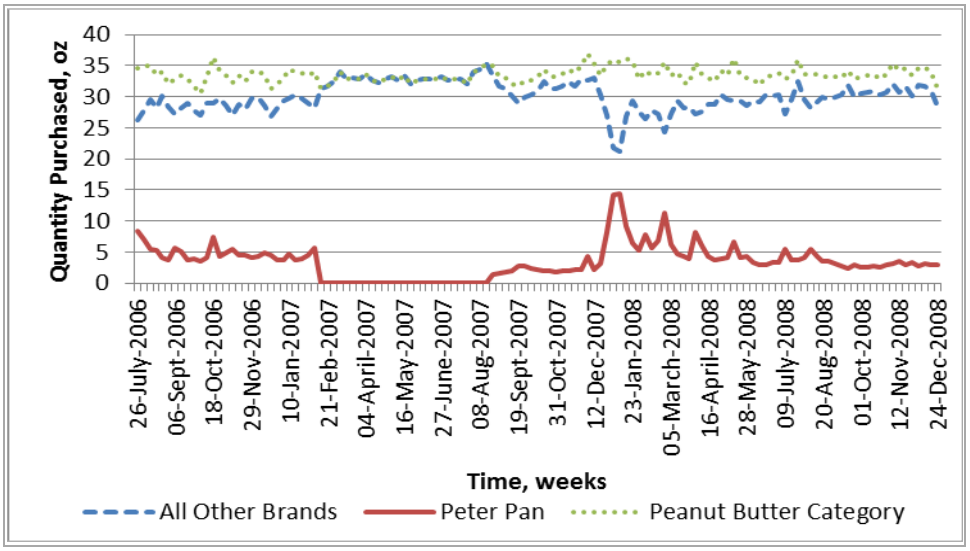

Figure 1. Quantity of Peanut Butter Purchased per Household.
[a]**Source:** Nielsen Homescan panel data for household purchases of peanut butter, 2006, 2007, and 2008.

This research provides a detailed analysis which traces the provision of information about illness incidence and aggregate demand for peanut butter within the context of the 2007 food safety event. We apply a polynomial distributed lag (PDL) specification to estimate the dynamics of the outbreak incident. The foodborne illness outbreak and subsequent product recall are associated with an initial growth in demand after the recall announcement and a downward shift in demand in the post-recall period. The category level demand recovered relatively soon after the re-introduction of the affected brand.

The paper is organized as follows. First, a review of relevant literature is presented. Then, the theoretical framework is discussed, and the model is presented. Subsequently, data are described followed by the discussion of the construction of variables. Next, the estimation results are presented and discussed. The conclusions and discussion comprise the final section.

Literature Review

The question for economic modeling of the market is how to utilize public health information in a model of consumer demand. Previous research relates consumer demand to indicators of the severity of a foodborne illness outbreak. In a study by Capps, Castillo, and Hernandez (2013), the influence of Food Safety Inspection Service (FSIS) recalls and BSE outbreaks on the marketing margins at the farm-to-wholesale and wholesale-to-retail levels in the U.S. beef and pork industries was studied allowing for delayed effects by applying the second-degree and three-lag polynomial distributed lag technique to the food safety incident variables. To account for the severity of the food safety incidents, the following classifications of the FSIS recalls were used: "1. recalls due to pathogenic bacteria or class I bacterial; 2. the rest of class I recalls that originate, for example, due to allergenic ingredients or under processing; and 3. national recalls that are effective in all of the states in the United States and are not necessarily a class I recall." In this analysis, three BSE events in the U.S. and 13 in Canada were considered. Data on prices, consumption, and marketing cost indices ranging from January 1986 through December 2008 were used to estimate a system of marketing margin equations for beef and pork applying the seemingly unrelated regression procedure. The FSIS recalls and BSE outbreaks were incorporated into the analysis as dummy variables. The estimation results showed that different types of the FSIS recalls and BSE outbreak had varying (in terms of direction and magnitude) statistically significant effects on the marketing margins at the farm-to-wholesale and wholesale-to-retail levels for the beef and pork industries.

Instead of focusing on aspects of the illnesses or the outbreaks, previous research relates consumer response to the intensity of media coverage. While media indices may not necessarily reflect the extent of the illness outbreak associated with a contamination, they are widely used approaches to measuring the information set that consumers use in making their choices (Burton and Young 1996; Verbeke and Ward 2001; Marsh, Schroeder, and Mintert 2004; Piggott and Marsh 2004; Pritchett et al. 2007; Swartz and Strand 1981; Smith, van Ravenswaay, and Thompson 1988; van Ravenswaay and Hoehn 1991).

The issue of consumer responsiveness to negative public health information available through various media has been examined extensively in prior research with several different econometric techniques. Demand systems that include both the affected good and substitutes are

a primary modeling choice (Burton and Young 1996; Verbeke and Ward 2001; Marsh, Schroeder, and Mintert 2004; Piggott and Marsh 2004; Pritchett et al. 2007). Other researchers use single-equation econometric models (Swartz and Strand 1981; Smith, van Ravenswaay, and Thompson 1988; van Ravenswaay and Hoehn 1991). All the aforementioned studies provide empirical evidence that food safety crises had a negative influence on the demand for those products.

The polynomial distributed lag method (Almon 1965) frequently has been used to study the timing of response to negative information, such as recalls and food safety announcements (Swartz and Strand 1981; Smith, van Ravenswaay, and Thompson 1988; van Ravenswaay and Hoehn 1991). Swartz and Strand (1981) studied the influence of information about oyster contamination with kepone (a compound used as an insecticide) on the demand for shucked oysters in Baltimore (1973-76) using a second-degree and four-lag PDL model. Media indices were developed using articles from the four major Baltimore and Washington newspapers. The PDL parameter estimates were statistically significant and were linked with reductions in consumption.

Smith, van Ravenswaay, and Thompson (1988) used a second-degree PDL specification with lag length of three months to evaluate the response of fluid milk sales to the negative newspaper coverage of heptachlor contamination (an insecticide) of fresh fluid milk in Oahu, Hawaii (January 1977 to June 1983). The coefficients associated with current and lagged media variables constructed based on newspaper articles concerning the incident from two major Honolulu newspapers were negative and significantly different from zero.

Van Ravenswaay and Hoehn (1991) estimated a PDL model with three lags (monthly) to evaluate the effect of Alar (a chemical sprayed on fruit later determined to be carcinogenic) on apple demand (January 1980 to July 1989). The risk information variable was developed using the total monthly number of articles in *New York Times.* The parameter estimates for the current and lagged risk information variables were all negative in sign with only the first-lag and the third-lag being statistically significant.

In sum, the literature on food contamination incidents that focuses on the dynamics of consumer reaction suggests in part immediate impacts without much delay of news media reports of contamination. However, persistent impacts were found as well, up to lags of three months (Smith, van Ravenswaay, and Thompson 1988; van Ravenswaay and Hoehn 1991). The fact that longer lags are significantly associated with demand implies that some consumers do not hear the initial messaging, or they do not act on it until the problem persists. When longer lags associated with information variable are found to be statistically significant, that means consumers took longer to respond. The statistically significant longer lags help us ascertain the time (given the time scale that the information variable is based upon) that consumers took to respond to the negative information. If only the contemporaneous lag of the negative information is statistically significant, that means consumers have not only responded immediately but also the impact of the negative information is felt all at once.

The literature on product harm crises largely is silent on the impact on the category when one brand is affected. Most researchers study the category level because attribution to a brand has not

been made. See for example, Arnade, Calvin and Kuchler (2009) and Fahs, Mittelhammer, and McCluskey (2009) in which the contamination of leafy greens in the United States was analyzed. In that incident, multiple brands were supplied by a number of growers/shippers. The study by Arnade, Calvin, and Kuchler (2009) showed that at the aggregate level of demand for all leafy greens and all other fresh vegetables, consumers temporarily substituted leafy greens with other vegetables. Also, the long-run influence was reflected by consumers switching among leafy green vegetables without lasting changes in the consumption of the aggregate leafy greens. At the individual leafy green commodity level, both temporary and permanent effects were detected. The findings from the study by Fahs, Mittelhammer, and McCluskey (2009) revealed that lettuce and cabbage were substitutes for spinach. In addition, the demand for spinach was negatively affected by a subsequent outbreak attributed to lettuce, indicative of cumulative negative market effects.

Consumers can be influenced by a food scare to turn away from a product, or they may be resilient in the desire to consume the product. Hallman, Cuite, and Hooker (2009) demonstrated the variation in the responses that consumers reported after the 2008 food safety incident involving chili peppers, where tomatoes were suspected initially and an alert was issued and later turned out to be incorrect. About one-third of the respondents discarded the food, about one-in-ten returned the implicated food to the store, and 12% of the respondents admitted knowingly eating a food under an alert. The proportion of consumers who ignored negative health news was relatively small, which is consistent with the typical finding that food safety news is associated with reduced consumer demand for the implicated product.

The peanut butter food safety event has been analyzed by a couple of studies. Bakhtavoryan, Capps and Salin (2012) investigated spillover effects, competition, and possible structural change in peanut butter demand in the light of the Peter Pan recall. The issue of delayed consumer response was not addressed directly in the demand system approach. The authors inferred on the basis of a comparison of the pre-recall period to the post-recall period that the recall contributed to structural change in consumer demand for peanut butter brands (generally increasing the own-price, cross-price, and expenditure elasticities) and that there were both negative and positive spillover effects among the leading national peanut butter brands. The leading national brand, Jif, was found to have benefitted from this recall.

In another study by Bakhtavoryan, Capps and Salin (2014), spillover effects were considered among peanut butter brands in the presence of the Peter Pan peanut butter recall. Barten's synthetic model was used with a PDL specification applied to the variable measuring the impact of the recall. The findings showed that the Peter Pan recall resulted in negative effects on the demand for Peter Pan and positive spillover effects for a major competing brand (Jif). The conflicting effects on brands leaves open the question of how the product category overall was affected.

Our study is similar to the aforementioned articles in analyzing the impact of a recall on demand while taking into account the potentially delayed response of consumers to the incident. However, in contrast to the studies that used newspaper articles to develop the negative information variable, in our study, the information set is measured with a variable constructed from the weekly number of confirmed cases associated with illnesses attributed to *Salmonella*

Tennessee. Figure 2 exhibits the extent of the outbreak as represented by the cumulative sum of illness counts over time.

According to the Public Health Agency of Canada, increasing case count, which is exhibited in Figure 2, is indicative of the severity and scope of the identified foodborne illness outbreak (Public Health Agency of Canada 2014). The count also precedes the official public health news and includes the period of industry actions to recover from the initial negative news. In light of all these information variables, it is important to determine how the product category fares.

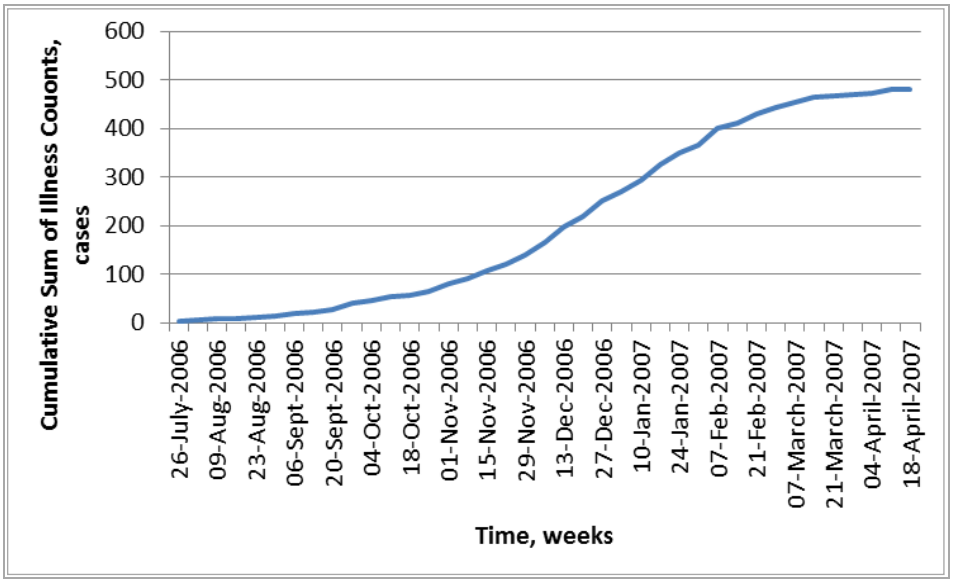

Figure 2. Cumulative Sum of Illness Counts Over Time.
[a]**Source:** Nielsen Homescan panel data for household purchases of peanut butter, 2006, 2007, and 2008.

Theoretical Framework

The impact of a food recall event on demand can be analyzed within the theoretical framework developed by Basmann (1956). In this framework, a consumer's utility function is represented by

$$(1) \quad U_t = U(q_t, \theta(r_t))$$

where q_t is the vector of the product consumed, $\theta(r_t)$ denotes the perception of quality of a product consumed in time period t, and r_t stands for a vector of perceived characteristics or attributes (for example, quality, safety) of a product in q_t. By assumption, changes in the product attributes lead to changes in the consumer's consumption decisions regarding q_t, which in turn results in changes in the parameters of the utility function. Assuming a quasi-concave and twice differentiable utility function for a rational consumer, the solution of the first-order conditions of the utility maximization with respect to q_t, given r_t, and subject to a budget constraint, gives the Marshallian demands $q_t = q_t(y, p, \theta(r_t))$, where y is total consumption budget and p is the vector of prices.

This theoretical framework is quite amenable for analyzing the effects of both negative food safety information and advertising (Capps and Schmitz 1991). Particularly, regarding negative food safety information, the focus of our study, by assumption consumer utility depends not only on quantities of goods consumed, but also on $\theta(r_t)$, which in turn is dependent on the perceived attribute (safety) of goods consumed, r_t. Demand decreases in response to the number of cases of illnesses reported and the resulting negative publicity.

Model

The single-equation model that dealt with the analysis of peanut butter as a category was specified as follows:

$$(2)\quad lnQPB_t=f(lnPPB_t, lnPJ_t, lnCOUPPB_t, lnINC_t, WKSFRRECALL_t, Q1, Q2, Q3, SQRTCDCCASE_t,...SQRTCDCCASEt_{t-j}\ DUMMY_t)+v_t$$

where $lnQPB_t$ is the natural logarithm of quantity purchased of peanut butter per household in time period t; $lnPPB_t$ is the natural logarithm of the real unit value of peanut butter in time period t; $lnPJ_t$ is the natural logarithm of the real unit value of jelly in time period t; $lnCOUPPB_t$ is the natural logarithm of values of coupons per household used in time period t when purchasing peanut butter; $lnINC_t$ is the natural logarithm of real disposable personal income of households in time period t; $WKSFRRECALL_t$ counts number of weeks from the recall announcement in time period t; $Q1$, $Q2$, and $Q3$ are dummy variables designed to handle seasonality; $SQRTCDCCASEt_{t-j}$ is the square root of the number of confirmed foodborne illness cases in time period t-j, j= 0,1,2…m, with m representing the optimal length of the lag. A square root transformation, rather than the logarithmic transformation, was used for the explicit purpose of handling zero observations of confirmed cases while still capturing diminishing marginal returns. $DUMMY_t$ is the dummy variable associated with the timing of the recall announcement and v_t is the disturbance term in time period t.

Equation (2) was estimated using a second-degree PDL specification with length of lag three. Head and tail endpoint restrictions were imposed and this specification was supported through statistical tests. Various combinations of both models were estimated using alternative lag lengths and degrees of polynomial. However, based on the Schwarz Information Criterion (SIC), the specification with lag length of three weeks and a second-degree polynomial was chosen as the best. Additionally, in the final estimation, the $SQRTCDCCASEt_{t-j}$ variable was lagged eight weeks to accommodate the time period health authorities needed to attribute the foodborne illness outbreak to peanut butter. In fact, alternative lags were tried for this variable, but based on the Schwarz criterion, eight lags were eventually selected. SAS 9.2 was the statistical software package used to estimate the model. Additionally, the model was estimated without the intercept to circumvent degrading collinearity problems with the income variable. Finally, no evidence of serial correlation was found.

Data

For our analysis, the data regarding the quantities purchased, prices, and coupons used of peanut butter were derived from the Nielsen Homescan Panel for calendar years 2006, 2007 and 2008.

The time-series data set spans 127 consecutive weeks, from July 26, 2006 to December 30, 2008 and includes weekly totals of quantities purchased across all households, prices (unit values), and value of coupons. The data set also was supplemented with a measure of weekly income and a set of information variables. Descriptive statistics of the continuous variables incorporated in the model are presented in Table 1.

Construction of Variables

Quantity variables were constructed as follows. The household quantity purchased of peanut butter was constructed by aggregating weekly total ounces of all peanut butter brands across households and then dividing this measure by the number of unique households that purchased peanut butter in the given week. For each week, unit values for peanut butter (*lnPPB*) and a complement good (jelly) (*lnPJ*) were calculated by dividing total expenditures by total ounces. The coupon variable for peanut butter (*lnCOUPPB*) was developed first by aggregating weekly values of coupons used and then dividing it by the number of unique households to express the variable on a per household basis. Real disposable personal income (*lnINC*) was reported on a monthly basis (U.S. Department of Commerce 2010); however, weekly interpolations of these data were used. Income variable was taken from the Department of Commerce (2010), since in the Nielsen data this variable is not amenable to our analysis. However, it is expected that this income variable will serve as a proxy to the Nielsen data income variable in reflecting household characteristics.

Table 1. Descriptive Statistics of the Variables Used in the Analysis of Peanut Butter at the Category Level[a].

Variables	Variable Description	Units	N	Mean	Std Dev	Min	Max
QPB	Quantity of peanut butter	oz	127	33.54	1.15	30.60	36.97
PPB	Unit value of peanut butter	cents/oz	127	5.01	0.25	4.39	5.65
PJ	Unit value of jelly	cents/oz	127	3.21	0.24	2.76	3.96
COUPPB	Coupon of peanut butter	cents	127	5.42	2.91	0.81	18.96
INC	Income	dollars	127	614.18	8.46	595.88	624.69
CDCCASE	number of confirmed cases by CDC	cases	127	3.79	7.92	0.00	36.00

Notes: [a]Derived from Nielsen Homescan panels for calendar years 2006, 2007, and 2008.
*The reported summary statistics is on a per household basis.
*The average weekly number of households that purchased peanut butter across the study period was 3,321 in our sample.

The product harm event was represented with three different variables that were included in the model at the same time. The outbreak variable (*SQRTCDCCASE*) was developed based on information from the CDC that showed the weekly number of newly confirmed cases of *Salmonella* Tennessee infection associated with consumption of peanut butter (CDC 2007). This measure allows for tracking the scope of the illness outbreak. The first 39 weekly observations of this variable corresponded to the actual number of confirmed cases, and the rest of the weekly observations running from 40 through 127 were all zeros.

To test the hypothesis that with the passage of time after the initial release of the recall announcement, consumers gradually increase their consumption of peanut butter, a variable that counts the weeks from the recall was created (*WKSFRRECALL*). The first 29 observations of this variable were zeros, the 30th observation was assigned a value of 1 (the week following the recall announcement), and the last observation was assigned a value of 98, with intermediate observations running chronologically.

A possible permanent shift in the demand for peanut butter was modeled as a dummy variable taking on a value of 0 before the issuance of the recall and a value of 1 afterwards (*DUMMY*). This permanent shift corresponds to an abrupt structural change attributed to the initiation of the recall announcement.

To assess the effects of seasonality on peanut butter demand, the weekly observations were partitioned into four 13-week periods (*Q1, Q2, Q3, Q4*). Using the 4th 13-week period as a reference period, three dummy variables were used in the actual estimation to circumvent the dummy variable trap. Unit values, coupon, and income variables were deflated using the consumer price index with 1982-84=100 reported by the Bureau of Labor Statistics (2011).

According to the law of demand, there is a negative relationship between price and quantity demanded. As such, the coefficient associated with the own real unit value of peanut butter was expected to be negative. Theory suggests a negative relationship between the price of a complement good and the demand for the good in question. Hence, it was expected that the coefficient associated with the unit value of jelly would be negative. Based on theory and the good in question (peanut butter), the income effects were hypothesized to be positive, suggesting that peanut butter is a normal good rather than an inferior good. Theory suggests a positive relationship between coupons (price reduction) and the demand for the good in question. Hence, the coefficient estimate associated with the coupon variable was anticipated to be positive. The parameter estimate for the variable that counts weeks from recall was expected to be positive implying that as more and more weeks passed from the announcement of the recall, consumers would increase their consumption of peanut butter.

According to theory, the issuance of recalls likely results in a consumer response that ultimately leads to a decrease in the demand for the affected good. However, theory does not reveal any information regarding the magnitude and duration of this negative consumer response, which largely depends on consumer perceptions of the health risks and extent of knowledge about the outbreak and product recall events. As such, a negative sign was anticipated on all the coefficients associated with current and lagged outbreak variables, as well as the parameter estimate for the dummy variable associated with the beginning of the recall. However, depending on the economic behavior of rival brands and the purchasing behavior of consumers as well as their perceptions of the safety related to peanut butter, the consumption of peanut butter at the category level could rise. For example, in the wake of the recall of Peter Pan, Jif and Skippy may choose to invest in the safety of their brands leading consumers to further disassociate their brands from Peter Pan. As a result, consumers may discard Peter Pan and replace it with the other brands, Jif and Skippy.

Estimation Results

The estimated coefficients, which also are the elasticities, as well as the associated standard errors from the single-equation specification, are reported in Table 2. The significance of

coefficient estimates is indicated with asterisks. The significance level chosen for this analysis was 0.05.

According to Table 2, the R^2 for the model concerning the peanut butter category was 0.57 meaning that 57% of variation in the dependent variable was explained by the model. Standard economic variables took on the expected signs and significance suggested by theory. As expected, the parameter estimate for the unit value of peanut butter (representing price) was negative and statistically significant. In addition, the demand for peanut butter was inelastic such that a 10% decline in peanut butter unit value led to 7.8% increase in the quantity of peanut butter demanded, holding all other factors constant. The parameter estimate for the unit value of jelly was negative, as hypothesized; however, it was statistically insignificant.

Table 2. Peanut Butter Demand Estimation Results.

Variables	Variable Description	Estimate	Std Error
lnPPB	(Unit value of peanut butter)	-0.778*	0.097
lnPJ	(Unit value of jelly)	-0.072	0.048
lnCOUPPB	(Coupons for peanut butter)	0.006	0.005
lnINC	(Income)	0.424*	0.014
WKSFRRECALL	(Weeks from recall)	0.001*	0.0002
Q1	(Seasonality in quarter 1)	-0.024*	0.008
Q2	(Seasonality in quarter 2)	-0.007	0.005
Q3	(Seasonality in quarter 3)	-0.006*	0.003
DUMMY	(Binary=1 in all weeks after recall)	-0.026*	0.008
SQRTCDCCASE(0)	(CDC cases 0 lags)	0.001*	0.001
SQRTCDCCASE(1)	(CDC cases 1 lag)	0.002*	0.001
SQRTCDCCASE(2)	(CDC cases 2 lags)	0.002*	0.001
SQRTCDCCASE(3)	(CDC cases 3 lags)	0.001*	0.001
R^2		0.57	
Durbin-Watson		1.59	

Note: * Statistically significant at the 5% level.

As expected, the parameter estimate for the coupon was positive albeit statistically insignificant. The parameter estimate associated with income was positive and significantly different from zero implying that peanut butter is a normal good and a 10% increase in income led to 4.2% increase in the demand for peanut butter, controlling for all other factors. As indicated by the seasonal dummy variables, the demand for peanut butter was significantly lower in the first and the third quarters relative to that in the fourth quarter. Demand in the second quarter was not significantly different than that in the fourth quarter.

The food safety event variables present a complicated picture of the peanut butter category in the time surrounding the illness outbreak and the product recall. First, consider the *DUMMY* variable, which controls for the potential structural shift in the demand for peanut butter in the weeks following the recall. This binary variable took on a negative and statistically significant coefficient, indicating a reduction in the consumption of peanut butter on average in the post-recall period compared to the pre-recall period. While there was an overall reduction in consumption apparent from the binary shift variable, the effects tended to dissipate over time. Specifically, the coefficient on the count variable of the number of weeks since the product recall

was positive and statistically significant, as hypothesized, implying that consumers increased their purchases of peanut butter with the passage of time after the recall.

In addition to event indicators associated with the recall of products from distribution, the results demonstrate the association of product purchases with the number of cases of illness. All of the estimated coefficients associated with the outbreak variable were positive and statistically significant suggesting growth in household purchases of peanut butter. This atypical result may be explained by the restocking behavior on part of the households, where the contaminated peanut butter jars were replaced by other brands thus contributing to an overall increase in the purchases of peanut butter. The pattern of the predicted peanut butter purchased over time (in weeks after the recall) is illustrated in Figure 3. As shown, the quantity of peanut butter purchased declined around the time of the recall and shortly thereafter. However, when Peter Pan returned to the shelves, the quantity purchased of peanut butter increased rather dramatically. Then, it declined with seasonal movement reaching approximately its pre-recall level.

The specific results are best expressed with elasticities that represent both short-run and long-run effects. Letting w_s stand for the weight for lag period s, the short-run response in the quantity purchased of peanut butter for a unit change in outbreak variable, evaluated at the sample means, is computed by $\frac{\sum w_0}{2} CDCCASE^{-0.5} QPB$ and the short-run elasticity associated with the outbreak variable is calculated by $\frac{\sum w_0}{2} CDCCASE^{0.5}$. In addition, the long-run response in the quantity purchased of peanut butter given a one unit change in outbreak variable, at the sample means, is given by $\frac{\sum w_s}{2} CDCCASE^{-0.5} QPB$ and the long-run elasticity associated with the outbreak variable, at the sample means, is given by $\frac{\sum w_s}{2} CDCCASE^{0.5}$.In the peanut butter category, the short-run response was 0.011 indicating that each successive unit increase in the outbreak variable was associated with a rise in the short-run quantity purchased of peanut butter by 0.011 ounces, *ceteris paribus*. The elasticity was 0.001 indicating that as the outbreak variable went up by 10%, the short-run quantity purchased of peanut butter increased by 0.01%, *ceteris paribus*.

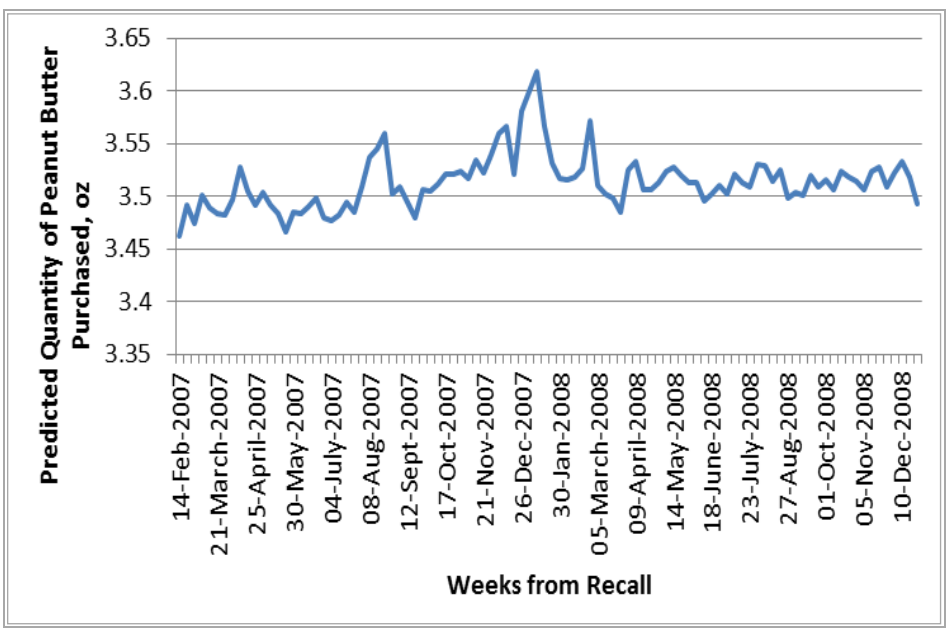

Figure 3. Predicted Quantity of Peanut Butter Purchased per Household vs. Weeks from Recall.
[a]**Source:** Authors' calculations based on parameters estimated from Nielsen Homescan panel data for household purchases of peanut butter, 2006, 2007, and 2008.

The long-run response was also modest but larger, with an increase in 0.056 ounces purchased for an incremental case of illness as reported by the CDC, everything else held constant. Upon conversion to percentages, the long-run elasticity associated with the outbreak variable was 0.006 meaning that, in the long-run, a 10% increase in illnesses was associated with a 0.06% increase in the quantity purchased of peanut butter, other factors held constant.

The connection between demand and the illness outbreak over defined periods of time also was explored. Three lags on the outbreak variable were statistically significant (and positive), suggesting that responses made by consumers to incremental cases of the foodborne illness occurred within three weeks cumulatively. The mean lag defined as $\frac{\sum sw_s}{\sum w_s}$, where w_s is the coefficient associated with lag period s, may be interpreted as the average length of time for unit changes in the outbreak variable to be transferred to changes in quantity of peanut butter purchased. The estimated mean lag was one and a half weeks.

Conclusions and Discussion

The impact of a foodborne illness outbreak on the demand for peanut butter was analyzed by estimating a second-degree distributed lag model with a lag length of three weeks and endpoint restrictions imposed. The estimation results showed that the food safety incident had various effects on the demand for the peanut butter category, depending on whether the incident was measured by outbreak variables ($SQRTCDCCASEt_{t-j}$) or by product recall variables ($WKSFRRECALL_t$, $DUMMY_t$).

After negative news reached the market, through public health alerts and a company-issued product recall, consumer demand for peanut butter fell immediately following the recall as measured by a dummy variable. This structural shift in demand is consistent with the finding by Bakhtavoryan, Capps, and Salin (2012), where a similar structural change in demand for peanut butter brought about by the recall was ascertained at the brand level. This general negative reaction is consistent with intuition that consumers associate risk to an entire product category and that a product can be damaged by lapses in safety due to a single company. At the same time, the estimation results show that, in this incident involving nationally branded goods, consumers did not entirely abandon the product category. There are positive market responses in the post-recall period that demonstrate that this public health alert was not a category killer. In particular, demand increased with the passage of time after the recall. This finding implies that after the recall consumers updated their perceptions regarding the safety of peanut butter in the presence of marketing actions taken by ConAgra, the manufacturer of the affected brands. In addition, consumer forgetfulness and dissipating fear may have also contributed to this market response. As for the outbreak variable, the illness cases were associated with increasing quantity purchased, which could be attributed to restocking behavior of the households. The households may have replaced the jars of recalled peanut butter brands with other peanut butter brands that were perceived to be safer actually purchasing more peanut butter in the end. In addition, the recovery of the category may well be due to the careful attribution of the outbreak to one brand in the health alert messages. This situation underscores the importance of public health officials' efforts to document outbreaks and link them to the food source as quickly as possible.

Using the 2007 peanut butter recall as a case study, this empirical study has implications for policymakers when dealing with food safety issues for brands of food products. This piece shows the importance of using a polynomial lag structure applied to the outbreak variable thus allowing for the dynamics of the dissemination of negative information and the potentially delayed consumer response to the negative information when considering the entire product category. Accurate information regarding the time period between the release of the negative information and consumer response can be used by policymakers to advocate for timely food safety warnings and recalls. This will result in the reduction of both potential risks associated with food safety crises and health care costs which are a major focus for many public policy interventions. Also, this piece demonstrates the importance of using number of confirmed cases associated with specific illnesses as an alternative source (besides media) at the disposal of policymakers when communicating food safety information to general public. Finally, in terms of policy relevance, it needs to be noted that the willingness of consumers to return to purchasing an implicated good means that public health officials should not hesitate to provide risk messages when the scientific evidence supports it, because there is precedent for the category to recover in relatively short time.

Acknowledgement

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Bad Quality and the Peach Industry: Consumer Reaction to Inferior Produce

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Abstract

The impact of introducing low quality fruit into the supply chain can have ramifications throughout the value chain. Taking peaches as an example, we utilize a Canada wide online consumer survey to better understand how a low quality purchase will affect a consumers' repurchase from the same producer, packer, retailer, and region. Results indicate that approximately half of respondents showed a lower propensity to repurchase from value chain members, including a decreased propensity to repurchase from the production region selling lower quality fruit. Further, consumer characteristics and behaviors do play a role in how a consumer places blame for lower quality peaches.

Keywords: organic, quality, value chain

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Introduction

Tender fruit, notably peaches, have long been a staple fruit within Canadian agriculture. In 2005, peach production was around 22,748 metric tonnes on a little over 3,000 hectares (Agriculture and Agri-Food Canada 2006). Ontario province makes up most of the production accounting for around 81% of the Canadian volume (Agriculture and Agri-Food Canada 2006). The economic value to Canada is substantial as peaches made up 3% of total farm gate fruit crop value in 2012, while making up as much as 15% of the total farm gate fruit crop value in Ontario (Statistics Canada 2013). Further, Ontario grown peaches maintain a market share between 51% and 79% depending on the season (Deolitte and Touche LLP 2010).

As the peach industry attempts to maintain market share and expand consumption, weaknesses have been noted. Notably, Canadian per capita consumption of peaches from 2008 to 2009 experienced a 17.7% decrease with longer term analysis indicating per capita consumption has remained stagnant at best (Agriculture and Agri-Food Canada 2010). In addition to stagnating to declining demand, competition from other countries has increased with Canada being a major importer of U.S. peaches along with the emergence of Chinese and Chilean product (Integrity Intellectual Property, Inc. 2009). Furthermore, the Ontario industry has experienced inconsistent quality at the consumer level and poor producer, packer, and shipper market orientation (Deloitte and Touche LLP 2010). Marketing boards have been set up to regulate harvest date and maturity, but inconsistent quality remains an issue for peach producers.

Introduction of lower quality peaches into the market can come from human/machine errors in harvesting/post-harvest handling or they could be due to other motives, such as a member of the value chain trying to increase profits or lower shrinkage by cheating on quality. As noted by Winfree and McCluskey (2005), unlike many products, produce is unique in that consumers often do not know the individual producer of the product, but instead rely on a collective reputation of a group of producers. This lack of identity or traceability can provide an incentive for a producer to provide “sub-optimal” quality product compared to the group and free ride on the reputation of the collective (Winfree and McCluskey 2005).

There exists extensive literature associated with supplying optimum quality peaches to consumers, see Crisosto (1989), Crisosto (1994), and Crisosto, Mitchell, and Johnson (1995). Regardless of how and why inferior quality peaches end up on the retail shelf, the consumer forms opinions about the product and subsequently value chain members, notably the producer, packer, and retailer and the production region. Given consumers can only evaluate quality after the purchase has been made, the pre-purchase quality can only be assessed in terms of the probability of being good or bad (Akerlof 1970). Assuming the consumer has a good experience they will have a higher propensity to repurchase. However, the extent to which a consumer repurchases given a “bad” experience is less understood, especially how it relates to repurchasing from the same source. For the purposes of this study, bad quality was considered to be unripe peaches. Therefore, the objective of this paper was to understand whether consumers would have a tendency to repurchase peaches from specific value chain members and the region of production given their preceding purchase of peaches was negative due to a bad quality experience. We anticipate that fruit packers and retailers would be blamed for lower quality compared to producers and the production region given packers and retailers are more likely to

have increased interaction with consumers. Specifically, our hypothesis was that consumers will have varying responses to previous bad quality experiences, notably that the fruit packer and retailer will be held responsible for unripe peaches as opposed to the producer and region. We also examine the role of demographic, purchasing behaviors, and postal code characteristics on the decision to repurchase. Our expectation was that demographics, especially age, income, and gender, and purchase behaviors, purchasing of local and organic, would have a significant impacts on the repurchase decision. Given the role of age and organic purchasing on repurchase, we then simulated how changing age and organic purchases would impact the repurchase decision.

Data and Methodology

Data

This study uses data from a Canada wide online survey sample conducted during Fall 2010. The survey was timed to coincide with when peaches were on the market. The intent of the survey was to gain a better understanding of how the peach purchase decision is made and how decisions by value chain members impact the value chain as a whole. Researchers contracted with a panel provider, Global Market Insite, Inc., to recruit consumers to take the survey. The only limiting question was age, which required respondents to be 18 years of age or older. The survey was divided into three sections depending on whether the respondent had purchased fruit and peaches (have not purchased fruit, purchased fruit but not peaches, purchased fruit and peaches). Respondents having not purchased fruit and/or peaches were given a slightly different survey (e.g. focused on reasons for not purchasing) than the peach purchasing group (e.g. focused on peach purchasing behavior). Notably, respondents that had not purchased fruit were asked to indicate why they had not purchased fruit during the last four months (such as allergic, too expensive, not available where shop, do not like taste, grow my own, someone else purchases, etc.), while respondents having purchased fruit but not peaches were asked to indicate why they had not purchased peaches (such as allergic, too expensive, not available where shop, do not like taste, do not like fuzz on peach skin, grow my own, someone else purchases, etc.).

The primary reason respondents had not purchased fruit was due to someone else purchasing, whereas lack of peach purchasing was most likely due to disliking the taste or the fuzzy skin. Respondents that had purchased both fruit and peaches were the primary group of interest for this study. A total of 1,469 consumers from across Canada were invited to participate in the study with 891 completed responses, representing a response rate of 61%. Of the 891 completed surveys, 3.4% did not purchase any fruit, 13.9% purchased fruit excluding peaches and 82.7% purchased fruit and peaches. The survey consisted of a variety of questions relating to demographic (e.g. age, gender, ethnic heritage, etc.), socio-economic (e.g. income), purchasing behavior (percent of food purchases that were local and organic), food attitude questions (e.g. does food matter?), and a conjoint section on peach products. Respondents also provided their postal code which was linked with 2006 Canadian Census records so as to provide key information (e.g. population density, median age, median income, etc.) about where they lived. In regard to representativeness as compared to the Canadian Census, our sample had a similar average household income of $60,949 (2010 Statistics Canada estimate - $69,860). A direct comparison of average age (study - 48.5 vs. census - 39.7 years) is not feasible given the average

census age takes into account the 22% of consumers under 18 years of age which were not a part of this study. Removing the under 18 age group from the census calculations, would make the average age of the sample similar to that of the census. Also, this study has a 60/40 female/male ratio, which is different from the 50/50 ratio found in the census. However, given women have been shown to be the major shopping group (Zepeda 2009; Flagg et al. 2013; Wolfe 2013), our survey oversampled women in order to be more representative of the actual shopping environment.

In order to assess the repurchase intent across value chain members, consumers were asked their likelihood of purchasing their next container of fresh whole peaches from the *same* source, such as a producer, packer, grocery store/farmer's market, and production region, given their *last purchase* was of bad quality due to being unripe. Producer, packer and grocery store/farmer's market are somewhat obvious points in the value chain, but region was included since firms selling a regional or specialty product often share a common or collective reputation, which is based on the group's aggregate quality (Landon and Smith, 1998; Winfree and McCluskey 2005). Based on the scenario given we were examining the effect if the previous peach purchasing experience was negative, so our results do not indicate how long-term positive and negative experiences would impact the consumer's decision.

A 7-point itemized semantic differential scale was used to measure the consumer's intention to purchase again after the initial bad quality purchase where 1 = "definitely would not purchase," 4 = "may or may not purchase," 7 = "definitely would purchase, and 2, 3, 5, and 6 are intermediate values of willingness to purchase again from the same source. This question is hypothetical in nature and does not purport to exactly measure whether they will repurchase. For instance, a consumer may say they will not purchase again from a producer, but in reality they may not know the producer or have the option of another producer; however, this question allows us to gain some insight into whom the consumer blames for the initial bad quality purchase. From these results we can gain some key insights into the purchasing decision as well as providing recommendations for the peach industry.

Empirical Methods

Given consumers were asked to rate their likelihood of re-purchasing whole fresh peaches from the same source on a 1 to 7 differential scale, the ordered nature of the categories must be accounted for in the analysis. Therefore, we utilized an ordered logit model (OLM) to analyze the producer, packer, retailer, and region models separately. The OLM assumes we observe y via the scale ratings, however, there is a continuous, unmeasured latent variable y* that dictates the value of y. Thus, the value of y is

(1) $y_i = j$ if $\tau_{j-1} \leq y_i^* < \tau_j$ for j = 1 to 7

where τ is the threshold between the scale ratings and j is the scale values. Furthermore, the log likelihood can be defined as

(2) $\ln L(\beta, \tau \mid y, x) = \sum_{j=1}^{7} \sum_{y_i=1} \ln[F(\tau_j - x_i\beta) - F(\tau_{j-1} - x_i\beta)]$

where $\beta_0 = 0$ and F(.) is defined as

$$(3)\ F(.) = \frac{\exp(.)}{1+\exp(.)}$$

with the error term having a logistic distribution zero mean and $\pi^2/3$ variance (Long, 1997). Equation 2 can then be maximized to get estimates for β and τ. As noted by McFadden (1986) many factors (e.g. demographics, habits, experience, and attitudes) can contribute to the purchase decision. Thereby, x represents a set of explanatory variables consisting of demographic (i.e. income, education, married/partner, age, adults and children in household, gender, length of time lived in Canada, and ethnic heritage), purchase behavior (i.e. primary shopper, primary shopping outlets, percent organic food purchases, percent local food purchases, and amount of fruit budget spent on peaches), attitudes (i.e. whether food matters and whether food is of interest), and postal code characteristics (i.e. live in fruit producing region, median income, median age, population density, population change, household size, and percent visible minority).

A core assumption of the OLM is the satisfaction of the proportional odds assumption. Results of Brant's (1990) test indicated that we failed to reject our null hypothesis of having proportional odds; thereby, implying the OLM is an appropriate econometric technique for our data. Furthermore, we found statistical difference between the thresholds, indicating that the seven categories cannot be reduced.

To further explore how consumers react to inferior quality produce, we utilized the predicted probabilities in order to observe changes in purchasing behaviors and their effect on willingness to repurchase from a previous supplier. We focused on the purchasing age and organic purchasing of peaches as the OLM results indicated these variables impacted consumers' purchasing behavior. Predicted probabilities associated with every observed outcome can be found by calculating:

$$(4)\ \Pr(y_i = j|x_i) = F[(\tau_j - x_i\beta) - F(\tau_{j-1} - x_i\beta)]$$

where τ is the threshold, x_i is a set of explanatory variables, β being the coefficients from equation 2, and F(.) taking the form given in equation 3 (Long 1997).

Results and Discussion

One of our main hypotheses was that consumers will have varying responses to previous bad quality experiences, notably that the fruit packer and retailer will be held more responsible than the producer and region. Examining Table 1 we see that the distribution of responses of peach repurchasing shows fairly consistent results across the value chain. For instance, the results indicate that only 2% of consumers definitely would repurchase from the same packer, with another 7% and 3% indicating they would fall in the range between "may or may not" and "definitely would" repurchase. However, 5%, 6% and 14% of respondents marked a response (i.e. either, 5, 6, or 7 on the scale) in the would repurchase part of the scale. Around 30-40% of consumers indicated they "may or may not" repurchase from the same source/region (scale

rating of 4). Thus, approximately one-half of consumers are undecided or have a high propensity to repurchase from the same source (i.e. marked 4, 5, 6, or 7 on the scale).
Approximately half of consumers indicated that they would be less inclined to purchase from the value chain members again. For retailers, who can directly be identified since they are the consumer's point of contact, 18% said they would "definitely not purchase" from them again (Table 1). Based on the results above, retailers would be directly impacted by their own decisions (e.g. introducing unripe peaches to the market) as well as decisions by producers and packers/processors (e.g. incorrect postharvest practices) given harvesting decisions at any level of the value chain will impact the retailer. Also of interest is that 34% of the sample (14%+9%+11%) had a tendency to not purchase peaches from the same region again (Table 1). Even though this is a lower percentage than for producers, packers, and retailers, it is still a sizable portion of the market, especially given the competition from U.S., Chinese, and Chilean peaches. From these results it is clear that a single producer, packer, or retailer can have a large impact on the collective reputation of the region if they introduce unripe peaches to market. Based on consumption trends and the highly competitive nature of the peach market, losing small amounts of consumers could be a major setback for the local industry.

Table 1. Consumer Willingness to Purchase Peaches from a Value Chain Member after a Bad Purchase Experience

		Supplier (Purchased from)			
Peaches	**Differential Scale**	**Producer**	**Packer**	**Retailer**	**Region**
Definitely not	1	24%	24%	18%	14%
	2	15%	16%	12%	9%
	3	13%	15%	13%	11%
May or may not	4	33%	33%	36%	40%
	5	8%	7%	13%	14%
	6	4%	3%	4%	6%
Definitely would	7	3%	2%	4%	5%
N		737			

Notes: [a] Scale used was a 1-7 itemized semantic differential scale where 1="Definitely would not purchase," 4="May or may not purchase," and 7="Would purchase," with 2, 3, 5 and 6 being intermediate responses.

On the whole, we reject our hypothesis that packers and retailers would be held more responsible for bad quality as producers and to a lesser extent the production region share blame. Our findings do provide interesting points for the industry. Currently, consumers most likely have asymmetric information about producers and packers, such that they may not know the name of the producer or packer. However, new campaigns are being implemented to link producer with consumer, such as increased food traceability and know your farmer campaigns. As these campaigns become more embedded in the food system, our results allow the value chain to see the potential effect of offering inferior quality to the consumer.

The results of Table 1 do invite a critical question, are there certain consumer characteristics that may lead a consumer to blame a specific value chain member and not others? This question leads to our second hypothesis that demographics (notably age, income, and gender) and purchase behaviors (local and organic purchasing) would have significant impact on the repurchase decision. Using the OLM models we evaluated this hypothesis.

Initial examination of the results from the OLM model indicate that there were significant Wald χ^2 values across models and that the Brant test failed to reject that the proportional odds assumption for all models (Table 2, see Appendix). Furthermore, each category threshold was significantly different from the next, implying categories should not be condensed.

Demographic Variables

With regard to the question whether consumer characteristics play a role in a consumers' repurchasing of peaches given a previous bad experience, we found certain consumer characteristics were indicators of consumers' tendencies to repurchase (Table 2). Examining our demographic variables of interest, we found that age had a significantly negative effect on how bad quality impacted the repurchase decision. For instance, as age increased, the ordered log-odds of being in a higher category (i.e. repurchasing) decreased between -0.026 and -0.014 depending on the value chain member. In other words, older consumers had a decreased propensity of repurchasing from a value chain member after experiencing bad quality. However, income and gender had no effect on the decision to repurchase. This is somewhat surprising as we would expect consumers that are female or that have more income to shift away from the peach product/brand that gave them a negative experience to peaches from other suppliers/regions.

With respect to the other demographics, we find that education, number of adults in the household, and Asian heritage impact repurchasing from producers, while education, number of adults, and Asian heritage effect packer sourcing. For instance, being of Asian heritage compared to Canadian heritage increased the ordered log-odds by 0.402 and 0.457 of being in a higher category for repurchasing from a producer and packer, respectively. This implies that Asian heritage consumers have an increased propensity for purchasing from the same producer and packer after a bad quality experience. Older consumers, on the other hand, are less likely to be in a higher category (of repurchase) from "bad quality" producers (-0.014) or packer (-0.026). For retailers we see no significant factor other than age, while for production region we only find number of adults in household as being a significant demographic influence. Given only limited demographic variables are significant across models, we can only partially fail to reject our hypothesis that demographics play a role in the repurchasing decision after experiencing bad quality. Our results do, however, offer key insights since we found a couple of significant demographic variables. Based on our findings it is clear that value chain members need to be acutely aware of the demographics they are servicing. As such peaches headed to certain clientele markets (e.g. older consumers) should probably be tested more thoroughly for ripeness than peaches headed to other markets in order to insure that fewer unripe peaches make it to the retail shelf.

Purchase Behavior Variables

The second part of our hypothesis was that purchasing behaviors would play a key role in the decision to purchase peaches after a bad quality experience. With respect to this part of the hypothesis, we see our biggest findings. First, as consumers purchase increasing amounts of locally produced food, there is no effect on their likelihood of repurchasing from anyone in the value chain after a bad experience (Table 2). Our expectation was that consumers that purchase

increased amounts of local food might be more tuned in to the dynamic nature of peaches, thereby being more amenable to a bad peach quality experience. However, our findings indicate there is no effect from increased purchasing of locally produced foods. In contrast, consumers that purchase increased amounts of organic food have a tendency to repurchase from all members of the value chain. This is most likely due to organic buyers either being more exposed to quality issues or they are more in tune to the dynamic nature of peaches (and most likely produce in general). Thus, organic buyers seem to be a little more forgiving for lower quality peaches than consumers purchasing less organic food.

Also of note, where a respondent primarily shops did not impact the likelihood of purchasing again from any value chain member. We anticipated that consumers shopping at farmers' markets would be more forgiving than consumers shopping at large chain stores, but we found that retail outlet had no effect on how likely consumers were to repurchase peaches from a value chain member or production region.

Attitude and Postal Code Variables

With regard to food attitudes and purchasing behavior, there are some interesting findings (Table 2). First, consumers saying "food is increasingly important to them" have lower likelihoods of purchasing again from the packer (-0.191), while not effecting the repurchase decision for any other value chain member or region. However, we see that as the percent of peach expenditures makes up an increasing amount of the fruit budget a consumer is more likely to repurchase from a producer and packer after a negative experience.

In examining the postal code characteristics, the most important finding surrounds the density per square km variable. A 100 person increase in population per square km results in a statistically significant reduction (-0.01) in the ordered log odds of repurchasing from the same retail store. A potential explanation for this revolves around rural consumers' potentially having a better understanding of the dynamic nature of peaches, such as the ripening cycle of peaches. However, the implication for retailers in more urban areas is that their customers are potentially more sensitive to lower quality than their more rural counterparts. Enacting more stringent testing policies or testing programs in-store could lead to less unripe peaches reaching consumer hands.

Simulations

Based on the results above, we investigated how changes in age and organic purchasing would impact willingness to repurchase across value chain members holding all other variables constant at their mean. Predicted probability outcomes were assigned to a differential scale category. As shown in Table 3 (see Appendix), older consumers are more likely to fall in a less likely to repurchase category. For instance, as consumer age moves from 20 to 65, holding all other variables constant, the percentage of consumers falling into the "definitely would not purchase" category doubles for each value chain member. The reason for this could stem from older consumers having more experience in purchasing peaches and, thereby, having an expectation that peaches should be of good quality.

Increased amounts of organic purchasing, holding other variables constant, shifts consumers from not willing to repurchase to moderate points on the scale and even gains in willingness to repurchase (Table 4, see Appendix). For instance, examining the producer model results at the 5% organic purchasing level indicates that 56% (25% + 17% + 14%) of consumers have a lower propensity of repurchasing peaches after a bad experience. When looking at the 95% of organic purchasing level, holding all other variables constant, only 38% are in the not willing to repurchase portion of the differential scale. The packer, retailer, and region models show the same shift, consumers purchasing more organic fruit tend to be more willing to repurchase from the same producer, packer, retailer, and region that sold them bad quality peaches in their last purchase occasion.

Conclusions

Based on the evidence of this study, our results suggests that the peach value chain and production region are intertwined such that actions of one member can harm the rest of the value chain and even the collective reputation of the region. Even though everyone can be harmed through bad quality, the regional label tends to be hurt the least compared to producers, packers, and retailers. However, the region is blamed by a fairly large percentage of consumers, which given the competitive nature of the produce industry can have important impacts.

Furthermore, we do see that certain characteristics and behaviors do drive how a consumer will react to a previous low quality preach purchase. Some characteristics and behaviors affect all value chain members, such as age and organic purchasing, while other characteristics affect only certain value chain members, such as Asian heritage, food matters, and some college education.

Even though the results of this survey are directly applicable to the peach industry, it is logical that a direct parallel can be drawn to other fruits and vegetables. Our results offer several applicable insights. Notably, value chain members need to be aware that their decisions matter and the impact of introducing bad quality product onto the market, either intentionally, or unintentionally, will directly depend on the characteristics of the final consumer. By incorporating more intense quality checks, such as insuring ripeness is at an acceptable level, value chain members can protect their reputation and the reputation of their regional brand. Many fruit products, peaches included, have quality standards around ripeness. Standards such as these should be monitored and improved depending on the market where the product will be sold. Also, our results indicate that value chain members need to work together to validate quality, as quality mistakes made by a value chain member can affect everyone within the value chain.

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Appendix

Table 2. Log-likelihoods from the Ordered Logit Model by Value Chain Member.

	Producer		Packer		Retailer		Region	
Variable	Coeff.	*p-value*	Coeff.	*p-value*	Coeff.	*p-value*	Coeff.	*p-value*
Income	-0.000	*0.672*	-0.000	*0.355*	-0.000	*0.341*	-0.000	*0.285*
Education:(base = college or less)								
Some college	**-0.485**	*0.019*	**-0.504**	*0.015*	-0.315	*0.119*	-0.086	*0.669*
Bachelor's degree	-0.336	*0.156*	-0.371	*0.126*	-0.344	*0.157*	0.072	*0.759*
Above Bachelor's	-0.285	*0.258*	-0.272	*0.261*	-0.117	*0.611*	0.031	*0.893*
Married/Partner: (1 = yes)	-0.236	*0.189*	-0.101	*0.576*	-0.016	*0.928*	0.005	*0.975*
Age	**-0.014**	*0.030*	**-0.026**	*0.000*	**-0.024**	*0.000*	**-0.022**	*0.000*
Persons ≥18 years in household	**0.135**	*0.057*	**0.132**	*0.071*	0.111	*0.165*	**0.206**	*0.007*
Persons <18 years in household	0.120	*0.177*	0.000	*0.997*	-0.026	*0.774*	-0.045	*0.633*
Gender: (1 = Male)	-0.080	*0.617*	-0.056	*0.726*	-0.001	*0.996*	0.016	*0.914*
Ethnic heritage: (base = Canadian)								
European	0.020	*0.906*	-0.039	*0.812*	-0.087	*0.613*	0.092	*0.589*
Asian	**0.402**	*0.094*	**0.457**	*0.068*	0.162	*0.480*	0.074	*0.753*
Other ethnic heritage	0.070	*0.800*	-0.159	*0.539*	-0.165	*0.538*	-0.359	*0.218*
Primary household shopper (1 = yes)	-0.139	*0.388*	0.006	*0.972*	0.002	*0.988*	0.112	*0.474*
Retail outlet primarily shop (choose all that apply question)								
Large chain store	-0.021	*0.906*	0.018	*0.920*	-0.031	*0.863*	0.004	*0.982*
Independent store	0.196	*0.192*	0.202	*0.187*	0.186	*0.231*	0.151	*0.303*
Discount store	-0.026	*0.906*	-0.059	*0.790*	0.041	*0.853*	0.276	*0.226*
Farmers' market	0.045	*0.776*	-0.036	*0.813*	0.146	*0.347*	0.165	*0.275*
Other	-0.022	*0.903*	-0.041	*0.822*	-0.088	*0.632*	0.079	*0.684*
Live in major fruit production region *(1 = no)* [a]	0.161	*0.368*	-0.067	*0.714*	-0.064	*0.722*	0.016	*0.931*
Food matters to me [b]	-0.149	*0.158*	**-0.191**	*0.076*	-0.098	*0.346*	0.010	*0.919*
Food interest to me [b]	-0.089	*0.362*	-0.088	*0.350*	0.013	*0.891*	-0.016	*0.871*

Table 2. *Continued*

	Producer		Packer		Retailer		Region	
Variable	Coeff.	*p-value*	Coeff.	*p-value*	Coeff.	*p-value*	Coeff.	*p-value*
Percent food purchases locally produced	0.002	*0.439*	0.001	*0.674*	-0.002	*0.599*	0.003	*0.415*
Percent food purchases organically produced	**0.008**	*0.083*	**0.008**	*0.070*	**0.008**	*0.030*	**0.009**	*0.021*
Length of time lived in Canada (years)	0.008	*0.734*	0.006	*0.776*	-0.011	*0.562*	-0.014	*0.505*
Spending dollar ratio: percent peach/fruit	**0.036**	*0.006*	**0.025**	*0.056*	0.019	*0.149*	0.019	*0.121*
Postal code characteristics								
% Population change from 2001 to 2006	0.010	*0.427*	0.008	*0.512*	0.006	*0.618*	0.018	*0.122*
Population density per square km [c]	-0.004	*0.458*	-0.006	*0.267*	**-0.010**	*0.056*	-0.060	*0.286*
Median age	-0.017	*0.424*	-0.034	*0.135*	**-0.054**	*0.020*	-0.017	*0.559*
Median after tax income	-0.000	*0.449*	-0.000	*0.921*	0.000	*0.828*	0.000	*0.945*
Average household size	-0.365	*0.308*	-0.533	*0.158*	-0.425	*0.232*	-0.450	*0.213*
Percent visible minority	**-0.199**	*0.040*	-0.126	*0.160*	-0.010	*0.918*	-0.040	*0.696*
	Cut point	***p-value***	**Cut point**	***p-value***	**Cut point**	***p-value***	**Cut point**	***p-value***
Cut point 1 vs. Cut point 2	-23.7		-18.5		-7.3		-7.8	
Cut point 2 vs. Cut point 3	-23.0	*0.000*	-17.7	*0.000*	-6.6	*0.000*	-7.1	*0.000*
Cut point 3 vs. Cut point 4	-22.4	*0.000*	-17.0	*0.000*	-6.0	*0.000*	-6.6	*0.000*
Cut point 4 vs. Cut point 5	-20.6	*0.000*	-15.1	*0.000*	-4.3	*0.000*	-4.7	*0.000*
Cut point 5 vs. Cut point 6	-19.7	*0.000*	-14.0	*0.000*	-3.2	*0.000*	-3.7	*0.000*
Cut point 6 vs. Cut point 7	-18.7	*0.000*	-13.1	*0.000*	-2.4	*0.000*	-2.9	*0.000*
Number	737		737		737		737	
log pseudo likelihood	-1203.0		-1165.7		-1241.2		-1220.0	
Wald chi^2	85.41	*0.000*	82.82	*0.000*	80.25	*0.000*	79.59	*0.000*
Brant test of proportional odds assumption	155.2	*0.481*	166.9	*0.243*	139.7	*0.805*	171.3	*0.176*

Notes: [a] Major production regions for Canadian produce include Ontario and British Columbia, so we defined major production regions as consumers living in Ontario or British Columbia.
[b] Represents values on a 7-point itemized semantic differential scale where 1 = disagree and 5 = agree.
[c] Multiplied by 100, implying an increase in 100 people per sq. km decreases the ordered log odds by -0.010

Table 3. Percentage of Consumers Willing to Purchase Again from Specific Value Chain Members (on 1-7 scale) Based on Predicted Probabilities from Changing Age, Holding All other Variables Constant.

	Definitely Would Not			**May or May Not**			**Definitely Would**
	1	**2**	**3**	**4**	**5**	**6**	**7**
Age			*Purchase Again from Same Producer*				
20	17%	12%	13%	41%	10%	4%	3%
25	18%	13%	14%	40%	9%	4%	3%
30	19%	14%	14%	39%	9%	4%	3%
35	20%	14%	14%	38%	8%	4%	2%
40	22%	15%	14%	37%	8%	3%	2%
45	23%	15%	14%	36%	7%	3%	2%
50	25%	16%	14%	34%	7%	3%	2%
55	26%	16%	15%	33%	6%	3%	2%
60	28%	16%	14%	32%	6%	2%	2%
65	29%	17%	14%	31%	6%	2%	1%
	Definitely Would Not			**May or May Not**			**Definitely Would**
	1	**2**	**3**	**4**	**5**	**6**	**7**
Age			*Purchase Again from Same Packer/Processor*				
20	13%	12%	14%	44%	10%	5%	3%
25	15%	12%	15%	42%	9%	4%	3%
30	17%	13%	16%	41%	8%	4%	2%
35	18%	14%	16%	39%	7%	3%	2%
40	20%	15%	16%	37%	6%	3%	2%
45	22%	16%	17%	36%	6%	3%	2%
50	24%	17%	17%	34%	5%	2%	1%
55	27%	17%	17%	32%	5%	2%	1%
60	29%	18%	16%	29%	4%	2%	1%
65	32%	18%	16%	27%	4%	2%	1%

Table 3. *Continued*

	Definitely Would Not			May or May Not			Definitely Would
	1	**2**	**3**	**4**	**5**	**6**	**7**
Age				*Purchase Again from Same Retailer*			
20	15%	12%	14%	42%	9%	5%	3%
25	16%	13%	15%	41%	8%	5%	3%
30	18%	13%	15%	40%	7%	4%	2%
35	20%	14%	16%	38%	7%	4%	2%
40	22%	15%	16%	37%	6%	3%	2%
45	24%	16%	16%	35%	5%	3%	2%
50	24%	16%	16%	35%	5%	3%	2%
55	26%	16%	16%	33%	5%	3%	1%
60	28%	17%	16%	31%	5%	2%	1%
65	30%	17%	16%	29%	4%	2%	1%
Age				*Purchase Again from Same Region*			
20	8%	5%	8%	44%	17%	9%	8%
25	9%	6%	9%	44%	16%	8%	8%
30	11%	6%	10%	44%	15%	8%	7%
35	12%	7%	10%	44%	14%	7%	6%
40	13%	8%	11%	44%	13%	6%	5%
45	15%	8%	12%	44%	12%	6%	5%
50	16%	9%	12%	43%	11%	5%	4%
55	18%	9%	13%	42%	10%	5%	4%
60	20%	10%	13%	40%	9%	4%	3%
65	22%	11%	14%	39%	8%	4%	3%

Table 4. Percentage of Consumers Willing to Purchase Again from Specific Value Chain Members (on 1-7 scale) Based on Predicted Probabilities from Changing the Percent of Organic Fruit Purchased, Holding All Other Variables Constant.

	Definitely Would Not			**May or May Not**			**Definitely Would**
	1	**2**	**3**	**4**	**5**	**6**	**7**
% Organic Purchases			*Purchase Again from Same Producer*				
5	25%	17%	14%	33%	6%	3%	2%
15	23%	16%	14%	34%	7%	3%	2%
25	22%	16%	14%	35%	7%	4%	2%
35	20%	15%	14%	36%	8%	4%	3%
45	19%	15%	14%	37%	8%	4%	3%
55	18%	14%	13%	38%	9%	5%	3%
65	17%	14%	13%	39%	9%	5%	3%
75	16%	13%	13%	40%	10%	5%	3%
85	15%	12%	13%	40%	11%	6%	4%
95	14%	12%	12%	41%	11%	6%	4%
% Organic Purchases			*Purchase Again from Same Packer/Processor*				
5	25%	18%	16%	33%	6%	2%	1%
15	23%	17%	16%	34%	6%	2%	1%
25	22%	17%	16%	35%	6%	2%	2%
35	21%	16%	16%	36%	7%	2%	2%
45	19%	16%	15%	37%	7%	3%	2%
55	18%	15%	15%	39%	8%	3%	2%
65	17%	15%	15%	40%	8%	3%	2%
75	16%	14%	15%	41%	9%	3%	2%
85	15%	14%	15%	42%	9%	3%	2%
95	14%	13%	14%	42%	10%	4%	3%

Table 4. *Continued*

	Definitely Would Not			May or May Not			Definitely Would
	1	**2**	**3**	**4**	**5**	**6**	**7**
% Organic Purchases			*Purchase Again from Same Retailer*				
5	19%	13%	14%	36%	12%	3%	3%
15	17%	12%	13%	37%	12%	4%	4%
25	16%	12%	13%	38%	13%	4%	4%
35	15%	11%	13%	38%	14%	4%	4%
45	14%	11%	12%	39%	15%	5%	5%
55	13%	10%	12%	39%	16%	5%	5%
65	12%	10%	12%	40%	16%	5%	5%
75	11%	9%	11%	40%	17%	6%	6%
85	11%	9%	11%	40%	18%	6%	6%
95	10%	8%	10%	40%	19%	7%	7%
% Organic Purchases			*Purchase Again from Same Region*				
5	15%	10%	12%	42%	12%	5%	4%
15	14%	10%	11%	43%	13%	5%	4%
25	13%	9%	11%	43%	14%	5%	5%
35	12%	8%	11%	43%	15%	6%	5%
45	11%	8%	10%	43%	16%	6%	6%
55	10%	7%	10%	43%	17%	7%	6%
65	9%	7%	9%	43%	18%	7%	7%
75	8%	6%	9%	43%	19%	8%	8%
85	8%	6%	8%	42%	19%	9%	8%
95	7%	6%	8%	42%	20%	9%	9%

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Institutional Demand for Locally-Grown Food in Vermont: Marketing Implications for Producers and Distributors

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Abstract

Institutional food service operations have shown increasing interest in locally grown foods, and are providing a business opportunity for farmers and distributors. The purpose of this paper is to present and discuss the results and implications of a survey assessing institutional food service operations in Vermont. We used the 4 P's (price, product, place, and promotion) Marketing Mix framework to highlight marketing strategies for farmers and distributors wanting to increase their sales of local food to institutions.

Keywords: institutional procurement, demand for local food, 4 P's Marketing Mix framework, fruits, vegetables, eggs

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Introduction

Interest in local food continues to grow. Direct sales channels such as farmers' markets and Community Supported Agriculture (CSA) farms continue to increase in number (Martinez et al. 2010; USDA 2011). The US Department of Agriculture (USDA) has begun promoting locally grown food and closer connections between farmers and eaters through the Know Your Farmer Know Your Food program (USDA 2010). At the same time, institutional food services, particularly those in K-12 schools, have shown interest in increasing procurement of local foods, often under the auspices of farm-to-school (FTS) or farm-to-institution (FTI) programs. Selling to institutional markets presents an opportunity for mid-scale farms who often have trouble competing in direct or commodity markets, yet play a vital role in US agriculture (Maine Sustainable Agriculture Society 2013, Kirschenmann et al. 2008). These markets provide diversification strategies for larger farms as well as smaller farms; however, the latter may need coordinated aggregation efforts among many farms to meet a needed scale.

Despite the potential benefits of FTI programs, no study has comprehensively examined how these programs can fit into marketing plans of producers and distributors. Specifically, there is a gap in the literature on: 1) what products and attributes of local food interest institutions (product), 2) the degree to which price is a barrier (price), 3) whether and how different types of institutions differ in their interest in and purchase behaviors around local foods (place), and 4) what materials and assistance would motivate each institution to increase local food purchases (promotion). This study proposes to fill these gaps and will inform efforts by farmers, distributors, and service providers. This paper discusses results and implications of a 2012 survey of institutional food service operations in Vermont, a state with a vibrant local food movement and well-established FTI programs. The next section will discuss: 1) prior studies on the benefits of locally grown foods, 2) literature on institutional food procurement, and 3) how these studies inform the marketing strategies of farmers and distributors, using the 4 P's (product, price, place, and promotion) Marketing Mix framework (McCarthy 1964). The subsequent sections will present the methods and survey results. The discussion focuses on implications for local food producers and distributors wanting to increase their sales to institutions, as well as for technical assistance providers working with producers and distributors.

Background

Institutional food services offer opportunities for increased sales of local food in two ways: 1) they are of a larger magnitude than direct sales, and 2) many institutions combine experiential education opportunities and missions which promote locally grown foods as part of broader healthy eating and community food system education efforts (Friedmann 2007, Conner et al. 2012). The desire on the part of institutions to source locally grown food is evidenced by the more than 12,000 FTS programs found in the US (National Farm to School Network 2013). The number of other institutions engaged in these efforts and assisted by national and regional programs such as the Real Food Challenge on college campuses and the Health Care Without Harm's Healthy Food initiative in health care facilities, is also growing and indicative of a strong desire to source food locally (National Farm to School Network 2013; Real Food Challenge 2012; Heatlh Care Without Harm 2013). FTS programs "connect schools (K-12) and local farms with the objectives of serving healthy meals in school cafeterias, improving student nutrition,

providing agriculture, health and nutrition education opportunities, and supporting local and regional farmers" (National Farm to School Network 2013). FTS programs, which are part of a grassroots movement, vary by school, and can include food and agriculture curriculum or just be limited to serving local food in the cafeteria. Beginning in 2012, $5,000,000 was made available annually by the US government through competitive grants to be used for training, planning, purchasing equipment, building school gardens, and developing partnerships to create new or support existing FTS programs.

The literature suggests an array of community benefits to FTI participation, which motivates interest from scholars and practitioners. Institutions cite motivations such as fresher, higher quality foods; higher participation/greater purchases; support for local farmers; and contributions to nutrition, health education and anti-obesity efforts, while communities cite increased civic engagement, pride and problem solving capacity (Izumi, Wright, and Hamm 2010, Vogt and Kaiser 2008, Bloom and Hinrichs 2011). FTI as part of a local food marketing strategy can contribute to farm viability and create environmental benefits by preserving vulnerable farmland, particularly that on the urban fringe (American Farmland Trust 2013).

Despite this institutional interest in local foods, several lingering barriers have been identified by multiple studies including infrastructure challenges such as inadequate kitchen equipment, untrained kitchen staff, and limited storage space for unprocessed food (Vogt and Kaiser 2008). In terms of the food itself, barriers include food safety concerns, distributors not carrying or identifying local foods, inconsistent quality, and seasonality (Izumi et al. 2006, Dimitri, Hanson, and Oberholtzer 2012). Seasonality is particularly an issue in parts of the country where the growing season is short. Institutional buyers and distributors have to shift their purchase patterns depending on the availability of the local produce supply, the result of inconsistent supply of local food.

Regulatory barriers that school food directors are faced with involve contradictory policies around procurement. For example, some schools are encouraged to purchase local food yet regulations prohibit geographical preferences during the bidding process. Lastly, the biggest barrier cited in the literature is the limited operating budget within institutions (Vogt and Kaiser 2008). Awareness of these barriers should help farmers and distributors better understand the needs and difficulties institutions face when it comes to sourcing local food, which can in turn inform their marketing approach.

While many types of institutions are moving towards purchasing more local food, their needs are most likely different. Schools do not operate year-round and due to summer vacations miss a big part of the growing season. Hospitals serve patients with compromised immune systems and might focus more on food safety and improving diets, while food services in colleges tend to be operated by contracted food services and the change in purchasing is often driven by students' demand.

Producers and distributors wanting to increase their institutional sales should consider the motivations and barriers that have been identified and market their products accordingly. The 4 P's (product, price, place, and promotion) Marketing Mix framework is a well-known framework for guiding a firm's marketing activities. A review of both peer-reviewed and outreach-oriented literature provides guidelines for how FTI programs may fit into both farms' and distributors'

marketing mixes. To our knowledge, there are no other studies that used the 4 P's Marketing Mix framework to inform the marketing strategies of farmers and distributors. The 4 P's model is criticized by some as outdated and limited in addressing marketing of services and new technologies (Constantinides 2006), yet it is a framework that is still widely used (Jobber 2001) because it outlines four well-defined and unique management processes (Goi 2009, Pomering and Noble 2008). Furthermore, we propose including the social aspect of sustainability in the 'promotion' component of the 4 P's as 'promotion' is conducive to communication around this attribute. In addition, we embed in the promotion section topics important to today's food marketing strategies (such as social media, branding and sustainability) not covered in the traditional 4 P's model.

Product

Institutional buyers' interest in local food stems from improved freshness and flavor as well as contributions to nutrition education efforts and support for the local economy (Izumi et al. 2006, Vogt and Kaiser 2008, Onozaka, Nurse, and McFadden 2010). Institutional markets may best serve as a means for producers to diversify their markets rather than as a primary revenue source due to pricing barriers. Some farmers see these markets as outlets for #2 (slightly blemished) or odd-sized items that are not cosmetically perfect or uniform enough for retail sale, but are able to gain prices higher than if used for processing (Conner et al. 2011).

A wide array of items from all food groups are sourced through FTI programs. Many institutional buyers prefer pre-cut fresh produce (Conner et al. 2011); flash freezing and storage of fresh produce in states with limited growing seasons, such as Vermont, provides an opportunity to extend the seasons in which local produce is available (Conner, Estrin, and Becot 2014). Meeting this demand requires farmers and distributors to either invest in processing equipment (e.g. cutting and freezing) and human capital, or to work with existing processors with these capacities. The former decision carries the risk of investment in new equipment and human capital as well as diverting the farmer or distributor from their core business competency. The latter implies another layer of complexity and transaction costs. Therefore, a clearer picture of what institutions want to buy, in what quantities and in what form, will inform investment and partnership strategies.

Price

While benefiting the local economy by supporting local farmers has been cited as a motivator to purchasing local food (Onozaka, Nurse, and McFadden 2010), price is often mentioned as a barrier for institutional sales. Institutions, especially K-12 schools, have tight budgets (Strohbehn and Gregoire 2003). A recent study found the food cost per school meal to be between $1.17 and $1.38, which must cover one serving each of protein, grain, milk, fruit, and vegetables (Newman 2012). Institutional buyers may utilize creative purchasing practices in order to make locally sourced foods competitive with those grown farther away and fit within their small budgets (Izumi, Wright, and Hamm 2010). One recent study suggests that non-school institutions like senior centers and hospitals may be less price constrained and therefore able to afford slightly higher prices (Sevoian and Conner 2012). Nonetheless, it is unlikely farmers will receive premium prices in the institutional market, even for products identified as locally grown. As a

result, farmers participating in FTS and FTI programs see these markets as diversifying their portfolios, creating market for aforementioned #2/oddly-sized items, and bringing ancillary social and community benefits rather than comprising of a sizable and lucrative market in and of itself (Conner et al. 2012, Izumi, Wright, and Hamm 2010).

Place

Many types of institutions are involved in FTI programs. K-12 schools are currently viewed as the most prominent and likely most numerous. The National Farm to School Network website claims 12,429 FTS programs currently exist nationally (National Farm to School Network 2013). Colleges and universities, hospitals, correctional facilities, food shelves, nursing homes, and senior centers are also involved in FTI to varying degrees. Institutions are motivated to buy local food as a way to support the local economy and local farmers (Bagdonis, Hinrichs, and Schafft 2009, Schafft, Hinrichs, and Bloom 2010) and, in the case of colleges and universities, to respond to student demand (Abatekassa, Conner, and Matts 2008). While many studies have researched procurement practices of schools and colleges, far fewer have looked at correctional facilities, food shelves, senior meal sites, nursing homes, and hospitals.

Institutional purchasing is primarily done via one of two main models: direct sales or through intermediaries such as a distributor or food hub. Farm-direct has the same benefits and drawbacks of other direct to consumer sales. Buyers can form relationships with farmers and have more transparent information on how the food was produced, which may assist in marketing and educational efforts. However, this model has high transaction costs as well as problems with quantity and reliability. As a result, buyers often prefer purchasing through a distributor (Izumi et al. 2006). Distributors can be organized in three main categories: broadline, regional and food hubs. Broadline distributors, such as Sysco and US Foods, carry a wide variety of products including fresh and processed foods, equipment and cleaning supplies. They offer reliability, consistency and desired quality to institutions. From the farmers' perspective, the requirements of broadline distributors are the most stringent; some of the broadline distributors' requirements, besides a markup for handling the food include minimum quantities, approved packaging and labeling, food safety certification and a certificate of insurance that meet the distributor's requirements. Due to these requirements, broadline distributors are the most challenging for small scale farms to sell through. Regional produce distributors may have more flexible requirements (e.g. they may hold the liability insurance to cover the farms) but they still have a markup for handling the food. Last food hubs "manage the aggregation, distribution and marketing of source-identified food products primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail, and institutional demand centrally located facility with a business management structure facilitating the aggregation, storage, processing, distribution, and/or marketing of locally/regionally produced food product" (Barham et al. 2012). Food hubs requirements in terms of product standards, insurance requirements and food safety certification vary greatly and are most likely the most flexible type of distributor for producers. They often try to keep their markup lower than broadline and regional distributors.

Promotion

FTI can provide promotional opportunities for both farms and institutions. Information about how and by whom food is grown may increase the value of food and is currently more easily transmitted in direct markets (Conner and Oppenheim 2008). Marketing the presence of locally grown food in their meals can benefit institutions. Institutions often develop materials to feature and tell the 'stories' of locally grown foods, as a means to increase purchases of meals, create community goodwill and to supplement nutrition education activities (Sevoian and Conner 2012). FTS programs have shown an increase in participation rates (i.e. the number of students eating school meals) by up to 16% (National Farm to School Network 2013). For farmers, institutional sales can introduce new customers to their products and increase customer loyalty (Sevoian and Conner 2012, Izumi, Wright, and Hamm 2010). While these sales and telling the 'story' of the food have broad benefit to institutions, farmers, and society at large, the cost of providing this information and conducting this promotion often falls on those least likely to bear the costs, namely the farmers and schools.

Promotion of local food can also foster branding and sustainability efforts. Sharing the 'stories' behind the local food via social media can create mutually beneficial cross-promotional opportunities for institutions and buyers (Sevoian and Conner 2012). Given the growing popularity of FTI programs, it can also help establish brands based on community cooperation and sustainability.

Despite the potential benefits of FTI programs, no study has comprehensively examined how these programs can fit into marketing plans of producers and distributors. Specifically, there is a gap in the literature on: 1) what products and attributes of local food interest institutions (product), 2) the degree to which price is a barrier (price), 3) which institutions are most interested in local foods (place), and 4) what materials and assistance would motivate each institution to increase local food purchases (promotion). This study proposes to fill these gaps and will inform farmers, distributors, and service providers interested in institutional local food procurement.

Methods

A team consisting of researchers from the University of Vermont, non-profit practitioners from the Northeast Organic Farming Association of Vermont (NOFA-VT) and Vermont FEED (Food Education Every Day) Project, and independent research consultants designed an on-line survey intended to measure current practices, obstacles, and needs for technical assistance pertaining to the institutional procurement of locally grown fruits, vegetables, and eggs. In the survey, local food was defined as originating in Vermont or within a 30 mile radius of Vermont, the definition used by the state of Vermont. The survey included questions on institutions' current activities including purchases of fruits, vegetables, and eggs, and what form of these products they purchase. It also included questions focusing on motivators and barriers to buying local food, as well as the type of tools and assistance that would help the institutions increase, or begin, purchasing local food. Questions were vetted by the NOFA-VT FTI advisory board and revised accordingly.

The survey sample frame was institutions in the state of Vermont; the list of potential respondents was created with the help of Vermont FTI stakeholders. The survey was uploaded to surveymonkey.com, and emails containing a short description of the survey and the link were sent to potential respondents in the spring of 2012. The survey was sent to representatives of 541 institutions and these representatives were prompted three times via email to respond to the

survey. In addition, some FTI stakeholders encouraged their local institutions to respond through a mix of in-person contacts, emails, and phone calls. A total of 183 surveys were completed on-line representing a response rate of 29%.

The data analysis includes descriptive and bivariate analysis. We conducted descriptive analysis to better understand the sample. We then conducted bivariate analysis to examine the responses of the different types of institutions in order to better understand the procurement needs of the less commonly researched institutions (e.g., senior centers and food shelves). We elected to use the 4 P's Marketing Mix framework to present the results of the analysis and to inform the marketing strategies of local producers and distributors wanting to increase their sales in the institutional marketplace. Therefore the variables presented are related to product, price, place and promotion. The statistical test, Chi-squared, was used to test the null hypotheses that there is no relationship between the type of institutions and their responses to the questions. The Chi-squared test does not assume normality of the distribution and was used for ordinal, Likert-scale type variables.

Results

In 2011, surveyed institutions reported spending on average $29,849 on fruits, $46,161 on vegetables, and $2,672 on eggs. About 48% of the institutions operated year-round, 49% operated during the school year and about 2% operated during the summer only. In terms of size, food shelves (also known as food banks), senior meals (also known as senior dining programs), and nursing homes tended to be the smallest institutions; none of them serve more than 301 meals a day. Colleges and universities were the biggest institutions surveyed as 20% served between 301 and 900 meals and 60% served more than 901 meals. Fifty-five percent of the schools served up to 300 meals and about 30% served between 301 and 900 meals (Table 1). Schools represented 57.8% of the respondents to the survey. Lastly, over 50% of the institutions surveyed reported buying local fruits and vegetables, and 44% reported purchasing local eggs. Broken down by institutional category, all the reporting universities, 80% of the schools, hospitals, correctional facilities and senior meal sites and 50% of the nursing homes reported buying some local food (Table 2). Factors influencing the purchase of local fruits, vegetables, and eggs and actions that would help institutions purchase more or begin purchasing local food will be presented in the subsequent sections and are summarized in Table 3 (see Appendix).

Table 1. Size of Institutions in Terms of the Number of Meals Served Daily (n = 180).

	Percentage of daily meals			
Type of Institution	**0 to 100 meals**	**101 to 300 meals**	**301 to 900 meals**	**901 meals and above**
School (n = 104)	16.3	39.4	30.8	13.5
Hospital (n = 12)	8.3	16.7	50.0	25.0
College (n = 5)	20.0	0.0	20.0	60.0
Correctional Facility (n = 6)	0.0	0.0	66.7	33.3
Food shelf (n = 32)	63.6	36.4	0.0	0.0
Senior meal site (n = 13)	54.5	45.5	0.0	0.0
Nursing home (n = 8)	25.0	50.0	25.0	0.0

Table 2. Importance of the Different Types of Institutions in the Sample and the Percentage of Reported Institutions Buying Local Produce (n = 180)

Type of Institution	Proportion of Sample (%)	Buying Local Produce (%)
School	57.8	87.5
Hospital	6.7	83.3
University/College	2.8	100.0
Correctional Facility	3.3	83.3
Food shelf	17.8	65.6
Senior meal site	7.2	84.6
Nursing home	4.4	50.0
Seasonality		
Year round	48.3	76.1
School year	49.4	88.8
Summer	2.2	75.0

Product: What products and attributes of local food interest institutions?

Institutions are interested in a variety of products. The fruits that were most often bought locally were apples (50%) and berries (18%). The vegetables that were most often bought locally were winter squash (20%) and white potatoes (19%). The most frequently purchased forms of different fruits and vegetables are summarized in Table 4. Fresh, whole was the preferred form of fruits and vegetables. Fresh, whole was ranked first for all four types of fruits included in the survey and for thirteen out of the sixteen of the surveyed vegetables. The second favorite form of fruits was canned and the second favorite form of vegetables was fresh, cut. Last, institutions indicated favoring whole, raw eggs (61%).

Since schools represented more than half of the respondents, we looked more specifically at their purchases. Of the schools, 82.2% spent under $25,000 on fruit purchases during the most recent fiscal year and 75.7% spent under $25,000 on vegetable purchases. In terms of local purchases, 35.1% of schools bought between 25 and 50% of their budget on local fruits and 23.4% spend over 50% of their budget on local fruits. In contrast, 31% of schools bought between 25 and 50% of their budget on local vegetables and 5.6% bought over 50% of their budget on local vegetables. For schools specifically, apples and berries were the preferred local fruits and, carrots, root crops (beets, parsnips, turnip, rutabaga and celeriac), winter squash and potatoes were the preferred local vegetables. Preferences of produce forms were similar to the preferred forms of the institutions as a whole (Table 4).

Table 4. Institutions' Preferred Fruit and Vegetable Forms (n = 180)

Produce	**1st**	**2nd**	**3rd**
Fruits			
Apples	Fresh, whole	Frozen, cut	Canned
Pears	Fresh, whole	Canned	Fresh, cut
Stone fruit	Fresh, whole	Canned	Fresh, cut
Berries	Fresh, whole	Frozen, whole	Frozen, cut
Vegetables			
Beans	Frozen, cut	Canned	Fresh, whole
Broccoli	Fresh, whole	Frozen, cut	Fresh, cut
Cabbage	Fresh, whole	Fresh, cut	Frozen, whole
Carrots	Fresh, whole	Frozen, cut	Fresh, cut
Corn	Frozen, cut	Fresh, whole	Canned
Cucumbers	Fresh, whole	Fresh, cut	N/A
Head lettuce	Fresh, whole	Fresh, cut	N/A
Mixed salad green	Fresh, whole	Fresh, cut	N/A
Onions	Fresh, whole	Frozen, cut	Fresh, cut
Peppers	Fresh, whole	Frozen, cut	Fresh, cut
Spinach	Fresh, whole	Fresh, cut	Frozen, cut
Stored root crops *(beets, parsnips, turnip)*	Fresh, whole	Fresh, cut	Frozen, cut
Summer squash	Fresh, whole	Frozen, cut	Fresh, cut
Tomatoes	Fresh, whole	Canned	Fresh, cut
White potatoes	Fresh, whole	Canned	Frozen, cut
Winter squash	Fresh, whole	Frozen, cut	Fresh, cut

Attributes that are motivators for buying local food vary for the different types of institutions (Table 3). Schools, colleges, nursing home and hospitals attributed more importance to freshness while prisons attributed more importance to quality. In terms of barriers, products not available in the desired form were an important factor for hospitals, colleges, correctional facilities and nursing homes while equipment availability was not an important barrier. Food safety was more important for hospitals, colleges and nursing homes. Food safety is an important consideration for institutions serving populations with weakened immune systems, seniors and children, yet food safety was not cited as a barrier for senior meals and was stated as a barrier for fewer than 20% of the schools.

Price: To what degree is the price a barrier?

Overall, the majority of institutions (65.6%) reported price as a barrier to local food purchases and we found price to be the biggest overall factor preventing local food purchases among the survey respondents. Indeed, food budget constraints was the first barrier for five out of the seven type of institutions surveyed. Over 60% of schools, colleges, correctional facilities and senior meal sites responded that price prevented them from buying more local fruits, vegetables, or eggs. In terms of motivators to purchase local food, the level of price was more of a motivator of

correctional facilities (66.7%) and nursing homes (87.5%) while it was less of a motivator for colleges (20.0%) and senior meal sites (30.8%). This suggests that prisons and nursing homes are more price sensitive than colleges and senior meals.

Place: Do different types of institutions differ in their interest in and purchase behaviors around local food?

When asked what factors encouraged institutions to buy local food, a majority of them responded that they wanted to support the local economy and farmers. Knowing where food comes from was not a big factor other than for colleges.

We then asked institutions what was, or would be, their preferred method to buy local produce and eggs and respondents were able to choose more than one method (Table 5, see Appendix). Fifty-three percent of institutions reported preferring buying produce directly from farmers and 52% through a broadline distributor. For eggs, 29% reported preferring purchasing through broadline distributors and 23% preferring egg distributors. Hospitals and colleges strongly favored produce distributors (above 80%) while schools, correctional facilities, senior meal sites and nursing homes favored broadline distributors. Buying directly from farmers ranked second for schools and correctional facilities and first for food shelves.

About 40% of institutions do not formally limit their number of vendors in their purchasing policies, suggesting a tolerance of transaction cost in pursuit of food that meets their procurement needs and goals. Institutions that most commonly limited the number of vendors in this survey were hospitals, colleges, correctional facilities and nursing homes. Of the institutions that limit the number of vendors they work with, 30% responded that it is to simplify the work related to orders and deliveries, 19% responded that it is due to a primary vendor contract and 13% do so in order to simply the work of the accounting department.

Promotion: What materials and assistance would motivate each institution to increase local food purchases?

We asked institutions what promotional tools would help them promote local fruits, vegetables and eggs in their institutions to in turn encourage consumer demand. The most popular tools were supporting connections with local producers (93.0%) and identifying products as ‘Vermont products’ (91.7%). Activities that are relatively easy to implement included indicating the name (82.3%) and location (86.1%) of the farmer and farm, and displaying photos of the farm and farmers (71.1%). Activities more difficult to implement included farmer visits to institutions (77.0%), field trips to farms (77.9%) and teaching farm education (73.0%). Supporting connections with local farmers can be done in several ways including direct contacts between the producers and the institutions, or mediation of the interaction and the institutions through the distributor or third parties such as farmer associations or food hubs. The type of connections can also vary from cafeteria display to helping the producer scale up their production for institutional demand through technical assistance.

Statistical Significance of the Results

The null hypothesis that we tested using Chi-squared is there is no relationship between the type of institutions and their responses to the questions. The results of the statistical tests are in Table 3 and 5. We rejected the null hypothesis when the statistical significance was less than or equal to 0.10. In Table 3, eleven out of the twenty-seven factors that influence local purchases, were statistically significant. Some of these statistically significant variables included: food safety, training staff to use products, price levels and distributors not carrying or identifying local food. We also found statistical significance for most of the promotional tools, suggesting different needs for different institution types. For instance, indicating the name of the farm and farmer ranked highly for all of the institutions while teaching farm education ranked higher for schools (90.8%) and colleges (80.0%) than for correctional facilities (16.7%) or nursing homes (37.5%). Looking at the preferred method to buy local produce and eggs (Table 5), two of the five methods to buy local produce were statistically significant and three out of the five methods to buy eggs were statistically significant. These methods are 'produce distributor' and 'broadline distributor', as well as 'no preferred method' for egg purchases.

Discussion and Implications

Our results provide insights into institutional demand of local food in Vermont. Demand in these markets will reportedly remain strong in the near future. Even though our study is focused on one state, there is evidence of institutional interest to purchase local food as shown by previous studies in Michigan (Izumi et al. 2006), Maryland (Dimitri, Hansonb, and Oberholtzerc 2012) and Oregon (Ratcliffe and Smith 2007). This broad interest is further evidenced by nationwide programs and initiatives such as the FTS program in K-12 schools, the Real Food Challenge on college campuses, and the Health Care Without Harm's Healthy Food Initiative in hospitals, as noted earlier.

In our study, we found differences in motivators and barriers among different types of institutions (Table 6). Freshness and quality are important motivators, but supporting the local economy and supporting local farmers were more often cited. Institutions favored whole, fresh produce, a result contrasting with some previous studies (Conner et al. 2011). A barrier to buying more local food was a lack of availability in desired form for hospitals, colleges and correctional facilities. Food safety was mostly a concern for hospitals, colleges, correctional facilities and nursing homes. Food budget constraints as well as budget to cover food preparation costs were common barriers for institutions. Similarly, our findings around price are consistent with the literature where price of local food is often seen as a barrier for institutional buyers (Strohbehn and Gregoire 2003, Vogt and Kaiser 2008).

Our findings suggest a few implications for farmers and distributors. We found variations around product and promotion attributes, suggesting that producers and distributors interested in increasing their sales of local fruits, vegetables and eggs should consider different marketing strategies for different types of institutions. We choose to highlight a few for each P of the Marketing Mix framework:

Product ─ Buyers' preference for fresh whole produce and eggs presents an opportunity for farms lacking processing equipment. There are also opportunities for partnerships with food hubs, which may offer processing capacities or other farmers wanting to process produce, as the lack of availability in the desired form was an important barrier for institutions such as hospitals, colleges, correctional facilities and nursing homes. Food safety was a barrier for hospitals, colleges and nursing homes. Broadline distributors are already well positioned to serve these institutions as they require food safety certifications. Farmers that are not currently certified may also have to go through a food safety audit in the light of the Food Safety Modernization Act.

Price ─ Farmers breaking into the institutional market may wish to focus first on less price sensitive buyers such as those in colleges and senior meal sites, then diversify into schools, correctional facilities and nursing homes as their production and distribution methods become more efficient, or as increased volume permits smaller margins per unit. Farmers could also focus on crops that are more cost efficient to grow such as root crops or squash, high turnover crops such as salad mix, or in climates with a limited season focus on crops that can be stored so that institutions can request them all year long.

Place ─ Buyers' willingness to buy either direct from farmers or distributors suggests opportunity for farmers to focus on providing whole raw items directly to institutions, with distributors filling gaps and providing processed items. The size of institutions in terms of the meals served can be used as an indicator of which institutions buyers could target selling directly to the institution or through an intermediary. Small scale farmers might be able to better serve smaller institutions while bigger farmers and aggregators are most likely better prepared to serve bigger institutions. In our study, the smaller institutions were food shelves, senior meal sites and nursing homes. The bigger institutions were correctional facilities, hospitals and colleges. School size varied reflecting the size of the community they serve, providing opportunities for farmers and distributors of varied sizes. Another consideration for farmers and distributors is whether or not institutions limit the number of vendors. The institutions which offered more opportunities for farmers by not limiting the number of vendors were schools, hospitals, food shelves and senior meal sites. However if they are to significantly ramp up their local food purchasing, they may need to begin to limit vendors.

Promotion ─ Farmers can add value to products by forging closer ties with buyers and end consumers. They can add particular value to schools by offering educational opportunities like field trips and in-class presentations. This type of offering would help with the idea of branding to reach the institution's end consumer. By developing a relationship with the producer through the institution, these consumers might directly purchase the producers' product in the future. This branding could also be done by depicting the story of the producer at the point of purchase through menus, social media and pictures in the cafeteria. An easy yet efficient promotional tool for farmers and distributors for all the institutions is to indicate the name of their farm and the location on their packaging or to simply identify the product as local. Motivation from institutions to support local farmers and the local economy was high. Promotional tools should then play a prominent role in communicating facets of locally grown food that are valued. This could be done by adding QR codes (ie. codes that can be scanned by smart phones) on products or other promotional materials to inform the customer of the history and origin of the product, or by providing a link to a farm's web site, blog or Facebook page.

Conclusions

This study measured Vermont's institutional demand and preferences for locally grown foods, framing the analysis of results in the 4 P's Marketing Mix framework. A strength of the study is the large sample size and breadth of institutions covered in the sample, suggesting that the results reflect the views of many stakeholders from many different types of institutions. Previous institutional food service surveys had smaller samples (Strohbehn and Gregoire 2008) or were completed in states (Michigan and Oklahoma) with much larger populations than Vermont (Izumi et al. 2006; Oklahoma Food Policy Council 2003). However, the sample in this survey was not representative and therefore does not permit generalization to the state as a whole. Given that the survey came from NOFA-VT, one of the state's leading FTI organizations, the survey may be biased toward those familiar with and supportive of NOFA-VT and/or those already participating in FTI; this suggests that the sample may be more composed of likely buyers who are experienced and knowledgeable about the topic. There is value in the results from this large and diverse group, especially in light of the difficulty of getting busy professionals to respond to surveys. Future directions of research and outreach may center around strategies for partnerships to coordinate supply and demand, and efficiently aggregate and distribute produce. These partnerships can take many forms and names, including values-based supply chains or food hubs.

Prior research suggests an effective division of labor and services, wherein distribution serves the information gatekeeper and physical delivery roles; food hubs or non-profit entities provide matchmaking and technical assistance to prepare farmers for participation in wholesale markets; and institutions provide the demand to pull local food products through the supply chain (Diamond and Barham 2012; Conner et al. 2012). Another area of future research could be to study non-school institutional buyers such as hospitals, prisons and colleges, as they have been comparatively less studied. This area of research could look at aspects such as trends in buying or innovative procurement practices.

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Appendix

Table 3. Factors Influencing the Purchase of Local Fruits, Vegetables, and Eggs and Corresponding Actions that Help Purchase More Local Food in Percent (n=180)

	Schools (n=104)	Hospitals (n=12)	Colleges (n=5)	Correctional facilities (n=6)	Food shelves (n=32)	Senior meal sites (n=13)	Nursing homes (n=8)	All institutions (n=180)
Product								
Freshness motivates	60.6	58.3	80.0	50.0	50.0	53.8	75.0	58.9
Quality motivates	55.8	58.3	40.0	83.3	37.5	46.2	75.0	53.3
Taste motivates	28.8*	58.3*	60.0*	33.3*	12.5*	38.5*	37.5*	30.0
Equipment prevents	5.8	0.0	0.0	16.7	15.6	0.0	12.5	7.2
Food safety prevents	19.2***	58.3***	40.0***	33.3***	6.3***	0.0***	37.5***	20.0
Product not available in desired form	22.1	41.7	40.0	33.3	9.4	15.4	37.5	22.2
Train staff to use product	70.7**	12.5**	0.0**	50.0**	50.0**	57.1**	62.5**	60.7**
Labor/food prep budget constraints	31.7	8.3	40.0	16.7	15.6	30.8	50.0	27.8
Products not available in form needed	22.1	41.7	40.0	33.3	9.4	15.4	37.5	22.2
Consumer Demand	16.3	16.7	40.0	33.3	21.9	15.4	25.0	18.9
Price								
Price levels (motivate)	56.7*	41.7*	20.0*	66.7*	43.8*	30.8*	87.5*	52.2*
Food budget constraints	68.3	41.7	80.0	83.3	59.4	76.9	37.5	65.0
Place								
Support local economy	53.8	66.7	60.0	100.0	56.3	69.2	87.5	59.4
Support local farmers	70.2	75.0	60.0	83.3	56.3	53.8	75.0	67.2
Know where food comes from	47.1**	25.0**	80.0**	33.3**	21.9**	53.8**	25.0**	41.1
Distributor does not carry it	14.4***	25.0***	40.0***	16.7***	6.3***	7.7***	62.5***	16.1***
Greater availability through distributor	97.8	100.0	80.0	100.0	100.0	100.0	100.0	97.9
Promotion								
Lack resources to receive deliveries from multiple farms	10.6	25.0	20.0	33.3	18.8	7.7	0.0	13.3
Support connection with local producers	90.4	100.0	80.0	100.0	95.0	100.0	100.0	93.0
Indicate location of farm	92.9**	72.7*	80.0**	66.7**	84.2**	80.0**	62.5**	86.1
Indicate name of farm and farmer	89.3***	81.8***	80.0***	0.0***	83.3***	77.8***	75.0***	82.3***
Tell story of the farmer	81.3	90.9	60.0	50.0	61.1	55.6	62.5	74.5
Farmer visit to institution	88.0***	81.8***	60.0***	50.0***	50.0***	60.0***	62.5***	77.0***
Field trip to farm	90.6***	90.9***	60.0***	33.3***	50.0***	44.4***	62.5***	77.9***
Photos of the farm and farmer	84.1***	81.8***	80.0***	0***	43.8***	28.6***	62.5***	71.1
Teaching farm education	90.8***	50.0***	80.0***	16.7***	43.8***	44.4***	37.5***	73.0
Identify as Vermont product	94.1	100.0	100.0	66.7	84.2	90.9	87.5	91.7

Note: Statistical significance: * = .10 level (10%), ** = .05 level (5%), *** = .01 level (1%)

Table 5. Preferred Method to Buy Local Produce and Eggs in Percent (n=180).

	Schools (n=104)	Hospitals (n=12)	Colleges (n=5)	Correctional Facilities (n=6)	Food Shelves (n=32)	Senior Meal Sites (n=13)	Nursing Homes (n=8)	All Institutions (n=180)
Produce								
Direct from a farmer	58.7	33.3	20.0	66.7	40.6	30.8	50.0	50.6
From a produce distributor	42.3**	83.3**	80.0**	33.3**	21.9**	30.8**	50.0**	41.6**
From a broadline distributor	66.3***	33.3***	60.0***	83.3***	3.1***	38.5***	87.5***	52.2***
From an egg distributor	3.8	0.0	0.0	16.7	3.1	0.0	25.0	4.4
No preferred method	5.8	16.7	0.0	33.3	18.8	15.4	0.0	10.0
Eggs								
Direct from a farmer	38.5	16.7	20.0	33.3	34.4	23.1	37.5	34.4
From a produce distributor	17.3**	50.0**	40.0**	0.0**	12.5**	15.4**	37.5**	19.4**
From a broadline distributor	36.5***	25.0***	40.0***	33.3***	0.0***	15.4***	75.0***	29.4***
From an eggs distributor	24.0	8.3	20.0	66.7	15.6	30.8	25.0	23.3
No preferred method	3.8*	8.3*	0.0*	33.3*	12.5*	15.4*	0.0*	7.2*

Note: Statistical significance: * = .10 level (10%), ** = .05 level (5%), *** = .01 level (1%)

Table 6. Top Motivators and Barriers to Buying Local Food for the Different Types of Institutions.

Type of institution	Motivator	Barriers
Schools	#1: Support local farmers #2: Freshness #3: Price level	#1: Food budget constraints #2: Food store on premise #3: Labor/food preparation budget
Hospitals	#1: Support local farmers #2: Support local economy #3: Quality #3: Freshness	#1: Food safety #2: Food budget constraints #2: Food not available in desired form
Colleges	#1: Freshness #1: Know where food comes from #2: Support local farmers #2: support local economy #2: Taste	#1: Food budget constraints #2: Food safety #2: Food not available in desired form #2: Distributor does not carry local
Correctional Faclities	#1: Support local economy #2: Support local farmers #3: Quality	#1: Food budget constraints #2: Food not available in desired form #2: Don't know how to purchase directly from farmers #2: Food safety
Food shelves	#1: Support local economy #2: Support local farmers #3: Freshness	#1: Food budget constraints #2: Food storage limitations #3: Lack resources to receive multiple deliveries
Senior meal sites	#1: Support local economy #2: Support local farmers #2: Freshness #2: Know where food is from	#1: Food budget constraints #2: Labor/food preparation budget #3: Food storage limitations
Nursing homes	#1: Price level #1: Support local economy #2: Support local farmers #2: Quality #2: Freshness	#1: Distributor does not carry local #2: Labor/food preparation budget #3: Food safety

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Analysis of Factors Influencing Agritourism Businesses Perceptions about Expansion

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Abstract

Agritourism can provide both on-farm recreational activities for visitors and educational activities showing how food is produced. It can help farmers diversify and add income to their operations. This study assesses how characteristics of agritourism operations and perceived barriers may influence future plans to expand using a logit model. This information will be useful to policymakers and economic development professionals, as they look for contributors to future growth in the agritourism sector, as well as special assistance needs by expansion-minded firms.

Keywords: agritourism, expansion, barriers

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Background

Tennessee is a state characterized by many small farms, with 76,000 farms overall and an average farm size of 146 acres. With the prevalence of small farms and the importance of tourism to the state's economy ($15.36 billion in economic impact to the state's economy in 2011), a niche market for agritourism enterprises has evolved in the state (Tennessee Department of Tourist Development 2012). From the 2002 Census of Agriculture to the 2007 Census of Agriculture, the number of operations with income from agritourism increased from 292 to 510 (USDA 2002, 2007). This growth in the number of agritourism enterprises may have recently been tempered by an overall slowdown in the state's economy, with 2008-2009 showing a 3.8 percent loss in real Tennessee GDP (BEA 2012, 2013) and a decline in travel expenditures in the state between 2005 and 2009 (Tennessee Department of Tourist Development 2012). Despite a recently slowed economy and uncertainty about future growth, results from this study suggest that some agritourism operators plan to expand.

Objective

The purpose of this study is to ascertain how characteristics of agritourism operations, such as size, type, and years in business, county characteristics, as well as potential business problems, may influence plans to expand operations via a logit model. Perceived barriers that operations may face are analyzed using factor analysis to develop factor scores which are then included in the logit model. This information will be useful to agritourism decision makers, including policy makers and economic development professionals, as they look for contributors to future growth in the agritourism sector.

Prior Research

Findings from several studies highlight the importance of location near population centers as influential on agritourism. Bagi and Reeder (2012) find that farms near central cities were more likely to participate in agritourism. Bernardo, Valentine, and Leatherman (2004) also note the geographic advantages of agritourism being located near urban areas. However, Brown and Reeder (2007) find that as the distance between the farm and a city of at least 10,000 in population increases, there is a greater likelihood of a farmer operating an on-farm recreation business. Conversely, they find that county population density had a positive impact on income from farm-based recreation.

Several studies note that farm size impacts agritourism. Bagi and Reeder (2012) note that agritourism participation should increase with farm size. However, in a Washington state study, they find that the size of farms involved in agritourism tends to be smaller than other types of agricultural production, with about 40 percent of the agritourism farms operating on 20 acres or less (Galinato et al. 2011). In dollar terms, findings by Brown and Reeder (2007) suggest that farms with farm-based recreation tended to have a higher net worth. Schilling, Sullivan and Komar (2012) find participation in agritourism varied across farm size as measured by sales volume of New Jersey farmers. Large farms are much more likely to report hosting agritourism than small farms. Small agritourism farms are, however, more likely to earn all of their farm income from agritourism activities.

Bagi and Reeder (2012) find that age has a positive influence on participation in agritourism activities. However, Brown and Reeder (2007) find that years of experience operating a farm does not significantly affect farmer participation in on-farm recreation or income from on-farm recreation.

Brown and Reeder (2007) observe that farms with in areas with high natural amenities scores (based on climate, topography, and water area) tend to be more likely to be involved in farm-based recreation. They also find that a higher recreation score for the county (recreation-related income, employment, and seasonal housing) has a positive influence on on-farm recreation based income.

Rainey et al. (2010) find that several business factors influenced Arkansas farmers' and landowners' attitudes toward participation in the agritourism industry. Three primary areas are identified including state's government support on training, certainty on laws and regulations, and state government's support on marketing and promotion. Their findings suggest that state promotion and agricultural extension agencies can play an important role in the future industry development. In a study of Montana farmers, researchers find that additional income, better use of resources, fluctuations in agricultural income, and employment of family members are listed as some of the more important reasons for diversifying into agritourism (Polovitz Nickerson, Black and McCool (2001). They find that larger farms view fluctuations in agricultural income, meeting the needs of a recreation/vacation market, tax incentives, and consumer education, as stronger motivations to diversify into agritourism than those with smaller farms Galinato et al (2011) note that state regulations or rules and land use rules or zoning concerns are common among agritourism operations in Washington State. Liability issues also created concerns for the agritourism operations.

Ollenburg and Buckley (2007) find that different farm tourism operators may have very divergent reasons for starting farm tourism enterprises, even if the resulting farm tourism products appear similar to users. They note for part-time farmers' reasons for starting a farm tourism businesses are primarily income-centered, providing an alternative to off-farm employment. In contrast, retirement farmers seek to gain social opportunities coupled with a less labor-intensive way to earn income.

Results from a survey of Missouri agritourism farms suggest that agritourism firms' goals may include capturing new customers, educating the public about agriculture, enhancing the family quality of life, better serving current customers, keeping the farmer active, and increasing direct sale of value-added products (Tew and Barbieri 2012). Years in agritourism business and number of marketing methods used have positive influences on the perceived importance of agritourism to the goal of farm profitability. Off-farm employment and number of marketing methods used positively influence the importance of using agritourism for the purposes of creating new market opportunities. Older operator age, years in business, number of employees, and number of marketing methods used significantly influence the overall goal of using agritourism to improve family connections (quality of life, keeping farm in the family, and providing family employment).

Data and Methods

Data

To obtain information for the study, a mail survey of Tennessee agritourism business operators was conducted in early 2013. Tennessee agritourism businesses were identified through the Tennessee Department of Agriculture's Pick Tennessee Products listings and/or referrals from County Extension agents across the state. A total of 450 contacts were identified for the survey. The first survey mailing occurred January 4, 2013, with a follow-up reminder postcard mailed January 15, 2013. A second mailing to those contacts who had not responded was conducted January 24, 2013. Of the contacts, 9 percent were bad addresses or the contact was deceased or out of business, leaving 429 viable contacts. In total, 171 responded, for an overall response rate of 39.9 percent. It should be noted that only businesses that were currently engaged in an agritourism enterprise were included in the analysis.

The survey contained questions about several topics. The respondents were asked about their current agritourism status and information regarding the characteristics of the agritourism operations, such as type of operation, sales, and years in business. Respondents were asked about the types of issues their business has faced during the past three years. They were also asked about their expectations regarding growth and expansion. A copy of the survey instrument is available upon request from the study authors.

Analysis of Barriers to the Agritourism Business

Several opinions about problems affecting agritourism businesses' start-up or operations during the past three years were examined using factor analysis to find common factors among these potential business barriers. The scales regarding opinions about problems were ordered 1=Not a Problem, 2=Somewhat of a Problem, 3=A Moderate Problem, and 4=A Serious Problem. The potential barriers, displayed in Table 1, were analyzed using principal factor analysis to look for factors with Eigenvalues of one or greater, the Kaiser-Guttman rule (Gorsuch 1983). Once the number of factors was determined based upon the Kaiser-Guttman rule, the factors analysis was conducted using that number of factors and then rotated with an orthogonal varimax rotation to examine the factor loadings (Thompson 2004). A coefficient of .5 or greater was used as the decision criterion for deciding which barriers would load onto a factor.

Factor Analysis of Barriers

The agritourism operators were asked to rate the importance of 23 barriers they may have experienced during the past three years of operating their business. The descriptions of the barriers and mean ratings of importance of these barriers are shown in Table 1. In order to identify commonalities among the barriers displayed in Table 2, a principal factor analysis was conducted. Four factors emerged as having Eigenvalues of one or greater. As shown in Table 2, rotated principal factor analysis revealed that the first factor explained 30.14 percent of the total variance, while the second factor explained 27.61 percent of the variation. Factors 3 and 4 explained 20.96 and 10.70 percent, respectively. The likelihood ratio test statistic for independent versus saturated was statistically significant at the 99 percent level.

Table 1. Potential Barriers Affecting the Start-Up or Operation of Agritourism Business over the Past Three Years

Potential barrier	Mean rating of seriousness of problem[a] (N=109)
Having enough capital for infrastructure, operation and marketing	2.257
Attracting customers	2.248
Deciding how to promote the business to target customers	2.165
Developing advertising and promotion materials	1.972
Obtaining permission for roadside signage	1.963
Identifying target customers	1.817
Staying current with new promotion methods	1.817
Finding/hiring employees	1.817
Obtaining liability insurance	1.716
Keeping and evaluating records	1.697
Dealing with increased competition	1.661
Obtaining financing	1.578
Training and managing employees	1.569
Maintaining visitor safety	1.495
Obtaining required permits or licenses	1.431
Understanding labor requirements	1.431
Scheduling employees	1.422
Scheduling groups for tours or parties	1.385
Facing challenges with local zoning	1.339
Providing excellent service	1.312
Meeting health department requirements	1.275
Maintaining good relationships with neighbors	1.229
Working with family members	1.211

Note: [a]1=not a problem, 2=somewhat a problem 3=moderate problem 4=serious problem

Table 2. Eigenvalues for Rotated Factors from Potential Barriers Using Principal Factor Analysis

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	3.35076	0.28131	0.3014	0.3014
Factor2	3.06946	0.73921	0.2761	0.5776
Factor3	2.33025	1.14070	0.2096	0.7872
Factor4	1.18955		0.1070	0.8942

N=109

LR test: independent vs. saturated: chi2(253) = 982.16 Prob>chi2 = 0.0000

The rotated factor loadings and uniqueness variances are shown in Table 3. Of the 23 barriers present to the business operators, all but nine loaded onto common factors. The factor loadings are shaded for each barrier. Four barriers, identifying target customers, deciding how to promote the business to target customers, developing advertising and promotion materials, and attracting

customers loaded onto the first factor. Hence, this factor was entitled as "Marketing". The second factor, named "Regulatory" showed five loadings including local zoning, obtaining required permits or licenses, maintaining visitor safety, meeting health department requirements, and understanding labor requirements. The third factor showed three loadings, finding/hiring employees, training and managing employees, and scheduling employees and was entitled "Labor". Lastly, obtaining financing and having enough capital for infrastructure, operation and marketing loaded onto a common factor called "Financial". The nine barriers which did not load onto any of the five factors included obtaining permission for roadside signage, obtaining liability insurance, dealing with increased competition, providing excellent customer service, staying current with new promotion methods, scheduling groups for tours or parties, recordkeeping, maintaining visitor safety, maintaining good relationships with neighbors, and working with family members.

Table 3. Rotated Factor Loadings and Unique Variances for Potential Barriers

Potential Barrier (N=109)	Marketing	Regulatory	Labor	Financial	Independence
Obtaining permission for roadside signage	-0.002	0.380	0.030	0.493	0.612
Obtaining liability insurance	0.146	0.158	0.020	0.248	0.892
Obtaining financing	0.088	0.094	0.055	0.608	0.611
Facing challenges with local zoning	-0.231	0.650	0.063	0.133	0.503
Dealing with increased competition	0.288	0.082	0.114	-0.075	0.892
Identifying target customers	0.751	0.095	-0.010	0.010	0.427
Deciding how to promote the business to target customers	0.870	0.024	0.080	0.112	0.224
Developing advertising and promotion materials	0.741	-0.008	0.162	0.143	0.405
Attracting customers	0.840	0.006	-0.015	-0.057	0.290
Providing excellent customer service	0.231	0.448	0.162	-0.102	0.709
Staying current with new promotion methods	0.308	0.294	0.237	0.126	0.747
Obtaining required permits or licenses	-0.049	0.718	0.094	0.176	0.443
Finding/hiring employees	0.132	0.050	0.702	0.040	0.486
Training and managing employees	0.064	0.215	0.869	0.069	0.190
Scheduling employees	-0.015	0.102	0.762	-0.042	0.407
Scheduling groups for tours or parties	0.251	0.224	0.017	0.177	0.855
Having enough capital for infrastructure, operation and marketing	0.348	0.054	0.084	0.565	0.549
Maintaining visitor safety	0.153	0.560	0.199	-0.020	0.623
Meeting health department requirements	0.217	0.657	0.285	0.013	0.440
Understanding labor requirements	0.052	0.600	0.334	0.021	0.526
Keeping and evaluating records	0.370	0.467	0.315	0.027	0.546
Maintaining good relationships with neighbors	0.024	0.331	-0.008	-0.142	0.870
Working with family members	0.208	0.325	0.133	-0.132	0.816

Expansion Plans by Agritourism Businesses

As can be seen in Table 4, about 90 percent somewhat or strongly agreed they had set attracting more customers as a goal (N=130). About 82.31 percent expected their sales to increase. Hence most business operators expected some type of business growth. About 66.15 somewhat or strongly agreed that they planned to expand the number of products or attractions they offered. The statement with which the operators were in least agreement was that they planned to hire more employees. Only about 35.38 percent somewhat or strongly agreed with this statement. These results suggest that among the growth and expansion indicators that hiring more employees is the most limiting indicator.

For this study, if a firm strongly agreed or agreed both that they planned to expand their number of products and hire more employees, they were considered expanders (*Expand*=1), otherwise not (*Expand*=0). Hence, to be included in the category of "expanding" the operator had to agree to the last two statements in Table 4. While the first two statements in Table 4 were considered to be expectations about growth, the last two actually indicated plans to adjust resources to expand the business. As can be seen in the first row of Table 5 (see Appendix), the percentage of firms that agreed or strongly agreed that they planned to both expand their number of products and hire more employees (*Expand*=1) was close to 31 percent.

Table 4. Attitudes Regarding Future Growth and Expansion among Agritourism Operators

	Percent (N=130)				
Growth and Expansion Perceptions	**Strongly Disagree**	**Disagree**	**No Opinion**	**Somewhat Agree**	**Strongly Agree**
My goals include attracting more customers	4.62	1.54	3.85	16.92	73.08
I expect my sales to increase	2.31	3.85	11.54	32.31	50.00
I plan to expand the number of products	6.92	6.15	20.77	29.23	36.92
I expect to hire more employees	14.62	12.31	37.69	22.31	13.08

Model of Probability of Expansion Plans

Each operator is hypothesized to have an expected utility from expanding the agritourism business or not expanding which is not directly observable. The unobserved utility, U_{Expand}, is a function of observed characteristics, $\boldsymbol{X}$, such that

$$(1)\ U_{Expand} = \boldsymbol{\beta}'\boldsymbol{X} + \varepsilon \quad U_{Expand} = \boldsymbol{\beta}'\boldsymbol{X} + \boldsymbol{\varepsilon}$$

where $\varepsilon\boldsymbol{\varepsilon}$ is the random component, $\boldsymbol{\beta}$ is a vector of parameters, and $\boldsymbol{X}$ is a matrix of the observed characteristics (see Table 5 and the discussion below for variable descriptions). Though the utility from choosing business expansion, *Expand*, cannot be observed, whether the business operator indicates their intention to expand is observable (*Expand* = 0, 1). The dependent variable, probability of choosing *Expand*=1, can be written as $\Pr\{U_{Expand} = 1 \geq U_{Expand} = 0\} = \boldsymbol{\beta}'\boldsymbol{X}$

F($\boldsymbol{\beta'X}$) (Greene 2012). If the logit model is chosen to estimate this probability, then F follows the logistic distribution, and probability of choosing expansion is

$$(2)\ \Pr(Expand = 1) = \frac{e^{(\beta' X)}}{1+e^{(\beta' X)}} \Pr(Expand = 1) = e^{(\beta' X)} / [1+e^{(\beta' X)}]$$

(a) Hypothesized Effects of Explanatory Variables

Following Bagi and Reeder (2012) and Brown and Reeder (2007), the value of sales from agritourism is hypothesized to have a positive effect on expansion plans. Therefore the sales dummies (*Sales1-Sales4*) compared with the largest sales category (*Sales 5*) are hypothesized to negatively influence plans to expand. While Brown and Reeder (2007) did not find experience significantly affects farmer participation in on-farm recreation or income from on-farm recreation, Tew and Barbieri (2012) find years in agritourism business has a positive influence on the perceived importance of agritourism to the goal of farm profitability. Given these mixed findings the sign on *YrsBus* is not hypothesized *a priori*. The coefficient on *DaysOpen* is hypothesized to be positive, with businesses that are open more days of the year being more willing to commit sufficient time resources toward expansion.

If a farmer has no off-farm income, this may signal that a larger share of their income earning efforts is focused on the farming operation, including their agritourism operation. In this case, it would be expected that *NoOffInc* would have a positive influence on expansion plans.

Effects of the types of agritourism attractions on the farms cannot be hypothesized *a priori*. However, some attractions were grouped that often occur together. Examples of these attractions would include animal exhibits and petting zoos (*AnimalExhib*), events including birthdays or other parties (*Events*), fall fun activities including pumpkin patches, corn mazes, hayrides, or haunted attractions (*FallFun*), on-farm food service or gift shops *(Food*), outdoor activities including day camps, overnight camping, horseback riding, fishing, or ziplines (*Outdoor*), and school or other tours *(Tours*). Other types of attractions included on-farm retail markets *(Retail*), pick-your-own operations (*PickYourOwn*), and classes or workshops (*FarmWork*). Recent attendance at workshops offered (*Workshops*) will likely have a positive influence on expansion plans. This hypothesis is based in part upon findings by Rainey et al. (2010).

It is anticipated that counties with interstate access (*Interstate*) would have a positive effect on expansion plans. Bagi and Reeder (2012) and Bernardo, Valentine, and Leatherman (2004) suggest there are geographic advantages of agritourism being located near urban areas. However, if an agritourism is located within a metropolitan area itself, there could be more limitations to expansion. Hence the sign on *Metro*, a dummy variable based on USDA/ERS's rural-urban continuum code (USDA/ERS 2013), will likely be negative.

Brown and Reeder's findings that higher recreation index scores influence farm-based recreation income would suggest that farmers' markets, agritourism operations, and travel expenditures all per 1,000 county population would positively influence perceptions about growth and expansion (*FmrMktPop1000, AgtourPop1000, TravExpPop1000*). However, these other attractions (farmers markets, other agritourism businesses, other tourist businesses) could also act as a

measure of competition intensity. Hence, the a priori signs on these variables are viewed as ambiguous. Similar logic would hold for the number of grocery stores (*GrocPop1000*) and full service (*FSResPop1000*) restaurants per 1,000 county population. The number of farmers markets (2012), agritourism operations (2007), grocery stores (2009), and full service restaurants (2008) are derived from the USDA/ERS Food Environment Atlas. The travel expenditures are derived from the U.S. Travel Association Research Department (2011) while 2012 county population data came from the Census Bureau.

The natural amenities scale (*NatAmen*) developed by USDA/ERS (USDA/ERS 1999) is expected to have a positive influence on expansion plans as it represents a measure of environmental qualities people prefer. Household income (*MedHHInc*) is hypothesized to have a positive effect. Prior research about the characteristics of visitors to Tennessee agritourism attractions suggests that the household income of adult visitors was higher than the median household income for Tennessee (Jensen et al. 2006). Results from that study also suggest the majority of adult visitors to these attractions were college graduates (Jensen et al. 2006). This would suggest expansion might be more likely in counties with higher percentages of Bachelor's degree graduates (*BSGrad*).

With respect to the barrier factors, *Marketing*, *Regulatory*, *Labor*, and *Capital*, a positive sign on the barriers could reflect that these are barriers more often experienced by expansion- minded agritourism businesses, while a negative sign could indicate that the barrier is an impediment to expansion. Other barriers that did not load onto factors, included *Signs* and *LiabIns*. Again for these potential problems, the same hypotheses would apply.

(b) Marginal Effects

The estimated coefficients from the model cannot be interpreted directly as slopes, hence the marginal effects must be calculated. The marginal effect of a given continuous variable, X_n, from the X matrix is

$$(3)\ \frac{\partial \mathrm{EXPAND}}{X_n} = \frac{e^{(\boldsymbol{\beta}'\boldsymbol{X})}}{\left[1+e^{(\boldsymbol{\beta}'\boldsymbol{X})}\right]^2}\ \beta_n \quad \partial Expand/\partial x_n = (e^{(\boldsymbol{\beta}'\boldsymbol{X})} / [1+e^{(\boldsymbol{\beta}'\boldsymbol{X})}]^2)\ \beta_n$$

An example of such a continuous variable would be years in business (*YrsBus*) from Table 5. The marginal effects are calculated for each observation and then averaged.

If the variable X_n is dichotomous, the marginal effect is calculated using equation 2 with the variable $X_{n\ vary}$ set at 0 and then 1 and all the other explanatory variables set at their means. Then the difference between the two probabilities is taken

$$(4)\quad \Pr(Expand = 1 \mid x_n = 1) - \Pr(Expand = 1 \mid x_n = 0)$$

$\Pr(EXPAND = 1|X_n = 1) - \Pr(EXPAND = 1|X_n = 0)$.An example of a dichotomous explanatory variable would be whether the operator has off-farm income (*NoOffInc*) from Table 5 (see Appendix).

The overall fit of the model can be evaluated with log likelihood ratio test LLR=-2(log likelihood model as coefficients set to zero but the intercept - log likelihood full model- log likelihood model). The test statistic LLR is distributed as χ^2 with the degrees of freedom being the number of coefficients restricted to zero. Another measure of fit is the percent of observations correctly classified by the model as *Expand*=0 or *Expand*=1.

Results

Logit Model for Expansion

The estimated logit model and marginal effects are displayed in Table 6. Using the log-likelihood ratio test (LLR), the model was found to be significant overall. The logit model correctly classified 90.91 percent of the observations. Variables with significant negative estimated coefficients included *Sales1*, *Sales2*, *YrsBus*, *Food, Metro, FmrMktPop1000, and MedHHInc*. The estimated marginal effects for each of these variables are significant. The marginal effect on *AnimalExhib* was also significant.[1] These results suggest that smaller sized agritourism operations in terms of sales (*Sales1* and *Sales2*) are less likely to be expanders than firms with sales of $50,000 and over. These findings are similar to those of Bagi and Reeder (2012) and Polovitz Nicerson, Black, and McCool (2001). In addition, as the businesses have been operating longer (*YrsBus*), the owner is less likely to plan expansion. This result could reflect that the business is in the resource maturity phase rather than the establishment or growth phases (Churchill and Lewis 1983). The negative sign on having on-farm food, concessions, or gift shops (*Food*), and on animal exhibits (*AnimalExhib*) may indicate these are not growth areas for agritourism businesses. However, to empirically answer this question would require further research. The negative sign on *Metro* indicates that agritourism businesses are more likely to indicate expansion in suburban or rural areas, unlike Brown and Reeder's findings about the population density's positive effect on participation in agritourism. However the results may support their finding regarding positive effect of distance between farm and city of at least 10,000. The number of farmers markets per 1,000 population (*FmrMktPop1000)* was negative, suggesting farmers markets may serve as competition for agritourism operations selling directly on-farm. In addition, the farmers markets may serve as another outlet for these farms' produce. Hence, more farmers markets might draw away on-farm sales and lessen the operator's wishes to expand the on-farm retail market component. An unexpected finding was that median household income of the county (*MedHHInc*) had a negative effect.

[1] For some variables the marginal effect was significant, while the estimated coefficient was not. There are two hypotheses tests used. The coefficient in the logit model gives the effect of the variable on the latent variable, while the marginal effect provides the effect on the probability of a positive outcome. The marginal effects are non-linear. The size of the effect and its significance depends on values of the explanatory variables. The method used computes the average effect rather than the effect at average values of the explanatory variables. Hence, each observation has its own effect on the probability, which depends on the values of all its individual explanatory variable values.

Table 6. Estimated Logit Model and Marginal Effects for Expansion Plans by Tennessee Agritourism Businesses [a]

	Est. Coeff.	Std. Err.	Z		Marg. Eff.	Std. Err.	Z	
Intercept	-10.313	7.563	-1.36					
Sales1	-9.952	4.485	-2.22	**	-0.641	0.243	-2.64	***
Sales2	-11.646	5.203	-2.24	**	-0.750	0.279	-2.69	***
Sales3	10.783	5.771	1.87	*	0.695	0.334	2.08	**
Sales4	7.564	4.303	1.76	*	0.487	0.252	1.93	*
YrsBus	-0.749	0.314	-2.39	**	-0.048	0.016	-2.93	***
DaysOpen	0.021	0.013	1.62		0.001	0.001	1.77	*
NoOffInc	-2.359	1.815	-1.30		-0.152	0.111	-1.37	
Retail	-1.995	2.201	-0.91		-0.129	0.139	-0.93	
PickYourOwn	4.926	2.966	1.66	*	0.317	0.176	1.80	*
AnimalExhib	-4.988	3.118	-1.60		-0.321	0.187	-1.72	*
Events	-1.923	1.635	-1.18		-0.124	0.101	-1.22	
FallFun	4.376	2.978	1.47		0.282	0.179	1.57	
Food	-6.684	3.089	-2.16	**	-0.431	0.168	-2.56	***
Outdoor	-1.202	2.443	-0.49		-0.077	0.156	-0.50	
Tours	4.628	2.399	1.93	*	0.298	0.137	2.18	**
FarmWork	4.332	2.700	1.60		0.279	0.159	1.75	*
Workshops	7.974	3.478	2.29	**	0.514	0.184	2.80	***
Interstate	8.843	5.070	1.74	*	0.570	0.296	1.92	*
Metro	-5.168	2.965	-1.74	*	-0.333	0.172	-1.94	*
FmrMktPop1000	-282.952	140.804	-2.01	**	-18.232	7.856	-2.32	**
AgtourPop1000	29.521	18.233	1.62		1.902	1.076	1.77	*
TravExpPop1000	0.824	0.587	1.40		0.053	0.036	1.48	
GrocPop1000	1.098	7.642	0.14		0.071	0.492	0.14	
FSResPop1000	-19.657	16.143	-1.22		-1.267	0.992	-1.28	
NatAmen	0.767	0.967	0.79		0.049	0.061	0.81	
MedHHInc	-0.368	0.202	-1.82	*	-0.024	0.012	-2.05	**
BSGrad	0.415	0.281	1.48		0.027	0.017	1.60	
Marketing	-0.433	0.873	-0.50		-0.028	0.056	-0.50	
Regulatory	-1.034	1.186	-0.87		-0.067	0.075	-0.89	
Labor	3.112	1.267	2.46	**	0.201	0.067	3.01	***
Capital	-1.831	1.597	-1.15		-0.118	0.099	-1.19	
Signs	3.833	1.845	2.08	**	0.247	0.104	2.38	**
LiabIns	2.320	1.165	1.99	**	0.150	0.066	2.27	**

LLR Test 82.96 w 33 df*** Pseudo R^2=0.67

Percent Correctly Classified= 90.91

Variables with significant positive estimated coefficients included *Sales3*, *Sales4*, *PickYourOwn*, *Tours*, *Workshops*, *Interstate*, *Labor*, *Signs*, and *LiabIns*. The estimated marginal effects for each of these variables are also significant. In addition, marginal effects on several other variables are positive and significant. These include *DaysOpen*, *FarmWork*, and *AgtourPop1000*. The positive signs on the two sales categories suggest that those with sales of $10,000 to $50,000 are more likely to plan on expanding than those with sales of greater than $50,000. Firms that were open more days of the year were more likely to indicate expansion plans. *PickYourOwn*, *Tours*, and *FarmWork* each appear to have a positive influence on expansion, suggesting these may be growth areas in agritourism. Workshops and classes (*FarmWork*) on the farm can inform visitors about how to use the products offered by the agritourism operation and can be offered to groups of visitors. Examples include gardening classes to inform visitors on how to grow plants sold from the farm or food preparation classes for produce sold from the farm. The positive sign on *Workshops* suggests that educational workshops can encourage agritourism operators to consider expansion.[2] Location factors positively influencing expansion plans are *Interstate* and *AgtourPop1000*. An interstate can provide access to additional customers, both from the local area and travelers passing through. Business operators may view having a cluster of agritourism businesses, as well as areas with high travel expenditures, as advantageous and more likely to attract visitors to their attractions. The positive coefficients *Signs* and *LiabIns* suggest that both of these are considered as serious problems for expanders. While other potential barriers that did not load onto common factors were considered in the logit, only *Signs* and *LiabIns* were significant. As firms are expanding they may wish to obtain more road signs, and encounter "red tape" or difficulties in dealing with the appropriate agencies. In addition, as firms expand, they will need to expand their liability coverage, hence the potential for greater issues with obtaining the correct level of insurance. As Galinato (2011) notes liability issues are of concern for agribusiness.

Conclusions

The results from this study suggest that several firm characteristics, including firm size, years in business, business type, and location factors influence plans for expansion. Firms more likely to plan expansion include newer firms, firms with medium sales, located in more rural counties, with interstate access. More established firms may be mature businesses for which expansion is not anticipated. Being among the smallest firms in terms of sales has a negative influence on expansion plans. These operations may be part-time lifestyle farms where expansion is not an objective. This result is bolstered by the positive influence of the number of days the operation is open. Presence of other agritourism operations in the county appears to have a positive influence on growth plans. This result could reflect that agritourism operators see the benefit of having several attractions in an area to draw visitors and travel expenditure levels in their county also had a positive influence on expansion plans.

[2] The attendance at workshops variable could potentially pose an endogeneity problem. For example operators who are expansion-minded might be more likely to attend workshops. Given this potential problem, we performed a Wu-Hausman test for endogeneity by regressing number of workshops attended on set of exogenous variables, calculating the errors, and then including these errors in the logit for expanders (Greene 2012). The calculated value for **H,** the Hausman statistic, does not exceed the critical value of $\chi 2$ at the 95 percent confidence level, therefore the hypothesis of exogeneity of *Workshops* could not be rejected.

The results also show that several potential barriers influenced plans for expansion. Labor issues, which include training and managing employees, influenced expansion plans. Educational efforts focusing on how to manage an expanding workforce and train employees to effectively operate within the agritourism business might be of special importance to expanding firms. The issue of obtaining roadside signage influenced expansion plans also. Assistance connecting the firm with the appropriate agencies and completing needed paperwork may be of particular importance for expanding firms. Educational efforts focusing on business growth might focus on ways to mitigate these problems. Obtaining liability insurance also influenced plans for expansion. Insurance workshops that provide education assistance regarding the types and level of insurance needed to protect the agribusiness might be of interest to firms planning expansion.

The results from this study suggest that certain types of agritourism attractions appeared to be more likely for expansion and some less likely. Additional research should examine identification of the types of agritourism attractions that may be most viable candidates for future growth, as well as programs to best assist agritourism businesses as they expand into offering these attractions. Future research might also examine what factors lead to sustained agritourism business growth.

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Appendix

Table 5. Variable Names, Definitions, and Means for Model of Probability of Expansion

Variable Name	Definition	Mean (N=99)
Expand	1 if plan increase the number of employees, and products/attractions offered, 0 otherwise	0.31
Farm Characteristics		
Sales1, Sales2, Sales3, Sales4, Sales5	Agritourism gross sales revenues in 2012, 1 if in sales category, 0 otherwise: 1=Less than $2,500,2=$2,500 - $9,999, 3=$10,000 - $24,999, 4=$25,000 - $49,999 (omitted 5=$50,000 or greater)	0.15, 0.16, 0.19, 0.11,0.39
YrsBus	Years in current agritourism business	10.56
DaysOpen	Number of days of the year business is open	171.97
YrsBus	Years in current agritourism business	10.56
NoOffInc	1 if have no off-farm income, 0 otherwise	0.42
Retail	1 if have an on-farm retail market that sells farm products, 0 otherwise	0.46
PickYourOwn	1 if have an on-farm retail market that sells farm products, 0 otherwise	0.33
AnimalExhib	1 if have animal exhibits or a petting zoo, 0 otherwise	0.24
Events	1 if host weddings, birthdays, or other events, 0 otherwise	0.39
FallFun	1 if have corn maze, hay ride, haunted attraction, or pumpkin patch, 0 otherwise	0.32
Food	1 if have on-farm food service, concessions, café, or restaurant or an on-farm gift shot, 0 otherwise	0.27
Outdoor	1 if offer outdoor oriented activities (day camps, overnight camping, horseback riding, fishing, or ziplines), 0 otherwise	0.15
Tours	1 if offer school or other tours, 0 otherwise	0.47
FarmWork	1 if offer workshops or classes, 0 otherwise	0.17
Workshops	1 if attended workshop, conference or tour sponsored by the Tennessee Department of Agriculture, Center for Profitable Agriculture and/or Tennessee Farm Fresh Program in the last three (3) years, 0 otherwise	0.69
County Characteristics		
Interstate	1 if have county has interstate access, 0 otherwise	0.67
Metro	1 if in metropolitan area population 250K or greater, 0 otherwise (based on USDA Rural Continuum Codes)	0.52
FmrMktPop1000	Farmers' markets per 1000 population in county, 2012	0.02
AgtourPop1000	Number of agritourism businesses from 2007 Agricultural Census per 1000 population in county	0.14
TravExpPop1000	Travel expenditures in county per 1000 population, 2011	1.87
GrocPop1000	Grocery stores per 1000 population, 2009	0.20
FSResPop1000	Full service restaurants per 1000 population, 2009	0.62
NatAmen	USDA/ERS Natural Amenities Scale, 1999	-0.14
MedHHInc	Median household income, 2009-2012, in $1,000	42.35
BSGrad	Percent of population over 25 with a Bachelor’s degree, 2008-2012	18.12

Table 5. *Continued*

Variable Name	Definition	Mean (N=99)
Expand	1 if plan increase the number of employees, and products/attractions offered, 0 otherwise	0.31
Perceived Barriers		
Marketing	Factor analysis score for marketing issues being problems for business in past three years	-.001
Regulatory	Factor analysis score for regulatory issues being problems for business in past three years	0.05
Labor	Factor analysis score for labor issues being problems for business in past three years	0.03
Financial	Factor analysis score for financial issues being problems for business in past three years	-0.02
Signs	Obtaining permission for roadside signage, 1=not a problem, 2=somewhat a problem 3=moderate problem 4=serious problem	1.92
LiabIns	Obtaining liability insurance, [a]1=not a problem, 2=somewhat a problem 3=moderate problem 4=serious problem	1.74

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An Empirical Assessment of Consumers' Preferences for Coffee

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Abstract

This study examines the purchasing behavior of inner-city and suburban shoppers for more than 265 brands and varieties of coffee. Weekly data for the 2011 calendar year are used for this study and these data represent purchases of shoppers in four stores in Columbus, Ohio. A national supermarket chain provided the data from a common price zone, meaning identical prices across all stores. The major premise of the research is that inner-city shoppers will show greater price-sensitivity toward the purchase of all brands of coffee.

Keywords: coffee, price sensitivity, own-price elasticity, cross-price elasticity, temporary price reductions

Introduction

Several studies have documented changes that consumers were motivated to make in their consumption and spending behavior in response to the 2007-2009 recession (Kaufman and Kumcu 2012; Wharton School of Business 2010). Consumers often react to a recession by purchasing lower-priced products within specific product categories[1], while attempting to maintain their previous consumption levels within these product categories. Coffee is a product category that offers a wide array of brands and varieties and these options provide opportunities for consumers to trade down. Most brands offer varieties across the spectrum of regular, premium, super premium and gourmet; some brands extend beyond this spectrum to include specialty products such as cappuccino and espresso. Consumers are expected to express a level of price-sensitivity toward brands and varieties of coffee that is dependent on their socioeconomic characteristics (Ailawadi and Rossi 1998; Aguiar and Hurst 2007; Nagle and Hogan 2006). Indeed shopping responses of consumers by socioeconomic characteristics are the primary focus of this research.

Economic theory suggests that an additional dollar of income provides a higher level of marginal utility to a lower-income person than it does to a higher-income one (Berry et al. 1995). Further, for a fixed market basket of goods, a price increase for a particular product within that basket, say coffee, is likely to have its greatest impact on lower-income individuals. In essence, lower- and higher-income individuals are likely to show different purchase responses to both price and income changes. Individual income data are not available to this researcher, but 2010 census tract data are available and these data are used to select four grocery stores within specific geographic locations from a single supermarket chain (Table 1).

Table 1. Socioeconomic Characteristics of Store Residents

		Median Household	**Median Family**	**% Population**	**% Population**	**% Population**
Suburban Stores	Population	Income	Income	over 65	in Poverty	College Grads
Store 1	51,047	93198	111540	7.33	4.22	57.79
Store 2	32,737	78086	94994	10.02	4.89	47.70
Average		86309	103929	8.38	4.58	52.75
Inner-City Stores						
Store 3	38,148	36538	51116	8.95	30.63	59.95
Store 4	18,569	35275	42381	12.81	23.78	17.61
Average		35918	47157	10.21	27.64	38.78

[a] Note that all variables are weighted by population values.
Census Tract Data for Ohio Counties, U.S. Bureau of Census, 2010.

[1] Buying lower-priced products in response to less disposable income is often described as "trading down." For example, within categories of frequently purchased food products, many consumers trade down from national brands to store or private label brands.

Although variations in socioeconomic characteristics are sure to exist among individuals within all geographic areas, this study adopts the premise that enough commonality in characteristics is likely to exist among individuals within specified geographic areas to extract meaningful patterns of behavior. To this end, two stores are selected within the inner-city of Columbus, Ohio, and these stores serve mainly residents with lower incomes; two additional stores are selected within suburban areas and they serve predominately residents with higher incomes. With respect to coffee purchases, it is hypothesized that shoppers within the two inner-city stores, relative to those in suburban stores, will show greater price-sensitivity for all brands of coffee (Ailawadi and Rossi 1998). Any noise in the data caused by higher-income (lower-income) residents shopping at lower-income (higher-income) stores is expected to lead to smaller (larger) own-price elasticities.

A recent survey by the National Coffee Association (NCA) revealed that 54% of Americans drink coffee daily and over 73% drink it several times per year (NCA 2013). In volume, the average American drinks 26 gallons of coffee per year (Osterweil 2011). At the retail level, dollar sales of coffee for 2012 are estimated at $9.6 billion, although it is not clear if this total includes Wal-Mart outlets (Jacobsen 2012). What is clear about coffee is that K-cups, a type of single serve, have been growing at an astronomical rate. Sales increased from $1 billion in 2011 to more than $1.8 billion in 2012, an increase in excess of 80% (Watson 2013). What is interesting about this surge in sales of K-cups coffee is that it is one of the most expensive types of coffee available and the 2007-2009 recession motivated consumers to trade down (Kaufman and Kumcu 2012; Wharton School of Business 2010). As evidence of consumers' attempt to economize during the recession, they increased their coupon redemption by 10% and 27% respectively in 2008 and 2009, as compared to increases in previous years of no more than 1 to 2 percent (Vanac 2013). With rapid increases in K-Cups sales and the effects of the recession still lingering, it seems reasonable to try and estimate demand elasticity relationships among various brands and varieties of coffee at the retail level. To accomplish this objective, store-level scanner data are used to try and identify product preferences and price-sensitivities among inner-city and suburban residents.

The rest of this paper is organized as follows. Section two provides a literature review of coffee studies, with the scope ranging from returns to Fair Trade coffee to price elasticities for specific brands. Section three presents the theoretical and empirical models, the study objectives, and provides a discussion of the econometric procedures used to estimate the empirical model. Section four provides a description of the coffee data and the process used to segment these data into meaningful characteristics for empirical estimation. Twelve categories of coffee are identified and considerable emphasis is placed on the brands and varieties comprising these categories. Section five provides a discussion of general socioeconomic characteristics for residents surrounding the selected grocery stores. Coupled with this discussion of socioeconomic characteristics is a discussion of differences among stores. Differences emphasized are focused on factors such as customer counts per store (customers who make a purchase), total store sales, and total coffee sales per store.[2] Additionally, a discussion of market shares for these 12 categories is provided. Section six provides a discussion of the empirical results. Finally, Section seven ends the paper with a summary and conclusions.

[2] A confidentiality agreement between this researcher and the supermarket chain forbids its name disclosure.

Literature Review

Many studies of coffee have focused on the distribution of retail prices between producing and consuming countries (Valkila et al. 2010; Bacon et al. 2008; Kilian et al. 2006; Mendoza and Bastiaensen 2003; Zehner 2002). Coffee certification schemes such as Fair Trade, Rainforest Alliance, and Organic have been implemented to help poor farmers in coffee-producing countries increase their prices and incomes. To try and measure the effectiveness of these schemes, researchers have used various methods. Fair Trade is one of the best known certification schemes and it is the only scheme that sets minimum prices in an attempt to raise prices for farmers in developing countries (Valkila et al. 2010). Researchers have concluded that roasters and retailers in consuming countries charge high margins for Fair Trade coffee and these margins provide large returns to marketers in developed countries (Valkila et al. 2010; Bacon et al. 2008; Kilian et al. 2006; Mendoza and Bastiaensen 2003; Zehner 2002). Valkila et al. (2008) concluded that, despite higher prices for Fair Trade coffee, producing countries receive a smaller share of the higher prices (35%) than they do for lower-priced conventional coffee (48%). Such results support the premise that retailers and roasters in developed countries have market power and this power limits returns to poor farmers from Fair Trade certification.

Several studies have extended analyses of coffee beyond Fair Trade to include other certification schemes and many other factors. Some prominent factors included in these studies are production (organic or non-organic), country of origin, roast type, bean type, product claim, supply constraints and droughts (Cranfield et al. 2010; Gabriele and Vanzetti 2008; Loureiro and Lotade 2005). Using a conjoint analysis approach, Cranfield et al. (2010) examined the significance of several factors for coffee purchases across two Canadian cities and found price to be most important. Other factors of significance, and listed in order of importance, include claim (whether the product was labeled as Fair Trade, certified as Fair Trade, or had no claim), region of origin (Colombian, Guatemalan, or blend of many beans), production (organic or nonorganic) roast (medium or dark), and bean (ground or whole). Separate analyses were conducted for Toronto and Vancouver and the results were almost identical to those for the combined sample. Importantly, several factors led to increased consumer utility: certified Fair Trade, labeled Fair Trade, Colombian origin, organic production, and medium roast. In short, the authors concluded that producers and consumers of coffee derive benefits from more than just certification schemes.

Although coffee certification schemes have served to raise prices for producers in developing countries, these schemes are not expected to protect farmers from wide swings in world prices. As such, some authors have proposed supply constraints as a way to raise world prices (Gilbert 1996; Deaton and Laroque 1992; Ponte 2002). This approach gained some momentum after the collapse of the International Coffee Organization (ICO) quota system in 1989. Gabriele and Vanzetti (2008) examined the likely impact of a 10% reduction in production and world exports for the top four producing countries: Brazil, Colombia, Indonesia and Vietnam. The authors concluded that this supply control mechanism would result in a 17% increase in world prices and a 6% increase in long-term coffee returns for these countries.

Other ways to increase coffee prices and producers' revenue have focused on price premiums that result from participating in the Cup of Excellence Auction programs (Wilson and Wilson

2013; Donnett et al. 2008; Teuber and Hermann 2012). Although these authors come to slightly different conclusions about the relative importance of various factors that influence price premiums, there is general consensus that high returns result from sensory quality, quality score, position placed within an auction, altitude of production and quantities supplied (Wilson and Wilson, 2013). Some noted differences among the aforementioned researchers are: (1) Teuber and Hermann (2012) find tree variety to be a significant determinant of price premiums, whereas the other researchers find this factor to be statistically insignificant; (2) Donnett et al. (2008) find the International Coffee Organization composite price to have a positive impact on price premium, whereas Wilson and Wilson (2013) find this effect to be significant and negative; and (3) Wilson and Wilson (2013) allow for diminishing returns to quality by including quality as both a linear and squared variable and find diminishing returns to it; the other researchers, by contrast, include quality only as a linear variable and find increasing returns to it.

This review concludes with a group of studies that have provided estimated elasticities for conventional, Fair Trade, and various brands of coffee. As a general rule, researchers have concluded that coffee, as a commodity, has low own-price elasticity (Larson 2003). Yet, price elasticities for brands of coffee have been found to be reasonably high, ranging in magnitude from -1.0 to -14.8 (Krishnamurthi and Raj 1991; Bell et al. 1999). Valkila et al. (2010) have argued that Fair Trade coffee, although not a brand, can be considered an “ethical luxury good” and treated much like a brand. To this end, Arnot et al. (2006) estimated price elasticities for Fair Trade coffee and two types of conventional coffee, Colombian and “all other”. Colombian coffee was chosen because it has a high-quality image and the author wanted to examine consumer preferences for it relative to Fair Trade coffee. Using a coffee shop at a Canadian university, the authors were able to discount coffee prices (change relative prices) and measure consumer responses to the discounted and non-discounted coffee. These experiments revealed own-price elasticities respectively of -1.55 and -.42 for Colombian and Fair Trade coffee. For “all other coffee”, own-price elasticity comparable in magnitude to that for Colombian coffee was found. Further, cross-price elasticities showed Fair Trade coffee to be a strong substitute for Colombian coffee (1.12), while Colombian coffee was shown to be a weak substitute for Fair Trade coffee (.13). These estimates led the authors to conclude that consumers have strong preferences for Fair Trade coffee and raising its price would lead to higher revenue for marketers and farmers in developing countries.

At a more refined level, Krishnamurthi and Raj (1991) estimated promotional elasticities, not own-price elasticities, for three brands of coffee: Folgers, Maxwell House, and Chock full o'Nuts. These brands represented 75% of total coffee sales, as each brand consisted of many UPCs of different sizes and grinds. The authors segmented consumers into loyal and non-loyal customers and found promotional elasticities that ranged from -2.7 to -3.0 for the loyal customers; from -6.6 to -14.8, for the non-loyal customers. Differences in magnitude for loyal and non-loyal customers were attributed to heavy brand switching by non-loyal customers. In essence, the magnitude of promotional elasticities that are estimated in the absence of customer segmentation will depend on the ratio of loyal to non-loyal customers. Indeed Bell et al. (1999) conducted a non-segmentation customer study for several brands of coffee and found consumers to have responses to promotional pricing that are fairly close in magnitude: brand switching (52.6%) and purchase acceleration (43.4%). In short, price promotions encouraged many non-loyal customers to switch brands, but they also encouraged loyal customers to purchase more of

their favorite brands. Promotional elasticities are relevant for this paper because they can be linked to own-price elasticities (Bolton 1989). For example, brands with large market shares and those with frequent displays in stores have been shown to have smaller own-price elasticities. Other market characteristics such as advertising, brand experience, budget share allocations, perceived differentiation, perishability, purchase frequency, and relative price position can also impact estimated own- and cross-price elasticities but these factors are not available to this researcher.

As a final reference, McManus (2007) estimated own-price elasticities for specialty coffee served at coffee shops on and near the University of Virginia campus. College students were the main customers for these establishments and they were found to have high price-sensitivity toward three types of coffee (drip, regular espresso, and sweet espresso), served in four cup sizes (8, 12, 16 and 20 ounces). Estimated elasticities ranged from -4.34 to -5.68. Although these are estimates for away-from-home specialty coffee, they provide a benchmark for comparing elasticities for brands of coffee purchased in supermarkets for at-home consumption.

Model Development, Estimation Procedures and Study Objectives

A double-log, seemingly unrelated regression model has been used in demand studies to estimate elasticities for food products involving supermarket scanner data (Capps 1989). For this study, this approach would provide a unique set of own-price and cross-price elasticities for each store, making comparisons across four stores extremely difficult. For example, it would be difficult to test the main hypothesis of this study that inner-city shoppers are more price-sensitive than suburban shoppers. To minimize problems of comparison, this study uses a time-series cross-section model (TSCS). Pindyck and Rubinfeld (1998) have shown that this approach is most appropriate for data involving time and space. The time element for this study involves 52 weekly observations, while space pertains to four stores in different geographic areas. Several model specifications are possible, but the error components model has been shown to be the most robust (Fuller and Battese 1974). Twelve product categories are estimated in this study (Table 2, See Appendix). The general form of the model is:

$$(1)\ Y_{qr} = \sum_{s=1}^{v} X_{qrs}\beta_s + \mu_{qr} \qquad q = 1,2 \ldots, N; \qquad r = 1,2, \ldots T,$$

where N is the number of cross-sections, and T is the length of a time-series for each cross-section. For this study, q goes from 1 to 4; r, from 1 to 52.

Four cross-sections and 52 weekly observations per cross-section are included in the specified model for this study. Twelve equations are specified and estimated for each coffee category, using the time-series cross-section regression (TSCSREG) procedure in SAS. The equations and included variables are specified as follows:

$$(2)\ Q_{ikt} = f(p_{ikt}, p_{jkt}s, p_{mkt}, SDUM_{kt}, TEXP_{kt}, TPR_{ikt}),$$

where Q_{ikt} is total ounces of category i for store k in week t; i = 1, …, 12; k = 1, …, 4; t = 1, …, 52; p_{ikt} is a weighted-average price of category i for store k in week t (note from equation 3 that weights are a function of product prices and unit sales and change weekly); p_{jkt}^{s} represents weighted-average prices for competing categories for store k in week t; p_{mkt} is identical to p_{ikt} for inner-city stores 3 and 4, but 0 for all other stores (it is intended to capture price-elasticity differences for inner-city and suburban shoppers); $SDUM_{kt}$ are zero-one dummy variables intended to capture store differences; $TEXP_{kt}$ represents total expenditures on coffee for store k in week t (intended as a proxy for consumer income); and TPR_{ikt} is the number of products at the UPC level in category i, within store k that are temporarily reduced in price (TPR) by 10% or more during week t. Categories with the most TPRs are: Folgers I; Starbucks I; and Private Label I.

It is important to emphasize the relationship between promotions and consumer response. Frequent promotions that increase price variability are likely to lead to lower consumer response (Bell et al. 1999). Such promotions have implications for estimated own-price elasticities because failure to capture these effects can influence own-price elasticities.

Prices are determined by expressing each coffee product as a ratio of all coffee products within a given category. Specifically, weighted prices for category i in each time period is:

$$(3)\ P_i = \sum_j W_{ij} P_{ij}, \quad where\ W_{ij} = (P_{ij} Q_{ij}) / (\sum_j P_{ij} Q_{ij}),$$

and *j* denotes coffee products at the UPC level in the same category. Because each category of coffee is a potential substitute for, or complement to, other categories of coffee, all categories are included in each equation.

Own-price, cross-price and expenditure elasticities are the estimates of primary interest for this study. These factors are emphasized because they can reveal many insights into consumer behavior. Own-price-elasticities measure consumers' price sensitivity toward changes in a product's price, which are critical to retailers' pricing and marketing strategies. For coffee, inner-city shoppers are hypothesized to show higher levels of price-sensitivity for all brands of coffee. This hypothesis stems from the characteristics of inner-city shoppers (lower incomes, lower opportunity cost of time, etc.) and the relative weights they are likely to place on price, as compared to other factors, such as brand and product attributes. Lower-income shoppers are likely to have less discretionary income than higher-income shoppers and this factor suggests a higher level of marginal utility of income for them. Because of this higher marginal utility of income and higher opportunity cost of time, these shoppers engage in more search and gain greater awareness of unit prices. Greater awareness of unity prices coupled with a tight budget constraint leads to increased price-sensitivity (Russo 1977; Berry et al. 1995).

Cross-price elasticity measures the change in quantity of one good with respect to a price change for another good. For this study, cross-price elasticities are estimated for price increases and they are hypothesized to be smaller for inner-city shoppers than for suburban shoppers; this hypothesis stems from the differential impacts that price increases have on real incomes for the two groups. For the econometric model used in this study, differences in cross-price elasticities for inner-city and suburban shoppers cannot be captured directly, but what can be captured are differences in the magnitude of cross-price elasiticites over product space. Specifically, it is

hypothesized that coffee products that are closest in product space will have the largest cross-price elasticities (Berry et al. 1995). For example, the cross-price-elasticity between Folgers II and Maxwell House II is hypothesized to be larger than the cross-price elasticity between Folgers II and Starbucks I.

Inner-city shoppers are hypothesized to have expenditure elasticities that are larger than those of suburban shoppers because income (expenditure) elasticities for food and beverages have been shown to decline with income (Tomek and Robinson 2003). Temporary price reductions are expected to have positive impacts on sales and this effect is captured with a promotion variable that is hypothesized to be positive and statistically significant. Finally, the four stores have average weekly sales ranging from $429,000 to $919,000 and these variations in sales are hypothesized to result in store differences. These differences are captured with zero-one dummy variables, with store 1 serving as the base store.

Data Description

This study consists of supermarket scanner data for four stores from a national supermarket chain. This chain has stores throughout the U.S. and more than 40 stores in the Columbus, Ohio, area. Weekly data are used in this study, covering all 52 weeks of the 2011 calendar year. These data are comprehensive, including UPCs at the product level, product description, unit price, flavor, size, unit sales, and unit quantities. The four stores are within a common price zone and the supermarket chain uses identical pricing across the zone. Brands and varieties of coffee offered, as well as brands and varieties selected by consumers, differ in the four stores and this allows consumers to pay different weighted prices for a given product category (Table 3)[3]. More than 265 brands and varieties of coffee are carried by the supermarket chain providing this data and, as previously discussed, the coffee products are segmented into 12 categories for empirical estimation. Folgers, Maxwell House and Starbucks respectively are the three leading brands of coffee in the U. S. and each brand is segmented into two categories for empirical estimation. Private label brands are numerous and diverse and these brands are segmented into three categories. Three other categories are also included: Nescafe Instant Brands, K-Cups Brands, and Other National Brands.

Folgers, the leading brand of coffee, is segmented into two categories: Folgers I and Folgers II. Included in the first category are all brands and flavors except decaf and instant coffee. More specifically, Folgers I include all brands of Regular, Premium, Colombian and Gourmet coffee. Folgers II includes all brands and flavors of Decaf and Instant coffee. Each of these varieties had sufficient weekly sales to allow for segmentation into separate categories but this approach is forgone in the interest of minimizing the size of the own-price, cross-price elasticity matrix. As a proportion of total coffee sales, Folgers I amounts to 19.39%; Folgers II, 5.38% (Table 4).

[3] This table provides average prices but deviations in these prices across stores show similar variability in weekly prices paid within each store.

Table 3. Weighted Prices Paid by Category and Store

Category	Store 1	Store 2	AVG1	Store 3	Store 4	AVG2	AVG1-AVG2
Folgers I	0.409	0.391	**0.400**	0.384	0.389	**0.386**	0.014
Folgers II	0.618	0.624	**0.621**	0.638	0.722	**0.680**	-0.059
Maxwell House I	0.419	0.329	**0.374**	0.330	0.321	**0.325**	0.049
Maxwell House II	0.659	0.801	**0.730**	0.866	0.785	**0.825**	-0.095
Starbucks I	1.144	0.873	**1.009**	1.615	1.366	**1.491**	-0.482
Starbucks II	0.375	0.388	**0.381**	0.257	0.332	**0.295**	0.087
Private Label I	0.391	0.402	**0.397**	0.377	0.374	**0.375**	0.021
Private Label II	0.422	0.368	**0.395**	0.419	0.411	**0.415**	-0.020
Private Label III	0.300	0.319	**0.310**	0.272	0.301	**0.286**	0.024
Other National Brands	0.525	0.532	**0.529**	0.648	0.529	**0.588**	-0.060
Nescafe Instant Brands	1.303	1.625	**1.464**	1.502	1.778	**1.640**	-0.176
K-Cups Brands	1.224	1.152	**1.188**	1.487	1.150	**1.318**	-0.130

Table 4. Market Shares by Category and Store

Category	Store 1	Store 2	AVG1	Store 3	Store 4	AVG2	AVG1& AVG2	AVG1-AVG2
Folgers I	19.58	20.11	**19.84**	16.82	16.82	**18.94**	19.39	0.91
Folgers II	5.78	4.94	**5.36**	2.90	2.90	**5.40**	5.38	-0.03
Maxwell House I	10.51	9.54	**10.02**	8.31	8.31	**10.72**	10.37	-0.70
Maxwell House II	2.18	3.15	**2.67**	1.80	1.80	**2.87**	2.77	-0.20
Starbucks I	12.71	12.97	**12.84**	12.50	12.50	**10.89**	11.86	1.95
Starbucks II	10.46	11.03	**10.75**	13.94	13.94	**9.59**	10.17	1.16
Private Label I	12.42	11.98	**12.20**	13.25	13.25	**13.71**	12.96	-1.51
Private Label II	4.09	5.32	**4.70**	6.52	6.52	**8.65**	6.68	-3.95
Private Label III	1.15	1.24	**1.20**	0.93	0.93	**0.87**	1.04	0.32
Other National Brands	12.92	13.72	**13.32**	14.43	14.43	**11.34**	12.33	1.98
Nescafe Instant Brands	1.67	1.78	**1.73**	5.64	5.64	**4.65**	3.19	-2.92
K-Cups Brands	6.53	4.22	**5.37**	2.96	2.96	**2.36**	3.87	3.01

Maxwell House coffee is the second largest brand and two categories of this coffee are defined the same way as specified for Folgers: Maxwell House I and Maxwell House II. Maxwell House I consists of all brands of Regular, Premium, Colombian and Gourmet coffee. This category

captures 10.72% of coffee sales. Maxwell House II consists of all remaining Maxwell House brands and this category represents 2.77% of coffee sales. For both categories of Folgers and Maxwell House, it should be noted that shoppers in inner-city Store 3 allocate a smaller share of their budget to purchases in these four categories than shoppers in the other three stores. Data in Table 1 suggest that these selection differences are likely due more to differences in educational attainment among shoppers than to differences in income. That is, an unusually large proportion (59.95%) of inner-city residents has college degrees.

Starbucks brands are also segmented into two categories: Starbucks I and Starbucks II. Starbucks I consists of all regular, blends and Colombian coffee, whereas Starbucks II consists of all specialty coffees: Frappuccino, Espresso and Double-Shot. Many of these specialty coffees are ready-to-drink products but they are all displayed with traditional coffee (non-refrigerated products). Across the four stores, Starbucks I constitutes 11.86% of all coffee sales; Starbucks II, 10.17% of sales. As compared to shoppers of other stores, shoppers of Store 3 are shown to purchase smaller shares of all four categories of Folgers and Maxwell House brands. Yet, as compared to shoppers of other stores, shoppers of Store 3 purchase the largest share of the best-known specialty coffee, Starbucks II. This budget allocation is undoubtedly influenced by the store's location around the Ohio State University campus and the educational attainment of these students, particularly those who patronize this store.

Private Label coffee is segmented into three categories: Private Label I, Private Label II, and Private Label III. The first category consists of Regular, Premium Blends, Colombian, and Gourmet coffee and it constitutes 12.96% of coffee sales (Table 4). Private Label II consists of Decaf and Instant varieties and this category represents 6.68% of total coffee sales. Finally, Private Label III consists of specialty coffee, Cappuccino and Espresso. This category is reasonably small, representing 1.04% of total coffee sales. It should be noted that this supermarket chain offers a wide variety of super-premium brands, just as offered by manufacturers of national brands. These brands are undoubtedly offered to compete for customers who are attracted to premium national brands.

An especially large category, Other National Brands, capture many well-known brands. Included among these are: 8 O'Clock, Caribou, Gevalia, Millstone, Peet, Seattle Best, and Yuban. These brands, representing category 10, are easily recognizable at the national level and many of them have sufficient sales to represent standalone categories. Yet, following the law of parsimony, these national brands are aggregated into one category and the market share for this category is 12.33%.

Nescafe Instant Brands represent a combination of Premium Clasico and Super Premium Taster's Choice. Both are instant coffee and therefore aggregation into one category (category 11) seems natural. This category is fairly large for inner-city shoppers but more meager for suburban shoppers. Overall, the category represents 3.19% of coffee sales. Finally, K-Cups, a surging variety of coffee, consist of all national brands of K-cups (retailer does not offer a Private Label K-cups brand). Although this retailer has yet to offer private label K-cups, it should be emphasized that many retailers have realized tremendous growth for their K-cups coffee since the 2012 expiration of the patent held by Green Mountain Coffee Roasters for the Keurig machine (Freeman 2013). As shown in Table 4, this category represents 3.87% of total coffee sales.

Socioeconomic Characteristics for Each Geographic Area

The primary objective of this section is to emphasize data (already shown in Table 1) that support the major premise of this study: Stores 1 and 2 are patronized largely by higher-income shoppers who are relatively price-insensitive; by contrast, Stores 3 and 4 are patronized mainly by lower-income shoppers who are relatively price-sensitive. This emphasis is provided because this researcher does not have access to panel data with socioeconomic characteristics for individual shoppers. To highlight differences among stores, descriptive statistics from the 2010 census are provided for residents surrounding each store. These statistics and/or socioeconomic factors include median household income, median family income, population over 65, poverty rate and educational attainment. These factors together with store location data offer support for segmenting shoppers into suburban (higher-income) and inner-city (lower-income) groups. These data are limited to a 3-mile radius around each store because research supports the notion that this area characterizes the food shopping behavior of most consumers (Drewnowski et al. 2012).

Although census tract data are used to isolate stores according to socioeconomic characteristics, it is recognized that no clear boundaries exist to separate inner-city shoppers from suburban shoppers. Further, even if such boundaries existed, there are no laws to keep residents from crossing them. If higher-income shoppers make purchases at lower-income stores, these purchases are expected to lead to smaller (less price-sensitive) own-price elasticities. Likewise, purchases in higher-income stores by lower-income shoppers are expected to lead to larger (more price-sensitive) own-price elasticities. A maintained hypothesis of this study is that such deviations from normal shopping patterns will be so small as to have no measureable effect on estimated price-elasticities.

As shown in Table 1, two of the selected stores are within the inner-city of Columbus and they serve the shopping needs of inner-city residents. Two others stores are outside the city limits and they serve the shopping needs of suburban residents. Socioeconomic data for these stores show residents within a 3-mile radius of the suburban stores to have median household income that is more than twice that of residents within this same radius of inner-city stores ($86,309 vs. $35,918). Further, comparable poverty rates are more than 5-times higher for inner-city residents than for suburban residents (27.6% vs. 4.6%). Significant differences also exist among other factors, such as educational attainment and age disparities. Simply stated, most shoppers of inner-city stores have socioeconomic characteristics that differ significantly from those of suburban shoppers and these characteristics are hypothesized to influence the magnitude of price-sensitivities for the two groups.

Data in Table 5, provided by the retail chain, are meant to strengthen the argument that differences exist for the two groups of stores. First, suburban stores are generally larger than inner-city stores. This is reflected in several factors but most clearly in weekly store sales and sales per customer. Average weekly sales for the two suburban stores total $812,532, but sales average just $531,679 for the two inner-city stores. Further, as support for the hypothesis that major income differences exist for the store groups, average purchases per customer amount to $44.17 for suburban shoppers, as compared to $29.35 for inner-city shoppers. As another indicator, weekly coffee sales averaged $4,111 for suburban stores, but just $3,094 for inner-city

stores. A z-test of mean differences for coffee sales is shown to be statistically different at the .001 level of significance (z = 4.22). Although weekly coffee sales for inner-city Store 4 are greater than those for suburban Store 2, coffee sales per customer are lower in Store 4. This observation is consistent with findings by Aguiar and Hurst (2007) that lower-income shoppers have lower opportunity cost of time. The larger customer count coupled with low purchases per visit suggests that shopper of this store make frequent trips to the supermarket. Indeed residents surrounding Store 4 have the lowest median family income ($42,381) but the largest customer count per week. In short, coffee sales per customer for Stores 3 and 4 support the view that shoppers of these two inner-city stores have lower-incomes than shoppers of Stores 1 and 2.

Table 5. Coffee Sales and Customer Observations by Store (Average weekly observations)

Store	Customer Count (CC)[a]	Store Sales (SS)[b]	SS/CC)[c]	Coffee Sales (CS)[d]	CS/CC)[e]	Total Coffee Sales[f]
1	20574	$919,596	$44.70	$4,981	$0.24	$258,993
2	16164	$705,468	$43.64	$3,241	$0.20	$168,556
3	13804	$429,391	$31.11	$2,011	$0.15	$104,553
4	22976	$633,968	$27.59	$4,177	$0.18	$217,221

Notes:
[a]Customer count is the number of customers making a purchase, not the number entering a store.
[b]The variable Store Sales is a proxy for store size and shoppers' income.
[c]Sales per customer (SS/CC) represents the weekly average purchase per customer.
[d]Coffee Sales (CS) is the average weekly sales of coffee per store.
[e]Coffee Sales per customer (CS/CC) is the average sales per customer, assuming all shoppers purchase coffee.
[f]Total Coffee Sales are store sales for the 52 weeks of this data period.

Empirical Results

Overview

Eleven of twelve own-price elasticities are negative and statistically significant and six of these eleven are greater than 1 in magnitude, suggesting a high level of consumer price-sensitivity (Table 6-A, see Appendix). The own-price elasticity for all shoppers is not statistically significant for K-cups coffee but it is statistically significant for inner-city shoppers. Temporary price reductions are effective in stimulating sales for eight of 12 categories and expenditure elasticities are positive and statistically significant for all categories, except Private Label III. Much of the variation in coffee weekly purchases is explained by the independent variables: price, promotion, coffee expenditures, and store differences. The percentage of explained variation (R^2) ranges from 56% to 91%. An unexpected result is that inner-city shoppers are shown to have the same level of price-sensitivity as suburban shoppers for nine of twelve product categories. The three exceptions are Private Label III, Other National Brands, and K-cups. All consumers are shown to have a high level of price-sensitivity for Other National Brands but inner-city shoppers are shown to have a lower level of price-sensitive than suburban shoppers. As the market share data in Table 4 shows, this relationship is undoubtedly due to a strong preference for these brands by inner-city shoppers of Store 3.

Own-Price Elasticities

As hypothesized, price is a major determinant of coffee purchases, as all but two elasticities are negative and statistically significant at the .001 level. Relative to the three leading brands of coffee—Folgers, Maxwell House and Starbucks—it is clear that consumers have the highest level of price-sensitivity for Maxwell House brands and the lowest level for Starbucks. Consumers are highly price-sensitive toward the purchase of both categories of Maxwell House coffee, but price-insensitive toward the purchase of both categories of Starbucks' coffee (Table 6-A). Folgers' brands fall in the middle of these price elasticities, with one category being mildly elastic (-1.14); the other, mildly inelastic (-.89). Unexpected for these six categories of coffee is the common elasticities for inner-city and suburban shoppers. These findings do not support the hypotheses of this study and these results are likely do to a combination of brand aggregation and data omissions.

Coffee is a storable product and many consumers do not make frequent purchases of their favorite brands. Hence, to deal with missing observations over several weeks, some aggregation was necessary. This aggregation process has undoubtedly averaged some of the substitution that occurs among brands and this process is likely to explain much of the similarity in own-price elasticities for all shoppers. Further, market characteristics that are missing from these data could be important determinants of price responses, particularly since researchers have demonstrated their explanatory power for promotional responses (Bell et al. 1999). These market characteristics include factors such as: brand experience, budget share, purchase frequency, perceived differentiation and relative price position. Related to the storability of coffee is the fact that consumers can time their purchases to take advantage of price promotions and these promotions can limit the effectiveness of everyday pricing to capture purchasing behavior. Finally, market share purchases for inner-city shoppers of Store 3 are so different from those of inner-city shoppers for Store 4 that these offsetting patterns may have constrained the capacity of the econometric model to capture price-sensitivity differences.

Private label coffee was aggregated into three categories: Private Label I, Private Label II, and Private Label III. Consumers show considerable price-sensitivity toward the purchase of Private Label I but far less price-sensitivity toward the purchase of Private Label II. For both categories, inner-city shoppers are shown to have the same level of price-sensitivity as suburban shoppers. These results could emanate from differences in market share purchases for Stores 3 and 4 (Table 4). That is, shoppers of Store 3 exemplify purchasing patterns for many product categories that are more consistent with suburban shoppers of Stores 1 and 2 than they are with shoppers of Store 4. However, it should be noted that Private Label II consists of instant coffee and this product has a low-quality image. That is, roasters make it from low-quality beans to keep the price attractive for lower-income consumers. Indeed inner-city shoppers are shown to have strong preferences for Private Label II products, showing market share differences between inner-city and suburban shoppers that is the largest among the twelve categories. For Private Label III, inner-city shoppers are shown to be more price-sensitive (-1.47) than suburban shoppers (-.87). This product category accounts for a small percent of total coffee sales but inner-city shoppers are quite sensitive to price changes for these products.

A category consisting of many well-known national brands, labeled Other National Brands, is shown to have own-price elasticities that are statistically different for the two consumer groups. An unexpected result, however, is that inner-city shoppers are shown to have a lower level of price-sensitivity for this product category. With more than twelve national brands included in this category, this estimated elasticity is possibly reflecting the fact that inner-city shoppers within the boundaries of Store 3 have a strong preference for many of these brands. Indeed inner-city shoppers surrounding Store 3 make larger purchases within this product category than those made by suburban shoppers surrounding Stores 1 and 2 (Table 4). Such preferences could reflect the fact that Store 3 includes the Ohio State University campus within its boundaries and all of its 55,000 students. These students, although part of a lower-income area, are likely to have product preferences that differ from those of more traditional populations. Further, these strong preferences of shoppers in Store 3 for this product category are possibly overwhelming preferences of shoppers in Store 4 for this same product category. If so, this could explain the lower price-sensitivity of lower-income shoppers. In short, a number of factors can explain inner-city shoppers' lower own-price elasticity of -1.32 for this product category versus the higher own-price elasticity of -2.78 for suburban shoppers.

Two brands of Nescafe are combined into one within the Nescafe Instant Brands category and both inner-city and suburban shoppers are shown to have an identical level of price sensitivity, an own-price elasticity of -1.29. Instant coffee is often viewed as a commodity that has special appeal to those attempting to save money. From this perspective, one would expect inner-city shoppers to purchase much larger market shares and also express a higher level of price-sensitivity. Larger market shares are realized (Table 4) but expected differences in price-sensitivity are not realized and this is possibly due to the fact that instant coffee has moved beyond its commodity image. Indeed Nescafe offers premium (Clasico) and super premium (Taster's Choice) brands of instant coffee and this latter brand is largely reflected in the market shares shown for suburban Stores 1 and 2.

The final category of coffee, K-Cups, is interesting in that it is the only category for which price is not a statistically significant determinant of purchases for all shoppers. It is one of the most expensive varieties of coffee; yet, it has shown the fastest growth over the past few years (Mintel 2012). Inner-city shoppers are shown to have a negative and statistically significant own-price elasticity (-1.24) for this product, confirming their high price-sensitive toward the purchase of K-cups coffee. Clearly the market share data of Table 4 shows that inner-city shoppers make much smaller purchases in this category than those made by suburban shoppers. Yet, it should be noted that inner-city shoppers within the Ohio State University area (Store 3) purchase larger shares than other inner-city shoppers (Store 4).

Cross-Price Elasticities

A price change for one good often generates a quantity change for another good and economists capture this effect with a cross-price elasticity. Twelve product categories are estimated in this study and this estimation results in 132 cross-price elasticities. All cross-price elasticities are hypothesized to show positive relationships because each brand meets a similar need and can therefore serve as a substitute for any other brand. Statistically insignificant cross-price elasticities relationships are found for most product categories but a total of 26 statistically

significant elasticities are revealed. Eighteen (69%) of these show substitute relationships and the other eight show complementary relationships (Table 6-B, see Appendix).

Folgers I is shown to be a substitute for both Maxwell House I and II coffees. Since Folgers and Maxwell House are the two leading brands of coffee, it seems reasonable that consumers would substitute Folgers, the leading brand, for brands of Maxwell House. Another category of Folgers, Folgers II, is a substitute for Maxwell House II and a complement to Folgers I. This latter effect suggests that a price increase for one category of Folgers' coffee leads to quantity reductions across both Folgers' categories (all Folgers' brands). That is, consumers associate a price increase for one brand as a price increase across the entire brand category and make purchases from other brands. In essence, they seek other brands of Maxwell House, as opposed to seeking similar products within Folgers' brands. With respect to estimated cross-price elasticities for this study, it seems appropriate to acknowledge that both the aggregation of brands into categories and the stockpiling effect that results from price promotions could be factors influencing these estimates.

Maxwell House I is shown to be a substitute for Folgers I and it is also a substitute for Other National Brands. This latter category consists of many national brands and this substitute relationship suggests that Maxwell House I coffee has product attributes that are similar to those found in Other National Brands. Maxwell House II, as estimated for Folgers I and Folgers II, is shown to be a complement to Maxwell House I. Again, aggregation of brands within categories and stockpiling incentives from price promotions could be factors in these estimated elasticities. Indeed weighted prices for these brands (Table 3) would suggest that Maxwell House I is a strong substitute for Maxwell House II. Yet, it is possible that a price increase for products within a product category is perceived as a price increase across all products within that category.

Products offered in the Starbucks I category are somewhat similar to those offered in Folgers I and Maxwell House I categories. Yet, Starbucks I is not a substitute for any Folgers or Maxwell House brands, but it is a substitute for Other National Brands. By contrast, Starbucks II is a substitute for Folgers I. These substitution patterns, especially for Starbucks I, suggest that consumers have unique perceptions of Starbucks' products. Specifically, price increases for the two leading brands, Folgers and Maxwell House, do not precipitate purchases of similar brands of Starbucks, Starbucks I. Yet, price increases for brands within Other National Brands make products within Starbucks I an attractive alternative. Further, price increases for Folgers I lead consumers to purchase specialty Starbucks products, Starbucks II. In essence, consumers are willing to switch from the leading brand, Folgers, to specialty products within the third-leading brand, Starbucks, but not from the leading brands (Folgers) to other similar products within the third-leading brand (Starbucks).

Private Label I coffee is a category with strong consumer preferences and it serves as a substitute for three other categories: Maxwell House I, Maxwell House II, and Folgers I. These three substitute relationships speak to the market strength of private label coffee in this Columbus, Ohio, market. Unexpectedly, this product category is also shown to be a complement to K-cups coffee. Because price is not a statistically significant determinant of K-cups coffee purchases, this effect could suggest that consumers decrease their purchases in other product categories as

they increase their purchases of K-cups coffee. Indeed cross-price relationships for this study suggest that they decrease their purchases of all private label coffee and Other National Brands.

Private Label II coffee is shown to be a substitute for Maxwell House II, Private Label III and Nescafe Instant Brands. These relationships are theoretically logical and it is of interest to note that neither Nescafe Instant Brands nor Maxwell House II is a substitute for Private Label II. In essence, private label is a substitute for national brands but national brands are not substitutes for private labels. This suggests that relative prices between private label decaf/instant and national brands of decaf/instant are such that price increases for Private Label II are below the threshold level that would precipitate a brand switch. Finally, as previously mentioned, this product category is a complement to K-cups coffee. Again, this relationship is possibly related to the statistical insignificance of the price-elasticity for K-cups.

Private Label III is shown to be a complement to K-cups coffee and a substitute for Folgers I. The complementary relationship is possibly related to the statistical insignificance of the own-price elasticity for K-cups and the substitute relationship suggests that price increases for the product category with the largest market share can lead consumers to experiment with products in other categories. Given the similarities in product attributes, it seems more reasonable to expect this product category to serve as a substitute for Starbucks II. Perhaps this relationship is not realized for two reasons: (1) major differences in market shares for the two categories; and (2) comparable prices across the two categories. In essence, those who purchase Starbuck coffee have strong preferences for these products and do not experiment with other brands; by contrast, those who purchase Folgers' products are willing to experiment with private label brands.

Other National Brands consist of many national brands and this broad aggregation complicates the interpretation of cross-price elasticities. The estimates show one substitute and two complementary relationships. Comparable to estimates for Private Label III, Other National Brands are also shown to be a substitute for Folgers I. With this category of Folgers being number one in coffee sales, it is logical for consumers to switch to some of the many brands within Other National Brands in response to price increases for Folgers I. By contrast, price increases for Private Label II and K-Cups coffee lead to decreased purchases of Other National Brands. These complementary relationships suggest that purchases in these three categories have moved together and these relationships suggest that some important market characteristics may be missing from these data.

Nescafe Instant Brands is a substitute for Maxwell House II, as theory would predict. Yet, it is not a substitute for Private Label II, but it is a substitute for Private Label I. These relationships are possibly influenced by the aggregation of decaf and instant coffee into a single category. Further, the aggregation of Nescafe regular and instant brands into a single category could have influenced these relationships. For example, many consumers who purchase Nescafe Taster's Choice may consider private label instant coffee to be an inferior product. Yet, those who purchase Nescafe Clasico brand might have a different view of private label instant coffee. In essence, consumers who trade down may set boundaries or limits on their willingness to "trade". Finally, K-Cups coffee is shown to be such a unique product that it has no substitutes or complements.

Temporary Price Reductions (TPRs) and Expenditure Elasticities

In cooperation with manufacturers, retailers often use temporary price reductions to try and stimulate sales. Most TPRs, as coded in this study, ranged between 10 and 21%, although a few were as high as 35%. These TPRs are instrumental in stimulating sales for eight of twelve product categories. For each TPR, changes in sales ranged from .01 ounces to .11 ounces, with an average of .07. As a general rule, slow-moving products received a smaller boost from TPRs than faster-moving products. From a shopping perspective, it seems that consumers are either unaware of great deals on less popular brands, or they have a set of fixed preferences that cause them to ignore some brands. It is of interest to note that three of the four categories for which TPRs are not effective involved some combination of instant coffee, Maxwell House II, Private Label II, and Nescafe Instant Brands. If indeed instant coffee is perceived to be a commodity purchase that appeals mainly to lower-income shoppers, then this factor could explain a limited response to price promotions. Further, the limited response to price promotions could be related to the aggregation of decaffeinated coffee into this category, as decaffeinated represents less than 10% of coffee sales for these stores.

Expenditures on coffee are used in this study as a proxy for income and the empirical results show positive and statistically significant responses in coffee quantities for 11 of 12 categories. Private Label III is the only category with a statistically insignificant elasticity and this effect could be related to its low market share of roughly one percent. Indeed expenditure elasticites show the largest percentage change in purchases for Maxwell House I and the smallest change for PL III. For most product categories, the percentage change in purchases is less than 1%, for each 1% change in coffee expenditures. As expected, a fairly large effect (.92%) is realized for K-cups coffee.

Store Effects

Considerable variations exist in total sales among the four stores and these differences were hypothesized to have statistically significant impacts on coffee purchases for the twelve product categories. Store 1 is used as the base store and, relative to this store, negative store differences are found for six product categories, positive store differences for four, both positive and negative differences for one, and no statistically significant effect for one (Table 6-C). Of particular interest are store differences for two categories of coffee: Starbucks II and K-Cups. Products in the Starbucks II category have strong appeal to those with high incomes; those in K-Cups have strong appeal to those with high levels of education. Shoppers of Stores 1 and 2 meet the conditions specified for Starbucks II products, while shoppers around Store 3 meet the conditions specified for K-Cups coffee. For these product categories, Stores 2 and 3 show no statistical difference in purchases from those of Store 1. Store 4, as expected, shows a negative difference with respect to Store 1 because shoppers surrounding Store 4 have lower education levels and lower incomes. For K-Cups coffee, the own-price elasticity is shown to be statistically insignificant for suburban shoppers of Stores 1 and 2, but statistically significant for inner-city shoppers of Stores 3 and 4. Thus, the negative store effects for Stores 3 and 4 and statistically insignificant effect for Store 2 are consistent with the estimates for own-price elasticities.

Summary and Conclusions

This research is rooted in the premise that inner-city shoppers have higher levels of price-sensitivity for all brands, varieties and categories of coffee. Economics serves as the foundation for this premise and this researcher has confirmed its validity for products such as breakfast cereals, cheese, milk and orange juice. Results from this study provide limited support for this premise, as nine of twelve own-price elasticities showed inner-city (lower-income) shoppers to have price-sensitivity levels statistically insignificant from those of suburban (higher-income) shoppers. Yet, purchased shares of coffee across the twelve categories show inner-city shoppers more inclined to purchase lower-priced, private labels and instant coffee.[4] For example, private label and instant coffee constituted respectively 23.2% and 4.6% of coffee purchases for inner-city shoppers, but 18.1% and 1.7% respectively for suburban shoppers and these differences are statistically significant at the .01 level. By contrast, suburban shoppers are more inclined to purchase higher-priced national brands and specialty coffee. For example, Starbucks and K-Cups coffee comprised 28.9% of purchases for suburban shoppers but just 22.8% of purchases for inner-city shoppers. These trends support the main premise of this paper, although this support is weaker than what would have been revealed with statistically significant differences in price-sensitivities. Three factors have likely influenced the own-price elasticities in this study: (1) store selections; (2) aggregation of brands into categories; and (3) unavailable market characteristics for brands, categories and consumers.

Store selections were guided by geographic locations and income levels surrounding these locations. Results from this study suggest that income and education may interact in ways to alter hypothesized relationships between income and purchasing patterns. This is evident by observations for Store 3; residents surrounding this store are shown to have the highest incidence of poverty but they purchase the largest share of the highest-quality specialty coffee, Starbucks II. A key difference between the two inner-city stores is revealed in the educational attainment of residents surrounding them. A total of 59.9% of residents surrounding Store 3 has college degrees, whereas just 17.6% of residents surrounding Store 4 have similar accomplishments. A normal profile of residents surrounding an inner-city store is one of high poverty and low levels of education. So, it seems reasonable to conclude that the results of this study have been influenced by deviations from this normal profile.

The aggregation of brands into categories is consistent with approaches used by other researchers; yet, it is likely that the twelve categories used in this study are too limiting to capture consumer responses to more than 265 brands, varieties and flavors of coffee. Bell et al. (1999) segmented 18 brands of coffee into a single category and Krishnamurthis and Raj (1991) segmented all brands of Folgers, Maxwell House and Chock full o'Nuts into three categories, representing 75% of total coffee sales. Despite these precedents from earlier studies, today's consumers have more product choices and less aggregation is likely to do a better job of capturing consumer responses to price changes for brands of coffee. Less aggregation seems especially relevant for estimating cross-price elasticities, as just 26 of 132 in this study are statistically significant. Since consumers are known to make substitutions among products that are close in product space, category aggregation has likely averaged meaningful substitution

[4] Instant coffee per ounce is not necessarily lower-priced than ground coffee. Many shoppers perceive it to be lower-priced because consuming it does not require the purchase of a coffee maker and filters.

patterns. Yet, it is of interest to note that more product categories serve as substitutes for the two leading brands, Folgers and Maxwell House, than these same brands serve as substitutes for other brands. In essence, price increases for these leading brands will cause consumers to switch to others brands more readily than price increases for other brands will cause them to switch to these leading brands. With budget share being an important determinant of purchase behavior, these substitution patterns could reflect the fact that these leading brands represent a larger share of consumers' budget.

Although stores were selected by geographic areas to account for major differences in consumers' socioeconomic characteristics, it is recognized that consumer panel data are much richer and are likely to yield better results than store-level data. Further, it is recognized that results from store-level data can be improved with the addition of market characteristics such as manufacturer advertising, coupon redemptions, display activities and retailer advertising. None of these enumerated factors were available to this researcher. Despite these data limitations, it should be noted that many of the results from this study are consistent with those from other studies. For all but K-Cups coffee, price is shown to be a significant determinant of quantity purchased. Further, both elastic and inelastic own-price estimates are shown for the twelve product categories and these estimates are consistent with studies that have found elastic measures for traditional varieties (Krishnamurthi and Raj 1991; Bell et al. 1999) and inelastic measures for specialty coffee, i.e., Fair Trade (Arnot et al. 2006). Additionally, as hypothesized, products close in product space are more likely to substitute for one another than products in more distant space. These results show Folgers I to be a stronger substitute for Maxwell House I than it is for Maxwell House II. Likewise, Private Label I is shown to be a stronger substitute for Folgers I and Maxwell House I than it is for Maxwell House II. In short, many results are consistent with the study hypotheses as well as with findings from other studies. If this study could be replicated with store-level data, it is likely that more significant differences in price-sensitivities would be revealed with less brand aggregation and more careful store selections.

Consistent with economic theory and other coffee research, findings from this study show that all consumers are sensitive to price but inner-city (lower-income) shoppers are more price-sensitive than suburban (higher-income) shoppers for many brands and varieties. While estimated own-price elasticities offer weak support for this conclusion, purchased shares offer strong support. Differences in purchase behavior for the two inner-city stores suggest that the selection of these stores may be a critical factor in explaining the realized results for own- and cross-price elasticities. Yet, the contributions of this paper are significant for coffee manufacturers, consumers and retailers. Temporary price reductions (TPRs) of significant magnitude are shown to be especially effective for brands with large market shares and this suggests opportunities for manufactures to influence the sale of these brands with increased incentives to retailers. Equally important, consumers can easily observe the frequency of TPRs and time their purchases to stock-up on favorite brands and possibly experiment with untried brands. Further, suburban (higher-income) shoppers are price-insensitive toward the purchase of K-cups and this provides opportunities for coffee manufactures and retailers to increase their sales and profit margins. Finally, inner-city (lower-income) consumers are more inclined to purchase private labels and this purchase behavior provides opportunities for retailers to stock and display more of these products in selected stores and ultimately increase coffee returns.

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Appendix

Table 2. Twelve Categories of Coffee and Some Selected Products in Each Category

Category	Selected Products within Each Category		
Folgers I -- Includes all brands of Folgers except Decaffeinated and Instant coffee			
	FOLGER 100% COLMBN COFFEE	FOLGER GRMT COLOMBN K CUP	FOLGER BRKFST BLND COFFEE
	FOLGER BRAZIL BLND COFFEE	FOLGER GRMT SPRME COFFEE	FOLGER GS CHOC TRFLE COFF
Folgers II -- Includes all Decaffeinated and Instant coffee			
	FOLGER DCF CLSC RST COFF	FOLGER GS DECAF CLMBN COFF	FOLGER DECAF COFF SINGLES
	FOLGER DCF INST JAR COFF	FOLGER INST PLST JAR COFF	FOLGER GS DECAF CLMBN COF
Maxwell House I -- Includes all brands of Maxwell House except Decaffeinated and Instant			
	MXHS BREAKFST BLND COFFEE	MXHS GOURMET RST	MXHS FRENCH ROAST COFFEE
	MXHS COLOMBN SPRM COFFEE	MXHS HOUSE BLEND COFF	MXHS ORIGINAL COFFEE
Maxwell House II -- Includes all Decaffeinated and Instant coffee			
	MXHS DECAF INSTANT COFFEE	MXHS ORIG DECAF COFF	MXHS LITE COFFEE
	MXHS INSTANT COFFEE	MXHS ORIG LITE COFF	MXHS DCF TRL PK COFF 10CT
Starbucks I -- Includes all regular, blends, Colombian and Gourmet coffee			
	STARBUCKS VIA HOUSE BLEND	STRBCK C RCA TARRZ GR COF	STRBCK 50% CAF BRKFST COF
	STBK GROUND VERANDA	STRBCK CFE VRNA DCF GR CF	STRBCK COLMBN WHL BN COFF
Starbucks II -- Includes all specialty coffee such as Frappuccino, Espresso and Double-Shot			
	STRBCK DOUBLESHOT COFFEE	STRBCK FRAPP LT VANILLA	STRBCK DBLSHT ENRGY VANLA
	STRBCK ESPRESSO GR COFFEE	STRBCK FRAPP MINT MOCHA	STRBCK FRAPPUCCINO COFFEE
Private Label I -- Includes all regular, blends, Colombian and Gourmet Coffee			
	BKFST BLND GRD V COF	KONA BLND WHL BN COF	PREM DRK ROAST COFFEE
	SUPREME VP COFFEE	KENYAN AA WHL BN COF	CINN HAZELNUT COFFEE
Private Label II -- Includes all Decaffeinated and Instant coffee			
	FRENCH VAN INST COFF	VP DECAF COFFEE	HZLN CR DCF GR VL CF
	CLMBN S MINI DCF COF	CLMBN DCF GRD VL COF	SF FF FRN VAN INS CF
Private Label III -- Includes all specialty coffee such as Cappuccino, Espresso and Mocha			
	CAFFE FRAPPE COFFEE	MCHA LTTE GRD VL COF	VANILLA CAFFE FRAPPE
	ESPRESSO GRND VL COF	ITLN ESPRESSO RST VP	MOCHA CAFFE FRAPPE
Other National Brands -- Includes all national brands except Folgers, Maxwell House and Starbucks coffee			
	PEET HSE BLND WHL BN COFF	WHTCST COFFEE	SPTLT VAL GROUND COFFEE
	PEET ITALIAN ROAST COFFEE	YUBN FACM COFFEE	SBST ANNIV ROAST COFFEE
Nescafe Instant Brands -- Includes all varieties of Clasico and Taster's Choices coffee			
	NSCF CLASICO	NSCF GOLD BLEND DECAF	NSCF ORIGIINAL
	NSCF CLASSIC REG	NSCF ORIGINAL DECAFF	NSCF ALTA RICA
K-Cups Brands -- Includes all national brands of K-Cups coffee			
	STRBCK HOUSE BLEND KCUP	FOLGER GRMT BLK SILK KCUP	NWMN OWN SPCL BLEND KCUP
	STRBCK SUMATRA KCUP	MLST HAZELNUT CREAM K CUP	GRMTN BREAKFAST BLND KCUP

Table 6-A. Selected Empirical Results for Time-Series Cross-Section Regression

Category	Own-Price Elasticity[a]	P Value	Own-Price Elasticity[b]	P Value	Own-Price Elasticity[c]	Expend Elasticity	P Value	TPR	P Value	R^2
Folgers I	-1.14	0.0001	-0.13	0.6412	-1.27	0.97	0.0001	0.045	0.0008	0.82
Folgers II	-0.89	0.0001	-0.07	0.8128	-0.97	0.99	0.0001	0.051	0.0901	0.86
Maxwell House I	-3.09	0.0001	-0.50	0.2546	-3.59	1.14	0.0001	0.097	0.0023	0.83
Maxwell House II	-1.87	0.0001	-0.53	0.8471	-2.40	1.02	0.0001	0.019	0.7128	0.83
Starbucks I	-0.15	0.0875	0.05	0.6939	-0.10	1.09	0.0001	0.046	0.0001	0.66
Starbucks II	-0.48	0.0011	-0.01	0.9408	-0.49	0.45	0.0006	0.027	0.0187	0.60
Private Label I	-1.48	0.0001	-0.23	0.3337	-1.71	0.56	0.0001	0.217	0.0756	0.73
Private Label II	-0.75	0.0001	-0.04	0.8817	-0.79	0.77	0.0001	0.022	0.4441	0.91
Private Label III	-0.87	0.0001	-0.60	0.0124	-1.47	0.17	0.6004	0.213	0.0886	0.56
Other National Brands	-2.79	0.0001	1.47	0.0047	-1.32	0.68	0.0001	0.015	0.2809	0.72
Nescafe Instant Brands	-1.29	0.0012	-0.53	0.3086	-1.82	0.84	0.0001	0.035	0.4336	0.69
K-Cups Brands	0.49	0.1425	-1.24	0.019	-0.75	0.92	0.0005	0.114	0.041	0.66

[a]Indicates price elasticity for all shoppers.
[b]Indicates price elasticity difference for inner-city shoppers.
[c]Sum of elasticities a and b is the price elasticity for inner-city shoppers.

Table 6-B. Own- and Cross-Price Elasticities for Time-Series Cross-Sectional Regression

		Price											
		Fol I	**Fol II**	**MH I**	**MH II**	**SB I**	**SB II**	**PL I**	**PL II**	**PL III**	**ONB**	**NIB**	**K-Cups**
Quantity	Fol I	-1.14	-	0.32	0.21	-	-	-	-	-	-	-	-
	Fol II	-0.44	-0.89	-	0.24	-	-	-	-	-		-	-
	MH I	0.81	-	-3.09	-	-	-	-	-	-	0.84	-	-
	MH II	-	-	-1.06	-1.87	-0.15	-	-	-	-		-	-
	SB I	-	-	-	-	-0.15	-	-	-	-	0.71	-	-
	SB II	0.73	-	-	-	-	-0.48	-	-	-	-	-	-
	PL I	0.33	-	0.31	0.27	-	-	-1.48	-	-	-	-	-0.93
	PL II	-	-	-	0.16	-	-	-	-0.75	0.09	-	0.35	-0.26
	PL III	0.83	-	-	-	-	-	-	-	-0.87	-	-	-0.61
	ONB	0.37	-	-	-	-	0.18	-	-0.18	-	-2.79	-	-
	NIB	-	-	-	0.39	-	-	0.46	-	-	-	-1.29	-
	K-Cups	-0.60	-	-	-	-	-	-	-	-	-	-	**0.49**

Variable Definitions:
[a]Fol I is Folgers I; Fol II is Folgers II; MH I is Maxwell House I; MH II is Maxwell House II;
[b]SB I is Starbucks I; SB II is Starbucks II; PL I is Private Label I; PL II is Private Label II;
[c]PL III is Private Label III; ONB is Other National Brands; NIB is Nescafe Instant Brands;
[d]K-Cups is K-Cups Brands; (-) and boldfaced represent statistically insignificant own- and cross-price elasticities.

Table 6-C. Selected Empirical Results for Time-Series Cross-Sectional Regression

	Folgers I		**Folgers II**		**Maxwell House I**	
Store Variables	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value
Store 2	-0.1539	0.0540	-0.3110	0.0070	-0.1000	0.7422
Store 3	-0.3801	0.1707	-0.9700	0.0001	0.3543	0.5594
Store 4	-0.1358	0.5989	0.0855	0.5989	0.7757	0.1545
Constant	-0.9383	0.3102	-2.5860	0.0554	-4.2230	0.0205
	Maxwell House II		**Starbucks I**		**Starbucks II**	
Store Variables	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value
Store 2	0.9572	0.0001	1.2620	0.0001	-0.1130	0.3276
Store 3	-0.4634	0.1615	1.3600	0.0001	-0.0046	0.9885
Store 4	0.4969	0.0177	1.1150	0.0001	-0.6706	0.0128
Constant	-5.5520	0.0105	-3.5520	0.0242	3.6180	0.0016
	Private Label I		**Private Label II**		**Private Label III**	
Store Variables	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value
Store 2	-0.1569	0.0961	0.0047	0.9652	-0.2176	0.3231
Store 3	-0.0568	0.8469	0.2254	0.4204	-1.7910	0.0002
Store 4	0.3503	0.1558	0.8352	0.0007	-1.1280	0.0018
Constant	2.1970	0.0442	-0.8375	0.4640	4.3240	0.1096
	Other National Brands		**Nescafe Instant Brands**		**K-Cups Brands**	
Store Variables	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value
Store 2	-0.2856	0.0070	-0.0553	0.7280	-1.5730	0.3602
Store 3	0.7089	0.0361	1.4360	0.0001	-1.0870	0.0015
Store 4	0.1893	0.5956	1.2270	0.0001	-1.8040	0.0001
Constant	0.2911	0.7836	-2.8230	0.0928	-1.5140	0.4714

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Characteristics of New Jersey Agritourism Farms

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Abstract

Agritourism is an important alternative farm enterprise strategy in the U.S., especially for farms operating under urban influence. This paper develops a logit model to identify the characteristics of farms engaged in agritourism using 2007 Census of Agriculture respondent-level records. New Jersey, which ranks first nationally in the proportion of farm income derived from agritourism, provides the geographic context. We find that fruit/vegetable farms, rural residential/retirement farms, and intermediate-scale farms are more likely to offer agritourism. We also find that the likelihood of engaging in agritourism is significantly higher for farms employing organic production techniques and farm conservation practices.

Keywords: agritourism, direct marketing, urban fringe agriculture

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Introduction

The convergence of global competition, rising input costs, structural changes in domestic markets, and urban expansion represents a significant challenge to the economic viability of many small American farms. When faced with declining profitability, farm operators may exit agriculture, expand off-farm employment, or develop alternative agricultural enterprises (McGehee 2007; Ollenburg and Buckley 2007). Agritourism is becoming an important alternative farm enterprise strategy for many U.S. farms, especially those operating within the fringe of urban influence where consumer markets are more proximate. Analysis of Census of Agriculture data reveal that the urbanized Northeast states produce less than 5% of total national farm revenue but account for more than one-quarter of farm direct marketing sales and nearly 14% of agritourism income (Schilling et al. 2012).

Agritourism has a long history in Europe; however, its emergence in the United States as a topic of agricultural discourse and academic attention has been a more recent phenomenon. Areas of past research have included the characterization and perceptions of agritourism operators (Barbieri and Mshenga 2008; Tew and Barbieri 2012), gender roles in agritourism (McGehee, Kim and Jennings 2007), and farmer motivations for agritourism development (McGehee and Kim 2005; Nickerson et al. 2001).

Farm income generation has been identified as a common rationale for agritourism development (see, for example, McGehee and Kim 2005; Schilling, Marxen, Heinrich and Brooks 2006); however, Tew and Barbieri (2012) consider the literature on the economic benefits of agritourism inconclusive. Several early studies conclude that agritourism income is often an insubstantial contributor to farm income (Busby and Rendle 2000; Opermann 1995; Sharpley and Vass 2006). More recent work by Barbieri (2012), however, concludes that agritourism has greater positive effect on farm profitability than other farm entrepreneurial activities. Schilling, Attavanich and Jin (2014) find that agritourism increases the profitability of small commercial farms in New Jersey.

While a few scholars have begun examining U.S. agritourism in earnest over the past decade, there remain gaps in our understanding of this sector's structure and economic importance, as well as factors likely to affect its future trajectory. Clear understanding of the dynamics of the agritourism sector, is obfuscated by several factors. First, consistent longitudinal data on U.S. agritourism are limited.[1] Contributing to this problem is the lack of a standard definition of agritourism, limited consensus on the types of activities that constitute agritourism, and variable nomenclature (i.e., farm tourism, agritourism, agritainment, agricultural tourism, and rural tourism) (Phillip, Hunter and Blackstock 2010; Schilling et al. 2006; Busby and Rendle 2000).

A second factor is the diversity of U.S. agriculture and emerging evidence that development of agritourism enterprises is driven by different motives, both monetary and non-pecuniary (Schilling et al. 2012). Agritourism offers the potential to increase farm income, diversify product lines and market outlets, fulfill operator entrepreneurial goals, educate the non-farm

[1] The National Agricultural Statistics Service only began collecting data on "recreational services" as a component of "income from farm-related services" in the 2002 Census of Agriculture. A slightly different definition, "agritourism and recreational services" was employed in the 2007 Census.

public about agriculture, and enhance community engagement (Busby and Rendle 2000; Nickerson, Black and McCool 2001; Che, Veeck and Veeck 2005; McGehee and Kim 2004; Mitchell and Turner 2010; Ollenburg and Buckley 2007; Tew and Barbieri 2012). The importance of these drivers of agritourism development vary across farm scales. Research on New Jersey's agritourism sector, for example, shows that small farms (defined by the USDA's Economic Research Service as those earning less than $250,000 in farm income) are more likely than large farms to earn a greater proportion of farm income from agritourism (Schilling et al. 2012). Census of Agriculture data support a similar observation. New Jersey's small family farms account for only 15% of total state farm income, but 58% of state agritourism revenues.

Assessment of future growth patterns in the agritourism sector, as well as industry challenges and educational programming needs, will benefit from knowledge of the type and characteristics of farms presently engaged in agritourism. For example, more informed understanding of the types of farms incorporating agritourism enterprises will enable refined industry performance benchmarking and analysis over time (i.e., by focusing on segments of the farm industry where agritourism is most prevalent). Similarly, such information will allow Extension educators and agricultural service providers to better predict clientele needs (i.e., certain types of farms may have a greater propensity to transition into agritourism over time) and deliver targeted educational training. To provide such insight, this study develops a logit model to identify the characteristics of New Jersey agritourism farms. Data are primarily derived from respondent-level records collected during the 2007 Census of Agriculture.

Conceptual Framework

Farm engagement in agritourism can be expressed in binary form (a farm is either offering agritourism or it is not). Therefore, we develop a logit model to analyze the characteristics of New Jersey farms offering agritourism. The logit model's asymptotic properties and constraint that the predicted probabilities range from zero to one make it a preferred method for this type of analysis (Agresti 1990).

The logit model assumes that the probability of agritourism adoption (P_i) can be predicted by a vector of independent variables (X_i):

(1) $$Prob(farm\ engages\ in\ agritourism) = P_i = \frac{e^{Xi}}{1+e^{Xi}}$$

and therefore

(2) $$Prob(farm\ does\ not\ engage\ in\ agritourism) = 1 - P_i = \frac{1}{1+e^{Xi}}.$$

Because X_i is a linear combination of independent variables, it follows that

(3) $$Z_i = log\frac{P_i}{1-P_i} = \alpha_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_j x_{ji} + \varepsilon_i$$

where Z_i is the log of the odds for the ith observation, X_{ji} is the jth explanatory variable for the ith observation, { α, β_1, β_2… β_j} are the parameters to be estimated, and ε is the error term. The likelihood of observing the dependent variable was tested as a function of independent variables including farm characteristics, location characteristics and farmer socio-demographic characteristics.

Data and Empirical Model

New Jersey provides an interesting geographic context for the analysis for several reasons. Since the 1950s, extensive urbanization has contributed to a significant displacement of agriculture in most parts of the state. Approximately 58 percent of the farms and 57 percent of the farmland acreage existing in 1950 have been lost, most often to suburban subdivisions and related commercial infrastructure. Today, the U.S Census Bureau's urban-rural classification data show that nearly 40 percent of New Jersey's land area is developed, making it the most urbanized state in the nation. Remaining farms have made various adaptations to urban growth pressures, including aggressive movement into direct marketing and agritourism. Schilling et al. (2007) find that 21 percent of New Jersey farms are engaged in agritourism (defined to include on-farm retail marketing). The 2007 Census of Agriculture shows that New Jersey ranks first nationally in the proportion of farm income derived from agritourism (2.5%) and sixth in terms of the percentage of farm income derived from direct marketing (3.1%) (USDA-NASS 2009).

Our study uses respondent-level data from the 2007 Census of Agriculture to examine the characteristics of New Jersey farms engaged in agritourism. As previously noted, there is no standard definition of agritourism. It is the authors' opinion that the National Agricultural Statistics Service definition employed in the Census of Agriculture is limited due to the exclusion of on-farm direct marketing activities. Following past agritourism research in New Jersey (Schilling et al. 2012) and Vermont (New England Agricultural Statistics Service 2004), this study defines agritourism broadly to include direct marketing (e.g., farm markets and pick-your-owns).

The binary dependent variable (AGTOURISM) developed for the logit model is therefore defined as one if a farm reported income either from "agri-tourism and recreational services" (common examples include farm tours, corn mazes, hayrides, hunting and fishing, and farm stays) or direct-to-consumer marketing, and zero otherwise. Cheng et al. (2012) note that the Census of Agriculture farm direct marketing definition includes only farm products that are "for human consumption," thus excluding non-edible products (i.e., ornamentals, a large sector within New Jersey agriculture). The authors correctly note that this leads to an underestimate of the extent and value of farm direct marketing. However, definitions of agritourism (inclusive of direct marketing) in the academic literature increasingly include the proviso that agritourism involves a link to a working farm. The NASS definition does not exclude off-farm marketing venues (i.e., community farmers markets), resulting in a potential overestimation of agritourism activity. Despite these limitations, the authors concur with Cheng et al. (2012), finding that Census of Agriculture data on direct marketing are the most accurate available.

Variables are described in Table 1. Farm characteristic variables derived from the 2007 Census of Agriculture include total farm acreage (FARMSIZE) and binary variables reflecting whether the farm is engaged in organic production (ORGANIC) or has installed conservation practices (i.e., no till production, nutrient management, etc.) (CONSERV). A binary variable is included to reflect whether the farm is preserved under the state's purchase of development rights (PDR) program. Data on farmland preservation status were obtained from the administrative records of the State Agricultural Development Committee, the administrative agency responsible for the state's farmland preservation program.

The USDA's Economic Research Service classifies farms under a farm typology that considers the economic scale of operation and operator characteristics (Hoppe and MacDonald, 2013; Hoppe and Banker, 2010). The basic classification scheme includes small family farms (farms with farm income less than $250,000), commercial family farms (farms with farm income of $250,000 or more) and non-family farms. Small family farms are further decomposed into rural-residence farms, which are small family farms operated by retired persons or individuals for whom farming is not a principal occupation, and intermediate family farms (farms with farm income less than $250,000 that are operated by individuals for whom farming is a primary occupation). For modeling purposes, farms are classified according to their 2007 Census of Agriculture designation as RURAL_RESID, INTERMEDIATE, COMMERCIAL or NON _FAMILY.

Farms are also classified in the Census of Agriculture by North American Industrial Classification System (NAICS) codes to reflect their primary production activity. A truncated set of production classes is employed in the model. ANIMAL represents farms primarily engaged in livestock (including poultry) production and dairy; EQUINE represents horse or pony production; FRUIT/VEG represents fruit, berry, or vegetable production; GRAIN represents grain, hay or other crop production; and NURSERY represents nursery, greenhouse or sod production.

Farm operator characteristics included in the final model are operator gender (OPSEX) and age (OPAGE) and the number of years the operator reported being on the current farm (OPYEARS). PCTINCFARM is the percentage of household income derived from farming and OCC_FARMING is a binary variable indicating whether the farm operator's principal occupation is farming. LIVEONFARM is a binary variable reflecting whether the operator lives on the farm.

Location and spatial variables were incorporated into the dataset from several secondary sources. Data on population density (POPDENS) are 2007 estimates from the New Jersey Department of Labor and Workforce Development's online municipal and county population and housing database. Data on median household income (MED_HH_INC) were obtained from the 2000 Census of Population and Housing. As a proxy for rurality, data on the percentage of the municipality in which a farm is located that is enrolled in farmland assessment (New Jersey's use value assessment program) (PCT_FA) were obtained from the New Jersey Field Office of the National Agricultural Statistics Service. To capture effects of proximity to urban centers, Euclidean distance (in miles) between each farm and New York City was determined using Geographic Information System (GIS) software. Farms were geocoded using farm zip codes and centroid point information for New York City was obtained from ESRI StreetMap USA 2006 (DIST_NYC).[2]

Descriptive statistics for all variables are presented in Table 2 for the entire sample and the subsets of agritourism farms (n=1479) and non-agritourism farms (n=5061). The final dataset contained 6,540 farms, of which 22.6% reported revenue from agritourism or direct marketing. The empirical model was formulated as:

[2] A Euclidean distance measure to Philadelphia was also constructed and included in earlier versions of the model. However, the measure was found to lack statistical significance as a predictor of agritourism adoption.

$$\begin{aligned} AGTOURISM = {} & \alpha_0 + \beta_1 FARMSIZE + \beta_2 ORGANIC + \beta_3 CONSERV + \beta_4 PRESERVE + \\ & \beta_5 ANIMAL + \beta_6 EQUINE + \beta_7 FRUIT/VEG + \beta_8 NURSERY + \\ & \beta_9 RURAL\_RESID + \beta_{10} INTERMEDIATE + \beta_{11} COMMERCIAL + \\ & \beta_{12} OPSEX + \beta_{13} OPAGE + \beta_{14} OPYEARS + \beta_{15} PCTINCFARM + \\ & \beta_{16} OCC\_FARMING + \beta_{17} LIVEONFARM + \beta_{18} PCT\_FA + \beta_{19} DIST\_NYC + \\ & \beta_{20} POPDENS + \beta_{21} MED\_HH\_INC + \varepsilon. \end{aligned}$$

The logit model was estimated with STATA using maximum likelihood estimation (MLE). MLE produces parameter estimates that are consistent and efficient asymptotically (Pindyck and Rubinfeld 1991).

Table 1. Description of Variables

Variable Name	Description
Dependent Variable	
AGTOURISM	'1' if farm engages in agritourism, '0' otherwise
Farm Characteristics	
FARMSIZE	Farm size (acres)
ORGANIC	'1' if organic production, '0' otherwise
CONSERV	'1' if conservation practices are used, '0' otherwise
PRESERVE	'1' if farm is preserved, '0' otherwise
Commodity Type	
ANIMAL	'1' if production is livestock, poultry, or dairy, '0' otherwise
EQUINE	'1' if production is equine, '0' otherwise
FRUIT/VEG	'1' if production is fruit, berry, or vegetable, '0' otherwise
GRAIN*	'1' if production is grain or hay, '0' otherwise
NURSERY	'1' if production is nursery, '0' otherwise
ERS Farm Type	
RURAL_RESID	'1' if small family farm with sales <$250k and operator's primary occupation is not farming (or operator is retired), '0' otherwise
INTERMEDIATE	'1' if small family farm with sales <$250k and operator's primary occupation is farming, 'o' otherwise
COMMERCIAL	'1' if family farm with sales of $250k or more, '0' otherwise
NON-FAMILY*	'1' if non-family farm, '0' otherwise
Operator Characteristics	
OPSEX	'1' if principal operator is male, '0' if female
OPAGE	Principal operator age (years)
OPYEARS	Operator years on current farm (years)
PCTINCFARM	Percent of household income earned from farm operation (%)
OCC_FARMING	'1' if operator's principle occupation is farming, '0' otherwise
LIVEONFARM	'1' if principal operator lives on farm, '0' otherwise
Location Characteristics	
PCT_FA	Percent of municipality's land area farmland assessed (%)
DIST_NYC	Euclidean distance to New York City (10's miles)
POPDENS	Municipality's population density (100 persons/sq. mile)
MED_HH_INC	Municipality's median household income ($10,000s)

* Represents the omitted category.

Table 2. Summary Statistics for Variables used in the Analysis

	Full Sample		Agritourism Farms		Non-Agritourism Farms	
Variable Name	**Mean**	**Std Dev**	**Mean**	**Std Dev**	**Mean**	**Std Dev**
Dependent Variable						
AGTOURISM	0.23	0.42				
Farm Characteristics						
FARMSIZE (acres)	83.98	208.86	66.44	172.94	89.11	218.00
ORGANIC	0.02	0.15	0.07	0.25	0.01	0.10
CONSERV	0.22	0.42	0.29	0.45	0.21	0.41
PRESERVE	0.11	0.31	0.10	0.29	0.11	0.31
Commodity Type						
ANIMAL	0.22	0.42	0.33	0.47	0.19	0.40
EQUINE	0.12	0.32	0.04	0.20	0.14	0.35
FRUIT/VEG	0.18	0.39	0.40	0.49	0.12	0.32
GRAIN[a]	0.24	0.43	0.12	0.33	0.28	0.45
NURSERY	0.23	0.42	0.10	0.30	0.27	0.44
ERS Farm Type						
RURAL_RESID	0.69	0.46	0.71	0.45	0.69	0.46
INTERMEDIATE	0.18	0.39	0.19	0.39	0.18	0.38
COMMERCIAL	0.08	0.26	0.06	0.23	0.08	0.27
NON-FAMILY[a]	0.05	0.22	0.04	0.19	0.05	0.23
Operator Characteristics						
OPSEX	0.80	0.40	0.80	0.40	0.80	0.40
OPAGE (years)	57.32	12.51	57.00	11.79	57.41	12.71
OPYEARS (years)	20.39	14.11	19.88	13.80	20.54	14.20
PCTINCFARM (%)	19.43	30.94	19.77	30.75	19.33	31.00
OCC_FARMING (%)	0.47	0.50	0.48	0.50	0.46	0.50
LIVEONFARM	0.808	0.394	0.842	0.365	0.799	0.401
Location Characteristics						
PCT_FA (%)	32.45	20.25	30.70	19.33	32.96	20.48
DIST_NYC (10s of miles)	6.56	2.75	6.16	2.62	6.67	2.78
POPDENS (100 ppl/sq. mi.)	12.39	74.89	11.30	41.84	12.71	82.07
MED_HH_INC ($10,000)	6.73	2.00	6.90	1.97	6.69	2.01

[a] Represents the base category in the analysis.

Model Results

Model results are summarized in Table 3. Farm size is found to have a significant and negative, but negligible, effect on the probability of a farm hosting agritourism. No statistically significant

correlation is found between participation in the state PDR program and engagement in agritourism. Positive relationships are found between engagement in agritourism and other practices designed to bolster market access or enhance farm sustainability within an urbanizing environment. Farms classified as organic are 30.2% more likely to engage in agritourism than farms employing traditional production systems. Farms employing some form of resource conservation method are 7.5% more likely to offer agritourism than those not utilizing conservation practices.

Relative to grain or hay farms, fruit or vegetable farms are 42.2% more likely to offer agritourism. This observed market response is consistent with past research documenting strong consumer demand for local produce among New Jersey consumers (Govindasamy and Nayga 1997). Livestock farms are 23.6% more likely to offer agritourism than grain or hay operations. In contrast, nursery operations and equine farms are less likely to host farm visitors (by 2.3% and 6.1%, respectively). The latter finding may be explained by the high numbers of residential/pleasure horse operations that have been documented in the state (Gottlieb et al. 2007).

Rural residential/lifestyle family farms are 8.7% more likely to offer agritourism than non-family farms, while small farms operated by individuals identifying farming as a primary occupation (intermediate farms) are 6.6% more likely. The finding that rural residential farms have a greater propensity to engage in agritourism is noteworthy. A possible explanation may be that these small-scale farms, which lack wholesale market access, are motivated by relatively low revenue expectations (i.e., income sufficient to qualify their properties for use value assessment or a secondary source of household income) that can be achieved by modest levels of direct marketing activity. This is consistent with a 2007 economic impact assessment which found a high reliance on agritourism as a source of farm income among small New Jersey farms (Schilling et al. 2011).

Unexpected is the finding that the likelihood of commercial farms offering agritourism is not statistically different from non-family farms. While not statistically significant, the negative coefficient is further surprising. This finding, upon first consideration, appears inconsistent with previous research which found that large-scale farms are significantly more likely to engage in agritourism (Schilling et al. 2012). However, the binary measure of agritourism engagement in this study assumes a value of one only when agritourism or direct marketing revenue is reported by the farm. Schilling et al. (2012) document that nearly one-third (32%) of large New Jersey agritourism farms (defined as having agricultural sales of at least $250,000) do not earn revenue from such activities.[3] Because of the manner in which Census of Agriculture data are collected, this study in not able to examine the characteristics of farms that offer agritourism without charge.

Several operator characteristics (age, gender, years on the current farm) were found to have no statistically significant influence on whether agritourism was offered on farms. The likelihood of offering agritourism rises nominally with the percentage of household income derived from farming. Similarly, farms with operators declaring farming as a primary occupation are 2.8% more likely to offer agritourism than farms operated by individuals that are retired or primarily

[3] Schilling et al. theorize that agritourism may be offered without immediate revenue expectations, at least in part, due to farmers' interest in generating public awareness of agricultural issues and support for farm retention policies. Practically speaking, the authors also point to anecdotal evidence of farmers allowing non-fee hunting to reduce crop damage caused by wildlife.

employed off-farm. Past research has documented a significant level of involvement in agritourism among farm women (see, for example, McGehee et al. 2007). The lack of significance assigned to the operator gender variable should not be construed as a contradictory finding since it reflects the gender of the *primary* farm operator. Farms managed by operators residing onsite are 3.5% more likely to host agritourism activities.

The variable capturing urban proximity effects (distance to New York City) carries the expected negative sign, indicating that the likelihood of offering agritourism declines as distance from the city increases. The negative marginal probability associated with PCT_FA suggests that farms are slightly more likely to offer agritourism in communities of suburban or urban character. This seemingly reflects the propensity for farms under immediate urban influence to capitalize upon proximity to consumer bases through agritourism development, as well as the general lack of "destination" farms in highly rural regions of the state.

Table 3. Maximum Likelihood Estimates from Logit Model

Parameter	Parameter Estimate	Standard Error	Marginal Probability
INTERCEPT	-2.091	0.351	
FARMSIZE	-0.001	0.000	0.000***
ORGANIC	1.452	0.202	0.302***
CONSERV	0.468	0.081	0.075***
PRESERVE	-0.075	0.120	-0.011
NURSERY	-0.158	0.123	-0.023
FRUIT/VEG	2.103	0.105	0.422***
EQUINE	-0.463	0.161	-0.061***
ANIMAL	1.299	0.100	0.236***
RURAL_RESID	0.635	0.182	0.087***
INTERMEDIATE	0.407	0.187	0.066**
COMMERCIAL	-0.202	0.218	-0.028
OPSEX	-0.006	0.004	-0.008
OPAGE	-0.055	0.086	-0.001*
OPYEARS	0.001	0.003	0.000
PCTINCFARM	0.003	0.001	0.000**
OCC_FARMING	0.188	0.090	0.028**
LIVEONFARM	0.247	0.091	0.035***
PCT_FA	-0.005	0.002	-0.001***
DIST_NYC	-0.082	0.016	-0.012***
POPDENS	-0.001	0.001	0.000
MED_HH_INC	0.023	0.021	0.003
No. of observations	6,540		
-2 log likelihood	5817.65		
McFadden's pseudo R^2	0.168		

Note: Statistical significance represented by *** p<.01, ** p<.05, * p<.10. Marginal probabilities are calculated at the mean of each covariate.

The Hosmer and Lemeshow goodness of fit test is insignificant (p = .12), indicating that the model provides a good logistic fit (Agresti 1990). Overall, the model correctly predicts whether a farm offers agritourism in 74.8% of the cases (Table 4).

Table 4. Predictive Success of the Logit Model

		Predicted	
		AGTOURISM=1	AGTOURISM=0
Actual	AGTOURISM=1	948	531
	AGTOURISM=0	1,120	3,941
Number of Correct Predictions		4,889	
Percent Correct Predictions		74.8%	

Conclusion

The objective of this paper is to examine the characteristics of farms offering agritourism in New Jersey, a leading agritourism state. A logit model is developed to determine the influence of farm and operator characteristics, as well as location and spatial variables, on the probability of farm engagement in agritourism. Data are derived from respondent-level 2007 Census of Agriculture records and other secondary sources.

In no other state is urbanization more advanced than in New Jersey. At the same time, the state is among the early adopters of several now ubiquitous farm retention policies (i.e., agricultural use value assessment and right to farm legislation) and has a long history of aggressive farmland preservation programming. Similarly, New Jersey farmers have made substantial structural and enterprise adjustments to adapt to rising farmland prices, farmland fragmentation, loss of supply and market infrastructure, and the less farm-friendly regulatory environments that frequently accompany suburban expansion into farming regions (Lopez, Adelaja and Andrews 1988; Larson, Findeis and Smith 2004).

Agritourism is a prime example of positive adaptation to urbanization pressure, one whereby farmers seek to capitalize on access to proximate markets for their products, expand on-farm employment, and effectuate greater appreciation and understanding of farming within the non-farm community. Our study finds that the development of agritourism enterprises on New Jersey farms correlates positively with other "sustainability" efforts, including the adoption of resource conservation practices and responsiveness to market opportunities (i.e., consumer interest in organic products). The emergence and growth of agritourism nationally, and particularly in the Northeast, represents a promising counterbalance to the "impermanence syndrome" affecting urban fringe farming first articulated by Berry (1978). Characterized by reduced investments in agriculture and less confidence in the long term viability of farming, this condition effectively shortens the planning horizons of farm operators in agriculture (Adelaja et al. 2011).

As anticipated, a strong link between produce production and agritourism development is demonstrated by the model. New Jersey is viewed by the USDA as a specialty crop state, meaning that it is heavily engaged in the production of intensively cultivated plants, including

fruits, vegetables, nursery products, and floricultural crops. The adoption of agritourism as a revenue-enhancing strategy is consistent with the well-defined shift among New Jersey producers from low-value to high-value production that has occurred over recent decades in response to rising land values, declining farmland resources, and other business climate factors. It is also a logical marketing response that allows farmers to capitalize on growing consumer interest in local farm production.

Lastly, model results also suggest a higher engagement in agritourism among small farms, particularly lifestyle and retirement farms. Although they are small contributors to statewide farm income, lifestyle and retirement farms operate 207,904 acres of New Jersey farmland, equivalent to more than one-quarter of the state's farmland base (USDA-NASS 2009). Identifying and addressing the programming needs of small and very small-scale agritourism operators represents an area of increasing demand for Cooperative Extension and other agricultural service providers, particularly on matters related to marketing, biosecurity (for livestock owners), farm safety, and liability management.

We conclude by recognizing a data limitation in this study. Previous research has documented the development of free recreational or educational activities (e.g., tours, non-fee hunting, hiking) on a significant proportion of large New Jersey farms. Since agritourism revenue is not earned, these farms do not appear as "agritourism farms" in the Census of Agriculture dataset used for this research. Therefore, the characteristics of these farms remain unexamined. A caveat about the applicability of this research to other states is also warranted. The structure of New Jersey's farm sector has been strongly influenced by urbanization pressures over the past half-century. The resulting agricultural business climate and market opportunities, as well as the nature of agritourism itself, are therefore dissimilar to more rural regions of the country. Therefore the robustness of findings from this research in other state contexts will need to be determined through further research.

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Variation of Consumer Preferences Between Domestic and Imported Food: The Case of Artisan Cheese

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Abstract

Increasing concerns about a healthy diet, food safety and support for the local economy provide new opportunities for farmers to increase their farm income by selling their farm products locally. The major challenge for the farmers is to predict consumer preferences correctly and provide goods to the market accordingly. By analyzing a consumer survey conducted in the Midwest region of the US, the current study analyzes the consumer preferences for domestic and imported artisan cheese. The results of the econometric analysis show that consumer preferences vary between domestic and imported artisan cheese. The results also show that consumer preferences vary with location. Hence, producers of local artisan cheese might need to adopt different marketing and production strategies to match the local consumer demand.

Keywords: artisan cheese, consumer preferences, ordered probit, willingness-to-pay

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Introduction

Increasing concerns about a healthy diet, food safety and support for the local economy provide new opportunities for farmers to increase their farm income by selling their farm products locally (Ilbery and Maye 2005). The major challenge for farmers is to predict consumer preferences correctly and provide goods to the market accordingly. For farmers selling their farm products locally, using direct marketing strategies has the advantage of cutting out middle men and attracting consumers directly to their products (Morgan and Alipoe 2001; Uva 2002). On the other hand, if farmers fail to understand consumer preferences correctly, then they face financial losses.

Previous studies have focused on identifying consumer preferences for different food quality attributes (e.g., Brown, Gandee, and D'Souza 2006; Monson, Mainville, and Kuminoff 2008; Thilmany and Watson 2004). Food quality has multiple dimensions, including *search*, *experience*, and *credence* attributes (Anderson and Anderson 1991). Search attributes refer to visual product attributes, such as color. Experience attributes refer to those realized when consuming the product. Taste is an experience attribute (Nelson 1974; Stigler 1961). Credence attributes of food products refer to quality features, such as organically grown (Anderson and Anderson 1991).

Empirical studies that analyzed consumer preferences found different results in terms of the relative importance of search, experience, and credence attributes (Wirth et al. 2011; Dentoni et al. 2009). For example, some studies found that certain credence attributes impact consumers' purchase decisions positively and lead to food item purchases (e.g. Dentoni et al. 2009; Wirth, Love, and Palma 2007). Studies by Dentoni et al. (2009) and Mabiso et al. (2005) reported that certain population segments are willing to pay more for organic food products. However, there are other studies that did not find a statistically significant price premium for organic food products (e.g. Onken et al. 2011; Wirth et al. 2011). Hence, overall, it is not known whether producers should invest in producing organic food or whether they should focus on other food quality attributes (Onken et al. 2011; Wirth et al. 2011). It is also not known whether farmers should focus on search and experience attributes or credence attributes in their marketing strategies. The answers to these questions will help farmers to focus and invest more on the attributes that better match consumer demand and receive higher price premiums.

Another important factor that impacts farmers' marketing strategies is consumer preferences for imported food versus domestic food. Previous research that has analyzed consumer preferences for imported food focused mostly on credence attributes, specifically country of origin labeling. The results of these studies show that consumers are willing to pay a premium for purchasing domestic food relative to purchasing imported food and that the country of origin label is an important factor (Peterson and Burbidge 2012; Xie, House, Hyeyoung 2012; Han et al. 2012; Xie et al. 2011; Krystallis and Chryssochoidis 2006). However, these studies did not comprehensively analyze how search, experience, and credence attributes vary between imported and domestic food, and they didn't indicate which of these attributes most impact consumers' willingness-to-pay (WTP). Even though the studies reviewed found higher willingness-to-pay for domestic food compared with imported food, US imports have been increasing for some food products, such as cheese. According to the Babcock Institute (2012), the US cheese trade deficit

totals $114 million. This is primarily due to highly valued cheese imports from European countries such as France, which accounted for 17 percent of US cheese imports in 2011. (Babcock Institute 2012). Hence, it is important to understand the impact of search, experience, and credence attributes on consumer demand for imported cheese to better match local demand by domestic production for high-valued cheese.

The first objective of the current study is to analyze the relative importance of experience, search, and credence attributes on consumers' willingness-to-pay for domestic artisan cheese (high-valued cheese) over domestic processed cheese.[1] The second objective of this study is to analyze the impact of experience, search, and credence attributes on consumers' willingness-to-pay for imported artisan cheese over domestic artisan cheese. By analyzing US consumer preferences for imported artisan cheese, the current study will provide guidance to farmers who aim at providing domestic cheese to replace imported cheese. By including consumers from different regions in the US, the current study will also show whether consumer preferences change from one region to another within the same country and indicate whether producers should adopt different marketing strategies in different regions within a country.

Data

To measure the regional consumer demand for artisan cheese, a consumer survey was conducted among consumers located in Iowa, Kansas, and Missouri in April 2010. Although these three states are not the top milk or cheese producing states, in terms of milk production in the US, Iowa, Kansas, and Missouri ranked 12th, 16th, and 25th, respectively, in 2012 (US Department of Agriculture 2013). Hence, dairy producers in these three states can benefit from processing milk into high-valued artisan cheese if there is regional demand for artisan cheese.

The consumer survey for the current was designed using Survey Monkey® and distributed to a panel of respondents through e-Rewards®. e-Rewards® is an internationally recognized online market research company, which has by-invitation-only membership for its consumer panels. For this study, a contract was made with e-Rewards® to obtain a total of 541 completed (or near to fully completed) surveys. Survey respondents were chosen based on being the primary household shopper and consuming cheese at some frequency. Due to the nature of e-Rewards® data collection, the company obtained the required number of responses, a response rate can't be calculated, which is a common issue for conducting surveys through online market research companies (Maples et al. 2014).

To measure consumers' willingness-to-pay for domestic artisan cheese over domestic processed cheese, consumers were specifically asked, "What is the maximum price above the price of processed cheddar cheese ($1.44/pound) that you would pay for artisan cheddar cheese?" For analyzing consumers' willingness-to-pay for imported artisan cheese over domestic artisan cheese, the consumers' were asked, "What is the maximum amount above the price of the US artisan cheese that would you pay for imported French artisan cheese?" The consumers were provided with pictures of sample artisan cheeses and the explanation for the term "artisan

[1] In the current study artisan cheese is defined as a specialty cheese. Artisan cheese is made primarily by hand and has been developed as a piece of art. It is made on small scale and with unique characteristics. Artisan cheese also has creative labeling and brand naming.

cheese." Based on the existing literature, variables related to demographics and consumer preferences were also included in the survey.

Table 1 (see Appendix) provides summary statistics and description of the variables, for a sample size of 541. For the consumer demographics, 43 percent of the responders are male. The average for the age category is closest to the age category of 35 to 44. The average for the annual family income corresponds to the category $51,000 - $75,000. A comparison of the average age and average income of the sample with the data from the US Census Bureau is done to test whether the data collected is representative. Based on the data from US Census Bureau (2013), the average age in Missouri, Kansas, and Iowa was, 37.9, 36, and 38, respectively, in 2012. In the sample for the current study, the average age for Missouri, Kansas and Iowa are all in the age category of 35 to 44. In 2012, the average income in Missouri, Kansas, and Iowa was, $63,405, $67,564, and $64,881, respectively (US Census Bureau 2013). In the collected sample, the average income for Missouri, Kansas and Iowa are all in the income category of $51,000-$75,000. Based on these comparisons, data collected is representative of the region's population. For the location of the responders, 16 percent are from Kansas, 22 percent are from Missouri, and the rest are from Iowa. Hence, consumers from Iowa are most represented in the sample.

For consumers' preferences about the way cheese is produced, 25 percent of survey respondents prefer hand-made cheese and 10 percent of survey respondents prefer farmstead cheese. Although some consumers have a preference for the way cheese is produced, 50 percent of survey respondents reported that they do not have a preference. As far as artisan cheese consumption purposes, 67 percent of survey respondents indicated that they would consume artisan cheese for entertainment and 64 percent of survey respondents indicated that they would consume artisan cheese as a snack. Cheese purchase point-of-sale indicates the frequency at which the responders purchase cheese from each source. The two highest frequencies in the sample are for supermarkets, such as Wal-Mart, and independent/ local grocery stores. Health/natural food stores and specialty cheese stores have relatively lower frequencies.

For consumers' ranking of the importance of artisan cheese attributes, the two highest ranked attributes are taste and enhancement of taste with other products, such as wine. Hence, the experience attributes received the highest importance in the sample. The shelf life of artisan cheese is also relatively more highly ranked than other search and credence attributes. Made from organic milk and natural milk are reported as somewhat important by the survey respondents and the same is valid for the search attribute color of the cheese. Location of origin within the US, which is a credence attribute, is not ranked with high importance. Hence, the survey sample shows some evidence that consumers rank differently the experience, search and credence attributes.

Table 2 shows the distribution of willingness-to-pay for domestic artisan cheese over domestic processed cheese and imported French artisan cheese over US artisan cheese. The survey data shows that 53 percent of the survey respondents are willing to pay 20 percent more to buy domestic artisan cheese over processed cheese, whereas only 30 percent of the respondents are willing to pay 20 percent more to buy imported French artisan cheese over US artisan cheese. Overall, 82 percent of the survey respondents are willing to pay a price premium to buy domestic artisan cheese over processed cheese and 44 percent of the respondents are willing to pay a price

premium to buy artisan cheese that is imported from France over US artisan cheese. Hence, there is opportunity for artisan cheese producers to obtain a price premium over processed cheese, but there is also significant demand for imported artisan cheese.

Table 2. Distribution of Willingness-to-Pay (WTP) Values (N=541)

Variable	None	20% More	30% More	50% More
WTP for Domestic Artisan Cheese[1]	18%	53%	21%	8%
WTP for Imported French Cheese[2]	56%	30%	11%	3%

Notes: [1]Indicates WTP a price premium for domestic artisan cheese over domestic processed cheese.
[2] Indicates WTP a price premium for imported French artisan cheese over US artisan cheese.

Empirical Model

The two dependent variables: Willingness-to-pay for domestic artisan cheese over domestic processed cheese and willingness-to-pay for imported French artisan cheese over US artisan cheese can be analyzed using an ordered probit model, as these variables are ordered from 0 to 3 (Greene 2008). Ordered probit models have been used in the literature for analyzing multinomial choice variables that are inherently ordered, e.g. consumer surveys for demand analysis (Kasteridis, Munkin, and Yen 2007; Hill et al. 2011; Pope et al. 2011). The ordered probit model is preferred to using a linear probability model, as using a linear probability model in this case would lead to heteroscedastic error terms and predicted probabilities to be out of the unit range (Greene 2008). Similar to other discrete choice models, the ordered probit model can be derived from a latent variable (Greene 2008). The special case of the current study is instead, that two dependent variables are determined jointly. Following Geene and Hensher (2008), the latent variables $y_{1i}*$ and $y_{2i}*$, which represent the random utility from consuming domestic artisan cheese and imported French artisan cheese respectively, can be represented as;

$$(1)\quad \begin{aligned} y_{1i}* &= \mathbf{x}_{1i}\boldsymbol{\beta}_1' + \varepsilon_{1i} \\ y_{2i}* &= \mathbf{x}_{2i}\boldsymbol{\beta}_2' + \varepsilon_{2i} \end{aligned} \qquad \begin{pmatrix}\varepsilon_{1i}\\ \varepsilon_{2i}\end{pmatrix} \sim N\left[\begin{pmatrix}0\\0\end{pmatrix}, \begin{pmatrix}1 & \rho\\ \rho & 1\end{pmatrix}\right]$$

where $\mathbf{x}_{1i}$ and $\mathbf{x}_{2i}$ are the vectors that include the values for the variables of the deterministic part of the latent variable for observation *i*. $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ are the vectors that include the coefficients to be estimated. ε_{1i} and ε_{2i} are the error terms for corresponding equations. The error terms ε_{1i} and ε_{2i} are assumed to have a bivariate standard normal distribution with correlation ρ. The latent variables $y_{1i}*$ and $y_{2i}*$ are unobservable. However, what is observed is the willingness-to-pay for domestic artisan cheese and imported French artisan cheese:

$$(2)\quad y_{1i} = \begin{cases} 0 & \text{if WTP Artisan Cheese = 0} \\ 1 & \text{if WTP Artisan Cheese = 20\% Premium} \\ 2 & \text{if WTP Artisan Cheese = 30\% Premium} \\ 3 & \text{if WTP Artisan Cheese = 50\% Premium} \end{cases} \qquad y_{2i} = \begin{cases} 0 & \text{if WTP French Cheese = 0} \\ 1 & \text{if WTP French Cheese = 20\% Premium} \\ 2 & \text{if WTP French Cheese = 30\% Premium} \\ 3 & \text{if WTP French Cheese = 50\% Premium} \end{cases}$$

Using the dependent variable definition, WTP values can be represented in terms of latent variables as:

$$(3)\quad \mathrm{WTP}_{1i} = y_{1i} = \begin{cases} 0 & \text{if } y_{1i}^* \le \mu_{11} \\ 1 & \text{if } \mu_{11} < y_{1i}^* \le \mu_{12} \\ 2 & \text{if } \mu_{12} < y_{1i}^* \le \mu_{13} \\ 3 & \text{if } \mu_{13} < y_{1i}^* \end{cases} \qquad \mathrm{WTP}_{2i} = y_{2i} = \begin{cases} 0 & \text{if } y_{2i}^* \le \mu_{21} \\ 1 & \text{if } \mu_{21} < y_{2i}^* \le \mu_{22} \\ 2 & \text{if } \mu_{22} < y_{2i}^* \le \mu_{23} \\ 3 & \text{if } \mu_{23} < y_{2i}^* \end{cases}$$

where μ values represent the unknown cutoff parameters to be estimated using $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$. The cutoff values satisfy the condition that $\mu_{11} < \mu_{12} < \mu_{13}$ and $\mu_{21} < \mu_{22} < \mu_{23}$. As the error terms ε_{1i} and ε_{2i} have bivariate standard normal distribution, the probability of each pair of outcomes can be represented as (Geene and Hensher 2008):

$$(4)\quad \begin{aligned} \Pr\left(y_{1i} = j, y_{2i} = k \middle| \mathbf{x}_{1i}, \mathbf{x}_{2i}\right) = {} & \Phi_2\left(\left(\mu_{1j} - \mathbf{x}_{1i}\boldsymbol{\beta}_1'\right), \left(\mu_{2k} - \mathbf{x}_{2i}\boldsymbol{\beta}_i'\right), \rho\right) \\ & - \Phi_2\left(\left(\mu_{1j-1} - \mathbf{x}_{1i}\boldsymbol{\beta}_1'\right), \left(\mu_{2k} - \mathbf{x}_{2i}\boldsymbol{\beta}_i'\right), \rho\right) \\ & - \Phi_2\left(\left(\mu_{1j} - \mathbf{x}_{1i}\boldsymbol{\beta}_1'\right), \left(\mu_{2k-1} - \mathbf{x}_{2i}\boldsymbol{\beta}_i'\right), \rho\right) \\ & + \Phi_2\left(\left(\mu_{1j-1} - \mathbf{x}_{1i}\boldsymbol{\beta}_1'\right), \left(\mu_{2k-1} - \mathbf{x}_{2i}\boldsymbol{\beta}_i'\right), \rho\right) \end{aligned}$$

where $\Phi_2(.)$ is the bivariate standard normal cumulative distribution function (Greene 2008). These probabilities enter the log-likelihood function for a maximum likelihood estimator of the parameters. The log-likelihood function for the entire sample of size *N* can be obtained as:

$$(5)\quad \ln\ L = \sum_{i=1}^{N}\sum_{j=1}^{4}\sum_{k=1}^{4} I(y_{1i} = j, y_{2i} = k) \ln \Pr(y_{1i} = j, y_{2i} = k)$$

The maximum likelihood estimation of the coefficients $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ are obtained by taking the derivative of the log-likelihood function with respect to each coefficient included in $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ (Greene 2008; Geene and Hensher 2008).

Marginal Effects

The marginal effects are calculated based on the derivate of $\Pr\left(y_{1i} = j, y_{2i} = k \middle| \mathbf{x}_{1i}, \mathbf{x}_{2i}\right)$ with respect to variables of interest. To proceed further, we define the following variables (Geene and Hensher 2008):

$$
(6)\quad
\begin{aligned}
A_L &= \mu_{1,j-1} - \mathbf{x}_{1i}\boldsymbol{\beta}_1' \\
A_U &= \mu_{1,j} \quad - \mathbf{x}_{1i}\boldsymbol{\beta}_1' \\
A_L &= \mu_{2,k-1} - \mathbf{x}_{2i}\boldsymbol{\beta}_2' \\
B_U &= \mu_{2,k} \quad - \mathbf{x}_{2i}\boldsymbol{\beta}_2'
\end{aligned}
$$

Using these variables $\Pr\left(y_{1i} = j, y_{2i} = k \middle| \mathbf{x}_{1i}, \mathbf{x}_{2i}\right)$ can be written as (Geene and Hensher 2008):

$$\Pr\left(y_{1i} = j, y_{2i} = k \middle| \mathbf{x}_{1i}, \mathbf{x}_{2i}\right) = \Phi_2\left(A_U, B_U, \rho\right) - \Phi_2\left(A_L, B_U, \rho\right) - \Phi_2\left(A_U, B_L, \rho\right) + \Phi_2\left(A_L, B_L, \rho\right)$$

and marginal effects are calculated as:

$$
(7)\quad \frac{\partial \Pr\left(y_1 = j, y_2 = k \middle| \mathbf{X}_1, \mathbf{X}_2\right)}{\partial \mathbf{X}_1} = (-\boldsymbol{\beta}_1)\begin{bmatrix} \phi\left(A_U\right)\Phi_2\left(\dfrac{B_U - \rho A_U}{\sqrt{1-\rho^2}}\right) - \phi\left(A_L\right)\Phi_2\left(\dfrac{B_U - \rho A_L}{\sqrt{1-\rho^2}}\right) \\ \phi\left(A_U\right)\Phi_2\left(\dfrac{B_L - \rho A_U}{\sqrt{1-\rho^2}}\right) - \phi\left(A_L\right)\Phi_2\left(\dfrac{B_L - \rho A_L}{\sqrt{1-\rho^2}}\right) \end{bmatrix}
$$

$$
\frac{\partial \Pr\left(y_1 = j, y_2 = k \middle| \mathbf{X}_1, \mathbf{X}_2\right)}{\partial \mathbf{X}_2} = (-\boldsymbol{\beta}_2)\begin{bmatrix} \phi\left(B_U\right)\Phi_2\left(\dfrac{A_U - \rho B_U}{\sqrt{1-\rho^2}}\right) - \phi\left(B_L\right)\Phi_2\left(\dfrac{A_U - \rho B_L}{\sqrt{1-\rho^2}}\right) \\ \phi\left(B_L\right)\Phi_2\left(\dfrac{A_U - \rho B_L}{\sqrt{1-\rho^2}}\right) - \phi\left(B_L\right)\Phi_2\left(\dfrac{A_L - \rho B_L}{\sqrt{1-\rho^2}}\right) \end{bmatrix}
$$

where $\dfrac{\partial \Phi_2(A, B, \rho)}{\partial A} = \phi\left(A\right)\Phi_2\left(\dfrac{B - \rho A}{\sqrt{1-\rho^2}}\right)$. Marginal effects are added for the independent variables that appear in both regression equations (Geene and Hensher 2008).

Sample Selection

An alternative specification for the econometric model uses Heckman's selection model (Lusk et al. 2001; Greene 2008). The advantage of this model is to account for the sample selection problem, which is causing regression estimates to be biased, seen in demand analysis (Lusk et al. 2001). However, the disadvantage of this model is not accounting for the correlation among the error terms for the two dependent variables, which can also cause biased estimates (Greene 2008). Another disadvantage of this model is not accounting for the ordered structure of the dependent variables. In the current study, the sample selection can be a potential problem, as some consumers might not be consuming cheese. For example, when willingness-to-pay for domestic artisan cheese is observed as zero, it could be that the consumer does not purchase cheese or that the consumer purchases cheese but does not prefer domestic artisan cheese over domestic processed cheese. To test for the existence of the sample selection problem, a selection equation is estimated for cheese purchases. Following Greene (2008), the selection equation is a probit model, specified as:

$$z^*_i = \mathbf{w}_i \boldsymbol{\gamma}' + u_i$$

(8) $z_i = 1$ if $z^*_i > 0$, the consumer purchases cheese

$z_i = 0$ if $z^*_i \leq 0$, the consumer does not purchase cheese

where $\mathbf{w}_i$ is the vector of independent variables: consumer attributes and the attributes of the cheese product. The vector γ' refers to the coefficients to be estimated and u_i is the error term. The willingness-to-pay equations are represented as:

(9) $y_{1i} = \mathbf{x}_{1i}\boldsymbol{\beta}'_1 + \varepsilon_{1i}$ observed if $z^*_i > 0$

$y_{2i} = \mathbf{x}_{2i}\boldsymbol{\beta}'_2 + \varepsilon_{2i}$ observed if $z^*_i > 0$

where y_i, $\mathbf{x}_i$, $\boldsymbol{\beta}$ and ε_i are defined as same as in the bivariate ordered probit model above. The error terms ε_{1i} and ε_{2i} are independent and have univariate standard normal distributions. The results of this regression show that the selection equation is not significant at the 10 percent significance level[2]. Hence, there is no statistical evidence for the existence of the sample selection problem in the current study, as all the consumers in the dataset indicated that they purchase cheese at some frequency. For this reason, we continue the empirical analysis using the bivariate ordered probit regression.

Factor Analysis

In addition to the regression analysis, statistical factor analysis is also conducted to identify the group of artisan cheese attributes for a focused and successful marketing plan. Factor analysis can be used for market segmentation and for targeted marketing (Sharma and Kumar 2006). Following Johnson and Wichern (2002), the observed values of consumer preferences for artisan cheese attributes can be represented by the observable random vector $\boldsymbol{Z}$ with p components, has mean $\boldsymbol{\mu}$ and covariance matrix $\boldsymbol{\Sigma}$. The factor model imposes that $\boldsymbol{Z}$ is linearly dependent on a few unobservable random variables $F_1, F_2, \ldots, F_m$, which are called common factors, and p additional sources of variation $\varepsilon_1, \varepsilon_2, \ldots, \varepsilon_p$, which are called errors. The factor analysis model is represented in matrix notation as:

(10) $\boldsymbol{Z} - \boldsymbol{\mu}_{p \times 1} = \mathbf{L}_{p \times m}\mathbf{F}_{m \times 1} + \boldsymbol{\varepsilon}_{p \times 1}$

where $\mathbf{L}$ is the matrix of factor loadings, which includes the loading of j th variable of the k th factor l_{jk}. Hence the model represents the p deviations $X_1 - \mu_1, X_2 - \mu_2, \ldots, X_p - \mu_p$ in terms of random variables $F_1, F_2, \ldots, F_m$ and $\varepsilon_1, \varepsilon_2, \ldots, \varepsilon_p$, which are unobservable (Johnson and Wichern 2002). The covariance structure for the factor model can be represented as: $\mathrm{cov}(\boldsymbol{\varepsilon}) = \boldsymbol{\xi}$ and $\mathrm{cov}(\boldsymbol{Z}) = \boldsymbol{\Sigma} = \mathbf{LL}' + \boldsymbol{\xi}$. The factor loading matrix can be represented as $\mathrm{cov}(\boldsymbol{Z}, \mathbf{F}) = \mathbf{L}$. The estimates of factor loadings are then found using the principal component method as:

[2] The regression results for this model are available upon request.

$$(11)\quad \hat{\mathbf{L}} = \left[\sqrt{\widehat{\lambda_1}}\widehat{\mathbf{e}_1} \vdots \sqrt{\widehat{\lambda_2}}\widehat{\mathbf{e}_2} \vdots \cdots \vdots \sqrt{\widehat{\lambda_m}}\widehat{\mathbf{e}_m}\right]$$

where $\widehat{\lambda_k}$ and $\widehat{\mathbf{e}_k}$ are the estimates of the eigenvalue-eigenvector pairs for $\mathbf{\Sigma}$ (Johnson and Wichern 2002). The eigenvalue estimates $\widehat{\lambda_k}$ represents the contribution of the k th factor to the total sample variance. In the current study both p and m are 17.

Results

The regression results from the bivariate-ordered regression are reported in Table 3 (see Appendix). Multi-collinearity for the regression variables is assessed using the variance inflation factor (VIF). The rule of thumb is to further investigate variables for which the VIF is greater than 10 (Chen et al. 2003). None of the variables had a VIF value that was greater than 10. Hence, there is no evidence of multi-collinearity in the data. The Wald Chi-square test is used to test the overall significance of the regression model. The hypothesis that all the regression coefficients, except the constant terms, are zero is rejected with a p-value of 0.000. Hence, the bivariate ordered probit regression is significant at the 1 percent significance level. The estimate for the correlation coefficient for the error terms is 0.38, which is statistically significant at the 1 percent significance level. This justifies the use of a bivariate model over two separate univariate models, which would have resulted in biased coefficient estimates. McFadden's pseudo R^2 is calculated to be 0.25 for the current model.

Overall, the regression results show differences between the factors that impact WTP for domestic artisan cheese over domestic processed cheese and WTP for imported French artisan cheese over US artisan cheese. For the demographics, only the age variable is significant for both equations. For WTP for domestic artisan cheese over domestic processed cheese, the older the respondents are the higher price premium they are willing to pay. However, younger respondents are more willing to pay a price premium for imported French artisan cheese over US artisan cheese. On the other hand, annual family income, gender, and location are not found statistically significant for either equation. We would expect higher annual family income to have a positive impact on artisan cheese consumption. It could be that consumers do not observe artisan cheese as a luxury food item, which has been determined to have an inelastic income elasticity (Davis et al. 2010).

For the way cheese is produced, respondents who prefer hand-made cheese are more willing to pay a price premium for domestic artisan cheese over processed cheese than consumers who do not have any preferences. However, the preference for farmstead (farm sourced) artisan cheese did not have a statistically significant impact on the price premium that consumers are willing to pay for artisan cheese. Survey respondents who would consume artisan cheese as a snack and for entertainment purposes are more willing to pay a price premium for domestic artisan cheese over processed cheese than respondents who did not specify the consumption purpose. Similarly, respondents who would consumer artisan cheese as an appetizer and for entertainment purposes are more willing to pay a price premium for imported French artisan cheese over US artisan cheese. These results show that consumers who are willing to pay a price premium for either cheese would use them on certain occasions. This might indicate that consumers might not purchase artisan cheese in big quantities or too frequently.

Point of sale also had some influence on respondents' WTP for both equations. The more frequently the responders shop at health/natural food stores, the more they are willing to pay a price premium for domestic artisan cheese over domestic processed cheese and for imported French artisan cheese over US artisan cheese. On the other hand, shopping at independent / local grocery stores had a negative impact on respondents' WTP for domestic artisan cheese over domestic processed cheese. These results indicate that the marketing channel that farmers use to sell their products might impact sales. Farmers might consider health/natural food stores to sell their farm products locally, if available, instead of selling their products directly to consumers.

With respect to artisan cheese attributes, the two experience attributes- taste and enhancements of taste with other products- are found to be positively impacting the price premium for domestic artisan cheese over domestic processed cheese. These results are statistically significant. However, only enhancement of taste with other products is found to be positive and statistically significant for WTP for imported French artisan cheese over US artisan cheese. Mostly emphasized credence attributes: made from organic milk, made from natural milk, and location of origin within the US are not found to be statistically significant for either equations. On the other hand, health attribute (fat content) has negative and statistically significant impact for WTP for domestic artisan cheese over domestic processed cheese. Search attributes such as cut and color of the cheese are also found to be statistically significant only for the domestic artisan cheese equation. On the other hand, package size, which is also a search attribute, has negative and statistically significant impact for both equations.

For the relative importance of experience, search, and credence attributes, all of the experience attributes are found to be statistically significant for WTP for the domestic artisan cheese equation. On the other hand, not all of the search and credence attributes are found to be statistically significant, even for the domestic artisan cheese equation. Overall, experience, search, and experience attributes are found to be more influential on the price premium for domestic artisan cheese over domestic processed cheese than on the price premium for imported French artisan cheese over US artisan cheese.

Marginal Effects

Marginal effects are also calculated to determine which factors have a large impact on consumers' willingness-to-pay a price premium for domestic artisan cheese over domestic processed cheese and French artisan cheese over US artisan cheese. Table 4 (see Appendix) represents the marginal effects for both dependent variables. Since a bivariate model is used, the marginal effects are reported based on the outcome for each dependent variable. Also, since willingness-to-pay levels are ordered from 0 to 3, four marginal effects are calculated. The sign of a variable is expected to change across different levels of willingness-to-pay. For example, having enhancement of taste with other products is found to be statistically significant for both dependent variables. Hence, this variable is expected to have negative marginal effects for low levels of the dependent variables (e.g., WTP=0) and have a positive effect on higher levels of dependent variables (e.g., WTP=3).

Overall, experience attributes, taste, enhancement of taste, and being aged have a high negative impact on not willing to pay a price premium, which translates into a positive impact on

willingness-to-pay for both domestic artisan cheese over domestic processed cheese and for imported French artisan cheese over US artisan cheese. Hence, producers who improve experience attributes of their artisan cheese product can increase the chance of getting a positive price premium from consumers. Search attributes, such as color of cheese and package size, have relatively large negative impact on the willingness-to-pay. Health attribute, which is a credence attributes, also has a relatively high marginal effect on willingness-to-pay. However, other credence attributes, such as whether or not the cheese is made with organic milk and location of origin do not have statistically significant marginal effects. Overall, if the farmers focus on experience attributes instead of other costly credence attributes, they might increase the probability of obtaining a positive price premium from the consumers.

State-Wise Regression Results

In addition to the pooled regression across different states, we also analyzed each state separately to account for the state-wise differences in consumer preferences. We again use the bivariate-ordered probit regression model for willingness-to-pay for domestic artisan cheese over domestic processed cheese and for willingness-to-pay for imported French artisan cheese over US artisan cheese. The regression results are reported in Table 5(see Appendix). The R^2 for individual state-wise regressions are higher than that for the pooled regression, the highest being 0.45 for Kansas. The Chow test is used to test that the regressions coefficients are, as a whole, different among the three states. The hypothesis that all the regression coefficients are the same among the three states is rejected at the 1 percent significance level.

For willingness-to-pay for artisan cheese over processed cheese, we see differences among three states. Only three variables- cheese is aged, color of cheese, and health attribute- are statistically significant for all three states. Other variables, such as consumer preferences for the way cheese is produced, mechanically processed and farmstead are statistically significant only for one state. There are also variables that are statistically significant for two of the states, but not for the third state. For example, for point of sale, health / natural food stores is statistically significant for Iowa and Kansas, but not significant for Missouri. Results also vary between states for experience, search and credence attributes. The taste variable, which is an experience attribute, is statistically significant for Iowa and Kansas, but it is not significant for Missouri. On the other hand, another experience attribute, whether cheese is aged, is statistically significant for all three states. The credence attributes- made from organic milk and made from natural milk- are statistically significant only for one state each. Overall, the results of the current study suggest that willingness-to-pay or consumer preferences in general should not be generalized across different locations. As willingness-to-pay results are fluctuant relative to geographic location, instead of just focusing on the national trends, producers should analyze the local consumer preferences closely to increase sales.

Factors Analysis

The results of the factor analysis for the artisan cheese attributes are reported in Table 6(see Appendix), in the Kaiser rotated form, which makes the interpretation easy and keeps the model structure unchanged (Johnson and Wichern 2002). We report the factors for the pooled data and for each state separately. As a rule of thumb, we only report the factors with eigenvalues equal to

or bigger than one (Johnson and Wichern 2002; Sharma and Kumar 2006). The results of the factor analysis show that location of origin within the US and unique label have the highest two loadings for the factor 1, which has the highest eigenvalue for the pooled and state-wise data. Factor loadings higher than 0.6 are used to name a factor (Sharma and Kumar 2006). If a factor has high loading of all factors, it is called a general factor (Sharma and Kumar 2006). The factor 1 then can be called consumers' concerns about the source of a food product. Factor 1 also differentiates between the taste variable and the rest of the variables for both pooled and state-wise data. Factor 2 for each state has different variables with the highest factor loadings, which confirms state-wise differences in consumer preferences.

Conclusions

The current study analyzed the consumer preferences for domestic artisan cheese over domestic processed cheese and imported French artisan cheese over US artisan cheese. The results of the current study show that consumer preferences vary between domestic and imported artisan cheese. The impact of various experience, search, and credence attributes on willingness-to-pay for domestic and imported artisan cheese were different. Overall, experience attributes had the most impact on the price premium for domestic artisan cheese over domestic processed cheese. Domestic producers will want to use different marketing and production strategies to compete with imported artisan cheese. The results of the current study show that some of the consumer preferences might vary among different geographical locations. Hence, instead of using national trends, producers can benefit from analyzing the local consumer preferences when producing and marketing cheese products.

Besides the artisan cheese attributes, the results of the current study also showed point of sale and purpose of consumption to be important. These factors are even more influential for state-wise regressions, and these factors showed variation across location. Hence, different points of sale might be needed based on the location to increase the price premium from consumers. For example, health / natural food stores might be better marketing channels for producers in Iowa and Kansas than in Missouri. Future research is needed to further analyze consumer preferences for imported foods. Consumer preferences in regions other than the Midwest should be analyzed by a future study. Future research also should include different food bundles, such as cheese and wine, to identify the variation in consumer preferences for different food products in combination.

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Appendix

Table 1. Variable Names, Description, Means and Standard Deviations (N = 541)

Variable	Description	Mean	Standard Deviation
Age	Range: 1 = 24 and under; 2 = 25–34; 3 = 35-44; 4= 45-54; 5=55-64; 6=65 and older	3.23	1.410
Annual Family Income	Range: 1 = $0-$25,000; 2 =$26,000-$50,000; 3=$51,000-$75,000; 4 =$76,000-$100,000; 5=More than $100,000	3.25	1.220
Male	1 if Male, 0 if Female	0.43	0.496
Iowa (*Base Category*)	1 if located in, 0 otherwise	0.62	0.596
Kansas	1 if located in, 0 otherwise	0.16	0.369
Missouri	1 if located in, 0 otherwise	0.22	0.838
Cheese Production Type			
No Preference (*Base Category)*	1 if no preference, 0 otherwise	0.50	0.259
Mechanically Processed	1 if preferred, 0 otherwise	0.15	0.359
Hand-made	1 if preferred, 0 otherwise	0.25	0.431
Farmstead	1 if preferred, 0 otherwise	0.10	0.304
Artisan Cheese Consumption Purpose			
Cooking Ingredient	1 if chosen, 0 otherwise	0.46	0.499
Snack	1 if chosen, 0 otherwise	0.56	0.497
Appetizer	1 if chosen, 0 otherwise	0.64	0.480
Entertainment	1 if chosen, 0 otherwise	0.67	0.470
Family Traditions	1 if chosen, 0 otherwise	0.18	0.381
Complement (i.e. with wine)	1 if chosen, 0 otherwise	0.50	0.500
Recommendations (from others)	1 if chosen, 0 otherwise	0.40	0.490
Previous Experience (restaurant)	1 if chosen, 0 otherwise	0.34	0.475
Point of Sale			
Supermarkets[1]	Range: 1 =Never; 2=Seldom; 3=Occasionally;4=Frequently	3.46	0.922
Health/Natural Food Stores		1.51	0.791
Specialty Cheese Stores		1.54	0.722
Independent Grocery Stores		3.09	1.039
Directly from Cheese Makers		1.29	0.585
Mail/Online Orders		1.24	0.517
Artisan Cheese Attributes			
Taste [2]	Range: 1=Not Important; 2=Somewhat Important; 3=Very important	2.89	0.369
Enhancement of taste (with other products)		2.21	0.688
Shelf-life		2.19	0.651
Cheese is aged		1.99	0.726
Color of cheese		1.94	0.673
Made with natural milk		1.99	0.725

Table 1. *Continued*

Variable	Description	Mean	Standard Deviation
Made with organic milk		2.09	0.290
Type of milk (goat or cow)		1.92	0.748
Health Attribute (fat content)		2.01	0.719
Package size		2.01	0.622
Package design (resealable)		1.82	0.718
Cut of cheese		1.69	0.644
Unique label image		1.36	0.584
Location of origin in the US		1.55	0.650
Supporting small local farmers		1.91	0.676
Dependent Variables			
Willingness-to-pay a price premium for domestic artisan cheese over domestic processed cheese.	Range: 0=None; 1=20% more, 2=30% more 3=50% more	1.22	0.837
Willingness-to-pay a price premium for imported French artisan cheese over US artisan cheese.	Range: 0=None; 1=20% more, 2=30% more 3=50% more	0.64	0.794

Notes:[1]The range is same for all the variables under "Point of Sale."
[2] The range is same for all the variables under "Artisan Cheese Attributes."

Table 3. Results for Bivariate Ordered Probit Regression

Variable	**WTP for Domestic Artisan Cheese**[1]		**WTP for Imported French Cheese**[2]	
	Coefficient	Std. Error	Coefficient	Std. Error
Age	0.08*	0.043	-0.10**	0.045
Annual Family Income	0.03	0.045	0.01	0.047
Male	-0.04	0.110	0.03	0.150
Kansas (*Base is Iowa*)	-0.22	0.147	-0.04	0.068
Missouri	0.01	0.064	-0.12	0.115
Cheese Production Type				
(*Base is No Preference*)				
Mechanically Processed	-0.23	0.160	-0.06	0.169
Hand-made	0.29**	0.136	-0.11	0.140
Farmstead	0.13	0.187	-0.11	0.191
Consumption Purpose				
(Base is No Specific Purpose)				
Cooking Ingredient	0.05	0.110	0.06	0.114
Snack	0.24**	0.120	0.14	0.124
Appetizer	0.13	0.123	0.27**	0.130
Entertainment	0.26**	0.124	0.28**	0.131
Family Traditions	0.06	0.141	-0.02	0.145
Complement	0.02	0.118	-0.10	0.124
Recommendations	0.04	0.121	-0.06	0.128
Previous Experience	0.02	0.122	-0.12	0.129
Point of Sale				
Supermarkets	0.03	0.063	-0.05	0.065
Health/Natural	0.32***	0.078	0.18**	0.078
Specialty Cheese Stores	0.09	0.095	0.08	0.096
Independent Grocery	-0.10*	0.056	0.00	0.059
Directly from Makers	0.02	0.107	-0.08	0.113
Mail/Online Orders	0.12	0.109	0.29***	0.111
Artisan Cheese Attributes				
Taste	0.53***	0.163	0.09	0.169
Enhancement of taste	0.21**	0.094	0.21**	0.097
Shelf-life	-0.13	0.096	-0.13	0.101
Cheese is aged	0.41***	0.099	0.05	0.103
Color of cheese	-0.26**	0.105	0.09	0.108
Made with natural milk	0.15	0.094	0.01	0.098
Made with organic milk	0.27	0.200	0.14	0.201
Type of milk	-0.15**	0.084	-0.14	0.089
Health Attribute	-0.24***	0.092	0.05	0.095
Package size	-0.18*	0.106	-0.26**	0.112
Package design	-0.06	0.093	0.02	0.098
Cut of cheese	0.21**	0.110	-0.01	0.114
Unique label image	0.03	0.124	0.03	0.126
Location of origin	-0.18	0.119	0.02	0.123
Supporting local farmers	0.06	0.102	0.05	0.107
N		507		
Pseudo R-squared (McFadden's)		0.25		
Wald Chi-square(38)		201		
p-value for Wald chi-square		0.00		
ρ		0.38***		

Notes:[1]Indicates willingness-to-pay a price premium for domestic artisan cheese over domestic processed cheese.
[2] Indicates willingness-to-pay a price premium for imported French artisan cheese over US artisan cheese.
Three asterisks (***) indicate significance at 1% level, two asterisks (**) at the 5% level, and one asterisk (*) at the 10% level.

Table 4. Marginal Effects for Bivariate-Ordered Probit Regression

Variable	WTPA[1]=0 WTPF[2]=0	WTPA=1 WTPF=1	WTPA=2 WTPF=2	WTPA=3 WTPF=3
Age	-0.007	-0.022***	-0.004	0.000
Annual Family Income	-0.005	-0.001	0.001	0.000
Male	0.009	-0.015	-0.007	-0.001
Kansas	0.030	0.021	-0.004	-0.001
Missouri	0.000	-0.006	-0.002	0.000
Cheese Production Type				
Mechanically Processed	0.035	0.007	-0.009	-0.001
Hand-made	-0.034**	-0.044**	0.000	0.000
Farmstead	-0.016	-0.014	0.002	0.000
Consumption Purpose				
Cooking Ingredient	-0.009	0.004	0.004	0.000
Snack	-0.039**	0.006	0.015**	0.002*
Appetizer	-0.028	0.030	0.017**	0.002*
Entertainment	-0.047**	0.023	0.020***	0.002**
Family Traditions	-0.007	-0.008	0.001	0.000
Complement	0.000	-0.017	-0.005	0.000
Recommendations	-0.003	-0.013	-0.002	0.000
Previous Experience	0.002	-0.020	-0.006	-0.001
Point of Sale				
Supermarkets	-0.003	-0.010	-0.002	0.000
Health/Natural	-0.049	-0.001	0.017***	0.002**
Specialty Cheese Stores	-0.015	0.004	0.006	0.001
Independent Grocery	0.013	0.008	-0.003	0.000
Directly from Makers	0.001	-0.013	-0.004	0.000
Mail/Online Orders	-0.026	0.033**	0.018***	0.002**
Artisan Cheese Attributes				
Taste	-0.075***	-0.032	0.018*	0.002*
Enhancement of taste	-0.035***	0.013	0.016***	0.002**
Shelf-life	0.022	-0.008	-0.010	-0.001
Cheese is aged	-0.057***	-0.028*	0.013**	0.002*
Color of cheese	0.032**	0.035**	-0.002	0.000
Made with natural milk	-0.020	-0.011	0.004	0.001
Made with organic milk	-0.040	-0.002	0.014	0.002
Type of milk	0.025**	-0.008	-0.011**	-0.001*
Health Attribute	0.031**	0.028**	-0.003	-0.001
Package size	0.032**	-0.025	-0.018***	-0.002**
Package design	0.008	0.008	0.000	0.000
Cut of cheese	-0.028*	-0.020	0.005	0.001
Unique label image	-0.006	0.002	0.002	0.000
Location of origin	0.023	0.018	-0.003	-0.001
Supporting local farmers	-0.010	0.002	0.004	0.000

Notes: [1] WTPA indicates willingness-to-pay a premium for domestic artisan cheese over domestic processed cheese. [2] WTPF indicates for willingness-to-pay a premium for imported French artisan cheese over US artisan cheese. Three asterisks (***) indicate significance at 1% level, two asterisks (**) at the 5% level, and one asterisk (*) at the 10% level.

Table 5. Results for Bivariate Ordered Probit Regression for State-Wise Data

Variable	**WTP for Domestic Artisan Cheese**[1]			**WTP for Imported French Cheese**[2]		
	Iowa	Kansas	Missouri	Iowa	Kansas	Missouri
Age	0.06	0.10	0.14	-0.13**	0.00	-0.09
Annual Family Income	0.03	0.00	0.15	0.01	0.01	-0.05
Male	-0.01	0.24	-0.30	-0.37**	-0.04	0.27
Cheese Production Type						
Mechanically Processed	-0.02	-0.92	-1.02**	-0.38*	-0.69	0.63
Hand-made	0.37**	-0.76	0.78**	-0.12	-1.63***	-0.01
Farmstead	-0.14	0.81	0.93**	-0.05	-0.61	0.39
Consumption Purpose						
Cooking Ingredient	0.11	-0.90**	-0.27	0.17	-0.48	0.16
Snack	0.07	0.60	0.82***	0.23	0.25	0.31
Appetizer	0.09	1.17**	0.06	0.24	2.38***	0.00
Entertainment	0.36**	0.56	-0.36	0.21	0.51	0.61*
Family Traditions	0.11	-0.44	0.60	0.06	-0.20	-0.03
Complement	-0.07	-0.42	-0.18	-0.25	-1.66***	0.14
Recommendations	-0.09	0.97**	0.70**	-0.11	1.52***	-0.02
Previous Experience	0.17	-0.10	0.07	-0.31*	-0.14	0.25
Point of Sale						
Supermarkets	0.04	0.10	0.00	0.00	-0.52*	0.05
Health/Natural	0.37***	0.72***	0.02	0.22	0.43*	0.15
Specialty Cheese Stores	0.00	0.08	0.41*	0.04	-1.16***	0.64***
Independent Grocery	-0.10	-0.07	-0.22	0.09	-0.27	-0.03
Directly from Makers	0.02	0.31	-0.06	0.01	0.81*	-0.58**
Mail/Online Orders	0.18	-0.05	0.18	0.41***	-0.25	0.15
Artisan Cheese Attributes						
Taste	0.62***	1.63**	-0.08	0.03	0.26	0.30
Enhancement of taste	0.24**	-0.28	0.72***	0.28**	-0.06	-0.13
Shelf-life	-0.12	-0.85*	-0.18	-0.12	-1.55***	0.08
Cheese is aged	0.38***	1.21***	0.51*	0.15	0.60	0.04
Color of cheese	-0.27**	-1.19***	-0.53*	0.17	-0.06	-0.41
Made with natural milk	0.18	0.07	0.49*	0.04	-0.05	0.14
Made with organic milk	0.67**	-0.73	-0.19	0.36	-0.33	-0.23
Type of milk	-0.03	0.14	-0.51**	-0.20*	0.15	-0.16
Health Attribute	-0.28**	-0.54*	-0.40*	0.02	0.68**	-0.30**
Package size	-0.17	-0.29	-0.67**	-0.11	-1.00**	-0.68*
Package design	-0.09	0.65*	0.08	-0.06	0.48	0.47
Cut of cheese	0.09	1.06***	0.31	-0.22	1.20***	0.40***
Unique label image	0.12	-0.86**	0.07	0.03	-0.51	0.28
Location of origin	-0.12	-1.10**	-0.40	0.01	-0.26	-0.37
Supporting local farmer	-0.05	0.59	0.21	0.07	-0.42	0.03
N	310	82	115	310	82	115
Pseudo R-squared	0.26	0.45	0.37	0.26	0.45	0.37
Wald Chi-square(36)	122	41	62	122	41	62
p-value for Wald chi-square	0.000	0.000	0.000	0.000	0.000	0.000
ρ	0.40***	0.58***	0.50***	0.40***	0.58***	0.50***
Chow (72)		132			110	
p-value for Chow		0.000			0.000	

Table 6. Factor Analysis (Rotated Factor Loadings) (N=541)

Variables	**Pooled** Factor λ=4.65	**Iowa** Factor 1 λ=4.51	**Iowa** Factor 2 λ=1	**Kansas** Factor 1 λ=4.49	**Kansas** Factor 2 λ=1.37	**Kansas** Factor 3 λ=1.02	**Missouri** Factor 1 λ=5.42	**Missouri** Factor 2 λ=1.10
Taste	-0.05	-0.05	0.18	-0.02	-0.11	-0.13	-0.09	0.17
Enhancement of taste	0.21	0.18	0.14	0.20	0.39	0.22	0.25	0.17
Shelf-life	0.09	0.10	0.31	0.00	-0.08	0.59	0.17	0.09
Cheese is aged	0.30	0.35	0.31	0.21	0.67	-0.03	0.23	0.73
Color of cheese	0.32	0.32	0.16	0.16	0.72	0.20	0.40	0.24
Made with natural milk	0.21	0.17	0.67	0.20	0.23	0.08	0.32	0.48
Made with organic milk	0.19	0.06	0.35	0.34	0.15	-0.01	0.27	0.31
Type of milk	0.20	0.19	0.54	0.18	0.17	0.10	0.20	0.50
Health Attribute	0.15	0.12	0.51	0.08	0.12	0.26	0.27	0.52
Package size	0.15	0.13	0.06	0.18	0.31	0.56	0.11	0.03
Package design	0.23	0.20	0.05	0.23	0.13	0.72	0.29	0.08
Cut of cheese	0.51	0.50	0.13	0.61	0.31	0.08	0.61	0.20
Unique label image	0.66	0.60	0.07	0.80	0.12	0.20	0.68	0.04
Location of origin	0.67	0.64	0.37	0.73	0.00	0.08	0.78	0.32
Supporting local farmers	0.40	0.31	0.59	0.59	0.07	0.10	0.41	0.57

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A Case Study of the Symbolic Value of Community Supported Agriculture Membership

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Abstract

Sometimes a vegetable is just a vegetable, but how and where it is grown and sold can imbue a lowly potato with status: organic, local, Fairtrade, Peruvian! This paper examines the symbolic value of Community Supported Agriculture (CSA) as a vegetable delivery system using a focus group study. We find that for both current and former members, CSA has both symbolic and private meaning and confers status to vegetables, but has little influence on the perceived status of agriculture. However, only continuing CSA members demonstrate learned cues, perceptions of appraisal, improved role performance, and confer status to the CSA farmer.

Keywords: Community Supported Agriculture (CSA), symbolic value

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Introduction

"Eat your vegetables," is an admonition we all remember from our childhood. Community Supported Agriculture (CSA) is a social innovation (Taylor 1970) that, among other things, facilitates eating vegetables (Pole & Gray 2013; Russell & Zepeda 2008). While CSAs sell many farm products, they are often prepaid shares of produce (Feagan & Henderson 2009; Fieldhouse 1996; Wells & Gradwell 2001). CSA began in the US in 1986 with two farms (McFadden n.d.) and by 2007, grew to over 12,500 (USDA 2009). For farmers, prepayment increases prices received and cash flow, provides a stable income, and transfers production risk to consumers (Fieldhouse 1996; Schmidt, Kolodinsky, DeSisto & Conte 2011). However, the origins of CSA has a distinctly activist tone: a desire to create community and an alternative to industrial agriculture (Indian Line Farm n.d.; Thompson & Coskuner-Balli 2007a).

This has led researchers to focus on the motivations to join CSA, and the extent membership results in community (DeLind 1999; Feagan & Henderson 2009; Sumner, Mair & Nelson 2010; Trauger, Sachs, Barbercheck, Brasier & Kiernan 2010) or in changing the food system (Thompson & Coskuner-Balli 2007a; Wells & Gradwell 2001). Recent research finds the primary motivations to join are acquisition of fresh local vegetables (Pole & Gray 2013) and increasing vegetable consumption (MacMillan Uribe, Winham & Wharton 2012; Russell & Zepeda 2008). While CSA members agree that environmental, economic and social sustainability are important aspects of CSA (Adams & Salois 2010; Brown, Dury & Holdsworth 2009; Hokanen, Verplanken & Olsen 2006; Kolodinsky & Pelch 1997; Lusk & Briggeman 2009; MacMillan Uribe, Winham & Wharton 2012; Roininen, Arvola & Lahteenmaki 2006; Thompson & Coskuner-Balli 2007a), research has not supported community building as a key outcome (Pole & Gray 2013) or has found that community building is imagined (Zepeda, Reznickova & Russell 2013). In their class analysis of CSA, Hinrichs and Kremer (2002) found more advantaged members (in terms of income, education and occupation) identified quality and philosophy as primary reasons to join CSA, while over half the disadvantaged members, who also received subsidies, identified affordability.

These studies point to primarily functional, individualistic explanations for joining CSA. However, a communal aspect of CSA that has been overlooked is the role of food in culture and social interaction. A study in France on the social value of organic food found CSA affected the perceived status of organic vegetables (Costa, Zepeda, & Sirieix 2011). Bourdieu (1984) identifies food as an important means of creating distinction between individuals or social classes within a culture. Applying this to American culture, Holt (1998) finds social class is associated with distinctive food preferences. Johnston, Szabo and Rodney (2011) find that social class is associated with access to ethical eating options. This points to the possibility that CSA may have social or symbolic value. Indeed, Press and Arnould (2011) claim that CSA is heir to the 19th century cultural legacy of American pastoralism, while Thompson and Coskuner-Balli (2007a) characterize CSA as creating an artisanal food culture. This raises the questions: is CSA membership a cultural symbol and does it affect the status of produce received?

Using focus group transcripts of continuing and former members of a CSA serving Madison, Wisconsin, USA, we use Solomon's (1983) paper on product symbolism to examine whether CSA has a symbolic function. Does CSA drive members' behavior and self-identity? Does CSA

also have private meaning? How does CSA affect the symbolic value of the produce received, and the farmers and farms that produce it?

Conceptual Framework: Symbolic Consumption and CSA

Symbolic interactionism is a sociological theory originating with Mead (1922) that asserts that we give meaning to our actions through symbols. Solomon (1983) views products as stimuli for role fulfillment rather than simply functional responses to needs. Solomon's propositions (Table 1) identify eight characteristics of symbolic products: shared meaning, learned cues, reflexive evaluation, role performance, private and social meaning, lack of role knowledge, script uncertainty, and role transition. Since status may not be obvious, Proposition 1 (P1) implies we use symbols to evaluate the status of others and to project our own status (Turner 2011). This symbolic value is learned (P2); the learning process helps define and validate one's role through everyday actions (Blumer 1969). The symbols convey meaning and status (P3, P5), influencing perceptions of the value of products used for self-image, group membership, role position, and ego identification (Boksberger & Melsen 2011; Holbrook 1996). Lee (1990) uses symbolic interaction to explain consumer choice as a form of image management for self and others about who the consumer wants to (appear to) be (P4). An implication is that the more visible or public the consumption of a product is, the more conscious one is about their choice, whereas the more private the consumption, the more one is concerned about a product's functional aspects. Lee is relevant to CSA to the extent that pickup is visible to, or one discusses CSA. Lynch and McConatha (2006) would apply similarly to the use of social media to communicate one's membership or by a CSA to attract and communicate with members.

Table 1. Solomon's (1983) Eight Propositions for Symbolic Use of Products

P1:	Material goods produced by a culture have symbolic properties with meanings that are shared within that culture.
P2:	Learned cues inherent in product symbolism drive behavior, either by facilitating or by inhibiting role performance.
P3:	Actor's reflexive evaluation of the meaning assigned by others is influenced by the products with which the self is surrounded.
P4:	The probability of a successful role performance is increased to the degree that material symbols surrounding the role player parallels the symbolism associated with that role.
P5:	Products are consumed both for their social meaning (as symbols) and for their private meaning (as signs).
P6:	The probability that product symbolism will exert an a priori influence on behavior is inversely proportional to the individual's degree of extant role knowledge.
P7:	Role demands characterized by script uncertainty are accompanied by an increased reliance upon (and hence consumption of) symbolic products as a guide to behavior.
P8:	Periods of role transition render the novice role player especially reliant upon the use of relevant product cues to guide role-appropriate behavior.

Leigh and Gabel (1992) identify the characteristics of consumers, products, and marketing strategies associated with symbolic consumption. They find that consumers in role transition (P8), those who place a high value on advancement and social group membership, and those

trying to gain membership into a particular group (P7) are most likely to engage in symbolic consumption. They posit that lack of role knowledge encourages reliance on products to demonstrate one's role (P6). Thus, children, teens, young adults, the upwardly mobile, those newest to a group, the insecure, and the status conscious are the most likely to use symbolic consumption. In addition, they identify more symbolic purchases within groups that are exclusive, distinctive, homogenous, formal, and or meet frequently, and that these groups are often characterized by race, age, education level, income, or occupation.

Leigh and Gabel (1992) identify the characteristics of products with symbolic value as: expensive, associated with performance, complex, specialty items, ego enhancing, consumed in public, or associated with social roles. Shavitt, Torelli, and Wong (2009) emphasize that products activate identity when they are visibly consumed and have shared meaning. Leigh and Gabel (1992) identify effective strategies in promoting symbolic consumption as: ambiguous; premium pricing; and/or an exclusive distribution system, even if the product is not expensive.

Analyzing CSA using Leigh and Gabel (1992) reveals that, albeit unintentional, CSA consumers, products, and marketing strategies are consistent with symbolic consumption. CSA is tied to place by construct, which serves as an exclusion factor that could encourage homogeneity among CSA members. Indeed, CSA members tend to be white, educated, high income, and female (Pole & Gray 2013). Even when CSAs have mechanisms to attract low-income households, they may fail to reach the truly disadvantaged (Hinrichs & Kremer 2002). As to the products, they are seasonal, with the quantity and variety determined by the farmer, as well as the weather, and they involve direct sales; all of these reflect a specialty product with symbolic characteristics. Indeed, Thompson and Coskuner-Balli (2007a) and Zepeda et al. (2013) characterize CSA as creating an artisanal food culture that promotes cooking skills and distinctive meal planning. Finally, the distribution system can be viewed as exclusive since most CSAs require members to prepay for the season, as well as, pick up at a specific time and place. This extra effort and expense may be too costly for some US households, particularly working poor using public transportation. Thompson and Coskuner-Balli (2007b) find that CSA members view these inconveniences as "enchanting moral virtues" demonstrating members' commitment to sustainability. Thus, by construct, not intent, CSA has exclusionary characteristics typical of products with symbolic value. While some CSAs try to be more inclusive by accepting government food benefits (Joshua Farm n.d.) or selling weekly shares (Growing Power n.d.), Holt (1998) would predict that educated, high-income members would value exclusionary characteristics *because* they are distinctive.

Berger and Shiv (2011) conduct experiments that show distinctiveness may be rewarding because it is often paired with other rewards. Looking specifically at green behaviors, Griskevicius, Tybur, and Van den Bergh (2010) show that status and higher cost influence consumers' desire for green products. They argue that one can build a pro-social reputation by using green products and this reputation is valuable because it yields greater trust, higher status, and more desirable friends, allies, and partners. With explicit environmental and community goals, CSA can be viewed as pro-social; the implications are that high cost, effort, and greater visibility increase the status value of CSA membership. In other words, members who discuss or use social media about their membership or are seen at the pick-up site may increase their status or reputation among their social circle.

Through everyday practices continuing members learn and ultimately create the CSA culture, explaining why CSA members tend to have similar characteristics. By becoming a member one approves of the practices in theory. Those not attracted to the practices will not join a CSA. If one is in conflict with the actual practices, she leaves or does not renew. Following Hallett (2003), if one continues membership, one integrates the practices, imbuing the CSA (farmer, membership, produce) with legitimacy and symbolic power. So while CSA may not intend to, it appears to have many aspects that are compatible with symbolic consumption.

Therefore, we propose to examine the symbolic value of CSA membership. We develop five research questions about CSA membership from Solomon's (1983) first five propositions of consumers' symbolic use of products. His propositions 6-8 would require observations over time, which we do not have. We propose research questions rather than hypotheses for two reasons: first, Solomon's propositions are not formulated as research questions, making it important to articulate empirical research questions. Second, we cannot test hypotheses statistically using qualitative information. The research questions are:

R1: Does CSA membership have symbolic properties with shared cultural meaning?
R2: Do learned cues from CSA membership drive member's behavior?
R3: Does CSA membership influence one's perception of others' appraisal?
R4: Does CSA membership increase the probability of successful role performance?
R5: Does CSA membership also have private meaning? Additionally, we examine whether CSA membership confers symbolic value or status to the vegetables received (R6), to the CSA farmer (R7) and to farming in general (R8).

Materials and Methods

We use a focus group study of current and former CSA members to address these research questions (Silverman 2000). Given the complex, qualitative, leading nature of these questions, a structured questionnaire would likely yield answers with social desirability bias. Indirect, open questions permit participants to talk about what is important to them, and a focus group is ideal to elicit perceptions (Kreuger 1994). Participants are encouraged to express their views, rather than limiting responses as with a survey instrument. The advantage of a focus group over individual interviews is it requires less time to collect responses and participants can interact; the disadvantage is that participants may influence each other and it does not permit as much probing as individual interviews.

The protocol was reviewed and approved by a university human subjects review board. The focus group study took place in Madison, Wisconsin, USA in 2006. The CSA was in its fourth year of operation and had grown from a half-hectare farm with about 20 members to a two-hectare farm with 100 members. Twenty-three participants who were current or former members of this CSA were recruited for the study, representing nearly a quarter of the current membership (Table 2). Restricting participants to a single CSA controlled for potential differences in responses due to the farm structure, farmer, or location; the quantity, quality and variety of produce; and the social and volunteering opportunities offered by the CSA.

Table 2. Participant Demographics

Demographic	Raw #	% of Participants	Demographic	Raw #	% of Participants
Age*			**Marital Status**		
Range	22-85	(mean 47)	Single	7	30%
Sex			Married	12	52%
Female	17	74%	Partner	3	13%
Male	6	26%	Undisclosed	1	4%
Education			**Employment**		
High School	1	4%	Employed	20	87%
Associates	2	9%	Stay At Home Parent	1	4%
Bachelors	12	52%	Retired	2	9%
Masters	4	17%	**Household Income**		
Professional	1	4%	Less than $30,000	3	13%
PhD	3	13%	$30,000-$59,999	13	57%
Ethnicity			$60,000-$89,999	3	13%
Caucasian	20	87%	Over $90,000	3	13%
Asian American	1	4%	Undisclosed	1	4%
Undisclosed	2	9%			

Krueger (1994) recommended that a focus group have no more than 12 participants and that each group have similar characteristics so participants feel comfortable expressing their opinions; clearly someone who had quit the CSA might feel self-conscious about their decision with current members. Three categories of participants were recruited to participate in four focus groups: new and renewing (Groups 1 and 2), engaged (Group 3), and former (Group 4) members. Two focus groups were permitted for new and renewing members because they were the largest number of members and this facilitated scheduling. Engaged participants were CSA members who were involved in the CSA beyond simply picking up their weekly farm share; they were part of a small leadership group that, among other things, planned events or provided oversight for operations, and/or worked on the farm in exchange for their weekly farm share. Former members belonged to the CSA for at least one year, but did not renew during the season this research was conducted. Each group had five participants, except Group 3, which had eight.

Each focus group discussion lasted between one-and-a-half to three hours, including introductions, informed consent, a short demographic survey, refreshments, and the discussion. A co-author moderated the discussions. Each discussion was audio recorded and then transcribed professionally. Codes replaced the names of each respondent to protect their privacy; a number refers to their group, a letter to a participant in that group. Thus, the participants are referred to as 1a-e, 2a-e, 3a-h, and 4a-e.

Participants were instructed that different points of view were welcome and the purpose was not to seek a consensus. They were also instructed that each individual would be asked to respond to ensure that everyone had a chance to talk, but they were not required to respond. The order was reversed so that the same person did not respond first to each question. The first set of questions was general:

- why did they join a CSA in general and the specific CSA, in particular;
- where appropriate, why they renewed;
- what improvements they would recommend;
- how they engaged with the farm;
- how they traveled to the farm;
- and what additional shopping they did.

To reduce respondent fatigue, a short break was taken, then participants were asked to describe:

- a positive or negative experience with the farm;
- whether they socialized with the other CSA members;
- a positive or negative experience with the other members;
- what they had in common with other members besides being a member of the CSA;
- what they had learned since joining;
- and how their lifestyle or habits had changed since joining.

The open-ended and indirect nature of the questions avoided leading responses and allowed participants to talk about what they thought was important. If responses were unclear, the facilitator followed-up with neutral probing questions, e.g. "tell us more about that."

One co-author categorized responses for each of the eight research questions using first cycle coding; these were reviewed by another co-author to resolve any ambiguities (Table 3). Quotes were selected to illustrate the discussion of each research question, choosing different respondents to ensure expression of multiple voices. Table 4 shows the number of respondents who made a statement concerning each of the research questions, however, often each respondent made multiple remarks per question.

Table 3. Examples of Codes Supporting Each of the Research Questions

Research Question #	Position	Key concepts
R1	CSA has shared meaning	Common values, philosophy and meanings
R2	CSA and learned cues	Learning, trying new things, changing habits based on CSA
R3	CSA alters appraisal perception	Teaching/talking to others, judgment of other food venues
R4	CSA promotes successful role performance	Perception of success in food preparation, storage; enjoyment of food related roles
R5	CSA has private meaning	Personal enjoyment associated with the CSA; aesthetics; fulfillment
R6	CSA enhances the status of vegetables	Quality, taste, freshness, inspiration
R7	CSA enhances the status of farmer	Hard-work; providing food; trying new things
R8	CSA enhances the status of agriculture	Interaction with farm land, appreciation of landscape

Table 4. Number of Participants Whose Comments Support Each Research Question

	Group 1	Group 2	Group 3	Group 4	All
R1 CSA has shared meaning	4/5	3/5	7/8	3/5	17/23
R2 CSA and learned cues	5/5	5/5	5/8	1/5	16/23
R3 Appraisal perception	3/5	4/5	4/8	1/5	12/23
R4 Successful role performance	5/5	3/5	7/8	0/5	15/23
R5 CSA has private meaning	4/5	5/5	7/8	3/5	19/23
R6 Status of vegetables	5/5	5/5	4/8	2/5	16/23
R7 Status of farmer	5/5	4/5	7/8	2/5	18/23
R8 Status of agriculture	2/5	3/5	1/8	0/5	6/23

Results

R1. Does CSA membership have symbolic properties with meanings shared within that culture?

Three-quarters of the participants expressed some form of shared meaning in their responses (Table 4). Examples of evidence for R1 included statements by participants that CSA membership was a means for them to obtain food that is organic, local, or healthy; support or share risks with the farmer; be a part of a community, neighborhood, or philosophy; or to have an alternative to buying from big corporations:

> *It's not just about health, but food is so important to everything. Who would have thought it, but it has social implications, it has socioeconomic implications, the local nature of it. CSA has the values. It's just an awareness, and thoughtfulness about it.* (Respondent 2-c)

Some of these characteristics (e.g. organic, local, shared risks) might be familiar to those not belonging to CSA, but it is the members' emphasis on these characteristics as highly valued within the membership community that gives them shared symbolic meaning. Thus, the concept of local or organic within the CSA membership has greater meaning than simply where and how food is produced; the members convey shared values when talking about the CSA food:

> *So the garden was important, but the philosophy of the whole (name of CSA removed) enterprise, the community aspect of it, was really tops for me.* (Respondent 3-h)

The fact that someone outside the membership may understand or even value these characteristics does not preclude the shared meaning within the community; the Golden Rule is a tenet of most religions, but one does not need to be religious to appreciate it.

R2. Do learned cues from CSA membership drive member's behavior?

All Group 1 and 2 participants made statements about what they learned by being members from the newsletter or by dealing with their weekly share (Table 4). This implies that part of the motivation behind joining for Groups 1 and 2 was to learn more about food and food preparation:

> *I think that's another part of it that's kind of interesting about having a farm share is that there is a lot more upkeep at home. You get your produce, and it's really different from buying it in the grocery store for the fact that you have to take care of it, and make sure that you're storing it properly, or it will go bad.* (Respondent 2-a)

In contrast, only 60% of the engaged members (Group 3) and only one former (Group 4) member made such statements. It may be that participants in Groups 3 and 4 were more knowledgeable and skilled in these matters. In fact, three former members stated they did not learn anything.

R3. Does CSA membership influence one's perception of others' appraisal?

At least half of the respondents in Groups 1-3 (Table 4) made statements reflective of CSA membership influencing their perceptions of others:

> *And the other thing that I've noticed changed is just some friends of mine are a little bit more receptive to the idea of gardening and stuff like that.* (Respondent 3-d)

In Group 1 during a discussion of why CSA members would prefer not shop at Wal-Mart, the following comment illustrated how this affected one's view of self and others:

> *Maybe I'm paying a little more for it than I would pay at a Wal-Mart type grocery store, but I'm getting so much more out of it, and it is informed. That helps support my lifestyle, which is more important to me than a cheap buy.* (Respondent 1-e)

Typical comments from Groups 2 and 3 regarding perceptions of others and CSA included:

> *It is also a little bit of sense of community, just belonging to the group, seeing the same people each week, picking up your vegetables, and realizing that in some way we share the same values, I think, is real nice.* (Respondent 2-e)

In contrast, only one former member made a positive comment. As might be expected, former members were generally dissatisfied with their experience. Their statements reflected other priorities or inflexibility; being a member was not tied to others' appraisal:

> *I also am a very cost conscious, and so I'm not going to buy something just because it says organic… why am I going to do that?* (Respondent 4-c)

This person wanted membership to provide them with cheap vegetables, not symbolic value through appraisal of others.

R4. Does CSA membership increase the probability of successful role performance?

We examined how CSA membership affected members' food related roles. Almost all the participants from Groups 1-3 (Table 4) talked about how membership changed the way they prepared and viewed food and food procurement:

> *I have been actually able to put into practice more being involved in getting the food, making the food.* (Respondent 1-c);

None of the participants in Group 4 expressed that CSA membership helped them in their role performance. Rather, they talked about how CSA membership did not meet their needs:

> *I would have liked to have had a heck of a lot more recipes and just a lot more vegetables.* (Respondent 4-e)

R5. Does CSA membership also have private meaning?

Along with symbolic or social meaning, nearly all participants talked about the private meaning of membership (Table 4). To illustrate:

> *I'm not looking necessarily for other people to share this…. It comes after a busy day at work and you might be really frantic, and rushed, and whatever. You go there and being at the place where your food is grown is very grounding, for me anyway. It reminds me of what is really important.* (Respondent 1-e)

For continuing members, nearly all expressed the importance of being a part of the CSA was to them personally. For some it was an aesthetic and emotional experience:

> *I remember the first year that the farm was there, and the first time I saw it after it was in production, I cried because it was so beautiful. I get choked up just saying it. It just took all those years and so much effort, for so many people to get it to happen. It's an incredible experience that I will never forget*. (Respondent 1-a)

For others the private meaning was about practical wellbeing:

> *I get to see a friend, and I get good food.* (Respondent 2-b)

For others it was transformative or spiritual:

> *I can't tell you what it did for my soul just to go down (farmer's name)'s basement and see all those things (seedlings) because I used to start all my own stuff.* (Respondent 3-b)

And for others the private meaning connected the participant to their own past:

> *I feel it's a part of my history … an agrarian strain that started out when I helped my grandmother in her garden … a feeling as if I'm close to the earth, even though I'm not gardening. I'm close to the food and close to its source and something that I think is really important that many people have simply lost*. (Respondent 3-h)

Even among those who discontinued their membership three out of five mentioned some form of private meaning. Typically, these reflected activities rather than emotional experiences:

I like the hard work. I went every Wednesday. I loved it. It was really fun. (Respondent 4-d)

R6. Does CSA membership confer status to the vegetables received?

All the participants in Groups 1 and 2 and about half the participants in Groups 3 and 4 made comments about how the vegetables from the CSA farm were superior to those purchased elsewhere (Table 4). The respondents were effusive in their praise of the quality of the vegetables and how this influenced them:

And I didn't anticipate the beauty of the vegetables…The vegetables are just so beautifully trimmed and displayed…And [the beets] are like a whole different creature in that they're both beautiful to behold and the sugars come up and they are very tasty. (Respondent 3-b)

Some were more general in their praise, saying they were delicious (e.g Respondent 2-c). While others had favorite vegetables:

I love those edamame. Oh my gosh! (Respondent 4-c)

R7. Does CSA membership confer status to the CSA farmer?

Membership raised most of the respondents' appreciation for the CSA farmer; nearly all the continuing members described the farmer in glowing terms (Table 4). Some comments were succinct:

I think (farmer's name) is awesome. (Respondent 1-b)

While others were more descriptive:

And last year was really hard (due to bad weather), so (the anxiety of being a farmer) probably showed a lot more….The fact that you go from being a pure consumer of vegetables, that someone else has to worry about growing and making a living off of, to being a part of the process of production, and then I feel like watching (name of farmer) is kind of another level of that because her commitment is so astounding! (Respondent 3-f)

While former members complained about the distribution or amount of produce they received from the farmer, two at least recognized the hard work and difficulties faced by the farmer.

R8. Does CSA membership confer status to farming?

While nearly all the continuing members were fans of the farmer and of the vegetables produced and what they learned about vegetables and farming, CSA membership did not seem to have as big an impact on the status of agriculture beyond the CSA. Only six of the 18 continuing members and none of the former members made comments that reflected a greater appreciation of farming (Table 4), for example:

> *Every year you're not just learning new things, but your horizons are broadened in some way that you didn't think they would be...always learning something new about agriculture.* (Respondent 3-e)

Discussion

CSA has many characteristics that are consistent with Leigh and Gabel's (1992) assessment of consumers, products, and marketing strategies associated with symbolic consumption: CSA is tied to geographic place, attracting consumers associated with that place who are likely to be homogenous. CSA also produces artisanal, specialty items and the emphasis on fresh, seasonal "shares" of a farm promotes distinctive meal planning and cooking skills (Thompson & Coskuner-Balli 2007a). Prepayment and set pick-up locations and times are characteristics of an exclusive distribution system. While CSA was not designed to create symbolic value, these characteristics are associated with symbolic value, hence the motivation to conduct this research. Although we understand there are mechanisms in place to make CSA more accessible and affordable (e.g. Growing Power n.d.; Joshua Farm n.d.), members tend to be middle/upper class, educated, white, not blue-collar people (Hinrichs & Kremer 2002; Lang 2005).

In this case study, we find support for five of Solomon's (1983) propositions of symbolic consumption, for Leigh and Gabel's (1992) analysis of the characteristics associated with symbolic consumption, as well as for Hallett's (2003) analysis that negotiated practices are self-reinforcing. Consistent with Lee's (1990) discussion, the CSA members showed signs of both private and public symbolic value; these are additional motivations for the growth in CSA membership. Private meaning included functional aspects of the product: preparing, cooking and storing the vegetable, but consistent with Chen (2013) members also used the CSA farm as a place of relaxation and to connect with the environment. Through private symbolic consumption, the status of the vegetables and the farmer increased. Looking at public symbolic consumption, paying for a CSA is perceived as a prestigious act and members are perceived as in-group. Rather than competing, this external motivation complements personal meaning. This points to the need for future work to examine public and personal motivations for symbolic consumption together, rather than separately.

Boksberger and Melsen (2011) would predict CSA membership should convey symbolic value to CSA products. Indeed, we found in this case study that membership did have a positive impact on the status of vegetables for the participants. The effect was less strong for engaged members and former members in this study. In the case of engaged members, it could be that they became engaged for other reasons than the vegetables, such as a desire for community and social change. Or perhaps vegetables already have high status in their eyes and so they did not feel the need to talk about them, instead, they focused on other issues they found important. Despite leaving the CSA, most former members still had a high opinion of the CSA produce; however, they were not satisfied with the quantity and variety they received.

The differences between continuing and former members were greater when looking at the status of the farmer. Nearly all the continuing members conveyed status to the farmer. While some former members complemented the farmer, as Hallett (2003) would predict, all former members expressed some form of dissatisfaction with the farmer. Finally, CSA membership in this case

study had little impact on the status of agriculture. None of the former members expressed an increased appreciation for agriculture, and only a third of the continuing members indicated that it was important to understand the food system.

The respondents in this case study view continuing CSA membership as a symbol having social value. That the interactions of members define social norms in their CSA is consistent with Mead (1922). As Solomon (1983) proposed, continuing membership becomes a stimulus for role performance and fulfillment for these participants. Continuing members learn and validate their roles via everyday actions related to food procurement, preparation, and consumption, while those who leave do not. They use the vegetables as guides or cues for their behaviors. Indeed Thompson and Coskuner-Balli (2007b) characterize CSA membership as having an experiential aspect that reconnects members to food production. CSAs could explicitly recognize this symbolic value by promoting membership to improve food preparation skills and knowledge, as well as to connect with like-minded people. For continuing members in this case study, CSA membership confers status to self, to the produce received, to the farmer, and to a lesser degree, agriculture. Whereas for those who left, there is a lesser degree of shared and private meaning, there are little or no learned cures, appraisal perception or improved role performance, and little status is conveyed to the vegetable or farmer and none to agriculture.

Conclusions

A focus group study of 23 current and former CSA members serving Madison, Wisconsin, USA is used to examine the symbolic value of CSA membership, and whether it confers status to the vegetables produced, the CSA farmer, and agriculture in general. The case study provides qualitative evidence that community supported agriculture has symbolic value for the continuing participants. The first five of Solomon's (1983) eight propositions about the symbolic value of products were examined as research questions (Table 1).

About three-quarters of the respondents, regardless of whether they continued their membership or not, mentioned shared meaning (Table 4). Even more made comments about the private meaning of CSA. Rather than a dichotomy of private and public meaning (Lee 1990) or a focus on only the public meaning (Griskevicius et al. 2010), CSA membership appears to have both important private and public meaning for the participants. Indeed a strong and emotional private meaning seems to reinforce public meaning in this case study.

While CSA appears to have public and private meaning for all participant groups, former CSA members learned less from membership than continuing members, were less likely to view membership as affecting their appraisal by others, and none indicated that CSA membership helped them in their role performance. Hallett (2003) would explain the former members' attrition as a result of having practices in conflict with the CSA (e.g. being cost conscious); thus, those in conflict leave of their own accord.

Applying Hallett's (2003) analysis to continuing members, by learning about different vegetables, how to care for and prepare them, they create a self-reinforcing, consumption culture. This in turn affected participants' role performance, how they saw themselves and how they perceived others saw them. In addition, they evaluated others based on belonging to a CSA,

adopting an "us" versus "them" mentality; they saw it as their task to inform and introduce their practices to their family and friends. The participants' perceptions of themselves as being higher status are reflected in their negative comments targeted to "others," for example, people perceived as not making the right choices, such as shopping at Wal-Mart.

This case study has several potential implications for CSA. Given that CSA consumers, products and venues have several characteristics typical of symbolic consumption (Leigh & Grabel 1992), it is not surprising that we found support for five of Solomon's (1983) propositions of symbolic value in this case study. While symbolic value can be benign, one must be mindful of how these characteristics may unintentionally pose a barrier to inclusive membership. For example, are CSA pickup locations and hours accessible for those utilizing public transport? Do the products in the farm share reflect a specific cuisine or cultural food tastes? In addition, Solomon's propositions help to reveal how the process of symbolic value is created and can be used to foster greater inclusivity within CSA membership. For example, a CSA can explicitly recognize and share meaning with new members through an orientation and/or be conscious about being open to new or different views and needs of members.

For this particular CSA, membership did confer rock star status to the vegetables and the farmer, but not agriculture. The implication is that making vegetables *desirable*, as opposed to, or in addition to, conveying that they are healthy, is an effective strategy to encourage greater consumption of vegetables. CSAs often use newsletters, websites, a farmer at the pickup site, or members coming to the farm as opportunities to tell the farmer's story. Symbolic value offers an explanation of why such practices would convey greater status to the farmer and her products. Finally, for this CSA, fostering greater appreciation for vegetables and the farmer did not convey greater status to agriculture; this suggests members may need more help in thinking abstractly about how their CSA fits into the agricultural landscape.

The main limitation of this research is that as a qualitative study, it involves a small number of participants, and these experiences cannot be generalized. However, the strength of a qualitative study is the ability to explore and examine why people do what they do (Johnston, Szabo & Rodney 2011) to provide directions for future research. We have found support for the five propositions of Solomon (1983) in this case study of CSA members and offer explanations for these findings. The findings point to the potential of a large quantitative study to examine the symbolic value conveyed by CSA membership, its products, farmers, and agriculture in general. In addition, future work could examine how symbolic value varies among classes to examine how to promote greater inclusion of disadvantaged populations in CSA.

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Assessing the Intensity of Market Competition in the US Papaya Import Market

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Abstract

Most of the empirical work addressing imperfect competition in international agricultural trade has focused on grains and meats. The present study is an attempt to help fill the gap by assessing market competitiveness in the US fresh papaya market, which can be characterized as oligopolistic whereby Mexico, Belize, and Brazil are the main suppliers. In order to assess the intensity of competition among fresh papaya exporters in the US market, an inverse residual demand model is specified and estimated. The findings suggest that Mexico, Belize, and Brazil are completely constrained in exercising market power in the US fresh papaya market.

Keywords: Papayas, market power, residual demand, imperfect competition

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Introduction

Papaya is the third most traded tropical fruit after pineapples and mangoes, respectively. World imports of fresh papayas exceeded 261,000 metric tonnes (MT) in 2011, with an import value of $250.82 million. Globally, the United States is the number one papaya importer, and in 2011, accounted for 53.43 percent of the trade valued at around $79.82 million (FAOSTAT 2013).

The US fresh papaya import market may be characterized as oligopolistic (imperfect competition), with Mexico, Belize, and Brazil being the main import suppliers. Mexico plays a dominant role in the US papaya import market; however, market share per se does not necessarily prove Mexican papaya exporters exercise market power for papaya exports in the United States. For instance, Brazil which exports the Solo cultivar, considered to be of higher quality and a slightly differentiated product, commands a higher price for its produce and could in fact be the one exercising market power.

The United States, although not currently a major player in the market, is considering becoming more active with an anticipated increase in supplies coming mainly from Florida. This potential development stems from ongoing research nearing completion, which could circumvent the major production constraint having to do with the presence of papaya ringspot virus (PRSV) that to-date has severely curtailed production supplies coming from this source. Since success in the market will depend on the extent to which US growers can compete in the market, an understanding of the level of competition that exists in the market is of paramount importance. Hence, the primary objective of this study is to investigate the intensity of the competition that currently exists in this market among the major players.

A secondary objective of the study is to fill the gap that currently exists in the literature with respect to the scarcity of studies investigating the competitiveness of tropical fruits in international markets within the context of imperfect, rather than perfect, competition. While international agricultural markets are often characterized by oligopoly (Reimer and Stiegert, 2006), most studies that tend to assume perfect completion and those that have studied the existence and nature of imperfect competition in international agricultural markets have focused mainly on commodities such as grains and meats.

Among the studies focusing on international competition of fruit is a study conducted by Arnade and Pick (2000). Their paper focused attention on deciduous fruits and proposed a method for estimating and testing for seasonal changes in the degree of oligopoly power in the US pear and grape markets. While the model tests for the seasonal nature of market conduct, it is not designed to identify the sources of market imperfections. Arnade and Pick found a small but significant degree of oligopoly power in the US pear market when domestic supply of the fruit declines. In the US grape market, it was found that oligopoly power measures tend to be higher when foreign grape supplies dominate the market.

Winfree et al (2004) estimated a seasonal oligopoly power model for the US D'Anjou pear market. It was found that the Northwest D'Anjou pear industry has some degree of oligopoly power when the new crop enters the market at a time that supplies of imported or other pears

varieties are low. Market power of the Northwest D'Anjou pear industry wanes as the marketing year progresses and becomes small following the arrival of imported pear supplies.

To our knowledge, there has not been any empirical work addressing imperfect competition in the international trade of tropical fruits. Our study is the first attempt to assess market competitiveness in the US fresh papaya import market. Specifically, we investigate the intensity of competition among the main US fresh papaya import suppliers. We adopted the general framework developed by Goldberg and Knetter (1999) and estimate an inverse residual demand model by country for the main US papaya suppliers—Mexico, Belize, and Brazil. In particular, we estimate the residual demand elasticity that each exporter faces in the US market. Results provide an estimate of the degree of market power, pricing, and competitive behavior of Mexico, Belize, and Brazil in the US fresh papaya import market.

The paper is organized into six sections. Section 2 presents a brief overview of the US papaya import market. Section 3 discusses the conceptual framework. In section 4, the empirical model is presented together with the data estimation procedures. The results are presented and discussed in section 5. The paper concludes with a brief summary and a few remarks in section 6.

Overview of the US Papaya Market (Main Features)

As mentioned earlier, the United States is the largest single-country importer of papayas. Imports of US fresh papaya have grown 39.58 percent, from 101,875 MT in 2003 to 142,199 MT in 2012. During this period, Mexico has been the leading supplier of fresh papaya to the United States, dominating the import market with a share of 72.57 percent, followed by Belize (19.56 percent) and Brazil (3.01 percent). Reflecting the increase in volume of papaya imported by the United States, the value of trade rose by 41.10 percent over the same period, from $60.80 million in 2003 to $85.79 million in 2012 (USDA/FAS 2013).

The noticeable increase in the volume of papaya imported by the United States is attributed to increased supplies in the main papaya-producing countries and the rising consumer interest in functional food products. Papaya is a rich source of biologically-active compounds such as antioxidants (carotenes, vitamin C, and flavonoids), B vitamins (folate and pantothenic acid), minerals (potassium and magnesium), and fiber (Mahattanatawee et al. 2006) that play a significant role in promoting a healthy cardiovascular system and preventing colon and prostate cancers. Another factor contributing to the rise in US fresh papaya imports is the national increase in ethnic populations, especially Hispanics and Asians who have familiarity with the fruit.

The two main papaya cultivars marketed in the United States are Maradol, and Solo. Maradol is by far the dominant cultivar consumed in the United States. The main suppliers of this cultivar to the United States are Mexico, Belize, Guatemala, and the Dominican Republic, respectively. The Solo cultivar, best known as Hawaiian papaya, is supplied by Brazil and the Dominican Republic, respectively.

Fresh papayas from the top three suppliers are available in the US market all year round. The US average monthly fresh papaya import quantities for the ten-year period 2003:01 to 2012:12 are shown in Figure 1. Mexico is by far the main supplier of the fruit. As shown in Figure 1, imports of Mexican papaya increased from January, reaching a peak in May, followed by a steady

decline until December. In contrast, papaya imports from other sources tend to remain relatively flat throughout the year, with a slight uptick in quantities imported from Belize during the period from May to August when the Mexican volume of the fruit decreases substantially.

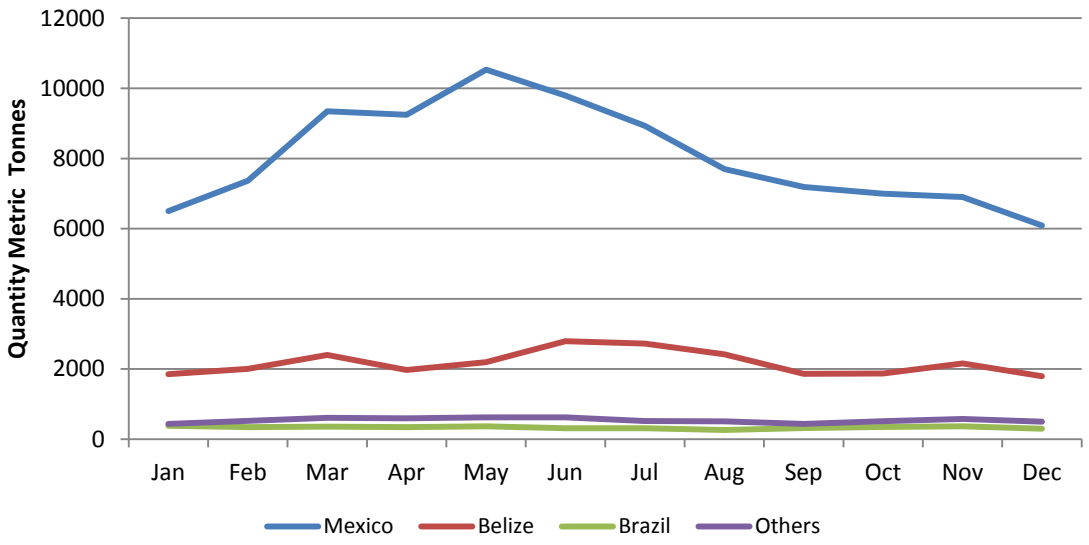

Figure 1. Average monthly US fresh papaya imports by origin, January 2003 to December 2012

Fresh papaya average monthly export prices for the January 2003 to December 2012 period are presented in Figure 2. Mexico papaya export prices decrease from January to March, when the export price reaches a low of $593/MT; then prices rise to a maximum of $612/MT in June. From June to September, export prices decrease because of summer competition from other fruits. Finally, prices start to recover from September to December due to a combination of reduced shipments from Mexico and the end of the season for several domestic fruit crops.

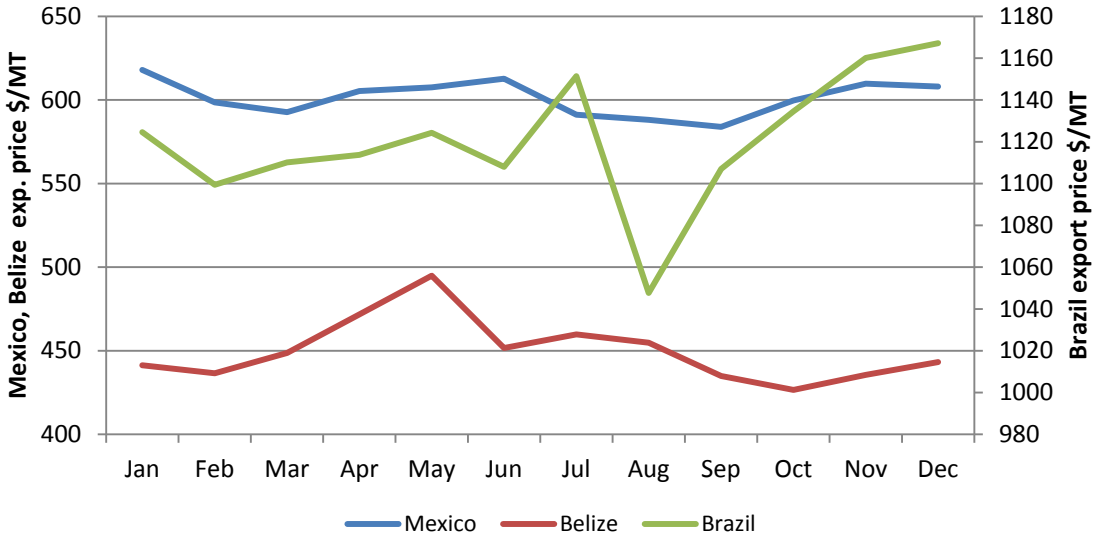

Figure 2. Average monthly US fresh papaya export prices by origin, January 2003 to December 2012

Belizean export prices increase from January to reach a peak of about $500/MT in May, followed by a downward trend until October due to competition from other types of fresh fruits in the market.

The main papaya cultivar exported by Brazil is Solo, which commands higher market prices, compared to the Maradol cultivar. Brazilian export prices oscillate around $1,120/MT during the first half of the year, reaching a peak of about $1,160/MT in July. Prices then drop from July to August, averaging $1,045/MT. In September, export prices begin increasing rapidly, reaching a maximum of about $1,167/MT during December.

Conceptual Framework

As pointed by Pick and Park (1991), despite its popularity in the literature, the perfect competition model has limited use to analyze agricultural trade and trade policies. This is so since, in most cases, international agricultural markets deviate from the perfect competition model due to the existence of firms large enough to exercise market power.

In antitrust cases, the method used to prove market power involves calculating the defendant's market share; a larger market share is considered evidence of market power. However, as pointed out by Goldberg and Knetter (1999), this method may be inadequate. A firm with a significant market share may still be constrained in its ability to exercise market power if it faces an elastic demand curve or if the supply of competing firms is elastic.

Historically, the Lerner index has been the customary measurement of market power. Defined as $L= (P-MC)/P$, the Lerner index measures the difference between price and marginal cost as a fraction of the price of the product. The index provides information about market power, defined as the ability of a firm to price above its marginal cost.

However, calculation of the Lerner's index is not a simple task since marginal costs are unknown and the lack of relevant data complicates the empirical estimation. Estimation of market power of a single firm requires the estimation of a full oligopoly model and data about competitors selling in a particular market may not be readily available. Data constraints in international markets are even more evident, as an exporter may face different demand conditions and different competitors in each destination market. To calculate the Lerner index for each destination market, it is necessary to have data about prices and quantities for every firm selling in a particular destination, which may be unavailable, as this information is subject to confidentiality. This has prompted researchers to consider alternative ways of estimating the degree of market power a firm has in a given market. Research in the new empirical industrial organization (NEIO) has come up with some methods to estimate market power without requiring information about marginal costs.

For instance, Goldberg and Knetter (1999) proposed a simpler method to estimate the market power a group of exporters may have in any destination market. This method uses the elasticity of the residual demand curve to measure the intensity of competition. The residual demand curve is derived as the difference between the market demand and the competitive fringe's supply curves. Therefore, properties of the residual demand schedule, such as elasticity, will depend on

properties of the market demand schedule, as well as the supply schedules of other firms in the market. As pointed out by the authors, competitor's products may or may not be perfect substitutes. Because this method is not based on particular assumptions about the shape of the cost function, marginal cost can be constant or a function of the quantity produced (for more details about the method, see Goldberg and Knetter (1999)). While estimation of market power of an exporter group in a particular destination market usually requires simultaneous equation techniques to estimate the demand, cost, and conduct parameters, the Goldberg and Knetter (1999) method estimates only one equation (the exporter's residual demand curve). Although this method cannot separately estimate own- and cross-price elasticities of demand, and conduct parameters, it captures their joint impact on market power through the elasticity of the residual demand curve. Moreover, as the authors point out, it can be shown that the residual demand elasticity coincides with the Lerner index in the following cases: Stackelberg leader, the dominant firm model with a competitive fringe, perfect competition, and extensive product differentiation.

In the present study, Mexico plays the role of the dominant firm, compared to Belize and Brazil, respectively. The estimating equation of the inverse residual demand function developed by Goldberg and Knetter (1999) takes the following general form:

$$(1)\ \ln P^{ex}_{m} = \lambda_m + \eta_m \ln Q^{ex}_{m} + \alpha'_m \ln Z_m + \beta'_m \ln W^{N}_{m} + \varepsilon_m$$

where α' and β' are vectors of parameters to be estimated, the subscript m indexes a specific market. The vectors Z_m and W^N_m denote the demand shifters for destination m, and the cost shifters for the n competitors the export group faces in a specific destination market, respectively; and ε_m is the error term which is assumed to be independently and identically distributed. This specification implies that separate equations will be specified for each product and destination; the price P^{ex}_m that the export group charges and the demand shifters are expressed in destination currency units. The coefficient of η_m can be interpreted as the residual demand elasticity, given the logarithmic specification of the model. If the estimated value of η_m is zero, the exporter operates in a perfectly competitive market and faces a perfectly elastic curve in the destination market; therefore, the export price is determined by the costs of other competitors in that market. The larger the absolute value of the residual demand elasticity, the larger the markup over marginal cost, and the more power the exporter has over price. The variable Q^{ex}_m refers to the quantity exported for the respective country.

The demand shifters Z_m consist of a combination of a time trend, real income, and the price level for the destination market. The cost shifters W^N_m for the n competitors include measures of input prices. These costs can be divided into two parts: (1) the part expressed in the competitor's currency that is not destination specific and (2) the part that varies with destination, specifically the exchange rate of the competitor country vis-a-vis the destination market. As stated by the authors, exchange rate movements are ideal cost shifters in international trade because they move the relative costs for the exporting countries.

The Goldberg and Knetter (1999) method has been used in the past to investigate competitive behavior in the Japanese meat import markets (Reed and Saghaian 2004; Poosiripinyo and Reed 2005) and in the Chinese soybean import market (Song et al. 2009). Reed and Saghaian (2004)

investigated the competitive behavior of the United States, Canada, Australia, and New Zealand in the Japanese import meat market. Results indicate that exporter's market power in the Japanese market varies by beef type.

Other application of the residual demand elasticity involved the competitive structure analysis of the Chinese soybean import market (Song et al. 2009). It was found that US soybean exporters were able to price their exports above their marginal cost; results indicate that the marketing margin of US soybean exporters in the Chinese soybean market is about four percent of the US farm-level price plus transactions costs.

Empirical Model and Data

We follow the framework developed by Goldberg and Knetter (1999) to measure exporter power in the US fresh papaya market. Mexico, Belize, and Brazil are considered the main competitive countries in the US market. The empirical model consists of two countries as competitors against one exporter; the inverse demand equation is specified as follows:

$$\ln p_{USt}^{ex} = \lambda_{US} + \eta \ln Q_{USt}^{ex} + \beta_1 \ln DPI_{US} + \beta_2 ln\, ER_{US}^{c1} + \beta_3 lnER_{US}^{c2} + \beta_4\, lnPPI^{c1} + \beta_5\, lnPPI^{c2} \quad (2)$$

where $\ln p_{USt}^{ex}$ represents the logarithm of the exporters' papaya prices in US dollars; $\ln DPI_{US}$ represents the logarithm of the US real disposable income; $ln\, ER_{US}^{c1}$ and $ln\, ER_{US}^{c2}$ stand for the logarithm of the real exchange rate of competitors 1 and 2, respectively; $lnPPI^{c1}$ $and\ lnPPI^{c2}$ represent the producer price index (PPI) for competitors 1 and 2, respectively. Both exchange rates and producer price indices of the competitors are used as cost shifters.

The quantity exported, Q_{USt}^{ex} ,is endogenous and has to be instrumented if there is simultaneity between quantity and prices; exchange rate and producer costs of the exporter are the natural instruments. In the first equation Mexico is the exporting country and Belize and Brazil are the two competitors. In the second equation Belize is the exporting country and Mexico and Brazil are the two competitors. Finally in the third equation Brazil is the exporting country and Mexico and Belize are the two competitors.

Monthly data for the period January 2003 to December 2012 were used for the empirical model. Average monthly export prices ($/MT) and quantities (MT) of fresh papaya exports from the top three import sources, Mexico, Belize, and Brazil, were obtained from the USDA/FAS Global Agricultural Trade System.

Real exchange rates for Mexico and Brazil were drawn from the USDA Economic Research Service (USDA/ERS 2013); the real exchange rate for Belize is calculated using the US–Belize nominal exchange rate (OANDA.COM), the monthly US Consumer Price Index for fresh fruits and vegetables (US BLS) and the quarterly Belize CPI (Belize Stats). Annual US disposable personal income data from FRED were converted to monthly data for the purpose of this analysis and used to represent the income variable. Owing to the general unavailability of international data on production costs, such as labor and energy, we used the monthly Mexican producer price

index (PPIMX) from INEGI and the monthly Brazilian producer price index (PPIBR) from IBRE as proxies of production costs for competitors; data about producer price index for Belize were unavailable.

A potential problem in estimating equation (2) above is the fact that quantity exported is likely to be endogenous. Several procedures are available to test for simultaneity, namely the Hausman (1978) specification test and the Spencer and Berk (1981) simultaneity test. The Spencer and Berk test can test the specification of a single equation system, while the Hausman test tests the specification of a single equation in a system of simultaneous equations. In this study, we apply the Spencer and Berk test. This test was completed as a two-step procedure. For the first step, it was necessary to obtain a reduced form equation using a set of instrument variables for each one of the three exporting countries.

$$(3) \qquad lnQ^{ex} = \beta_{us}^{'} \; lnIV_{us} + \xi_{us}$$

where IV represents instrumental variables—a vector of exogenous or predicted variables that are strongly correlated with Q^{ex} and uncorrelated with the disturbances; $\beta_{us}^{'}$ represents the vector of coefficients to be estimated; and ξ_{us} is an error term. For instance, IV variables correlated with quantity exported for the Mexican exporters' equation were the US–Mexico exchange rate and the Mexican producers' price index. Because the choice of instrumental variables affects the final estimation results, the instruments were chosen based on their statistical significance (Cho et al. 2002); therefore, variables were eliminated if they were not statistically significant at the 5 percent level.

The second step consisted of estimating equation (2) by OLS using the residual ξ_{us} obtained in equation 3 as an independent variable. Under the null hypothesis of no simultaneity, the coefficient of ξ_{us} must not be statistically different from zero. A *t test* on the coefficient of ξ_{us} is the appropriate specification test. Table 1 shows the results of the simultaneity test.

Based on the results of the test, the estimated coefficients of the ξ_{us} residual in the equations of each of the three main papaya suppliers to the US market are not statistically different from zero; there is no simultaneity between own prices and own quantities. Therefore, there was no need to use the instrumental variable method to conduct the empirical estimation.

Table 1. Spencer and Berk Simultaneity Test Results

Country	Residual estimate	t value	P-value	Simultaneity
Mexico	0.5821	1.36	0.1753	No
Belize	0.0702	0.88	0.3789	No
Brazil	0.3721	-1.52	0.1311	No

The null hypothesis of the Spencer and Berk test has no simultaneity between P^{ex} and Q^{ex}. The null hypothesis is not rejected at the 10% level.

Estimation Results and Discussion

The customary diagnostic tests were performed for the model; multicollinearity was detected in the equation in which Belize is the exporting country. In order to address the multicollinearity issue, the Brazilian producer price index was dropped from this equation.

Results of the Durbin Watson test for autocorrelation indicated that first-order positive autocorrelation existed. In order to correct for autocorrelation, equation 2 was estimated by Generalized Least Squares (GLS) using the Cochrane-Orcutt iterative procedure.

Table 2 summarizes the estimation results for the residual inverse demand elasticities for the three main fresh papaya exporters to the US market. The R-square values are high, ranging from 0.70 for Brazil to 0.89 for Mexico, indicating that the empirical model explains most of the variation in the export prices. Autocorrelation is not an issue as the Durbin-Watson statistics were close to 2.

Table 2. Estimation results for the market power of Mexico, Belize, and Brazil in the US papaya import market, 2003–2012.

	Mexico	**Belize**	**Brazil**
Intercept	4.8189 (1.82)	2.0645 (0.96)	8.1654 (2.19)
LQMEX	–0.0447 (–1.11)		
LQBEL		–0.0291 (–1.23)	
LQBRA			0.0532 (1.40)
LUSDPI	**0.9999**** (2.19)	**1.1757***** (2.67)	0.1053 (0.14)
LERUS-MEX		**–1.0349***** (3.45)	–0.5326 (–1.20)
LERUS-BEL	–1.3628 (–1.05)		**–4.7467**** (–2.15)
LERUS-BR	0.2433 (1.60)	**0.3457**** (2.54)	
LPPIBR	**–0.6808**** (–2.05)		
LPPIMEX		–0 .2014 (–0.95)	0.3448 (1.27)
R-Square	89.18	71.10	70.95
DW	1.856	1.995	2.336

t statistics are in parentheses.
**Significant at the 5% level.
***Significant at the 1% level.

The estimated inverse residual demand elasticity of Mexican papaya has the expected negative sign but was not statistically different from zero. This suggests that although Mexico has a significant share in the US fresh papaya market, they behave competitively and do not exercise market power. In other words, the price they obtained for their papayas is largely determined by

market conditions of supply and demand. One possible explanation is that given the increased availability of papayas in Mexico, the US market is seen more as an outlet market to reduce pressure on prices in the Mexican domestic market. Were it not for the US market, prices in Mexico would plummet given the level of supply. Papaya exporting firms operate on both sides of the US-Mexico border. This is also true in the case of Belize and Brazil. In this regard, Mexican producers/exporters are more concerned with maximizing overall profit through a strategy of increased export volume despite relatively small profit margins. A further incentive could be the prices in the US market are much higher than those in the Mexican domestic market. The results could also be explained in terms of a desire by Mexican exporters to dominate the US papaya import market and compete with other fruits, mainly on the basis of low commodity prices. It is also possible that given the highly perishable nature of the produce and volume to be marketed, that there could be a level of cut-throat competition among exporters, with the result that prices are kept close to the marginal cost of production.

The coefficient for the income variable had the expected sign and magnitude, as tropical fruits are beyond basic food necessities; therefore, increases in income may lead to a higher consumption of fresh papayas. The coefficients of the US–Belize and US–Brazil exchange rates were not significantly different from zero. The exchange rate of the two main competitors did not have a significant impact in the pricing of Mexican papaya exports to the US market. The coefficient for the Brazilian producer price index was statistically significant at the five percent level; the negative sign indicates that a decrease in Brazil production costs has a negative effect in the papaya export prices Mexico exporters receive.

With respect to Belizean exports of fresh papaya, the results indicate that the estimated coefficient of the inverse residual demand elasticity had the expected negative sign; however, it was not statistically different from zero. This implies a zero markup of export prices over marginal cost, suggesting that the exporters were not exercising market power. Again, prices in international markets are higher than in domestic markets, making it more profitable to export the fruit. Results indicate that Belizean fresh papaya exporters face an elastic demand curve; Belize papaya export prices are determined by the prices charged by the competitors.
The income elasticity coefficient had the right sign and magnitude; changes in income have a significant effect on the prices receive by Belizean exporters. Consumers with higher disposable income tend to include more fruits as part of their diets. The coefficient of the US–Brazil exchange rate is positive and significant at the five percent level. An appreciation of Brazil's currency increases its cost of selling the fruit to the US market, allowing Belize exporters to charge higher prices.

The estimated inverse residual demand elasticity for Brazilian fresh papaya exports to the United States had a positive sign; however, it is not statistically significant, meaning that Brazilian exporters of fresh papayas do not charge an export price above their marginal cost. One of the interesting features of the Goldberg and Knetter (1999) model is that it may be used in cases involving product differentiation. Solo-type papayas are considered sweeter than Maradol papayas and of excellent quality (California Rare Fruit Growers 1997). Results therefore suggest that the Solo papaya cultivar exported by Brazil is not sufficiently differentiated in the market to enable the exporters to exert market power.

Summary and Conclusions

In the present paper, we assessed the intensity of competition among fresh papaya exporters in the US market. An inverse residual demand model for the three main competitors (Mexico, Belize and Brazil) is specified and estimated. Results of this analysis offer an interesting insight into the competitive behavior of the three main fresh papaya exporters in the US market. The empirical estimates indicate that over the sample period, imperfect competition was not an issue for the three main fresh papaya exporters to the US market.

Mexico, Belize, and Brazil are completely constrained in the exercise of market power in the US fresh papaya market as they were unable to price their exports above the marginal cost. Mexico and Belize face relatively flat residual demand curves for their papaya exports to the United States as the estimated parameters were not statistically different from zero. Costs shifters of the competitors have a significant effect on the export prices charged by each of the three main papaya exporters in the US market.

In the case of Brazil, despite some claims that Solo-type papayas are of better quality, compared to Maradol papayas, there was no evidence that this particular cultivar had a competitive advantage on the US market. In fact, Brazilian papaya exporters have gradually experienced a decrease in their market share, signaling an intense competitive pressure on the US fresh papaya import market.

One of the interesting features of the Goldberg and Knetter approach is that it incorporates the role of competition through competitors' exchange rates. For Belizean papaya exporters, a change in the US–Brazil exchange rate, particularly with an appreciation of Brazil's currency, gives them the opportunity to obtain higher export prices.

Our findings suggest that from 2003:01 to 2012:12, the three main fresh papaya exporters behaved in a competitive way; however, this does not necessarily mean that during certain months, they are unable to price above their marginal costs, although that is a topic for further research. The present study addressed the issue of imperfect competition only from the exporter's side and found no evidence of it. However, for the United States as the largest fresh papaya importer, the opportunity to exercise market power in the form of oligopsony exists.

The findings of this study imply that the US papaya market is very competitive and is driven mainly by price competition and to a lesser extent by cultivar/quality characteristics. It therefore suggests that Florida growers can do reasonably well in the market as long as they can compete on a price basis since there are no major barriers to entry. The shorter distance to the market should aid Florida producers in this regards.

Market power in international agricultural markets remains a topic for future research to address trade inequality, particularly in the tropical fruit trade as many of these products come from developing countries. The Goldberg and Knetter approach is a simpler methodology to investigate concerns of intensity of competition in international markets using publicly available data.

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