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Preferences for Farmstead, Artisan, and Other Cheese Attributes: Evidence from a Conjoint Study in the Northeast United States

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Abstract

While many small American dairy farms are struggling to stay in business due to fluctuating milk prices and rising production costs, value-added products such as cheese may help to boost revenue and diversify production practices. This study assesses consumer preferences and willingness to pay (WTP) for selected cheese attributes (farmstead, artisan, organic, local, and use of renewable energy in cheese production) through a conjoint survey conducted in Vermont, Manhattan, and Boston. Survey participants were found to segment into two groups: a quality-seeking group that displays strong preferences and a significant WTP of 15% to 25% more for each of the quality attributes, and a price-sensitive group with preference ratings highly determined by price. This research provides useful information to managers and marketers involved in farmstead and artisan dairy production and marketing.

Keywords: farmstead cheese, artisan cheese, conjoint analysis, willingness to pay, Northeast United States

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Introduction

While on-farm production of value-added dairy products such as cheese, yogurt, butter, and ice cream may provide small dairy farms a means to increase revenue, escape the cyclical boom and bust pattern of fluid milk prices, and improve economic stability, the potential opportunities and benefits to dairy farms depend heavily on consumer preferences and willingness to pay (WTP) for such products. This study is motivated by the growing interest in on-farm production of value-added dairy products and by the lack of information on the market potentials for such products.

The economic pressure placed on dairy farms by highly variable milk prices is the primary factor in small dairy farm business cessation in the United States (Gierzynski et al. 2010). National trends have moved toward fewer but significantly larger dairy farms, as large farms have been more likely to find efficiencies in production and to survive when the fluid milk price is low (MacDonald et al. 2007). For example, in Vermont, a traditional dairy shed of the Northeast United States, the annual statewide milk production increased from 1.49 billion pounds in 1947 to 2.61 billion pounds in 2013 but, over the same period, the number of dairy farms dropped from 11,206 to fewer than 900 (Gierzynski et al. 2010; Gould 2015; Vermont Agency of Agriculture, Food & Markets 2015). Most dairy farm business cessations in Vermont and across the United States have occurred in operations with 200 or fewer milking cows while the number of large farms with more than 500 cows has increased significantly. As a result, the percentage of milk produced by large farms has increased dramatically. In Vermont, the contribution to total state milk production from farms with more than 500 head rose from 9% in 1997 to 37% in 2007 (Gould 2010).

As per capita fluid milk consumption in the United States has decreased significantly in the past three decades, the per capita consumption of cheese has increased year after year—reaching a record high of 33.51 pounds in 2012 (International Dairy Foods Association 2014). To meet the increasing demand for cheese and capture the benefits of economies of scale, modern cheese production has abandoned many traditional practices and embraced industrial-scale production models. The majority of this cheese is produced at factories that rely heavily on mechanization and automation. This cheese, often referred to as industrial, factory, or commodity cheese, is produced in very large batches intended to meet uniform standards, for trading in commodity markets. This process has led to very large increases in the quantities of cheese available in the market, bringing cheese to the diets of many people, but has also favored an agricultural system that relies on efficiency and large-scale production over traditional techniques and skills.

Traditional cheeses, often referred to as artisan cheeses, are produced primarily by hand, in small batches, and with particular attention to the tradition and art of cheese making (American Cheese Society 2010). Further designating a cheese as *farmstead* indicates that the cheese was made on-farm and that the milk used in the cheese-making process came from only the farm where the cheese was made. Artisan and farmstead cheeses typically reflect the traditional flavors and characteristics of the particular region in which the cheese is made (a characteristic known as *terroir*), support small-scale milk producers, and benefit local economies in multiple ways, including through milk production and cheese-making cooperatives.

Industrialized food production and distribution systems have raised public concerns about food safety and the disconnection between consumers and producers and, as a result, there is growing demand for traditional food products with attributes such as organic, local, and artisan. The major purposes of this study are to examine consumer preferences and WTP for artisan and other attributes of cheese and to provide market information to dairy farmers who are interested in producing and marketing cheese as a value-added product. Specifically, a conjoint survey was conducted in Vermont, Manhattan, and Boston to collect primary data, and the data were then used to analyze the relative importance of selected cheese attributes, assess WTP for artisan and other quality attributes, and derive marketing information and recommendations. The rest of this paper describes the research method and procedures, presents the empirical results, and summarizes the major findings and conclusions.

Data and Methods

Conjoint analysis was used to collect primary data and quantify consumer preferences and WTP for selected attributes of cheese in this study. Conjoint analysis has been widely used in marketing research and provides a means of empirically estimating consumer preferences and WTP for attributes of a specific product (Wittink and Cattin 1989). Although conjoint analysis may not eliminate the potential difference between the estimated WTP and true WTP in a marketplace, it has been considered to be more reliable than some other methods, such as contingent valuation (Wang, Shi, and Chan-Halbrendt 2004; Caruso, Rahnev, and Banaji 2009).

Conjoint analysis is a decompositional method that assesses consumer preferences through the rating or ranking of a set of product profiles with varying attribute levels (Green and Srinivasan 1990). First introduced by Luce and Tukey (1964), conjoint analysis was shortly afterward developed into a practical method of measuring the joint effects of product or service attributes on consumer preferences for the product or service. In conjoint analysis, regression is generally used to estimate the contributions of selected attributes to the overall preference rating or ranking, and the estimated regression coefficients can then be used to calculate the relative importance of each attribute as well as the trade-offs between price and other attribute levels (Green and Srinivasan 1978; Wang, Shi, and Chan-Halbrendt 2004). In a conjoint survey, respondents are placed in a hypothetical situation that is as similar as possible to a purchase decision-making situation in which they have to consider the trade-offs between attributes, especially between price and other attributes. This ability to quantify trade-offs is one of the major reasons that conjoint analysis has been widely used in marketing research for product modification or new product development. This conjoint study of cheese is completed via the procedures detailed in the following sections.

Selection of Attributes and Their Levels

The most frequently used means of attribute selection are expert judgment and group interviews (Wittink and Cattin 1989). In this study, the attributes and their levels were selected on the basis of the objectives of the study, findings from reviews of relevant literature, input from focus groups of cheese consumers, and feedback from cheese industry professionals. The attributes and levels selected for this study are listed in Table 1. Note that the variable type to be used in the regression analysis in a later section is also included in Table 1.

Table 1. Attribute names, levels, and variable types

Attribute Name	Attribute Levels	Variable Type
Production Type	Farmstead	Effect coding via two dichotomous variables
	Artisan	
	Commodity	
Localness	Local[1]	Dichotomous
	Not Local	
Organic Certification	USDA-Certified Organic	Dichotomous
	Not Certified	
Renewable Energy Use	Uses Renewable Energy[2]	Dichotomous
	None	
Unit Price Per Pound	$8, $12, $16, $20, and $24	Continuous

[1] defined as "produced in your state and within 250 miles of the purchase location."
[2] defined as "production uses more than 50% renewable energy."

Construction of Cheese Profiles

The selected levels of attributes are combined to create product profiles for consumers to evaluate. For this study, the first four attributes listed in Table 1 are used to generate 24 unique combinations, or cheese profiles (3 x 2 x 2 x 2 = 24). As price is treated as a dependent attribute of the first four attributes in Table 1, it is therefore not included in the creation of the profiles. Each of the 24 profiles is then assigned a price according to the profile composition. This is logical because cheese price is closely associated with each of the other four attributes.

For example, United States Department of Agriculture (USDA) certified organic cheese costs more to produce than non-certified organic cheese, and artisan cheese costs more than commodity cheese. With an assigned price of $8 for a reference cheese that is a commodity cheese that is not local or organic and whose production does not use renewable energy, the price for each of the other 23 profiles was assigned based on the assumption that each of the organic, local, artisan, farmstead, and use of renewable energy attributes would increase the price by $4. For example, a commodity cheese that is local but not organic and whose production does not use renewable energy is assigned a price of $12, and a farmstead cheese that is local and USDA-certified organic and whose production uses renewable energy is assigned a price of $24. These procedures have eliminated profiles that are logically not feasible to producers (e.g., an artisan cheese at a lower price than a commodity cheese) as well as profiles that are logically not acceptable to consumers (e.g., a commodity cheese at a higher price than an artisan cheese).

As rating all of the 24 product profiles would be burdensome to respondents, the 24 profiles were randomly split into two survey versions (A and B), and each version included 12 unique profiles. The two versions were then randomly distributed to the survey participants in a mail survey and via an Internet survey, as described in the next section.

Data Collection

The survey questionnaire included four major sections: (1) a one-page introduction to the survey and about how to complete the questionnaire, (2) a table for rating each of the 12 selected cheese profiles, (3) questions about cheese purchase behavior and patterns, and (4) demographic information. Survey instructions requested the primary food shopper in the household to complete the survey. The survey questionnaire also included definitions of artisan, farmstead, and commodity cheese based on the American Cheese Society glossary of terms (American Cheese Society 2010). These definitions are reported in Table 2.

Table 2. Definitions of terms included in the survey instrument

Artisan cheese	Cheese that is produced primarily by hand, in limited production amounts, using as little mechanization as possible and with particular attention to the tradition and art of cheese making
Farmstead cheese	Cheese that is produced on the cheese maker's farm with milk that comes only from the farmer's own herd or flock. Almost all farmstead cheeses produced in the northeastern U.S. are also artisan cheeses.
Commodity cheese	Cheese that is made in large quantities using a high degree of mechanization, with attention to minimizing cost and meeting uniform quality specifications

Both the rating method and ranking method have commonly been used in conjoint studies. This study uses the rating method, and it is assumed that the rating responses provided by respondents are measured on an interval scale (Louviere 1988). The rating scale used in this study was from 1 to 7, with 1 representing the lowest preference and 7 the highest preference. Also, two or more profiles can receive the same rating.

The most frequently used stimulus presentation options in conjoint analysis are verbal cues, written descriptions, tables, pictures, and physical products (Green and Srinivasan 1990). Conjoint surveys are often conducted through face-to-face interviews, by mail questionnaire, or via the Internet. Phone interviews are generally considered to be troublesome for conjoint surveys because there is no readily available option for visual and textual cues (this situation may change when computer-based phone systems with video options are widely used). This study used a combination of mail survey and Internet survey methods.

The target population for this study was consumers who are likely to be purchasers of farmstead and artisan cheese. Sample selection for the mail survey was performed using marketing research software to identify household records by geographic region and to select primary householders of a specific age group. Previous studies of artisan and farmstead cheese markets have observed that most consumers of these products are in the middle age ranges (Kupiec and Revell 1998; Mesías et al. 2003), and therefore record selection was limited to primary householders aged 30 to 64. An Internet survey was also conducted to reach more farmstead and artisan cheese purchasers. The Internet survey used the same questionnaire as the mail survey and was distributed directly through advertising and announcements at 11 cheese retailers specializing in

local, artisan, and farmstead cheese products that are located in the same geographic regions of the mail survey.

Mail survey records were selected using a stratified sampling method. First, the state of Vermont, the Manhattan borough of New York City, and the Boston metro area were selected. Vermont is a primarily rural, dairy production region, home to 43 cheese-making operations (Vermont Cheese Council 2011) and is the primary focus region of this research project funded by USDA. The Manhattan and Boston metro areas are large, urban markets that are the primary export markets for many Vermont dairy products. Second, 2,000 records were randomly selected from Vermont, and 750 records were randomly selected from each of the Manhattan and Boston regions.

This set of records for the mail survey was selected from a database of 202,000 potential records for Vermont, 555,000 potential records for Manhattan, and 128,000 potential records for the Boston metro area. Note that the sample size for each of the three regions was not proportional to its total potential records and that a greater share of the limited sampling resources was devoted to the Vermont region. This was partially because Vermont was the primary focus of this funded research project and partially because of uncertainty regarding response rates from the more distant urban areas and the need to ensure that the overall sample was large enough for statistical analysis. This sampling method has certain limitations, which will be discussed in a later section.

For the 3,500 selected records, 440 records were deleted due to undeliverable addresses; the final sample sizes were 1,588 for Vermont, 737 for Manhattan, and 735 for Boston (see Figure 1). The 3,060 mail surveys were distributed in January 2012, and responses were collected until the end of March 2012. Respondents were tracked using individualized ID codes placed on each return envelope. These codes have been found to have no effect on response rate (Kundig et al. 2011). Also, two weeks after the initial mailing date, recipients who had not responded were sent one follow-up reminder. In surveys where budget is constrained, the use of follow-up mailings has been shown to be preferred over other measurements (Larson and Chow 2003).

The Internet surveys were distributed and collected at the same time as the mail surveys. There were 458 respondents in total from both surveys, 241 from the mail survey and 217 from the Internet survey. After the 83 respondents with incomplete questionnaires (42 from the mail survey and 41 from the Internet survey) were excluded, data from the remaining 375 respondents (199 from the mail survey and 176 from the Internet survey) were used in the analysis. While it is not feasible to measure the response rate of the Internet survey, the mail survey had an overall response rate of 7.8%. A copy of the survey questionnaire can be found in Thompson (2012) and is also available from the authors.

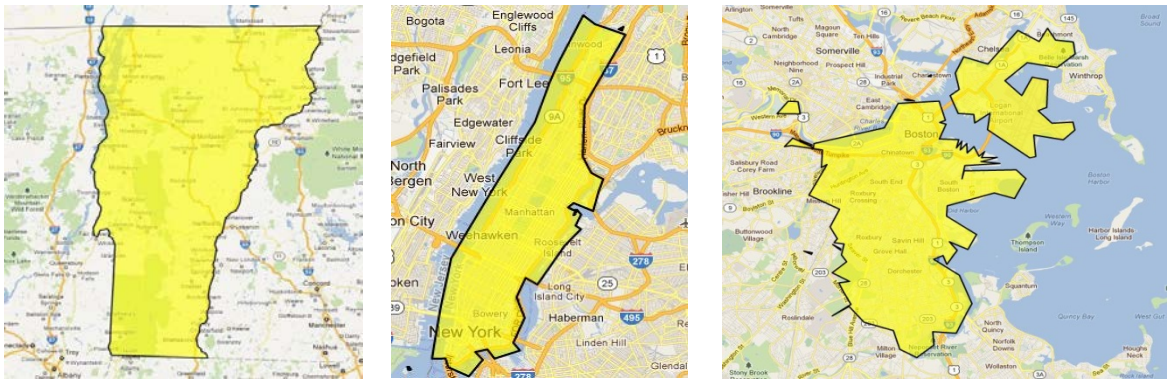

Figure 1. Study regions and sample size

Survey response rates in the United States have been declining for several decades (Dey 1997). In addition to the common factors cited by many individuals who refuse to participate in mail or phone surveys, such as busy schedule and lack of compensation for their time, one potential factor for the low response rate for this survey is that some individuals may not be cheese consumers and therefore did not want to participate in this survey about cheese. This confirms the commonly observed trend that respondents who are interested in a survey are more likely to respond than those who are not interested (Schiltz 1988).

Vermont provided 69.6% of the valid survey responses, while Manhattan and Boston generated 14.7% and 6.7%, respectively; the remainder were internet survey responses that originated from other areas in the Northeast. Because of the relatively low response rates in general and the small numbers of respondents from Manhattan and Boston, there are potential non-response bias issues in interpreting and applying the empirical results. The results of this study enhance our understanding of consumer preferences and WTP for artisan and other cheese attributes in the study regions, but these findings should be interpreted with caution and may not be used to estimate the preferences and WTP at the market level. More extensive studies with larger samples are needed to accurately estimate the market demand, especially in urban markets like Manhattan and Boston.

Because each respondent provided rating responses for 12 cheese profiles, the 375 valid survey responses provided a total of 4,500 observations for use in the subsequent quantitative analysis. This is considered to be a major advantage of conjoint analysis as compared to other marketing research methods that provide only one observation from each respondent (Halbrendt et al. 1995). Efforts were also made to identify potential measurement errors or rating inconsistencies, which were then incorporated into the regression analysis through weighted least squares (WLS), discussed later.

Specification of the Preference Model

Conjoint analysis assumes that consumer preference ratings or rankings of a particular product or service are determined by the product's attributes including price. In this study, consumer rating of the cheese profiles is assumed to be a function of the five selected cheese attributes:

(1) $R = f(P, LO, OC, RE, PR)$

where R is the preference rating for each profile, P represents the production type, LO is localness, OC is the presence of USDA organic certification, RE is the use of renewable energy in cheese production, and PR is the price.

In an empirical analysis, the above function needs to be presented in a specific functional form. Following the discussion about alternative preference model specifications by Green and Srinivasan (1978), this study uses a linear function to estimate the impacts of selected cheese attributes on the preference rating:

$$(2) \quad R_{ij} = a_0 + a_1 P1_j + a_2 P2_j + a_3 LO_j + a_4 OC_j + a_5 RE_j + a_6 PR_j + e_{ij}$$

where R_{ij} is the preference rating of the ith respondent for the jth profile; $P1_j$ and $P2_j$ are two dichotomous variables to represent production type through effect coding; LO_j, OC_j, and RE_j are dichotomous variables for localness, organic certification, and renewable energy use, respectively; PR_j is a continuous variable for price; a_0 is the intercept; a_1–a_6 are the coefficients to be estimated; and e_{ii} is the error term.

As identified in Table 1, the production type is coded using effect coding through two dichotomous variables (*P1 and P2*). Specifically, *P1* equals 1 for farmstead, 0 for artisan, and –1 for commodity, while *P2* equals 0 for farmstead, 1 for artisan, and –1 for commodity cheese.

Results and Discussion

This section presents the empirical results of the conjoint analysis and discusses the major findings.

Market Segmentation

Preliminary analysis of the 4,500 observations in the dataset indicated a very limited association between the preference rating and the five cheese attributes. This finding was quite different from our research hypothesis, which was based on the consumer preference theory and findings from previous studies. One possible reason for this lack of close association for the whole sample was that the respondents might be from different groups or clusters defined by certain characteristics or preferences. Cluster analysis confirmed that the respondents were likely from two groups: one group with strong preferences for quality attributes and the other group with a strong preference for a low price.

The analysis of consumer preferences through a survey relies on a representative sample of the study population. However, when the sample is not from a homogenous population, the analysis based on the sample data can be subject to many problems. For example, in a study of consumer preference for cars, if the sample includes one group or segment that prefers large cars and another group or segment that prefers small cars, the aggregate analysis based on the sample data may suggest a preference for medium cars, which does not accurately represent the views of the individuals in the sample (Stoker 1993). In such a situation, cluster analysis should be used to

separate the sample into groups with homogenous preferences, as suggested by Hagerty (1985), and preference analysis should be conducted for each group.

Cluster analysis was performed using the "two-step" method in SPSS in order to differentiate groups of respondents based on their preferences for cheese profiles. Clustering provides good predictive power for observations that one wishes to describe using a particular set of attributes, and aids in useful communication by allowing for compression of descriptive data (MacKay 2003). Clustering based on preference ratings for the reference profile, premium profile, and a calculated variable capturing the difference between the premium and reference profiles resulted in two distinct clusters: one containing a majority of respondents who prefer the premium profile and one with a majority of respondents who prefer the reference profile (Figures 2 and 3). The cluster displaying a preference for the premium profile was designated "quality seeking," and the cluster displaying a preference for the reference profile was designated "price sensitive." The quality-seeking cluster displays increasing preferences for additional quality attributes that also increase the price of the cheese, and the price-sensitive cluster displays decreasing preferences as quality attributes are added that increase the price. Each cluster displays clear and distinctly different patterns of preferences for each cheese profile.

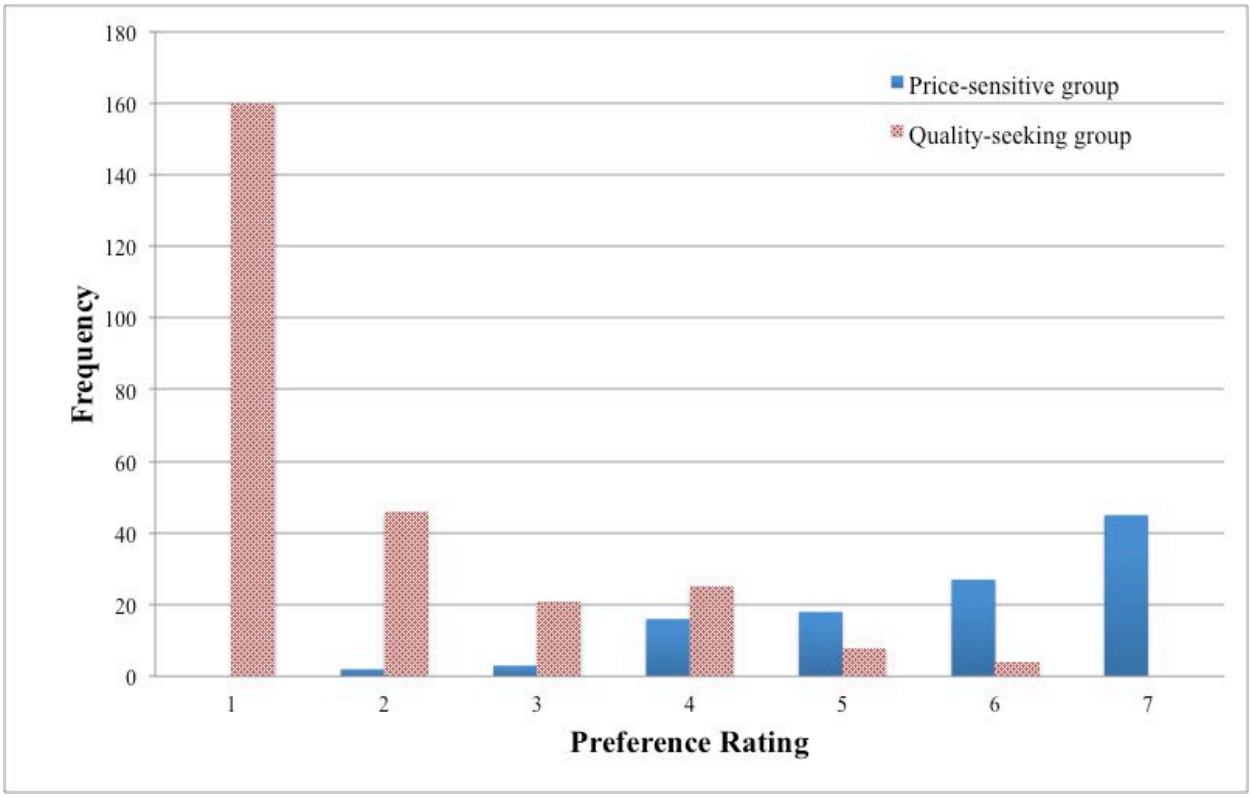

Figure 2. Preference ratings of the reference cheese profile ($8/lb)

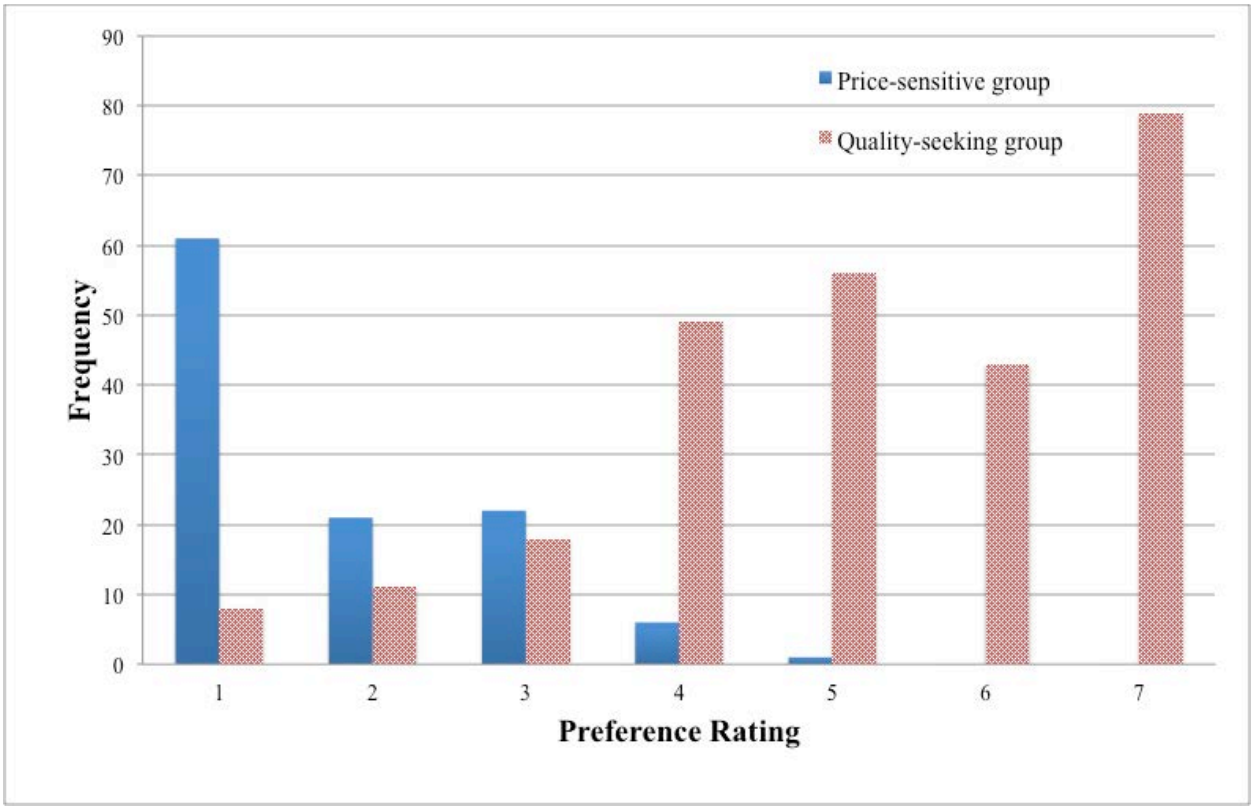

Figure 3. Preference ratings of the premium cheese profile ($24/lb)

Because large differences in preferences were observed, the characteristics of the respondents in the two clusters were analyzed to better understand predictors of cluster membership (Table 3). Small but significant variations were found between the clusters for age and household size, with quality seekers found to be slightly younger and to have a smaller average household size.

A significant difference was also found in the average amount of farmstead and artisan cheese purchased each month, with those in the quality-seeking cluster purchasing an average of 2.24 pounds per month and those in the price-sensitive cluster purchasing 0.98 pounds per month. No significant difference was found for total pounds of cheese purchased per month, indicating that respondents in the clusters are buying about the same amount of cheese but that the quality seekers are buying significantly more varieties with farmstead and artisan designations.

Pearson chi-square tests were used to determine whether the difference between the two clusters was significant for some categorical variables. The quality-seeking cluster was found to have a significantly higher proportion of females (73.9% versus 55.6%), and the price-sensitive cluster had a significantly higher percentage of Vermont residents (79.3% versus 65.5%). No significant differences were found for education, income, or race between the clusters. Significantly more quality seekers reported purchasing farmstead or artisan cheese at least once in the month before the survey.

Table 3. Descriptive statistics of the clusters

	Price-Sensitive Cluster		**Quality-Seeking Cluster**	
	Mean	Std Dev	Mean	Std Dev
Age**	48.22	13.30	46.31	13.03
Household size**	2.87	1.61	2.77	1.302
Farmstead & artisan cheese (lb/month)***	0.98	1.68	2.24	2.39
Total cheese (lbs/month)	4.00	2.98	3.86	3.57
	Number	%	Number	%
Gender***				
Female	60	55.6	190	73.9
Male	48	44.4	67	26.1
Residence***				
Vermont	88	79.3	173	65.5
Boston	6	5.4	19	7.2
Manhattan	14	12.6	41	15.5
Other	3	2.7	31	11.7
Education				
Some high school	0	0.0	3	1.2
High school diploma	6	5.6	16	6.2
Some college	15	13.9	27	10.5
2-year associate degree	9	8.3	20	7.8
4-year college degree	44	40.7	107	41.6
Graduate or doctoral degree	34	31.5	84	32.7
Household Income				
Less than $20k	9	8.7	13	5.2
$20k–$34,999	12	11.5	30	12.0
$35k–$49,999	15	14.4	35	13.9
$50k–$74,999	19	18.3	48	19.1
$75k–$99,999	19	18.3	50	19.9
$100k–$149,999	16	15.4	43	17.1
$150k or more	14	13.5	32	12.7
Race				
White	98	88.3	237	89.8
Hispanic	2	1.8	0	0.0
Black or African American	1	0.9	5	1.9
Asian	4	3.6	8	3.0
Native American or Alaskan Native	1	0.9	7	2.7
Other	3	2.7	6	2.3
Purchased farmstead or artisan cheese in the last month***				
Yes	62	55.9	235	89.0
No	49	44.1	29	11.0
Data collection method***				
Mail	72	64.9	127	48.1
Internet	39	35.1	137	51.9

**Significant difference between the two clusters at the $p < 0.05$ level

***Significant difference between the two clusters at the $p < 0.01$ level

The lack of significant difference in income between the two clusters was surprising because the price-sensitive group would be expected to have a lower, more constrained income than the quality seekers. There are at least two possible explanations. First, price-sensitive consumers may be displaying preferences that stem from other underlying social and political values, rather than solely from income. Second, the effect of non-response bias stemming from low response rates, particularly from the Manhattan and Boston regions, may have resulted in underrepresentation of certain income brackets in the sample.

Results of chi-square tests performed to analyze the significance of the differences between clusters in purchase locations for farmstead and artisan cheese show that similar rates of purchase at grocery chains were observed for both clusters, but quality seekers made significantly higher rates of purchase at grocery co-ops, specialty cheese shops, farmers' markets, community-supported agriculture (CSA) shares, Internet sites, and restaurants (Table 4).

Table 4. Comparison of cheese purchase locations by cluster

Purchase Location for Farmstead and Artisan Cheese	**Price-Sensitive Cluster**	**Quality-Seeking Cluster**
Grocery chain	36.0%	34.8%
Grocery co-op***	28.8%	51.5%
Specialty cheese shop***	20.7%	34.5%
Farmers' market***	9.9%	44.7%
CSA share***	2.7%	6.8%
Internet***	0.0%	5.3%
Restaurant***	3.6%	8.7%

***Significant difference between the two clusters at the $p < 0.01$ level

A binary logistic regression was used to test whether the method of data collection (mail versus Internet) was a significant predictor of cluster membership when the variables of geographic region (from Vermont versus from Boston or Manhattan), age, gender, and monthly pounds of farmstead and artisan cheese purchased by the subject were considered. All independent variables were found to be significant at $p < 0.05$ with the exception of the data collection method, indicating that a subject's method of response (mail or Internet) was not a significant predictor of cluster membership. Detailed results of the binary logistic regression analysis are available in Thompson (2012).

Estimation of Coefficients and Part-worth Utilities

A weighted least squares (WLS) regression procedure was used to estimate the preference model presented in equation (2) for the full sample and for the two clusters, respectively, and estimation results are reported in Table 5. WLS is an estimation procedure that gives a different weight to each subject or observation in estimating a regression model. The subjects or observations with higher weights play relatively more important roles in determining the estimated regression model than the subjects or observations with lower weights. In this study, following the conjoint

rating table in the survey, each respondent was asked to identify his or her most and least favorite cheese profiles in order to identify potential measurement inconsistency. The responses were compared with the respondents' profile ratings. The comparison results were used to create a consistency index, which was then used as the weight in the WLS estimation. The consistency index has a value range from zero (totally inconsistent) to one (totally consistent). For example, a respondent whose most favorite cheese profile received the highest rating and whose least favorite cheese profile received the lowest rating was assigned a consistency index value of one. On the other hand, a respondent whose favorite profile received the lowest rating and whose least favorite profile received the highest rating was assigned a consistency index value of zero. See Thompson (2012) for more details about the procedures of calculating the weights.

Table 5. Estimated WLS regression coefficients for the full sample, price-sensitive cluster, and quality-seeking cluster

	Estimated Parameters								
Variable	**Full Sample**			**Price-Sensitive Cluster**			**Quality-Seeking Cluster**		
	B	t-value		B	t-value		β	t-value	
Intercept	3.898	87.11	***	3.362	38.953	***	4.086	93.071	***
Production Type									
Farmstead (P1)	0.185	6.136	***	0.029	0.475		0.245	8.248	***
Artisan (P2)	0.245	6.576	***	0.058	0.799		0.299	8.039	***
Localness (LO)	0.364	6.803	***	0.253	2.289	**	0.403	7.672	***
Organic Certification (OC)	0.277	4.560	***	0.134	1.098		0.306	5.074	***
Renewable Energy (RE)	0.242	4.179	***	0.154	1.336		0.226	3.926	***
Price (PR)	–0.573	–4.464	***	–0.861	–3.226	***	–0.380	–3.020	***
F-Statistic	46.924***			72.542***			196.274***		
Adjusted R-Square	0.058			0.244			0.271		

*p < 0.10; **p < 0.05; ***p < 0.01

T-test of each estimated coefficient in Table 5 indicates whether the estimated coefficient is significantly different from 0 or whether the attribute is a significant factor in determining the preference rating. For the price-sensitive cluster, price and whether a cheese was identified as local were significant attributes. For quality seekers, all attributes were significant predictors of preferences. The F-statistic indicates the overall significance of the estimated model in explaining the variation in cheese profile preferences. For both clusters, the F values are significant at the $p < 0.05$ level.

The adjusted R-square values indicate the proportion of variation in the preference ratings that is explained by the estimated model; 24.4% and 27.1% for the price-sensitive and quality-seeking groups, respectively. These R-square values are similar to those reported in many other conjoint analysis studies. The R-square values are significantly higher for the price-sensitive and quality-seeking subsets of the sample obtained using cluster analysis than for the full sample (0.058), indicating that the segmented model does a better job explaining the variation in preference ratings than the full sample model.

The estimated model for the full sample indicates that the five attributes (production type, localness, organic certification, renewable energy use, and price) are all significant factors, but the low adjusted R-square value as compared to that for the estimated models for the two clusters suggests that there is much more unexplained variance in the preference ratings for the full sample. This was to be expected, as it was observed that subsets within the sample of respondents display opposing preferences for cheese profiles that are at opposing ends of the price–quality spectrum. The models for the price-sensitive and quality-seeking clusters achieve significantly higher adjusted R-square values.

Relative Importance of Cheese Attributes

Part-worth utility estimates were used to calculate the relative importance of each attribute, using the following three-step procedure. First, the utility range (UR) was found by calculating the difference between the highest and lowest values of the part-worth utilities for each attribute. Second, the sum of the URs for all attributes was calculated, and, finally, the relative importance (RI) of the i^{th} attribute was calculated using the following equation (Halbrendt et al. 1995):

$$3)\ RI_i = 100\ x\ \frac{UR_i}{\sum_{j=1}^{n} UR_j}$$

The RI for each attribute is a percentage weight, and the sum over all attributes is equal to 100. Thus the RI of each attribute can be directly compared to that of other attributes, and an RI value that is twice that of another can be interpreted as having twice the importance in determining the preference rating (Figure 4).

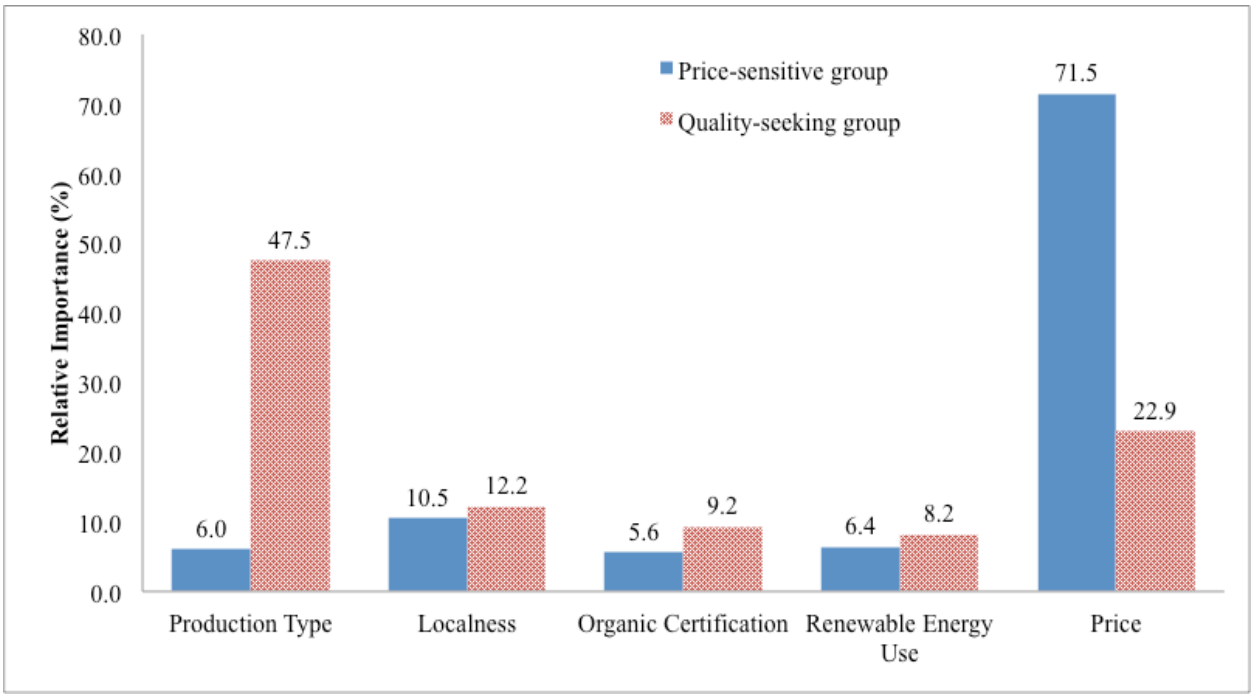

Figure 4. Relative importance of selected cheese attributes

Respondents in the price-sensitive cluster were found to place the most importance on price. For this group, price is nearly seven times as important as the second most important attribute, localness. As indicated in Table 3, price and localness are the only attributes that significantly affected preferences for the price-sensitive group. This suggests that the promotion of local cheese production would be expected to affect the price-sensitive consumer's preferences to a greater degree than the promotion of any other non-price attribute.

Quality-seeking consumers were found to place the most importance on production type, designated as commodity, artisan, or farmstead. This attribute informs consumers about the scale of production, production practices and expected sensory qualities of the cheese. The importance of production type is approximately twice that of the second most important attribute, price, and about five times that of localness, organic certification, and renewable energy use. Overall, whereas price is much less important for quality seekers than for price-sensitive consumers, each of the other attributes appears to be more important to quality seekers.

Consumer WTP

Analysis was performed to determine WTP for each cheese attribute by calculating the expenditure equivalent index (EEI) for the attribute. WTP is a valuable measurement for producers because it quantifies the additional price that can be expected in the market for each attribute. The EEI is calculated following the equation from Payson (1994):

$$4)\ EEI = 1 - \frac{\sum_{i=1}^{k} B_i\, dc_i}{yP}$$

where B_i is the estimated parameter for the *i*th attribute, y is the estimated parameter of price, dc_i is the change in the *i*th attribute level, and P is the base price level. The EEI indicates the proportion change in price necessary for the purchasers to be indifferent in preference between the reference profile and an alternate profile (Payson 1994). For example, compared to a reference profile with an EEI of 1, an alternative profile with an EEI of 1.2 indicates that the purchasers are willing to pay 20% more for the alternative than for the reference. On the other hand, an EEI of 0.8 for another profile indicates that, for this profile, the purchasers are willing to pay only 80% of the reference profile's price.

Quality-seeking cheese consumers are found to be willing to pay more for all quality attributes than their price-sensitive counterparts. Local production leads to the largest WTP for any single attribute in both clusters. Price-sensitive purchasers display very low WTP for artisan or farmstead designations, indicating little value placed on these attribute levels over a commodity cheese. Quality seekers are willing to pay 19.7% and 16.1% more for these attributes, respectively (Figure 5).

Based on these results, a price-sensitive purchaser would be expected to be willing to pay 18.2% more for a cheese that is designated artisan, farmstead, locally produced, USDA-certified organic, and produced using renewable energy than they would for the reference commodity cheese with no additional attributes. This translates to a price of $9.46 per pound when the reference cheese is priced at $8 per pound. Quality seekers on the other hand are found to be

willing to pay 97.3% more for a cheese with all of the above attributes, translating to a per-pound retail price of $15.78 when the reference commodity cheese is priced at $8 per pound.

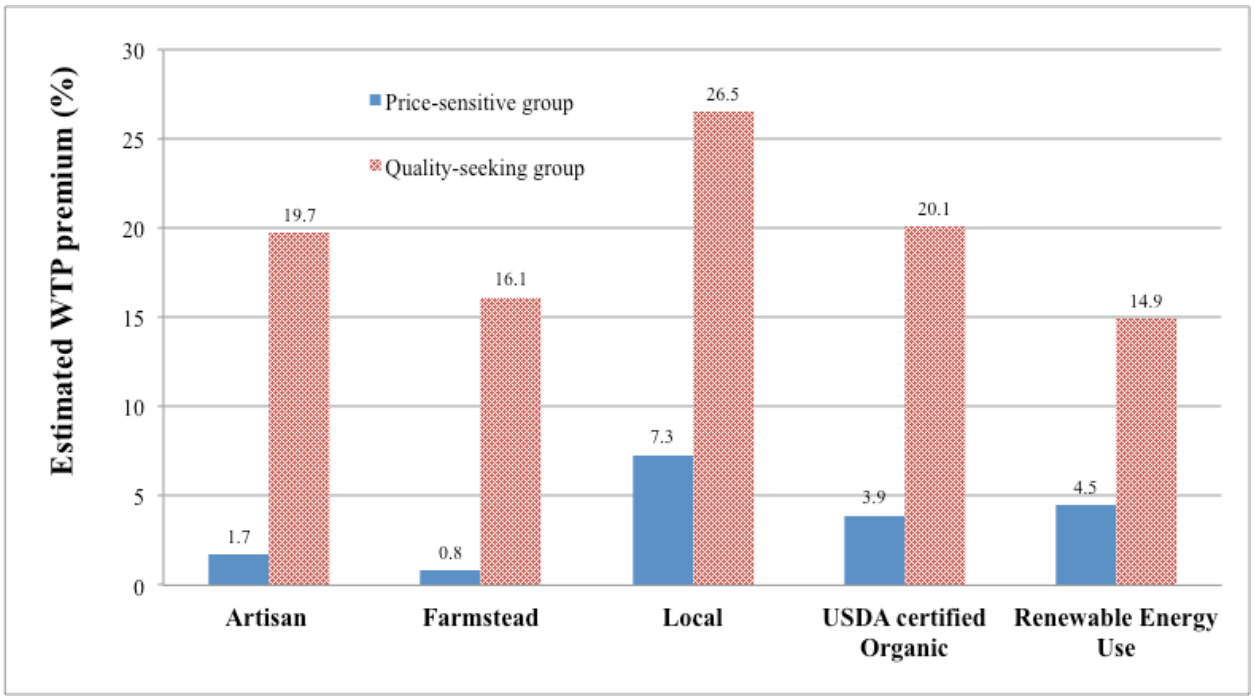

Figure 5. Estimated premium of WTP for selected cheese attributes

Conclusions and Implications

The empirical results of this study suggest four major conclusions with significant implications for cheese marketing, especially for cheeses with special attributes such as artisan, farmstead, local, and organic. First, although cheese consumers are not homogenous in their preferences, survey participants in this study fell into two groups: quality seekers with strong preferences for cheeses carrying designations of artisan, farmstead, local, organic, and produced with renewable energy, and a price-sensitive group whose preference ratings are influenced primarily by retail price. Also, preferences of the quality-seeking cluster are significantly influenced by all attributes, while preferences of the price-sensitive group are significantly influenced by local designation and price. Local designation has a significant positive influence on the preferences of both groups, but it is important to note that there are many definitions of local, and individual perceptions of what local means varies. This study defined local as produced in the same state and within 250 miles of the purchase location.

Second, quality seekers are found to be willing to pay 15%–25% more for each of the attributes of farmstead, artisan, produced locally, USDA certified organic, and made using 50% or more renewable energy, allowing a cheese with all these attributes to sell for approximately twice as much as a cheese with none of the attributes.

Third, quality-seeking cheese consumers can be distinguished from price-sensitive cheese consumers by socio-demographic and cheese purchasing behavior variables. Quality seekers are found to be more likely to be younger, live in smaller households, and purchase a larger percentage of artisan and farmstead cheese than price-sensitive cheese consumers. Quality seekers are also more likely to buy artisan and farmstead cheese at grocery co-operatives, farmers' markets, restaurants, specialty cheese shops and through CSA shares than their price-sensitive counterparts. The level of educational attainment and household income were not found to be significant predictors of group membership, indicating that, although the price of cheese significantly influences the preferences of both groups, the relationship of cluster membership to household socioeconomics is complex and not directly related to income.

Fourth, quality seekers were found to be willing to pay more for artisan cheese than for farmstead cheese. This preference may stem from a lack of clear market information regarding the specific meanings of these two designations. Indeed, in almost all cases, farmstead cheeses are of artisan quality but have the additional attribute of being made on-farm, generally providing a greater economic support to regional dairy farms. Both artisan and farmstead cheese making provide a strategy for dairy farmers to transition from fluid milk production toward diversified product lines and value-added niche markets, but the artisan designation was found to garner more market support than the farmstead designation. This finding indicates an area for focused market attention and efforts toward consumer education about the farmstead designation, to highlight that the cheese is made on the farm and so provides the dairy farmers with the revenue benefit of adding value to their milk. Farmstead cheeses possess the same attributes as artisan cheeses—traditional practices, handmade techniques, and small batch size—so, with its additional attribute of small-farm support, farmstead cheese could likely realize greater market support than artisan cheese.

In summary, this study found significant WTP for selected cheese attributes, including artisan, farmstead, local, organic, and use of renewable energy in production. Consumer WTP for these attributes translates to additional revenue potential for cheese makers who use milk from their farms or purchase milk from local farms, certify their products as USDA organic, and opt to use a label indicator when renewable energy is used during the production process. Regardless of the desirability of product attributes perceived by quality-seeking consumers, an associated price increase tied to each attribute will cause a segment of the market to be unwilling to pay the premium necessary to support the attribute. In a dairy market that continues to experience steady losses of small and medium farms, artisan and farmstead cheese production and marketing provide an opportunity to enhance the economic viability of struggling farms, preserve traditional working landscapes, create more resilient and diversified production systems, and increase the availability of unique and exciting regional cheeses.

Similar to many empirical studies based on consumer surveys, this study was limited by low survey response rates, particularly from the urban markets of Manhattan and Boston, and by the different sampling populations of the mail survey and Internet survey. As a result, it is likely that the proportions of consumers in the price-sensitive and quality-seeking groups differ significantly from that in the general population. While findings from this study help shed light on the preferences and WTP of each of the two groups of respondents, the potential sample bias of the two groups means that the results should not be used to estimate the preferences and WTP

at any market level. To accurately measure the market size of quality-seeking cheese consumers in a given region, it may be useful for future research to quantify total commodity and artisan cheese sales, calculate the proportions of each to the whole, and obtain WTP data from statistically representative samples of cheese purchasers. Such information would further this line of research and help the makers and marketers of artisan and farmstead cheeses identify areas with unmet market potential and prioritize marketing and distribution efforts.

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