Consumer Willingness to Pay for Locally Grown Plants

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Abstract

Over the last decade there has been a move by many consumers to purchase locally grown products. Many studies have focused on food with limited studies examining plants. Utilizing a choice experiment in conjunction with latent class modeling with examine the impact of locally labeling and retail outlet on preference and willingness to pay for azaleas. Results indicate that only one of the latent classes, about 43% of the sample, valued locally labeling. Furthermore, the same class that valued local also preferred a nursery/greenhouse outlet over a home improvement center. Recommendations for the different retail outlets are given based on the results.

Consumer demand for local products has continued to climb over the past decade. Notably, much of the focus has been on food products. Recent estimates of local food sales were $6.1 billion in 2012, which was an increase of 27% from 2008 (Low and Vogel 2011; Low et al. 2015). Studies have shown that many consumers prefer and may be willing to pay (WTP) a premium for local food (e.g., Darby et al. 2008; Yue and Tong 2009; Onozaka and McFadden 2011). Furthermore, numerous states have established initiatives to increase locally grown food sales. For instance, the Governor's Council for Agricultural Development in Connecticut has been tasked with increasing local food sales to five percent of total food sales by 2020 (Connecticut General Assembly 2011).

Even with the increased emphasis of purchasing locally grown products, little attention has been devoted to evaluating the value of locally grown labeling and retail outlet on green industry products. Given many nursery/greenhouse firms operate on "thin profit margins" (Sturdivant 2013), it is essential to understand how local labeling or whether the intrinsic value associated with an outlet type (i.e., home improvement center versus nursery/greenhouse) can impact consumer preference and/or WTP. A limited number of studies have attempted to value the impact of local labeling programs. Notably, Collart, Palma, and Hall (2010) showed dichotomy in the market with some consumers (i.e., those aware of a local brand) willing to pay more while other consumers (i.e., those not aware of a local brand) potentially discounting a local brand. Collart, Palma, and Carpio (2013) showed that consumers purchasing plants more often are more likely to pay a premium for a local brand. Rihn et al. (2015) found that an in-state label (Fresh from Florida) and domestic (grown in United States) increased preference for indoor foliage plants. Yue et al. (2011) found that women and some types of plant buyers value local

plants. However, these studies do not evaluate the effect of regional labeling and do not evaluate how consumers value varying retail outlets.

In order fill the above noted gap in the literature as well as offer recommendations to green industry firms, we utilized a choice experiment to better understand the role of geographic labeling as well as the value of retail outlet for a green industry product. Our main hypothesis was that a locally labeled plant would be preferred to a regional, domestic, and imported plant across all consumer groups given the increasing trend toward purchasing local products. We also hypothesized that a nursery/greenhouse retail outlet would be preferred by older consumers that have experience in purchasing the plant offered in the experiment.

Methods

An online survey was administered in the fall of 2012. The survey was focused on Connecticut residents for several reasons, notably due to the funding agency's interest in only the Connecticut market. Furthermore, unlike many other states, Connecticut has a strict definition (i.e., produced within the state or ten miles from point-of-purchase) around the use of the term local and synonymous terms. Of note, the green industry in Connecticut is the largest agricultural sector in both direct sales and economic impact (Lopez, Plesha, and Campbell 2015). Thereby, increasing the value of this sector could have major implications to the economic climate in the state.

Before initiating the study, the survey and protocols were approved by the requisite Internal Review Board(s) at participating universities. Potential respondents were recruited from the database of Global Market Insite, Inc. (GMI). Potential respondents were contacted via email and asked to participate. Respondents choosing to participate were directed to the study. The first step of the study involved respondents answering some general purchasing questions

about plant products. They then proceeded to the choice experiment where they were provided information about how the experiment worked, reminder they were purchasing only one plant, and a statement about how they should consider their budget constraint when making their choices. After completing the choice experiment respondents answered typical demographic and socio-economic questions.

The response rate for the survey was 85 percent which resulted in 720 completed surveys. With respect to representativeness, significance testing is feasible since census estimates to not include standard errors. However, our sample tends to be older, has a higher median household income, majority female and Caucasian compared to the average Connecticut resident. Even though our sample appears to be different from the average Connecticut resident, it is seemingly in-line with a typical green industry consumer (Dennis and Behe 2007; Balwin 2015)

Choice experiments are becoming increasingly common to assess preference and WTP. In designing a choice experiment, there are several important questions that must be answered. Notably, the researcher must determine the product(s) to be examined. Then the attributes and corresponding levels need to be identified. Finally, the number of choice sets and method of analysis needs to be chosen.

Product Attributes and Levels

The product, attributes, and levels were determined in consultation with the Connecticut Department of Agriculture, leading nursery/greenhouse outlets as well as a review of past literature. A two gallon azalea was chosen as the product with price, origin, bloom, location, and color being the key attributes identified as important within the purchase decision (Table 2). The price range was from $15.99 to $27.99 per plant, while color levels were white, red, pink, and

fuchsia. Also of interest was the value of a blooming plant. Discussions with several retailers indicated that consumers often show preference and WTP premiums for plants in-bloom. Thereby, we included the bloom attribute with two levels, in-bloom and not in-bloom. The final two attributes below were of particular interest to this study. Plants were labeled as grown in Connecticut, New Jersey, Washington, U.S., or Canada. The grown in Connecticut label is the local label, while New Jersey would represent a state in close proximity to Connecticut, thereby, would be a regional plant. Washington, U.S. and Canada serve as other potential labels that could be found on the market at varying geographic distances from Connecticut. We also included a "no label" level whereby no information was given about the production origin. The "no label" is important as many retailers do not label the origin of their plants, so understanding the implication of not labeling is critical. Finally, we indicated that the azaleas were either for sale at a home improvement center or nursery/greenhouse.

Experimental Design and Analysis

Each respondent was presented with eight choice sets that included three azalea products plus a "none" option. The number of choice sets was determined via optimization of the D-efficiency criterion. The criterion compares design efficiency with an orthogonal balanced design in order to give optimal designs (Kuhfeld 2010).

Given there is the potential for heterogeneity across consumer tastes and preferences, we utilized a latent class model (LCM) (Wedel and Kamakura, 2000; Boxall and Adamowicz, 2002; Greene and Hensher 2003; Kafle, Swallow, and Smith, 2014). According to Green and Hensher (2003), LCM is a similar to the mixed logit model but relaxes the requirement that assumptions have to be made about the distribution of parameters across individuals. However, there is no

exact means to determine the number of classes. Similar to other studies using LCM, we utilized the Bayesian Information Criteria (BIC) whereby we chose the number of classes that had the lowest BIC. For our model, three latent classes produced the lowest BIC value.

For developing the LCM model, we can think of consumer *i*'s indirect utility conditional on class *s* when choosing product *j* as:

$$U_{ij|s} = X_j\beta_s + \varepsilon_{ij} \quad [1]$$

where X_j is a vector of product attributes *j*. Class specific taste and preferences are represented by vector β_s and ε_{ij} is the i.i.d. Type I extreme value distributed error term. The unconditional probability that consumer *i* is in class *s* based on socio-demographic characteristics is noted by:

$$Prob_{is} = \frac{\exp(\theta_s Z_i)}{\sum_s \exp(\theta_s Z_i)} \quad [2]$$

where Z_i are demographic and socio-economic characteristics of consumer *i* and θ_s is a parameter vector that determines the probability of class membership. The probability of individual *i* choosing product *j* after being assigned their most probable class can be found via:

$$Prob_{ij|s} = \frac{\exp(\mu_s X_j \beta_s)}{\sum_j \exp(\mu_s X_j \beta_s)} \quad [3]$$

where μ_s is the scale parameter for a class *s* and is normalized to 1. The joint probability that consumer i in class s chooses product j is:

$$Prob_{ijs} = Prob_{ij|s} * Prob_{is} = \frac{\exp(\mu_s X_j \beta_s)}{\sum_j \exp(\mu_s X_j \beta_s)} * \frac{\exp(\theta_s Z_i)}{\sum_s \exp(\theta_s Z_i)} \quad [4]$$

WTP for each attribute level can then be calculated using the LCM coefficients via equation five:

$$WTP_j = -\left(\frac{\beta_j}{\beta_p}\right) \quad [5]$$

where β is the estimated coefficient for each attribute level *j* and *p* is the price attribute.

Results and Discussion

Examining Table 3, we see three distinct classes with varying preferences. Notably, we find that price is significant and negative across all classes. However, class two has the smallest price coefficient which implies that this class is most likely the least price sensitive.

Latent Class 1

Class one is made up of consumers that are primarily focused on price in their decision to purchase. Based on price being the primary driver and the negative sign associated with the coefficient, this segment is most likely the price sensitive segment. Price sensitive segments have been found in other plant studies, such as Hall et al. (2010) and Behe et al. (2014). The market share associated with this class (14%) is comparable to 13% and 16% reported for price sensitive segments reported by Hall et al. (2010) and Behe et al. (2014), respectively.

In comparison to the other classes we would most likely see older consumers in this class. Given older consumers are more likely to be plant buyers (Balwin 2015), retailers that cater to the typical plant buyer should be make sure their price points are attractive in order to better serve this demographic.

Latent Class 2

A primary focus of class two is the retail outlet and origin labeling. Notably, we see that the nursery/greenhouse retail outlet is preferred to home improvement centers (Table 3). Furthermore, the local (grown in Connecticut) label is preferred to all other labels as well as the no label option. Further making this a unique market segment, this class prefers a fuschia

colored azalea compared to all the other colors. Comparatively, white colored azaleas were the least preferred color.

This class of consumers has a higher probability of being young, Caucasian, and having purchased an azalea in the last two years. The previous experience variables significance and importance of local labeling align with Yue et al. (2011). Given there is some evidence that Caucasian consumers may be more likely to purchase local produce (Racine et al. 2013), this value of local may translate from food to non-food. For instance, supporting the local economy is consistently listed as a major reason for purchasing local (Darby et al. 2008; Yue and Tong 2009; Food Martinez et al. 2010; Onozaka et al. 2010; Marketing Institute 2011). This class may perceive purchasing local plants as a means to help support the local economy similar to the effect of purchasing local food.

Taking the results of class two in totality, the recommendations for nursery/greenhouse and home improvement centers differ assuming the results hold outside of azaleas. Nursery/greenhouse retail outlets need to focus on capitalizing on the fact this group values the nursery/greenhouse shopping environment. By offering non-traditional colors nursery/greenhouse outlets can directly focus on this consumer group compared to the home improvement center which most likely has a more diverse audience. Nursery/greenhouse outlets should also insure that they promote the local azaleas, and most likely other plants, as consumers in this group prefer to buy a local plant. However, home improvement outlets need to overcome the preferential view of nursery/greenhouses by these consumers which may entail promoting local azaleas, and other plants, and work to capture sales when/if a consumer from this group shops at their location.

Latent Class 3

Class three has a unique set of purchase drivers (Table 3). This class values the pink and fuchsia colors over red but values red over white. This is the only class where consumers have distinct preferences across a broad array of colors. Further, we see that this class prefers plants in-bloom. With respect to retail location we find that consumers in this class have a negative preference toward purchasing their two gallon azalea at a nursery/greenhouse compared to a home improvement center. In contrast to our hypothesis about local labeling we find that class one does not prefer a locally (CT grown) labeled azalea over a regional (New Jersey grown), U.S. grown, or international import (Canada). Of particular significance to retailers and marketers we find that the local label was not preferred over the "no label." However, the grown in Washington label was preferred over the local label.

We find that age is an indicator of membership in this class. Older consumers are less likely to be a member of this class compared to class three. With respect to recommendations retail outlets, home improvement centers would be advised to target this class as the preferential view of nursery/greenhouse outlets is no longer a barrier. Furthermore, this consumer group is open to wider variety of colors as well as azaleas that are in-bloom. Nursery/greenhouse may be best advised to focus on class two as nursery/greenhouses are not preferred to home improvement centers.

Willingness to Pay (WTP)

As can be seen in Table 4, latent class one does not have any significant WTP values. This is not surprising as this class is focused only on price. However, nursery/greenhouse outlets could expect to get a premium of $7.17 from class two consumers for two gallon azaleas while having

to discount the price by $1.49 for class one consumers. With respect to labeling, class two would give approximately $8-16 more for locally grown azaleas. However, Washington grown azaleas would garner a premium over local azaleas when a member of class one is shopping.

Conclusions

With respect to our findings, it is clear that the market for azaleas, and most likely plants in general, is filled with heterogeneous consumers. Our results show why it is hard for green industry firms to remain in business. As can be seen by the varying preferences of class one, two, and three members it is extremely hard to give all consumers everything they want. Price sensitive consumers do not have a preference for retail location so competing directly on price, especially nursery/greenhouse outlets that may have higher costs, is risky as potential revenue may be left on the table if class two consumers are the primary shoppers at the outlet. However, home improvement centers may be better situated if they have a lower cost structure as they can capitalize on class one's price sensitivity as well as class three's preference for their outlet type. For nursery/greenhouse outlets insuring that they capture class two and take a percentage of consumers from classes one and three may be the ideal scenario.

It is essential for firms to identify their consumer base and work to retain the loyal consumers while capturing some from their non-base group. Firms that can effectively identify their consumer base can then utilize the results above to develop effective marketing strategies to remain successful.

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Table 1. Descriptive statistics for key demographic and behavior variables.

Variable	Mean	Std. Dev.
Experienced (%) [a]	0.43	0.43
Mean Income	97,928	54,107
(median)	95,000	--
Mean Age	50.0	14.4
(median)	52.0	--
Children	0.22	0.51
Male (%)	0.34	0.47
Caucasian (%)	0.89	0.32
Number of respondents	720	
Number of obs.	5,760	

[a] Experience = 1 implies a respondent purchased a two gallon azalea at least once during the past two years.

Table 2. Attributes (and levels) included in the choice experiment.

Price	Origin	Bloom	Location	Color
15.99	Connecticut	In-bloom	Home improvement center	White
18.39	New Jersey	Not in-bloom	Nursery/Greenhouse	Red
20.79	U.S.			Pink
23.19	Washington			Fuchsia
25.59	Canada			
27.99	No label			

Table 3. Latent class model results for two gallon azaleas.

	Latent Class 1 Coefficient (Std. Error)		Latent Class 2 Coefficient (Std. Error)		Latent Class 3 Coefficient (Std. Error)	
None option	-5.796	***	-4.85	***	-12.903	***
	(1.060)		(0.732)		(1.269)	
Price	-0.367	***	-0.084	***	-0.518	***
	(0.060)		(0.026)		(0.067)	
Nursery/greenhouse	0.034		0.604	***	-0.769	***
	(0.440)		(0.144)		(0.286)	
Canada	-0.232		-1.483	***	0.098	
	(0.566)		(0.309)		(0.425)	
Washington	0.002		-1.335	***	1.675	*
	(0.610)		(0.245)		(0.862)	
U.S.	-0.125		-0.738	***	0.467	
	(0.681)		(0.216)		(0.497)	
New Jersey	-0.343		-0.851	***	0.368	
	(0.610)		(0.240)		(0.554)	
No label	-0.192		-1.242	***	-0.112	
	(0.641)		(0.198)		(0.492)	
White	0.083		-0.438	**	-0.794	***
	(0.517)		(0.206)		(0.283)	
Pink	0.060		0.226		1.143	***
	(0.542)		(0.165)		(0.365)	
Fuchsia	-0.464		0.466	***	1.622	**
	(0.517)		(0.168)		(0.656)	
In-bloom	0.602		-0.060		1.549	***
	(0.487)		(0.164)		(0.353)	

Class Probability Model			
	Latent Class 1 Coefficient (Std. Error)	Latent Class 2 Coefficient (Std. Error)	Latent Class 3 Coefficient (Std. Error)
Experience	--	1.102 **	0.853
		(0.543)	(0.540)
Income	--	0.000	0.000
		(0.000)	(0.000)
Age	--	-0.047 **	-0.058 **
		(0.021)	(0.021)
Children	--	0.120	-0.052
		(0.397)	(0.391)
Male	--	-0.229	0.750
		(0.547)	(0.524)

Caucasian	--	1.980	**	0.415	
		(0.923)		(0.714)	
Constant	--	0.744		2.628	**
		(1.292)		(1.136)	
Log likelihood		-1,320.51			
Number of respondents (times 8 choices for total number of observations)		720			
Percent share	0.14	0.43		0.43	

BIC values for varying latent classes: 2 = 3016.2, 3=2900.7, 4=2917.7, and 5=2976.4.

Table 4. Willingness to pay estimates from the latent class model results.

	Latent Class 1 Coefficient (Confidence Interval)	Latent Class 2 Coefficient (Confidence Interval)	Latent Class 3 Coefficient (Confidence Interval)
Nursery/greenhouse	0.09	7.17 **	-1.49 ***
	(-2.25, 2.44)	(0.58, 13.76)	(-2.47, -0.51)
Canada	-0.63	-17.60 **	0.19
	(-3.70, 2.44)	(-33.08, -2.13)	(-1.40, 1.78)
Washington	0.00	-15.84 ***	3.24 **
	(-3.25, 3.26)	(-27.56, -4.13)	(0.58, 5.89)
U.S.	-0.34	-8.76 **	0.90
	(-4.02, 3.34)	(-17.43, -0.09)	(-0.86, 2.66)
New Jersey	-0.93	-10.11 **	0.71
	(-4.12, 2.25)	(-19.90, -0.31)	(-1.31, 2.73)
No label	-0.52	-14.74 ***	-0.22
	(-3.96, 2.91)	(-25.09, -4.40)	(-2.11, 1.67)
White	0.23	-5.20 **	-1.53 ***
	(-2.53, 2.98)	(-9.94, -0.47)	(-2.54, -0.53)
Pink	0.16	2.68	2.21 ***
	(-2.73, 3.06)	(-1.53, 6.89)	(1.13, 3.29)
Fuchsia	-1.26	5.53 *	3.13 ***
	(-4.08, 1.55)	(-0.29, 11.36)	(1.15, 5.09)
In-bloom	1.64	-0.71	2.99 ***
	(-0.73, 4.01)	(-4.63, 3.20)	(2.11,3.88)

*, **, and *** represent significance at the 0.1, 0.05, and 0.01 levels, respectively.
Base categories are: home improvement center/mass merchandiser, CT grown, red color, and not in-bloom.