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Organic Produce: Who's Eating it?

A Demographic Profile of Organic Produce Consumers

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Fueled by an increasingly health conscious and environmentally aware consumer base, organic produce, the largest organic sector, has experienced unprecedented growth in recent years. With growth rates averaging 15 percent over the past eight years and sales totaling \$5.4 billion in 2006, organic produce is expected to play a consistently important role within the organic industry with sales expected to increase an average of 7 percent between 2007 and 2010 (Nutrition Business Journal, 2007).² Understanding the types of consumers who purchase organic produce is particularly important for growers, processors, and retailers since organic produce has long been considered a 'gateway' product with consumers often entering the organic market by first purchasing organic produce and subsequently widening their purchases to include other organic products (Hartman, 2000, 2002).

Growth in organic food sales is induced both by growing consumer demand for organic food and greater accessibility in retail outlets. Consumer demand for fresh produce has exploded in recent years with per capita consumption of fruits and vegetables increasing 27 percent between 1970 and 2005 (ERS USDA, 2007). In response to growing demand from convenience orientated customers, retailers have introduced and experienced booming sales in organic precut produce (such as bagged salads and baby carrots). As a result of the upsurge in consumer demand, many food retail outlets, including conventional supermarkets and mass merchandisers, have added

organic fruits and vegetables to their shelves, increasing consumer access to organic produce.

As the organic market grows, a natural question arises: who is buying organic food? Gaining insight into this issue is more than just an intellectual exercise, as retailers and members of the organic industry (for example, farmers, processors, distributors) can further maximize profits by understanding who buys their products. One approach to discovering who buys organic food is to develop a profile of the organic consumer by analyzing purchase and household demographic data, with the intent of identifying which consumers are more likely to buy organic food, or in this case, organic produce. This type of analysis was not possible until the recent addition of organic products to the Nielsen Homescan dataset, opening up new possibilities for consumer research. For the purpose of organic research, Homescan data provides the richest information currently available since it captures purchasing patterns for each household, as well as providing demographic information about each panel household.

This paper uses purchase and household demographic data to characterize organic produce consumers, and is part of an ongoing, broader effort to gain insight into organic consumers.

To accomplish this, produce purchase information from Nielsen's 2006 panel of 41,000 households is utilized. Two research objectives are achieved: one, which demographic characteristics influence the likelihood that a household will buy organic produce, and two, once the decision to buy organic produce is made, what share of produce purchases will be organic? A Heckman two-stage model is used to examine this

decision, since it is assumed consumers make purchase decisions in two phases. The first stage examines which demographic characteristics influence the likelihood that consumers purchase organic produce, and the second stage analyzes which demographic factors influence the share of produce expenditures devoted to organic produce.

Literature Review

Most studies attempting to profile organic consumers rely on surveys conducted by the industry or academic researchers; these studies often come to conflicting conclusions. Most research typically addresses one of the following questions: What preferences drive consumers to purchase organic, what organic products are consumers purchasing, and who is buying organic food? The Hartman Group's surveys are the most widely cited; their studies have been conducted periodically since at least 2000.

Hartman initially focused on identifying consumer rationale for buying organic products. According to Hartman and others in the industry, including the natural foods retailer Whole Foods Market, consumers state they buy organic foods because of their superior taste, environmental benefits of organic production systems, and nutrition and health concerns (Whole Foods Market, 2004; Hartman, 2002). Others found that consumers purchase organic food products for food safety reasons and interest in trying new products (Govindasamy and Italia, 1990). Recently Hartman's focus has shifted to understanding the demographic profile of organic consumers. Results of their 2004 survey indicate that half of frequent organic food purchasers have incomes below \$50,000, and African-Americans, Asian-Americans and Hispanics use more organic

products (Howie, 2004; Barry, 2004.) The most recent Hartman study (2006) indicated Asians and Hispanics were the two ethnic groups (when considering Asians, Hispanics, Whites, and African-Americans) most likely to have purchased organic products in the previous three months, while core consumers (defined by the Hartman Group as consumers committed to an organic lifestyle) were most likely to be Hispanic and African-American (Baxter, 2006; Hartman, 2006.)

Some of the industry findings, particularly those concerning race, are contradicted by academic research. Caucasian consumers, those with more education, and those with higher incomes were more likely to purchase organic vegetables, but less likely to spend a higher share of their vegetable income on organic vegetables (Dettmann and Dimitri, 2007). Relative to African-American consumers, Caucasians were more likely to purchase organic produce. African-American consumers, however, were found to have more confidence in organic labels, and thus were more likely to try organic products (Zepeda et al., 2006). Contradicting these three studies, Stevens-Garmon et al (2007) reported Asian and African Americans were more likely to purchase organic produce compared to Caucasian and Hispanic consumers.

Households with graduate degrees were less likely to buy organic produce, while households with children under 18 were more likely to buy organic produce (Thompson and Kidwell, 1998). Consumers with three or more children and those over 50 years old were less likely to buy organic produce, while households with some college education were more likely to purchase organic produce (Govindasamy et al., 2001). In a stated choice experiment Byrne et al. (1991) found that women without a college degree and

those in higher income brackets were most likely to purchase organic produce. Wang and Sun (2003) also incorporated a stated choice experiment to find that younger consumers with smaller households and larger incomes were most likely to purchase organic produce.

Market research produced by the Hartman group in 2004 and 2006 and a wide variety of academic studies have attempted to provide demographic profiles of organic consumers; however, the results are conflicting and fail to paint a consistent picture of the 'typical' organic consumer. Further, while stated choice studies provide insight into consumer willingness to purchase organic food, there is often a difference between what consumers say they will purchase and what they actually purchase. This study contributes to the current body of literature by relying on actual purchase and demographic data to investigate which factors contribute to a higher likelihood of buying organic foods, and further expanding our understanding of organic consumers.

Data Description and Summary Statistics

This paper makes use of the 2006 Nielsen Homescan dataset, which is unique in that it records household grocery purchases from a wide variety of retail outlets, along with household demographic information, for 41,000 households.³ Every time a household purchases groceries, they scan their purchases into the database by using a Nielsen scanner kept in their home. The households in the Nielsen data set comprise a stratified random sample, selected on both demographic and geographic targets. Stratification ensures that the sample matches the demographic profile of consumers according to the

U.S. Census (down to the census tract level). The household was the primary sampling unit and there was no intentional clustering. All analysis incorporates the household level projection factor (Nielsen sample weights, which reflect the demographic distribution of the US population) to estimate model coefficients, and sample statistics, including proportions, means, and standard errors.

The design of the Nielsen dataset constrained the analysis to pre-packaged organic produce with universal product codes (UPC). Random weight produce purchases, such as bulk apples or lettuce, were excluded since Nielsen does not distinguish between organic and conventional products for products sold by the pound.⁴ Within the panel, 37,414 households purchased prepackaged produce, and 14,881 (39.9 percent) of the households made at least one purchase of organic prepackaged produce in 2006, (table 1). The majority of produce purchases were prepackaged vegetables (77 percent), with the remaining 22 percent of produce purchasing being prepackaged fruit.

Nielsen reports demographic information (education level, age and racial/ethnic composition) for both the female and the male heads of households.⁵ In this study, demographic information for either the female or the male head of household was used based on the following rule, which implicitly assumes that females make the majority of grocery purchases: if a female was present in the household, her demographic information was used in the model, otherwise the male's demographic information was used. This rule was followed for race/ethnicity, age and education. Income and presence of children are reported for the entire household.

Table 2 presents summary statistics of the model's variables, which include: race/ethnicity of the household head, presence of young children, age of household head, education of household head, and household income. Race/ethnicity consists of five categories, representing Caucasian, Asian, African-American, Hispanic, and Other. Age of the household head includes three groups: those less than 30, 30-49 years, and 50 and older. Education of household head has four categories: high school education or less, some college, college graduate, and post graduate work. The baseline consumer (ie, those for whom the dummy variable is omitted) is Caucasian, under 30, with a high school education or less.

In order to capture whether the presence of children in households influences a household's decision to purchase organic vegetables, households with at least one child under 18 were assigned to one group, and households with no children were assigned to another. The final variable included in the model is income. Nielsen classifies household income into 16 grouped categories, ranging from a low of under \$5,000 a year to a high of over \$100,000 per year, which were reclassified into three categories: low, middle and upper incomes. Low incomes included all households with incomes below \$30,000, middle incomes were households between \$30,000 and \$70,000, and upper incomes were households with incomes greater than \$70,000 a year.

In categorizing market or geographic areas, Nielsen divides households into 52 different market groups, which they define as market identifications (market IDs). These market IDs segment households in both urban and rural markets, and are included in this analysis to account for factors omitted from the model, which are presumably uniform

within each market but vary across market. The main model specific factors captured by the market ID are consumer preferences regarding organic foods or availability of organic products in the different market areas.⁶

The final two variables are the dependent variables used in the two stages of the model: organic household and organic share. Used as the first stage discrete dependent variable, an organic household is defined as a household who makes at least one purchase of a relevant organic product (that is, total vegetables, salads, or carrots) during the year. In order to calculate the organic shares for each product (second stage dependent variable), household expenditures on the relevant organic product are divided by total household expenditures on the same product; for example, the organic share for carrots equals the expenditures on organic carrots divided by total expenditure on carrots for each household. This variable ranges from 0, for households that buy no organic, to 1, for households buying only organic.

Methodology and Conceptual Model

The analysis is organized around the concept that the decision to buy organic vegetables occurs in two stages. A consumer first chooses whether to purchase organic vegetables. Once she decides to buy organic, she then decides how much money to devote to such purchases. This two-stage decision is modeled using the Heckman model. The first stage decision (whether to buy organic) is estimated in a probit model, and the second stage (how much to buy) is estimated with ordinary least squares. This approach was first

developed in 1979 by Heckman to correct for the bias that occurs in analyzing non-random samples and consumer purchase behavior.

In this analysis, a non-random sample occurs since the subpopulation, drawn from a larger random population, is comprised of households who either purchase organic vegetables or do not purchase organic vegetables. To correct for sample selection bias, the first stage of Heckman analysis (the probit model) estimates the expected value of the error term, which is included as an additional explanatory variable in the second stage of OLS analysis (Hoffmann and Kassouf 2005).

The first stage decision is modeled as:

$$\Pr\{orghh = 1\} = X_i' \beta_i + \varepsilon_i$$

1. where $\varepsilon_i | X_i \sim N(0,1)$

$$\Pr\{orghh = 1\} = \phi(X_i' \beta)$$

where X_i' is the demographic vector for consumer i , and β_i represents the corresponding coefficients associated with X_i' demographics; *orghh* represents households who buy organic vegetables. The independent demographic vector contains the discrete variables market ID, race/ethnicity, presence of children under six, age of household head, education of household head and household income.

During the second stage, a linear regression is estimated using the share of household vegetable income spent on organic vegetables as the dependent variable:

2. $S = \alpha + X_i'' \gamma_i + \lambda + \varepsilon_i$

The variable X_i'' represents the vector of consumer demographic variables (excluding age and children under six variables, to account for exclusion restrictions between the probit

and OLS model), as well as γ_i , the corresponding coefficients for X_i characteristics.

Sample selection is accounted for by the inverse mills ratio, λ , estimated in the first stage.

Model results

The Heckman model was used to understand the demographics that impacted the probability of purchasing organic pre-packaged produce, and which demographics impacted the share of household produce expenditures spent on organic produce; model results are detailed in table 3. The first stage chi-squared test statistic, which tests for sample selection bias, was statistically significant at the five percent level and therefore justified employing the Heckman model for this analysis. Within the first stage of results education, household income and one race variable were statistically significant, revealing that African-Americans were less likely to purchase organic produce when compared to Caucasians. Conversely, higher levels of education and incomes increased a consumer's likelihood of purchasing organic produce, when compared to consumers without college education, and those with incomes below \$30,000.

Within the second stage of results, variable categories of education and household income remained statistically significant. The share spent on organic produce increased for consumers with higher education levels, while increasing household incomes had a negative impact on the organic share of produce expenditures. According to these results, while higher income households were more likely to try organic vegetables, they were

less likely to consistently dedicate significant shares of their income to purchasing organic vegetables.

Concluding Remarks

Both industry and academic studies have investigated the demographic profile of the organic consumer, and to date, these studies have yielded conflicting results. This paper adds to the current body of literature by analyzing purchase and demographic data, in an effort to develop a demographic profile of the organic produce consumer. When the results are compared to past literature, the findings both support and contradict past works.

African American households are less likely to purchase organic vegetables when compared to Caucasian households. These results are consistent with Zepeda et al.'s focus groups and Hartman's findings. Zepeda et al. found that African Americans were less apt to purchase organic products, since many were unfamiliar with the products, or had little access to them. Hartman's results that Hispanic households were more likely to be core consumers were not confirmed by this analysis.

Education and income were also significant factors throughout the model. Increases in education led to higher likelihoods of purchasing organic produce, and spending a greater share of household income on fruits and vegetables. These results were contradictory to Thompson and Kidwell's finding that consumers with graduate degrees were less likely to purchase organic products.

Household income produced predictable results in the first decision stage (whether to buy organic), but presented surprising results in the second decision stage (how much to buy). In the first stage of the organic purchase decision, increases in income levels led to an increase in the likelihood of purchasing organic vegetables, consistent with Wang and Sun's findings that higher income households were more likely to purchase organic. This makes sense since lower income households face stringent budget constraints and may be unable to afford higher priced organic vegetables. However, when deciding how much organic to buy, higher income households were not likely to spend as much on organic vegetables proportionate to their expenditures on vegetables. This suggests higher income households were more likely to try organic vegetables, but unlikely to consistently devote a large share of their expenditures towards organic vegetables.

This paper builds off of Dettmann and Dimitri's (2007) previous work which examined the demographics of organic vegetable consumers. Similar to this paper's findings, Dettmann and Dimitri found increasing levels of education and income increased the likelihood consumers would purchase organic vegetables. African Americans were less likely to purchase organic compared to Caucasians but differed in this paper's findings by stating if African Americans did purchase organic vegetables, they were more likely to spend a greater share of their vegetable budget on organic vegetables.

As with most research endeavors, data limitations were encountered. The largest constraint is that the data do not account for consumer preferences that underlie a

consumer's decision to purchase organic products. Expanding the model to include variables that capture non demographic factors leading to a consumer's choice to purchase organic vegetables would likely strengthen the results. One way to gather this hard to find information would be to ask households in the Nielsen panel questions that capture their preferences about health and environmental issues. Including such information would make it possible to fine tune the analysis of the organic consumer's demographic profile.

As organic markets continue to grow, understanding the demographic factors that influence a consumer's choice to purchase organic vegetables as well as the factors that influence the share of organic vegetables purchased can help guide those making organic marketing and production decisions. From these results, well educated Caucasians with higher incomes are the most likely sector to focus marketing of organic vegetables. However, these results also provide an understanding of demographic groups that are missing from the organic vegetable consumer profile, such as African Americans. Further research should explore why minorities are less likely to purchase organic vegetables, which may provide insight into ways to target marketing organic vegetables to this large undeveloped market segment. Given that organic vegetables are a gateway product, future research might aim at comparing these findings with those of other organic product sectors.

¹ Dettmann is an economist with the Economic Research Service of the US Department of Agriculture. The views expressed here are those of the author and not necessarily those of the Economic Research Service or the Department of Agriculture. The author thanks Carolyn Dimitri, Danny Pick, and Barry Krissoff for insightful comments. All remaining errors are the responsibility of the author.

² Organic is defined as products grown or processed in accordance with the standards set out by USDA's National Organic Program (United States Department of Agriculture, 2002).

³In order to be included in the panel, households were required to record weekly purchase information for a minimum of 10 months per year.

⁴Random weight produce purchases comprised 21 percent of the total vegetable purchases in the dataset. One possible way to incorporate random weight purchases would have involved sorting through the dataset, item by item, to identify which random weight products were organic according to product title. This would have introduced a significant amount of error, since there is no guarantee that all organic products had the word "organic" in the Nielsen description field.

⁵Please refer to Appendix A for a complete summary of variable descriptions and variable frequencies within all four datasets.

⁶Dummy variables for each of the markets are used in the analysis to account for differences between market areas; results are not reported. Interested readers can contact the authors for these results.

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Table 1: Organic households as a share of households buying product

Product	Organic households	Share of households buying product
	<i>number</i>	<i>percent</i>
Aggregate Produce	14,881	39.8
Vegetables	14,110	37.9
Fruits	4,057	11.8

Note: An organic household is one that made at least one organic purchase of the relevant vegetable in 2006. A large share of fruit purchases are in the random weight from. Random weight purchases do not include a UPC code like pre packaged produce, and therefore it is not easily discernable what products are organic.

Table 2. Descriptive statistics of model variables

Variable	Mean*	Standard Deviation**
Ethnicity		
Caucasian	0.743	0.437
Hispanic	0.038	0.191
African American	0.116	0.32
Asian	0.24	0.154
Other	0.079	0.269
Children in Household		
Child < 6 years old in household	0.318	0.466
Age		
Younger than 30 years	0.05	0.218
Between 30-49 years	0.434	0.496
50 years and over	0.513	0.5
Education		
High school or less	0.402	0.49
Some college	0.305	0.461
College graduate	0.2	0.4
Post collegiate	0.088	0.284
Income		
Low	0.296	0.456
Medium	0.372	0.483
High	0.283	0.451
Dependent variables		
Organic household	0.37	0.483
Share of expenditures on organic product	0.024	0.066

*Descriptive statistics were calculated with the AW procedure in STATA using the AC Nielsen weights to represent total U.S. population. The share of expenditures on organic is calculated by dividing expenditures on organic during the year by total expenditures on the vegetables, salad, or carrots. All other variables are dummy variables.

**Standard Deviation

Table 3. Heckman Results

Variable	Produce	
	<i>One</i>	<i>Two</i>
Ethnicity		
Hispanic	0.105	-0.008
African American	-0.251**	0.0002
Asian	0.071	0.0003
Other	-0.033	-0.0001
Children in household		
Children less than 6 years	0.008	<i>Excluded</i>
Age		
Between 30 and 49	-0.134	<i>Excluded</i>
Older than 50	-0.145	<i>Excluded</i>
Education		
Some College	0.154**	0.015**
College Graduate	0.218**	0.034**
Post College	0.431**	0.036**
Income		
Medium	0.084*	-0.011*
High	0.251**	-0.012*
Inverse Mills		
Lambda (λ)	<i>na</i>	2.497*

Note: refer to Appendix Table I for the robust standard errors of each coefficient.

*Denotes significance at the 5% level

**Denotes significance at the 1% level

Appendix

Table I. Robust Standard Errors for Heckman Results

Variable	Produce	
	<i>One</i>	<i>Stage Two</i>
Ethnicity		
Hispanic	0.0687	0.006
African American	0.0396	0.006
Asian	0.0783	0.008
Other	0.0521	0.005
Children in Household		
Children less than 6 years	0.0334	<i>excluded</i>
Age		
Between 30 and 49	0.0762	<i>excluded</i>
Older than 50	0.0789	<i>excluded</i>
Education		
Some College	0.0300	0.003
College Graduate	0.0334	0.004
Post College	0.0438	0.005
Income		
Medium	0.0289	0.004
High	0.0325	0.004
Inverse Mills		
Lambda (λ)	<i>na</i>	0.004