Consumer Preference Variation between Domestic and Imported Food

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Abstract

Increasing concerns about a healthy diet, food safety and support for the local economy provide new opportunities for farmers to increase their farm income by locally selling their farm products. The major challenge for farmers making local sales is to predict consumer preferences correctly and provide goods to the market accordingly. By analyzing results from a consumer survey conducted in the Midwest, the current study determines the consumer preferences for domestic artisan cheese compared with processed cheese and imported French cheese compared with U.S. artisan cheese. The results of the econometric analysis show that consumer preferences vary between domestic and imported cheese. The results also show that experience attributes are more influential than search and credence attributes on consumers' willingness to pay a price premium for a food item.

Key Words: Willingness to Pay, Consumer Preferences, Ordered Probit, Factor Analysis

Increasing concerns about a healthy diet, food safety and support for the local economy provide new opportunities for farmers to increase their farm income by locally selling their farm products (Ilbery & Maye, 2005). The major challenge for farmers making local sales is to predict consumer preferences correctly and provide goods to the market accordingly. For farmers, directly marketing and selling their farm products locally has the advantage of receiving a higher price from consumers (Morgan & Alipoe, 2001; Uva, 2002), and the farmers can use the "local" attribute to attract consumers to their products instead of non-local products. On the other hand, if farmers fail to understand the consumer preferences correctly, they face financial losses because they've already invested capital and time. In response to consumer demand for locally produced farm products, supermarkets such as Wal-Mart have announced that they would increase their offerings of locally produced farm products (Monson, Mainville, & Kuminoff, 2008).

The existing literature has focused on identifying consumer preferences for different food quality attributes (Brown, Gandee, & D'Souza, 2006; Monson, Mainville, & Kuminoff, 2008; Thilmany & Watson, 2004). Food quality is multidimensional; certain dimensions, such as color and taste, are readily discernible by consumers (Anderson & Anderson, 1991). These readily discernible dimensions are known as *search* and *experience* attributes (Nelson, 1974; Stigler, 1961). Specifically, the search attributes refer to a product's visual attributes, such as size and color, for which consumers can seek pre-purchase information. On the other hand, experience attributes, such as taste, are the ones that are ascertained on the basis of consuming the product (Nelson, 1974; Stigler, 1961). Food product *credence* attributes are quality features, such as organic and locally grown, that cannot be ascertained by direct experience, so consumers cannot know with certainty whether a credence attribute is actually present within a product (Anderson

& Anderson, 1991). Credence attributes cannot be evaluated by consumers before purchase or after consumption without incurring information costs (Anderson & Anderson, 1991; Darby & Karni, 1973). Unless there is reliable and verified information, the consumer would not know whether the product really has the credence attributes.

Empirical studies that analyzed consumer preferences found different results in terms of the relative importance of search, experience and credence attributes. Some studies found that credence attributes impact consumers' purchase decisions positively and lead them to purchasing food items that bear the credence attributes (Dentoni et al., 2009; Wirth, Love, & Palma, 2007). Certain population segments are willing to pay more for food products that carry a label that shows that the product was produced organically (Mabiso et al., 2005). Studies have shown that "local" or "locally grown" attribution affects consumers' willingness to pay for food products (Darby et al., 2008; Froehlich, Carlberg, & Ward, 2009). Onken et al. (2011) found that consumers pay a premium for local food, but they wouldn't pay a significant premium for organic foods compared with natural foods. However, there is not enough information about the relative importance of individual credence attributes. Thus, it is not known whether farmers should invest in producing organic food or whether they should only focus on selling their products as "locally produced." It is also not known whether farmers should emphasize the search and experience attributes or the credence attributes in their marketing efforts. The answers to these questions can help farmers to focus and invest more on the attributes that most appeal to consumers. One of the current study's objectives is to analyze the relative importance of search, experience and credence attributes.

Literature also hasn't analyzed how consumer preferences change between domestic and imported food products. The current study will determine the variation in consumer preferences

between domestic and imported food by analyzing the consumer preferences for cheese. By analyzing U.S. consumer preferences for French cheese, the current study will provide guidance to farmers who aim at providing domestic cheese to replace imported cheese.

Empirical Model

The willingness to pay (WTP) for domestic artisan cheese and imported French cheese can be determined using an ordered probit model because this variable is in the form of ordered numbers from 0 to 3 (Greene, 2008)[1]. Ordered probit models have been used in the literature for analyzing multinomial choice variables that are inherently ordered, e.g., for taste tests and opinion surveys. Similar to other discrete choice models, the ordered probit model can also be derived from a latent variable (Greene, 2008). The special case of the current study is having two dependent variables: WTP for artisan cheese (domestic) compared with processed cheese (domestic) and willingness to pay for imported French artisan cheese compared with U.S. artisan cheese. Following Geene and Hensher (2008), the latent variables $y_{1i}*$ and $y_{2i}*$, which represent the random utility from consuming artisan cheese and French artisan cheese, respectively, can be represented as:

$$y_{1i}* = \mathbf{X}_{1i}'\boldsymbol{\beta}_1 + \varepsilon_{1i}$$
$$y_{2i}* = \mathbf{X}_{2i}'\boldsymbol{\beta}_2 + \varepsilon_{2i}$$
$$\begin{pmatrix}\varepsilon_{1i}\\ \varepsilon_{2i}\end{pmatrix} \sim N\left[\begin{pmatrix}0\\0\end{pmatrix}, \begin{pmatrix}1 & \rho\\ \rho & 1\end{pmatrix}\right]$$

where $\mathbf{X}_{1i}'$ and $\mathbf{X}_{2i}'$ are the vectors that include the values for the variables of the deterministic part of the latent variable, and *i* denotes an individual observation. $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ are the vectors that

[1] In the current study, artisan cheese is defined as a specialty cheese. Artisan cheese is made primarily by hand and has been developed as a piece of art. It is typically made on small scale and has unique characteristics. Artisan cheese also has creative labeling and brand naming.

include the coefficients to be estimated. ε_{1i} and ε_{2i} are the error terms for corresponding equations. The error terms ε_{1i} and ε_{2i} are assumed to have a bivariate standard normal distribution with correlation ρ. The latent variables y_{1i}^* and y_{2i}^* are unobservable, but willingness to pay for both types of cheese is observed:

$$y_{1i} = \begin{cases} 0 & \text{if WTP Artisan Cheese = 0} \\ 1 & \text{if WTP Artisan Cheese = 20\% more} \\ 2 & \text{if WTP Artisan Cheese = 30\% more} \\ 3 & \text{if WTP Artisan Cheese = 50\% more} \end{cases} \quad y_{2i} = \begin{cases} 0 & \text{if WTP French Cheese = 0} \\ 1 & \text{if WTP French Cheese = 20\% more} \\ 2 & \text{if WTP French Cheese = 30\% more} \\ 3 & \text{if WTP French Cheese = 50\% more} \end{cases}$$

Following these equations, the WTP values can be represented in terms of the latent values as:

$$\text{WTP}_{1i} = y_{1i} = \begin{cases} 0 & \text{if } y_{1i}^* \le \mu_{11} \\ 1 & \text{if } \mu_{11} < y_{1i}^* \le \mu_{12} \\ 2 & \text{if } \mu_{12} < y_{1i}^* \le \mu_{13} \\ 3 & \text{if } \mu_{13} < y_{1i}^* \end{cases} \quad \text{WTP}_{2i} = y_{2i} = \begin{cases} 0 & \text{if } y_{2i}^* \le \mu_{21} \\ 1 & \text{if } \mu_{21} < y_{2i}^* \le \mu_{22} \\ 2 & \text{if } \mu_{22} < y_{2i}^* \le \mu_{23} \\ 3 & \text{if } \mu_{23} < y_{2i}^* \end{cases}$$

where μ values represent the unknown cutoff parameters to be estimated with $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$. The cutoffs satisfy the condition that $\mu_{11} < \mu_{12} < \mu_{13}$ and $\mu_{21} < \mu_{22} < \mu_{23}$. If the error terms ε_{1i} and ε_{2i} have bivariate standard normal distributions, then the probability of each pair of outcomes can be represented as (Geene & Hensher, 2008):

$$\begin{aligned} \Pr\left(y_{1i} = j, y_{2i} = k \middle| \mathbf{X}_{1i}, \mathbf{X}_{2i}\right) = {} & \Phi_2\left(\left(\mu_{1j} - \mathbf{X}_{1i}\boldsymbol{\beta}_{1i}\right), \left(\mu_{2k} - \mathbf{X}_{2i}\boldsymbol{\beta}_{2i}\right), \rho\right) \\ & - \Phi_2\left(\left(\mu_{1j-1} - \mathbf{X}_{1i}\boldsymbol{\beta}_{1i}\right), \left(\mu_{2k} - \mathbf{X}_{2i}\boldsymbol{\beta}_{2i}\right), \rho\right) \\ & - \Phi_2\left(\left(\mu_{1j} - \mathbf{X}_{1i}\boldsymbol{\beta}_{1i}\right), \left(\mu_{2k-1} - \mathbf{X}_{2i}\boldsymbol{\beta}_{2i}\right), \rho\right) \\ & + \Phi_2\left(\left(\mu_{1j-1} - \mathbf{X}_{1i}\boldsymbol{\beta}_{1i}\right), \left(\mu_{2k-1} - \mathbf{X}_{2i}\boldsymbol{\beta}_{2i}\right), \rho\right) \end{aligned}$$

where $\Phi_2(.)$ is the bivariate standard normal cumulative distribution function (Greene, 2008). These probabilities enter the log-likelihood function for a maximum likelihood estimator of the parameters. The log-likelihood function for the entire sample of size *N* can be obtained as:

$$\ln L = \sum_{i=1}^{N}\sum_{j=1}^{4}\sum_{k=1}^{4} I(y_{1i} = j, y_{2i} = k) \ln \Pr(y_{1i} = j, y_{2i} = k)$$

Maximum likelihood estimation of the coefficients $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ are obtained by taking the derivative of the log-likelihood function with respect to each coefficient included in $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ (Greene, 2008; Geene & Hensher, 2008).

Marginal Effects

The marginal effects are calculated based on derivate of $\Pr\left(y_{1i} = j, y_{2i} = k \middle| \mathbf{X}_{1i}, \mathbf{X}_{2i}\right)$ with respect to variables of interest. Before we proceed further, we define the following variables and drop the observation subscript for convenience (Geene & Hensher, 2008):

$$A_L = \mu_{1,j-1} - \mathbf{X}_{1i}'\boldsymbol{\beta}_1$$
$$A_U = \mu_{1,j} - \mathbf{X}_{1i}'\boldsymbol{\beta}_1$$
$$A_L = \mu_{2,k-1} - \mathbf{X}_{2i}'\boldsymbol{\beta}_2$$
$$B_U = \mu_{2,k} - \mathbf{X}_{2i}'\boldsymbol{\beta}_2$$

Then $\Pr\left(y_{1i} = j, y_{2i} = k \middle| \mathbf{X}_{1i}, \mathbf{X}_{2i}\right)$ can be written as (Geene & Hensher, 2008):

$$\Pr\left(y_{1i} = j, y_{2i} = k \middle| \mathbf{X}_{1i}, \mathbf{X}_{2i}\right) = \Phi_2\left(A_U, B_U, \rho\right) - \Phi_2\left(A_L, B_U, \rho\right) - \Phi_2\left(A_U, B_L, \rho\right) + \Phi_2\left(A_L, B_L, \rho\right)$$

and

$$\frac{\partial \Pr\left(y_1 = j, y_2 = k \middle| \mathbf{X}_1, \mathbf{X}_2\right)}{\partial \mathbf{X}_1} = (-\boldsymbol{\beta}_1)\begin{bmatrix} \phi(A_U)\Phi_2\left(\frac{B_U - \rho A_U}{\sqrt{1-\rho^2}}\right) - \phi(A_L)\Phi_2\left(\frac{B_U - \rho A_L}{\sqrt{1-\rho^2}}\right) \\ \phi(A_U)\Phi_2\left(\frac{B_L - \rho A_U}{\sqrt{1-\rho^2}}\right) - \phi(A_L)\Phi_2\left(\frac{B_L - \rho A_L}{\sqrt{1-\rho^2}}\right) \end{bmatrix}$$

$$\frac{\partial \Pr\left(y_1 = j, y_2 = k \middle| \mathbf{X}_1, \mathbf{X}_2\right)}{\partial \mathbf{X}_2} = (-\boldsymbol{\beta}_2)\begin{bmatrix} \phi(B_U)\Phi_2\left(\frac{A_U - \rho B_U}{\sqrt{1-\rho^2}}\right) - \phi(B_L)\Phi_2\left(\frac{A_U - \rho B_L}{\sqrt{1-\rho^2}}\right) \\ \phi(B_L)\Phi_2\left(\frac{A_U - \rho B_L}{\sqrt{1-\rho^2}}\right) - \phi(B_L)\Phi_2\left(\frac{A_L - \rho B_L}{\sqrt{1-\rho^2}}\right) \end{bmatrix}$$

where $\frac{\partial \Phi_2(A, B, \rho)}{\partial A} = \phi(A)\Phi_2\left(\frac{B - \rho A}{\sqrt{1-\rho^2}}\right)$ and for variables that appear in both equations, the effects are added.

Sample Selection

An alternative specification for the econometric model can be done using Heckman's selection model (Greene, 2008). The advantage of this model is to account for the sample selection problem seen in choice analysis. However, the disadvantage of this model is not taking into account the correlation among the error terms for the two dependent variables, which can cause biased estimates (Greene, 2008). Another disadvantage of this model is not taking the ranked structure of the dependent variables into account. In the current study, the sample selection problem may be caused by some consumers not consuming cheese. For example, when willingness to pay for artisan cheese is observed as zero in the data, it could be that the consumer does not purchase cheese or that the consumer purchases cheese but does not prefer artisan cheese. To test for the existence of this problem in the data, a selection equation is estimated for purchasing cheese. Following Greene (2008), for the selection equation, a probit model is used:

$z^*_i = \mathbf{w}'_i\boldsymbol{\gamma} + u_i$

$z_i = 1$ if $z^*_i > 0$, the consumer purchases cheese

$z_i = 0$ if $z^*_i = 0$, the consumer does not purchase cheese

where $\mathbf{w}'_i$ is the vector of independent variables, consumer attributes and the cheese product's attributes. $\boldsymbol{\gamma}$ is the vector that includes the coefficients to be estimated, and u_i is the error term. Willingness to pay equations in this case can be represented as:

$y_{1i} = \mathbf{x}'_{1i}\boldsymbol{\beta}_1 + \varepsilon_{1i}$ observed if $z^*_i > 0$

$y_{2i} = \mathbf{x}'_{2i}\boldsymbol{\beta}_2 + \varepsilon_{2i}$ observed if $z^*_i > 0$

where y_i, $\mathbf{x}'_i$, and ε_i are defined as the same as in the bivariate ordered probit model above, with on distinction as in the current model the error terms ε_{1i} and ε_{2i} are not correlated and have univariate standard normal distributions. The results of this regression show that the selection equation is not significant at the 10 percent significance level[2]. Hence, there is no statistical evidence for the sample selection in the data as almost all consumers in the dataset had consumed cheese at some frequency. For this reason, we continue the empirical analysis using the bivariate-ordered probit regression.

Factor Analysis

In addition to regression analysis, we also conducted the statistical factor analysis to identify the group of artisan cheese attributes that could be stressed in a focused and successful marketing plan. Following Johnson and Wichern (2002), the observed values of consumer preferences for artisan cheese attributes can be represented by the observable random vector $\boldsymbol{Z}$ with *p* components; it has mean $\boldsymbol{\mu}$ and covariance matrix $\boldsymbol{\Sigma}$. The factor model imposes that $\boldsymbol{Z}$ is linearly dependent on a few unobservable random variables $F_1, F_2, \ldots, F_m$, which are called

[2] The regression results for this model are available upon request.

common factors, and p additional sources of variation $\varepsilon_1, \varepsilon_2, \ldots, \varepsilon_p$, which are called errors. The factor analysis model then can be represented in matrix notation as:

$$\boldsymbol{Z} - \boldsymbol{\mu}_{\,p \text{ x } 1} = \mathbf{L}_{p \text{ x } m}\mathbf{F}_{m \text{ x } 1} + \boldsymbol{\varepsilon}_{p \text{ x } 1}$$

where **L** is the matrix of factor loadings, which includes the loading of j th variable of the k th factor l_{jk}. Hence the model represents the p deviations $X_1 - \mu_1, X_2 - \mu_2, \ldots, X_p - \mu_p$ in terms of random variables $F_1, F_2, \ldots, F_m$ and $\varepsilon_1, \varepsilon_2, \ldots, \varepsilon_p$, which are unobservable (Johnson and Wichern, 2002). The covariance structure for the factor model can be represented as: $\text{cov}(\boldsymbol{\varepsilon}) = \boldsymbol{\xi}$ and $\text{cov}(\boldsymbol{Z}) = \boldsymbol{\Sigma} = \mathbf{L}\mathbf{L}' + \boldsymbol{\xi}$. Finally, the factor loading matrix can be represented as $\text{cov}(\boldsymbol{Z}, \mathbf{F}) = \mathbf{L}$. The estimates of factor loadings are then found using the principal component method as:

$$\hat{\mathbf{L}} = \left[\sqrt{\widehat{\lambda_1}}\widehat{\mathbf{e}_1} \vdots \sqrt{\widehat{\lambda_2}}\widehat{\mathbf{e}_2} \vdots \cdots \vdots \sqrt{\widehat{\lambda_m}}\widehat{\mathbf{e}_m}\right]$$

where $\widehat{\lambda_k}$ and $\widehat{\mathbf{e}_k}$ are the estimates of the eigenvalue-eigenvector pairs for $\boldsymbol{\Sigma}$ (Johnson and Wichern, 2002). The eigenvalue estimates $\widehat{\lambda_k}$ show the contribution of the k th factor to the total sample variance. In the current study, we have p = 17 and m = 17.

Data

A survey was conducted among consumers located in Missouri, Nebraska, Kansas, Oklahoma and Iowa. The survey was conducted through SurveyMonkey®. One thousand surveys were distributed, and 840 surveys were completed. Thus, the response rate was 84 percent. One survey objective was to determine consumers' perceptions about different attributes of domestically produced artisan cheese and cheese that is imported from France. Another objective was to measure consumers' willingness to pay for artisan cheese compared with processed cheese and for cheese that is imported from France compared with domestically produced artisan cheese. Consumers were specifically asked "what is the maximum price above the price of

processed cheddar cheese ($1.44/pound) that they would pay for the artisan cheddar cheese" and "what is the maximum amount above the price of the U.S. gouda artisan cheese would you pay for the imported French gouda artisan cheese?" The consumers were provided with pictures of sample artisan cheese and an explanation of "artisan cheese."

Table 1 provides the summary statistics and description of each variable. For the demographic information, 43 percent of the respondents were male. The average respondent age ranged from 35 to 44. The average respondent's annual family income corresponded to the $51,000 to $75,000 category. Hence, the response group was middle aged and earned good annual income. For the location of the respondents, 16 percent were from Kansas, 22 percent were from Missouri, and the rest were from Iowa. Hence, consumers from Iowa were the most represented.[3]

For consumer respondents' preferences about the way cheese is produced, 25 percent preferred hand-made cheese, and 10 percent preferred farmstead cheese, which is made from milk that is from the farmer's own herd. Although some respondents had some preferences about the way cheese is produced, 50 percent of respondents reported that they do not have any preferences. For the artisan cheese consumption purposes, 67 percent of the responders indicated that they would consume artisan cheese for entertainment, and 64 percent of respondents said they would consume artisan cheese as a snack. Relatively few respondents, 40 percent, indicated that they would consume artisan cheese based on recommendations from friends and a store's sales staff. Hence, a person's own observations might be more effective on purchase decisions.

Points of cheese purchase indicate the frequency at which the respondents purchase cheese from each source. Cheese is most frequently purchased at supermarkets, such as Wal-

[3] This survey region was used to reflect regional demand for Missouri artisan cheese. Iowa was chosen because the state borders both Missouri and Wisconsin. Wisconsin has a strong artisan cheese manufacturing and production industry.

Mart, and independent/local grocery stores. Consumers purchase cheese at health/natural food stores and specialty cheese stores less frequently. Artisan cheese attributes are shown in Table 1, in terms of their importance for the consumers. The two highest ranked attributes were taste and enhancement of taste with other products, such as wine. Hence, consumers identified the experience attributes as the most important in the sample. Artisan cheese shelf-life was also ranked relatively higher than other search and credence attributes. Made from organic milk and natural milk were reported as somewhat important for the respondents, which is the same for some search attributes, such as color of the cheese. Lastly, location of the origin within the U.S., another credence attribute, was not ranked with high importance. Hence, the sample shows some evidence that consumers rank differently the search, experience and credence attributes.

Table 2 shows the distribution of WTP values for artisan cheese and French cheese. The survey data shows that 53 percent of the respondents were willing to pay 20 percent more for domestic artisan cheese, whereas only 30 percent of the respondents were willing to pay 20 percent more to buy imported French artisan cheese. Overall, 82 percent of the respondents were willing to pay a price premium to buy artisan cheddar instead of processed cheese, and 44 percent of the respondents were willing to pay a price premium to buy artisan cheese that is imported from France compared with U.S. artisan cheese.

Results

The regression results from the bivariate-ordered regression are reported in Table 3. Multi-collinearity for the regression variables was checked using the variance inflation factor (VIF). The rule of thumb is to further investigate variables for which VIF is greater than 10 (Chen et al., 2006). None of the variables had a VIF value that was greater than 10. Hence, there was no evidence of multi-collinearity in the data. For the overall significance of the regression

model, using the Wald Chi-square test, the hypothesis that all the regression coefficients except the constant terms are zero was rejected with a p-value of 0.000. Hence, the bivariate-ordered probit regression was significant at the 1 percent significance level. The estimate for the correlation coefficient for the error terms is 0.38, and it was statistically significant at the 1 percent significance level, which justifies the use of a bivariate model instead of two independent univariate models. McFadden's pseudo R^2 is calculated to be 0.25, which is not low for a cross-section model.

Overall, the regression results show some differences between the factors that impact WTP for artisan cheese compared with processed cheese and WTP for French artisan cheese compared with U.S. artisan cheese. For the demographic variables, only the age variable was significant for both equations. However, the impact is opposite. The older the respondent, the more the respondent was willing to pay for artisan cheese compared with processed cheese. However, respondents indicated less willingness to pay a price premium for French artisan cheese compared with U.S. artisan cheese. Hence, older consumers might be more protective of the domestic cheese. Annual family income, gender and location were not statistically significant for either equation. We would expect annual family income to have an impact on artisan cheese purchases, which is a higher valued cheese than processed cheese. It could be that consumers do not perceive artisan cheese as a luxury food item.

For the way cheese is produced, consumers who prefer hand-made cheese were more willing to pay a price premium for artisan cheese compared with processed cheese than consumers' who do not have a preference. However, the preference for farmstead, or farm-sourced, artisan cheese did not statistically impact the price premium that consumers are willing to pay. Purpose of consumption seems to impact the WTP for both equations. Consumers who

would consume artisan cheese as a snack and for entertainment purposes were more willing to pay a price premium for artisan cheese. Similarly, use as an appetizer and for entertainment were two statistically significant factors that positively impact the price premium for French artisan cheese. These results show that consumers who are willing to pay a price premium for either domestic or artisan cheese would use the cheese only for certain occasions.

The point of cheese purchase has minor influence for both equations. The more frequently the respondents shop at health/natural food stores, the more willing they were to pay a price premium for artisan cheese compared with processed cheese and French artisan cheese compared with U.S. artisan cheese. On the other hand, shopping from independent/local grocery stores had a negative impact on the price premium for artisan cheese compared with processed cheese. These results indicate that the marketing channel farmers choose by which to sell their products might impact the sales numbers. Farmers might consider selling their products to local health/natural food stores instead of directly selling their products to consumers.

With respect to attributes of artisan cheese, taste and taste enhancement with other products, both of which are experience attributes, positively impacted the price premium for artisan cheese compared with processed cheese. These results were also statistically significant. However, only enhancement of taste with other products was significant for French artisan cheese willingness to pay. Respondents indicated a preference for the following credence attributes: made from organic milk, made from natural milk and location of origin within the U.S. However, none of these factors was statistically significant in explaining respondent willingness to pay. On the other hand, other credence attributes, e.g., health attribute, is significant for the domestic artisan cheese equation. Search attributes such as cheese cut and color were statistically significant for domestic artisan cheese equation.

Overall, artisan cheese attributes were more influential on the price premium for domestic artisan cheese compared with domestic processed cheese than for French artisan cheese compared with U.S. artisan cheese. Among the different attributes, all of the experience attributes were statistically significant for the domestic artisan cheese equation. On the other hand, not all of the search and credence attributes were statistically significant.

Marginal Effects

Marginal effects were also calculated to determine which factors have a large impact on consumers' willingness to pay more for domestic artisan cheese than processed cheese and French artisan cheese than U.S. artisan cheese. Table 4 presents the marginal effects for both dependent variables. Since a bivariate model is used, the marginal effects are reported based on the outcome for each dependent variable. Also, because willingness to pay levels were ranked from 0 to 3, four marginal effects were calculated. The sign of a variable is expected to change across different levels of willingness to pay. For example having enhancement of taste with other products was found to significantly impact both dependent variables. Hence, this variable is expected to have negative marginal effects for low levels of the dependent variables and have a positive effect on higher levels.

Overall, the experience attributes taste, taste enhancement and cheese age affect respondents' willingness to paying a price premium for both cheeses. Hence, producers who improve the experience attributes of their artisan cheese products can increase the chance of earning a positive price premium. On the other hand, by selling their artisan cheese through health and natural food stores, the farmers increase their chances of earning a price premium of 30 percent or 50 percent. These results were also statistically significant. Finally, health attribute,

which is a credence attribute, had a statistically significant impact on the lowest two outcomes, but it had no statistically significant impact on the highest two outcomes.

Statewise Regression Results

In addition to the pooled regression across different states, we also analyzed each state separately to account for the state-by-state differences. We again used the bivariate-ordered probit regression model to determine the willingness to pay for artisan cheese compared with processed cheese and the willingness to pay for French artisan cheese compared with U.S. artisan cheese. The regression results are reported in Table 5. The R^2 values for individual statewise regressions were higher than those for the pooled regression; the highest was 0.45 for Kansas. To test that the regression coefficients were as a whole different among the three states, we conducted the Chow test. The hypothesis that all the regression coefficients were same among the three states was rejected at the 1 percent significance level. Hence, as a whole, the regression coefficients were statistically different among the three states.

For willingness to pay for artisan cheese compared with processed cheese, we saw differences among the three states. Consumer preferences for the way cheese is produced were statistically significant for all three variables for Missouri, but none of them were significant for Kansas. On the other hand, for points of purchase, health/natural food stores were significant for Iowa and Kansas but not significant for Missouri. For the artisan cheese attributes, there were differences among states. The taste attribute was positive and statistically significant for Iowa and Kansas, but it was not statistically significant for the Missouri model. Being an aged cheese was positive and statistically significant for all three states. Of the highly emphasized credence attributes, made from organic milk and made from natural milk were statistically significant only for one state. Overall, we saw differences with respect to consumer preferences across different

states. Thus, producers may not want focus on the nationwide trends when they produce and market farm products.

Factors Analysis

Table 6 reports the factor analysis results for the artisan cheese in the Kaiser rotated form, which makes the interpretation easy and keeps the model structure unchanged (Johnson & Wichern, 2002). We reported the factors for the pooled data and each state separately. As a rule of thumb, we only report the factors with eigenvalues equal to or bigger than one (Johnson & Wichern, 2002). According to the factor analysis results, location of origin within the U.S. and imported cheese and unique label showed high loading for factor 1, which had the highest eigenvalue for the pooled and statewise data. The factor 1 then might show the consumers' concerns about a food product's source. The second factors for each state emphasized different variables, which show statewise differences.

Conclusions

The current study analyzed consumer preferences for domestic artisan cheese compared with processed cheese and imported French cheese compared with U.S. artisan cheese. The results of the current study show that consumer preferences vary between domestic and imported cheese. We found that experience attributes are more influential than search and credence attributes. The results also vary among Iowa, Kansas and Missouri. Hence, farmers should analyze the local consumer preferences when producing and marketing new farm products. Point of purchase is also important. Health and natural food stores might be better marketing channels for farmers to sell their farm products. Future research is needed to learn more about the preferences for imported food. Also, a comparison of different food products will be beneficial.

References

Anderson, J.G., & Anderson, J.L. (1991). Seafood Quality: Issues for Consumer Research. *Journal of Consumer Affairs*, *25*(1), 144-163.

Anderson, D.A., & Capps, O., Jr. (2004). Country-of-Origin Labeling and the Beef Industry. *Choices*, 4th Quarter.

Brown, C., Gandee, J.E., & D'Souza, G. (2006). West Virginia Farm Direct Marketing: A County Level Analysis. *Journal of Agricultural and Applied Economics*, *38*(3), 575-584.

Chen, X., Ender, P., Mitchell, M. & Wells, C. 2006. Regression with Stata. www.ats.ucla.edu/stat/stata/webbooks/reg/default.htm

Darby, M.R., & Karni, E. (1973). Free Competition and the Optimal Amount of Fraud. *Journal of Law and Economics*, *16*(1), 67-88.

Dentoni, D., Tonsor, G.T., Calantone, R.J., & Peterson, H.C. (2009). The Direct and Indirect Effects of 'Locally Grown' on Consumers' Attitudes towards Agri-Food Products. *Agricultural and Resource Economics Review*, *38*(3), 384-396.

Froehlich, E.J., Carlberg, J.G., & Ward, C.E. (2009). Willingness-to-Pay for Fresh Brand Name Beef. *Canadian Journal of Agricultural Economics*, *57*(1), 119-137.

Greene, W. H. (2008). Econometric Analysis. New York: Prentice-Hall Inc.

Greene, W.H., & Hensher, D.A. (2008). Modeling Ordered Choices: A Primer and Recent Developments. *New York University*. Retrieved from http://w4.stern.nyu.edu/emplibrary/greene%20OrderedChoiceModeling%5B1%5D.pdf

Ilbery, B., & Maye, D. (2005). Food Supply Chains and Sustainability: Evidence from Specialist Food Producers in the Scottish/English Borders. *Land Use Policy*, *22*(4), 331-344.

Johnson, R.A., & Wichern, D.W. (2002). Applied Multivariate Statistical Analysis. New York: Prentice-Hall Inc..

Mabiso, A., J. Sterns, L. House, & A. Wysocki. 2005. "*Estimating Consumers' Willingness-to-Pay for Country-of-Origin Labels in Fresh Apples and Tomatoes: A Double-Hurdle Probit Analysis of American Data Using Factor Scores*." http://agecon.lib.umn.edu/cgi-bin/detailview.pl?paperid=16215

Monson, J., D. Mainville, & N. Kuminoff. 2008. "The Decision to Direct Market: An Analysis of Small Fruit and Specialty-Product Markets in Virginia." Journal of Food Distribution Research 39(2): 1–11.

Morgan, T.K., & D. Alipoe. 2001. “Factors Affecting the Number and Type of Small-Farm Direct Marketing Outlets in Mississippi.” Journal of Food Distribution Research 32(1): 125–132.

Nelson, P. 1970. “Information and Consumer Behavior.” Journal of Political Economy 78(2): 311–329.

Onken, K. A., J.C.,Bernard, & Jr., J, D, John. 2011. “Comparing Willingness to Pay for Organic, Natural, Locally Grown, and State Marketing Program Promoted Foods in the Mid-Atlantic Region” Agricultural and Resource Economics Review 40(1):33-47.

Stigler, G.J. 1961. “The Economics of Information.” Journal of Political Economy 69(3): 213–225.

Uva, W.-F.L. 2002. “An Analysis of Vegetable Farms’ Direct Marketing Activities in New York State.” Journal of Food Distribution Research 33(1): 186–189.

Wirth, F.F., L.A. Love, & M.A. Palma. 2007. “Purchasing Shrimp for At-Home Consumption: The Relative Importance of Credence versus Physical Product Features.”Aquaculture Economics and Management 11(1): 17–37.

Table 1. Variable Names, Description, Means and Standard Deviations

Variable	Description	Mean	Standard Deviation
Age	Range 1 = 24 and under; 2 = 25–34; 3 = 35-44; 4= 45-54; 5=55-64; 6=65 and older	3.23	1.410
Annual Family Income	Range 1 = $0-$25,000; 2 =$26,000-$50,000; 3=$51,000-$75,000; 4 =$76,000-$100,000; 5=More than $100,000	3.25	1.220
Male	1 if Male, 0 if Female	0.43	0.496
Iowa (*Base Category*)	1 if located in, 0 otherwise	0.62	0.596
Kansas	1 if located in, 0 otherwise	0.16	0.369
Missouri	1 if located in, 0 otherwise	0.22	0.838
Cheese Production Type			
No Preference (*Base Category)*	1 if no preference, 0 otherwise	0.50	0.259
Mechanically Processed	1 if preferred, 0 otherwise	0.15	0.359
Hand-made	1 if preferred, 0 otherwise	0.25	0.431
Farmstead	1 if preferred, 0 otherwise	0.10	0.304
Artisan Cheese Consumption Purpose			
Cooking Ingredient	1 if chosen, 0 otherwise	0.46	0.499
Snack	1 if chosen, 0 otherwise	0.56	0.497
Appetizer	1 if chosen, 0 otherwise	0.64	0.480
Entertainment	1 if chosen, 0 otherwise	0.67	0.470
Family Traditions	1 if chosen, 0 otherwise	0.18	0.381
Complement (i.e. with wine)	1 if chosen, 0 otherwise	0.50	0.500
Recommendations (from others)	1 if chosen, 0 otherwise	0.40	0.490
Previous Experience (restaurant)	1 if chosen, 0 otherwise	0.34	0.475
Points of Cheese Purchase			
Supermarkets[a]	Range 1 =Never; 2=Seldom; 3=Occasionally;4=Frequently	3.46	0.922
Health/Natural Food Stores		1.51	0.791
Specialty Cheese Stores		1.54	0.722
Independent Grocery Stores		3.09	1.039
Directly from Cheese Makers		1.29	0.585
Mail/Online Orders		1.24	0.517
Artisan Cheese Attributes			
Taste [b]	Range 1=Not Important; 2=Somewhat Important; 3=Very important	2.89	0.369
Enhancement of taste (with other products)		2.21	0.688
Shelf-life		2.19	0.651
Cheese is aged		1.99	0.726
Color of cheese		1.94	0.673
Made with natural milk		1.99	0.725
Made with organic milk		2.09	0.290
Type of milk (goat or cow)		1.92	0.748
Health attribute (fat content)		2.01	0.719
Package size		2.01	0.622
Package design (resealable)		1.82	0.718
Cut of cheese		1.69	0.644

Table 1. Continued

Variable	Description	Mean	Standard Deviation
Unique label image		1.36	0.584
Imported cheese		1.44	0.607
Location of origin in the U.S.		1.55	0.650
Supporting small local farmers		1.91	0.676
Dependent Variables			
Willingness to pay for artisan cheese	Range 0=None; 1=20% more, 2=30% more 3=50% more	1.22	0.837
Willingness to pay for French artisan cheese	Range 0=None; 1=20% more, 2=30% more 3=50% more	0.64	0.794

Note: [a] The range is same for all the variables under "Points of Purchase"
[b] The range is same for all the variables under "Artisan Cheese Attributes"

Table 2. Distribution of Willingness to Pay (WTP) for Artisan Cheese and French Cheese

	None	20% More	30% More	50% More
WTP for Artisan Cheese	18%	53%	21%	8%
WTP for French Cheese	56%	30%	11%	3%

Table 3. Results for Bivariate-Ordered Probit Regression

Variable	WTP Artisan Cheese		WTP French Cheese	
	Coefficient	Std. Error	Coefficient	Std. Error
Age	0.08*	0.043	-0.10**	0.045
Annual Family Income	0.03	0.045	0.01	0.047
Male	-0.04	0.110	0.03	0.150
Kansas (*Base is Iowa*)	-0.22	0.147	-0.04	0.068
Missouri	0.01	0.064	-0.12	0.115
Cheese Production Type (*Base is No Preference*)				
Mechanically Processed	-0.23	0.160	-0.06	0.169
Hand-made	0.29**	0.136	-0.11	0.140
Farmstead	0.13	0.187	-0.11	0.191
Consumption Purpose				
Cooking Ingredient	0.05	0.110	0.06	0.114
Snack	0.24**	0.120	0.14	0.124
Appetizer	0.13	0.123	0.27**	0.130
Entertainment	0.26**	0.124	0.28**	0.131
Family Traditions	0.06	0.141	-0.02	0.145
Complement	0.02	0.118	-0.10	0.124
Recommendations	0.04	0.121	-0.06	0.128
Previous Experience	0.02	0.122	-0.12	0.129
Points of Purchase				
Supermarkets	0.03	0.063	-0.05	0.065
Health/Natural	0.32***	0.078	0.18**	0.078
Specialty Cheese Stores	0.09	0.095	0.08	0.096
Independent Grocery	-0.10*	0.056	0.00	0.059
Directly from Makers	0.02	0.107	-0.08	0.113
Mail/Online Orders	0.12	0.109	0.29***	0.111
Artisan Cheese Attributes				
Taste	0.53***	0.163	0.09	0.169
Enhancement of taste	0.21**	0.094	0.21**	0.097
Shelf-life	-0.13	0.096	-0.13	0.101
Cheese is aged	0.41***	0.099	0.05	0.103
Color of cheese	-0.26**	0.105	0.09	0.108
Made with natural milk	0.15	0.094	0.01	0.098
Made with organic milk	0.27	0.200	0.14	0.201
Type of milk	-0.15**	0.084	-0.14	0.089
Health Attribute	-0.24***	0.092	0.05	0.095
Package size	-0.18*	0.106	-0.26**	0.112
Package design	-0.06	0.093	0.02	0.098
Cut of cheese	0.21**	0.110	-0.01	0.114
Unique label image	0.03	0.124	0.03	0.126
Imported cheese	0.23*	0.126	0.33***	0.128
Location of origin	-0.18	0.119	0.02	0.123
Supporting local farmers	0.06	0.102	0.05	0.107
N		507		
Pseudo R-squared (McFadden's)		0.25		
Wald Chi-square(38)		201		
p-value for Wald chi-square		0.00		
ρ		0.38***		

Note: Three asterisks (***) indicate significance at 1% level, two asterisks (**) at the 5% level, and one asterisk (*) at the 10% level.

Table 4. Marginal Effects for Bivariate-Ordered Probit Regression

Variable	WTPA=0 WTPF=0	WTPA=1 WTPF=1	WTPA=2 WTPF=2	WTPA=3 WTPF=3
Age	-0.007	-0.022***	-0.004	0.000
Annual Family Income	-0.005	-0.001	0.001	0.000
Male	0.009	-0.015	-0.007	-0.001
Kansas	0.030	0.021	-0.004	-0.001
Missouri	0.000	-0.006	-0.002	0.000
Cheese Production Type				
Mechanically Processed	0.035	0.007	-0.009	-0.001
Hand-made	-0.034**	-0.044**	0.000	0.000
Farmstead	-0.016	-0.014	0.002	0.000
Consumption Purpose				
Cooking Ingredient	-0.009	0.004	0.004	0.000
Snack	-0.039**	0.006	0.015**	0.002*
Appetizer	-0.028	0.030	0.017**	0.002*
Entertainment	-0.047**	0.023	0.020***	0.002**
Family Traditions	-0.007	-0.008	0.001	0.000
Complement	0.000	-0.017	-0.005	0.000
Recommendations	-0.003	-0.013	-0.002	0.000
Previous Experience	0.002	-0.020	-0.006	-0.001
Points of Purchase				
Supermarkets	-0.003	-0.010	-0.002	0.000
Health/Natural	-0.049	-0.001	0.017***	0.002**
Specialty Cheese Stores	-0.015	0.004	0.006	0.001
Independent Grocery	0.013	0.008	-0.003	0.000
Directly from Makers	0.001	-0.013	-0.004	0.000
Mail/Online Orders	-0.026	0.033**	0.018***	0.002**
Artisan Cheese Attributes				
Taste	-0.075***	-0.032	0.018*	0.002*
Enhancement of taste	-0.035***	0.013	0.016***	0.002**
Shelf-life	0.022	-0.008	-0.010	-0.001
Cheese is aged	-0.057***	-0.028*	0.013**	0.002*
Color of cheese	0.032**	0.035**	-0.002	0.000
Made with natural milk	-0.020	-0.011	0.004	0.001
Made with organic milk	-0.040	-0.002	0.014	0.002
Type of milk	0.025**	-0.008	-0.011**	-0.001*
Health Attribute	0.031**	0.028**	-0.003	-0.001
Package size	0.032**	-0.025	-0.018***	-0.002**
Package design	0.008	0.008	0.000	0.000
Cut of cheese	-0.028*	-0.020	0.005	0.001
Unique label image	-0.006	0.002	0.002	0.000
Imported cheese	-0.041**	0.030	0.023***	0.002**
Location of origin	0.023	0.018	-0.003	-0.001
Supporting local farmers	-0.010	0.002	0.004	0.000

Note: Three asterisks (***) indicate significance at 1% level, two asterisks (**) at the 5% level, and one asterisk (*) at the 10% level.

Table 5. Results for Bivariate-Ordered Probit Regression for State Wise Data

Variable	WTP Artisan Cheese			WTP French Cheese		
	Iowa	Kansas	Missouri	Iowa	Kansas	Missouri
Age	0.06	0.10	0.14	-0.13**	0.00	-0.09
Annual Family Income	0.03	0.00	0.15	0.01	0.01	-0.05
Male	-0.01	0.24	-0.30	-0.37**	-0.04	0.27
Cheese Production Type						
Mechanically Processed	-0.02	-0.92	-1.02**	-0.38*	-0.69	0.63
Hand-made	0.37**	-0.76	0.78**	-0.12	-1.63***	-0.01
Farmstead	-0.14	0.81	0.93**	-0.05	-0.61	0.39
Consumption Purpose						
Cooking Ingredient	0.11	-0.90**	-0.27	0.17	-0.48	0.16
Snack	0.07	0.60	0.82***	0.23	0.25	0.31
Appetizer	0.09	1.17**	0.06	0.24	2.38***	0.00
Entertainment	0.36**	0.56	-0.36	0.21	0.51	0.61*
Family Traditions	0.11	-0.44	0.60	0.06	-0.20	-0.03
Complement	-0.07	-0.42	-0.18	-0.25	-1.66***	0.14
Recommendations	-0.09	0.97**	0.70**	-0.11	1.52***	-0.02
Previous Experience	0.17	-0.10	0.07	-0.31*	-0.14	0.25
Points of Purchase						
Supermarkets	0.04	0.10	0.00	0.00	-0.52*	0.05
Health/Natural	0.37***	0.72***	0.02	0.22	0.43*	0.15
Specialty Cheese Stores	0.00	0.08	0.41*	0.04	-1.16***	0.64***
Independent Grocery	-0.10	-0.07	-0.22	0.09	-0.27	-0.03
Directly from Makers	0.02	0.31	-0.06	0.01	0.81*	-0.58**
Mail/Online Orders	0.18	-0.05	0.18	0.41***	-0.25	0.15
Artisan Cheese Attributes						
Taste	0.62***	1.63**	-0.08	0.03	0.26	0.30
Enhancement of taste	0.24**	-0.28	0.72***	0.28**	-0.06	-0.13
Shelf-life	-0.12	-0.85*	-0.18	-0.12	-1.55***	0.08
Cheese is aged	0.38***	1.21***	0.51*	0.15	0.60	0.04
Color of cheese	-0.27**	-1.19***	-0.53*	0.17	-0.06	-0.41
Made with natural milk	0.18	0.07	0.49*	0.04	-0.05	0.14
Made with organic milk	0.67**	-0.73	-0.19	0.36	-0.33	-0.23
Type of milk	-0.03	0.14	-0.51**	-0.20*	0.15	-0.16
Fat content	-0.28**	-0.54*	-0.40*	0.02	0.68**	-0.30**
Package size	-0.17	-0.29	-0.67**	-0.11	-1.00**	-0.68*
Package design	-0.09	0.65*	0.08	-0.06	0.48	0.47
Cut of cheese	0.09	1.06***	0.31	-0.22	1.20***	0.40***
Unique label image	0.12	-0.86**	0.07	0.03	-0.51	0.28
Imported cheese	0.23	0.83	0.84**	0.19	2.00***	1.02
Location of origin	-0.12	-1.10**	-0.40	0.01	-0.26	-0.37
Supporting local farmers	-0.05	0.59	0.21	0.07	-0.42	0.03
N	310	82	115	310	82	115
Pseudo R-squared	0.26	0.45	0.37	0.26	0.45	0.37
Wald Chi-square(36)	122	41	62	122	41	62
p-value for Wald chi-square	0.000	0.000	0.000	0.000	0.000	0.000
ρ	0.40***	0.58***	0.50***	0.40***	0.58***	0.50***
Chow (72)	132			110		
p-value for Chow	0.000			0.000		

Note: Three asterisks (***) indicate significance at 1% level, two asterisks (**) at the 5% level, and one asterisk (*) at the 10% level.

Table 6. Factor Analysis (Rotated Factor Loadings)

Variables	**Pooled** Factor λ=4.65	**Iowa** Factor 1 λ=4.51	**Iowa** Factor 2 λ=1	**Kansas** Factor 1 λ=4.49	**Kansas** Factor 2 λ=1.37	**Kansas** Factor 3 λ=1.02	**Missouri** Factor 1 λ=5.42	**Missouri** Factor 2 λ=1.10
Taste	-0.05	-0.05	0.18	-0.02	-0.11	-0.13	-0.09	0.17
Enhancement of taste	0.21	0.18	0.14	0.20	0.39	0.22	0.25	0.17
Shelf-life	0.09	0.10	0.31	0.00	-0.08	0.59	0.17	0.09
Cheese is aged	0.30	0.35	0.31	0.21	0.67	-0.03	0.23	0.73
Color of cheese	0.32	0.32	0.16	0.16	0.72	0.20	0.40	0.24
Made with natural milk	0.21	0.17	0.67	0.20	0.23	0.08	0.32	0.48
Made with organic milk	0.19	0.06	0.35	0.34	0.15	-0.01	0.27	0.31
Type of milk	0.20	0.19	0.54	0.18	0.17	0.10	0.20	0.50
Health attribute	0.15	0.12	0.51	0.08	0.12	0.26	0.27	0.52
Package size	0.15	0.13	0.06	0.18	0.31	0.56	0.11	0.03
Package design	0.23	0.20	0.05	0.23	0.13	0.72	0.29	0.08
Cut of cheese	0.61	0.60	0.13	0.61	0.31	0.08	0.61	0.20
Unique label image	0.66	0.60	0.07	0.80	0.12	0.20	0.68	0.04
Imported cheese	0.75	0.71	0.12	0.88	0.14	0.03	0.74	0.22
Location of origin	0.67	0.64	0.37	0.73	0.00	0.08	0.78	0.32
Supporting local farmers	0.40	0.31	0.59	0.59	0.07	0.10	0.41	0.57

Note: [1]Estimation method is principal component and rotation method is Kaiser.
[2]Factors with eigenvales equal to or bigger than one are reported.