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Three Essays on Households Consumption Patterns and Labeling

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The difference in product attributes presented by different labels represents an important factor for consumers when making a purchase decision. Research has shown that a greater variety of options can cater to a wider range of tastes and preferences (Lancaster 1990). That is, with different product attributes, the quality of the product, as perceived by consumers, increases. However, providing consumers with more information on the product's attributes does not necessarily imply a direct effect on their preference ordering. Other emotional triggers may drive the purchase decision and can be hard for the researcher to capture.

The current dissertation continues a long line of previous work that have focused on consumer's perceptions of different labels for both food and plants products, and how their perception of these labels can have a direct impact on their buying decision. In the first essay, I examine the role of different labeling formats (i.e. calorie, percent daily intake, and traffic light signals) on food choice at both sit down and fast food establishments. Notably the impact of labeling formats on calorie and other nutritional choices. In this essay, I further examine how prices paid by consumers are affected by a change of these labeling formats. To achieve these objectives, nutrition information of food ordered was analyzed by food category: entrée, appetizer, dessert and drink. Results from this study indicate that the implementation of different calorie labeling significantly decrease calories ordered by participants for most food categories. In addition, calorie labeling had almost no impact on food prices. Furthermore, via eye tracking technology we find that participants looked at the nutritional information similarly across treatments. In the second essay, I evaluate

how the restriction of food brands in the approved WIC (women, infants, and children program) food package may impact consumer brand preference even outside of the WIC program. As expected, I find that non-benefit households tend to buy less PL milk and less PL cereal compared to the benefit households. However, the entry-exit households show a different behavior. These households buy more PL milk and less PL cereal when they are participating in the program, and they buy less of both products when they lose eligibility and drop out the program. These results could be very helpful and important to consider for policy makers when designing the WIC food package. In the third essay, utilizing an online survey of Connecticut residents in conjunction with a choice experiment I examine the impact of various attributes (e.g., local labeling, retail outlet, color, bloom, and price) on preference and willingness to pay for azaleas. Results of the latent class model indicate that only one of the latent classes, about 43% of the sample, valued local labeling. Furthermore, the same class that valued local also preferred a nursery/greenhouse outlet over a home improvement center/mass merchandiser. Recommendations for the different retail outlets are given based on the results.

Three Essays on Households Consumption Patterns and Labeling

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Three Essays on Households Consumption Patterns and Labeling

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"If anyone travels on a road in search of knowledge, God will cause him to travel on one of the roads of Paradise. The angels will lower their wings in their great pleasure with one who seeks knowledge. The inhabitants of the heavens and the Earth and (even) the fish in the deep waters will ask forgiveness for the learned man. The superiority of the learned over the devout is like that of the moon, on the night when it is full, over the rest of the stars. The learned are the heirs of the Prophets, and the Prophets leave (no monetary inheritance), they leave only knowledge, and he who takes it takes an abundant portion."

Prophet Muhammad (peace be upon him)

To my parents for their immense love and support throughout my life.
To my beloved husband Youssef for his unlimited love and support.

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Chapter 1

The Effect of Restaurant Menu Labeling on Consumer's Choice: Evidence from a Choice Experiment Involving Eye-Tracking

Introduction

American consumers have significantly increased their frequency of eating away from home (EAFH) over the last several decades. As noted by Gutherie et al. (2013), people tend to unconsciously underestimate their calorie intake and usually over-consume when EAFH. Thereby, EAFH has contributed to the obesity epidemic within the U.S. whereby more than one-third of Americans are considered obese (National Health and Nutrition Examination Survey (NHNES 2010). To counteract the upward trend in unhealthy eating, policy makers and other health advocates have pushed for increased nutritional labeling at restaurants.

The Food and Drug Administration (FDA) is in the process of releasing rules mandating a new national menu-labeling standard for how chain restaurants present calorie and other nutrition information on menus and at the point-of-sale. Chain restaurants, with 20 or more locations operating under the same brand name, will be impacted by these changes and will soon need to disclose calorie information on menus in order to try to get consumers to make healthier choices (Food and Drug Administration 2014). In this context, several studies have examined restaurant menu labeling and have reported mixed results. These studies range from survey, laboratory, to field based experiments. On one hand, it appears that, for some consumers, there are no statistically significant differences in calories purchased before and after labeling is implemented because

these consumers consider other factors, such as taste, more relevant during their meal selection process. For example, Liu et.al. (2012) tested the effect of calorie information presented in different formats on calories ordered and perceived restaurant healthfulness using real restaurant menus. They found no significant difference between the calorie and no calorie groups. However, participants in each calorie label condition were significantly more accurate in estimating calories ordered compared to the no calorie group.

Similarly, Elbel et.al. (2009) examined the influence of menu calorie labels on fast food choices in New York City, NY and Newark, NJ. The authors did not detect any change in calories purchased after the introduction of calorie labeling in both cities. In addition, no differences occurred by gender, race or age. Dumanovsky et.al. (2011) extended the analysis beyond calorie content only and studied the energy content of individual purchases -based on customers' register receipts and calorie information provided for all items in the menu- before and after the implementation of regulation requiring chain restaurants' menus to contain details of the energy content in New York City, NY. For the full sample, mean calories purchased did not change from before to after implementation of the regulation. After regulation implementation only one in six lunchtime customers used the calorie information provided, and these customers made lower calorie choices. In the same context, Thunstrom et al. (2011) conducted a field experiment to analyze if easily accessible nutritional information, such as a healthy symbol, increases consumption of healthy meals away from home. Their findings show that an introduction of a healthy symbol had no effect on the mean nutritional content or on meal expenditure. Based on these findings it seems apparent that finding a means of relaying nutritional information is complex, but that increasing visual attention could be key in decreasing calorie consumption.

On the other hand, research has shown that nutrition labeling of restaurant menus can effectively impact consumer choice. Avcibasioglu et al. (2011) conducted a survey to determine the possible impact of the pending California menu labeling law. 62% of the participants indicated a change in their meal selection, with a high level of intention to order lower-calorie alternatives or eliminate some items. Equivalently, Bates (2009) found that nutrition disclosures can have an impact on consumer product evaluations and preferences, particularly for restaurant items that are less healthful than anticipated. This result was concluded to be more persistent in young females than males as they were found to be more likely to attend, process, and utilize nutrition information. In addition to gender, Girz et al. (2012) observed that people with dietary restraints tend to order low calorie items when they are exposed to calorie labeling, while non-dieters did not eat less in response to calorie information. Lusk et.al. (2014) used field experiment data to show the numeric calorie label did not have any significant effect on total calorie intake, but the introduction of a traffic light symbol to the numeric label led to a 67.8 kcal reduction in average calories ordered. Restaurant revenue was found to not be affected by the addition of calorie labels on menus.

This paper had several major objectives. First, this study evaluated the impact of several proposed labeling schemes (calorie only labeling, red/green light, calorie and percent daily value) to determine which, if any, have the largest impact on calorie choice. To further the policy implications we also examine how the treatment groups impact other nutritional factors such as fat, sugar, protein, etc. Second, we examined the impact of mandatory restaurant menu labeling on consumers' food selection for varying menu categories (appetizer, entrée, dessert, and drinks). Previous studies have focused on total calorie changes; however, understanding how consumers add or subtract calories from varying categories can provide useful information to restaurants as

well as policy makers. Third, as noted by Dumanovsky et al. (2011), visual attention to a label can be critical to a labeling schemes success; thereby, we utilized eye-tracking technology (ETT) to objectively measure a consumer's visual attention to nutrition information by examining the pattern and duration of attention to them. This analysis looks at the number of fixations and total visit duration as a function of different variables: label formats, calorie content, and consumer' choice (healthy vs. unhealthy). Fourth, this study aimed to examine how prices paid by consumers are affected by a change of calorie labeling formats. Several studies have examined the effect of restaurant menu labeling on food choice and total caloric intake. However, non-health outcomes, such as total cost of the meal, have been given little attention. The potential monetary impacts to a firm of mandatory labeling could be critical to restaurant profitability and may have a significant impact on pricing decisions. Notably, forced inclusion of health information could have a detrimental impact on food expenditures which in turn may result in decreased sales at the firm level.

Data Collection and Measures

A sample of 242 college students with diverse demographic characteristics were presented with two different restaurant menus: a sit-down restaurant menu (Olive Garden) and a fast food restaurant menu (McDonald's). These two restaurants were chosen because they are well known franchises throughout the U.S (more than 800 locations for Olive Garden and more than 14,267 locations for McDonald's) and they both possess considerable food variety offerings, with diverse nutritional profiles as well as having establishments in close proximity to the study. Furthermore,

the menus are broken down into the specific categories of interest to this study: entrees, appetizers[1], desserts and drinks. Participants were randomly assigned to one of six treatment groups:

1) Menu items, no nutrition information (control group).
2) Menu items plus calories for each item, similar to the FDA proposed guidelines.
3) Menu items, calories, and percent daily intake (% DI) of calories based on a 2,000 calorie diet.
4) Menu items, calories, and traffic light menu labeling. A green symbol represents low calories (<750 calories for entrees, <250 calories for appetizers, sides, or desserts; 0 calories for beverages.) and a red symbol represents high calories (>750 calories for entrée, >250 calories for appetizers, sides, or desserts; >0 calories for beverages). This is similar to traffic light signals used in school systems throughout the nation.
5) Menu items, calories, traffic light, and % DI of calories.
6) Menu items with only green traffic lights to indicate low calorie food.

Respondents were asked to view a McDonalds and Olive Garden menu that had the prescribed nutritional information associated with the treatment group they were assigned. Each menu was presented on a computer screen to allow for ETT measurements. Respondents were asked to select the food item(s), if any, which they would like to order for dinner from each menu. After making their selection from the first menu, the respondent was asked to choose items from the second menu. The order of menu presentation was random as was the assignment of treatment group. At the end of the experiment, participants were presented with a questionnaire regarding their dinning

[1] Appetizers appear only in Olive Garden's menu. No appetizers are defined for McDonald's restaurant

habits, their restaurant purchasing habits, health information (e.g. on a diet, height, weight, etc.), and demographics. Table 1 describes the sample characteristics.

To measure a consumer's visual attention to nutrition information presented by different types of labelling, we simultaneously incorporated ETT into the experiment. We hypothesized that consumer's choice would be affected by the labelling information only if the latter receives attention. Therefore, we assume that the labeling formats we employed will affect food choices differently given that some formats are potentially more attention capturing than others. In this context, participants eye gaze measures were tracked and measured when viewing different labelling scenarios on a computer screen. Within the ETT data, areas of interest (AOI) can be formulated to represent a predefined area (e.g. calorie label, price label, traffic light label, etc.) on the computer screen whereby measurements specific to that area can be identified. ETT measurements within each AOI included time to first fixation (TFF), first fixation duration (FFD), fixation count (FC), and total visit duration (TVD)[2]. TFF measures the time in milliseconds it takes a respondent to fixate on an AOI. FFD represents the time in milliseconds that it a respondent fixated on an AOI during the first fixation. FC is the number of times a respondent fixates on an AOI, while TVD is the total time a respondent spent fixating on an AOI.

Methodology

Model 1: Effect of Different Menu Labeling on Food Selection

Based on existing literature, menu labeling is expected to significantly impact a consumers' choice for food. However, it may also push consumers to substitute among food items in order to eat

[2] Although all these variables are generated using the ETT, we only use fixation count in our analysis.

healthier. To quantify this potential substitution effect, prices and calorie information generated during this experiment were divided into four food categories: entrée, appetizer, dessert and drink. Using equation 1 we can capture the impact of each labeling treatment on calories selected.

$$NI_{ij} = f\left(TR, D_i, PB_i, Menu_j, FC\_Number_{ij}, Time_i\right) \quad i = 1, \dots, 242 \; and \; j = 1, \dots, 4 \quad \textbf{(1)}$$

Whereby, the outcome variable NI_{ij} represents, TR is a set of dummy variables indicating which treatment was used. Di and PB_i are demographic and purchasing behavior characteristics of each participant i. $Menu_j$ is a binary variable that indicates which menu a food category j belongs to. FC_number_{ij} counts how many items were ordered by each individual i in each food category j. $Time_i$ refers to what time of the day an individual i participated in the experiment. Calorie and other nutritional information values were taken from the company websites. See Table 2 for a list of outcome and explanatory variables.

An important characteristic of our data sample is that the dependent variable –nutrition information in this part of the analysis- contains zero observations. This is mainly because some participants did not select all food categories subject to the study or because they selected a calorie-free item, such as a diet drink. For example, a participant who chose to have an entrée, an appetizer and a drink, will have zero nutrition information for the dessert category. Similarly, when a participant selected a diet drink, a zero calorie value is associated with the person's drink category.

This is a common problem in microeconomic data called "censoring" of the dependent variable (Greene 2003). In this study, the data exhibits censoring from below given the zero values associated with no calories selected for some categories. Therefore, the use of an ordinary least squares regression to estimate equation 1 will produce biased and inconsistent parameter estimates, notably a downward-biased estimate of the slope coefficient and an upward-biased estimate of the intercept (Amemiya 1973).

To minimize the impact of this problem we used a Tobit model (proposed by Tobin in 1958). Following Greene (2008), the Tobit model (also called standard Tobit or type I Tobit) is expressed in terms of a latent variable y_i given by

$$y_i^* = \begin{cases} X_i\beta + \varepsilon_i, & X_i\beta + \varepsilon_i > 0 \\ 0, & X_i\beta + \varepsilon_i \leq 0 \end{cases} \quad \textbf{(2)}$$

Where i= 1, 2, 3 …242 is the number of participants, y_i is the censored dependent variable, X_i is the vector of explanatory variables, β is a vector of parameter estimates and $\varepsilon_i \sim N(0, \sigma^2)$. Let z = Xβ/σ, $f(z)$ be the standard normal density and F (z) be the cumulative normal distribution function, then,

$$E(y^*) = X\beta F(z) + \sigma f(z) \quad \textbf{(3)}$$

$$E(y^*|y^* > 0) = X\beta + \sigma f(z)/F(z) \quad \textbf{(4)}$$

Equations 3 and 4 represent the unconditional and conditional expected value of y_i respectively. The corresponding unconditional and conditional marginal effects are respectively given by

$$\frac{\partial E(y^*)}{\partial x_j} = F(z)\beta_j \textbf{ (5)}$$

$$\frac{\partial E(y^*|y^*>0)}{\partial x_j} = \beta_j[1 - \frac{zf(z)}{F(z)} - \frac{f(z)^2}{F(z)^2}] \textbf{ (6)}$$

These effects are combined in equation 7 following McDonald and Moffitt (1980) decomposition.

$$\frac{\partial E(y^*)}{\partial x_j} = F(z)\left(\frac{\partial E(y^*)}{\partial x_j}\right) + E(y^*)(\frac{\partial F(z)}{\partial x_j}) \textbf{ (7)}$$

Therefore, the total change in the unconditional expected value of y* can be decomposed into two parts: 1) the change in the expected value of y being above zero weighted by the probability of being above zero and 2) the change in the probability of being above zero weighted by the conditional expected value of y*.

Model 2: Effect of Different Menu Labeling on Cost of the Meal

In this part of the analysis the effect of different menu labeling formats on the cost of meal is estimated. In this case, we use food item prices on the menu to determine the total price for each food category (e.g. if one person selected two appetizers, their corresponding prices were added to represent total price of the appetizer category) and the total price for the total meal ordered.

Prices are regressed on the same set of explanatory variables that appear in equation 1, see Table 2. Given the appearance of censoring in the outcome variables, we again utilize a Tobit model, as discussed above, to determine the impacts of the treatment groups on expenditures.

Results

Table 3 presents the average calorie and price chosen by the respondents for each food category, treatment, and restaurant type. A T-test was conducted for these averages compared to the mean average, for both price and calorie, in order to determine if the differences are statistically significant.

Consistent with previous research, the control treatment (Tr1: no information) resulted in the most calories selected for both the fast food (1259 calories in total) and sit down (1492 calories in total) restaurant menus compared to the other treatments. Further, we see that treatment 6 (prices with green traffic lights) provided the lowest calorie value for the fast food menu with the average participant choosing a meal with 975 calories or a 23% reduction in total calories. For the sit down restaurant we see that the calorie only information treatment (Tr2) had the largest reduction in total calories compared to the control treatment (1192 vs. 1492). In addition, breaking down the analysis into different food categories provides more interesting results. For instance, the McDonald's menu sees the lowest calorie-entrée in treatment 6 and the lowest calorie-dessert in

treatment 3. However, no significant calorie-drink reduction was observed. From these results it is clear that adding nutritional information to both fast food and sit down restaurant menus can reduce the number of calories chosen in a meal but the impact of where the calorie reduction is coming from is not the same across labeling schemes.

A different calorie consumption pattern was observed for Olive Garden menu. Unlike the McDonald's menu, we do not see the highest number of calories of all food categories in the control treatment. For instance, calories derived from entree are found to be significantly lower in treatment 4 and calories derived from appetizers reach their maximum under treatment 3. This further supports the claim that location type impacts the effectiveness of calorie labeling.

Table 4 presents nutrition facts averages by restaurant type and by food category. Overall, the control treatment shows the highest nutrition information numbers for both the fast food and sit down restaurant menus compared to the other treatments.

Result 1: Eye-Tracking

Table 5 reports the average fixation count among participants which is an indicator of how many times participants fixated on an AOI. Of interest in Table 5 we see that respondents looked at price more at McDonald's than at Olive Garden while looking at the other information a similar number of times. For instance, treatment 1 (price only) the average participant fixated on price 33 times during their fast food decision process while fixating on price only 26 times at the sit down restaurant. We also see this trend hold for calorie information across restaurant types. However, the percent daily intake was almost identical across restaurant types. From these results it is clear that calorie information, percent daily intake, and the red/green light labeling draw attention, but as shown in the regression results, the impacts will vary by restaurant type and food category.

Result 2: Effect of Different Menu Labeling on Food Selection

In table 6 we estimated the effect of different menu labeling treatments by restaurant type for different food categories and for the total meal selected. We observe that all treatments (regardless of their significance) provide a lower calorie purchase compared to treatment 1 (price only). We can infer that calorie labeling can be effective in persuading consumers to lower their calorie intake and therefore eat healthier. From a demographic perspective, males were found to consume more calories from entrée items and more calories in total compared to females. Respondents on a diet tended to lower their total calorie intake by purchasing a diet drink. Apart from Hispanic consumers that were found to purchase less calories in total, ethnicity did not have much effect on calorie consumption by food category.

Our model results support the notion that calories ordered are affected by the type of restaurant menu, because the menu indicator variable is found to be highly significant across all food categories. On average, consumers were likely to decrease their calorie intake at McDonald's restaurant. However, this negative effect does not hold for the drink category where people tend to order more caloric drinks at McDonald's. This may be explained by the fact that the taste and variety of McDonald's drinks may be valued more than their nutritional information.

The addition, the time variable that captures any time effect associated with participating in the survey was insignificant. However, as expected, we found that the number of items ordered increased the calorie amount.

Tobit coefficient estimates are hard to interpret, therefore, we discuss the resulting marginal effects derived in equations 3 and 4. Table 7 presents the unconditional marginal effects of each independent variable on calorie consumption. In terms of total calories purchased,

treatment 5, where all labeling formats are included, was found to be the most powerful labeling method. On average, people in this treatment ordered 281 less calories for their total food selection. Notably, they ordered 189 calories less for entrée items only. This may suggest that the inclusion of various nutrition information can be useful in persuading consumers to lower their calorie intake. The color-coded labeling in treatment 6, whereby only a green traffic light was used provided the second largest reduction in total calories at 272 calories. This treatment shows the highest calorie reduction for both entrée and drink categories with 154 and 55 calories less, respectively. This is in line with our initial expectations.

We also observe some substitution effects among food categories. For example, in treatment 4 (price + calories + traffic light) the calorie reduction in the entrée and appetizer items (166 and 127 respectively) is much higher compared to the reduction in dessert and drink calories (22 and 34 less respectively). This may reveal that calorie labeling drives consumers to substitute to lower calorie food items (Bollinger et al. 2010).

Lastly, in terms of restaurant type, we observe a huge calorie decrease (e.g.,482 calories less in total, 330 less for entrée, and 67 less for dessert) in all food categories expect for the drink category.

In addition to calorie regressions, we estimated the effect of different menu labeling on various nutrition facts associated with each food category. Results are shown in the appendix.

Result 3: Effect of Different Menu Labeling on Cost of the Meal

Tables 8 presents the effect of different labeling formats on prices using Tobit regression, while tables 9 presents the corresponding unconditional marginal effects. In table 8 we do not see any significant effect of menu labeling on the total price of the meal or on the price paid for entrée

items. However, we do observe a negative effect of some labeling treatments on the other food categories. For example, the overall expenditures for dessert were less in treatments 3, 4 and 6. In addition, consumers tend to spend less for the appetizer when calories and traffic lights were combined (Treatment 4), and they spent less for drinks when they are exposed to green traffic lights only (Treatment 6). Similarly to the calorie results, the menu indicator and the number of items variables are found to be highly significant.

According to table 9, participants were price sensitive in treatments 3, 4 and 6. For instance, the conditional marginal effects produced in these treatments show that, on average, respondents would spend $0.14 less for dessert when exposed to dessert calorie and their percentage daily intake labeling (treatment 3). Further, the average respondent could be expected to spend $1.3 less for appetizers when exposed to appetizer calories and their corresponding traffic light symbols (Treatment 4). These reductions do sound large, but in the context of a restaurant where thousands of meals are served the dollar value could be substantial. However, we do not see any impact on total meal expenditures (Lusk et al. 2014).

Conclusion

The objective of this study was to assess the impact of calorie information presented in different formats on food choices and food cost. In this case, a sample of 242 participants with diverse demographic characteristics were presented with two different restaurant menus: a sit-down restaurant menu (Olive Garden) and a fast food restaurant menu (McDonalds). In addition to our experimental choice task towards food items, we also added an eye tracking experiment to objectively measure consumer's visual attention to nutrition information, by examining the pattern and duration of attention to them.

Results revealed that calorie labeling on a restaurant menu can significantly impact consumer's food selection as defined by calorie count. Furthermore, our results indicate that calorie information is effective at reducing caloric choice at both sit down and fast food restaurants. This calorie reduction varies by food category where, sometimes, consumers tend to substitute to lower calorie food items when they are exposed to nutrition information. In addition, the results show that calorie labeling has a very small effect on prices paid by consumers and therefore restaurants revenues may not be affected.

Table 1.1 Demographic Profile of Participants by Treatment

	Tr1	Tr2	Tr3	Tr4	Tr5	Tr6
	No labeling	Calories only	Cal+%DI	Cal+TL	Cal+%DI+TL	Cal+Green TL
Male	52%	43%	53%	28%	50%	31%
Age	21.5	21.5	21.8	21.8	21.5	22
White/Caucasian	68%	75%	68%	68%	65%	50%
African American	-	1%	-	5%	5%	17%
Hispanic	13%	3%	5%	-	8%	4%
Asian	18%	13%	25%	27%	22%	21%
Other	3%	-	2%	-	-	7%
On diet	18%	15%	23%	13%	23%	12%

Table 1.2 Description of the Dependent and Independent Variables Used in the Analysis

Independent Variables	**Explanation**
Male	=1 for male and =0 for female
On diet	=1 if the person is on diet and =0 otherwise
White	=1 if white (Base outcome is other ethnicity)
African-American	=1 if African American
Hispanic	=1 if Hispanic
Asian	=1 if Asian
Tr2	Treatment 2: Item price + calories (Base outcome is Tr1: price only)
Tr3	Treatment 3: Item price + calories +% daily intake value
Tr4	Treatment 4: Item price + calories + traffic light symbols
Tr5	Treatment 5: Item price + calories +% daily intake value + traffic light symbols
Tr6	Treatment 6: Item price + green traffic lights *only*
Menu Indicator	=1 for McDonald's and 0 for Olive Garden
Noon	=1 if the time of the day is between 12:00 – 2:00pm (Base outcome is morning)
Afternoon	=1 if the time of the day is after 2:00pm
Items Number	Number of items within each food category
Dependent Variables	**Explanation**
Calorie_entree	Total calorie of all entrée items
Calorie_drink	Total calorie of all drink items
Calorie_dessert	Total calorie of all dessert items
Calorie_appetizer	Total calorie of all appetizer items
Total_calorie	Total calorie of the meal selected
Price_entree	Total price of all entrée items
Price _drink	Total price of all drink items
Price _dessert	Total price of all dessert items
Price _appetizer	Total price of all appetizer items
Total_ price	Total price of the meal selected

Table 1.3 Price and Calorie Averages by Treatment, Restaurant Type and Food Category

		Tr1 No labeling	Tr2 Calories only	Tr3 Cal+%DI	Tr4 Cal+TL	Tr5 Cal+%DI+TL	Tr6 Cal+Green TL
McDonald's	Price_entree	6.53	6.13	5.94	5.46**	5.82	6.13
	Price_drink	1.69	1.93	1.67	1.48	1.96	2
	Price_dessert	0.71	0.52	0.51	0.87	0.48	0.66
	Total_price	8.92	8.58	8.12	7.81*	8.26	8.78
	Calorie_entree	902	881.75	748.00**	724.75**	815.75	711.76**
	Calorie_drink	218.5	230	174.5	152.5	188.75	181.43
	Calorie_dessert	138.25	72.88*	70.38*	120.88	70.75*	82.02
	Total_calorie	1258.75	1184.63	992.88***	998.13***	1075.25*	975.21**
Olive Garden	Price_appetizer[a]	3.58	4.18	5.71*	5.35	4.16	4.55
	Price_entree	14.85	13.45	14.33	15.91	17.22	17.13
	Price_drink	2.16	2.19	2.34	2.19	2.05	2.22
	Price_dessert	2.27	0.87*	2.23	2.37	1.93	1.26
	Total_price	22.85	20.69	24.61	25.82	25.36	25.17
	Calorie_appetizer	281.5	331.75	460.25*	376.75	303	344.29
	Calorie_entree	915.75	704.50*	787	679.50**	739.5	815
	Calorie_drink	75	81	74.03	72.75	72	69.29
	Calorie_dessert	219.25	74.25**	167.25	192.5	183.75	93.33**
	Total_calorie	1491.5	1191.50**	1488.53	1321.5	1298.25	1321.91

[a] There are no "appetizers" at McDonald's so the menu indicator variable was not included in the model.

Table 1.4 Nutrition Facts Averages by Treatment, Restaurant Type and Food Category

	Treatment 1		Treatment 2		Treatment 3		Treatment 4		Treatment 5		Treatment 6	
	MC	**OG**	**MC**	**OG**	**MC**	**OG**	**MC**	**OG**	**MC**	**OG**	**MC**	**OG**
Entrée												
Fat (g)	42.98	49.23	41.00	39.53	34.78	37.51	35.00	39.71	36.39	45.43	35.29	48.61
Sat fat (g)	11.20	22.60	10.59	16.74	8.66	16.03	12.38	14.84	9.70	20.68	9.43	21.82
Trans fat (g)	0.55	3.46	0.51	4.14	0.35	2.31	1.91	2.06	0.53	4.25	0.49	3.75
Cholesterol (mg)	104.25	155.25	91.75	110.00	77.75	132.13	96.63	100.63	88.25	152.75	82.26	160.95
Sodium (mg)	1573.00	1647.75	1433.13	1423.50	1257.88	1345.00	1382.25	1407.38	1316.00	1338.83	1240.48	1624.52
Carbs (g)	109.38	56.95	105.18	47.70	93.23	42.35	62.48	68.90	98.83	37.55	94.83	53.98
Fiber (g)	5.88	4.03	5.88	3.80	5.38	3.98	5.00	4.93	5.55	6.03	5.55	5.21
Sugar (g)	34.28	4.80	31.38	3.88	26.33	4.43	12.78	13.35	28.00	15.08	29.55	5.90
Protein (g)	38.98	43.80	33.98	36.80	29.58	38.70	34.98	36.03	31.83	31.98	31.00	42.62
Appetizer [a]												
Fat (g)	-	14.80	-	14.76	-	20.59	-	11.33	-	12.81	-	13.83
Sat fat (g)	-	1.68	-	1.81	-	4.09	-	1.35	-	1.96	-	2.38
Trans fat (g)	-	0.00	-	0.00	-	0.06	-	0.00	-	0.00	-	0.00
Cholesterol (mg)	-	77.75	-	79.50	-	92.75	-	63.50	-	53.25	-	64.76
Sodium (mg)	-	682.15	-	662.98	-	852.23	-	533.10	-	319.03	-	636.64
Carbs (g)	-	17.68	-	14.88	-	20.88	-	14.30	-	9.30	-	16.12
Fiber (g)	-	1.03	-	0.75	-	1.20	-	1.08	-	0.85	-	0.86
Sugar (g)	-	0.55	-	0.38	-	0.93	-	0.68	-	3.50	-	1.76
Protein (g)	-	7.18	-	7.33	-	10.40	-	5.55	-	4.13	-	7.81
Drink												
Fat (g)	5.43	2.64	6.38	0.58	3.80	3.23	1.76	1.53	3.08	3.41	3.15	3.51
Sat fat (g)	2.48	1.26	2.94	0.25	1.63	1.25	0.59	0.75	1.28	1.75	1.37	1.75
Trans fat (g)	0.11	0.00	0.16	0.00	0.08	0.03	0.03	0.03	0.08	0.05	0.06	0.06
Cholesterol (mg)	14.13	5.50	19.25	1.25	10.88	7.25	5.50	4.00	9.75	14.38	10.24	14.05
Sodium (mg)	109.50	73.50	127.63	28.88	91.50	91.13	56.88	91.75	94.88	30.68	95.36	86.07
Carbs (g)	33.43	25.88	28.78	20.63	28.90	22.90	27.43	21.10	32.05	18.15	29.45	19.19
Fiber (g)	0.45	0.60	0.65	0.10	0.60	0.40	0.48	0.08	0.80	4.38	0.60	0.29
Sugar (g)	26.65	16.98	22.30	16.35	23.68	15.20	23.43	17.40	26.70	14.35	24.45	12.57
Protein (g)	3.45	3.10	4.25	0.88	2.93	3.20	2.08	2.68	3.03	1.03	3.71	2.60
Dessert												
Fat (g)	5.16	11.63	2.21	4.78	2.63	9.73	8.31	8.00	2.03	8.95	2.40	5.26
Sat fat (g)	2.94	6.14	1.35	3.35	1.36	5.20	5.90	4.44	1.08	3.96	1.42	2.86

Trans fat (g)	0.01	0.14	0.01	0.05	0.00	0.15	0.14	0.06	0.00	0.10	0.02	0.05
Cholesterol (mg)	9.38	24.50	4.75	15.50	4.13	31.50	26.38	21.00	3.38	27.00	4.76	14.52
Sodium (mg)	52.75	106.13	19.75	29.25	39.48	81.88	55.25	85.38	31.75	89.48	30.48	32.74
Carbs (g)	19.70	22.35	9.23	9.45	12.40	17.78	20.58	18.80	10.55	9.90	12.69	10.17
Fiber (g)	0.55	1.10	0.15	0.33	0.35	0.68	0.63	0.75	0.38	7.20	0.31	0.38
Sugar (g)	16.43	8.85	8.13	5.45	8.98	8.43	14.80	11.48	7.90	8.28	10.36	4.64
Protein (g)	2.50	2.60	1.23	0.95	1.50	1.78	2.63	2.08	1.33	0.95	1.64	0.95

Table 1.5 Average Fixation Count in Seconds

	McDonald's				*Olive Garden*			
	Price	**Calorie**	**% DI**	**Traffic Lights**	**Price**	**Calorie**	**% DI**	**Traffic Lights**
Treatment								
Tr1 (No labeling)	33.3	-	-	-	26.4	-	-	-
Tr2 (Calories only)	34.8	23.4	-	-	37	22.4	-	-
Tr3 (Cal+ %DI)	26.8	22.8	10.2	-	23.2	21.1	10	-
Tr4 (Cal+ TL)	32.2	31.8	-	7.7	26.5	21.9	-	7.1
Tr5 (Cal+%DI+TL)	34.4	27.8	17.5	8.3	26.2	20.7	17.4	7.4
Tr6 (Cal+ Green TL)	38.5	-	-	7.5	30.7	-	-	7.2

Table 1.6 Tobit Results of Calorie Regressions

Variables	Calorie_Appetizer	Calorie_Entree	Calorie_Drink	Calorie_Dessert	Total_Calorie
Age	0.104	-0.319***	-5.637**	-0.398*	-0.553***
	(0.129)	(0.0798)	(2.694)	(0.208)	(0.0970)
Male	32.47	102.6***	9.689	60.00*	166.2***
	(60.58)	(37.24)	(19.58)	(33.44)	(45.76)
On Diet	-64.71	-48.15	-57.75**	41.36	-92.29*
	(65.29)	(44.52)	(29.35)	(42.18)	(54.22)
White	-17.71	-102.1	-102.8	58.51	-229.3
	(131.6)	(149.5)	(64.59)	(99.13)	(147.8)
African American	10.92	-95.39	-34.16	66.17	-134.5
	(176.1)	(170.5)	(66.55)	(118.7)	(172.1)
Hispanic	-163.5	-177.5	-87.64	169.3	-284.7*
	(139.8)	(160.5)	(73.74)	(113.6)	(170.3)
Asian	-20.23	-146.7	-105.4	67.12	-227.8
	(138.8)	(151.4)	(65.79)	(101.2)	(151.2)
Tr2	-24.71	-120.6**	-29.21	-114.9**	-149.7**
	(89.39)	(53.72)	(36.86)	(54.25)	(75.86)
Tr3	-38.70	-126.3**	-46.92	-185.5***	-171.4**
	(84.73)	(54.21)	(32.23)	(61.67)	(73.18)
Tr4	-248.2**	-170.0***	-64.60*	-136.2**	-249.2***
	(107.4)	(55.93)	(35.84)	(61.54)	(71.34)
Tr5	-163.5	-194.3***	-49.41	-73.19*	-283.2***
	(99.04)	(56.29)	(31.14)	(44.01)	(74.55)
Tr6	-111.8	-157.4***	-109.0***	-193.2***	-273.5***
	(103.7)	(59.22)	(34.19)	(55.95)	(75.27)
Menu_indicator (=1 for MCD)	N/A	-335.7***	121.8***	-306.0***	-483.8***
		(39.39)	(17.65)	(33.48)	(38.66)
Noon	69.28	53.19	-1.483	-50.35	25.12
	(93.69)	(50.31)	(29.07)	(58.25)	(68.64)
Afternoon	35.79	35.28	16.25	1.588	17.19
	(70.79)	(44.25)	(23.34)	(45.21)	(62.74)
Items_number	961.7***	419.7***	312.1***	670.8***	351.7***
	(64.90)	(25.77)	(23.15)	(47.75)	(20.61)
Constant	-359.3**	434.9***	-47.65	-243.3**	670.6***
	(172.5)	(161.1)	(94.74)	(114.8)	(170.3)
Observations	242	484	484	484	484

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 1.7 Unconditional Marginal Effects on Calorie Consumption

Variables	Calorie_Appetizer	Calorie_Entree	Calorie_Drink	Calorie_Dessert	Total_Calorie
Age	0.0638	-0.315***	-3.271**	-0.0811*	-0.552***
	(0.0784)	(0.0788)	(1.456)	(0.0438)	(0.0968)
Male	19.98	101.3***	5.637	12.55*	165.9***
	(37.46)	(36.76)	(11.40)	(7.476)	(45.67)
On Diet	-37.97	-47.40	-31.04**	9.100	-92.06*
	(36.65)	(43.74)	(14.21)	(10.02)	(54.04)
White	-10.91	-100.8	-62.98	11.35	-228.9
	(81.38)	(147.7)	(41.47)	(18.40)	(147.6)
African American	6.753	-93.59	-18.69	15.82	-134.1
	(109.9)	(166.3)	(34.34)	(32.98)	(171.3)
Hispanic	-85.78	-173.0	-43.27	51.51	-283.1*
	(61.26)	(154.0)	(30.46)	(47.45)	(168.3)
Asian	-12.25	-143.9	-54.06*	15.25	-227.0
	(83.08)	(147.5)	(29.41)	(25.72)	(150.3)
Tr2	-14.89	-118.3**	-16.32	-18.88***	-149.2**
	(53.07)	(52.33)	(19.81)	(7.207)	(75.53)
Tr3	-23.11	-123.9**	-25.60	-26.96***	-170.8**
	(49.43)	(52.80)	(16.50)	(6.775)	(72.81)
Tr4	-127.2***	-166.3***	-34.39**	-21.55***	-248.2***
	(44.72)	(54.19)	(17.30)	(7.502)	(70.79)
Tr5	-89.38*	-189.8***	-26.87*	-12.98*	-281.9***
	(47.72)	(54.21)	(15.72)	(6.899)	(73.95)
Tr6	-63.62	-154.2***	-54.67***	-28.01***	-272.3***
	(54.53)	(57.49)	(13.90)	(5.632)	(74.65)
Menu_indicator (=1 for MCD)	N/A	-330.1***	70.47***	-66.69***	-482.4***
		(38.23)	(9.761)	(7.418)	(38.40)
Noon	43.92	52.52	-0.859	-9.502	25.08
	(61.77)	(49.74)	(16.82)	(10.19)	(68.52)
Afternoon	21.82	34.79	9.388	0.323	17.15
	(42.98)	(43.61)	(13.46)	(9.185)	(62.61)
Items_number	589.1***	414.0***	181.1***	136.5***	351.0***
	(49.13)	(25.15)	(14.73)	(10.43)	(20.51)
Constant	326.6***	348.8***	179.2***	246.1***	421.0***
	(24.00)	(15.49)	(11.26)	(15.00)	(16.59)
Observations	242	484	484	484	484

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 1.8 Tobit Results of Price Regressions

Variables	Price_Appetizer	Price_Entree	Price_Drink	Price_dessert	Total_Price
Age	0.00406***	-0.00475***	0.000198	-0.00378**	-0.00389***
	(0.00124)	(0.00120)	(0.000315)	(0.00188)	(0.00111)
Male	0.448	-0.182	-0.201	0.231	0.538
	(0.606)	(0.495)	(0.135)	(0.285)	(0.495)
On Diet	-0.134	0.110	-0.219	-0.0263	-0.462
	(0.626)	(0.664)	(0.189)	(0.390)	(0.662)
White	-1.092	-0.115	-0.410	0.0989	-2.502*
	(1.280)	(1.381)	(0.446)	(1.121)	(1.275)
African American	-0.107	0.0571	0.612	-0.220	-0.163
	(1.516)	(1.767)	(0.460)	(1.248)	(1.656)
Hispanic	-1.897	0.634	-0.672	0.626	-1.828
	(1.528)	(1.609)	(0.502)	(1.226)	(1.572)
Asian	-1.333	0.0158	-0.434	0.202	-1.943
	(1.407)	(1.430)	(0.457)	(1.160)	(1.356)
Tr2	-0.465	-0.963	-0.289	-0.684	-1.086
	(0.897)	(0.785)	(0.233)	(0.446)	(0.791)
Tr3	-0.587	-0.356	-0.0798	-1.039**	0.0349
	(0.883)	(0.705)	(0.226)	(0.510)	(0.744)
Tr4	-1.912*	0.261	-0.273	-0.954*	0.292
	(1.150)	(0.754)	(0.230)	(0.539)	(0.727)
Tr5	-1.492*	-0.0758	-0.260	-0.277	-0.270
	(0.897)	(0.794)	(0.232)	(0.365)	(0.833)
Tr6	-1.087	0.530	-0.409**	-1.205**	0.109
	(0.954)	(0.728)	(0.205)	(0.487)	(0.724)
Menu_indicator (=1 for MCD)	N/A	-14.33***	-0.747***	-4.625***	-17.99***
		(0.478)	(0.126)	(0.289)	(0.507)
Noon	0.838	0.515	-0.177	-0.452	0.238
	(0.863)	(0.754)	(0.208)	(0.485)	(0.698)
Afternoon	0.736	0.430	0.123	-0.00977	0.469
	(0.607)	(0.706)	(0.176)	(0.390)	(0.643)
Items_number	10.99***	5.509***	2.775***	6.789***	3.808***
	(0.580)	(0.440)	(0.119)	(0.404)	(0.243)
Constant	-2.745*	8.690***	0.0246	-1.464	14.83***
	(1.585)	(1.665)	(0.530)	(1.229)	(1.525)
Observations	242	484	484	484	484

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 1.9 Unconditional Marginal Effects of Prices

Variables	Price_Appetizer	Price_Entree	Price_Drink	Price_dessert	Total_Price
Age	0.00304***	-0.00468***	0.000179	-0.000656*	-0.00389***
	(0.000869)	(0.00119)	(0.000283)	(0.000350)	(0.00110)
Male	0.337	-0.179	-0.182	0.0405	0.537
	(0.460)	(0.487)	(0.121)	(0.0517)	(0.495)
On Diet	-0.0997	0.108	-0.195	-0.00454	-0.461
	(0.463)	(0.654)	(0.167)	(0.0669)	(0.661)
White	-0.834	-0.113	-0.373	0.0170	-2.501*
	(0.992)	(1.360)	(0.409)	(0.191)	(1.274)
African American	-0.0796	0.0562	0.571	-0.0358	-0.163
	(1.120)	(1.740)	(0.438)	(0.190)	(1.655)
Hispanic	-1.247	0.625	-0.575	0.130	-1.825
	(0.850)	(1.588)	(0.403)	(0.303)	(1.569)
Asian	-0.944	0.0155	-0.384	0.0364	-1.940
	(0.927)	(1.407)	(0.396)	(0.218)	(1.354)
Tr2	-0.341	-0.945	-0.257	-0.102*	-1.085
	(0.640)	(0.767)	(0.203)	(0.0590)	(0.790)
Tr3	-0.427	-0.350	-0.0718	-0.144**	0.0349
	(0.618)	(0.693)	(0.203)	(0.0603)	(0.743)
Tr4	-1.300*	0.257	-0.244	-0.135**	0.292
	(0.686)	(0.743)	(0.202)	(0.0630)	(0.726)
Tr5	-1.038*	-0.0746	-0.232	-0.0452	-0.270
	(0.571)	(0.781)	(0.203)	(0.0566)	(0.832)
Tr6	-0.773	0.523	-0.362**	-0.163***	0.109
	(0.637)	(0.718)	(0.177)	(0.0510)	(0.723)
Menu_indicator (=1 for MCD)	N/A	-13.62***	-0.673***	-0.981***	-17.81***
		(0.459)	(0.122)	(0.0842)	(0.490)
Noon	0.644	0.507	-0.159	-0.0725	0.238
	(0.687)	(0.743)	(0.186)	(0.0722)	(0.697)
Afternoon	0.547	0.423	0.111	-0.00170	0.469
	(0.451)	(0.694)	(0.159)	(0.0679)	(0.643)
Items_number	8.221***	5.422***	2.509***	1.179***	3.805***
	(0.669)	(0.428)	(0.108)	(0.0980)	(0.243)
Constant	3.273***	4.906***	1.314***	2.236***	5.099***
	(0.289)	(0.183)	(0.0564)	(0.157)	(0.189)
Observations	242	484	484	484	484

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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Appendix

Appendix Table 1.10 Nutrition Information Results for Entree

	Nutrition Information of the Entrée Items								
Variables	Fat	Sat-fat	Trans-fat	Cholesterol	Sodium	Carbs	Fiber	Sugar	Protein
Age	-0.0146	-0.0481	-0.473	-0.148	-0.413	-0.0183	0.0137	0.00420	-0.0394
	(0.0707)	(0.0769)	(1.710)	(0.169)	(0.830)	(0.0826)	(0.0660)	(0.0779)	(0.0768)
Male	6.701	1.111	20.74	53.45***	345.3***	13.39	-6.216	3.432	3.552
	(7.716)	(7.453)	(13.15)	(16.85)	(90.15)	(9.002)	(7.246)	(8.800)	(7.507)
On diet	-2.784	-2.680	-4.526	14.08	14.84	-8.969	-5.614	-9.313	-2.425
	(10.05)	(9.703)	(17.21)	(21.98)	(117.1)	(11.72)	(9.444)	(11.54)	(9.770)
White[a]	0.289	2.305	10.87	-16.37	73.31	1.645	3.615	-2.269	5.092
	(14.12)	(13.65)	(24.50)	(30.66)	(165.3)	(16.49)	(13.28)	(16.00)	(13.78)
African American	30.20	39.86**	63.34*	12.87	-190.5	19.37	44.83**	40.48*	39.55**
	(20.22)	(19.49)	(34.06)	(43.73)	(236.6)	(23.61)	(18.98)	(22.76)	(19.67)
Asian	-15.08	-8.699	7.490	-47.70	-130.4	-13.26	-5.721	-5.441	-8.906
	(15.63)	(15.10)	(26.85)	(33.99)	(182.4)	(18.22)	(14.69)	(17.70)	(15.24)
Tr2	-10.62	-8.377	-19.65	-10.85	-109.0	-9.043	-8.273	-1.654	-13.03
	(13.35)	(12.90)	(22.34)	(29.23)	(156.0)	(15.57)	(12.56)	(15.30)	(12.97)
Tr3	-8.586	-4.911	-26.85	-3.447	-258.8*	-12.11	-0.512	2.653	-7.407
	(12.99)	(12.59)	(22.37)	(28.45)	(151.6)	(15.14)	(12.22)	(14.91)	(12.61)
Tr4	-4.841	-1.875	-16.99	-4.512	-46.72	-10.84	-2.540	-4.356	-5.426
	(12.97)	(12.54)	(21.80)	(28.56)	(151.4)	(15.13)	(12.20)	(14.95)	(12.60)
Tr5	-2.507	2.036	-9.754	16.21	-269.8*	-12.21	1.321	10.26	-14.56
	(12.92)	(12.48)	(21.37)	(28.25)	(151.2)	(15.08)	(12.15)	(14.76)	(12.65)
Tr6	12.74	13.80	2.618	36.40	-4.193	11.72	12.77	18.43	9.474
	(12.81)	(12.38)	(21.41)	(28.00)	(149.7)	(14.95)	(12.03)	(14.62)	(12.44)
Menu indicator	-20.99**	-14.96*	-28.53*	-23.45	-189.0*	-22.41**	-12.33	-11.29	-13.30
	(8.402)	(8.106)	(14.54)	(18.36)	(98.20)	(9.807)	(7.877)	(9.574)	(8.168)
Noon	12.89	11.39	15.34	50.53**	-30.45	10.79	8.018	18.73	3.963
	(11.48)	(11.07)	(19.94)	(25.09)	(134.2)	(13.40)	(10.77)	(13.06)	(11.18)
Afternoon	14.88	12.18	23.71	23.28	2.072	13.57	9.641	11.10	8.709
	(9.809)	(9.469)	(17.13)	(21.54)	(114.5)	(11.44)	(9.208)	(11.22)	(9.532)
Items Number	15.53***	10.09**	18.71**	30.91***	388.5***	23.40***	8.596*	13.90**	15.58***
	(5.024)	(4.850)	(8.319)	(10.95)	(58.41)	(5.849)	(4.735)	(5.715)	(4.882)
_se	77.85***	74.72***	110.6***	167.0***	914.3***	91.01***	72.64***	85.69***	75.60***
	(2.651)	(2.564)	(5.671)	(6.338)	(31.49)	(3.108)	(2.482)	(3.218)	(2.594)
Constant	13.55	-8.535	-97.28**	18.76	804.1***	35.26	-14.57	-28.13	9.806
	(18.57)	(18.00)	(49.08)	(40.71)	(216.6)	(21.65)	(17.57)	(21.39)	(18.09)
Observations	484	484	484	484	484	484	484	484	484

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
[a] Hispanic category was eliminated from the model for convergence purpose

Appendix Table 1.11 Nutrition Information Results for Appetizer

Nutrition Information of the Appetizer Items							
Variables	Fat	Sat-fat	Cholesterol	Sodium	Carbs	Fiber	Protein
Age	0.0763	0.0133	0.658	1.755	-0.103	0.00782	-0.0484
	(0.0649)	(0.0117)	(0.500)	(2.623)	(0.259)	(0.00579)	(0.165)
Male	15.23	2.546	111.6	585.7	10.46	0.426	6.522
	(9.882)	(1.803)	(84.00)	(400.4)	(10.20)	(0.961)	(5.035)
On diet	-9.419	-1.144	-127.4	-344.8	-8.531	-0.512	-2.284
	(14.38)	(2.567)	(131.7)	(583.1)	(14.85)	(1.376)	(7.199)
White[b]	-22.72	-4.012	-158.2	-1,061	-28.48*	-1.808	-14.19*
	(16.83)	(3.059)	(141.8)	(678.3)	(17.21)	(1.547)	(8.506)
African American	-38.42	-6.461	-381.2	-1,751*	-50.84**	-5.324**	-19.08
	(24.64)	(4.464)	(235.2)	(997.6)	(25.45)	(2.634)	(12.26)
Asian	-36.97*	-5.820*	-243.2	-1,508*	-44.58**	-4.576**	-17.27*
	(19.36)	(3.517)	(163.6)	(778.0)	(19.90)	(1.938)	(9.645)
Tr2	14.78	2.135	96.19	688.7	16.70	0.825	10.19
	(19.74)	(3.626)	(164.7)	(793.6)	(20.49)	(1.984)	(9.901)
Tr3	14.36	3.707	129.7	559.4	16.42	1.802	8.674
	(19.21)	(3.477)	(158.0)	(774.7)	(19.90)	(1.879)	(9.625)
Tr4	30.71	4.690	225.8	1,359*	37.29*	3.500*	16.89*
	(18.72)	(3.456)	(156.3)	(750.8)	(19.30)	(1.864)	(9.372)
Tr5	22.92	3.979	84.12	482.0	16.73	2.482	-1.145
	(19.05)	(3.502)	(164.1)	(779.9)	(20.00)	(1.880)	(10.20)
Tr6	31.61*	6.061*	166.9	1,339*	37.42**	2.927	17.37*
	(18.40)	(3.363)	(157.4)	(738.3)	(18.98)	(1.874)	(9.195)
Noon	28.74*	3.533	179.6	1,253*	28.39*	1.559	14.11*
	(16.51)	(2.991)	(137.0)	(669.2)	(16.90)	(1.555)	(8.257)
Afternoon	24.67*	4.056	160.5	951.1	23.17	2.145	8.349
	(14.66)	(2.619)	(122.1)	(599.0)	(15.05)	(1.376)	(7.377)
Items Number	43.12***	7.293***	299.0***	1,767***	46.27***	4.102***	20.48***
	(8.784)	(1.594)	(74.04)	(355.6)	(9.078)	(0.867)	(4.469)
_se	49.08***	8.817***	369.7***	1,980***	50.35***	4.288***	24.36***
	(5.715)	(1.054)	(53.70)	(229.1)	(5.884)	(0.556)	(3.073)
Constant	-94.12***	-16.77***	-749.1***	-3,663***	-86.88***	-8.856***	-41.43***
	(26.76)	(4.845)	(228.4)	(1,077)	(27.77)	(2.565)	(13.78)
Observations	242	242	242	242	242	242	242

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
a Trans -fat and sugar models did not converge.

Appendix Table 1.12 Nutrition Information Results for Drink

Nutrition Information of the Drink Items									
Variables	Fat	Sat-fat	Trans-fat	Cholesterol	Sodium	Carbs	Fiber	Sugar	Protein
Age	-0.0503	-0.0273	-0.00327	-0.462	-0.996	-0.612	-0.373	-0.796	-0.0312
	(0.0909)	(0.0566)	(0.0134)	(1.199)	(1.252)	(0.981)	(0.257)	(0.822)	(0.0458)
Male	-2.827	-2.016	0.384	-8.710	4.925	5.420	-1.280	5.928	-1.473
	(2.452)	(2.021)	(0.354)	(7.868)	(36.11)	(6.332)	(1.563)	(5.309)	(1.657)
On diet	-2.199	-1.683	-0.213	-7.545	-52.71	-13.88	-4.677**	-9.050	-2.847
	(3.207)	(2.675)	(0.508)	(10.27)	(47.71)	(8.639)	(2.232)	(7.210)	(2.208)
White[a]	2.166	3.698	0.735	-1.562	-25.87	2.838	-5.763**	-1.527	-1.132
	(4.771)	(4.196)	(0.815)	(15.17)	(68.32)	(12.32)	(2.722)	(10.27)	(3.077)
African American	9.160	4.596	-8.572	22.49	110.4	28.19*	-3.352	21.41	4.134
	(6.327)	(5.623)	(0)	(19.97)	(94.64)	(16.84)	(3.836)	(14.04)	(4.187)
Asian	8.794*	9.027**	0.937	21.37	65.81	6.892	-3.788	0.832	2.877
	(5.178)	(4.539)	(0.880)	(16.36)	(75.24)	(13.51)	(2.990)	(11.28)	(3.375)
Tr2	-4.041	-2.612	0.511	-7.037	-77.40	-18.20	-2.500	-14.19	-4.209
	(4.335)	(3.388)	(0.586)	(14.12)	(64.64)	(11.30)	(2.882)	(9.466)	(2.982)
Tr3	-1.629	-3.385	-0.121	-0.655	-15.02	-9.423	0.0133	-7.437	-0.628
	(4.070)	(3.269)	(0.587)	(13.25)	(61.28)	(10.74)	(2.702)	(8.987)	(2.740)
Tr4	-5.757	-7.985**	-0.641	-8.493	-68.75	-14.32	-0.484	-7.553	-3.327
	(4.147)	(3.540)	(0.667)	(13.36)	(62.36)	(10.82)	(2.783)	(9.025)	(2.818)
Tr5	-4.149	-5.856*	-0.264	-4.892	-34.91	-11.05	5.073**	-9.417	-3.159
	(4.171)	(3.445)	(0.588)	(13.49)	(61.38)	(10.75)	(2.570)	(9.034)	(2.828)
Tr6	-5.622	-6.436*	0.0547	-9.464	-78.94	-23.38**	0.656	-18.81**	-3.301
	(4.166)	(3.469)	(0.580)	(13.43)	(61.66)	(10.93)	(2.652)	(9.181)	(2.802)
Menu indicator	-0.869	-1.931	-0.262	-0.832	-26.32	4.892	-1.514	5.988	0.485
	(2.358)	(1.964)	(0.351)	(7.561)	(34.86)	(6.147)	(1.506)	(5.156)	(1.598)
Noon	-4.000	-3.228	-0.247	-12.67	-45.42	-3.690	-0.525	-3.330	-3.422
	(3.758)	(3.099)	(0.519)	(12.07)	(55.76)	(9.771)	(2.520)	(8.199)	(2.543)
Afternoon	-1.758	-1.929	-0.439	-7.717	5.631	-2.110	4.511**	-2.014	-0.999
	(3.095)	(2.596)	(0.476)	(9.850)	(46.97)	(8.219)	(2.010)	(6.899)	(2.083)
Items Number	8.142***	5.975***	0.718**	27.86***	101.8***	29.07***	3.939**	26.03***	5.307***
	(2.403)	(1.984)	(0.333)	(7.724)	(34.93)	(6.209)	(1.563)	(5.206)	(1.615)
_se	19.36***	13.94***	1.740***	61.04***	329.4***	58.55***	10.63***	48.80***	13.54***
	(1.367)	(1.358)	(0.304)	(4.519)	(16.41)	(3.231)	(0.947)	(2.716)	(0.921)
Constant	-17.31***	-16.45***	-3.799***	-51.03	-112.5	-11.88	-3.577	-6.050	-8.326**
	(6.490)	(5.479)	(1.218)	(32.81)	(93.38)	(27.00)	(6.627)	(22.59)	(4.136)
Observations	484	484	484	484	484	484	484	484	484

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
[a] Hispanic category was eliminated from the model for convergence purposes.

Appendix Table 1.13 Nutrition Information Results for Dessert

Nutrition Information of the Dessert Items									
Variables	Fat	Sat-fat	Trans-fat	Cholesterol	Sodium	Carbs	Fiber	Sugar	Protein
Age	-0.0741	-0.0441	-0.0129	-1.196	-0.805	-0.123	-0.229	-0.100	-0.0222
	(0.174)	(0.104)	(0.175)	(2.606)	(2.159)	(0.308)	(0.445)	(0.239)	(0.0609)
Male	0.241	0.0695	8.474	-15.77	-12.27	-6.747	1.158	-11.90	-0.917
	(4.175)	(2.993)	(5.506)	(15.61)	(34.20)	(7.472)	(2.667)	(7.512)	(2.262)
On diet	1.597	2.803	12.37*	-6.675	-3.493	-3.479	3.837	-5.337	3.565
	(5.255)	(3.739)	(6.490)	(19.85)	(43.61)	(9.644)	(3.269)	(9.606)	(2.780)
Whitea	0.222	2.618	11.16	67.23*	-8.732	10.47	0.359	24.13	3.872
	(7.905)	(5.761)	(11.45)	(37.37)	(65.40)	(14.49)	(4.916)	(15.56)	(4.442)
African American	2.512	3.896	2.127	93.78**	50.59	21.81	-2.757	40.42**	2.853
	(11.07)	(7.959)	(15.71)	(46.40)	(90.78)	(19.65)	(7.249)	(19.93)	(6.058)
Asian	5.827	5.407	9.800	88.54**	64.56	14.23	2.681	24.37	5.181
	(8.547)	(6.215)	(12.24)	(39.24)	(70.67)	(15.71)	(5.328)	(16.67)	(4.784)
Tr2	-14.30*	-8.766	-2.397	-26.62	-137.1**	-26.57**	-7.550	-14.29	-7.143*
	(7.479)	(5.337)	(10.13)	(28.02)	(61.07)	(13.04)	(4.899)	(12.89)	(4.000)
Tr3	-8.188	-5.888	6.924	-4.663	-63.45	-16.41	-3.826	-15.90	-4.885
	(6.813)	(4.899)	(8.478)	(25.89)	(55.74)	(12.19)	(4.394)	(12.59)	(3.658)
Tr4	-4.378	-1.958	5.178	-8.999	-66.24	-14.94	-2.211	-13.09	-2.775
	(6.648)	(4.760)	(8.458)	(25.13)	(55.12)	(12.01)	(4.294)	(12.16)	(3.561)
Tr5	-7.445	-5.949	-14.90	-6.268	-51.29	-26.57**	4.568	-3.645	-7.313*
	(6.767)	(4.877)	(11.91)	(25.72)	(55.17)	(12.48)	(4.138)	(11.96)	(3.809)
Tr6	-9.987	-4.947	13.02	-27.05	-132.2**	-22.49*	-0.752	-14.99	-2.006
	(6.887)	(4.914)	(8.317)	(26.26)	(57.23)	(12.29)	(4.344)	(12.35)	(3.625)
Menu indicator	-5.578	-2.856	9.971*	-22.69	-66.51**	-17.29**	-5.429**	-23.69***	-1.183
	(3.966)	(2.835)	(5.336)	(14.87)	(32.93)	(7.159)	(2.551)	(7.374)	(2.130)
Noon	-1.908	-2.231	6.551	14.85	-14.70	-5.221	3.565	6.158	-2.562
	(6.204)	(4.449)	(8.157)	(23.31)	(50.98)	(11.16)	(3.989)	(11.05)	(3.372)
Afternoon	0.202	-0.333	-0.584	3.698	-6.029	-1.692	3.065	3.620	-0.762
	(5.152)	(3.683)	(7.206)	(19.32)	(42.34)	(9.209)	(3.344)	(9.190)	(2.769)
Items Number	30.27***	20.47***	15.98***	102.6***	244.2***	58.19***	13.61***	52.80***	13.81***
	(3.451)	(2.450)	(3.997)	(12.79)	(28.07)	(6.205)	(2.136)	(6.350)	(1.813)
_se	31.74***	22.55***	26.23***	111.1***	266.6***	58.81***	18.86***	54.32***	16.66***
	(2.234)	(1.552)	(3.227)	(8.451)	(17.81)	(3.986)	(1.365)	(4.157)	(1.145)
Constant	-23.12**	-20.40***	-74.52***	-153.2**	-133.0	-30.83*	-18.58	-59.52***	-16.99***
	(10.39)	(7.350)	(16.97)	(71.06)	(92.49)	(18.63)	(11.35)	(19.11)	(5.472)
Observations	484	484	484	484	484	484	484	484	484

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

a Hispanic category was eliminated from the model for convergence purposes.

Chapter 2

Spillover Effect of Participation in Women, Infant and Children (WIC) Program on Consumer's Purchasing Behavior of Private Label Goods

Introduction

The special supplemental nutrition program for women, infants, and children program (WIC) serves to safeguard the health of low income pregnant, postpartum, and breastfeeding women, infants, and children up to age 5 who are at nutritional risk by providing nutritious foods to supplement diets, information on healthy eating including breastfeeding promotion and support, and referrals to health care[3]. Most state WIC programs provide vouchers that participants use at authorized food stores. A wide variety of State and local organizations cooperate in providing the food and health care benefits, and 46,000 merchants nationwide accept WIC vouchers[4].

WIC participation was almost 8.26 million in 2014 serving 76% of the infants and children in the US and with approximately an average monthly food cost of $43.7 per person. The Food and Nutrition Services (FNS) ranks WIC as one of most the successful and cost-effective nutrition programs in the nation. In fact, research has shown that every $1.00 spent on WIC results in savings of between $1.77 and $3.13 in health care costs in the first 60 days after an infant's birth. The cost

[3] http://www.fns.usda.gov
[4] http://www.fns.usda.gov

savings are due in part to WIC's effectiveness in reducing rates of low birth weight, and improving rates of childhood immunization[5].

The WIC program provides its participants with a voucher or electronic benefit card that allows them to purchase food items from a WIC approved list at retail grocery stores. This foods list is selected based on the individual's nutritional needs aligned with certain dietary guidelines, for the purpose to improve the nutrition and health of low-income pregnant women, new mothers, infants and children. Furthermore, WIC does not only restrict the type and the quantity of food to be consumed but also the specific food brand. In fact, the voucher has a prescription for the corresponding brand names of every listed food product that the program participants are limited to. Approved WIC food lists change from one state to another, however, most of the states require participants to buy private label brands for some of the products, given that they usually represent the least expensive brand in the store.

In this context, it is important to consider how this food restriction may have an impact on consumers brand preference that may probably carry on even beyond participation in the WIC program. This raises some important research questions: 1) is brand preference driven by WIC program participation for benefit-households? 2) Does brand preference last after participants drop out of the WIC program? 3) And how does brand preference change as participants enter and exit the program?

This study aims to answer the above questions by using panel data of household's daily food purchases across the country to examine their consumption patterns. Many empirical studies have examined the effects of WIC participation on health, psychosocial, academic and nutritional

[5] Children's health watch policy action brief

outcomes. To our knowledge, there is no previous study that evaluated the effect of WIC program participation on brand purchasing behavior and brand preference. In this study, we focus of this part and we primarily consider consumption of private label brands for milk and cereal products. We are interested in private label brands given their strong popularity in the last decades and also given that they represent a considerable part of the generated retail revenue. In fact, in our sample, we observe a high presence of private label products purchases (e.g. 64% of private label milk), especially among WIC recipient households. Our dependent variables are : the monthly PL milk consumption in ounces and the monthly PL cereal consumption in ounces.

Literature Review

Participation in WIC program

Past research on outcomes from participation in food assistance programs FAP -such as WIC- on consumers can be divided into two major categories: one category had primarily focused on evaluating the effect of participation in these programs from a health and nutrition perspectives, and another category examined the effect of participation on individuals' food consumption decisions.

In the first category, most existing studies (e.g. Lee et al. 2006; Lee et al. 2000; Montgomery et al. 1997; Gayman et al. 2010; Kowaleski-Jones et al. 2000; Chatterji and Brooks-Gunn 2004) serve as an indicators of the benefits of participation in such programs for the low-income households. They concluded that when people participate only in WIC, or in another food assistance program, or in both at the same time, there is a lower risk of abuse and neglect reports, and of diagnosis of several nutrition related health problems, especially for infants and young children. In fact,

participation in WIC program in particular was associated with many positive outcomes, mainly an increased probability of breastfeeding among mothers which helps decrease developmental delays, and therefore young children receiving WIC are found to be more healthier than those who are eligible but do not receive the benefit.

In the second category, the focus was more on food consumption behavior among participants in FAP (e.g. Andreyeva et al. 2012; Andreyeva and Luedicke 2014; Gleason et.al. 2011). Although in this category the number of studies is very limited, but they all shed light on how the design of WIC food package can directly incentivize participants in the program to increase their purchase for products belonging to that package.

For example, Andreyeva et al. 2013 reported an increased purchases of sugar-sweetened beverages among households enrolled in WIC and SNAP programs. However, when comparing participants from each program, the authors found that SNAP households tended to buy less nutritious fruit drinks, whereas WIC households favored 100% juice as this is what the WIC program provides. In another study, Andreyeva and Luedicke 2014 examined how the provision of cash value vouchers to purchase fruits and vegetables in the revised WIC food packages, had an impact on overall purchases of these products among WIC benefit households. Results show that the implementation of package revision generated a decline in the amounts of fruits and vegetables purchased with non-WIC funds and participants in the program spent three times more of their WIC vouchers buying fresh fruits than fresh vegetables. In a recent study, the USDA-ERS conducted focus groups among WIC participants to discuss their preference for some of the changes occurring in the WIC food package. As an example, significant changes were made to the types of milk provided. Based on the findings, these changes have not deterred participants from buying milk through WIC, however, they are found to affect what type of milk is being purchased

outside of WIC. In fact, more participants reported buying the restricted type by the program with their own money even after they fully used their WIC checks.

Private Label Brands

Private labels (PL) have witnessed an explosive growth in the US especially in the last two decades. PL are now present almost in every packaged product categories and on the shelf on all supermarkets stores. As of 2014, PL brands account for 16.6 % of total spending on packaged goods, which represents an increase of 2.1 % compared to the previous year (IRI Consumer Network 2014). In particular, the food and beverage industry shows that the PL's share of household servings increased from 18% in 2000 to 27% in 2011 (NPD Group. National Eating Trends). Looking at these statistics, an important question that arises in this context is: what are the drivers of PL purchase? In response to this question, an enormous number of studies examined consumer/household purchasing behavior in order to identify the major factors that influence their buying decision for PL. For example, Sethuraman et.al. 2014 provides a detailed analysis of data from 54 different market studies that analyzed the determinants of PL purchase. The authors classify these determinants into two categories: Determinants derived from price utility; such as the price difference between national brands NB and PL brands, promotions, income and other demographic characteristics; and determinants derived from non-price utility such as store loyalty, level of education and advertising. We follow this paper's variables identification when selection our explanatory variables

Data

This analysis uses the Nielson Homescan data on daily food purchases. The Nielsen Home-scan panelists use in-home scanners to record all of their purchases, from any outlet, intended for

personal, in-home use. The data describes when, where, and what the panelists purchase, and at what price. It contains approximately 40,000 households for 2004-2007, and 60,000 for 2007 onwards. Some panelists stay on the panel for several years, while others may join or drop off each year. Data collection is performed for products purchased in many different retail channels. Nielsen assigns each retail chain a retailer code and a channel type, and channels are classified into different mutually exclusive categories.

Each item that a consumer purchases is recorded using a UPC code which provides detailed product attributes about type, brand, size, unit, quantity, and the price paid for this item.

Demographic and product ownership variables are recorded for the entire household and the head of household, as well as demographics for other household members. Demographic variables include household size, income, age, presence and age of children, employment, education, marital status, occupation, type of residence, race, and WIC participation.

The WIC indicator variable appears only in the data for years 2006 and later (panelists were not asked to indicate their WIC status prior to the year 2006). Therefore, in the analysis below, we use data from 2006 to 2011 on daily consumption for private label milk and private label cereal products as they belong to the WIC-eligible food category.

To best address our research questions, we divide the sample into three major groups: 1) households that have never participated in the WIC program before, 2) households that have always participated in the program, and 3) households that participated in the program and dropped out later on. We refer to these groups as, non-benefit households (grp 1), benefit households (grp 2), and entry-exit households respectively. Tables 1 and 2 describe the sample demographic characteristics by each household group for milk and cereal respectively.

Our variable of interest is represented by the monthly household consumption in ounces for both private label milk and private label cereal. Although the purchase data is provided on a daily basis, the analysis aggregates household milk purchases by month. Table 3 describes the average monthly consumption of milk by milk type in each household group. In this table, we observe that the three households groups buy more PL milk than NB milk, with a higher average PL milk consumption for the benefit households. Table 4 however shows an opposite consumption pattern for cereal, where NB cereal consumption is higher compared to PL cereal consumption for the three household groups.

Both tables 3 and 4 provide other PL characteristics that will serve as explanatory variables in our analysis. The first characteristic is store loyalty and is included to reflect a positive purchasing behavior of PL products mainly because store-loyal consumers tend to trust the store they like and therefore tend to buy more quantities of this store brands. We first calculated a loyalty value for each retailer by dividing the number of visits household paid to this retailer by the total number of shopping trips this household made in a month. Second we calculated a weighted average of the loyalty values across retailers to obtain our store loyalty variable. For both PL milk and cereal, tables 3 and 4 indicate that benefit households tend to be more store loyal than the other household groups.

The second characteristic is the difference between the price of a NB product and the price of a PL product. For each brand type, we first divided the total price paid in dollar amounts by the total volume in ounces in order to obtain the per ounce price. Then our price difference is found by subtracting the per Oz price of a NB from the per ounce price of a PL brand. Tables 3 and 4 indicate that, on average, the NB is more expensive than the PL brand.

Another important characteristic is the usage of coupons. This variable is calculated by dividing the number of times a household used a coupon to buy PL brand by the number of shopping times. Table 3 shows a similar coupon usage among household groups for PL milk. However, table 4 shows that households that are not WIC participants tend to use more coupons compared to the other groups.

Methodology

In order to assess the impact of WIC participation on household preference for PL milk and cereal purchase, a Double Hurdle model is estimated. This model was proposed by Cragg (1971) and provides an extension of the Tobit model by combining a selection model that determines the boundary points of the dependent variable with an outcome model that determines its unbounded values. Unlike the Tobit model, the double Hurdle model treats the boundary values as observed instead of censored. Therefore, in the context of consumer demand, the first hurdle is a decision to whether or not to purchase a good, and the second hurdle is how much to buy of that good.

This model is the most appropriate model for the current analysis because the dependent variable, which is represented by monthly consumption in ounces of PL products, is censored from below at 0. Therefore, using the Double Hurdle model, we can construct a selection equation to determine the factors that impact household decision of entering or not the PL market, and an outcome equation to determine the factors that impact the quantity of PL being consumed.

The Double hurdle model is given by

$$y_i = s_i h_i^*$$

Where y_i is the observed value of the dependent variable and s_i is the selection variable given by

$$s_i = \begin{cases} 1 \; if \; z_i\gamma + \; \epsilon_i > 0 \\ 0 \; otherwise \end{cases}$$

Where zi is a vector of explanatory variables, γ is a vector of coefficients, and ϵ_i is a standard normal error term.

The continuous latent variable is observed only if si = 1 and therefore the outcome model is given by

$$h_i^* = x_i\beta + \; \nu_i$$

Where x_i is a vector of explanatory variables, β is a vector of coefficients, and ν_i is an error term with a truncated normal distribution. The dependent variables in this analysis are the monthly consumption of PL milk in ounces and the monthly consumption of PL cereal in ounces respectively. The explanatory variables consist of two groups: demographics (Household age, income, female education, presence of kids, geographic regions, and ethnicity) and PL characteristics (store loyalty, price difference, and coupon usage on PL). We use the same set of explanatory variables for both regression models.

The obtained coefficients from both the selection model and outcome model are not directly interpretable. The partial effect of each independent variable is calculated in order to assess its effect on the dependent variable. In this context, three partial effects are estimated: Average partial effect of the unconditional expected value of y (APEU), average partial effect of the conditional expected value of y (APEC), and average partial effect (APE). We will only discuss the APEU to have a better understanding of the impact of our explanatory variables on the unconditional expected value of consumption of PL products.

Results

Tables 5 and 6 report results of the Double Hurdle model regression on PL milk and PL cereal respectively. To better understand the effect of WIC status on PL consumption, we use the benefit household groups as our comparison base category. We further divide our entry-exit household groups into two dummies: EE in WIC dummy variable to indicate when the entry-exit households are actively in WIC program, and EE off WIC to indicate when the entry-exit households left the program. This group break down is very important as it will help us better understand the consumption pattern of the entry-exit households group when they are in and when they are off the program.

In tables 5 and 6 we observe a significant effect of WIC status on PL consumption for both milk and cereal. However, as coefficients from the Double Hurdle estimation are not directly interpretable, we are more interested in discussing the partial effects of the explanatory variables, and in particular, we will focus on the partial effects on the unconditional value of the dependent variable.

Partial Effects of the WIC Status on PL Milk Consumption

Table 7 provides the partial effects of the explanatory variables on the unconditional expected value of PL milk consumption. Of interest, we observe that participation in WIC program has a high significant influence on households' decision to buy PL milk. Table 7 shows that, compared to benefit households, households that have never received WIC benefit are less likely to purchase PL milk. In this group, the average household is estimated to buy approximately 127 ounces less of PL milk. Entry-exit households however, exhibit a dual behavior. We observe that, when they

are using WIC benefits, these households tend to buy more PL milk simply because the WIC package provides them with a free voucher for PL milk and because the latter one is the only brand option they have. However, when they lose eligibility and leave the program we can clearly see that they buy less of PL milk because now they have more freedom over choosing other milk brands given that they are using their own funds. Although the entry-exit households group consumes less PL milk when they are off the WIC program, they still consume more of it compared to the non-benefit households group (an average of 38 ounces less among EE off WIC is much bigger compared to an average of 127 ounces less among NB households). Therefore, we can conclude that there is a lingering effect from participation in WIC program on consumption for PL milk but this effect may probably not last for a long time period.

Partial Effects of the WIC Status on PL Cereal Consumption

Table 8 provides the partial effects of the explanatory variables on the unconditional expected value of PL cereal consumption. As with PL milk consumption, we also observe that, compared to benefit households, the non-benefits households tend to buy less PL cereal, with an average of almost 4 ounces less. However, unlike PL milk, the entry-exit households prefer to buy less PL cereal even when they are actively participating in the WIC program. This is not a surprising result given that WIC food package provides more brand variation in the cereal category, including both national and PL brand, compared to the dairy category. Therefore, households with WIC vouchers have more choice freedom with cereals and are not forced to buy only PL ones compared to the case of milk. Table 8 also indicates that the WIC lingering effect is also present in the case of PL cereal consumption. The table shows that households still buy less of PL cereal when they leave the WIC program but with a lower amount compared to the non-benefits households.

Partial Effects of the Other Explanatory Variables

As expected, the difference between NB price and PL price and the use of coupons to buy PL products are found to have a positive effect on PL consumption for both milk and cereal products. The positive coefficient on price difference between national brand and PL brand suggests that people tend to buy PL because it is usually cheaper than other branded products. On average, every one dollar price difference would result in 697 ounces more of PL milk indicated by table 7and 38 ounces more of PL cereal indicated by table 8. Similarly, a 1% increase of PL coupon usage will increase PL milk and Pl cereal consumption by almost 814 ounces and 320 ounces respectively. However, store loyalty shows a different effect by product. Table 7 shows that the more store loyal the household is, the more PL milk he would buy, but table 8 shows the opposite where less PL cereal is consumed. This negative effect on cereal is mainly related to our previous results of all WIC groups buying less PL cereal.

Household income is found to have a different significant effect on PL consumption. Every additional dollar will increase PL milk consumption by 2 ounces but will decrease PL cereal consumption by 5 ounces. The presence of kids under the age of 18 years old in the household did not have any effect on PL milk consumption but is found to increase PL cereal by almost 2.5 ounces more for each additional kid added to the household. Consistent with previous research, households tend to consume less milk as they grow older. This fact is observed in table 7 as every additional one year of age would result in a decrease in PL milk consumption of 1.2 ounces. Table 8 however indicates that people still consume more PL cereal even if they grow older.

With respect to ethnicity and geographic regions, table 7 shows that White people are found to consume more PL milk but African American and Asian people would consume less compared to other ethnicities, and Northeastern people consume on average 51 ounces less of PL milk compared to Southern people. In table 8, on average, African American households tend to buy 3.1 ounces less of PL cereal. We also observe that people in Midwest tend to buy 1.4 ounces more and people in the West buy 1.6 ounces less of PL cereal.

Table 2.1 Demographic Profile of the Milk buyers by Household Group

Variable	Milk		
	Non Benefit Household	**Benefit Households**	**Entry-Exit Households**
Average Household Age	55	39	46
Average Income	56576	64880	68029
Female with High Education	0.62	0.80	0.75
Presence of Kids Under 18	0.28	0.97	0.80
Regions			
South	0.38	0.35	0.36
Northeast	0.19	0.19	0.20
Midwest	0.27	0.29	0.28
West	0.17	0.17	0.15
Ethnicity			
White	0.85	0.80	0.79
African American	0.09	0.09	0.11
Asian	0.02	0.04	0.04
Hispanic	0.04	0.10	0.09
Other	0.04	0.07	0.06
Number of Households	91291	12247	4263

Table 2.2 Demographic Profile of the Cereal buyers by Household Group

Variable	Cereal		
	Non Benefit Household	**Benefit Households**	**Entry-Exit Households**
Average Household Age	55	39	46
Average Income	57402	64758	68563
Female with High Education	0.62	0.80	0.76
Presence of Kids Under 18	0.14	0.97	0.77
Regions			
South	0.38	0.35	0.35
Northeast	0.19	0.18	0.20
Midwest	0.27	0.30	0.29
West	0.16	0.17	0.15
Ethnicity			
White	0.86	0.81	0.81
African American	0.08	0.08	0.10
Asian	0.02	0.04	0.03
Hispanic	0.04	0.10	0.08
Other	0.04	0.07	0.06
Number of Households	90589	12261	4259

Table 2.3 Monthly Average National Brand and Private Label brand Consumption of Milk

Variable	Milk		
	Non Benefit Household	**Benefit Households**	**Entry-Exit Households**
Private Label Consumption (Oz/month)	187.37	386.46	335.86
National Brand Consumption (Oz/month)	84.04	136.29	125.73
Private Label Characteristics			
Store Loyalty	0.22	0.26	0.24
Price Difference ($/Oz)	0.01	0.01	0.01
PL Coupon Use	0.01	0.01	0.01

Table 2.4 Monthly Average National Brand and Private Label brand Consumption of Cereal

Variable	Cereal		
	Non Benefit Household	**Benefit Households**	**Entry-Exit Households**
Private Label Consumption (Oz/month)	11.86	16.02	13.48
National Brand Consumption (Oz/month)	48.69	75.19	67.68
Private Label Characteristics			
Store Loyalty	0.27	0.30	0.28
Price Difference ($/Oz)	0.01	0.06	0.06
PL Coupon Use	0.06	0.004	0.004

Table 2.5 Double Hurdle Results of the Milk Model

	Milk	
Variables	**Tier (1)**	**Tier (2)**
NB Households	-0.751***	-1,416***
	(0.0119)	(120.6)
EE in WIC	0.132***	-152.9**
	(0.0186)	(75.67)
EE off WIC	-0.202***	-488.9***
	(0.0194)	(90.92)
Store Loyalty	1.526***	-543.4***
	(0.0186)	(83.91)
Price difference	9.241***	21,164***
	(0.592)	(2,885)
PL Coupon Use	160.5***	1,364***
	(8.514)	(133.9)
Average Income	1.71e-06***	0.00104*
	(9.60e-08)	(0.000561)
Kids Presence	-1.082***	2,365***
	(0.00761)	(192.3)
Female with High Education	0.0278***	-229.0***
	(0.00709)	(46.80)
Average Household Age	-0.0125***	3.864*
	(0.000363)	(2.218)
White	0.152***	415.8***
	(0.0162)	(103.0)
African American	-0.164***	-3,352***
	(0.0188)	(308.8)
Asian	-0.0604**	-439.6**
	(0.0263)	(173.4)
Hispanic	0.0257*	-261.3***
	(0.0156)	(93.77)
Northeast	-0.274***	-651.9***
	(0.00950)	(80.28)
Midwest	-0.176***	726.2***
	(0.00853)	(74.19)
West	-0.152***	507.7***
	(0.00948)	(71.61)
Constant	1.501***	-5,346***
	(0.0281)	(542.7)
Sigma	1,380***	
	(59.63)	
Observations	3,781,895	3,781,895

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.6 Double Hurdle Results of the Cereal Model

	Cereal	
Variables	**Tier (1)**	**Tier (2)**
NB Households	-0.126***	-73.98***
	(0.0123)	(11.57)
EE in WIC	-0.0384**	-49.47***
	(0.0177)	(11.38)
EE off WIC	-0.0363**	-57.02***
	(0.0178)	(11.53)
Store Loyalty	-0.0140	-25.86***
	(0.0131)	(7.378)
Price difference	1.219***	713.8***
	(0.187)	(129.6)
PL Coupon Use	248.2***	26.99***
	(10.15)	(7.789)
Average Income	-3.58e-06***	-0.000167***
	(9.65e-08)	(5.07e-05)
Kids Presence	0.0895***	42.81***
	(0.00892)	(6.788)
Female with High Education	-0.0139**	-4.442
	(0.00695)	(3.472)
Average Household Age	0.00564***	1.322***
	(0.000353)	(0.233)
White	0.0288*	1.607
	(0.0162)	(6.861)
African American	-0.167***	-27.66***
	(0.0194)	(8.953)
Asian	-0.156***	13.65
	(0.0274)	(16.86)
Hispanic	-0.0326**	-11.43
	(0.0153)	(8.040)
Northeast	-0.0125	16.12***
	(0.00936)	(5.292)
Midwest	0.0376***	30.76***
	(0.00820)	(5.038)
West	-0.155***	15.64***
	(0.00938)	(4.599)
Constant	-0.570***	-333.7***
	(0.0295)	(51.36)
Sigma	117.2***	
	(7.307)	
Observations	2,314,319	2,314,319

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.7 Unconditional Average Partial Effects of the Milk Model

	Milk	
Variables	**APEU**	**P Value**
NB Households	-127.337	0.0000
EE in WIC	8.503	0.0336
EE off WIC	-38.024	0.0000
Loyalty	140.608	0.0000
Price diff	696.648	0.0000
PL Coupon Use	813.500	0.0000
Average Income	0.0002	0.0000
kids Presence	-31.250	0.6565
Female with High Education	-5.013	0.0669
Average Household Age	-1.175	0.0000
White	30.247	0.0000
African American	-132.985	0.0000
Asian	-21.498	0.0204
Hispanic	-6.342	0.1678
Northeast	-51.101	0.0000
Midwest	6.752	0.1909
West	1.681	0.3730

Table 2.8 Unconditional Average Partial Effects of the Cereal Model

	Cereal	
Variables	**APEU**	**P Value**
NB Households	-3.898	0.0059
EE in WIC	-1.992	0.0761
EE off WIC	-2.190	0.0654
Loyalty	-0.960	0.1385
Price diff	37.629	0.0107
PL Coupon Use	319.687	0.0000
Average Income	-0.00005	0.0000
kids Presence	2.476	0.0030
Female with High Education	-0.319	0.2220
Average Household Age	0.115	0.0001
White	0.432	0.3047
African American	-3.055	0.0008
Asian	-1.671	0.1825
Hispanic	-0.777	0.2085
Northeast	0.315	0.3139
Midwest	1.421	0.0133
West	-1.603	0.0000

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Chapter 3

Consumer Preference and Willingness to Pay for Azaleas: Effect of State Labeling and Various Types of Retail Outlets

Introduction

The market for green industry products, especially plants, has begun to reach maturity which means sales are increasing at a decreasing rate (Hall and Dickson, 2011). As the industry reaches maturity, firms can either take market share from other firms or transition non-buyers to buyers in order to increase sales (Behe et al., 2013). As firms struggle to gain/retain market share and bring in new customers, it is essential to evaluate consumer reaction to various marketing activities. Given that many nursery/greenhouse firms operate on "thin profit margins" (Sturdivant, 2013), it is important to understand how local labeling and the intrinsic value, if any, associated with an outlet type (i.e., home improvement center/mass merchandiser versus nursery/greenhouse) can impact consumer preference and/or willingness to pay (WTP).

Consumer demand for local products has continued to climb over the past decade. Notably, much of the focus has been on food products with recent estimates of local food sales around $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 a premium for local food (e.g., Darby et al., 2008; Onozaka and McFadden, 2011; Yue and Tong, 2009). Perceived benefits of locally labeled plants, such as being better for the environment from a production perspective, helping the local economy, and product quality, closely align with perceived benefits

of local food (Campbell et al., 2014; Khachatryan and Rihn, 2015). However, little attention has been devoted to evaluating the value of locally grown labeling on plants. The few studies that have examined this topic have shown that local labeling has the potential to generate positive consumer preference and price premiums. For instance, Collart, Palma, and Hall (2010) showed dichotomy in the market with some consumers (i.e., those aware of a local plant brand) willing to pay more, while other consumers (i.e., those not aware of a local plant brand) discounted a local plant 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 (Fresh from Florida) and domestic (grown in the United States) label increased preference for indoor foliage plants. Yue et al. (2011) found that women and certain types of plant buyers value local plants.

The intrinsic value associated with a nursery/greenhouse (home improvement center/mass merchandiser) retail outlet can also be a potentially valuable selling point compared to home improvement center/mass merchandiser (nursery/greenhouse) retail outlet. However, as with local labeling, there has been limited research examining the value of retail outlet on consumer preference and WTP for plants. Yue and Behe (2008) examined consumer choice of floral retail outlet and found that consumers purchasing foliage and garden plants were more likely to choose a box store. Further, they found that box stores and a general retailer were chosen because of their reputation for convenience and lower prices. Satterthwaite, Haydu, and Hodges (2006) noted that convenience was the primary reason for shopping at an independent garden center followed by service, quality, and then price. However, chain outlets are primarily shopped at due to convenience and price with quality and service ranked lower on the list of priorities.

This study differs from previous studies in several ways. First, we evaluated local (grown in Connecticut) against a regional state (New Jersey), non-regional state (Washington), U.S., and international (Canada) label so as to understand the trade-offs associated with these different labeling schemes. No study could be found in the literature that utilized specific regional and non-regional states. The use of specific states instead of an aggregate (e.g., regional, domestic) label is an important distinction as most products on the market list, if listed, a specific origin (i.e., producing state) and not a more general origin (e.g., product of U.S.). Our main hypothesis was that a locally labeled plant would be preferred to a non-locally labeled plants across all consumer groups given the increasing trend toward purchasing local products. Second, we evaluated the value of retail outlet (nursery/greenhouse versus home improvement center/mass merchandiser) in order to determine if differences exist between different market segments. Our hypothesis was that nursery/greenhouse outlets would be preferred by some, but not all, of the classes.

Materials and 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 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. Furthermore, the green industry in Connecticut is the largest agricultural sector (compared to all other agricultural production) 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 (#X13-074) at the participating university. 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 only criteria for participating in the survey was to be 18 years or older. We allowed purchasers and non-purchasers of azaleas (the plant used in the choice experiment) to participate as we wanted to see if any preference differences existed between these two groups. The first step of the study involved respondents answering general purchasing questions about plant products. They then proceeded to the choice experiment where they were provided information about how the experiment worked, a reminder they were purchasing only one plant, and a statement about how they should consider their budget constraint when making their purchase decision. After completing the choice experiment respondents answered typical demographic and socio-economic questions, such household income, age, number of children in household, gender, and ethnicity.

The completion rate for the survey was 85 percent which resulted in 720 completed surveys. With respect to representativeness, significance testing was not feasible since census estimates do not include standard errors. However, our sample tended to be older, have a higher median household income, and was made up of more females than males compared to the average Connecticut resident (Table 1). For comparison, the median age (including minors which does not directly align with our sample of only adults) and household income for Connecticut residents is around 40 years and $70,000, respectively (U.S. Census Bureau, 2011; U.S. Census Bureau, 2015). Exclusion of children would put the Connecticut median age closer to our sample median age. Even though our sample appears to be different from the average Connecticut resident with respect to household income, it is seemingly in-line with a typical green industry consumer which is

thought to be older with a higher income (Baldwin, 2015; Butterfield, 2004; Dennis and Behe, 2007).

Product Attributes and Levels

Azaleas were chosen as the plant used in the experiment after consultation with the Connecticut Department of Agriculture and leading nursery/greenhouse outlets. Specific attributes and attribute levels were identified through discussions with leading nursery/greenhouse outlets and via a review of past literature of consumer plant studies, such as Behe et al. (1999), Palma et al. (2005) and Rihn et al. (2015). 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 included were of particular interest to this study. Plants were labeled as either grown in Connecticut, New Jersey, Washington, U.S., Canada, or were not labeled. The grown in Connecticut label was the local label (as defined by Connecticut law), while New Jersey represented a state in close proximity to Connecticut, thereby, a plant from New Jersey would be regional in nature. Washington (azalea producing state on the West coast), U.S. and Canada served as other potential labels that were found on the market and represented 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/mass merchandiser or nursery/greenhouse. Home improvement centers (e.g., Lowe's and Home Depot) and mass merchandisers (e.g., WalMart and Target) constitute the major competitors to nursery/greenhouse outlets.

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). Each product within a choice set was in the form of text detailing the prescribed attributes. When a product had a 'no label' (e.g. no origin specified), no text was provided to denote it was a 'no label' option. Given plant labels in a store setting do not put text when an attribute level is not present, leaving no text for a 'no label' should provide the most realistic experience for respondents. An example choice set is provided in Figure 1.

Given there is the potential for heterogeneity across consumer tastes and preferences, we utilized a latent class model (LCM) (Boxall and Adamowicz, 2002; Greene and Hensher, 2003; Kafle, Swallow, and Smith, 2014; Wedel and Kamakura, 2000). According to Green and Hensher (2003), the LCM is 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 (such as Dekhili, Sirieix, and Cohen (2010) and Lim et al. (2013), 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. Confidence intervals for WTP estimates were found via the Delta method.

Results and Discussion

Examining Table 3, we see three distinct classes with varying preferences. Notably, we find that each class has a significant coefficient associated with the "none" option. This implies that a respondent experienced a decrease in utility if they chose the "none" option, which implies that most consumers received a positive utility from making a choice other than the "none" option. With respect to price, we found a significant and negative coefficient for all classes. The negative coefficient aligns with economic theory that respondents value a lower price to a higher price. However, class two had the smallest price coefficient which implies that this class was most likely the least price sensitive.

Latent Class 1 – "Price Emphasis"

Class one was 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 class was termed the "price emphasis" group. Other plant studies have found classes/segments that rely heavily on price in their decision making process, such as Hall et al. (2010) and Behe et al. (2014). The market share associated with this class (14%) is comparable to the 13% and 16% reported for price sensitive segments reported by Hall et al. (2010) and Behe et al. (2014), respectively.

There are several interesting features of the "price emphasis" class that impact marketing recommendations for retailers targeting this group. First, in comparison to the other classes older consumers were more likely to be a part of this class. Given older consumers are more likely to be plant buyers (Baldwin, 2015), it would be easy to recommend that retailers catering to older consumers should make sure their price points attractive in order to better serve this demographic. However, this class had the smallest market share (14%) and the lack of significance of the retail

outlet variable in the latent model could mean these consumers are transient in where they shop and migrate to where they can get the lowest price. Thereby, a strategy built to attract this customer group focusing only on price may not be the right strategy for firms offering higher service, convenience, quality, etc.

Latent Class 2 – "Local/Outlet"

A primary focus of class two was retail outlet and origin labeling; therefore, we named this class the "local/outlet" class. Notably, we see that the nursery/greenhouse retail outlet is preferred to home improvement centers/mass merchandisers (Table 3). Also, the local (grown in Connecticut) label was preferred to all other labels as well as the no label option. As noted above, the "local/outlet" class was the least price sensitive of all the classes. Considering this class most likely preferred local CT grown azaleas, retailers may be able to market these plants at higher prices in conjunction with local labeling. Further making this a unique market segment, this class prefers a fuchsia colored azalea compared to all the other colors. Comparatively, white colored azaleas were the least preferred color.

Furthermore, the "local/outlet" class had a higher probability of being young, Caucasian, and having purchased an azalea in the last two years. The previous experience variable's 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 items. For instance, supporting the local economy is consistently listed as a major reason for purchasing local (Darby et al., 2008; Food Marketing Institute, 2011; Martinez et al., 2010; Onozaka et al., 2010; Yue and Tong, 2009). This class may perceive purchasing local plants as a means to help support the local economy

similar to the effect that is assigned for purchasing local food. Alternatively, the local label may be perceived as an indicator that a plant will be more adaptable to local growing conditions and pest pressures.

Taking the results of class two in totality, the recommendations for nursery/greenhouse and home improvement centers/mass merchandisers 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/mass merchandiser which most likely have a more diverse customer base (e.g. broad mix of class one, two, and three consumers). This is not to say that other colors should not be offered as there is bound to be overlap between consumers frequenting both home improvement centers/mass merchandisers and nursery/greenhouse outlets, but rather having colors available that may not be available, such as fuchsia, at a home improvement center/mass merchandiser can be a means to differentiate from the home improvement center/mass merchandiser. Nursery/greenhouse outlets should also insure that they promote local azaleas, and most likely other plants, as consumers in this group prefer to buy local plants. However, home improvement centers/mass merchandisers need to overcome the preferential view of nursery/greenhouses by these consumers which may entail promoting local azaleas, and other plants, and working to capture sales when/if a consumer from this group shop at their location.

Latent Class 3 – "Variety Consumer"

Class three had a unique set of purchase drivers so they were termed the "variety consumer" (Table 3). The "variety consumer" valued the pink and fuchsia colors over red but values red over white.

This was the only class where consumers have distinct preferences across a broad array of colors. Further, we see that this class preferred plants in-bloom. With respect to retail location, we found 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/mass merchandiser. In contrast to our hypothesis about local labeling we found that class three does not prefer a locally (CT grown) labeled azalea over a regional (New Jersey grown), U.S. grown, or international import (Canada) label. This class does valued a Washington label over all other labels, which could be related to this class having the perception that the Washington label provides quality azaleas. However, we do not have high quality answer as to why the Washington label is preferred. Of particular significance to retailers and marketers, the local label was not preferred over the "no label." Given this class was the most price sensitive, the results align with this class preferring home improvement centers/mass merchandisers and having no preference for locally grown since nursery/greenhouse retail outlets and local products are generally perceived as having higher prices (Safley and Wohlgenant, 1995).

Age was an indicator of membership in this class. Older consumers were less likely to be a member of this class compared to class one. With respect to recommendations for retail outlets, home improvement centers/mass merchandisers 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 outlets may be best advised to focus on class two as class three consumers do not prefer nursery/greenhouse outlets to home improvement centers/mass merchandisers.

Willingness to Pay

As can be seen in Table 4, latent class one does not have any significant WTP values. This is not surprising as this class primarily focused 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 three consumers as class three consumers prefer home improvement centers/mass merchandisers. With respect to labeling, class two would give approximately $8-16 more for locally grown azaleas. However, Washington grown azaleas garnered a premium over local azaleas. As noted earlier, a best guess for the Washington premium would be perceived quality differences; however, more research is needed to understand why a non-local/regional label is preferred. Furthermore, we find that the premium for an in-bloom two gallon azalea is $2.99 by those consumers that were more likely to prefer to purchase from a home improvement center/mass merchandiser. The premium associated with in-bloom azaleas could be occurring for a variety of reasons, such as the instant gratification associated with a fully colored plant or it could be due to a consumer believing that the plant is of better quality because of the blooms. Future research should delve further into why exactly some consumers prefer plants in-bloom.

Conclusions

It is essential for firms to identify their consumer base and work to retain the loyal consumers while capturing new customers 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. Firms that do not know their consumer base can use the results to make better decisions about how to market their products by having a better understanding of the factors that go into a consumer's decision to purchase.

With respect to our findings, it is clear that the market for azaleas, and most likely plants in general, is filled with heterogeneous consumers. 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. For instance, the "price emphasis" class only values the price of the azalea but they are indifferent to retail outlet, implying they may drift across outlet types. So attempting to gain these consumers by competing directly on price, especially for nursery/greenhouse outlets that may have higher costs, is risky as potential revenue may be left on the table if "local/outlet" (class two) consumers are the primary shoppers at the outlet. However, home improvement centers/mass merchandisers may be better situated if they have a lower cost structure due to their economies of scale and/or size, 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. Notably, nursery/greenhouse outlets may be well advised to focus on local labeling which can gain consumers from class two. Based on the results of this study, retail outlets can put a variety of marketing strategies in place to capture consumers that may be predisposed to shopping at their store, whether it is a focus on price, product origin, or plant characteristics.

Table 3.1 Descriptive statistics for key demographic and behavior variables.

	Sample		Connecticut
Variable	Mean	Std. Dev.	Mean
Experience (%) [z]	0.43	0.43	--
Mean Income ($)	$97,928	54,107	--
(median)	$95,000	--	$69,899 [y]
Mean Age (years)	50	14.4	--
(median)	52	--	-- [x]
Children per household	0.22	0.51	-- [x]
Male (%)	0.34	0.47	0.49
Caucasian (%)	0.89	0.32	0.81
Number of respondents	720		
Number of obs. (720 resp. x 8 sets x 4 products)	23,040		

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

[z] Reference: U.S. Census Quickfacts (2014)

[y] Median age is not provided as the census reported median age for Connecticut is 41, but this includes persons under 18 years of age. Given participation in the survey was contingent on being older than 18, comparisons to the overall median age would be inappropriate. The number of children per household in Connecticut could not be found. The number of "own" children was available but this is not a direct comparison as our question was for the number of total children.

Table 3.2 Attributes (and levels) included in the choice experiment

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

Table 3.3 Latent class model results for azaleas in two gallon containers

	Latent Class 1 – "Price Emphasis" Class Coefficient (Std. Error)		Latent Class 2 – "Local/Outlet" Class Coefficient (Std. Error)		Latent Class 3 – "Variety" Class Coefficient (Std. Error)	
Percent share (%)	0.14		0.43		0.43	
Parameter Estimates						
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

	"Price Emphasis" Class Coefficient (Std. Error)	"Local/Outlet" Class Coefficient (Std. Error)		"Variety" Class 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			

Bayesian Information Criteria values for varying latent classes: 1= 5546.4 (from multinomial model as latent class has two or more classes), 2 = 3016.2, 3=2900.7, 4=2917.7, and 5=2976.4. The Bayesian Information Criteria is a set criteria for selecting among different models. In general, a lower Bayesian Information Criteria indicates a better model.

*, **, *** represent significance at the 0.1, 0.05, and 0.01 level, respectively.

Base categories are: home improvement center/mass merchandiser, CT grown, red color, and not in-bloom.

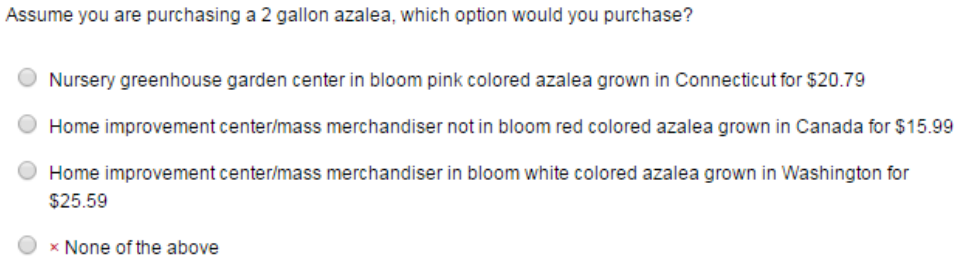
Table 3.4 Willingness to pay estimates from the latent class model results

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

Figure 3.1 Example of choice set seen by survey respondents



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