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Variation of Consumer Preferences Between Domestic and Imported Food: The Case of Artisan Cheese

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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 selling their farm products locally. The major challenge for the farmers is to predict consumer preferences correctly and provide goods to the market accordingly. By analyzing a consumer survey conducted in the Midwest region of the US, the current study analyzes the consumer preferences for domestic and imported artisan cheese. The results of the econometric analysis show that consumer preferences vary between domestic and imported artisan cheese. The results also show that consumer preferences vary with location. Hence, producers of local artisan cheese might need to adopt different marketing and production strategies to match the local consumer demand.

Keywords: artisan cheese, consumer preferences, ordered probit, willingness-to-pay

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Introduction

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 selling their farm products locally (Ilbery and Maye 2005). The major challenge for farmers is to predict consumer preferences correctly and provide goods to the market accordingly. For farmers selling their farm products locally, using direct marketing strategies has the advantage of cutting out middle men and attracting consumers directly to their products (Morgan and Alipoe 2001; Uva 2002). On the other hand, if farmers fail to understand consumer preferences correctly, then they face financial losses.

Previous studies have focused on identifying consumer preferences for different food quality attributes (e.g., Brown, Gandee, and D'Souza 2006; Monson, Mainville, and Kuminoff 2008; Thilmany and Watson 2004). Food quality has multiple dimensions, including *search*, *experience*, and *credence* attributes (Anderson and Anderson 1991). Search attributes refer to visual product attributes, such as color. Experience attributes refer to those realized when consuming the product. Taste is an experience attribute (Nelson 1974; Stigler 1961). Credence attributes of food products refer to quality features, such as organically grown (Anderson and Anderson 1991).

Empirical studies that analyzed consumer preferences found different results in terms of the relative importance of search, experience, and credence attributes (Wirth et al. 2011; Dentoni et al. 2009). For example, some studies found that certain credence attributes impact consumers' purchase decisions positively and lead to food item purchases (e.g. Dentoni et al. 2009; Wirth, Love, and Palma 2007). Studies by Dentoni et al. (2009) and Mabiso et al. (2005) reported that certain population segments are willing to pay more for organic food products. However, there are other studies that did not find a statistically significant price premium for organic food products (e.g. Onken et al. 2011; Wirth et al. 2011). Hence, overall, it is not known whether producers should invest in producing organic food or whether they should focus on other food quality attributes (Onken et al. 2011; Wirth et al. 2011). It is also not known whether farmers should focus on search and experience attributes or credence attributes in their marketing strategies. The answers to these questions will help farmers to focus and invest more on the attributes that better match consumer demand and receive higher price premiums.

Another important factor that impacts farmers' marketing strategies is consumer preferences for imported food versus domestic food. Previous research that has analyzed consumer preferences for imported food focused mostly on credence attributes, specifically country of origin labeling. The results of these studies show that consumers are willing to pay a premium for purchasing domestic food relative to purchasing imported food and that the country of origin label is an important factor (Peterson and Burbidge 2012; Xie, House, Hyeyoung 2012; Han et al. 2012; Xie et al. 2011; Krystallis and Chryssochoidis 2006). However, these studies did not comprehensively analyze how search, experience, and credence attributes vary between imported and domestic food, and they didn't indicate which of these attributes most impact consumers' willingness-to-pay (WTP). Even though the studies reviewed found higher willingness-to-pay for domestic food compared with imported food, US imports have been increasing for some food products, such as cheese. According to the Babcock Institute (2012), the US cheese trade deficit

totals $114 million. This is primarily due to highly valued cheese imports from European countries such as France, which accounted for 17 percent of US cheese imports in 2011. (Babcock Institute 2012). Hence, it is important to understand the impact of search, experience, and credence attributes on consumer demand for imported cheese to better match local demand by domestic production for high-valued cheese.

The first objective of the current study is to analyze the relative importance of experience, search, and credence attributes on consumers' willingness-to-pay for domestic artisan cheese (high-valued cheese) over domestic processed cheese.[1] The second objective of this study is to analyze the impact of experience, search, and credence attributes on consumers' willingness-to-pay for imported artisan cheese over domestic artisan cheese. By analyzing US consumer preferences for imported artisan cheese, the current study will provide guidance to farmers who aim at providing domestic cheese to replace imported cheese. By including consumers from different regions in the US, the current study will also show whether consumer preferences change from one region to another within the same country and indicate whether producers should adopt different marketing strategies in different regions within a country.

Data

To measure the regional consumer demand for artisan cheese, a consumer survey was conducted among consumers located in Iowa, Kansas, and Missouri in April 2010. Although these three states are not the top milk or cheese producing states, in terms of milk production in the US, Iowa, Kansas, and Missouri ranked 12th, 16th, and 25th, respectively, in 2012 (US Department of Agriculture 2013). Hence, dairy producers in these three states can benefit from processing milk into high-valued artisan cheese if there is regional demand for artisan cheese.

The consumer survey for the current was designed using Survey Monkey® and distributed to a panel of respondents through e-Rewards®. e-Rewards® is an internationally recognized online market research company, which has by-invitation-only membership for its consumer panels. For this study, a contract was made with e-Rewards® to obtain a total of 541 completed (or near to fully completed) surveys. Survey respondents were chosen based on being the primary household shopper and consuming cheese at some frequency. Due to the nature of e-Rewards® data collection, the company obtained the required number of responses, a response rate can't be calculated, which is a common issue for conducting surveys through online market research companies (Maples et al. 2014).

To measure consumers' willingness-to-pay for domestic artisan cheese over domestic processed cheese, consumers were specifically asked, "What is the maximum price above the price of processed cheddar cheese ($1.44/pound) that you would pay for artisan cheddar cheese?" For analyzing consumers' willingness-to-pay for imported artisan cheese over domestic artisan cheese, the consumers' were asked, "What is the maximum amount above the price of the US artisan cheese that would you pay for imported French artisan cheese?" The consumers were provided with pictures of sample artisan cheeses and the explanation for the term "artisan

[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 made on small scale and with unique characteristics. Artisan cheese also has creative labeling and brand naming.

cheese." Based on the existing literature, variables related to demographics and consumer preferences were also included in the survey.

Table 1 (see Appendix) provides summary statistics and description of the variables, for a sample size of 541. For the consumer demographics, 43 percent of the responders are male. The average for the age category is closest to the age category of 35 to 44. The average for the annual family income corresponds to the category $51,000 - $75,000. A comparison of the average age and average income of the sample with the data from the US Census Bureau is done to test whether the data collected is representative. Based on the data from US Census Bureau (2013), the average age in Missouri, Kansas, and Iowa was, 37.9, 36, and 38, respectively, in 2012. In the sample for the current study, the average age for Missouri, Kansas and Iowa are all in the age category of 35 to 44. In 2012, the average income in Missouri, Kansas, and Iowa was, $63,405, $67,564, and $64,881, respectively (US Census Bureau 2013). In the collected sample, the average income for Missouri, Kansas and Iowa are all in the income category of $51,000-$75,000. Based on these comparisons, data collected is representative of the region's population. For the location of the responders, 16 percent are from Kansas, 22 percent are from Missouri, and the rest are from Iowa. Hence, consumers from Iowa are most represented in the sample.

For consumers' preferences about the way cheese is produced, 25 percent of survey respondents prefer hand-made cheese and 10 percent of survey respondents prefer farmstead cheese. Although some consumers have a preference for the way cheese is produced, 50 percent of survey respondents reported that they do not have a preference. As far as artisan cheese consumption purposes, 67 percent of survey respondents indicated that they would consume artisan cheese for entertainment and 64 percent of survey respondents indicated that they would consume artisan cheese as a snack. Cheese purchase point-of-sale indicates the frequency at which the responders purchase cheese from each source. The two highest frequencies in the sample are for supermarkets, such as Wal-Mart, and independent/ local grocery stores. Health/natural food stores and specialty cheese stores have relatively lower frequencies.

For consumers' ranking of the importance of artisan cheese attributes, the two highest ranked attributes are taste and enhancement of taste with other products, such as wine. Hence, the experience attributes received the highest importance in the sample. The shelf life of artisan cheese is also relatively more highly ranked than other search and credence attributes. Made from organic milk and natural milk are reported as somewhat important by the survey respondents and the same is valid for the search attribute color of the cheese. Location of origin within the US, which is a credence attribute, is not ranked with high importance. Hence, the survey sample shows some evidence that consumers rank differently the experience, search and credence attributes.

Table 2 shows the distribution of willingness-to-pay for domestic artisan cheese over domestic processed cheese and imported French artisan cheese over US artisan cheese. The survey data shows that 53 percent of the survey respondents are willing to pay 20 percent more to buy domestic artisan cheese over processed cheese, whereas only 30 percent of the respondents are willing to pay 20 percent more to buy imported French artisan cheese over US artisan cheese. Overall, 82 percent of the survey respondents are willing to pay a price premium to buy domestic artisan cheese over processed cheese and 44 percent of the respondents are willing to pay a price

premium to buy artisan cheese that is imported from France over US artisan cheese. Hence, there is opportunity for artisan cheese producers to obtain a price premium over processed cheese, but there is also significant demand for imported artisan cheese.

Table 2. Distribution of Willingness-to-Pay (WTP) Values (N=541)

Variable	None	20% More	30% More	50% More
WTP for Domestic Artisan Cheese[1]	18%	53%	21%	8%
WTP for Imported French Cheese[2]	56%	30%	11%	3%

Notes: [1]Indicates WTP a price premium for domestic artisan cheese over domestic processed cheese.
[2] Indicates WTP a price premium for imported French artisan cheese over US artisan cheese.

Empirical Model

The two dependent variables: Willingness-to-pay for domestic artisan cheese over domestic processed cheese and willingness-to-pay for imported French artisan cheese over US artisan cheese can be analyzed using an ordered probit model, as these variables are ordered from 0 to 3 (Greene 2008). Ordered probit models have been used in the literature for analyzing multinomial choice variables that are inherently ordered, e.g. consumer surveys for demand analysis (Kasteridis, Munkin, and Yen 2007; Hill et al. 2011; Pope et al. 2011). The ordered probit model is preferred to using a linear probability model, as using a linear probability model in this case would lead to heteroscedastic error terms and predicted probabilities to be out of the unit range (Greene 2008). Similar to other discrete choice models, the ordered probit model can be derived from a latent variable (Greene 2008). The special case of the current study is instead, that two dependent variables are determined jointly. Following Geene and Hensher (2008), the latent variables y_{1i}^* and y_{2i}^*, which represent the random utility from consuming domestic artisan cheese and imported French artisan cheese respectively, can be represented as;

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

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 for observation i. $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ are the vectors that 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. However, what is observed is the willingness-to-pay for domestic artisan cheese and imported French artisan cheese:

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

Using the dependent variable definition, WTP values can be represented in terms of latent variables as:

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

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

$$\begin{aligned} (4)\qquad \Pr\left(y_{1i} = j, y_{2i} = k \middle| \mathbf{x}_{1i}, \mathbf{x}_{2i}\right) = {} & \Phi_2\left(\left(\mu_{1j} - \mathbf{x}_{1i}\boldsymbol{\beta}_1'\right), \left(\mu_{2k} - \mathbf{x}_{2i}\boldsymbol{\beta}_i'\right), \rho\right) \\ & - \Phi_2\left(\left(\mu_{1j-1} - \mathbf{x}_{1i}\boldsymbol{\beta}_1'\right), \left(\mu_{2k} - \mathbf{x}_{2i}\boldsymbol{\beta}_i'\right), \rho\right) \\ & - \Phi_2\left(\left(\mu_{1j} - \mathbf{x}_{1i}\boldsymbol{\beta}_1'\right), \left(\mu_{2k-1} - \mathbf{x}_{2i}\boldsymbol{\beta}_i'\right), \rho\right) \\ & + \Phi_2\left(\left(\mu_{1j-1} - \mathbf{x}_{1i}\boldsymbol{\beta}_1'\right), \left(\mu_{2k-1} - \mathbf{x}_{2i}\boldsymbol{\beta}_i'\right), \rho\right) \end{aligned}$$

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:

$$(5)\ \ln L = \sum_{i=1}^{N}\sum_{j=1}^{4}\sum_{k=1}^{4} \mathrm{I}(y_{1i} = j, y_{2i} = k) \ln \Pr(y_{1i} = j, y_{2i} = k)$$

The 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 and Hensher 2008).

Marginal Effects

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

$$
\begin{aligned}
A_L &= \mu_{1,j-1} - \mathbf{x}_{1i}\boldsymbol{\beta}_1' \\
A_U &= \mu_{1,j} - \mathbf{x}_{1i}\boldsymbol{\beta}_1' \\
A_L &= \mu_{2,k-1} - \mathbf{x}_{2i}\boldsymbol{\beta}_2' \\
B_U &= \mu_{2,k} - \mathbf{x}_{2i}\boldsymbol{\beta}_2'
\end{aligned} \quad (6)
$$

Using these variables $\Pr(y_{1i} = j, y_{2i} = k | \mathbf{x}_{1i}, \mathbf{x}_{2i})$ can be written as (Geene and Hensher 2008):

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

and marginal effects are calculated as:

$$\frac{\partial \Pr(y_1 = j, y_2 = k | \mathbf{X}_1, \mathbf{X}_2)}{\partial \mathbf{X}_1} = (-\boldsymbol{\beta}_1)\begin{bmatrix} \phi(A_U)\Phi_2\left(\frac{B_U - \rho A_U}{\sqrt{1-\rho^2}}\right) - \phi(A_L)\Phi_2\left(\frac{B_U - \rho A_L}{\sqrt{1-\rho^2}}\right) \\ \phi(A_U)\Phi_2\left(\frac{B_L - \rho A_U}{\sqrt{1-\rho^2}}\right) - \phi(A_L)\Phi_2\left(\frac{B_L - \rho A_L}{\sqrt{1-\rho^2}}\right) \end{bmatrix} \quad (7)$$

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

where $\frac{\partial \Phi_2(A, B, \rho)}{\partial A} = \phi(A)\Phi_2\left(\frac{B - \rho A}{\sqrt{1-\rho^2}}\right)$. Marginal effects are added for the independent variables that appear in both regression equations (Geene and Hensher 2008).

Sample Selection

An alternative specification for the econometric model uses Heckman's selection model (Lusk et al. 2001; Greene 2008). The advantage of this model is to account for the sample selection problem, which is causing regression estimates to be biased, seen in demand analysis (Lusk et al. 2001). However, the disadvantage of this model is not accounting for the correlation among the error terms for the two dependent variables, which can also cause biased estimates (Greene 2008). Another disadvantage of this model is not accounting for the ordered structure of the dependent variables. In the current study, the sample selection can be a potential problem, as some consumers might not be consuming cheese. For example, when willingness-to-pay for domestic artisan cheese is observed as zero, it could be that the consumer does not purchase cheese or that the consumer purchases cheese but does not prefer domestic artisan cheese over domestic processed cheese. To test for the existence of the sample selection problem, a selection equation is estimated for cheese purchases. Following Greene (2008), the selection equation is a probit model, specified as:

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

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

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

where $\mathbf{w}_i$ is the vector of independent variables: consumer attributes and the attributes of the cheese product. The vector $\boldsymbol{\gamma}'$ refers to the coefficients to be estimated and u_i is the error term. The willingness-to-pay equations are represented as:

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

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

where y_i, $\mathbf{x}_i$, $\boldsymbol{\beta}$ and ε_i are defined as same as in the bivariate ordered probit model above. The error terms ε_{1i} and ε_{2i} are independent 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 existence of the sample selection problem in the current study, as all the consumers in the dataset indicated that they purchase cheese at some frequency. For this reason, we continue the empirical analysis using the bivariate ordered probit regression.

Factor Analysis

In addition to the regression analysis, statistical factor analysis is also conducted to identify the group of artisan cheese attributes for a focused and successful marketing plan. Factor analysis can be used for market segmentation and for targeted marketing (Sharma and Kumar 2006). 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, 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 common factors, and p additional sources of variation $\varepsilon_1, \varepsilon_2, \ldots, \varepsilon_p$, which are called errors. The factor analysis model is represented in matrix notation as:

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

where $\mathbf{L}$ 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: $\mathrm{cov}(\boldsymbol{\varepsilon}) = \boldsymbol{\xi}$ and $\mathrm{cov}(\boldsymbol{Z}) = \boldsymbol{\Sigma} = \mathbf{L}\mathbf{L}' + \boldsymbol{\xi}$. The factor loading matrix can be represented as $\mathrm{cov}(\boldsymbol{Z}, \mathbf{F}) = \mathbf{L}$. The estimates of factor loadings are then found using the principal component method as:

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

$$(11)\quad \hat{\mathbf{L}} = \left[\sqrt{\widehat{\lambda_1}}\widehat{\mathbf{e}_1} \vdots \sqrt{\widehat{\lambda_2}}\widehat{\mathbf{e}_2} \vdots \cdots \vdots \sqrt{\widehat{\lambda_m}}\widehat{\mathbf{e}_m}\right]$$

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

Results

The regression results from the bivariate-ordered regression are reported in Table 3 (see Appendix). Multi-collinearity for the regression variables is assessed using the variance inflation factor (VIF). The rule of thumb is to further investigate variables for which the VIF is greater than 10 (Chen et al. 2003). None of the variables had a VIF value that was greater than 10. Hence, there is no evidence of multi-collinearity in the data. The Wald Chi-square test is used to test the overall significance of the regression model. The hypothesis that all the regression coefficients, except the constant terms, are zero is rejected with a p-value of 0.000. Hence, the bivariate ordered probit regression is significant at the 1 percent significance level. The estimate for the correlation coefficient for the error terms is 0.38, which is statistically significant at the 1 percent significance level. This justifies the use of a bivariate model over two separate univariate models, which would have resulted in biased coefficient estimates. McFadden's pseudo R^2 is calculated to be 0.25 for the current model.

Overall, the regression results show differences between the factors that impact WTP for domestic artisan cheese over domestic processed cheese and WTP for imported French artisan cheese over US artisan cheese. For the demographics, only the age variable is significant for both equations. For WTP for domestic artisan cheese over domestic processed cheese, the older the respondents are the higher price premium they are willing to pay. However, younger respondents are more willing to pay a price premium for imported French artisan cheese over US artisan cheese. On the other hand, annual family income, gender, and location are not found statistically significant for either equation. We would expect higher annual family income to have a positive impact on artisan cheese consumption. It could be that consumers do not observe artisan cheese as a luxury food item, which has been determined to have an inelastic income elasticity (Davis et al. 2010).

For the way cheese is produced, respondents who prefer hand-made cheese are more willing to pay a price premium for domestic artisan cheese over processed cheese than consumers who do not have any preferences. However, the preference for farmstead (farm sourced) artisan cheese did not have a statistically significant impact on the price premium that consumers are willing to pay for artisan cheese. Survey respondents who would consume artisan cheese as a snack and for entertainment purposes are more willing to pay a price premium for domestic artisan cheese over processed cheese than respondents who did not specify the consumption purpose. Similarly, respondents who would consumer artisan cheese as an appetizer and for entertainment purposes are more willing to pay a price premium for imported French artisan cheese over US artisan cheese. These results show that consumers who are willing to pay a price premium for either cheese would use them on certain occasions. This might indicate that consumers might not purchase artisan cheese in big quantities or too frequently.

Point of sale also had some influence on respondents' WTP for both equations. The more frequently the responders shop at health/natural food stores, the more they are willing to pay a price premium for domestic artisan cheese over domestic processed cheese and for imported French artisan cheese over US artisan cheese. On the other hand, shopping at independent / local grocery stores had a negative impact on respondents' WTP for domestic artisan cheese over domestic processed cheese. These results indicate that the marketing channel that farmers use to sell their products might impact sales. Farmers might consider health/natural food stores to sell their farm products locally, if available, instead of selling their products directly to consumers.

With respect to artisan cheese attributes, the two experience attributes- taste and enhancements of taste with other products- are found to be positively impacting the price premium for domestic artisan cheese over domestic processed cheese. These results are statistically significant. However, only enhancement of taste with other products is found to be positive and statistically significant for WTP for imported French artisan cheese over US artisan cheese. Mostly emphasized credence attributes: made from organic milk, made from natural milk, and location of origin within the US are not found to be statistically significant for either equations. On the other hand, health attribute (fat content) has negative and statistically significant impact for WTP for domestic artisan cheese over domestic processed cheese. Search attributes such as cut and color of the cheese are also found to be statistically significant only for the domestic artisan cheese equation. On the other hand, package size, which is also a search attribute, has negative and statistically significant impact for both equations.

For the relative importance of experience, search, and credence attributes, all of the experience attributes are found to be statistically significant for WTP for the domestic artisan cheese equation. On the other hand, not all of the search and credence attributes are found to be statistically significant, even for the domestic artisan cheese equation. Overall, experience, search, and experience attributes are found to be more influential on the price premium for domestic artisan cheese over domestic processed cheese than on the price premium for imported French artisan cheese over US artisan cheese.

Marginal Effects

Marginal effects are also calculated to determine which factors have a large impact on consumers' willingness-to-pay a price premium for domestic artisan cheese over domestic processed cheese and French artisan cheese over US artisan cheese. Table 4 (see Appendix) represents 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, since willingness-to-pay levels are ordered from 0 to 3, four marginal effects are 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 is found to be statistically significant for both dependent variables. Hence, this variable is expected to have negative marginal effects for low levels of the dependent variables (e.g., WTP=0) and have a positive effect on higher levels of dependent variables (e.g., WTP=3).

Overall, experience attributes, taste, enhancement of taste, and being aged have a high negative impact on not willing to pay a price premium, which translates into a positive impact on

willingness-to-pay for both domestic artisan cheese over domestic processed cheese and for imported French artisan cheese over US artisan cheese. Hence, producers who improve experience attributes of their artisan cheese product can increase the chance of getting a positive price premium from consumers. Search attributes, such as color of cheese and package size, have relatively large negative impact on the willingness-to-pay. Health attribute, which is a credence attributes, also has a relatively high marginal effect on willingness-to-pay. However, other credence attributes, such as whether or not the cheese is made with organic milk and location of origin do not have statistically significant marginal effects. Overall, if the farmers focus on experience attributes instead of other costly credence attributes, they might increase the probability of obtaining a positive price premium from the consumers.

State-Wise Regression Results

In addition to the pooled regression across different states, we also analyzed each state separately to account for the state-wise differences in consumer preferences. We again use the bivariate-ordered probit regression model for willingness-to-pay for domestic artisan cheese over domestic processed cheese and for willingness-to-pay for imported French artisan cheese over US artisan cheese. The regression results are reported in Table 5(see Appendix). The R^2 for individual state-wise regressions are higher than that for the pooled regression, the highest being 0.45 for Kansas. The Chow test is used to test that the regressions coefficients are, as a whole, different among the three states. The hypothesis that all the regression coefficients are the same among the three states is rejected at the 1 percent significance level.

For willingness-to-pay for artisan cheese over processed cheese, we see differences among three states. Only three variables- cheese is aged, color of cheese, and health attribute- are statistically significant for all three states. Other variables, such as consumer preferences for the way cheese is produced, mechanically processed and farmstead are statistically significant only for one state. There are also variables that are statistically significant for two of the states, but not for the third state. For example, for point of sale, health / natural food stores is statistically significant for Iowa and Kansas, but not significant for Missouri. Results also vary between states for experience, search and credence attributes. The taste variable, which is an experience attribute, is statistically significant for Iowa and Kansas, but it is not significant for Missouri. On the other hand, another experience attribute, whether cheese is aged, is statistically significant for all three states. The credence attributes- made from organic milk and made from natural milk- are statistically significant only for one state each. Overall, the results of the current study suggest that willingness-to-pay or consumer preferences in general should not be generalized across different locations. As willingness-to-pay results are fluctuant relative to geographic location, instead of just focusing on the national trends, producers should analyze the local consumer preferences closely to increase sales.

Factors Analysis

The results of the factor analysis for the artisan cheese attributes are reported in Table 6(see Appendix), in the Kaiser rotated form, which makes the interpretation easy and keeps the model structure unchanged (Johnson and Wichern 2002). We report the factors for the pooled data and for each state separately. As a rule of thumb, we only report the factors with eigenvalues equal to

or bigger than one (Johnson and Wichern 2002; Sharma and Kumar 2006). The results of the factor analysis show that location of origin within the US and unique label have the highest two loadings for the factor 1, which has the highest eigenvalue for the pooled and state-wise data. Factor loadings higher than 0.6 are used to name a factor (Sharma and Kumar 2006). If a factor has high loading of all factors, it is called a general factor (Sharma and Kumar 2006). The factor 1 then can be called consumers' concerns about the source of a food product. Factor 1 also differentiates between the taste variable and the rest of the variables for both pooled and state-wise data. Factor 2 for each state has different variables with the highest factor loadings, which confirms state-wise differences in consumer preferences.

Conclusions

The current study analyzed the consumer preferences for domestic artisan cheese over domestic processed cheese and imported French artisan cheese over US artisan cheese. The results of the current study show that consumer preferences vary between domestic and imported artisan cheese. The impact of various experience, search, and credence attributes on willingness-to-pay for domestic and imported artisan cheese were different. Overall, experience attributes had the most impact on the price premium for domestic artisan cheese over domestic processed cheese. Domestic producers will want to use different marketing and production strategies to compete with imported artisan cheese. The results of the current study show that some of the consumer preferences might vary among different geographical locations. Hence, instead of using national trends, producers can benefit from analyzing the local consumer preferences when producing and marketing cheese products.

Besides the artisan cheese attributes, the results of the current study also showed point of sale and purpose of consumption to be important. These factors are even more influential for state-wise regressions, and these factors showed variation across location. Hence, different points of sale might be needed based on the location to increase the price premium from consumers. For example, health / natural food stores might be better marketing channels for producers in Iowa and Kansas than in Missouri. Future research is needed to further analyze consumer preferences for imported foods. Consumer preferences in regions other than the Midwest should be analyzed by a future study. Future research also should include different food bundles, such as cheese and wine, to identify the variation in consumer preferences for different food products in combination.

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Appendix

Table 1. Variable Names, Description, Means and Standard Deviations (N = 541)

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
Point of Sale			
Supermarkets[1]	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 [2]	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

Table 1. *Continued*

Variable	Description	Mean	Standard Deviation
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
Unique label image		1.36	0.584
Location of origin in the US		1.55	0.650
Supporting small local farmers		1.91	0.676
Dependent Variables			
Willingness-to-pay a price premium for domestic artisan cheese over domestic processed cheese.	Range: 0=None; 1=20% more, 2=30% more 3=50% more	1.22	0.837
Willingness-to-pay a price premium for imported French artisan cheese over US artisan cheese.	Range: 0=None; 1=20% more, 2=30% more 3=50% more	0.64	0.794

Notes:[1]The range is same for all the variables under "Point of Sale."
[2] The range is same for all the variables under "Artisan Cheese Attributes."

Table 3. Results for Bivariate Ordered Probit Regression

Variable	WTP for Domestic Artisan Cheese[1]		WTP for Imported French Cheese[2]	
	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 *(Base is No Specific 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
Point of Sale				
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
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***		

Notes:[1]Indicates willingness-to-pay a price premium for domestic artisan cheese over domestic processed cheese.
[2] Indicates willingness-to-pay a price premium for imported French artisan cheese over US artisan cheese.
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[1]=0 WTPF[2]=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
Point of Sale				
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
Location of origin	0.023	0.018	-0.003	-0.001
Supporting local farmers	-0.010	0.002	0.004	0.000

Notes: [1] WTPA indicates willingness-to-pay a premium for domestic artisan cheese over domestic processed cheese.
[2] WTPF indicates for willingness-to-pay a premium for imported French artisan cheese over US artisan cheese.
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 for Domestic Artisan Cheese[1]			WTP for Imported French Cheese[2]		
	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
Point of Sale						
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
Health Attribute	-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
Location of origin	-0.12	-1.10**	-0.40	0.01	-0.26	-0.37
Supporting local farmer	-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	

Table 6. Factor Analysis (Rotated Factor Loadings) (N=541)

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	0.51	0.50	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
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