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Willingness to pay a high-premium for fresh organic produce: an econometric analysis

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Abstract This paper aims at predicting characteristics of the buyers who are willing to pay (WTP) a high-premium for organic fruits and vegetables in the mid-Atlantic region of US. The results indicate that those who are Caucasian, have a graduate degree and income above $100,000/annum, use advertisements, prefer certified labels, frequently buy at direct markets, think organic food has better taste, switch supermarkets to buy organic produce, prefer processed organic foods are more likely to pay a high-premium. While, those who regularly shop at more than one food store, are influenced by the naturally grown label, prefer conventionally grown local produce and consider buying organic food is a waste of money are less likely to pay a high-premium for organic fresh fruits and vegetables. These findings provide essential feedback to producers of organic produce in targeting customers for sale of organic products.

Keywords Organic fresh produce, Willingness to pay, High-premium, Logistic regression model, Mid-Atlantic region

JEL classification Q22, M310

1 Introduction

Trade in global organic foods and drinks touched 80 billion US dollars in 2014 (FIBL-IFOMA Survey 2016) almost 10-times more than in 2000. The demand for organic products is high in Europe and North America, sharing 95% of the global income from organic produce (FIBL-IFOMA Survey 2016). In the US, the growth in organic food sector in the past few decades has remained steady (USDA 2015a; 2013b). The total retail sale of organic products was over $39 billion in the US, close to half of the global sales of about $75 billion (USDA 2016a). In 2014, the size of the organic market in the US was $35 billion; 43% of this was accounted for by fruits and vegetables (USDA 2013a). The countries that have significant markets for the organic product are the US, France, and Germany, with highest per-capita consumption in Switzerland, Luxemburg, and Denmark (Willer 2012).

Organic products are usually more expensive than conventional products (Katsarova 2015; Lohr 2001). The cost of cultivation of organic products is often not higher compared to the cost of cultivation of the same products under conventional system. But, the yield difference and the lack of market development for organic products are the significant challenges for organic producers (Post & Schahczenski 2012). Many studies show that a premium price is necessary for organic farming to be competitive (OFRF 2012; Delbridge et al. 2011). For example, 18 years of cropping systems trial data show that in the absence of price premium on organic produce the non-organic system is more profitable than the organic system

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(Delbridge et al. 2011). In general, higher prices reduce incentives for consumers to buy organic products (The Packer 2000, 2002; Walnut Acres 2002).

Consumers' willingness-to-pay (WTP) and willingness-to-buy (WTB) studies are often used in determining the market potentials (Govindasamy et al. 2015; Govindasamy et al. 2014; Surendran and Sekar 2010; Xia and Zeng 2008). Several studies have reported that the rich and educated consumers have a higher willingness to pay for organic products (Dettmann & Dimitri 2010; Zepeda & Li 2007; Krystallis et al. 2006; Fotopoulos & Krystallis 2002; Cicia et al. 2002; O'Donovan & McCarthy 2002; Magnusson et al. 2001). Similarly, many authors contend that consumers' socioeconomic characteristics, and their awareness and perceptions influence their willingness to pay a higher premium for organic products (Onozaka and Mcfadden 2011; Ariyawardanaet et al. 2010; Lin et al. 2009; Govindasamy et al. 2005; Wolf 2002; Bailey 1996; Goldman and Glancy 1991; Ott 1990; Hay 1989).

In general, farmers in the mid-Atlantic region of US operate relatively smaller pieces of land (USDA 2016b) that often result in higher cost of production. Smaller land sizes and higher input costs make farming a risky business in the mid-Atlantic region. To improve the viability of the farm business, farmers in many parts of this region are switching over to organic cultivation of niche crops (Govindasamy et al. 2015; Klonsky 2010). Also, the improvements in market infrastructure for organic products can increase net profits; and hence the viability of small farms. Against this background, this study attempts to identify the factors that influence consumers' willingness to pay a high-premium for organically grown fresh fruits and vegetables. These factors may relate to consumers' buying behavior, social, economic, demographic attributes and attitudes towards organic foods. An analysis of such traits of consumers can provide policymakers important feedback to target efforts and investment towards the development of markets and infrastructure for organic products and provide required policy support to farmers to improve the viability of organic farming.

2 Data and methodology

2.1 Data

An online survey of 1100 consumers was conducted in the mid-Atlantic region of the US (New York, Delaware, New Jersey, Maryland and Pennsylvania) by Survey Sampling International, LLC (Warrington PA), a market research firm. This sample was drawn from a surveyed group of 5191 participants. The survey was administered during March 7 to 15, 2016 to document consumers' preferences and perceptions for the organically grown fresh fruits and vegetables, and their socioeconomic and demographic traits.

The survey participants were pre-screened from the surveyed group, for their age (18 years and above), residence (mid-Atlantic region), primary food shopper in the household and purchase of organic products at least once in the past 12 months. The data related to market attributes that identify the type of produce bought, visits per month, the amount spent, etc., were collected using a structured questionnaire. An online tool was used to pre-test 100 consumers, and then the proposed questions were revised before the final deployment of the survey. The survey was developed by a team of researchers and was approved by the Office of Research and Sponsored Programs at Rutgers University.

2.2 Analytical framework

The sample respondents were enquired whether they are willing to pay a high-premium (11% to over 20%) for organically grown fresh fruits and vegetables. In the logit model design, the response variable is defined as, '1' if the respondent was willing to pay a high-premium for organically grown fresh fruits and vegetables, and '0' otherwise. The logit model assumes that the chance of observing the response variable, P_i, is contingent upon a vector of explanatory variables, x_{ij} associated with consumer i and variable j. The relationship between willingness to pay a high-premium and consumers' purchase behavior, attributes of organic fruits and vegetables, and socio-demographic characteristics can be expressed as:

$$P_i = F(\beta_j \chi_{ij} + \varepsilon) \quad \ldots(1)$$

$= \beta_0 + \beta_1$ Purchasing behavior of consumers

$+ \beta_2$ Organic fruits and vegetable attributes

$+ \beta_3$ Socio-demographic characteristics $+ \varepsilon$

Where, P_i is the probability of willingness to pay a high-premium (11% to over 20%), χ_{ij} is the set of explanatory variables, β_s are the parameters to be estimated, and ε is the error term.

The probability P_i can be expressed as:

$$P_i = F(\beta_0 + \Sigma_{j=1}^{j} \beta_j \chi_{ij}) = F(\beta\chi_i) = 1/[1 + \exp(-\beta\chi_i)] \quad \ldots(2)$$

The estimated coefficients of probability function (Eq. 2) do not directly denote marginal effects (ME) of the explanatory variables on the probability, P_i.

If the response variable is continuous, the marginal effect of χ_i on P_i is given as:

$$\partial P_i/\partial \chi_{ij} = [\beta_j \exp(-\beta\chi_i)] / [1 + \exp(-\beta_j\chi_i)]^2 \quad \ldots(3)$$

Whereas, for a binary explanatory variable , that takes values of 1 or 0, the marginal effect is determined as:

$$\partial P_i/\partial \chi_{ij} = [P(\chi_{ij} = 1) - P(\chi_{ij} = 0)]/[1 - 0] \quad \ldots(4)$$

The empirical specification of the logit model is:

WTP_High-Premium = β_0 + β_ (1) URBAN + β_2 LIVEYEAR + β_3 HOUSEHOLD + β_4 GENDER +β_5GRADUATE+β_6SELF_EMPLOYED +β_7CAUCASIAN+β_8INCABOVE10K + β_9 INF_ONLINE + β_10 FOOD_ADVERTIS + β_11 HOMEGROW + β_12 FOOD_STORE + β_13 L_GROWN + β_14 C_ORGANIC + β_15 N_GROWN + β_16 C_GROWN + β_17 ECO-FRIENDLY + β_18 COOL + β_19 P_FREE + β_20 C & L_GROWN + β_21 O & NL_GROWN + β_22 O_ PURCHASE + β_23 DM _FARM + β_24 ACM_FARM +β_25 PYO_FARM+β_26 RS_FARM +β_27BET_TASTE+β_28ORG_GMOS+ β_29SORG_SUPPORT+β_30MON EY_WASTE +β_31SWI_SUPEMRT+β_32VISITS_MONTH+β _33ANT_SPEND+β_34VISITED_FARM+ β_35MILS_TRAVEL+β_36ORG_JAM/ JELLY+β_37ORG_CHUTNY/PICKLES+β_38 ORG_JUICE + β_39ORG_SAUCES+ β_40ORG_WINE+β_41 ORG_DRIED/CHIPS+ β_42 ORG_SLICED+ β_43 ORG_NON+ ε

…(5)

The definitions of the variables in Eq.5 and their units of measurements are explained in table 1.

3 Results and discussion

3.1 Descriptive statistics

The response variable (WTP) is dichotomous such that it equals 1 if the respondent is willing to pay a high-premium for organically grown fresh fruits and vegetables, and zero otherwise. Among the explanatory variables, HOUSEHOLD, LIVEYEAR, VISITS_MONTH, VISITS_MONTH, ANT_SPEND, VISITED_FARM and MILS _TRAVEL are continuous and discrete, and all other variables are defined as dualistic dummy variables. The continuous and discrete variables are measured as means over the sample and the dualistic dummy variables are described in terms of percentage.

On average, 38% of the consumers were willing to pay a high-premium (11% to over 20%) for organic produce, and the remaining 62% were not. Of the total respondents, 26% were located in urban areas (URBAN). The average number of years residing at the present location (LIVEYEAR) was around 14.4 years. The average number of persons living in the household was 2.7. Concerning gender, 75% females (FEMALE) participated in this survey. Further, 23% of the respondents had a graduate degree (GRADUATE), and 12% were self-employed. Regarding ethnicity, 83% were Caucasian (CAUCASIAN), and nearly 32% of them had income over $100,000 (INC>$100K). On average, 80% of the respondents received food safety, and nutritional information from online (INF_ONLINE) resources and 42% grew fruits and vegetables for consumption at home (HOMEGROW).

Eighty-one percent of the respondents frequently shop at more than one food store. In terms of label, 87% were influenced by certified organic label (C_ORGNIC), 85% by pesticide free label (P_FREE), 84% by locally grown label (L_GROWN), 81% by naturally grown label (N_GROWN), 65% by country of origin label (COOL), 58% by eco-friendly label (ECO-FRIENDLY), 33% by conventionally grown label (C_GROWN). Nearly, 17% of the respondents preferred conventionally grown local produce (C & L_GROWN), and 25% preferred organically grown but not local produce (O & NL_GRN). In terms of respondents purchasing behavior (3 to over 9 times per month), 24% purchased from community farmers' market (CM_FARM), 14% from direct market at the farm (DM _FARM), 12% through pick your own (PYO_FARM) and roadside stands (RS_FARM), and only 5% purchased through online (O_ PURCSE). Approximately 63% of the respondents thought organic produce tastes better than non-organic produce (BET_TASTE), 83% considered organic food does not

Table 1. Variables used to predict WTP a high-premium of organic fresh produce

Variables	Description	Mean or %
WTP_Organic	1 if respondent's WTP a high-premium (11% to over 20%) for organic fresh produce; otherwise 0.	38%
URBAN	1 if the respondent's residence in urban; otherwise 0	26%
LIVEYEAR	No. of years the respondent has been living at current place or residence	14.38
HOUSEHOLD	Number of people live in the household	3
GENDER	If 1 means male, 0 means female.	25%
GRADUATE	1 if the respondent has a graduate degree; otherwise 0.	23%
EMPLOYED	1 if the respondent is self-Employed by others; otherwise 0.	12%
CAUCASIAN	1 if the respondent Caucasian ethnicity; otherwise 0.	83%
INCABOV100K	1 if the respondent's earnings above $100,000; otherwise 0.	32%
INF_ONLINE	1 if the respondent received food safety and nutritional information from online; otherwise 0.	80%
FOOD_ADVERTIS	1 If food advertisements help the consumers to decide which agricultural food items to purchase; otherwise 0.	3%
HOMEGROW	1 if the respondent grows fruits and vegetables for consumption at home; otherwise 0.	42%
FOOD_STORE	1 if the respondent frequently shops at more than one store in order to buy agricultural products; otherwise 0.	81%
L_GROWN	1 if the respondent influenced by locally grown label; otherwise 0.	84%
C_ORGNIC	1 if the respondent influenced by certified organic label; otherwise 0.	87%
N_GROWN	1 if the respondent influenced by naturally grown label; otherwise0.	81%
C_GROWN	1 if the respondent influenced by conventionally grown label; otherwise 0.	33%
ECO-FRIENDLY	1 if the respondent influenced by eco-friendly label; otherwise 0.	58%
COOL	1 if the respondent influenced by country of origin label; otherwise 0.	65%
P_FREE	1 if the respondent influenced by pesticide free label; otherwise 0.	85%
C & L_GROWN	1 If the respondent preferred conventionally grown local produce; otherwise 0.	17%
O & NL_GRN	1 If the respondent preferred organically grown but not local produce; otherwise 0.	25%
O_ PURCSE	1 If the respondent purchased 3 to over 9 times / month through online; otherwise 0.	5%
DM -FARM	1 If the respondent purchased 3 to over 9 times / month through direct market at the farm; otherwise 0.	14%
CM_FARM	1 If the respondent purchased 3 to over 9 times/month through community farmers market; otherwise 0	24%
PYO_FARM	1 If the respondent purchased 3 to over 9 times / month through Pick your own; otherwise 0	12%
RS_FARM	1 If the respondent purchased 3 to over 9 times / month through roadside stand; otherwise 0	12%
BET_TASTE	1 if the respondent thinks organic food tastes better than non-organic food; otherwise 0.	63%
ORG_GMOS	1 if the respondent thinks organic food does not contains GMOs; otherwise 0.	83%
ORG_SUPPORT	1 if the respondent likes to provide support for local farmers and agriculture; otherwise 0.	83%
MONEY_WASTE	1 if the respondent thinks buying organic food is a waste of money; otherwise 0.	16%
SWI_ SUPEMRT	1 if the respondent likes to switch supermarkets to be able to purchase organic produce; otherwise 0.	66%
VISITS_MONTH	Average number of visits/ month to an organic fruits and vegetable shops.	4

Contd...

Variables	Description	Mean or %
ANT_SPEND	Average amount spent on each visit for organic fruits and vegetables ($)	26.88
VISITED_FARM	Average number of organic farms/ markets/ stores visited in the past year	4
MILS _TRAVEL	Average miles travelled to reach organic farms/ stores (one way)	11.83
ORG_ JAM / JELLY/	1 if the respondent like to buy value-added organic jam/jelly/ marmalade; otherwise 0.	38%
ORG_CHUTNEY/ PICKLES	1 if the respondent like to buy organic chutney/ pickle; otherwise 0.	50%
ORG_JUICE	1 if the respondent would like to buy organic Juice; otherwise 0.	21%
ORG_SAUCES	1 if the respondent would like to buy organic sauces; otherwise 0.	46%
ORG_WINE	1 if the respondent would like to buy organic Wine; otherwise 0.	22%
ORG_DRIED/CHIPS	1 if the respondent would like to buy organic dried/chips, fruits and vegetables; otherwise 0.	39%
ORG_SLICED	1 if the respondent would like to buy organic sliced fruits and vegetables; otherwise 0.	39%
ORG_NON	1 if the respondent don not like to buy value-added / processed organic fruits; otherwise 0.	18%

contain GMOs (ORG_GMOS) and almost a similar proportion consider it a support to local farmers and agriculture (ORG_SUPPORT).

About 16% of the respondents thought buying organic food is a waste of money (MONEY_WASTE), and 66% like to switch supermarkets (SWI_ SUPEMRT) to purchase organic products. On average, a respondent visited 3.9 times a month (VISITS_MONTH) to buy organic fruits and vegetables, spent US$ 26.9 per visit (ANT_SPEND) on purchases of organic fruits and vegetables.

The average number of organic farms/ markets /stores visited in the past one year was about four (VISITED_FARM). The respondents traveled an average distance of 11.8 miles to reach the nearest organic grocery store. On average, 38% of the respondents would like to buy value-added / processed organic jam / jelly / marmalade (ORG_ JAM / JELLY), 50% organic chutney/ pickles (ORG_CHUTNEY/ PICKLES), 21% organic juice (ORG_JUICE), 46% organic sauces (ORG_SAUCES), 22% organic wine (ORG_WINE), 39% each organic dried / chips (ORG_DRIED / CHIPS) and sliced (ORG_SLICED) fruit and vegetables.

3.2 Results of the logit model

The logit model results indicate that consumers are willing to pay a high-premium for organic fresh fruits and vegetables. The correct prediction of the outcome of the response is 71 % (table 2). The β^2 test rejects the null hypothesis that the explanatory variables as a set are insignificant in explaining variations in the response variable at 0.00 level. The McFadden Pseudo R-squared is 0.167, and the χ^2 value is 243 with 43 degrees of freedom (df).

Table 2. Logit model predictive accuracy

Actual	Predicted		Total
	0	1	
0	553 (50.3%)	130 (11.8%)	683 (62.1%)
1	194 (17.6%)	223 (20.3%)	417 (37.9%)
Total	747 (67.9%)	353 (32.1%)	1,100 (100.0%)

Note: Successful predication: 70.55%; Pseudo $R^{2:}$ 0.167; Overall model significance level 0.00.

The estimated logit model results presented in table 3 indicate that GRADUATE, CAUCASIAN, INCABOVE100K, FOOD_ADVERTIS, C_ORGANIC, O&NL_GROWN, DM–FARM, BET_TASTE, SWI_SUPEMRT, VISITS_MONTH, ORG_JAM/JELLY, ORG_SAUCES and ORG_DRIED/CHIPS positively influence the WTP; while FOOD_STORE, C & L_GROWN, and MONEY_WASTE negatively impact WTP.

Table 3. Consumers' willing to pay a high premium for fresh organic produce

Variables	Coefficient	Standard error	Marginal effect
Constant|	-2.720***	0.532	-0.606
URBAN	0.229	0.171	
LIVEYEAR	-0.006	0.006	
HOUSEHOLD	0.027	0.039	
GENDER	0.155	0.171	
GRADUATE	0.379**	0.174	0.087
EMPLOYED	-0.363	0.234	
CAUCASIAN	0.747***	0.204	0.151
INCABOVE100K	0.326**	0.158	0.074
INF_ONLINE	0.219	0.196	
FOOD_ADVERTIS	1.193***	0.414	0.289
HOMEGROW	-0.227	0.154	
FOOD_STORE	-0.349*	0.200	-0.080
L_GROWN	0.075	0.210	
C_ORGANIC	0.511*	0.299	0.106
N_GROWN	-0.320*	0.197	-0.073
C_GROWN	-0.140	0.165	
ECO-FRIENDLY	0.043	0.161	
COOL	0.086	0.160	
P_FREE	0.087	0.231	
C & L_GROWN	-0.387*	0.240	-0.082
O & NL_GROWN	0.292*	0.168	0.066
O_ PURCHASE	-0.024	0.341	
DM -FARM	0.469*	0.268	0.109
CM_FARM	0.242	0.190	
PYO_FARM	-0.224	0.262	
RS_FARM	-0.066	0.255	
BET_TASTE	0.285*	0.171	0.063
ORG_GMOS	-0.028	0.203	
ORG_SUPPORT	-0.008	0.212	
MONEY_WASTE	-0.950***	0.261	-0.185
SWI_ SUPEMRT	0.937***	0.190	0.196
VISITS_MONTH	0.001**	0.000	0.001
ANT_SPEND	0.000	0.001	
VISITED_FARM	0.000	0.001	
MILS _TRAVEL	0.002	0.002	
ORG_ JAM / JELLY/	0.289*	0.162	0.065
ORG_CHUTY/ PICKLES	0.145	0.164	
ORG_JUICE	-0.047	0.182	
ORG_SAUCES	0.274*	0.157	0.061
ORG_WINE	0.078	0.186	
ORG_DRIED/CHIPS	0.295*	0.164	0.066
ORG_SLICED	-0.215	0.158	
ORG_NON	-0.134	0.268	

***, **, * significant at 1, 5 and 10% level respectively.

Those who have graduate or advanced degree (GRADUATE) are 8.7% more likely to willing to pay a high-premium for fresh organic produce compared to those with no advance or graduate degree. Darby et al. (2008) and Liu et al. (2009) also found WTP being positively associated with education. In the case of ethnicity, the Caucasian (CAUCASIAN) respondents have a higher probability to pay a high-premium for fresh organic produce compared to others. Those who have income over $100,000 (INCABOVE100K) are also likely to pay high-premium for fresh organic produce. Similar evidence linking income to the willingness to pay a high-premium for organic produce has been reported in Govindasamy & Italia (1999) and Govindasamy et al. (2005). These findings re-confirm the role of income in consumers' willingness to pay for organic products.

Those who tend to rely on food advertisements (FOOD_ADVERTIS) in their decision to purchase food items have 29% higher probability to pay a high-premium for organic fresh fruits and vegetables. Regarding shopping behavior, those who regularly shop at more than one food store (FOOD_STORE) have less willingness to pay a high-premium for organic fresh fruits and vegetables.

The respondents who are influenced by certified organic label have 11% more willingness to pay a high-premium for fresh organic produce. On the other hand, those who are influenced by naturally grown label (N_GROWN) and prefer conventionally grown but local produce (C & L_GROWN) are less likely to pay a high-premium for fresh organic produce. However, those who prefer organically grown but not local produce (O & NL_GRN) and prefer purchasing direct from farms (DM _FARM) have a higher probability to pay a high-premium for fresh organic produce.

The respondents who think organic food tastes better than non-organic food (BET_TASTE) have 6% higher probability to pay a high-premium for fresh organic produce. Some other studies have also reported that, better quality and taste are among the chief consumer motivations to purchase organic food (Doorn & Verhoef 2011; Bourn & Prescott 2002; Haglund et al. 1998; McEachern & McClean 2002). As expected, those who think buying organic food is a waste of money (MONEY_WASTE)) are less likely to pay a high-premium for fresh organic produce. However, those who switch supermark*et*s (SWI_ SUPEMRT), make

more visits per month (VISITS_MONTH) and prefer value-added organic jam/jelly/ marmalade (ORG_JAM/JELLY) more likely to pay a high-premium for fresh organic produce. Also, those who prefer organic sauces (ORG_SAUCES) and organic dried chips (ORG_DRIED/CHIPS) will likely pay a high-premium for fresh organic produce.

4 Conclusion

The findings indicate that, amongst the respondents, those who are Caucasian, rich and educated rely on food advertisements, frequently buy at direct farm markets, prefer certified organic labels and natural labels are more likely to pay a high-premium for organic produce compared to others. As expected, those who think that organic food tastes better than conventional food and switch supermarkets to buy organic produce, prefer organic jam, jelly, marmalade, juices, sauces, and dried chips are more likely to pay a high-premium for organic produce. On the other hand, those who regularly shop at more than one food store has a concern about the naturally grown label, has a preference for conventionally grown local produce and think buying organic food is a waste of money are less likely pay a high-premium. These findings provide important feedback to producers of organic produce in targeting customers for sale of organic products.

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