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Recipient Contact:	**Ben Campbell, 706-542-0852, bencamp@uga.edu**
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Title: Growing Local Milk: Analysis of Consumer Demand and Marketing Practices

Project co-investigators:
Benjamin L. Campbell, Assistant Professor, Department of Agricultural and Applied Economics, University of Georgia

Yizao Liu, Assistant Professor, Department of Agricultural Economics, Sociology, and Education, University of Georgia

Adam N. Rabinowitz, Assistant Professor, Department of Agricultural and Applied Economics University of Georgia

Background and Justification:
The buy local movement designed to increase consumption of local-grown farm products has become a focus of policymakers in recent years, going as far as state legislation establishing legislative goals for increases in the amount of consumer dollars spent on locally grown food products (Connecticut Public Act 11-189). Advocates of local food consumption highlight benefits such as fresher, healthier, better tasting food that is not only better for the environment but also supports growth of the local economy (King, 2010). Consumer surveys have even found that 70% of shoppers are willing to pay a premium for local food (Rushing and Goldblatt, 2014).

As more attention is given to the purchasing of local foods, many have tried to define exactly what "local" means. Many variations exist, starting from a 100-mile radius, to focusing on political boundaries like county, metropolitan area, or region (Darby et al., 2008; Durham, King, and Roheim, 2009). Policymakers focus on state boundaries with the development of state marketing strategies and labeling, yet this designation does not fully capture the consumer definition that may include a regional focus (Brown, 2003; Ostrom, 2007). This can be especially true in the northeast United States where states cover a smaller geographic area. In fact economic impact is often measured in reference to the northeast regional area with northeast agriculture, commercial fishing, and forest products combining for $71 billion in economic activity and 379,000 jobs (Lopez and Laughton, 2012). One of the largest sectors of this region is dairy that constitutes 23% of northeast agricultural output (Lopez and Laughton, 2012).

In the dairy sector, fresh fluid milk has a regional production focus with the relatively limited transportation range and perishability of raw and processed milk. However, the branding of processed fluid milk most often does not take the dairy farmer label and thus often loses the "local" marketing label. Unlike fruits and vegetables where the harvested product is also a finished consumer product, fresh fluid milk sold in supermarkets must first go through a homogenization and pasteurization process prior to bottling for consumer sale. Thus the raw milk harvested by a dairy farmer is shipped to processing plants, most often via dairy cooperatives like Agri-Mark in the northeast. The milk is then processed, packaged and labeled with national brands, private label store brands, and local brands. At the national brand level, Dean Foods, the leading dairy processor in the United States, processes and bottles roughly 70 percent of the northeast regions fresh fluid milk under the name Garelick Farms and a variety of other national brands and private label store brands. HP Hood, another national brand, bottles about 20 percent of the regions fresh fluid milk. Thus 90 percent of the fluid milk sold in the northeast moves through these two processing companies.

Some of the remaining milk in the northeast region is produced and processed by smaller local brands. For example, Farmer's Cow and Mountain Dairy in Connecticut, Rhody Fresh in Rhode Island, and Our Family Farms and High Lawn Farm in Massachusetts, just to name a few. All of the other northeast states also have local brands that produce, market, and distribute their own finished fluid milk product. By branding their own milk these farms create a connection between the farm and consumer and an opportunity for long term sustainability while also helping other local businesses (Felson, 2013). With the growth of the local food movement it is essential for the success of these farms to understand the local food consumer and what types of marketing practices might be more effective in stimulating consumer demand.

National surveys of consumers have found perceptions of increased freshness, eating quality, food safety, and nutritional values for local foods (Onozaka, Nurse, and Thilmany McFadden, 2010; Campbell et al., 2014). Furthermore, about 12 percent of consumers are willing to pay more than 10 percent more for local foods (Rushing and Goldblatt, 2014). However, little is known about demand and price premiums associated with local milk. Pricing and demand are of particular interest because local brand milk can be priced by retailers at close to 40 percent more than private label store brand milk and comparable to the price of private label organic milk. A price differential this large can create difficulties for local brand milk to compete with national and private label brands. Thus local dairies need to find alternative marketing strategies to be competitive in the dairy case.

Cotterill and Rabinowitz (2003) discuss dairy farmers' ability to develop local brands, recognizing some of the challenges that exist when competing against large national firms with economies of scale. One of those major challenges is competing on price, thus a question is whether consumers are willing to pay higher prices for local brand milk and what marketing strategies can be used to help local brands compete. Wolf, Tonsor, and Olynk (2011) do a choice experiment through an online survey of U.S. consumers in 2008 to examine the value of fluid milk attributes. One of the attributes is the identification of a local origin for which they find that consumers are willing to pay about 10 percent more for locally branded milk. Kovalsky and Lusk (2013) also do an online survey to determine the willingness to pay for milk in the Midwest and South. Their research finds that consumers are willing to pay between $0.46 and $1.55 per gallon, depending on how far the milk travels greater than 25 miles from the store. These studies, however, do not consider actual purchase behavior which can be observed through purchase data, or the impact of other marketing strategies to enhance the value of the local brand.

Given this literature, there is interest in examining consumers' willingness to pay for local brand milk. It is also of use to compare how estimates obtained through surveys and auctions compare to actual behavior identified through actual purchase data. Furthermore, the value of the dairy industry in the northeast cannot be understated. As noted by a Farm Credit East report, dairy cattle and milk production was the largest agricultural sector in the northeast with $4 billion in output and generating 32,000 jobs. Furthermore, fluid milk processing generated 36,000 jobs and $9.4 billion in output (Lopez and Laughton, 2012). Gaining a better understanding of consumer behavior in this market with respect to local brand purchasing of milk and the impact of different marketing strategies can provide valuable information to aid in the growth of local dairy farmers.

Our goal was to **identify consumer segments** that would be more likely to **buy local brand milk** and **develop a profile of those segments using attitudes, purchases, preferences, and demographic characteristics.** We hypothesize that there are demographic and attitudinal differences between consumers who prefer to purchase local brand milk compared to consumers who prefer to purchase national brand milk. We also seek to **determine consumers' willingness to pay for local brand milk.** Here we hypothesize that consumers with certain demographics or attitudinal characteristics have a differing willingness to pay for local brand milk. Our interest in consumers of local brand milk goes beyond purchase behavior and willingness to pay. We are also interested in **estimating the effects of nutritional factors, prices, packaging size and characteristics, store promotions, social media, distribution channel, and horizontal brand extension on consumers' choices of local brand milk. With these estimates we can simulate**

alternative marketing strategies for selling local brand milk. To date, no studies have analyzed consumer preferences and different marketing strategies for local brand milk in the U.S.

MAJOR ACTIVITIES COMPLETED

Methods and Data Collection

Objective A: To identify consumer segments that would be more likely to buy local brand milk and develop a profile of those segments using attitudes, purchases, preferences, and demographic characteristics.

We integrated several research methodologies to gain several types of data that can be analyzed to formulate a thorough examination of the demand, price premiums and market segments within the northeastern market for local milk. First, we utilized choice experiment to better understand preferences for local milk characteristics and identify consumer segments within the market.

Data for the choice experiment portion of the project was obtained via an online survey. Researchers contracted with an online database company to obtain respondents from the northeastern U.S. The internet is used by many industries to conduct survey research because of the relative advantages including the fact that thousands of surveys can be transmitted at a time, they are automatically coded, and it is a very cost effective process (Cobanoglu et al., 2001). Internet based surveys are also more advantageous because they are faster to conduct than telephone or face-to-face interviews, generate more accurate information with less human error, and are less expensive because of the less labor needed to create, deliver, and analyze the survey (McCullough, 1998).

The internet survey focused on milk drinking consumers within six New England states (CT, MA, RI, ME, VT, NH). The survey was initiated in June 2015 with 906 completed responses. There were nine attributes identified for the choice experiment. Each consumer was presented with eight choice sets containing three milk products (choices) plus a "no option." The milk product sizes were standardized at a half-gallon. Before beginning the experiment, each respondent was reminded of both their budget constraint and that they were purchasing a half-gallon of milk as described. The attributes (and levels) consisted of:

- Price: 2.49, 3.69, 4.69, 5.49
- Fat content: whole, reduced fat (2%), low fat (1%), and fat free (skim)
- USDA Organic Certified: Yes/No
- Non-GMO Verified: Yes/No
- rBST/rBGH free: Yes/No
- No Artificial Growth Hormone Used: Yes/No
- Antibiotics free: Yes/No
- HACCP Certified: Yes/No (Hazard Analysis & Critical Control Points)
- Geographic region of production: [Respondent State]/New England/None

A latent class model was used to analyze the data in order to capture heterogeneity within preferences across consumers. Explanatory variables in the latent class model in addition to the attribute variables included: income, age, male, Caucasian, state fixed effects, and animal welfare perception.

Objective B: To determine consumers' willingness to pay for local brand milk through the use of experimental auctions.

The success of surveys is primarily focused on collecting intentions, attitudes, and behaviors. Thus determining willingness to pay (WTP) for products is most often best assessed by real auctions with real money and real products. Experimental auctions are a different type of consumer insight that has been used to determine WTP for a wide variety of food attributes (Hobbs et al. 2005; Alfnes, 2009; Yue, et al., 2009; Olesen et al., 2010). A (real) second-price sealed-bid auction is an auction in which the bidders submit sealed bids and the price is set equal to the second highest bid where winners are those who have bid more than that price. Vickrey (1961) showed that, in an auction in which the price equals the first-rejected bid, and each consumer is allowed to buy only one unit, it is a weakly dominant strategy for people to bid so that if the price equals their bid and they are indifferent to whether they receive the product or not. Since people do not know the value of other participants they have an incentive to truthfully reveal their individual preferences. If they bid lower than their true WTP they risk not making a profitable purchase. If they bid higher than their WTP they risk buying a product at a price above what they perceive the product to be worth given the available alternatives.

An experimental auctions was conducted with Connecticut residents from November 2015 to April 2016. We used a variant on the true-value revealing auction mechanism proposed by Becker, DeGroot and Marschak (1964) (the BDM procedure) to elicit participants' WTP for milk products. The BDM auction is ideal elicitation method because participants do not bid against each other but rather submit a sealed bid for each product. Once a subject has submitted all bids in a session, we randomly chose a market price for one randomly selected milk product. Then the participants "won" a randomly selected milk product if their bid exceeded the randomly drawn price (from a distribution of the retail price of the auctioned product). Only one product was randomly selected to be sold at the end of the auction and therefore the participants could only have the opportunity to purchase one milk container.

A total of 193 adult, non-student participants participated in the experiments. The participants must have consumed regular milk (not plant-based beverages) in the past six months. And they were paid $20 for participating. The participants could use part of the cash payment to bid on several milk products that were presented in the auctions. Furthermore, to better understand the impact of information, participants were randomly assigned to one of the two information treatments: T0: Control group with no additional information; T1: Additional information on local milk. The information sheet provided in treatment T1 summarized the features of local milk and its impact of the local economies and local communities.

At the beginning of the experiment, participants were provided with an instruction booklet which gave a detailed explanation of how the auctions and the bidding process worked. To guarantee that participants understood the mechanism of the auctions, a practice round of auction was also performed in which each subject submitted bids for chocolate bars. After the practice round, a real biding for sixteen milk products took place. Images of sixteen half gallon milk products with varying brand types, butterfat content, and package were displayed to participants. To eliminate the effects of specific brand image and packing design, we only presented images of plain milk bottle/cartons with information on brand types and butterfat content to participants. After the auction was completed, participants were asked to complete a computerized questionnaire, which

covers questions about their demographic information, past milk consumption, and attitude towards local and organic products.

To assess the WTP for locally branded milk and the impact of informational treatment on WTP, we used a Tobit model to analyze the experimental auction data. The censored model is used because of the presence of zero WTP values in the data. The participants in the auction were told explicitly that they could provide a WTP of zero dollars if they did not want to buy the product at all. Therefore, the WTP of consumer *i* in treatment group *m* of product *j* can be modeled as:

$$WTP_{ijm} = Brand_j'\alpha + x_j'\beta + z_i'\delta + \gamma * Brand_j * I_m + \varepsilon_{ijm}$$

where $Brand_j$ is the product j's brand types, which can be a Connecticut brand, a New England Brand, a National brand, or a private label product. x_j is a vector of product characteristics, including butterfat content, container size, and bottle type. z_i is a vector of consumer demographic variables (income, education, health condition, etc.) I_m is a dummy variable for the local information treatment, which equals to 1 if the participants were randomly assigned to the treatment group T1.

Objective C: To analyze consumer demand and estimate the effects of nutritional factors, prices, packaging, store promotions, social media, distribution channel, and complementary product offering on consumers' choices of local milk.

We used Nielsen Retail Scanner data to collect the fluid milk products' characteristics including price, brand description, fat content, and package size. Furthermore, Nielsen Retail Scanner data collects information from grocery stores, drug stores, mass merchandiser, and other stores with annual sales greater than 2 million dollars. Since local brands usually have limited presence in terms of the geographic scope, we focused on Massachusetts and Connecticut where most local brands are sold in both states. Our data sample covers a period from January 1, 2006 to December 31, 2011. We restrict our analysis to the top 7 national brands and top 9 local brands, which account for over 98% of total milk sales in these two states.

In this analysis, a market was defined as a month-county combination. The potential market size was defined for each period and county as population of the county times the combined per capita consumption (in volume) of milk plus other beverages, including water, tea, and fruit juice. The market share for each milk product was calculated as sales volume divided by the potential market size.

Following Berry, Levinsohn, and Pakes (1995; hereafter BLP), we assume that consumers choose one milk product among all available alternatives in each market to maximize utility driven by product characteristics as well as the consumer's own characteristics. Use *j=1*,...*J* to denote a milk product, and *j*=0 to denote a general outside choice in the beverage market. The total number of milk products in market *m* is *J* and there are *M* markets. Then the indirect utility of consumer *i* from buying milk product *j* in market *m* is given by

$$U_{ijm} = \alpha_i p_{jm} + \beta x_j + \Phi_{1,i} Local_{jm} + \Phi_{2,i} National_{jm} + \xi_{jm} + \varepsilon_{ijm}$$
$$, i = 1, \dots, n; j = 0, \dots, J; m = 1, \dots, M$$

where p_{jm} is the price of product j in market m and x_j is a vector of product characteristics including butterfat content, container size, and the number of retail outlets in market *m* where product *j* were sold. Specifically, we collect information for four butterfat content categories: whole milk, 2% milk, 1% milk and fat free milk. As for container size, we focus on the one-gallon and half-gallon milk which are the most popular container sizes on the market. The number of outlets is the number of retailers that sell product *j* in a market *m,* which represents the availability and easiness to access for a brand. For example, if a milk brand is only sold in *Price Chopper* and *Stop & Shop* in a market, then the number of retail outlet of product *j* in market *m* is 2. $Local_{jm}$ and $National_{jm}$ are dummy variables indicating the brand type of product *j* in market *m*. Private label brands are used as a basis. ξ_{jm} is unobserved product characteristics and ε_{ijm} is a stochastic term with zero mean and is distributed independently and identically as a Type I extreme value distribution. Therefore, $\Phi_{1,i}$ and $\Phi_{2,i}$ are our main interest which are consumer-specific taste for local brand products and national brand products compared with private labels.

To capture the heterogeneity of consumer preference, we use individual-specific coefficient in our model. Further, the consumer-specific taste parameters are decomposed into observed consumer characteristics (D_i) and unobserved consumer characteristics (v_i). We use household income to capture the observable consumer characteristic. The unobservable consumer characteristics are assumed to have a standard multivariate normal distribution:

$$\begin{aligned} \alpha_i &= \alpha + \lambda D_i + \gamma v_i \\ \Phi_{1,i} &= \Phi_1 + \varphi D_i + \rho v_i \\ \Phi_{2,i} &= \Phi_2 + \tau D_i + \pi v_i \end{aligned}$$

Then the indirect utility can be decomposed into three parts written as

$$U_{ijm} = \delta_{jm} + \mu_{ijm} + \varepsilon_{ijm}$$

where (1) δ_{jm} is the mean utility term and $\delta_{jm} = \alpha p_{jm} + \beta x_j + \Phi_1 Local_{jm} + \Phi_2 National_{jm} + \xi_{jm}$, which is common to all consumes. (2) μ_{ijm} is a brand-specific and consumer-specific deviation from the mean and $\mu_{ijm} = \lambda D_i p_{jm} + \gamma v_i p_{jm} + \varphi D_i Local_{jm} + \rho v_i Local_{jm} + \tau D_i National_{jm} + \pi v_i National_{jm}$, which is the interaction between consumer and product characteristics. (3) ε_{ijm} is the stochastic term with zero mean and is distributed independently and identically as a Type I extreme value distribution.

Therefore, the probability that consumer *i* choose product *j* in market *m* is

$$s_{ijm} = \frac{\exp(\delta_{jm} + \mu_{ijm})}{1 + \sum_{r=1}^{J} \exp(\delta_{rm} + \mu_{irm})}$$

Aggregated over consumers, the market share of product *j* in market *m* is corresponding to the probability product *j* is chosen in market *m* which is approximated[1] as

[1] See Nevo (2000)

$$s_{jm} = \frac{1}{ns}\sum_{i=1}^{ns}\frac{\exp(\delta_{jm} + \mu_{ijm})}{1 + \sum_{r=1}^{J}\exp(\delta_{rm} + \mu_{irm})}$$

Following BLP, we matched the predicted market share with observed shares and solve the model using the generalized moment method. The estimated coefficients can reveal the consumer's preferences towards the local brand milk.

Objective D: To simulate and assess the effects of alternative marketing practices, including pricing, packaging, store promotion, social media usage, and horizontal brand extension on the market shares of local milk brands.

Based on the methodology and results from Objective C, we were able to simulate alternative marketing practices to understand how consumer preference might change given varying parameters.

Results

Objective A: To identify consumer segments that would be more likely to buy local brand milk and develop a profile of those segments using attitudes, purchases, preferences, and demographic characteristics.

Our hypothesis was that there are demographic and attitudinal differences between consumers who prefer to purchase local brand milk compared to consumers who prefer to purchase national brand milk. Within the Northeast, we found three consumer segments, of which two had a higher propensity to purchase local (state brand) milk with those segments also preferring regional (New England) milk compared to any other production location (Table 1). The willingness pay values from the online survey are potentially biased due to the hypothetical nature of the experiment, but we find a segment willing to pay $0.94 for local labeled milk with the other segment paying between $0.14. Of interest, we find that younger, higher educated and non-Caucasian consumers preferred local milk more than the intermediary ($0.14 WTP) segment. Furthermore, we find that:

- Consumers who are most price sensitive are less concerned about animal welfare and environmental attributes.
- Consumers more likely to prefer locally or regionally branded products are also more likely to be concerned about animal welfare and environmental issues. These are younger and higher educated consumers who have children.
- Understanding the impact of animal welfare and environmental concerns in the market is important, however, we need to recognize that externalities exist from these issues where non-milk consumers may experience further disutility that is not captured by studies focused on milk consumers.

Table 1: Latent Class Results for the Online Survey.

	Class 1		Class2		Class 3	
Attribute	**coeff.**	**std. err.**	**coeff.**	**std. err.**	**coeff.**	**std. err.**
Price	**-0.784**	0.063	**-0.312**	0.018	**-1.004**	0.024
Reduced Fat	**-1.808**	0.173	**0.451**	0.049	**1.397**	0.089
Low Fat	**-2.508**	0.272	**-0.216**	0.044	**2.540**	0.088
Skim Milk	**-3.550**	0.306	**-1.425**	0.069	**2.183**	0.080
Organic	**0.407**	0.155	**0.450**	0.042	**-0.097**	0.048
Antibiotics free	0.224	0.174	-0.001	0.045	**-0.097**	0.048
rBGH/rBST free	0.214	0.150	**0.487**	0.069	**-0.306**	0.065
non-GMO	-0.172	0.148	0.028	0.049	**-0.362**	0.052
HACCP	-0.089	0.149	**0.146**	0.049	**-0.116**	0.058
Hormone free	-0.187	0.183	**0.240**	0.053	**0.597**	0.064
Local	0.141	0.134	**0.294**	0.054	**0.143**	0.076
New England	0.201	0.126	**0.358**	0.056	**0.177**	0.073
No Option	**-2.417**	0.306	**-2.743**	0.115	**-2.397**	0.081
Class Probabilities	0.261		0.305		0.434	
Statistically signfiicant coefficients in bold.						

Class Probability Model						
	Class 1		Class2		Class 3	
Variable	**coeff.**	**std. err.**	**coeff.**	**std. err.**	**coeff.**	**std. err.**
Constant	**#####**	0.584	0.022	0.533	-	
Age	**0.014**	0.006	**#####**	0.006	-	
Male	0.172	0.217	0.299	0.193	-	
White	#####	0.392	**#####**	0.319	-	
Primary Shopper	#####	0.243	0.232	0.238	-	
MA	#####	0.239	#####	0.234	-	
NH	0.096	0.341	0.097	0.342	-	
RI	0.203	0.338	0.289	0.327	-	
ME	#####	0.357	#####	0.344	-	
VT	0.417	0.331	0.227	0.333	-	
Income	**0.001**	0.001	0.000	0.000	-	
Graduate	**1.092**	0.317	**0.573**	0.311	-	
College	**1.024**	0.289	**0.954**	0.270	-	
Bachelor	0.244	0.302	**0.455**	0.267	-	
# of Kids drinking milk	**#####**	0.001	**0.220**	0.103	-	
Animal Welfare	**#####**	0.000	**#####**	0.000	-	
Statistically signfiicant coefficients in bold.						

	Willingness to Pay		
Attribute	**Class 1**	**Class 2**	**Class 3**
Reduced Fat	**-2.31**	**1.45**	**1.39**
Low Fat	**-3.20**	**-0.69**	**2.53**
Skim Milk	**-4.53**	**-4.57**	**2.17**
Organic	**0.52**	**1.44**	**-0.10**
Antibiotics free	0.29	0.00	**-0.10**
rBGH/rBST free	0.27	**1.56**	**-0.30**
non-GMO	-0.22	0.09	**-0.36**
HACCP	-0.11	**0.47**	**-0.12**
Hormone free	-0.24	**0.77**	**0.59**
Local	0.18	**0.94**	**0.14**
New England	0.26	**1.15**	**0.18**
No Option	**-3.08**	**-8.79**	**-2.39**

Objective B: To determine consumers' willingness to pay for local brand milk through the use of experimental auctions.

As noted above, the auction was utilized to get a more accurate understanding of local WTP as well as the impact of providing local information on WTP for local. Compared with private label milk, consumers are willing to pay $0.45 more for local brand milk and $0.30 more of regional brand milk (Table 2). On average, additional information on local milk does not affect consumers' WTP. Further, we find that the effect of additional information on WTP works differently on organic and conventional shoppers (Table 3). For organic shoppers, additional information on local milk will decrease their WTP to pay for local milk, possibly due to clarity of information. For conventional shoppers, additional information on local milk will lead to higher WTP for local milk.

Table 2. Full Sample Results

Variable	Coef.	Std. Err.	t
CT Brand	0.4549***	0.1159	3.93
New England Brand	0.3023***	0.1160	2.61
National Brand	0.1970*	0.1160	1.70
Treatment * CT Brand	0.0289	0.1197	0.24
Treatment * New England Brand	0.0703	0.1200	0.59
Treatment * National Brand	-0.0422	0.1201	-0.35
Treatment * Private Label	-0.0101	0.1204	-0.08
1% Milk	0.1342	0.0834	1.61
2% milk	0.1277	0.0834	1.53
Whole Milk	0.2945***	0.0833	3.53
Plastic	-0.0446	0.0588	-0.76

Income	0.0023***	0.0006	3.86
BMI	-0.0230***	0.0059	-3.88
Age	-0.0113***	0.0025	-4.47
White	-0.3456***	0.0905	-3.82
Female	-0.0554	0.0625	-0.89
No. of Adults	-0.1315***	0.0429	-3.06
No. of Adult Milk Drinkers	0.2065***	0.0456	4.53
No. of Kids	0.1025***	0.0165	6.23
No. of Kid Milk Drinker	0.0468	0.0311	1.50
Some College	0.2623***	0.1191	2.20
Undergraduate	-0.0029	0.1149	-0.03
Graduate	0.4721***	0.1131	4.17
Constant	2.2542***	0.2259	9.98

Table 3. Estimation Results by Group

Variable	Organic Shopper			Conventional Shopper		
	Coef.	Std. Err.	t	Coef.	Std. Err.	t
CT Brand	0.5404***	0.1641	3.29	0.3823***	0.1491	2.56
New England Brand	0.3913***	0.1642	2.38	0.2263	0.1493	1.52
National Brand	0.2285	0.1644	1.39	0.1687	0.1493	1.13
Treatment * CT Brand	-0.3841***	0.1776	-2.16	0.2769***	0.1513	1.83
Treatment * New England Brand	-0.2900	0.1777	-1.63	0.2895***	0.1519	1.91
Treatment * National Brand	-0.4120***	0.1780	-2.32	0.1712	0.1520	1.13
Treatment * Private Label	-0.4651***	0.1782	-2.61	0.2519*	0.1524	1.65
1% Milk	0.0394	0.1223	0.32	0.2027***	0.1042	1.94
2% milk	0.0743	0.1223	0.61	0.1609	0.1043	1.54
Whole Milk	0.3419***	0.1220	2.80	0.2570***	0.1044	2.46
Plastic	-0.0939	0.0863	-1.09	-0.0089	0.0736	-0.12
Income	0.0014	0.0010	1.35	0.0022***	0.0007	2.89
BMI	-0.0439***	0.0100	-4.38	-0.0054	0.0071	-0.76
Age	-0.0270***	0.0044	-6.09	-0.0010	0.0030	-0.32
White	0.0815	0.1543	0.53	-0.4657***	0.1147	-4.06
Female	0.4632***	0.0964	4.80	-0.2367***	0.0813	-2.91
No. of Adults	-0.3252***	0.0632	-5.14	0.0151	0.0576	0.26

No. of Adult Milk Drinkers	0.1759***	0.0740	2.38	0.1703***	0.0574	2.97
No. of Kids	0.0048*	0.0277	1.70	0.1166***	0.0204	5.70
No. of Kid Milk Drinker	0.3049***	0.0536	5.69	-0.0499	0.0375	-1.33
Some College	0.8423***	0.2017	4.18	0.0250	0.1469	0.17
Undergraduate	-0.4181***	0.1784	-2.34	0.2081	0.1451	1.43
Graduate	0.5412***	0.1715	3.16	0.3445***	0.1468	2.35
Constant	3.7066***	0.3760	9.86	1.1773***	0.2813	4.18

Objective C: To analyze consumer demand and estimate the effects of nutritional factors, prices, packaging, store promotions, social media, distribution channel, and complementary product offering on consumers' choices of local milk.

We find that price negatively affects consumers mean utility and it does not show significant heterogeneity among consumers (Table 4). The local feature negatively influences the consumers' mean utility compared with private labels and the negative impact diminishes with higher income for the corresponding consumer-specific tastes. As for the fat content, consumers significantly prefer more whole milk and 1% milk than 2% but less fat free milk than 2% on average. In terms of package size, one gallon is significantly preferable than half gallon for most consumers. The number of outlets positively affects the consumer demand.

Table 4. Demand estimation Results.

	Mean Preference		Deviations			
	Mean	Std.Err	Income	Std.Err	Unobservable	Std.Err
Constant	-11.239***	(0.058)	2.881***	(0.197)	1.048	(0.510)
Price	-34.812***	(1.397)	1.043	(0.872)	0.014	(29.634)
Local	-3.793***	(0.026)	0.629**	(0.292)	0.269	(2.827)
National	-4.289***	(0.019)	0.876***	(0.256)	-2.329***	(0.326)
Whole Milk	0.284***	(0.024)				
Fat free Milk	-0.187***	(0.023)				
1%	0.309***	(0.023)				
Gallon Size	0.687***	(0.023)				
# of Retail Outlets	0.494***	(0.004)				

Objective D: To simulate and assess the effects of alternative marketing practices, including pricing, packaging, store promotion, social media usage, and horizontal brand extension on the market shares of local milk brands.

Price cutting, 1-gallon offering and outlet expansion marketing strategies can all boost consumers' consumption for local milk (Table 5). However, the effect of price cutting is less efficient than the other two with smaller market share changes. Moreover, different local brands show heterogeneous market demand reactions to these marketing strategies, especially for 1-gallon offering practice. These findings suggest that even though the most obvious problem faced by local milk is priced much higher by retailers than private label, direct price cut does not solve the issue

efficiently as expected. Instead, alternative strategies have greater impact on the local milk consumption and are important for local dairies to be competitive in fluid milk market.

Table 5. Simulation Results of Alternative Marketing Strategies

	Percentage Change in Sales		
	Simulation 1: 10% Price Cut (%)	Simulation 2: 1-gallon Offering (%)	Simulation 3: Sold by One More Retailer (%)
Local Milk	12.95	71.37	61.93
Private Label Milk	-0.05	-0.27	-0.23
National Brand Milk	-0.03	-0.19	-0.17

SUMMARY OF RESULTS, CONCLUSIONS, AND LESSONS LEARNED

Local branding of milk in the Northeast provides a unique opportunity for producers to capture price premiums or increasing demand. However, an average consumer will pay only $0.45 more for a half-gallon of local milk. All consumers will not pay this premium so producers need to thoroughly understand their market before charging a price premium. Furthermore, we see that information about the benefits of local will have no effect on average and a negative effect for some consumers, notably those that purchase organic products. Conventional shoppers are more likely to be swayed by local information. Finally, local milk producers need to examine alternative strategies to increase their demand and sales. A 10% price cut would generate 13% more sales, while offering a 1-gallon container or having product in more than one retail outlet would increase sales by 71% and 62%, respectively.

CURRENT OR FUTURE BENEFITS TO BE DERIVED FROM THE PROJECT

The team has a large data set from which we anticipate multiple manuscripts to be created and published. We strongly believe this investigation will be among the first studies published about the impact of providing local information on WTP and how alternative marketing strategies could increase local milk sales. Next steps will be to more fully analyze this data set before seeking additional grant funding to further examine the impact of local information on varying products.

Manuscripts in preparation:

Liu, Y., A.N. Rabinowitz, X. Chen,* and B. Campbell "The Consumer Premium for Locally Branded Milk and the Value of Informational Campaigns."

Liu, Y., A.N. Rabinowitz, X. Chen,* and B. Campbell. "Demand for Niche Local Brands in the Fluid Milk Sector."

Presentations Delivered:

Campbell, B.L., A.N. Rabinowitz, Y. Liu, and Q. Yu*. 2016. "Perception of Fluid Milk Production Practices on Animal Welfare and Environmental Attribute Willingness to Pay."

Agricultural and Applied Economics Association (AAEA): July 31-Aug. 2. Invited Track Session: Using Experimental Economics to Offer.

Liu, Y., A.N. Rabinowitz, X. Chen,* and B. Campbell. 2016. "Demand for Niche Local Brands in the Fluid Milk Sector." Agricultural and Applied Economics Association (AAEA): July 31-Aug. 2.

Contact Person:
Dr. Ben Campbell, Assistant Professor
University of Georgia, Department of Agricultural and Applied Economics
706-542-0852, ben.campbell@uga.edu

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