Are Food Exchange Websites the Next Big Thing in Food Marketing? A Latent

Class Analysis.

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Abstract

A Latent Class model is utilized to examine vegetable and livestock producers' preferences for a number of different features offered by food exchange websites. The results indicate that growers are willing to pay on average $55.69 per month if an online marketplace is offered. Additionally, the WTP for advertising on Social media is on average $20.43 per month. Lastly, the producers are willing to pay $31.37 per month more for the service if it is provided by a private for profit company.

Introduction

For more than four decades entrepreneur producers have been interested in electronic marketing. The initial driving force behind this interest was the need for a more transparent pricing and trading mechanism, especially for sectors that were vertically integrated (Montealegre et al., 2007). However, the majority of these early endeavors were not successful. Consequently, most of these organizations have been terminated, or, changed their focus (Williams, 2001; Henderson, 1984). Notable exceptions in this rule are the Egg Clearing House, Inc. and the TELCOT established in 1972 and 1975 respectively.

The last decade producers' interest in electronic commerce, both for business to business (B2B) and business to consumers (B2C) transactions, has been revitalized for a number of reasons. First, the advent of the internet has brought electronic commerce (e-commerce) to an entirely new level (Corbitt et al., 2003). Specifically, today, the internet is commonly accepted as a potential marketing outlet (Baourakis et al., 2002). Furthermore, because of the internet, time and space are not limiting factors anymore (Grieger, 2003). Moreover, promoting food products and establishing a brand name can be achieved faster and cheaper through the internet (Baourakis et al., 2002). Second, through e-commerce producers may realize increased profits. This is a direct result of: i) the reduced intermediate costs, ii) the potential increase in sales, iii) the greater efficiencies, iv) the improved management of the supply, v) the development of better relationships with the customers in conjunction with the creation of a consumer network and vi) the automation of transactions (Baourakis, 2002; Zapata et al., 2013, Galoway et al., 2011; Montealegre et al., 2007). Lastly, the changes in consumers' preferences, the diffusion of the internet among consumers and time demands on workplace make on-line grocery shopping a more attractive option (Hiser et al., 1999; Hossain and Adelaja, 2000).

One of the most recent and promising B2C endeavors are the Food Exchange websites. These websites are operated either by the Land Grand universities' extension program (i.e. MarketMaker) and are free of charge, or by private institutions that require a fee for registration (i.e. Local Orbit). The primary goal of the Food Exchange websites is to provide an alternative marketing channel especially for small and medium scale growers. This is achieved by connecting local producers with consumers and business at the same time.

Considering the great variety and features offered by the food exchange websites three important questions are of interest: 1) what features producers value the most, 2) what is the relationship between growers' personal characteristics and the probability of participation in a food exchange website and 3) does it make any difference in gropers' preferences the host agency of the website (i.e. are growers more likely to participate in a food exchange website if it is supported by a university extension service or not).

The objective of the present study is to examine producers' opinion and willingness to pay for various features included in the food exchange websites. Specifically, these features include: different fee requirements, automated payments through an online market place, social media advertisement, an online directory service where producers can search for potential buyers and the provision of demographic statistics. The main data source for this study is an electronic survey. The survey was administered to vegetable and livestock producers in four states: North Carolina, South Carolina, Florida and Georgia. Mailing information for the growers was obtained from farmermarketid.com.

A latent class model formulation is used to analyze growers' preferences and willingness to pay for the different features examined. This approach has a number of desirable properties. For instance, the model: 1) relaxes the restrictive independence from irrelevant alternatives (IIA)

assumption, ii) unveils unobserved preference heterogeneity, and iii) due to its semiparametric nature, the model does not require from the researchers any detailed assumptions for the distribution of the parameters (Greene and Hensher, 2003).

The contributions of this study to the literature are twofold. First, although some research has been conducted regarding the economic impact of e-commerce (i.e. Zapata et al., 2013; Subramaniam and Shaw, 2002) to the best of our knowledge, this is the first endeavor to estimate growers' preferences and willingness to pay for e-commerce features using choice experiments. Second, the study will provide insights regarding the validity of the experimental methods and models used in predicting producers' behavior for a largely new attribute.

The findings of the study provide useful information to the food production industry as well as the extension service agencies that operates the MarketMaker web site. In detail, one of the ways that retailers, restaurants, and others can increase their inventories of local production is the use of I\internet purchases. Thus, a better understanding of farmers' preferences can lead to opportunities for mutually beneficial arrangements. Moreover, information regarding farmers 'acceptance and willingness to pay for the different site attributes in interaction with their characteristics and risk aversion levels will provide useful intuition in better understanding how different producers view this emerging option of marketing, thus, improving the probability of success.

Data Collection

The main data source for the present study is an online survey. The survey was administered to a random sample of 6,000 livestock and vegetable growers in four states: North Carolina, South Carolina, Georgia and Florida. The mailing addresses for the growers were purchased from FarmMarketid.com. An invitation email was sent to the growers at May 1st, 2014. Following the guidelines provided by Dillman et al. (2009) the initial email provided a brief description of the survey, highlighted the importance of responses and contained a link to survey. Furthermore, in line with Dillman et al. (2009), an informative subject line, indicating that the e-mail is about a survey conducted by Clemson University, was included in the email communications. Moreover, the emails were personalized for each grower and signed by the researchers. Two reminder emails were sent to the producers (one week and two weeks after the initial mailing). Lastly, all email communications were sent from the same e-mail address (Dillman et al., 2009).

Survey Design

The survey instrument consisted of five questions. The first section included introductory questions to attract growers' interest in the survey. A choice experiment was included in the second section. The third section focused on growers' experience with electronic commerce. The fourth section asked questions related to the producers risk comfort levels as well as their trust in different institutions. The survey concluded with the traditional demographic questions. The clarity of the survey instrument, the wording and order of questions etc. were pretested in a number of focus groups sessions. The focus groups included producers, extension service agents and university professors.

Choice Experiment Design

    A choice experiment is utilized to elicit producers' preferences and willingness to pay (WTP) for the various features that can be potentially offered by a food exchange website. Specifically, in the second section of the survey, producers were presented with a series of choice scenarios. In each scenario they were asked to select among two different website alternatives or indicate that they prefer none of them. The website alternatives were different in the number of features offered and/or in the monthly fee required from the producers. Before the choice experiment producers were provided with a detailed instruction page describing the experiment and explaining each of the features.

In detail, the following features are examined: online directory, demographic research tool, social media advertisement, online marketplace, the type of service providers and a monthly fee. The selection of these features based on literature review (i.e. Zapata et al., 2013; Montealegre et al., 2007), the feedback received from the focus groups and research of online food hubs available during the period of this research.

The online directory allows the growers to search the website's database for potential buyers. This option is offered as a feature for all the potential alternatives. The demographic research tool is an expansion of the online directory. This tool allows the producers to use the website database in order to search for demographic characteristics, income level, race distribution etc. at a specific zip code. As a result, if this is offered, growers can target specific niche markets. The social media advertisement refers to the advertisement on social network websites). With this option the advertisements can be delivered directly to specific groups of consumers. The online marketplace refers to the ability of buying and selling directly from the

web site (i.e. consumers can pay online with their credit/debit card). Lastly, service provider, refers to the host agency of the website.

The first two attributes have two levels (offered or not offered). The online marketplace feature consisted of four levels. The first level reflects whether or not the feature is supported. If the feature is supported, three additional levels indicating different commission fess based on the sales are included. The service provider has three levels (university extension service, for profit organization, not for profit organization). Lastly, there are four different monthly fee levels ($20/month, $60 month, $100/month and $140/month). A description of the features and their levels is reported in Table 1. A sample choice set is presented in Figure 1.

Given the five attributes and their levels a full factorial design results in 384[1] unique profiles. Since it is not practical to evaluate all this combinations a D-optimality fraction design was adopted. The final experiment included 60 unique choice profiles. In order to avoid responders fatigue and have a reasonably long survey we generated 32 choice sets and divided then into four blocks. Thus, each responder had to answer eight choice sets. Huber and Zwerina (1996) illustrated the importance of utility balance in avoiding unrealistic choice profiles. In order to avoid this danger, we adopted a Bayesian Experimental Design approach in which a set of priors was utilized. Our final experiment design achieved a D-optimal score of 89.94[2].

Empirical Model

A Latent Class Model (LCM) was utilized to analyze the data from the choice experiment. This type of approach has been frequently used during the last decade to analyze heterogeneous preferences among consumers (i.e. Hu et al., 2004; Lim et al., 2013) or farmers (Ruto and Garrod, 2006).

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[1] 4*2*2*3*4 =384
[2] JMP 10 DOE procedure was used for the derivation of the optimal design

The LCM builds on conditional logit model, but provides extra flexibility in incorporating unobserved heterogeneity with the assumption that population preference can be decomposed into different classes (Greene and Hensher 2003).

The Random Utility Model provides the theoretical foundation of all discrete choice models. Specifically, assume that the utility of an individual i selecting the alternative j from a choice set t is given by:

(1) $U_{ijt} = \mathbf{x}_{ijt}\boldsymbol{\beta} + \varepsilon_{ijt}$

This utility function can be decomposed into a deterministic $\mathbf{x}_{ijt}\boldsymbol{\beta}$ and a random componentε_{ijt}. The vector x_{ijt} represents the choice profile expressed in alternative j of choice set t. The random error follows an IID maximum extreme value Type I distribution. In contrast with the conditional logit model, LCM assigned individuals into Q classes with homogeneous preferences in each class. Thus, the probability of individual i choosing alternative j in choice set t, given class q is given as:

(2) $P_{it|q}(j = 1) = \dfrac{\exp(\alpha\, c_{ijt} + \mathbf{x}'_{it,j}\boldsymbol{\beta_q})}{\sum_{j=1}^{J} \exp(\alpha\, c_{ijt} + \mathbf{x}'_{it,j}\boldsymbol{\beta_q})}$

where we separate the price, c_{ijt}, from the rest of the attributes in vector $\mathbf{x}$ to accommodate the discussion. A number of different criteria, such as the minimum of the Akaike Information Criterion (AIC)) and the Bayesian\I information Criterion, have been proposed to determine the number of classes (Lim et al., 2013). For the objectives of the present research AIC and BIC are used as the criteria to select the number of classes (Green and Hensher, 2003).

Results

The final sample consists of 97 individuals. Given that each individual had eight choice tasks, there are a total 776 choices in the sample. The LCM fails to converge when three or more classes were specified. A comparison (Table 2) of the two models confirms that the two class model provided a superior fit to the data. Additionally, the McFadden Pseudo R^2 for the final model was 0.61. The first class includes producers that are not interested in registering in food exchange websites. The second class includes growers that may participate in food exchange web sites.

For the first class named non-user, all estimated coefficients other than price were not statistically significant. This suggests that the producers categorized in this class were not interested in subscribing to the online food exchange service. The model reveals about 76.6% of producers were within this class. Given that about 70% of the observed choice were opt-out, this is hardly surprising. Additionally, this is consistent with the fact that the majority of producers are not selling products through online food hubs.

The model estimated that 23.4% of the growers are included in the second class. The price coefficient, in line with our initial expectations was negative. This finding indicates that the higher the monthly registration fee the lower the probability that growers will register in the website. On the other hand, online marketplace and social network advertisement variable have a positive and statistically significant coefficient. Thus, growers are more likely to participate in food exchange websites if these two features are offered.

The negative and statistically significant coefficient associated with the opt-out variable indicates that growers, in this group, will suffer a utility loss if the food exchange websites were not offered to them as a marketing alternative. Lastly, the positive coefficient associated with the

for-profit attribute suggested that the producers prefers the service to be conducted by a private, for profit enterprise than a not for profit organization.

The coefficients are readily translated into willingness to pay estimates. We utilized effect coding to avoid confounding interpretation of the base category (no online marketplace, no demographic research tool, no social media advertisement, not for profit organization) with the base category of the opt-out option (Bech and Gyrd Hansen 2005). The willingness to pay (WTP) for an attribute is then given as,

$$(3) \; WTP = -2 \times \frac{\beta_{attribute,q}}{\alpha_q}$$

The mean and standard error of the WTP were generated with 1000 draws of Krinsky and Robb simulation (Hole, 2007; Krinsky and Robb,1986). Since all coefficients associated with attributes were insignificant in the non-user class, we only include the WTP estimates for the second group.

The WTP for online marketplace is estimated to be on average $55.69 per month (see Table 3). Additionally, the WTP for advertising on Social media is on average $20.43 per month. Lastly, the producers are willing to pay $31.37 per month more for the service to be provided by a for profit enterprise.

Conclusions

Despite the special characteristics of agricultural production (i.e. perishability, seasonality etc.) and the, until recently, low adoption rate of internet among growers electronic commerce is nothing new or revolutionary for the farming sector of the economy. Producers are experiment with electronic marketing options for almost forty years.

However, a rapid growth in e-commerce, both business to business (B2B) and business to consumers (B2C), has been noticed during the last decade in agriculture. A number of factors drive this growth. First, there is a potential for increased profits (i.e. Zapata et al., 2013). Second, the advent of the internet in conjunction with the reduced cost and wider availability of broadband connections made the internet a great potential marketing outlet. Lastly, the change in consumers' preferences increased the appeal of e-commerce among producers.

As a result, a densely populated market emerged. Food exchange websites are among the most prominent of these endeavors. In order for the food exchange web sites to be successful an important requirement is to achieve a constant supply of products. Thus, it is imperative to have growers registering and using the website. Consequently, it is of paramount importance to understand the factors that attract producers in these websites.

The present study used a choice experiment in conjunction with a Latent Class Model (LCM) formulation to investigate livestock and fresh vegetable producers' preferences for a number of features potentially offered by the food exchange websites. The attributes examined include: the service provider, online marketplace, the provision of demographic statistics by the website, social media advertisement and different levels of monthly fees. The main data source of the study is an electronic survey administered to 6,000 producers.

The findings of the study indicate that a big portion of the producers are reluctant to register in food exchange websites. This finding is not surprising considering that only 14% of the farms in the U.S.A. conduct agricultural marketing activities over the internet (NASS, 2013). Of the producers that are interested in food exchange websites the results indicate that online marketplace and social media advertisement are desirable features. Lastly, the findings indicate

that producers are willing to pay more if the service is provided by a private, for profit, host. This may indicate that growers have a higher level of trust for private companies.

Future research may include different samples of growers. For instance, it would be interesting to examine if there is consistency between the findings of the present study and of a second study that will examine only the preferences of growers that participate in food exchange websites.

Table 1: Choice Experiment Attributes and their Levels

Attribute	Description	Levels				
		1	2	3	4	5
Service Provider	The host agent of the website.	State University Extension Service	Local Gourmet (A privately owned, for profit business)	Local Food Hub Association (Not for Profit Association)		
Online Marketplace	Sell products and receive payments online.	No	Offered and no commission is required	Offered, with a 2% commission on sales required	Offered, with a 4% commission on sales required	
Social Media Advertisement	Advertise your business on social media.	Yes	No			
Demographic Statistics	Provide income, gender and other demographic statistics of targeted markets by zip code.	Yes	No			
Monthly Fee	A fee that the grower has to pay in order to use the website.	$20/month	$40/month	$60/month	$100/month	$140/month

Table 2: Latent Class Models Estimates

Dependent Variable = Choice	Two Class						One Class		
	Class 1 Non-Users			Class 2 Interested Users					
Coefficients	Estimates		S.E.	Estimates		S.E.	Estimates		S.E.
Price	-0.0538	***	0.0113	-0.0251	***	0.0046	-0.0211	***	0.0031
Opt Out	0.2582		0.3165	-0.4073	**	0.1963	0.5779	***	0.1393
Demographic Tool	-0.2974		0.2308	-0.0967		0.1055	-0.0730		0.0820
Online Marketplace	0.2893		0.3616	0.6980	***	0.2044	0.4325	***	0.1400
Online Marketplace + 2% commission	-0.6059		0.4949	0.2735		0.1903	0.0676		0.1457
Online Marketplace + 4% commission	-0.3967		0.4476	-0.4060		0.2956	-0.4944	**	0.2156
Advertisement on Social Media	-0.3305		0.2322	0.2561	**	0.1174	0.0359		0.0861
For Profit Operator	0.2688		0.3109	0.3931	**	0.1624	0.2548	**	0.1134
Extension Operator	0.0788		0.3105	-0.1063		0.1619	0.0399		0.1216
Class Probability	0.7659	***	0.0444	0.2341	***	0.0444			
Number of Parameters	19						9		
Number of Individual	97						97		
Number of Choice Sets	753						753		
Log likelihood	-322.50						-476.34		
AIC	683.00						970.70		
BIC	770.87						1012.30		
Pseudo R2	0.6102						0.0699		

Notes: Significance level * = 10 % ** = 5% *** = 1%

Table 3: Willingness to Pay of Interested Users

Coefficients	Estimates		S.E.
Opt Out	-32.4997	**	16.1449
Demographic Tool	-7.7126		8.8106
Online Marketplace	55.6940	***	19.7484
Online Marketplace + 2% commission	21.8194		16.4717
Online Marketplace + 4% commission	-32.3991		26.2323
Advertisement on Social Media	20.4349	**	9.8428
For Profit Operator	31.3670	**	15.5985
Extension Operator	-8.4783		13.8632

Notes: Significance level * = 10 % ** = 5% *** = 1%

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APPENDIX: A Sample Choice Set

Please select the plan that you are most like to purchase for your business. You can select "None" if neither plans appeal to you.

Service Provider: State University Extension Service **Online Directory** List your business on an online directory; and search for potential buyers. **Online Marketplace** Sell and receive payment online $80/month + 4% of online sales	**Service Provider:** Local Food Hub Association **Online Directory** List your business on an online directory; and search for potential buyers. **Demographic Statistics** Provide income, gender, and other demographic statistics of targeted market by zipcodes. **Online Marketplace** Sell and receive payment online **Social Media Advertisement** Advertise your business on social media. $40/month + 2% of online sales	I would not purchase these plans
● Plan 1	● Plan 2	● None