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Title:

Clustering online shoppers and explaining their preferences for ways to receive marketing information about local/regional fresh produce

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Abstract

Using a k-mean clustering algorithm and ordered Logit models, this study classifies online shoppers into three clusters and explains their preferences for marketing channels to receive information about local/regional fresh produce. Data were collected in 2016 from a stratified random sample of 1,205 online shoppers within Southern region of the U.S. The likelihood for the word-of-mouth, radio and TV ads, newspapers, and Internet-based to be at least preferred (preferred, very preferred, and extremely preferred) as channel to receive/access information/advertisement about market outlets for locally/regionally grown fresh produce is 69 percent, 61 percent, 57 percent, and 48 percent respectively. This study is useful for fresh produce growers, agricultural marketers, online shopper, and researchers.

Key Words: Online shoppers, local/regional fresh produce

Introduction

Kotler and Armstrong, (2012) and Rigby, (2012) indicated that the web presence is a common practice among consumers and organizations. Judith, (2012) reported that the use of mobile devices, smartphones, and tablets contributes much to this trend. Neilson Company, (2015) found that online retailers of fresh produce have tremendous opportunity to do well in the online market environment. Previous studies such as Abello et al., (2012), Obadia et al., (2013), Gumirakiza et al., (2014), Zepeda et al., (2014), and Freedman et al., (2014) focused on explaining purchasing behaviors of consumers who attend farmers' markets. Curtis et al. (2015), Meyer, (2012), Conner et al., (2010),

Connolly and Klaiber, (2012), and Woods and Troppy, (2015) looked at consumers who participate in community supported agriculture programs. This study targeted consumers in the South region of the U.S. who made at least two online purchases within six months prior to participating in this study in 2016. We refer to such consumers as “online shoppers”. Research questions are: what are characteristics of online shoppers based on their monthly expenditures on fresh produce? What is the most preferred channel to convey information about markets for fresh produce to online consumers? Consequently, there are two specific objectives: (i) cluster the online shoppers based on their monthly expenditures on fresh produce, (ii) analyze preferences for communication channels that online shoppers would like receive marketing information about local fresh produce.

Methodology

This study used survey data collected in 2016 from a stratified randomly selected sample of 1,205 online shoppers. We used the Qualtrics software to create the survey. The software has capabilities to make possible for accurate tracking, profiling, and monitoring of responses for each respondent. It also allowed us to use the design survey questions using advanced branching logic, randomization, question block presentation, and question timing. The benefit from these features was to avoid possible bias that could arise during survey taking. To ensure that respondents are in fact paying attention to each question included in the survey, we added questions requiring respondents to think and provide a correct answer. Those who gave incorrect answers were automatically excluded from the survey. The electronic survey link was distributed to online shoppers within the Qualtrics actively managed market research panels and those using social media such as Facebook, and Twitter. Qualtrics is a professional survey software provider that offers sophisticated and advanced online data collection tools combined with respondent panels. To ensure quality and data validity, every IP (Internet Protocol) address/location was checked and a sophisticated digital fingerprinting technology was used.

To analyze data, we conducted a cluster analysis and used an ordered logistic model. First, a cluster analysis grouped the online shoppers into three categories based on their monthly expenditures on fresh produce. The analysis followed the partitioning clustering

process where the K-Means algorithm minimizes the distance of each point from the center value of the group to which the point belongs. Based on shopper characteristics, the algorithm initialized a set of cluster centers and assigned each observation in the dataset to the cluster with the nearest center. The process continued until the centers of the clusters stopped changing.

Second, an ordered logistic model was used to explain the advertising ways that online shoppers would like to receive information about markets for local and/or organic fresh produce. Respondents were presented five options and asked: Based on how you get information about shopping and events in your community, order the following advertising ways you would like to be informed about market outlets for local and/or organic food products (1 being the most preferred and 5 being the least preferred). The options were: (A) Internet advertisement on websites and/or social media, (B) local radio stations and/or TV advertisement, (C) word of mouth, (D) newspapers, and (E) information displays on public places such as roadside signs, buses, etc.

An individual i is assumed to assign a favorable number to the that gives the highest utility among j ranking levels. The probability that the response outcome will take on a particular value is given by

$$Prob(y = j/X_{ki}) = \frac{\exp(\beta_k X_{ki})}{1 + \exp(\beta_k X_{ki})}$$

Cluster Analysis Results

Table 1 shows mean values associated with each of the characteristics. Conveniently, we display the statistics per each of the five categories of the dependent variable. Age is variable representing actual age for each respondent with a minimum of 18 years. Female is a binary variable with one if a respondent's gender is female and zero otherwise. Married is a binary variable with one if a respondent is married and zero otherwise. "FPDiet_Concerns" is a dummy variable that represents those shoppers who believe that eating more fruits and vegetables regularly helps address dietary concerns. "GovAssistance" is another dummy variable with one representing respondents who participate in either food stamps, WIC, and/or senior nutrition assistance programs and zero otherwise. Caucasian is a binary variable with one if a respondent is white and zero

otherwise. The variable “IncomeYear2015” represents thousands of respondents’ gross income for year 2015. The “MonthlySpendFreshProduce” represents the average amount of money respondents spend on fresh produce per month. Education is a categorical variable with five categories (no high school, high school diploma, 2-year college degree, 4-year college degree, graduate degree). The “InterestedInLocalFP” represents a 5-likert scale of levels of interests respondents have in locally grown fresh produce. The WouldBuyLocalProduceOnline is another 5-likert scale representing levels of possibility for shoppers to purchase fresh produce online.

Table 1: Clustered Descriptive statistics

Variables	Clusters		
	Moderate Spenders	High Spenders	Low Spenders
Age	44	41	49
Female	0.542	0.407	0.636
Married	0.627	0.661	0.541
FPDiet_Concerns	0.827	0.864	0.691
Caucasian	0.764	0.729	0.842
IncomeYear2015	\$80.98	\$89.29	\$56.66
GovAssistance	0.147	0.136	0.152
InterestedInCSA	0.68	0.723	0.501
MonthlySpendFreshProduce	\$109.88	\$289.94	\$25.40
Education	3.56	3.814	3.281
InterestedInLocalFP	4.52	4.559	4.338
WouldBuyLocalProduceOnline	2.689	3.356	2.029
Observations	225 (= 21%)	59 (= 6%)	784 (= 73%)

The largest cluster consists of low-spender online shoppers. The clustering algorithm placed 73 percent of all respondents into this group. In this cluster, the average monthly expenditure on fresh produce is \$25.40. An average low-spender is 49 years old. This cluster is the least affluent cluster with average annual income of \$56,660 in 2015. In this group, females are about 64 percent. This is the cluster with the lowest percentage of married (54 percent) online shoppers. Similarly, it contains the lowest number of respondents interested in CSA programs (50 percent). Compared to other two clusters (high and moderate spenders), the percentage of low-spender online shoppers who believe that eating fresh produce could help address their dietary concerns is low (69

percent as opposed to 83 and 86 percent for moderate and high spenders respectively). Almost 84 percent are Caucasian and 15 percent receive some sort of food-related assistance from government programs. An average low-spender online shopper barely has a 2-year college degree, is very interested in locally grown fresh produce. This shopper would probably not shop for fresh produce online.

The second largest cluster consists of moderate-spender online shoppers. There are 21 percent of all respondents into this cluster. An average moderate-spender online shopper spends roughly \$110 on fresh produce each month. This average moderate-spender is 44 years old, has a 4-year college degree, and earned a gross income of \$80,980 in 2015. He/she is very interested in locally grown fresh produce and is neutral/unsure about buying local fresh produce online. This cluster contains 54 percent females, 63 percent married, and 76 percent Caucasians. The portion of respondents interested in CSA programs in this cluster is 68 percent. Moderate-spender online shoppers who believe that eating fresh produce could help address their dietary concerns is 83 percent.

Finally, the smallest cluster consists of high spenders. The clustering algorithm placed only 6 percent of all respondents into this group. In this cluster, the average monthly expenditure on fresh produce is \$289.94. An average respondent in this cluster is 41 years old. This suggests that the cluster includes a majority of consumers with children to feed at home; resulting in high expenditures on fresh produce. This cluster is the most affluent cluster with average annual income of \$89,290 in 2015. This cluster also contains the highest percentage (66 percent) of married online shoppers; which could be another explanation for high spending. There are nearly 41 percent females in this cluster. We found that 86 percent of high-spender online shoppers believe that eating fresh produce could help address their dietary concerns. Almost 73 percent are Caucasian, 14 percent receive some sort of food-related assistance from government programs, and 72 percent are interested in community supported agriculture programs. We finally found that an average high-spender online shopper barely has a bachelor's degree, is extremely interested in locally grown fresh produce, but is neutral about shopping for fresh produce online. Overall, across these three clusters, online shoppers are very interested in locally

grown fresh produce, but are not decisive about their likelihood to purchase it from online stores.

Ordered Logit Model Results

This study uses an ordered Logit model to explain preferences for marketing channels among the online shoppers. Table 2 presents results from this model. For each of the five common marketing/advertising channels, levels of preferences were regressed against twelve independent variables.

Table 2: Results from the Ordered Logit Model

Independent Variables	Internet-Based Advertisement	Radio and TV	Word of mouth	Newspapers	Public Places
Age	-0.01597***	0.000473	-0.00174	0.0197***	-0.000463
Female	0.4180***	-0.257*	-0.0661	-0.219	0.149
Married	0.06928	0.0803	0.374***	0.222	0.0388
FPDiet_Concerns	-0.1709	-0.206	0.0956	-0.288*	-0.100
Caucasian	-0.07317	-0.103	-0.225	0.182	0.179
IncomeYear2015	-0.2936	0.243	0.243	-0.0321	-0.176
GovAssistance	0.1934	-0.00458	0.0776	-0.0609	-0.163
InterestedInCSA	0.001157	-0.00159	0.00281**	-0.00106	0.169*
MonthlySpendFreshProduce	-0.001627	0.000879	0.000497	0.000473	-0.000475
Education					
No High School	(base)				
High School Diploma	0.06396	1.196	0.970	-0.546	0.328*
2-Year College Degree	-0.06460	1.291	0.530	-0.297	0.044*
4-Year College Degree	0.08917*	1.114	0.373	-0.0365	0.619*
Graduate Degree or Higher	0.03380	0.735	0.690	-0.140	0.968**
Interest In Fresh Produce					
Not Interested	(base)				
Somewhat Interested	0.4273	14.23	0.070*	-1.748	0.356
Interested	0.2818	13.54	0.085**	-1.962	0.320
Very Interested	0.5582	13.60	0.097*	-1.720	-0.165
Extremely Interested	0.4365	14.02	0.023**	-1.775	-0.0893
Would Buy Local Produce Online?					
Definitely Not	(base)				
Probably Not	0.3595	0.107	0.183	-0.201	-0.0813
Might or Might Not	0.6616	-0.150	0.0562	-0.562***	0.0712
Probably Yes	0.7818***	-0.105	0.305	-0.308	-0.105
Definitely Yes	0.6220**	0.00143	0.623**	-0.239	0.199
Constant cut1	-0.6828**	12.97*	-14.40*	-2.233*	-3.410**
Constant cut2	0.1359*	14.31*	-13.41**	-1.335*	-2.076*
Constant cut3	0.7296*	15.25**	-12.57*	-0.429**	-1.101*
Constant cut4	1.5658*	16.30**	-11.56**	0.572*	0.0890*
Stats:					
Observations	798	798	798	798	798
LR chi2(21)	69.77	34.63	38.20	62.20	20.71
Prob > chi2	0.0000	0.0310	0.0122	0.0000	0.4769

Pseudo R2	0.0281	0.0136	0.0151	0.0244	0.0082
Log likelihood	-1204.5575	-1253.2778	-1247.5	-1243.727	-1251.4652

The *, **, *** denote significance at the 10%, 5%, and 1% level, respectively.

These findings indicate that age is a significant factor on the preferred communication channel concerning internet-based advertisement. Younger online shoppers prefer Internet-based advertising. Women are more like to favor Internet-based advertising as well. Another significant factor is that men prefer advertisement from the radio/television. We found that married online shoppers prefer the word-of-mouth as a way to receive advertisement about fresh produce. Newspapers were found to be the preferred communication channel among older online shoppers as well as those who are considered FPDiet_Concerns. Those who are not interested in CSAs were more likely to prefer public places as a source of advertising information regarding local fresh produce.

Education, “interests in local fresh produce”, and “would buy local produce online” were included in the model as categorical variables. We used No high school, not interested, and definitely not were respectively as base categories. We found that levels of education do not have any significant effect on any one of the advertisement channels for locally grown fresh produce. Levels of interests in fresh produce do not have any significant effect on any one of the advertisement channels. We found significant differences among levels of commitment to buying local produce online. In comparison with those who would “definitely not”, results indicate significant preferences for Internet-based advertisement among those respondents who might, probably, and definitely buy local produce online. Finally, it was found that those who would probably not buy local produce online do not prefer newspapers. Likewise, results indicate that those who would definitely buy local produce online less likely to prefer word-of-mouth channel of advertising. Table 3 shows predicted probabilities for each of the advising channels to be not preferred, somewhat preferred, preferred, very preferred, or extremely preferred.

Table 3: Predicted Probabilities for Information Channels

Information Channels	Probabilities				
	Not Preferred	Somewhat Preferred	Preferred	Very Preferred	Extremely Preferred
Internet-based	.3223	.1966	.1424	.1570	.1816

Radio/TV stations	.1441	.2456	.2310	.2025	.1767
Word-of-mouth	.1446	.1676	.1999	.2308	.2570
Newspapers	.2349	.1948	.2213	.1843	.1646
Public places	.1210	.2222	.2375	.2392	.1801

This study indicates that the probability for Internet-based (website and social media) to be at least preferred (preferred, very preferred, and extremely preferred) as channel to receive/access information/advertisement about markets for locally grown fresh produce is 48 percent. The probability for local radio and TV stations is estimated to be 61 percent. The likelihood for the “word-of-mouth” to be at least preferred is 69 percent. The likelihood for the newspapers to be at least preferred is 57 percent. The likelihood for the ads on public places (roadside signs, buses, buildings) to be at least preferred is 66 percent. Clearly, many online shoppers indicated that the most preferred communication channel to receive information about market outlets for locally grown fresh produce is through word-of-mouth.

Conclusion

While several previous studies explained purchasing behaviors among consumers at farmers’ markets and CSA subscribers, this study focuses on online shoppers to explain preferences for communication channels that online shoppers would like to receive marketing information about local fresh produce. This study used survey data collected in 2016 from a stratified randomly selected sample of 1,205 online shoppers within Southern region of the U.S. We used k-mean clustering, binary and ordered Logit models to analyze data.

Based on monthly expenditures on fresh produce, the clustering algorithm placed 73 percent of all respondents into the low-spender group, 21 percent in the moderate-spender category, and 6 percent in the high-spender cluster. Results from Logit models indicate that the likelihood for the word-of-mouth to be at least preferred (preferred, very preferred, and extremely preferred) as channel to receive/access information/advertisement about market outlets for locally/regionally grown fresh produce is 69 percent. The probability for local radio and TV stations is estimated to be 61 percent. The probability for Internet-based to be at least preferred is 48 percent. The

likelihood for the newspapers to be at least preferred is 57 percent. The likelihood for the ads on public places to be at least preferred is 66 percent. Overall, across these three clusters, online shoppers are very interested in locally grown fresh produce, but are not decisive about their likelihood to purchase it from online stores.

There are a couple of suggestions this study brings. First, this study suggests that growers/sellers of fresh produce need to take possible measures to reinforce produce quality and enhance customer satisfaction; which will consequently continue speaking favorably for fresh produce. Second, suggest further that those selling (or planning to sell) fresh produce online should target the three clusters, but the most recommended cluster to start/focus on is the high-spender. Third, we suggest that industry professionals who would like educate online shoppers about market outlets for local/regional fresh produce should target females, those concerned with their dietary habits, those who receive any type of food-related assistance from government programs (WIC, food stamps, senior nutrition program and the like), low-income shoppers, shoppers with interests in CSA programs, and those who buy (or would) fresh produce online. Finally, future researchers will find this analysis useful when furthering knowledge in this increasingly popular market.

References:

1. Abello, F.J., M.A. Palma, D.P. Anderson, and M.W. Waller. (2014). Evaluating the factors influencing the number of visits to farmers' markets. *Journal of Food Products Marketing* 20: 17—35
2. Conner, D., Colasanti, K., Ross, R. B., & Smalley, S. B. (2010). Locally Grown Foods and Farmers Markets: Consumer Attitudes and Behaviors. *Sustainability*, 3(2): 742–756
3. Connolly, C., and H.A., Klaiber. (2012). Are Consumers Willing to Pay for Organic When the Food is Already Local? *Journal of Economic Literature*, 13(51)
4. Curtis, K., R., Ward, K., Allen and S., Slocumd. (2013). Impacts of Community Supported Agriculture Program Participation on Consumer Food Purchases and Dietary Choice. *Journal of Food Distribution Research*, 44(1): 42-51
5. Freedman, D.A., Mattison-Faye, A., Alia, K., Guest, M.A., Hébert, J.R. (2014). Comparing Farmers' Market Revenue Trends Before and after the Implementation of a Monetary Incentive for Recipients of Food Assistance. *Prev Chronic Dis*, 11: E87
6. Gumirakiza, J.D, K. Curtis, and R. Bosworth. (2014). Who Attends Farmers' Markets and Why? Understanding Consumer and their Motivations. *International Food and Agribusiness Management Review* 17(2): 65—82
7. Judith, A. (2012), Tablets and smartphones transform the in-store customer experience, *CRM Magazine*, 16(1)
8. Kotler, P., Armstrong, G. (2010), *Principles of Marketing*, (13th edition), New Jersey: Pearson Education
9. Kraschnewski J.L., George D.R., Rovniak, L.S., Monroe, D.L., Fiordalis, E., Bates, E. (2014). Characterizing Customers at Medical Center Farmers' Markets. *J Community Health*, 39(4): 727—731
10. Martinez S., M. Hand, M. D. Pra, S. Pollack, K. Ralston, T. Smith, S. Vogel, S. Clark, L. Lohr, S. Low, and C. Newman. May 2010. Local Food Systems: Concepts, impacts, and Issues. *ERR 97, U.S. Department of Agriculture, Economic Research Service*
11. Meyer, J. (2012). Community Supported Agriculture: A Strategic Analysis of the Market and a Competency-based Strategic Plan. A Thesis at Michigan State University. Available at <http://ageconsearch.umn.edu/handle/140519>
12. Obadia, J., and Porter, J. (2013). “Farmers Markets: Impact on Fruit and Vegetable Consumption of Supplemental Nutrition Assistance Program Clients.” *The Boston Collaborative for Food and Fitness*, 1—17. Available at http://bostonfarmersmarkets.org/wpcontent/uploads/2012/07/FarmersMarket-Impact-on-FV_Website.pdf
13. Neilson Company. 2015. The future of grocery. E-commerce, digital technology, and changing shopping preferences around the world. Available at <http://www.nielsen.com/content/dam/nielsen-global/vn/docs/Reports/2015/>
14. Racine, E. F., Mumford, E. A., & Laditka, S. B. (2013). Understanding Characteristics of Families Who Buy Local Produce. *Journal of Nutrition Education and Behavior*, 45(1): 30– 38
15. Ruelas, V., Iverson, E., Kiekel, P., Peters, A. (2012). The Role of Farmers' Markets in Two Low Income, Urban Communities. *J Community Health*, 37(3): 554-562

16. U.S. Census Bureau. 2016. Census Regions and Divisions of the United States. Available at http://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf
17. Woods, T.A., and D. Troppy. (2015). CSAs and the Battle for the Local Food Dollar. *Journal of Food Distribution Research*, 46(2): 17-29
18. Zepeda, L., & Nie, C. (2012). What Are the Odds of Being an Organic or Local Food Shopper? Multivariate Analysis of US Food Shopper Lifestyle Segments. *Agriculture and Human Values*, 29(4): 467–480.