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Factors Influencing the Probability that Consumers Will Purchase Local and Organic Dairy Products

Caleb Edward Orr
Clemson University, caleborr95@gmail.com

FACTORS INFLUENCING THE PROBABILITY THAT CONSUMERS WILL PURCHASE LOCAL AND ORGANIC DAIRY PRODUCTS

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Caleb Edward Orr
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Dr. Lisha Zhang, Committee Chair
Dr. Michael Vassalos
Dr. Nathan Smith

ABSTRACT

U.S. consumption of dairy products is trending upward, however, per capita consumption of fluid milk has decreased (USDA, 2017). By contrast, organic milk and other milk produced in non-conventional ways have experienced significant growth (AMS, 2017). By examining the preferences of specific consumer groups, dairy producers can make production decisions that better fit consumers' needs, which can in turn lead to a more efficient market for fluid milk in the U.S.

This thesis seeks to identify factors that can influence consumers' decision to purchase organic and local fluid milk. The data is obtained from a 2015 nationwide online survey of U.S. consumers, in which participants were asked to evaluate their preferences toward different milk attributes.

Results of Probit model for organic milk consumers indicate that younger males, that are members of a fitness club, and find nutrition to be important, have the highest probability of purchase. Additionally, non-conventional factors of production, for example organic and non-GMO are also important to organic milk consumers. Results from a Tobit model for local milk consumers also find younger males that are fitness members to have a high probability of purchasing local milk, but also the presence of children in the household increases this probability. It was also found that local and brand were extremely important to local consumers, suggesting that they buy local for the connection or experience to help their local economy.

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TABLE OF CONTENTS

Table of Contents (Continued)

LIST OF TABLES

LIST OF FIGURES

I. Introduction

In the U.S., the dairy industry is a crucial contributor to the economy through fluid milk production, dairy products, and impact on secondary industries. Per the USDA in 2017, cash receipts from milk production totaled $37.9 billion. This ranks the milk market fourth, behind cattle ($66.5 billion), corn ($46.4 billion), and soybeans ($38.7 billion) among individual agriculture commodities cash receipts from production (USDA, 2017). Despite its importance for the U.S. economy, the per capita consumption of fluid milk over the last forty years has been declining. Per capita consumption in 1975, was reported to be 247 pounds per person, and that trended downward to 149 pounds per person, an almost 39.7% reduction (ERS, 2018) (Figure 1). However, per capita consumption (demand) of all dairy products increased from 564 pounds per person to 643 pounds per person, a 14% increase in per capita consumption during the same period (ERS, 2018) (Figure 2).

To combat the falling consumption of fluid milk in the U.S., dairy producers implemented specialization into their farms. There two main types of milk conventional and non-conventional. Conventional milk is abundant and sold in every grocery store, convenience store, and gas station. Non-conventional milk however, are the specialty milks, for example organic, local, non-GMO, rBST-free, and others. Conventional milk has always dominated the market of fluid milk in the U.S. and around the world, but non-conventional options have started to become more attractive. This was the result of an attempt by dairy producers to differentiate their products, and consumers becoming more curious and conscious about what is in their food. Organic and local milk are the two most

prevalent milks among all non-conventional milks, therefore they were chosen for the focus of this thesis.

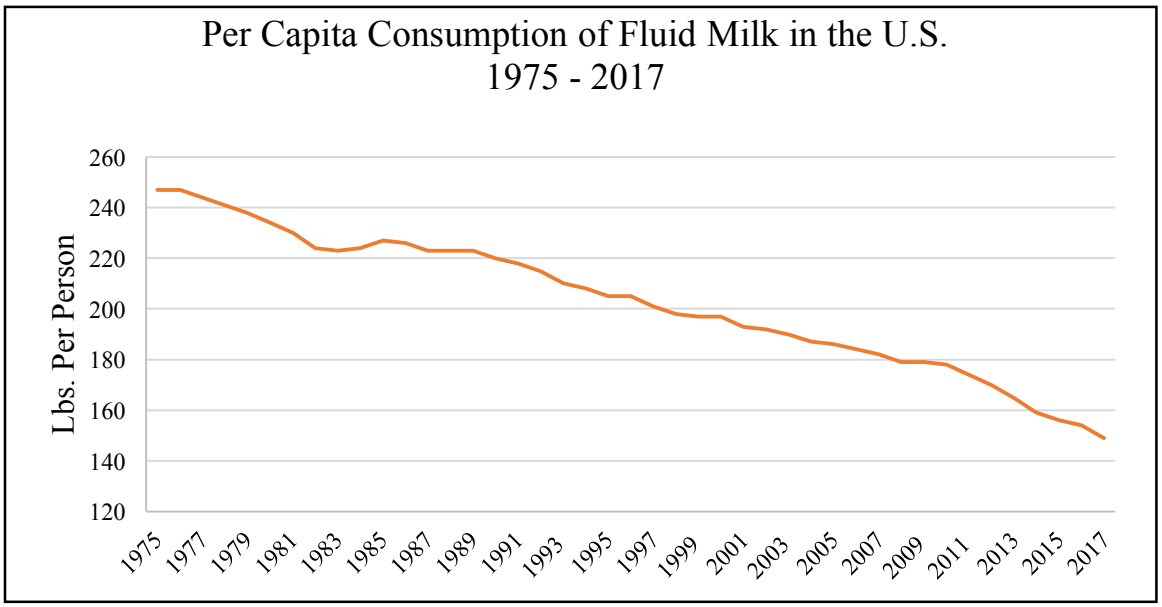

Figure 1: Per Capita Consumption of Fluid Milk in the U.S. from 1975 to 2017
Source: USDA Economic Research Service: "Dairy Products: Per Capita Consumption"

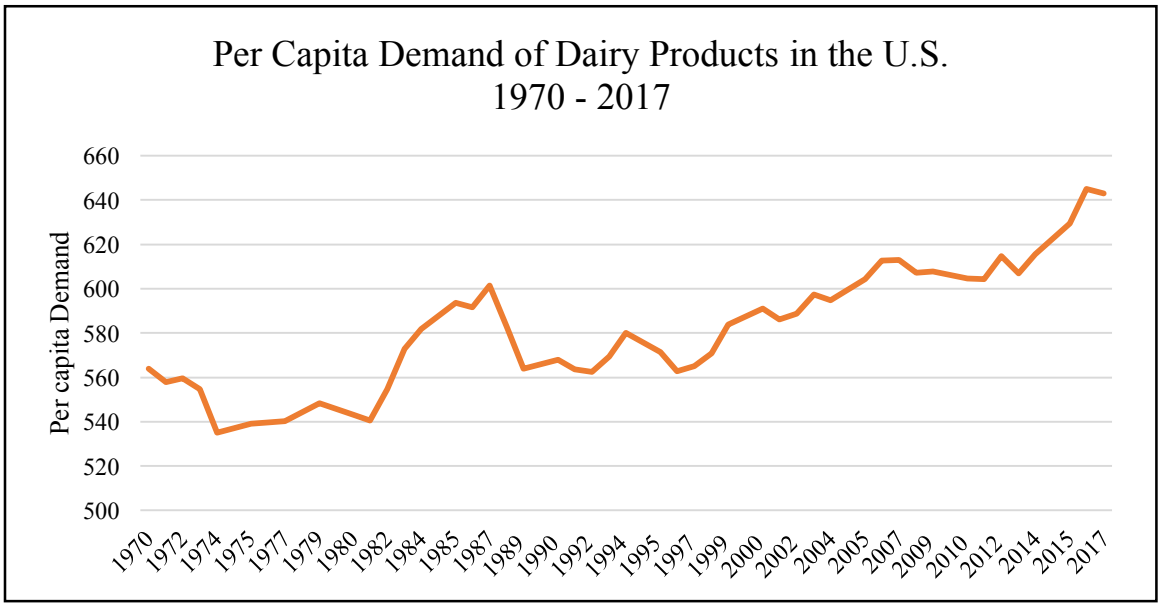

Figure 2: Per Capita Demand of Dairy Products in the U.S. from 1970 to 2017
Source: USDA Economic Research Service: "Milk: Supply and utilization of all dairy products on a milk-fat milk-equivalent basis"

Organic Milk

For organic milk, specifically, the USDA guidelines for Organic Certification of Dairy Livestock have a tremendous number of requirements with which farmers must comply. The National Organic Service (NOS), a department of the USDA, breaks down all aspects of production, living, and feeding of the animals to ensure their certification. A strong focus for organic production is to keep all foreign substances (drugs, hormones, supplements, or antibiotics) from being introduced, directly or indirectly. In addition, to be organic there can be no genetically modified processes. They even go as far as to require organic producers to work with organic packing facilities (NOS, 2013). To be able to use the organic label at least 95% of the product must be from organic ingredients or processes. The NOS requires the information for confirmation purposes, and farmers must keep accurate records about their farms in case any certification questions come to light.

The demand for organic milk has been increasing over the past few decades, and gaining ground in market share versus conventional milk. Per the Organic Milk Market Report for 2017, 1 million more people chose to purchase organic milk than in the previous year, a 15% increase (OMSCO, 2017). Moreover, as it can be seen from Figure 3, organic fluid milk as a percentage of total milk sold has increased over the last 10 years from 1.92% to 4.38% (ERS, 2018). Organic milk is not the only niche of the fluid milk market that is gaining traction in the U.S.

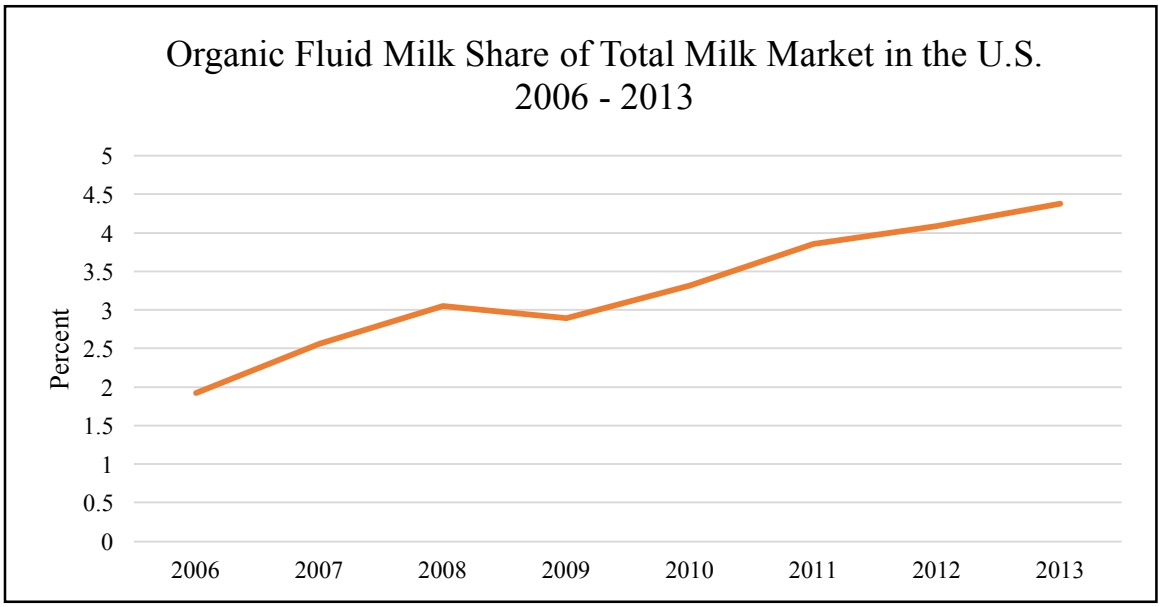

Figure 3: Organic Fluid Milk Share of Total Milk Market in the U.S. from 2006 to 2013
Source: USDA Economic Research Service: "Estimated US Sales of Organic and Total Fluid Milk Products"

Local Milk

Studies suggest that the local produce market has been growing over the past few decades because of a consumer interest in where their food comes from (Loureiro and Hine, 2002; Zepeda and Li, 2006; Smith and Mackinnon, 2007; Zepeda, 2009; Onken, 2010). While there is less research about local dairy specifically, Kovalsky and Lusk (2010), Wolf *et al.* (2011), and Liu *et al.* (2018) claim that the growing trend for all other local foods applies to milk as well.

The USDA defines local food to be produced within 400 miles of where it is sold, however, there is an unclear and undecided definition amongst consumers over what is considered local. In a choice experiment by Wolf *et al.,* (2011), they included local as a variable without a definition. Following the experiment, they asked consumers to interpret the term local (Wolf *et al.*, 2011). The top two responses to the question regarding

proximity to your home to be labeled local food, are "50 miles" and "Within state" (Wolf *et al.,* 2011). Similar results were found by Adams and Adams, (2008), who concluded that 42% of their respondents said local meant within 50 miles of them. Smith and Mackinnon, (2007) used 100 miles as a range of local food when they experimented with the 100-mile local food diet. A year later the Hartman Group, (2008) surveyed consumers and reported that 50% of their respondents chose products within 100 miles as the best definition for local products.

Other scholars decided to use a tighter proximity. Kovalsky and Lusk (2012) decided not to use the term local, but instead asked geographical proximity questions in an effort not to influence the respondents. The basis for their conclusions were estimated on using within 25 miles of their home, comparing it with over 500 miles away (Kovalsky and Lusk, 2012). In Onken's (2010) thesis participants were asked to state the number of miles' consumers considered to be local, and the mean response was 77.76 miles. This is hypothesized to be because of most respondents choosing between 50 and 100 miles. As seen from the literature, the use of local as a label for food products is most often between 50 and 100 miles, but there is not a concrete definition.

Fluid milk in the U.S. is regionally based for production because of issues with keeping the milk fresh and preventing it from turning sour. However, the local label most often does not reach the milk because most farmers do not have the means to homogenize and pasteurize their own milk. Instead the raw milk is often shipped to large regionally focused processing plants owned by dairy cooperatives (Campbell *et al.* 2016). Once bottled at the plant, the milk is labeled with national brands, private labels, store brands,

and local brands (Campbell *et al*. 2016). Liu *et al.* (2018) estimated that 90% of the milk in the northeast region of the U.S. is processed through two large cooperative plants. The remaining 10% is local farms making their best effort at building their brand and creating a farm to consumer connection (Liu *et al.,* 2018). This locally branded milk is priced higher because of economies of scale disadvantage the small farm has when competing with the large cooperatives.

Liu *et al. (2018)* hypothesize that consumers relate proximity to "local"*, and* conclude that compared to private labeled milk, "consumers generally prefer not to purchase local milk". They argue that this negative significant result is attributed to the higher price and unavailability of local milk to be bottled in gallon bottles (Liu *et al.,* 2018).

Objectives of Thesis

This thesis aims to identify the factors that are influencing consumer purchasing behavior for local and organic milk, the most important non-conventional milk. The purpose of identifying the factors that influence consumer purchasing decisions, is to assist dairy producers to make informed decisions for differentiating their milk. Producers will be able to use this information for production, target marketing, and other decisions within their business to hopefully increase their profitability by selling non-conventional milk at a premium. Local and organic milks were chosen because they are the two most common types of non-conventional milk available.

The primary goal of identifying the factors that influence consumer purchasing decisions was to be able to estimate a probability that the consumers will purchase local (coded as dummy variables 1 = purchase local milk and 0 = does not purchase local milk)

or organic milk (coded as dummy variables 1 = purchase organic milk and 0 = does not purchase organic milk). Due to the difference in the distributions of the two response variables, two different models were used for estimation. The first model is a Probit model, used to estimate for the organic model. The Probit model is a logistic regression bounded between 0 and 1, giving an accurate estimate of probabilities when the distribution is approximately normal. A Tobit model was used to estimate the local model for similar reasons to the Probit, except the Tobit model is a censored model, used to capture distributions that have many of one observation, resulting in a skewness of data, which result from the majority of respondents being 0. The marginal effects are obtained to allow for an interpretation of magnitude.

The data for this analysis was collected from and online survey of U.S. consumers distributed in 2015. Consumers were asked about the importance of certain factors when purchasing local or organic milk. The final sample includes 681 observations. The data is comprised of four main types of variables: i) demographic, ii) lifestyle, iii) intangible attributes of milk, and iv) tangible attributes of milk.

This thesis is organized as follows; the next section reports the previous literature of local and organic food, a description of the survey and data is presented in the third section, followed by a theoretical discussion of the two models. The estimation of the coefficients and marginal effects is reported in the results section. The thesis concludes with recommendations to the industry, future work, and potential limitations.

II. Literature Review

Research into local and organic food products has been growing in the literature over the past decades because of social movements. Most of the relevant literature about local and organic foods pertain to produce, but there are few papers using organic or local milk as the focal point. Eastwood *et al.* (1987), Brown (2003), Loureiro and Hine (2002), Wolf *et al.* (2005), Adams and Adams (2008), and Onken (2010) all focus on local produce using regional data to identify important attributes to consumers. A willingness to pay (WTP) study was modeled on local produce in Adams and Adams (2008) and Onken (2010). Local produce consumer demand can also be found by Zepeda and Lin (2006) and Zepeda (2009), and they analyzed U.S. consumers. Wolf *et al.* (2011), Liu *et al.* (2016), and Liu *et al.* (2018) talk about the consumer demand for locally produced milk, but only Wolf used U.S. data. Kovalsky and Lusk (2012), modeled a WTP for that locally branded fluid milk using regional data.

Some of the literature examines the demand and consumer preferences for local and organic fluid milk, while others focus solely on WTP. The papers focusing only on consumer demand often include different demographic and lifestyle variables to test significance in buying behavior. Lifestyle variables are meant to provide additional insight to understanding consumer buying habits. Income is the most common demographic variable to include in a model. Liu et al. (2016) determined in their analysis that income did not have a significant effect on the value consumers put on local milk. However, Liu et al. (2018) determined that income in fact does have a positive significant effect on the probability that consumers will pay a premium for local milk. Similar results regarding

income having a positive significant sign and WTP were found in relevant literature focusing on organic milk (Smith et al., 2009). Smith et al. (2009), also estimated that children being in the household led to consumers paying a slight premium, but a strong likelihood to purchase organic milk. Age was negative and significant, meaning that as a person gained in age their likelihood of purchasing organic milk was decreasing by a significant margin (Smith et al., 2009). Additionally, education was found in their paper to have no significant effect on organic milk purchase (Smith et al., 2009). By contrast, Glaser and Thompson (2000) and Wolf et al. (2011) did not include demographic variables in their analysis of organic and local milk respectively. Furthermore, lifestyle attributes of consumers have not been included in relevant literature, leaving room for further investigation. These lifestyle variables can include but are not limited to veganism or fitness memberships.

Much of the literature focuses on tangible and intangible attributes of milk that affect purchasing local and organic milk. Tangible attributes refer to what the consumer can directly observe when purchasing milk, for example price, taste, etc. Intangible attributes of milk are traits that are not directly observable, for example, organic, local, non-GMO. Price under all relevant circumstances was estimated to have a negative coefficient (Smith et al., 2009; Kovalsky and Lusk, 2012; Liu et al., 2016; Liu et al., 2018). This means that price has an inverse relationship with purchasing decisions as well as WTP estimates for both local and organic milk.

Container size (private vs. non-branded) of milk was among popular variables found significant. Liu et al. (2016) and Liu et al., (2018) estimated that consumers preferred

to purchase milk in gallon containers and preferred whole milk to skim milk. This is interesting because of the possible inflated premiums associated with local and organic milk due to the nature of its packaging. Most often they are packaged in half gallon sizes. Smith et al. (2009) supported the previous claim about consumers preferring gallon over half gallon, but disputed that consumers preferred whole organic milk. They instead stated that consumers who purchase organic milk are largely more conscious about their health leading them to prefer the low-fat milk (Smith et al., 2009).

Branding of milk was popular in relevant literature. There was a consensus that consumers preferred a recognizable private brand compared with an unrecognizable brand. Liu et al. (2016) and Liu et al. (2018) found that consumers preferred to purchase a private brand than a local brand. Furthermore, it was estimated that USDA labels and private brands had positive premiums for purchase by Wolf et al. (2011). Smith et al. (2009) estimated premiums to exist between branded and unbranded milk. For conventional milk, he concluded that there is a 15% premium that consumers are WTP when the milk is branded. A larger result of 26% was estimated for branded versus unbranded organic milk (Smith et al., 2009). Kovalsky and Lusk (2012) supported branding to have a positive and significant effect on the WTP of organic and local fluid milk. However, the literature is lacking evidence about nutrient information influencing local and organic consumer buying for milk.

In addition to tangible attributes, intangible attributes play a role in consumer buying behavior for organic and local milk. Intangible attributes differ from tangible attributes because they cannot be directly observed. The consumer cannot use one of their

senses to formulate an opinion regarding fluid milk. Personal goals, environmental impact, fair trade, animal welfare, GMO-free, organic, local, etc., are all examples of intangible attributes. It is often the case where one attribute is both intangible and tangible. For example, a gallon of milk can be labeled organically or locally produced; the physical label is inherently tangible, but organic and local farming practices are intangible. The consumer cannot directly observe this practice. Organically and locally produced milk are estimated as intangible attributes in relevant literature. Liu et al. (2016) and Liu et al. (2018) both estimated, given the price premium local fluid milk commands in the market, that consumers prefer not to purchase local milk compared to private. When they simulated reducing the price premium by 10%, the demand for local increased significantly (Liu et al., 2016; Liu et al., 2018).

WTP estimates have been conducted in relevant literature for premiums and monetary magnitudes. Kovalsky and Lusk (2012) estimated that consumers are WTP $1.55 per gallon extra for locally produced fluid milk 25 miles or less from the grocery store. Additionally, Wolf et al. (2011) estimated that local milk combined with moderate grazing commands a 10% premium. This is consistent with the previous WTP estimate when compared with the average price of milk per gallon used. Wolf et al. (2011) also estimated that consumers are WTP $1.00 per half gallon for milk that is produced rBST-free. Aside from local, organic milk also drives for a higher price premium. Smith et al. (2009) estimated that organically produced fluid milk is largely significant for a premium above conventionally produced milk. This leaves a gap in the literature regarding a magnitude

WTP for organic fluid milk. Another gap is the possible GMO-free influence that could be affecting consumer buying behavior in the organic and local milk market.

Choice experiments were conducted in four cases dealing with local and organic milk (Wolf et al., 2011; Kovalsky and Lusk, 2012; Liu et al., 2016; Liu et al., 2018). Wolf et al. (2011), estimated the demand for local milk in the U.S. against conventional milk by surveying consumers to rank milk production attributes. Kovalsky and Lusk (2012) used a similar approach on production attributes, but included WTP premiums for local and organic milk to encompass a more dynamic model. Random discrete choice models were implemented to estimate the demand and issues associated with local milk as a niche market in Liu et al. (2016) and Liu et al. (2018).

Stated preferences are a common approach for economic evaluation, but also may introduce "potential bias in the response due to the hypothetical market" (Daly et al., 2012). Instead of using stated preferences, Smith et al. (2009) implemented revealed preferences to estimate local milk demand through a hedonic price function. The hedonic price function creates an indirect utility for given factors to estimate demand (Smith et al., 2009). Glaser and Thompson (2000) had a different approach when estimating organic demand. They used a non-linear almost-ideal demand system, AIDS (Glaser and Thompson (2000). The AIDS system models the expenditure share on a product, in this case, organic milk, and is then used to estimate the demand (Glaser and Thompson, 2000).

III. Data Collection

A nationwide online survey was distributed in 2015, to household consumers in the U.S. The survey was dedicated to two different topics, milk and strawberries. This thesis

uses only the milk questions for the analysis. Two screening questions were included at the beginning of the survey to ensure that the data only contained relevant responses. The first was Q5 that asked respondents if they were the primary shopper and if they did no say yes they were skipped to the end of the survey. The second screening was Q8, if they purchased milk in the past 6 months, and similarly if they did not respond yes they were removed. Both of these questions are found in the appendix. Initially, there were 2,263 responses recorded. To determine if a respondent accurately read the questions, this survey asked respondents in a trap question to select "C", *(see appendix for Q83).* This resulted in 1,441 responses being removed because of incorrectly selected answers. Question 51_1 and 51_7 asked respondents approximately how many dollars were spent on organic and local food products respectively in their weekly grocery expenditure. Question 82 asked how much was their total weekly expenditure for all food was. If the respondent selected that they were unsure of the dollar amount they spent on either local, organic or total, they were removed. After removing those observations as stated, there were 681 responses used for estimation.

In this study, there are two y-variables (organic consumers and local consumers) that were analyzed independently. Respondents were asked in Q61_3 and Q62_3, about the percentage of dairy products purchased were organic or from a farmer's market respectively, (*see appendix).* If they selected any positive percentage for purchasing organic or local products, they were counted as their respective consumer groups. The breakdown of respondents placed in each category is shown in Figure 4. The largest group represented in the sample was from the individuals that have purchased both organic and

local dairy products in the last 6 months. This group makes up 38% of our 681 observations. Furthermore, Figure 4 indicates that 31% of individuals that took the survey neither purchase local nor organic dairy products and it can be inferred that these individuals are the conventional consumers. Of the 681 respondents in the survey, 188 (28%) individuals purchased only organic food and 19 (3%) purchased only local food. This large difference is hypothesized to be due to the larger array of access that organic consumers have outside of a local setting. An interesting relationship between the local and organic consumers is the number of individuals that buy the other type of dairy products. This relationship in shown in Figure 5. While 93% of local consumers also buy organic dairy products, only 58% of organic consumers purchase local products.

An in-depth breakdown of the summary statistics for the demographic and lifestyle variables is reported in Table 1. There are interesting trends regarding the demographic and lifestyle variables in Table 1 that should be mentioned. Firstly, the gender profile for local consumers has almost 10% more males than the organic and population data. The entire sample however, is almost identical to the U.S. census gender (approximately 51% females and 49% males. The variable age has a heavily left concentration with a long right-skewed tail for both consumer groups, which differs from the census data. In other words, roughly 60% of the respondents were between the ages of 18 and 35, afterward the number of respondents dropped significantly and tapered down. The population indicates age is more evenly distributed, with a slight peak around 50 years of age.

The distribution for income is more bell-shaped with the highest bracket being $50,000 to $74,999 across the sample and population. The only exception is to the bell

shape is in the lowest income bracket (less than $14,999). There is approximately 12% of individuals in that bracket. It is hypothesized that this large number may correspond with the high percentage of individuals' college aged. Over 38% of respondents stated that they do not have any children living in their household, but around 50% have one or two children. There is a sharp decline for respondents that have three of more children, and no respondents have five or more in this sample. There is no census data found for the number of children in the household. Amongst both consumption groups approximately 11 to 12% claim to be either vegetarian or vegan. Furthermore, fitness membership stands out, because 50% of respondents claim to be members for local dairy consumers, and 41% claim to be members for organic consumers. Overall, the sample of all respondents that are fitness members is lower at 32%.

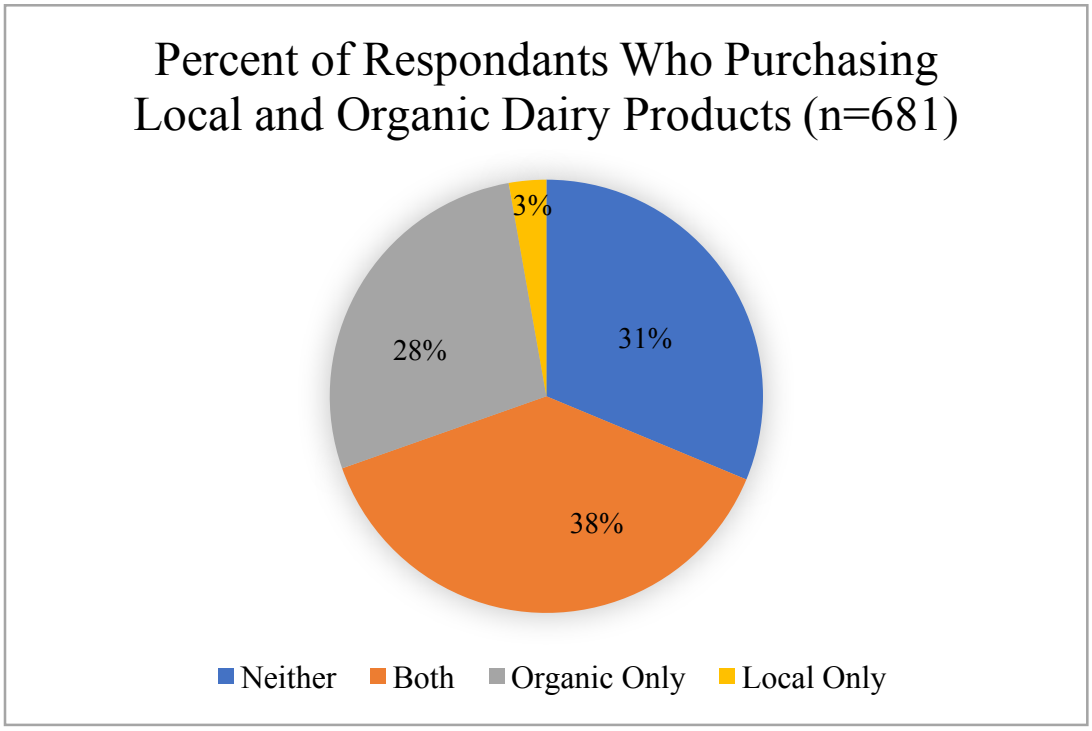

Figure 4: Percent of Respondents Who Purchase Local and Organic Dairy Products

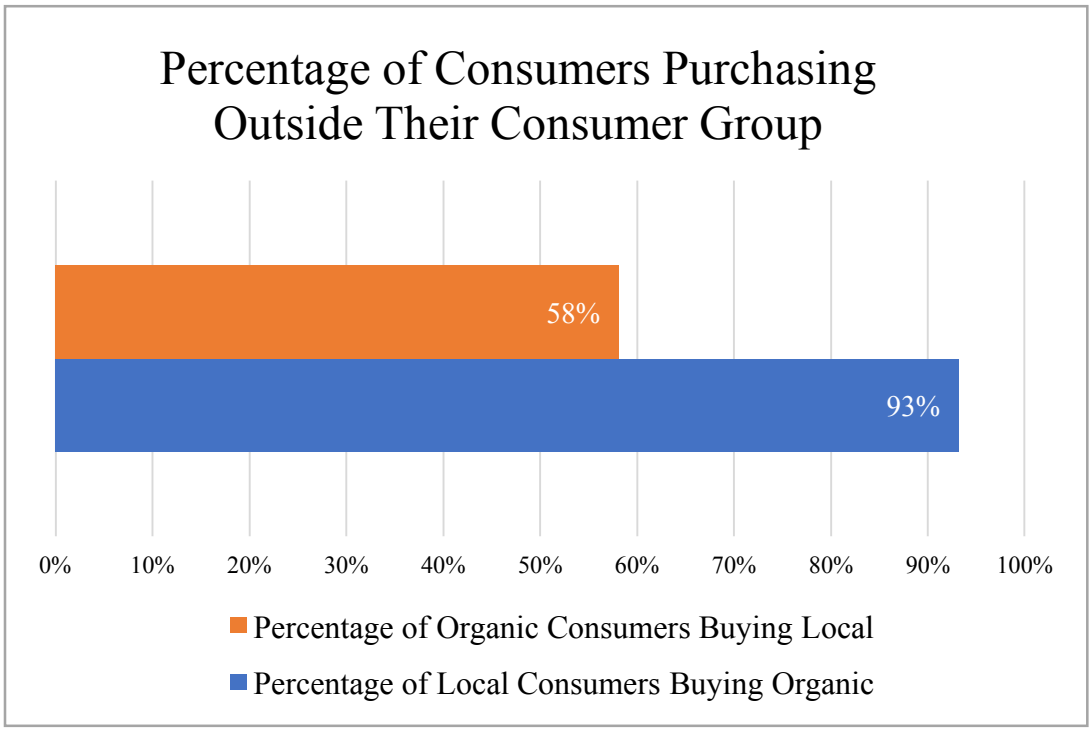

Figure 5: Percentage of Consumers Purchasing Outside Their Consumer Group

Table 1. Summary Statistic Breakdown for Demographic and Lifestyle Variables

	Local[a]	**Organic**[b]	**Entire Sample**	**U.S. Census**
Variable	n = 280	n = 449	n=681	N ≈ 308M
Gender				
Male	58.93%	50.33%	48.02%	49.16%
Female	41.07%	49.67%	51.98%	50.84%
Age (Years Old)				
18-24	21.79%	22.27%	18.21%	-
25-29	22.86%	19.38%	16.15%	6.83%
30-34	20.36%	16.04%	12.92%	6.47%
35-39	12.86%	9.13%	9.10%	6.54%
40-44	3.93%	3.56%	4.26%	6.77%
45-49	3.57%	5.57%	5.29%	7.36%
50-54	3.93%	4.01%	4.99%	7.22%
55-59	3.57%	7.57%	7.78%	6.37%
60-64	2.86%	4.23%	6.31%	5.45%
65-69	2.50%	4.23%	7.05%	4.03%
70-74	1.07%	2.23%	4.70%	3.01%
75-79	0.71%	1.56%	2.50%	2.37%
Above 80	0.00%	0.22%	0.73%	3.64%
Household Income ($)				
Less than 14,999	12.14%	12.47%	11.60%	10.65%
15,000 – 24,999	7.50%	8.02%	8.22%	9.58%
25,000 – 34,999	9.64%	11.14%	13.51%	9.23%
35,000 – 49,999	13.21%	13.81%	14.39%	12.33%
50,000 – 74,999	20.36%	18.93%	18.94%	16.45%
75,000 – 99,999	17.86%	15.81%	14.83%	12.52%
100,000 – 149,000	12.14%	13.14%	12.19%	14.49%

150,000 – 199,999	4.29%	3.34%	3.38%	7.03%
200,000 or Above	2.86%	3.34%	2.94%	7.74%
# of Children in Household				
No Children	38.21%	45.88%	53.45%	-
1 Child	26.07%	23.39%	20.56%	-
2 Children	23.57%	18.71%	15.71%	-
3 Children	8.93%	8.24%	7.34%	-
4 Children	3.21%	3.56%	2.50%	-
5 or More Children	0.00%	0.22%	0.44%	-
Lifestyle Dummy Variables				
Vegan/ Vegetarian	11.79%	11.14%	7.78%	-
Fitness Member	49.64%	40.53%	32.31%	-

a: "Local" represents the 280 respondents who stated they purchased dairy products from a farmer's market in the last 6 months.

b: "Organic" represents the 449 respondents stated they have purchased organic dairy products in the last 6 months.

The summary statistics for all the variables included in the final model are displayed in Table 2. Demographic variables are important to include to see if there is a pattern that emerges from traits of respondents. Gender was included, and coded 1 for male and 0 for female, and respondents were also asked their age. Dummy variables were created for the lifestyle variables to take the value 1 if the respondent identifies themselves as being either a vegan/vegetarian or a fitness member and if not, the variable takes the value of 0. The binary variable values for all the dummy variables are shown to the right in italics. For the dummy variables, the mean value indicates the percentage of the total number of respondents that are a "1". The last group of variables included in the model pertained to the tangible and intangible attributes for milk itself. All the attributes took on a value from 1 to 5 and corresponded with the importance at the time of purchase, with 1 being not at all important and 5 being very important.

Table 2. Summary Statistics for Variables (n=681)

Variables	Mean	Std. Dev.	Min	Max
Dependent				
Local Consumers *(1 = yes; 0 = no)*	0.411	0.492	0	1
Organic Consumers *(1 = yes; 0 = no)*	0.659	0.474	0	1
Demographics and Lifestyle				
Male *(1 = male; 0 = female)*	0.480	0.500	0	1
Age[a]	5.944	3.478	2	14
Income[b]	4.486	2.105	1	9
# of Children in House[c]	1.862	1.124	1	6
Vegan/ Vegetarian *(1 = yes; 0 = no)*	0.078	0.268	0	1
Fitness Member *(1 = yes; 0 = no)*	0.323	0.468	0	1
Milk Attributes[d]				
Price	4.186	1.011	1	5
Nutrient Content	4.032	1.059	1	5
Brand	3.455	1.220	1	5
Organic	3.001	1.367	1	5
Local	3.147	1.252	1	5
GMO-Free	3.558	1.339	1	5

a: Age brackets; 1 if 17 or below; 2 if 18-24; 3 if 25-29; 4 if 30-34; 5 if 35-39; 6 if 40-44; 7 if 45-49; 8 if 50-54; 9 if 55-59; 10 if 60-64; 11 if 65-69; 12 if 70-74; 13 if 75-79; 14 if 80 or above; all "1's" were dropped from analysis to only include participants 18 years of age and older

b: Annual Household Income: 1 if less than $14,999; 2 if $15,000 – $24,999; 3 if $25,000 – $34,999; 4 if $35,000 – $49,999; 5 if $50,000 – $74,999; 6 if $75,000 – $99,999; 7 if $100,000 – $149,000; 8 if $150,000 – $199,999; 9 if $200,000 or above

c: Number of Children in household: 1 if zero; 2 if 1 child; 3 if 2 children; 4 if 3 children; 5 if 4 children; 6 if 5 or more children

d: Importance when Purchasing for all variables listed under milk attributes; 1 if not at all important; 2 if somewhat unimportant; 3 if neither important or unimportant; 4 if somewhat important; 5 if very important

IV. Econometric Formulation

Probit Model - Organic

The objective for this paper is to model the probabilities of consumers choosing to purchase organic or local milk, based upon specific variables. These variables consist of intangible and tangible attributes of milk, lifestyle, and demographic attributes of consumers. A standard linear probability function is not appropriate to model the relationship between the response and explanatory variables, because the relationship is non-linear and because it is not bounded between 0 and 1. Furthermore, a Probit model was chosen to model the relationship due to the binary nature of the response variable. A Probit model estimates the probability that an event will occur using a normal cumulative density function.[1] The Probit model was used only for the organic model because the normal distribution does not fit the shape of the local consumers due to a right skewness in the distribution. This skewness is a result the majority of respondents stating they do not buy local milk.

Equation (1) below is a general form of the Probit model for organic milk:

$$(1)\quad \bar{A}_{\bar{A}}^{*} = \bar{A}\&\bar{A}_{\bar{A}} + \bar{A}_{\bar{A}}$$

where $\bar{A}_{\bar{A}}^{*}$ is an unobserved measure of the probability of the $\bar{A}$th respondent to purchase organic milk. The dependent variable (y-variable) is a binary variable of whether a consumer purchases organic dairy or not. The variable is assigned 1 if the respondent stated that they do purchase organic dairy products, and assigned 0 for anything else.

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[1] The normal CDF is $\bar{A}(\bar{A}_{\bar{A}}) = \int_{2\,9}^{4_5} \frac{,}{\sqrt{-.\,/0}} e^{2\,(4_5 2\,6)^{/}/-.\,/}$

This relationship is shown below in equation (2). The response variable Ā* is represented with superscript O for organic milk:

$$(2)\ \bar{A}_{i} = \begin{cases} 1\ if\ y_{i}^{*} > 0 \\ 0\ if\ anyĀhing\ else \end{cases}$$

The term Ā is the vector for the observed explanatory variables. The independent variables are comprised of four categories. These four types of variables are demographic, lifestyle, tangible, and intangible. The variable names are italicized and shown in parentheses. The demographic variables chosen for the model are gender (*male*), age (*age*), household income (*income*), and number of children in the household (*hhchildren*). The lifestyle questions included in the model are whether someone is a vegan/vegetarian *(vegan)* and if they are a member of a fitness club *(fitnessmember)*. The attributes of the milk included in the model are price (*price*), nutrient content (*nutrients*), brand (*brand*), organic farming practice (*organic*), local farming practice (*local*), and non-GMO (*gmofree*). It is important to note that all attributes are measured for importance at the time of purchase. These variables were chosen because of comparisons with relevant literature.

The term Ā represents the vector of the coefficients of the independent variables to be estimated. These coefficients are used to assign a numerical effect that the independent variables have on the response, however, only the sign of the Ā coefficients produced by the initial Probit model can be interpreted, not the magnitude. For example, if the coefficient is positive, the variable is said to have a positive effect on the probability of the response variable occurring, and vice versa.

From there, the marginal effect must be obtained to interpret the magnitude of the Ā coefficients. The marginal probability effect for the Probit model can be modeled as:

$$(3)\ \frac{\mathrm{HI}_5^*}{\mathrm{H4}_5} = \bar{\mathrm{A}}(\bar{\mathrm{A}}\&\bar{\mathrm{A}}_{\cdot})\beta'$$

where Ā is the cumulative normal distribution of Ā· and takes a value 0 to 0.4. Additionally, Ā· is the error term and is assumed to be normally distributed. Once the marginal effects are obtained, the magnitude of the coefficients is interpreted for the effect each explanatory variable has on the response. The marginal coefficient can be expressed as a percentage increase (or decrease) that the independent variable has on the probability of the dependent variable being true. For example, in this paper specifically, the marginal coefficient will give a probability that a consumer will purchase either organic or local milk for that single explanatory variable, holding all others constant. All the estimated coefficients and the marginal effects were obtained using Stata version 13.

Tobit Model - Local

The distribution of the respondents that chose to buy local dairy products is different from the group that buy organic, because of the shape of the distribution have many a single observation. In our case, of the 681 observations, 401 respondents stated that they do not purchase local dairy. The Probit model assumes the distribution to be approximately normal, therefore it is not appropriate to model this distribution. Instead a Tobit model is used. A Tobit model is a combination of two models. It uses a Probit model and combines it with a truncated regression model to account for a high number of one observation. Furthermore, the general form equation for the Tobit model is the same as the Probit model, equation (4).

$$(4)\ \bar{A}_{"}^{*} = \bar{A}\&\bar{A}_{"} + \bar{A}_{"}$$

The dependent variable (y-variable) is a binary variable of whether a consumer purchases local milk or not. The variable is assigned 1 if the respondent stated (in Q62_3, *see appendix*) that they do purchase dairy products from a farmer's market (local), and assigned 0 for anything else. The model is censored from below at zero, and that relationship is shown in equation (5) with a superscript L for local.

$$(5)\ \bar{A}_{"}^{L} = \begin{cases} \bar{A}_{"}^{*}\ if\ y_{"}^{*} > 0 \\ 0\ if\ y_{"}^{*} \leq 0 \end{cases}$$

Furthermore, the marginal probability effect for the Tobit model can be modeled by equation (6).

$$(6)\ \frac{\mathrm{HI}_{5}^{*}}{\mathrm{H4}_{5}} = \bar{A}(\underset{\cdot}{\overline{\mathrm{N}^{\mathrm{O}}}}\bar{A}_{"})\beta'$$

V. Results

Probit Model Results – Organic Milk Consumers

The organic milk consumer Probit model estimated coefficients are shown in first column of Table 3. It is important to remember that the magnitude of these coefficients cannot be interpreted, only the value being positive or negative. The marginal effect of the coefficients must be obtained to interpret the magnitude, and those marginal effects are reported in the third column of Table 3. The Probit model results among the demographic explanatory variables in Table 3 indicate that being a male makes you more likely to purchase organic milk, significant at an alpha level of 1%. Additionally, age is strongly significant to have a negative effect for organic milk. In other words, when the age of a consumer increases the probability of them purchasing organic milk decreases. The age coefficient is significant using an alpha of 1%.

Furthermore, the demographic variable for income was not significant. This indicates that the coefficient for income is indistinguishable from 0, meaning that consumers income does not influence the probability of consuming organic milk. This conclusion was made using an alpha of 10%. The last included demographic variable pertains to having children living within the household. It was included to see how the purchasing decisions for consumers are influenced by having children. Children in the household was not significant for organic milk consumers, indicating they did not influence the probability of purchasing organic milk.

As previously stated, lifestyle variables were included to try and capture more variation of human influence on the response that demographics cannot account for. Consumers were asked if they were vegans or vegetarians, and this was found to increase

the probability of purchasing organic milk at the 10% level. This means that if an individual is a vegan or vegetarian then they are more likely to purchase organic milk. The next lifestyle variable included was being a fitness member. This dummy variable shares similar results as the vegan/ vegetarian dummy variable. Consumers that are in a fitness club are more likely to purchase organic milk at a significance of 1%.

Furthermore, the Probit model yielded significant results regarding the attributes of organic. The first attribute looks at the importance of price when deciding to purchase. As the price of milk increases, the probability of organic consumers purchasing this milk decreases, because the coefficient was negative at an alpha level of 1%. This result was hypothesized to be negative because of the inverse relationship price shares with quantity demanded. The explanatory variable for nutrient content resulted in a significant strong positive coefficient to increase the probability of purchasing organic milk at an alpha level of 1%. The organic milk model failed to reject the null hypothesis, concluding its coefficient for brand was indistinguishable from 0 at alpha equal to 10%. This means that brand does not play a role in influencing the probability that an organic consumer will purchase organic milk.

As expected, organic farming practices yielded great statistical importance (alpha equal to 0.1) for respondents that purchase organic milk. The estimated coefficients for local farming practices were estimated to be indistinguishable from 0 for organic milk purchasers. This indicates that local farming practice does not contribute to being more likely to purchase organic milk. Lastly, results were estimated for GMO-free milk; the organic model was estimated to have positive significant coefficients at 1%.

Probit Model Marginal Effects – Organic Milk Consumers

As stated previously the estimated coefficients from the Probit model cannot be interpreted for their magnitude until the marginal effects are obtained. Now in place of a sign, a percentage change in the likelihood of purchase can be stated. The marginal effects of the Probit model calculated are shown in the third column of Table 3. These estimations should follow an identical significance as the coefficients in the first column, however they will provide further analysis to how the explanatory variables effect the response.

First off, the marginal effect for male was estimated, and resulted in a large magnitude for being a male. Per the model, males are 11.9% more likely to purchase organic milk over females. This marginal effect is reported with a significance level of alpha of 1%. Furthermore, as age increases, the likelihood of purchasing organic milk decreases by 2.7% on average. This age variable is significant at an alpha level of 1%. No significant marginal effect was found for income; therefore, it is estimated that income does not directly contribute to whether a consumer purchases organic milk. Furthermore, the number of children in the household yielded no significant marginal effects. This indicates that children being present in the household do not influence the probability of purchasing organic milk.

It is important that lifestyle variables were included in the model, because the demographic variables alone might not capture the entire effect of an individual's purchasing behavior for organic milk. The dummy variable for vegan or vegetarian was significant to influence the probability of organic milk consumption to an alpha level of 10%. If an individual is a vegan or vegetarian, then the probability that they will purchase

organic milk increases by 16% over an individual who is not a vegan or vegetarian. The second lifestyle variable, fitness member, yielded similar effects as the vegan/vegetarian dummy variable. The marginal effect of being a fitness member was strongly significant (alpha equal to .01) to influence the probability of purchasing organic milk. If an organic dairy consumer is a member of a fitness club, then the probability of them purchasing organic milk increases by 9.9% over an individual that is not a fitness member in the same consumer group.

The milk attribute marginal effects were also consistent with the estimated coefficients from the Probit model. Price was negative and significant at the 1% level. Among respondents that find price to be important, the likelihood that they will purchase organic milk decreases by 9.6%. For respondents that purchase organic milk and find nutrient content to be important are 5.6% more likely to purchase organic milk than individuals that do not find nutrient content to be important. The variable brand was not significant for organic milk consumption. Consumers that find brand to be important are not more or less likely to purchase organic milk because of brand. Individuals that deem organic farming to be important are 6.7% more likely to purchase organic milk.

The local farming practice milk attribute is not significant for organic milk consumers at an alpha of 10%. Lastly, GMO-free milk had the opposite marginal results. Individual who deemed GMO-free milk to be important were 3.3% more likely to purchase organic milk. Overall, this model shows that these individuals who decide to purchase organic dairy are heavily concerned with the intangible and tangible attributes of milk.

There are a few unique results that could result in policy changes, or more likely farming practice changes with regards to the consumer purchasing behavior for organic milk. The first conclusion seen from the marginal effects table is that the demographics for younger male individuals are much more likely to purchase organic milk over older females. Furthermore, the vegan and vegetarian market for organic milk producers could be an incredible marketing opportunity, because of a 16% increase in the likelihood of purchase for organic. Similarly, organic milk producers could tap into the fitness member sector to increase their market because of a high increase in the probability of purchase for membership and nutrient content 9.9%. Another important note to look at is the price variable. The magnitude sheds light on consumer behavior. The organic consumers 9.6% decrease in the probability of purchase is concerning for organic producers.

Table 3. Probit Model Result and Marginal Effects for Organic Consumers

VARIABLES	Coefficients		Marginal Effect	
	Coeff.	Std.Error	dy/dx	Std. Error
	(1)	(2)	(3)	(4)
Demographics/Lifestyle				
Male *(1 = male; 0 = female)*	0.497***	0.131	0.119***	0.030
Age[a]	-0.111***	0.020	-0.027***	0.004
Income[b]	0.026	0.031	0.006	0.007
# of Children in House[c]	0.085	0.059	0.020	0.014
Vegan *(1 = yes; 0 = no)*	0.669*	0.355	0.160*	0.085
Fitness Member *(1 = yes; 0 = no)*	0.413***	0.146	0.099***	0.035
Milk Attributes[d]				
Price	-0.401***	0.074	-0.096***	0.017
Nutrient Content	0.232***	0.069	0.056***	0.016
Brand	-0.008	0.057	-0.002	0.014
Organic	0.281***	0.064	0.067***	0.015
Local	0.108	0.066	0.026	0.016
GMO-Free	0.140**	0.056	0.033**	0.013
Constant	-0.299	0.415	-	-

*** p<0.01, ** p<.05, * p<0.1

a: Age brackets; 1 if 17 or below; 2 if 18-24; 3 if 25-29; 4 if 30-34; 5 if 35-39; 6 if 40-44; 7 if 45-49; 8 if 50-54; 9 if 55-59; 10 if 60-64; 11 if 65-69; 12 if 70-74; 13 if 75-79; 14 if 80 or above; all "1's" were dropped from analysis to only include participants 18 years of age and older

b: Annual Household Income: 1 if less than $14,999; 2 if $15,000 – $24,999; 3 if $25,000 – $34,999; 4 if $35,000 – $49,999; 5 if $50,000 – $74,999; 6 if $75,000 – $99,999; 7 if $100,000 – $149,000; 8 if $150,000 – $199,999; 9 if $200,000 or above

c: Number of Children in household: 1 if zero; 2 if 1 child; 3 if 2 children; 4 if 3 children; 5 if 4 children; 6 if 5 or more children

d: Importance when Purchasing for all variables listed under milk attributes; 1 if not at all important; 2 if somewhat unimportant; 3 if neither important or unimportant; 4 if somewhat important; 5 if very important

Tobit Model Results – Local Milk Consumers

The local milk Tobit model estimated coefficients are reported in the first column of Table 4. These coefficients indicate the overall trend or influence that a variable has on the probability of purchasing locally produced milk not a magnitude. Firstly, the demographic variable for male was positive and significant at an alpha level of 1%. This indicates that men are more likely to be local milk consumers compared with females. Furthermore, the variable for age was also significant to an alpha level of 1%, however, the age coefficient is negative. When an individual gets older, or increases in age, they are less likely to continue to purchase local milk. The next two demographic variables included in the Tobit model are income and number of children in the household. The estimated coefficient for income is statistically indistinguishable from 0, and does not influence the probability of purchasing local milk at an alpha level of 10%. The children present in the house however, was positive and significant at an alpha level of 5%.

As previously stated, two lifestyle dummy variables were added to the model to capture some influence that an individual has on the probability of purchasing local milk, that is not accounted for in the demographics. Respondents were asked if they were vegan or vegetarian and if they were fitness club members. The dummy variable for being vegan or vegetarian was not significant in this model, concluding that the estimated coefficient is indistinguishable from 0, at an alpha level of 10%. The dummy variable for being a fitness member, however, was significant and positive to an alpha level of 1%. Being a fitness member makes an individual more likely to purchase local milk over an individual who is not.

The attributes of milk are important to look at for dairy producers, because they can identify what factors are important to local consumers. The first attribute was how important price was to the consumer. This estimated coefficient is significant and negative at an alpha of 5%, indicating that when a consumer finds price to be important they are less likely to purchase local milk. Furthermore, nutrient content of milk is not significant to an alpha of 10%. When a consumer finds nutrients to be important they are no more or less likely to purchase local milk. Additionally, the attribute brand is significant to an alpha level of 1%. This indicates that the importance of brand has a positive influence the probability of purchasing local milk.

The two farming practices that were included as a milk attribute are organic and local production. Both of factors were estimated and are significant to influence the probability that an individual will purchase local milk. If the consumers hold organic farming practices in high regard, then the probability of them purchasing local milk increases. Similarly, if an individual finds local milk production to be important, then the likelihood of them purchasing local milk increases. The organic attribute was significant to an alpha level of 10% and the local production attribute was significant to the 1%. Furthermore, GMO-free was also asked for importance, and was not significant to an alpha level of 10%. The coefficient for GMO-free is statistically indistinguishable from 0 to influence the probability of purchasing local milk.

Model Marginal Effects – Local

The marginal effects of the Tobit model shed insight into how much each variable affects the probability of purchasing local milk. They provide a quantifiable effect that is useful for dairy producers facing production or marketing decisions. These marginal effect results are reported in column 3 of Table 4. The two demographic variables that were significant were male and age. Per our marginal results, being a male increases the probability of purchasing local milk by 21.6% over females. Additionally, as the age of a consumer increase they are 4.8% less likely to purchase local milk. No significant marginal effect was found for income; therefore, it is estimated that income does not directly contribute to whether a consumer purchases local milk. Furthermore, the number of children in the household yielded significant marginal effects. Children being present in the household increases the probability of purchasing local milk by 3.7%. Local consumers have a tie to the community, and want to get their children involved.

Only one of the two lifestyle variables were significant for local consumers. Being a vegan or vegetarian was found not to influence whether an individual bought local milk or not. Being a fitness member, however, did. The marginal effects indicate that fitness members are 14.6% more likely to purchase local milk over an individual that is not a fitness member. Furthermore, price is a factor that should be looked at by dairy producers. Consumers that care about price are 3.6% less likely to purchase local milk, which does demand a premium in the market place. There is no significant marginal effect for consumers that find nutrient content to be important.

A specific brand of local milk is significant and important to local consumers when deciding to purchase. Individuals who find brand to be important are 5.2% more likely to purchase local milk. Interestingly, consumers that find organic farming practices to be important are 3.1% more likely to purchase local milk. This could be from the notion that local milk might be organic. Furthermore, local farming practices being important to consumers increase the probability of local milk purchase by 5.8%. The final attribute was non-GMO or GMO-free. Those whom found GMO-free milk to be important were no more likely to purchase local milk over consumers that did not find it to be important.

Some take ways from these Tobit model marginal effects are certainly important for dairy producers to look at. First off, the ideal consumer for local milk is a younger male, who is a member of a fitness member. Focusing their marketing efforts toward consumers could bode well for dairy producers to increase their sales. Additionally, local dairies should be careful about the premium pricing for local milk. There is a negative magnitude associated with price that is influencing local consumers. Lastly, local consumers buy local milk because of the non-conventional way it is produced. Brand being important to local consumers suggest they have a relationship with community, or individual dairy producer. They find aspects of alternative production to be important, for example organic and local farming. These can be highlighted by farmers to increase the probability that consumers will purchase their milk.

Table 4. Tobit Model Results and Marginal Effects for Local Milk Consumers

VARIABLES	Coefficients		Marginal Effect	
	Coeff.	Std.Error	dy/dx	Std. Error
	(1)	(2)	(3)	(4)
Demographics/Lifestyle				
Male *(1 = male; 0 = female)*	0.477***	0.080	0.216***	0.036
Age[a]	-0.106***	0.014	-0.048***	0.006
Income[b]	0.012	0.019	0.006	0.009
# of Children in House[c]	0.082**	0.035	0.037**	0.016
Vegan *(1 = yes; 0 = no)*	-0.023	0.134	-0.010	0.061
Fitness Member *(1 = yes; 0 = no)*	0.322***	0.084	0.146***	0.038
Milk Attributes[d]				
Price	-0.079**	0.038	-0.036**	0.017
Nutrient Content	0.006	0.045	0.003	0.020
Brand	0.115***	0.037	0.052***	0.017
Organic	0.068*	0.041	0.031*	0.019
Local	0.128***	0.044	0.058***	0.020
GMO-Free	-0.026	0.039	-0.012	0.018
Constant	-0.611**	0.252	-	-

*** p<0.01, ** p<.05, * p<0.1

a: Age brackets; 1 if 17 or below; 2 if 18-24; 3 if 25-29; 4 if 30-34; 5 if 35-39; 6 if 40-44; 7 if 45-49; 8 if 50-54; 9 if 55-59; 10 if 60-64; 11 if 65-69; 12 if 70-74; 13 if 75-79; 14 if 80 or above; all "1's" were dropped from analysis to only include participants 18 years of age and older

b: Annual Household Income: 1 if less than $14,999; 2 if $15,000 – $24,999; 3 if $25,000 – $34,999; 4 if $35,000 – $49,999; 5 if $50,000 – $74,999; 6 if $75,000 – $99,999; 7 if $100,000 – $149,000; 8 if $150,000 – $199,999; 9 if $200,000 or above

c: Number of Children in household: 1 if zero; 2 if 1 child; 3 if 2 children; 4 if 3 children; 5 if 4 children; 6 if 5 or more children

d: Importance when Purchasing for all variables listed under milk attributes; 1 if not at all important; 2 if somewhat unimportant; 3 if neither important or unimportant; 4 if somewhat important; 5 if very important

VI. Conclusion

Although the dairy industry is at an overall increase from the mid 1970s the fluid milk industry is in a decline in terms of per capita consumption. It is vitally important for dairy farmers to know how to identify their target consumers, and what attributes of milk are important to them. Dairy producers can use this information to change their production practices to hopefully increase farm revenues. Additionally, these results can provide insight for different marketing to segmented parts of U.S. consumers that have a high magnitude for the probability of purchasing their milk. The following paragraphs aim to highlight each market for potential benefits for dairy producers.

Foremost, the data was obtained using on online survey of U.S. consumers in 2015. Two groups were defined from the 681 observations for local and organic milk consumers. The consumer groups were modeled to identify the factors that are important to consumers while purchasing non-conventional milk, and to estimate the influence on the probability of purchasing the milk. The model used for analysis of organic milk was a Probit model and a Tobit model was used to model the local milk, to censor the regression.

The Probit model results indicate that the target consumers for organic milk are young males that are fitness members. Although, the vegan/ vegetarian consumer is a relatively small percentage of the population, they have a high probability that they will purchase organic milk. This group, along with the fitness members would be great for target marketing for dairy producers. Unless organic dairy producers are also selling their milk at a local market they have little influence on the price premium that organic milk demands. Therefore, the large negative effect that price has on the organic milk consumers

is largely out of their hands. Lastly, labeling efforts should focus on organic farming practices and non-GMO production, because that is was organic milk producers find important.

Similarly, among the responders that purchase local milk, the primary target are also younger males that are fitness members. Additionally, local consumers are more likely to purchase local milk when they have children, so it could be beneficial to dairy producers to focus marketing efforts to children. This could be in the form of Agritourism to help bring families to the farm and build a community relationship. Not surprisingly consumers buy local milk, because it is produced locally, and they would like to contribute to the local milk market. These consumers are motivated to purchase, because they know where their milk comes from. This is indicated by the importance brand is to local consumers. It is important for farmers to establish a proximity to market to capture these consumers. Local producers have more flexibility with their pricing strategies, because price being important to local consumers has a relatively low influence on the probability of purchase.

Overall, the purpose of this thesis is to identify different niches in the non-conventional milk market for producers to be able to combat the declining U.S. fluid milk market. The models were created to provide insight to the demographics, lifestyle demographics, and milk attributes that non-conventional consumers find important to purchase. The marginal probabilities can be used to determine an estimate to the financial impact farmers can receive from specialty marketing of their milk. These milks demand a premium in the market, which if done correctly and cost efficiently can lead to increased farm revenues to a struggling industry.

APPENDIX

Shown below is a partial survey, only showing relevant questions used in this study.

Q3. Please indicate your age?

○ 17 or below	○ 18-24	○ 25-29
○ 30-34	○ 35-39	○ 40-44
○ 45-49	○ 50-54	○ 55-59
○ 60-64	○ 65-69	○ 70-74
○ 75-79	○ 80 or above	

Q4. Please indicate your gender.

○ Male ○ Female

Q5. Are you the primary shopper for food for yourself or your family (shop more than 50% of the time)?

○ Yes ○ No ○ Not sure

Q6. Are you a vegetarian or vegan?

○ Yes ○ No

Q8. Have you purchased **milk (not soy milk and other plant based milk)** in the past **6 months**?

○ Yes ○ No ○ Not sure

Q11. Are you currently a fitness club member?

○ Yes ○ No

Q20_4. How important is the attribute **nutrient content** when you are **purchasing milk**?

○ Not at all Important ○ Somewhat Unimportant

O Neither Important nor Unimportant

O Somewhat Important O Very Important

Q20_8. How important is the attribute **brand** when you are **purchasing milk**?

O Not at all Important O Somewhat Unimportant

O Neither Important nor Unimportant

O Somewhat Important O Very Important

Q21_1. How important is **whether the milk is organic** when you are **purchasing milk**?

O Not at all Important O Somewhat Unimportant

O Neither Important nor Unimportant

O Somewhat Important O Very Important

Q21_2. How important is **whether the milk is locally produced** when you are **purchasing milk**?

O Not at all Important O Somewhat Unimportant

O Neither Important nor Unimportant

O Somewhat Important O Very Important

Q21_5. How important is **whether the milk is GMO-free** when you are **purchasing milk**?

O Not at all Important O Somewhat Unimportant

O Neither Important nor Unimportant

O Somewhat Important O Very Important

Q51_1. **In an average week**, how much money did you spend on food from a local grocery store during grocery shopping?

O $0 O $1-$50 O $51-$100

O $101-$150 O $151-$200 O $201-$250

O $251-$300 O $301-$350 O $351-$400

O $401-$450 O $451-$500 O $501-$550

O $551-$600 O >$600 O Not Sure

Q51_7. **In an average week**, how much money did you spend on organic food during grocery shopping?

O $0 O $1-$50 O $51-$100

O $101-$150 O $151-$200 O $201-$250

O $251-$300 O $301-$350 O $351-$400

O $401-$450 O $451-$500 O $501-$550

O $551-$600 O >$600 O Not Sure

Q61_3. In the **last six months**, what percentage of each food you purchased in daily life that was **organic** (quantity, not value)?

O Do Not Purchase Organics O 10% or Less

O 11- 35% O36-55%

O56-75% O More than 75

Q62_3. In the **last six months**, what percentage of each food you purchased in daily life that was **from farmer's markets** (quantity, not value)?

O Do Not Purchase Organics O 10% or Less

O 11- 35% O36-55%

O56-75% O More than 75%

Q79. How many children under the age of 18 currently live in your household?

O 0 O 1 O 2

O 3 O 4 O Other ___

Q82. Please indicate your estimated average **annual household** income.

O Less than $14,999 O $15,000 – $24,999

O $25,000 – $34,999 O $35,000 – $49,999

O $50,000 – $74,999 O$75,000 – $99,999

O $100,000 – $149,000 O$150,000 – $199,999

O$250,000 or above

Q82. Please indicate your **household weekly food expenditure** (grocery shopping only, **NOT** including eating at restaurants).

O Less than $49 O $50-$99 O $100-$149

O $150-$199 O $200-$249 O $250-$299

O $300-$349 O $350-$399 O $400-$449

O $450-$499 O Above $500 O Not Sure

Q83. Please select "C" for this question. Thank you.

O A O B O C O D O E

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