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## Consumer Preferences for “Made with Tennessee Milk” Processed Dairy Products

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### Abstract

This study examines consumer willingness to pay (WTP) for a hypothetical logo on processed dairy products (cheese, butter, sour cream, ice cream, or yogurt), indicating the products are made in Tennessee using Tennessee milk. A survey of 381 Tennessee consumers elicited WTP for logoed processed dairy products using the contingent valuation method. Results show consumers' WTP to be \$2.61 more weekly for processed products bearing the *Made with Tennessee Milk* logo. Of those interested in buying the logoed processed dairy products, 13% would likely shop for the products at farmers' markets or farm stands.

**Keywords:** dairy products, local, willingness to pay, shopping patterns

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## Introduction and Objectives

The Tennessee Department of Agriculture (TDA), enabled by legislation, established a *TN Milk* logo program in September 2018 (TDA, 2018). This logo can only appear on fluid milk that is produced, processed, and bottled within the state (see Figure 1). Previous research by DeLong et al. (2020) found that consumers would pay a premium for fluid milk bearing this logo. However, it is unclear if this premium would extend to a state logo indicating that processed dairy products such as ice cream, butter, cheese, or yogurt were produced with Tennessee fluid milk. Since a logo for processed dairy products made with Tennessee milk does not yet exist, this paper investigates consumers' willingness to pay for a hypothetical logo, *Made with TN Milk*. This may be particularly important for policy makers and producers to understand given the decline in the United States per capita consumption of fluid milk over the past decade and the large portion of fluid milk, approximately two-thirds in 2019, that is used to produce processed dairy products (Agricultural Marketing Resource Center, 2021; USDA/ERS, 2021; USDA). Consumers' willingness to pay a premium for locally processed dairy products produced with local milk may suggest policy makers could develop appropriate logo programs to help producers capture these premiums.



**Figure 1.** *TN Milk* Logo

*Given the weekly amount of around \$E1 you indicated that you spend on processed dairy products, would you be willing to pay P% more for these dairy products if they have the Made with Tennessee Milk Logo? This would make your weekly expenditures about \$E2.*

- Yes
- No



**Figure 2.** *Made with TN Milk* Processed Dairy Products Choice Question

Hence, the goal of this research is to ascertain consumers’ preferences and willingness to pay for processed dairy products bearing the hypothetical logo *Made with TN Milk*. This study also seeks to identify target market segments for processed dairy products bearing the *Made with TN Milk* logo. Because farmers’ markets and/or farm stores/stands may serve as initial sale entry points for locally made dairy products, the influence of consumer shopping preferences for dairy products at these types of outlets is investigated.

To obtain data for the study, a survey of adult Tennessee consumers who are primary food shoppers and whose household has one or more members that at least occasionally consume milk and/or dairy products was conducted in 2019. To estimate consumer WTP a premium over conventional dairy products, this study uses the contingent valuation method to elicit Tennessee consumer preferences for processed dairy products carrying the hypothetical *Made with TN Milk* logo. The study also includes a logit model examining the probability that those who would purchase *Made with TN Milk* dairy products would shop for them at farmers’ markets or farm stores. Results from the study are informative in understanding (i) whether consumers would pay premiums for processed dairy products that are made with local milk and (ii) drivers of consumer shopping preferences for these products.

## Literature Review

### *Consumer Preferences for Local Dairy and Other Food Products*

Darby et al. (2008) investigated the value of localness generally and found that consumers valued localness separately from other attributes, such as freshness and the size of the farm that produced the product. Their results also showed that a local label was viewed similarly to a state-based label. Hence, state lines may form a boundary for localness in the minds of consumers. Barnes et al. (2014) found that WTP for lesser-known cheeses was heavily influenced by brand and that although the local brand received the highest sensory ratings, it received the lowest WTP. The low WTP for a lesser-known brand was only offset when a state-based identification was added. They also found that local designations strengthened brands in general, but state designations appeared to be most effective for lesser-known, high-quality cheeses. In the current study, we examine the effect of a state-based logo for a local ingredient (milk) used to produce a dairy product locally. DeLong et al. (2020) examined Tennessee consumer preferences and found they would pay about a 12% premium for fluid milk labeled as *TN Milk*, which is defined as fluid milk that is entirely sourced, processed, and bottled in Tennessee. However, it is important to note that this premium percentage could be different for milk versus processed dairy products. Olynyk and Ortega (2013) studied consumers’ WTP premiums for attributes in ice cream and yogurt, including cattles’ pasture access, use of antibiotics, and rbST. They found that WTP premiums as a percentage of product price for the studied attributes within yogurt were higher than for ice cream, and they posited this might be the case because consumers may associate yogurt as being in a less processed form than ice cream. Hence, based on their findings, it is possible that the *Made with TN Milk* logo might have a lower percentage premium than *TN Milk*.

Neither DeLong et al. (2020) nor Best and Wolfe (2009) found strong effects of demographics on preferences for locally produced milk in the region. However, some prior studies have found WTP for locally processed products and fresh produce to be at least partially driven by demographics. Education has been shown to have a negative effect on WTP for locally made dairy products (Forbes-Brown, Micheels, and Hobbs, 2015) and specialty foods (Giraud, Bond, and Bond, 2005). Forbes-Brown, Micheels, and Hobbs (2015) found that older consumers were more likely to be WTP a premium for dairy products made with Canadian milk. Barnes et al. (2014) found that older, middle-income females were more likely to pay for state-sponsored designation in cheeses. Darby et al. (2008) examined the effects of demographics on preferences for local attributes in fresh strawberries and only found gender to be significant. They found that male direct-market shoppers in their sample exhibited stronger preferences for locally grown products than females. A locally based label or logo may hold perceived quality benefits, such as greater freshness, better taste, more safety, or environmental benefits. In addition, locally based labels may hold perceived economic benefits, such as greater local farm incomes or helping support the local economy.

Results from DeLong et al. (2020) showed perceived quality benefits (freshness, taste, safety, and environmental) associated with a local milk logo had positive effects on WTP for the locally labeled milk, but perceived economic benefits (benefits to farmers and local economies) had no significant effect. Similar to findings by DeLong et al. (2020), Gedikoglu and Parcell (2014) found that consumers responded positively to possible product benefits, such as taste, but supporting local farmers had no effect on whether consumers would pay a premium for artisanal cheese. Zepeda and Li (2006) did not find that attitudes or behaviors related to the environment or health to be significant influences on whether shoppers buy local foods. However, Njange et al. (2011) also found that consumers' WTP for an *Arizona Grown* label varied across two products, spinach and carrots. They also posited that WTP was greater for the spinach than carrots as a result of a recent food safety incident with spinach. Hence, they hypothesized that WTP for local produce might be driven in part due to food safety concerns. Based on findings from these studies, we anticipate that local quality benefits would positively influence WTP for processed dairy products with the *Made with TN Milk* label. However, based on findings from these studies, economic benefits (benefits to farmers and local economies) may not significantly influence WTP for processed dairy products that are *Made with TN Milk*.

Studies have shown that preferences for local foods influence WTP for state-logged foods. DeLong et al. (2020) found that consumers who stated they paid premiums for local food products were more likely to choose *TN Milk*. Studies of other nondairy products have also found that state logos and preferences for local foods can influence WTP for foods. Giraud, Bond, and Bond (2005) discovered that pro-local attitudes positively influenced WTP for specialty foods products that were labeled as locally made. Zepeda and Li (2006) found that attitudes and behaviors related to food and shopping significantly increased shoppers' buying local foods. Based on these studies' findings, we would anticipate that preferences for local foods, as measured by WTP a premium for local foods, will have a positive effect on WTP a premium for processed dairy products bearing the *Made with TN Milk* logo.

Several studies have examined WTP for dairy products and/or local products. However, this study examines the effects of a state-based logo on WTP for dairy products that are made locally with locally produced milk and provides a unique contribution to the literature. DeLong et al. (2020) examined the effects of a state-based logo on WTP for milk, but did not examine the effects of a state-based logo on WTP for other dairy products. Although Best and Wolfe (2009) examined consumers’ willingness to purchase and pay more for dairy products, their analysis did not include estimates of WTP. While Geidikoglu and Parcell’s (2014) findings provide insights into drivers of preferences for artisanal cheese preferences, their study did not specifically examine the consumer perceptions of cheese that was labeled as locally made using local milk. Also, Barnes et al. (2014) examined the effects of a state-sponsored designation on consumer willingness to pay for cheeses; however, their results were limited to cheeses and not the broader products grouping. Further, this study not only examines the WTP for the logoed dairy products, but also the factors that drive consumer shopping for these products at farmers’ markets and farm stores, which might serve as initial market entry points for smaller processors.

### *Shopper Preferences for Farmers’ Markets*

Because locally produced processed dairy products might initially be offered at farm stores or farmers’ markets, it is also helpful to examine findings from prior research regarding use of these shopping outlets. Gumirizaka, Curtis, and Bosworth (2014) found that consumers who attended farmers’ markets were primarily interested in purchasing fresh produce, followed by reasons related to social interaction. Ready-to-eat foods or packaged foods were lesser motivators. Those who intended to purchase fresh produce at farmers’ markets tended to be married, females, of higher income levels, with diet or health concerns, and supportive of local farming. Conner et al. (2010) found that supporting local farmers was a motivator for attending farmers’ markets. Zepeda and Carroll (2018) found that shoppers at farmers’ markets tended to be white and more likely to shop at farmers’ markets regularly. Zepeda (2009) found no significant difference in overall food expenditures or household income between farmers’ market shoppers and non-shoppers. With respect to demographics, Zepeda (2009) found farmers’ market shoppers were more likely to be female, but found no significant differences in education or race across the two types of shoppers.

Other studies have found a positive association between farmers’ market visits and higher education levels (Govindasamy et al., 1998; McGarry Wolf, Spittler, and Ahern, 2005; Onianwa, Mojica, and Wheelock, 2006; Abello et al., 2014). Abello et al. also found a negative correlation between distance to market and visits. Based on the findings from these prior studies, it is possible that shoppers looking for processed dairy products with the *Made with TN Milk* logo are more likely to shop for these products at farmers’ markets or farm stores. Those who indicate they would shop for them at these outlets might more likely be female, highly educated, supportive of local farmers (economic benefits), and frequent farmers’ market food shoppers.

## Methods

### *Survey Data Collection and Referendum-Style Contingent Valuation*

Survey data were collected via the online platform Qualtrics in June 2019. Qualtrics provided a panel of Tennessee residents who were aged 18 years or older and who were primary food shoppers for their household. Also, to qualify for the survey, the respondent or someone residing in their household was required to consume milk or dairy products at least occasionally. Qualtrics recruited panelists until at least 400 qualified responses were obtained. All survey materials and protocols were approved by the University of Tennessee Institutional Review Board (UTK IRB-18-04484-XM).

Demographic summary measures for the survey respondents were calculated and are shown in Table 1. They were compared with state averages to examine the representativeness of the sample. The comparisons are discussed in the results section of this paper.

**Table 1.** Survey Respondent Demographics and State Averages

Demographic	Sample Average	State Average or Median <sup>a</sup>
Age in years	43.69	39
Female gender	82.4	51
Annual household income	\$46,024	\$52,000 <sup>b</sup>
College graduate	23.1%	27.5%
Household size	3.00	2.52

<sup>a</sup>Source: U.S. Census Bureau, 2020

<sup>b</sup>Median of household income

The survey began with questions about household consumption of milk and dairy products. The current *TN Milk* logo was presented to respondents, and they were asked to rate their familiarity with the existing logo prior to the study. The survey questions related to processed dairy products and whether one or more of the household members consumed processed dairy products (e.g., cheese, ice cream, sour cream, yogurt, or butter). A question regarding weekly expenditures on dairy products was asked in categorical form (\$1–\$3, \$3–\$5, \$5–\$10, \$10–\$15, \$15–\$20, and \$20 or more). Midpoints were used to calculate weekly expenditures, with the \$20 endpoint being used as the maximum to create the variable *Wkly Expend*.

The respondents were then shown an information screen about a hypothetical *Made with TN Milk* logo (logo shown in Figure 2). In this information screen, the following logo information was provided:

“The Made with *TN Milk* logo [that] appears on processed dairy products would indicate that these products use milk that is entirely sourced and processed in Tennessee. This means the milk used in making the processed dairy products (for example, cheese, yogurt, sour cream, or ice cream) with this logo is 100 percent from Tennessee dairy farms.”

After providing survey participants with the definition of and hypothetical logo for *Made with TN Milk*, they were informed that they would be making a hypothetical product choice. The respondents were reminded that they should try to make as realistic a choice as possible (Blamey, Bennett, and Morrison, 1999). They were also reminded to consider their household budget, and if they spent more on processed dairy products, they would have less to spend on other goods (Cummings and Taylor, 1999).

An example of a choice set is provided in Figure 2. A referendum-style contingent valuation method was used to elicit consumers’ willingness to pay more for their dairy products each week if the products were labeled as *Made with TN Milk*. With a referendum style, the consumer could choose to select the logoed dairy products at the premium percent offered or not choose these products. This method of elicitation was used for three reasons. First, the primary interest was eliciting the willingness to pay for the *Made with TN Milk* logo on processed dairy products, a single attribute. Second, we investigated the WTP premium of the logo for a grouping of dairy products, hence the simplicity of a referendum-style question was appealing. Furthermore, this style of question enabled us to prompt respondents with a reminder about the level of their self-reported usual weekly expenditures on processed dairy products (E1) and then, based on the percentage premium they selected, provide them with the amount in additional spending this would entail.

In the choice question, respondents were asked if they would pay a certain percentage premium, *Pct Premium* (5%, 8%, 10%, 15%, or 20%), more for the processed dairy products (ice cream, butter, sour cream, yogurt) if they were *Made with TN Milk* and carried the logo. Twenty percent of the sample saw each percentage premium level. The respondents were also prompted with the dollar amount of their usual weekly dairy products expenditures (E1), and this amount plus the premium E2 where  $E2 = E1 \cdot (1 + P)$  and P is the premium in decimal form. For example, if they indicated they usually spent around \$4 a week on processed dairy products, and they would pay 10% more for the logoed dairy products, the question was, “Given the weekly amount of around \$4 you indicated that you spend on processed dairy products, would you be willing to pay 10% more for these dairy products if they had the *Made with TN Milk* logo? This would make your weekly expenditures about \$4.40.” The respondent could then answer yes or no.

Following the product choice question, respondents interested in purchasing the logoed dairy products were asked about where they might buy the logoed processed dairy products, including retail stores, farmers’ markets, on-farm stores, food cooperatives, home delivery, wholesale clubs, specialty stores, limited assortment stores, convenience stores, big box stores, and other. The focus of this study was farmers’ markets and on-farm stores ( $Y_{FMKTSTORE}$ ) because they may likely be an initial market channel where these logoed dairy products would be sold. Survey participants were asked how far out of their way they would travel to buy processed dairy products that are labeled with the *Made with TN Milk* logo. Choices included 1–2 miles, 2–3 miles, 3–4 miles, or 5 miles or greater. Around half of the respondents indicated they would travel greater than 3 miles. A dummy variable, *Travel Miles GT3*, captures respondents who are willing to travel greater than 3 miles and was used in the model of the probability of shopping for logoed dairy products at farmers’ markets or farm stores.



Agreement ratings (1 = strongly disagree, ..., 5 = strongly agree) for statements regarding the dairy products with the logo relative to non-logoed products were considered but found to be very correlated with one another. The correlations were that the products *Made with TN Milk* would be (i) fresher, (ii) safer, (iii) better for the environment, (iv) help support farm incomes, (v) help the local economy, and (vi) taste better. Cronbach's alpha (Cronbach, 1951) was used to test for reliability of using a linear index to represent the variables. The variables *fresher*, *safer*, *better for the environment*, and *taste better* (alpha = 0.90) were formed into a simple average index called *Quality Benefits*. The variables *help support farm incomes* and *help the local economy* (alpha = 0.87) were formed into a simple average index called *Economic Benefits*.

Survey participants were asked about their agreement with statements on a scale of 1 = strongly disagree, ..., 5 = strongly agree regarding local foods (purchase local foods regularly, shop at a local farmers' market regularly, would pay price premiums for locally produced food). Dummy variables were generated from these with the values of "1" if the respondent agreed or strongly agreed with the statement or "0" otherwise (*Shop Local Foods*, *Shop Farmers' Markets Regularly*, and *Premium Local*).

Next, questions were asked about where the survey participants obtained information about milk and other dairy products. These sources included family and friends (*Info Family/Friends*), the Internet and social media (*Info Internet/Social Media*), and store representatives (*Info Store*). Survey participants were then asked demographic questions, such as age (*Age*, *AgeSq*), gender (*Female*), education (*College Graduate*), household income (*Income*), urbanization of residence (*Metro*), race (*White Race*), and household size (*Household Size*).

#### *Economic Model and Conceptual Framework for Willingness to Pay*

Following random utility theory, a consumer will choose a product if the utility they derive from that product is greater than if they do not choose it (McFadden, 1974). The individual,  $i$ , will choose the dairy products labeled as *Made with TN Milk* if their expected utility from choosing the products denoted by  $E(U_{i,Made\ TN\ Milk})$  is greater than their expected utility if they do not choose them, represented by  $E(U_{i,0})$ . While the difference in the two expected utility levels ( $y_{i,Made\ TN\ Milk}^*$ ) cannot be observed directly, an indicator ( $y_{i,Made\ TN\ Milk}$ ) can be. In this case, the consumer chooses the dairy products *Made with TN Milk*, or they do not. This difference in expected utility ( $y_{i,Made\ TN\ Milk}^*$ ) can be expressed as a function of the variables, such as prices, demographics, expenditure patterns, or opinions ( $\mathbf{x}$ ), a set of parameters associated with the variables ( $\boldsymbol{\beta}$ ), and a random error term ( $\varepsilon$ ) where

$$y_{i,Made\ TN\ Milk}^* = \mathbf{x}'\boldsymbol{\beta} + \varepsilon. \quad (1)$$

The observed indicator reflects whether the dairy products *Made with TN Milk* are chosen such that

$$y_{i,Made\ TN\ Milk} = \begin{cases} 1 & \text{if } y_{i,Made\ TN\ Milk}^* > 0 \\ 0 & \text{otherwise} \end{cases}. \quad (2)$$

The probability that a consumer will choose the processed dairy products that are *Made with TN Milk* ( $\Pr[y_{\text{Made TN Milk}} = 1]$ ) is then,

$$\Pr[y_{\text{Made TN Milk}} = 1] = \Pr[\mathbf{x}'\boldsymbol{\beta} + \varepsilon > 0 | \mathbf{x}'\boldsymbol{\beta}] = F(\mathbf{x}'\boldsymbol{\beta}) \quad (3)$$

where  $F$  is the cumulative logistic distribution function (Greene, 2018). In the case of this study, the independent variables,  $\mathbf{x}$ , the percent premium for processed dairy products that bear the *Made with TN Milk* logo compared with dairy products not bearing this logo, consumer weekly dairy product expenditures, perceived quality and economic benefits of the products, attitudes toward localness, *TN Milk* logo familiarity, farm background, demographics, and use of information sources about milk and dairy products. The variable names, definitions, and summary measures for those comprising  $\mathbf{x}$  are shown in Table 2. The dependent variable  $y_{\text{Made TN Milk}}$  model is equal to 1 if a consumer selected the dairy products *Made with TN Milk* at the specified premium, and 0 otherwise. Note the means presented in Table 2 for useable responses where the respondent qualified to be in the study and answered all questions used in the estimation of the logit model of WTP.

To estimate the logit regression and the associated marginal effects, the *logit* and *margins* commands in STATA 17.0 were used (StataCorp, 2017). The marginal effect of the  $k^{\text{th}}$  variable on  $\Pr[y_{\text{Made TN Milk}} = 1]$  is  $f(\mathbf{x}'\boldsymbol{\beta}) * \hat{\beta}_k$ , where  $f(\mathbf{x}'\boldsymbol{\beta})$  is the logistic density function calculated at  $\mathbf{x}'\boldsymbol{\beta}$ . For a squared explanatory variable, such as *AgeSquared*, the marginal effect is calculated as  $f(\mathbf{x}'\boldsymbol{\beta}) * (b_{\text{Age}} + 2 * b_{\text{Age Squared}} * \text{Age})$ , where  $f(\mathbf{x}'\boldsymbol{\beta})$  is the logistic density function.

In addition, the variance inflation factors (VIFs) (scores greater than 10) and conditional index tests (scores greater than 30) were used to evaluate the presence of multicollinearity among the independent variables using the *vif* and *coldiag2* Stata commands (StataCorp, 2017). A VIF of under 10 indicates that multicollinearity is not a concern with the independent variables (Gujarati and Porter, 2009). A conditional index number of under 30 indicates multicollinearity is not a concern (Belsley, 1991).

### *Shopping for Products at Farmers’ Markets and Farm Stores*

Those survey participants who indicated they would purchase the *Made with TN Milk* processed dairy products were asked about whether they would anticipate shopping for these products at farmers’ markets or farm stores ( $y_{\text{FMKTSTORE}}=1$ ). Anticipated shopping at these types of outlets was examined because they may be some of the initial avenues for smaller farmer/processors to enter the market (Onyango Govindasamy, and Alsup-Egbers, 2015).

**Table 2.** Definitions and Summary Statistics of Tennessee Survey Respondents for Variables Used in the Estimation of the Logit Regression of Probability of Choosing Dairy Products that are *Made with TN Milk* ( $\Pr[y_{Made\ TN\ Milk} = 1]$ ) and Logit Regression of Probability of Shopping at Farmers’ Markets/Farm Stores for Dairy Products that are *Made with TN Milk* ( $\Pr[y_{FMKTSTORE}=1]$ )<sup>a</sup>

Variable	Definition	Probability of Choosing Dairy Products that are <i>Made with TN Milk</i> Respondents			Probability of Shopping at Farmers’ Markets/Farm Stores for Dairy Products that are <i>Made with TN Milk</i> Respondents		
		Mean	Min (N = 381)	Max	Mean	Min (N = 247)	Max
	1 if chose dairy products <i>Made with TN Milk</i> , 0 otherwise	0.648	0	1	----	----	----
	1 if would shop for dairy products <i>Made with TN Milk</i> at farmers markets’ or farm stores	----	----	----	0.134	0	1
Pct premium	Percent price premium for dairy products <i>Made with TN Milk</i> (5%, 8%, 10%, 15%, 20%)	11.28%	5	20			
Wkly expend	Weekly expenditures on dairy products	\$11.14	2	20	10.988	2	20
Economic benefits	Economic benefits index (help local dairy farmers, help local economy), 1 = strongly disagree, ...,5 = strongly agree	4.367	1	5	4.47	1	5
Quality benefits	Quality benefits index (fresher, safer, better for environment, taste better), 1 = strongly disagree, ...,5 = strongly agree	3.638	1	5	3.892	1	5
Premium local	Will pay premium for local foods, 1 if agree or strongly agree, 0 otherwise	0.312	0	1	----	----	----
TN milk logo familiarity	1 = if at least moderately familiar, 0 otherwise	0.152	0	1	0.1984	0	1
Farm background	1 if self-identify as having a farm background, 0 otherwise	0.444	0	1	0.474	0	1
Female	1 if female gender, 0 otherwise	0.824	0	1	0.813	0	1

**Table 2. (cont)**

Variable	Definition	Probability of Choosing Dairy Products that are <i>Made with TN Milk</i> Respondents			Probability of Shopping at Farmers’ Markets/Farm Stores for Dairy Products that are <i>Made with TN Milk</i> Respondents		
		Mean	Min (N = 381)	Max	Mean	Min (N=247)	Max
Age	Age in years	43.69	18	79	44.259	18	79
AgeSq	Age in years squared	2,104.05	324	6,241	2165.470	324	6241
Income	Household income in thousand dollars (2018)	46.024	5.000	150.000	47.975	5.000	150.000
College graduate	1 if college graduate, 0 otherwise	0.231	0	1	0.251	0	1
Household size	Number of persons residing in the household	2.997	1	8	2.951	1	8
White race	1 if self-identify as primarily white race, 0 otherwise	0.864	0	1	0.854	0	1
Metro	1 if reside in metro area, 0 otherwise	0.167	0	1	0.162	0	1
Info family/friends	1 if obtain information about milk and dairy products from family and friends, 0 otherwise	0.333	0	1	0.364	0	1
Info internet/social media	1 if obtain information about milk and dairy products from the Internet or social media, 0 otherwise	0.136	0	1	0.162	0	1
Info store Representatives	1 if obtain information about milk and dairy products from store representatives, 0 otherwise	0.052	0	1	0.061	0	1
Shop farmers’ markets regularly	Shop farmers’ markets for food regularly, 1=if agree or strongly agree, 0 otherwise	----	----	----	0.34	0	1
Shop local foods	Shop for local foods regularly, 1 if agree or strongly agree, 0 otherwise	----	----	----	0.567	0	1
Travel miles GT3	1 if would travel greater than 3 miles to shop for <i>Made with TN Milk</i> dairy products, 0 otherwise	----	----	----	0.506	0	1

The decision to shop for the processed dairy products at these types of outlets is also assumed to follow random utility theory, ultimately resulting in estimation of the probability of shopping for the products at farmers’ markets/farm stores or other specialty stores. This probability that survey participants anticipate shopping at a farmers’ market, farm store, or other specialty store ( $y_{FMKTSTORE}=1$ ) can be expressed as,

$$\Pr[y_{FMKTSTORE} = 1] = \Pr[\mathbf{z}'\boldsymbol{\gamma} + \xi > 0 | \mathbf{z}] = F(\mathbf{z}'\boldsymbol{\gamma}), \quad (5)$$

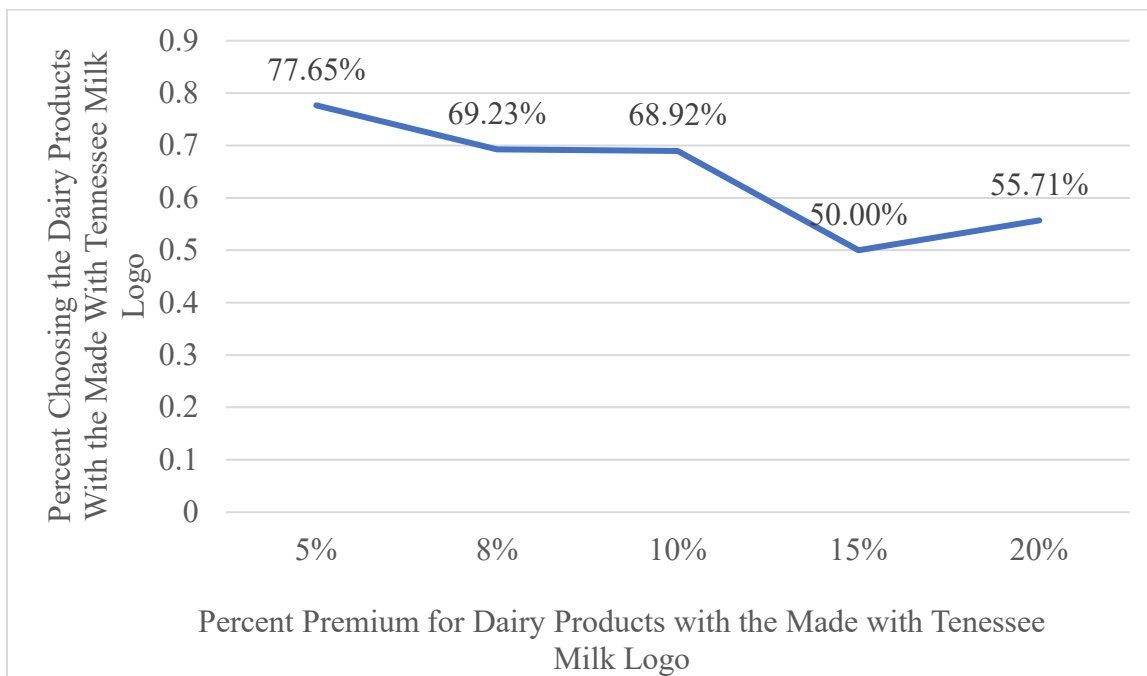
where  $F$  is the cumulative logistic distribution function,  $\mathbf{z}$  is comprised of consumer demographics and other variables,  $\boldsymbol{\gamma}$  are the associated parameters to be estimated, and  $\xi$  is the random error component (Greene, 2018). The independent variables,  $\mathbf{z}$ , consist of consumer demographics, local foods perceptions, weekly dairy products expenditures, attitudes toward quality and economic benefits associated with products bearing the *Made with TN Milk* logo, and sources of dairy products information. The independent variables also include shopping patterns for local foods, farmers’ markets, and distance one would travel out of their way to purchase *Made with TN Milk* dairy products. The variable names, descriptions, and summary measures for this logit model are presented in columns 6 through 8 in Table 2. The *logit* module is used to estimate the probability in STATA 17.0 (StataCorp, 2021) along with the estimated marginal effects of the variables on probability of shopping for the logoed processed dairy products at these types of outlets. As with the model of WTP, multicollinearity testing is conducted using the methods described in that section.

## Results

A total of 409 individuals qualified for the survey (Tennessee residents who were aged 18 years or older, who were a primary household food shopper, and whose household consumed milk or dairy products). Individuals who qualified for the survey but did not answer all questions needed to estimate the logit model for the WTP for the processed dairy products with the *Made with TN Milk* logo were omitted from the analysis, resulting in a total of 381 useable responses.

To examine how representative the sample is of Tennessee consumers, several summary measures of the demographics of survey respondents are shown in Table 1 and compared with state averages or medians based on U.S. census data (U.S. Census Bureau, 2020). Compared with the general Tennessee population, respondents tended to be older (sample average of 44 years versus the state average of 39 years), were more likely to be female (sample average of 82.4% versus the state average of 51%), have a lower income (sample median of \$46,024 versus the state median of \$52,000), and were less likely to be a college graduate (sample, 23%, versus state, 27.5%). Household size was fairly similar (sample average of 3 persons versus the state average of 2.52). Discrepancies from the state averages may reflect the nature of the survey, which utilized primary food shoppers and included only households that regularly purchase milk and dairy products. In particular, prior research has found that the majority of household food shoppers are female (Schaeffer, 2019).

Overall, 65% of consumers would choose dairy products *Made with TN Milk* (see Table 2). As with DeLong et al. (2020), this result suggests that consumers are interested in choosing a product produced in Tennessee. Figure 3 further examines the percentages of consumers who would choose *Made with TN Milk* at the various premium levels provided. For example, among consumers presented with the 5% premium for *Made with TN Milk*, 78% chose to purchase; among consumers presented with the 8% premium, 69% chose to purchase. Figure 3 shows an unexpected, but small, increase in the percent of consumers choosing to purchase the *Made with TN Milk* dairy products (50% to 56%) when moving from the 15% to 20% premium levels, which may be due in part to the small number of consumers exposed to each price premium. Given that 20% of respondents were assigned to each price premium, only a few additional affirmative responses would be required for the percentage of consumers choosing the *Made with TN Milk* products at the given price premium to increase from 50% to 55%. Thus, this increase may not be significantly different.



N = 381

**Figure 3.** Percent of Tennessee Survey Respondents Choosing the *Made with TN Milk* Dairy Products at the Percent Premiums Provided

Consumers’ average weekly dairy product expenditure was \$11.14. When asked if the economic benefits of *Made with TN Milk* would include helping farmers and local communities, the average response was 4.4, suggesting that respondents on average “agree” with this statement. When asked about the quality benefit of *Made with TN Milk* (i.e., products would be fresher, safer, better for the environment, or taste better), the average response was 3.6, suggesting that respondents “slightly agreed” with this statement. Thirty-one percent of consumers stated they would pay a premium for local foods; however, only 15% of consumers were at least moderately familiar with

the *TN Milk* logo. Therefore, more advertising would likely be beneficial for this TDA logo campaign. Nearly 44% of consumers considered themselves to have a farming background.

*Willingness to Pay Estimates*

The estimated logistic regression of the probability of selecting the *Made with TN Milk* dairy products is shown in Table 3. As can be seen from the log-likelihood ratio test against an intercept only model, the model is significant overall. In addition, the model correctly classified 77.17% of the observations, while the pseudo R<sup>2</sup> was 0.2567. The VIF was 5.68. However, the Condition Number was higher than desired at 87.58. *AgeSquared* was thought to be a likely contributor to the high condition number. As a test, *AgeSquared* was removed, and the Condition Number fell to around 30. Hence, the high Condition Number is attributable to the squared term for age and not the other regressors. For the purposes of measuring nonlinear effects of age, both the variable and its squared term were left in the model.

The estimated coefficient on the percent premium for the dairy products bearing the logo (*Pct Premium*) was negative and significant as expected. As indicated by the marginal effect, for each percent increase in price premium, the probability of selecting the logo-bearing processed dairy products would decrease by around 1.3%. The WTP estimate was a 23.42% premium compared with usual weekly expenditures on dairy products and was higher than that found for *TN Milk* in DeLong et al. (2020). Because households spent an average of \$11.14 on dairy products weekly, the premiums suggest households would spend an additional \$2.61 (\$11.14 times 23.42%) on dairy products labeled as *Made with TN Milk*, or \$13.75 for *Made with TN Milk* dairy products weekly.

**Table 3.** Estimated Logit Regression of Probability of Choosing Dairy Products That Are *Made with TN Milk* ( $\Pr[y_{Made\ TN\ Milk} = 1]$ ) among Tennessee Survey Respondents<sup>a</sup>

Variable	Est Coeff		Marginal Effect on $\Pr[y_{Made\ TN\ Milk}=1]$		Effect on WTP <sup>b</sup>		
					Mean	95% LCL	95% UCL
Intercept	-0.922						
Pct premium	-0.078	***	-0.013	***			
Wkly expend	-0.067	**	-0.011	**	-0.856	-1.719	0.007
Economic benefits	-0.082		-0.013		-1.043	-5.098	3.013
Quality benefits	1.061	***	0.170	***	<b>13.517</b>	<b>4.336</b>	<b>22.699</b>
Premium local	1.695	***	0.272	***	<b>21.596</b>	<b>5.971</b>	<b>37.221</b>
<i>TN Milk</i> logo familiarity	0.900	*	0.144	*	11.462	-3.056	25.980
Farm background	0.209		0.034		2.668	-4.622	9.958
Female	0.409		0.066		5.205	-4.739	15.149
Age	-0.117	*	-0.019	*	-1.485	-3.184	0.215
AgeSq	0.002	**	0.000	**	0.020	0.000	0.040
Income	0.000		0.000		0.000	0.000	0.000

**Table 3. (cont)**

Variable	Est Coeff	Marginal Effect on Pr[ $y_{Made\ TN\ Milk}=1$ ]	Effect on WTP <sup>b</sup>		
			Mean	95% LCL	95% UCL
White race	-0.064	-0.010	-0.809	-10.905	9.287
Metro	0.043	0.007	0.554	-8.735	9.843
Info family friends	0.325	0.052	4.140	-3.864	12.144
Info internet social media	0.722 *	0.116 *	9.194	-2.352	20.741
Info store reps	0.893	0.143	11.373	-4.247	26.992
Pct premium WTP			23.42	18.04	43.65
N = 381					
LLR against intercept only					
Model = 126.86***					
Pseudo R <sup>2</sup> = 0.2567					
Percent correctly classified = 77.17%					
VIF = 5.68					
Condition Number = 87.58					

<sup>a</sup>Single, double, and triple asterisks (\*, \*\*, \*\*\*) indicate statistical significance at the 10%, 5%, and 1% levels.

<sup>b</sup>Bolded values in the effect on WTP are those for which the mean, lower 95% confidence level and upper 95% confidence level are all positive or all negative, indicating a significant difference from zero at the 95% confidence level.

Households with higher weekly expenditures on dairy products (*Wkly Expend*) were less likely to pay a premium for *Made with TN Milk* dairy products, possibly because households with higher weekly dairy product expenditures would have to pay the most total expenditure increase if their dairy products increased by a percentage premium. An increase in expenditures by \$1 per week decreases the probability of purchasing *Made with TN Milk* dairy products by 1.1%. However, the marginal effects of weekly expenditures on the WTP for the *Made with TN Milk* dairy products are not significant at the 95% confidence level. This latter result suggests that, on average, regardless of weekly dairy products expenditures, consumers would be willing to pay about the same percentage premium for processed dairy products bearing the *Made with TN Milk* logo.

While the *Quality Benefits Index* had a positive and significant effect on the probability of choosing *Made with TN Milk* dairy products, the *Economic Benefits Index* had no significant effect. This suggests that consumers may value the quality aspects of dairy products that are *Made with TN Milk* over local benefits, such as helping farmers or local incomes. For each increase in the level of the *Quality Benefits Index*, the probability of choosing the dairy products that are *Made with TN Milk* increases by 17%. An increase in the level of the Index is projected to increase premiums the consumer would pay by about 13.52%. These results highlight the importance of high-quality locally made processed dairy products over the attribute that the milk is locally sourced. These findings are similar to those from several prior studies (Zepeda and Li, 2006; Gedikoglu and Parcell, 2014; DeLong et al., 2020).



The willingness to pay a premium for local food products (*Premium Local*) increased the probability of choosing dairy products *Made with TN Milk* by 27.20% and WTP premium by 21.60%. Hence, those respondents more willing to pay premiums for local foods, in general, are more likely to pay premiums for dairy products that are made with local milk, suggesting that the *Made with TN Milk* may hold greater appeal to those willing to pay more for local foods. This finding, similar to that from prior research (Zepeda and Leviten-Reid, 2004; Giraud, Bond, and Bond, 2005; Zepeda and Li, 2006; DeLong et al., 2020), suggests that logoed processed dairy products will hold greater appeal to those preferring local foods. Marketing of processed dairy products with the logo might, at least initially, focus on venues where consumers shop most for local foods.

While *TN Milk Logo Familiarity* positively influenced the probability of selecting the *Made with TN Milk* dairy products by 14.4%, the effect on WTP was not significant at the 95% confidence level. This result suggests that those previously unfamiliar with the already existing *TN Milk* logo are willing to pay about the same for the logoed processed dairy products as those more familiar with the *TN Milk* logo. This result does not suggest much brand halo effect from the *TN Milk* logo. However, it is important to keep in mind at the time of this study that the *TN Milk* logo was relatively new. In addition, the *Farm Background* variable did not significantly influence choosing dairy products that are *Made with TN Milk*.

As with DeLong et al. (2020) and Best and Wolfe (2009), demographic variables had no significant effect on willingness to pay for the *Made with TN Milk* logoed products. Age had a negative effect on the probability of purchase up to around 37 years, when the effect became positive. The overall marginal effect of age on the probability of choosing the *Made with TN Milk* dairy products is  $f(\mathbf{x}'\boldsymbol{\beta}) * (\mathbf{b}_{Age} + 2 * \mathbf{b}_{Age\text{ Squared}} * Age)$ , where  $f(\mathbf{x}'\boldsymbol{\beta})$  is the logistic density function. This marginal effect value is 0.0057 (95% CI = -0.000, 0.0114), or for each increase in years of age, the probability of choosing *Made with TN Milk* dairy products increases by 0.57%. However, the marginal effect of *Age* on WTP for processed dairy products with the *Made with TN Milk* logo was not significant overall. Neither gender, income, education level, household size, nor race significantly influenced the choice of dairy products purchased. These results suggest that the willingness to pay for processed dairy products with the *Made with TN Milk* logo are fairly consistent across demographics.

Use of the Internet or social media (*Info Internet Social Media*) to obtain information about milk or dairy products significantly influenced the probability of choosing *Made with TN Milk* dairy products by 11.6%. It is possible that Internet and social media users may employ these sources to find out more about locally produced dairy products and ultimately positively influence the likelihood of their choosing these types of dairy products. However, use of information from this source did not significantly influence the WTP at the 95% confidence level.

### *Shopping for Made with TN Milk Dairy Products at Farmers' Markets and Farm Stores*

The variable names, definitions, and means for those used in the estimated logit regression of probability of shopping for *Made with TN Milk* dairy products at a farmers' market or farm stores

are shown in Table 2. As with the sample summary measures reported in Table 1, a greater proportion of the subsample is female than the general population of Tennessee, while the other measures—age, education, and household income—were similar to the Tennessee population.

The estimated logit model of probability of shopping for the *Made with TN Milk* dairy products at farmers’ markets/farm stores  $\Pr[y_{FMKTSTORE} = 1]$  is shown in Table 4. As indicated by the log-likelihood ratio the model is significant overall. The model correctly classified 88.26% of the observations. The Pseudo  $R^2$  was 0.1668. The VIF was 5.82, while the Condition Number was 90.44 (as a test, age squared was removed and the Condition Number, again, declined to around 30; hence, the higher condition number was driven by the squared term).

**Table 4.** Estimated Logit Regression of Probability of Shopping at Farmers’ Markets/Farm Stores for Dairy Products that are *Made with TN Milk* ( $\Pr[y_{FMKTSTORE} = 1]$ ) among Tennessee Survey Respondents Who Chose *Made with TN Milk* Products

Variable	Estimated Coefficients	Marginal Effect on $\Pr[y_{FMKTSTORE} = 1]$
Intercept	1.782	
Wkly expend	0.003	0.000
Economic benefits	0.004	0.000
Quality benefits	0.082	0.008
<i>TN Milk</i> logo familiarity	0.729	0.072
Farm background	0.312	0.031
Female	-0.417	-0.041
Age	-0.256 ***	-0.025 ***
AgeSq	0.003 ***	0.000 ***
Income	0.000	0.000
College graduate	0.226	0.022
Household size	-0.032	-0.003
White race	-0.068	-0.007
Metro	0.934 *	0.092 *
Info family/friends	0.457	0.045
Info internet/social media	-0.195	-0.019
Info store representatives	0.090	0.009
Shop farmers’ markets regularly	0.949 **	0.094 **
Shop local foods	0.914 *	0.090 *
Travel miles GT3	1.012 **	0.100 **

N = 247

LLR test against intercept only

(19 df) = 31.82\*\*

Pseudo  $R^2$  = 0.1668

% Correctly classified = 88.26%

VIF = 5.82

Condition number = 90.44

Note: Single, double, and triple asterisks (\*, \*\*, \*\*\*) indicate statistical significance at the 10%, 5%, and 1% levels.

As reflected in the estimated marginal effects, many of the household demographics (weekly dairy products expenditures, economic or quality benefits of the products, familiarity with the *TN Milk* logo, farm background, gender) had no influence on the probability of shopping for *Made with TN Milk* processed dairy products at farmers' markets or farm stores. *Age* had a negative effect on the probability of shopping for the products at a farmer's market/farm store up to the age of 49.4 years old, although the overall marginal effect of age was not statistically significant (marginal effect = -0.003 95% CI = -0.006, 0.0004). This finding is in contrast to previous research, which has found a strong linkage between demographics and shopping at farmers' markets or farm stores (Govindasamy et al., 1998; Wolf, Spittler, and Ahern, 2005; Onianwa, Mojica, and Wheelock, 2006; Abello et al., 2013; Gumirizaka, Curtis, and Bosworth, 2014; McGarry Zepeda and Carroll, 2018). Unlike Gumirizaka, Curtis, and Bosworth (2014) and Conner, et al. (2010), economic benefits (e.g., supporting local farmers) was not a strong motivator for shopping for these products at local farmers' markets, potentially indicating that consumers make less of a connection between the farm and more processed products as was suggested by Olynyk and Ortega (2013). Metro residence, shopping for foods at farmers' markets regularly, and shopping for local foods regularly influenced the probability of shopping for the dairy products at farmers' markets and farm stores. Willingness to travel greater than 3 miles out of their way to buy dairy products that are *Made with TN Milk (Travel Miles GT3)* increased the likelihood that they would shop for them at farmers' markets or farm stores, which is in contrast to Abello et al. (2013), who found a negative correlation between distance to market and visits. Metro shoppers are 9.21% more likely to shop for the dairy products at a farmers' market or farm store than more suburban or rural shoppers. This result suggests that farmers' markets located in, or around, more metro areas might be considered initial marketing venues to sell processed dairy products with the *Made with TN Milk* logo.

As with Zepeda and Carroll's (2018) findings, those who regularly shop at farmers' markets (*Shop Farmers Markets Regularly*) are 9.36% more likely to shop for the *Made with TN Milk* dairy products at farmers' markets or farm stores than those who do not regularly shop at these outlets. Hence, this suggests that repeat farmers' market shoppers are more likely to shop for the dairy products at these types of outlets. Those who regularly shop for local foods (*Shop Local Foods*) are about 9.02% more likely to shop for the *Made with TN Milk* dairy products at farmers' markets or farm stores than those who do not regularly shop for local foods. Hence, local food shoppers are more likely to seek out these dairy products at farmers' markets or farm stores.

## Conclusions

To assist the state's dairy farmers in capturing additional value-added opportunities, in 2018 a Tennessee milk logo, *TN Milk*, was instated. However, this logo only applied to bottled fluid milk, not to dairy products beyond milk. As yet, no state-approved logo identifies processed dairy products that are made using milk from within the state. Hence, additional value-added opportunities might exist by expanding the use of the *TN Milk* logo to dairy products that are made using Tennessee milk, but doing so would require an expansion of the current law enabling the *TN Milk* logo. The purpose of this study was to investigate consumer preferences for a hypothetical logo, *Made with TN Milk*, that indicates a processed dairy product is produced within the state

using Tennessee milk. Findings from this study could inform future policy decisions in Tennessee to expand the scope of the logo used for milk produced in Tennessee as well as the decision to develop logos for processed dairy products in other states.

The results from this study suggest that consumers have an interest in purchasing dairy products, such as cheese, ice cream, butter, sour cream, or yogurt, that are made with *TN Milk*, with about 64.8% indicating interest in purchasing these dairy products at the premiums offered. Results suggest that consumers would be willing to pay about \$2.61 additional per week for dairy products with the *Made with TN Milk* logo, which equates to a 23.42% premium. This amount exceeds the 12% premium associated with the logo for fluid milk, *TN Milk*, previously estimated in DeLong et al. (2020). This difference may be because fluid milk is considered more as a necessity than an ingredient in processed products such as cheese or ice cream (Okrent and Alston, 2012), or it could be a result of differences between the respective contingent valuation approaches between the two products. In the milk contingent valuation, a reminder about weekly fluid milk expenditures was not provided, while in the contingent valuation for processed dairy products, a reminder about weekly dairy products expenditures was provided along with what the expenditures would be with purchases of the logoed processed dairy products.

This study examined the willingness of consumers to pay more for dairy product expenditures in the aggregate (cheese, ice cream, sour cream, butter, and yogurt). Additional research should disaggregate these products and examine how consumer preferences for processed dairy products that are made with locally sourced milk vary across the type of dairy product. The purpose of this study was to look at consumer preferences for the logo in the aggregate product grouping. However, additional detail about the effects on WTP for specific logoed products could provide insights into the types of products that might initially be marketed with the logo.

In addition, it is important to note that at the time of this study, the *TN Milk* logo was in its initial phases and many consumers were not familiar with the milk logo. As the milk logo circulates in markets over a longer time period, consumer preferences for a similar logo on dairy products may adjust as there is greater familiarity with the *TN Milk* logo.

Perceived quality benefits, such as freshness, better taste, greater safety, and better for the environment increased WTP, while economic benefits did not add significantly to WTP. Hence, this may suggest that *Made with TN Milk* processed dairy products should be promoted as the basis of improvements to the product by using locally sourced milk. Furthermore, a similar result was found in DeLong et al. (2020)’s study of Tennessee consumers’ WTP for locally produced milk. Those selecting to pay premiums for *Made with TN Milk* dairy products are those who tend to be willing to pay premiums for local foods in general.

This study also found that among those interested in purchasing these dairy products, about 13% would likely shop for them at farmers’ markets or farm stands. Those interested in shopping for the products at farmers’ markets tended to be those who already shop for local foods and already shop at farmers’ markets. If farmers’ markets and farm store markets serve as an initial market access for dairy products that are made using locally sourced milk, 8.7% more household food

shoppers who at least occasionally consume fluid milk or dairy products (64.8% interested in purchasing logoed products\*13.4% would shop for these products at farmers' markets or farm stores = 8.7%) may be attracted to them. Prior research has suggested that the average farmers' market consumer shops farmers' markets about every 1-2 weeks per year (Govindasamy et al., 1998).

This study has several limitations. First, we examined the willingness to pay for a hypothetical logo on dairy products. While we took measures to reduce yea-saying and included a budget reminder, we do not have market data regarding actual prices consumers paid for locally produced dairy products with a *Made with TN Milk* logo. Second, this study focused on one attribute, the *Made with TN Milk* logo. Additional research might extend this study by examining willingness to pay for other dairy product attributes along with the logo in the framework of a choice-based conjoint. In addition, we examined processed dairy products in aggregate, while additional research might examine WTP for the logo on individual dairy products, such as cheese or ice cream, for example. Further, this research represents a snapshot in time. The study was done early in the introduction of the *TN Milk* logo. Hence, many were not familiar with the existing milk logo. Because the milk logo has been on the market for a longer period, consumers' attitudes toward the logo being extended to dairy products could change. Also, it is difficult to extrapolate an overall market potential for dairy products with the *Made with TN Milk* logo, because our sample was limited to primary food shoppers and those who at least occasionally consume milk or dairy products. Hence, several of the demographics of our sample are slightly different from the overall state population averages. In addition, we researched a hypothetical logo; thus, if a logo is implemented that covers dairy products processed locally from milk produced in the state, additional confirmatory research should examine revealed versus stated preferences.

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