# It's All About Produce: Flexing the Muscles of Western U.S. Organic Spinach Consumption

Christiane Schroeter and Xiaowei Cai[1]

## Introduction

Over the past few decades, consumers have become more concerned about health and nutrition, which is displayed by an increased demand for organic foods. Once considered a niche product, organic food has become more affordable for consumers through its availability in conventional supermarkets. In 2010, organic food and beverages showed a 7.7% increase in annual sales compared to 2009 sales, with the highest growth rate of 11.8 % in organic produce (Organic Trade Association (OTA), 2011).

Organic produce has been considered a "gateway product." These products form the first organic purchasing experience, which is then widened to include other organic products (Hartman Group, 2000 and 2002). Responding to the growing popularity of organic produce, its production has more than doubled since the late 1990s. Currently, all U.S. states grow certified organic crops (The Food Institute, 2009). The competition in the organic food market is increasing due to more firms participating in the industry (Dimitri and Oberholtzer, 2009). Thus, producers have expressed an interest in determining and refining their target market.

Given that multiple venues such as specialized food stores and farms with direct sales offer organic produce, its customer base appears to have become more diverse (Dimitri and Greene, 2002; Stevens-Garmon, Huang, and Lin, 2007). There are a variety of demographic factors, such as age, gender, and income level that are important for the individual food choice. Food environmental variables, such as the number of specialty supermarkets in a shopper's neighborhood and fast food expenditures might also impact an individual's purchasing decision of organic foods. These food environmental factors have an increasingly important effect on a household's produce choice, along with the demographic determinants (Sturm and Datar, 2005).

Current economic studies that focus on organic food consumption present limited information about the profile of the organic spinach consumer. The range of factors has been restrictive, limited to either demographic or socio-economic determinants. To our knowledge, no comprehensive assessment of organic produce purchasing decisions with food environmental information has been performed. There is need for research that evaluates actual purchasing decisions of organic foods, together with information about demographic, socio-economic, and food environmental variables (e.g. Onyango, Hallman, and Bellows, 2006; Dettmann and Dimitri, 2007).

The objective of this study is to analyze the purchasing factors of organic spinach in the Western United States. Specifically, this study determines the impact of demographics, socio-economics, and the food environment on (1) the purchasing likelihood of organic spinach and (2) expenditure shares of organic spinach. California and Arizona produce 85% of the U.S. supply of spinach, and households in the Western U.S. purchase more organic produce than those residing in other regions (U.S. Department of Agriculture-Economic Research Service

[1] The authors are assistant professors in the Agribusiness Department at California Polytechnic State University, San Luis Obispo. They would like to thank the Agribusiness Department for the purchase of the IRI data set. In addition, the comments of Don McLeod and two anonymous reviewers were greatly appreciated.

(USDA-ERS), 2007). Thus, this study focuses on organic spinach purchases in the Western states, which will provide a significant research contribution.

Developing a better understanding of factors that impact organic spinach purchases can lead to more efficient decisions by producers, food businesses, consumers, and policy makers. The availability of this information could help manufacturers develop products which better correspond to consumer tastes and preferences. Organic food distributors will benefit by developing more effective marketing strategies in a more competitive and saturated market for organic produce, and an opportunity to expand market share. Finally, consumers will benefit by a greater availability of products and information that meet their needs and circumstances.

## Empirical Background on Organic Spinach Demand

Organic spinach has increased in popularity due to the availability of the convenient triple-washed cello-packed version, also called 'bagged organic spinach'. With regard to the produce purchasing decision, convenience is an important decision factor. Over the past two decades, the value of time has been altered by several demographic and societal changes. The individual cost of nutritional and leisure time choices has increased, and thus, convenience plays an important role in consumers' food choices.

Given the convenience of bagged spinach, the conventional and organic versions have become one of the fastest growing segments of the packaged salad industry (USDA-ERS, 2007). Figure 1 shows the sales trend of total and organic bagged spinach in the Western U.S. over time. Organic spinach sales increased by 250% from 2007 to 2010, while total organic and conventional spinach sales increased by 57% during the same time (Information Resources, Inc. (IRI), 2011).

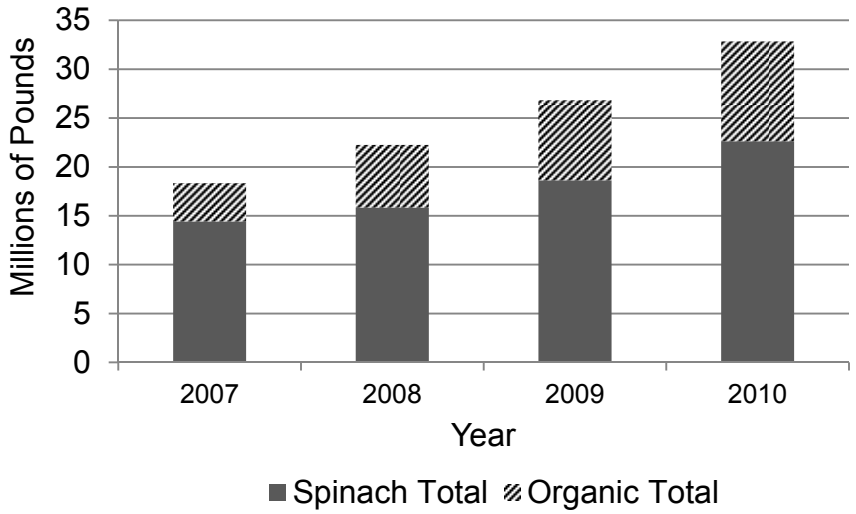


Figure 1: Bagged Total and Organic Spinach Sales in the Western U.S., 2007-2010 (Information Resources, Inc. (IRI), 2011)

One driving force for the increased demand for convenience food might be a higher number of women working, particularly mothers, which may lead to an increase in households with both parents in the work force. Placing a higher value on labor market time leads to decrease in the time spent in the household, and thus, less time can be devoted to preparing meals for the family (Capps, Tedford, and Havlicek, 1985; Chou, Grossman, and Saffer, 2004). The decrease

in home time has increased the demand for easy-to-prepare meal solutions, such as bagged spinach.

Previous studies determined the impact of household demographic variables such as ethnicity, age, income, gender, and education influence consumer's organic food purchase behavior (e.g. Dettmann and Dimitri, 2007; Li, Zepeda and Gould, 2007; Zhuang, Dimitri and Jaenicke, 2009). According to popular perception, organic consumers are white, wealthy, and have young children (Stevens-Garmon, Huang, and Lin, 2007). However, other findings suggest that frequent buyers of organic produce are African-Americans, Asian, or Hispanics and earn lower to mid-range incomes. Lower-income families might choose to buy organic when possible, as a means of preventative medicine (Hartman Group, 2003). Thus, given these mixed results, it is important to investigate the role of demographics and socio-economics such as food security in organic food choices.

Furthermore, households with working parents might go out more often for meals or buy take-out (Capps, Tedford, and Havlicek, 1985; Chou, Grossman, and Saffer, 2004). A loss of proper cooking skills increases the need to eat convenience food or food away from home (European Food Information Council, 2005). Another factor contributing to the increased demand for food away from home is the fact that the per-capita number of fast food restaurants doubled between 1972 and 1997, which reduces the search and travel time (Chou, Grossman and Saffer, 2002). Aertsens et al. (2009) gave a comprehensive review on the determinants of organic food consumption and concluded consumers' organic food choice is affected by numerous macroeconomic and general food environment factors. Thus, there is a need to include food environmental variables such as food accessibility into the specification for the profile of the organic spinach consumer.

## Data

We use the 2007 Symphony IRI Group of Information Resources Inc. (IRI) National Consumer Network Panel on individual households' pre-packaged spinach purchases in the U.S. Western region (IRI, 2011).[2] The panel is based on demographically representative sample of 100,000 households nationwide. Panel members could either be volunteers or recruited by IRI. After their purchase, participating households used hand-held scanners to record the dates of spinach purchases, Universal Product Code (UPC) code, purchase volume, and total expenditures. Random weight purchases, such as of fresh loose-leaf spinach, are not included in the data set (Lusk and Brooks, 2011).

The IRI Consumer Panel also provides associated household demographic information (IRI, 2011). In addition, we added socio-economic and food environmental factors that might influence the individual household's choice for organic spinach, and the expenditure share on organic spinach.

The socio-economic and food environmental variables are collected from the 2007 Food Environment Atlas based on each household's Federal Information Processing Standards (FIPS) code (USDA-ERS, 2010). FIPS codes uniquely identify geographic areas (U.S. Census Bureau, 2011). The data from the Food Environment Atlas includes FIPS code-specific information about household-level food insecurity, information about food accessibility, fast food expenditure per capita, three different related price ratios, and the local organic food availability.

[2] Given the time of the data collection, our analysis does not account for the 2006 E.coli outbreak in spinach.

Our final sample includes 2,607 households residing in the U.S. West that purchased spinach at least once during year of 2007. This spinach purchase could be either organic or conventional, or a mix of these two types. This study employs four groups of variables: 1) spinach purchase information; 2) demographics; 3) socio-economics, and 4) food environment information.

Table 1 shows the definitions, means and standard deviations of each variable used in the estimations. The table is divided into five categories of variables. While the likelihood of purchasing organic spinach and the organic spinach expenditure share served as our dependent variables, the remaining four variable categories were used as independent variables in our analyses.

As indicated in Table 1, 29% of the households had purchased organic packaged spinach during 2007, with a 21% expenditure share of organic vs. total spinach. As calculated from the IRI data set, the average price of organic spinach in the Western U.S. is $5.33 per pound. The average household expenditures and purchases of organic spinach are $2.38 and 0.4 pounds, respectively.

About 41% of the participating households are California residents. Per household member, the average income is $28,514 and 82% are white. Of all household heads, 48% earned a college or post-graduate degree. Of all male household heads that purchased spinach at least once during 2007, only 2.1% could be classified as young, while 29.5% belong to the mid-aged category. A mid-aged female resides in 47% of the households and only 9% of the households have children younger than 6 years of age. The majority, 66%, of the household heads is married.

Regarding socio-economics, we utilized the food insecurity prevalence from the USDA-ERS Food Atlas. The prevalence includes households with low and very low food security by state relative to the national average, according to an annual survey conducted by the U.S. Census Bureau. The food security status of the household was assessed based on the number of food-insecure conditions reported, such as being unable to afford balanced meals, cutting the size of meals or being hungry because of too little money for food (USDA-ERS, 2010).

**Table 1: Descriptive Statistics (N = 2,607)**

| Variable | Definition | Mean | Std. Dev. |
|---|---|---|---|
| *Dependent variables* | | | |
| Organic | 1 = if Household has purchased organic spinach in 2007 | 0.289 | 0.453 |
| Organic share | Organic spinach expenditure/total spinach expenditure | 21.177 | 36.860 |
| *Spinach purchase information* | | | |
| Spinach price | Price of organic and conventional spinach calculated by household reported expenditures/purchase quantities, $/lbs | 5.325 | 2.766 |
| Organic expenditure | Average household total expenditures in $ for organic spinach | 2.380 | 7.192 |
| Organic purchase | Average household total organic spinach purchase volume, lbs | 0.402 | 1.352 |
| Spinach purchase | Average 2007 household total spinach purchase volume, lbs | 1.830 | 2.493 |
| *Demographics* | | | |
| California | 1 = if household is located in California | 0.414 | 0.493 |
| HH Income | Mean of each annual household income category per household member in $1,000s $4.999 if x<$10; $17.499 if x<$20; $22.499 if x<$25; $42.499 if x<$50; $62.499 if x<$75; $87.499 if x ≥$75 | 28.514 | 15.601 |
| White | 1 = if Household head is white | 0.821 | 0.383 |
| College | 1 = if Household head has graduated from college | 0.343 | 0.475 |
| Post graduate | 1 = if Household head has a post-graduate degree | 0.145 | 0.353 |
| Male young | 1 = male and 18 ≤ age ≤ 34 | 0.021 | 0.144 |
| Male mid-aged | 1 = male and 35 ≤ age ≤ 54 | 0.295 | 0.456 |
| Female young | 1 = female and 18 ≤ age ≤ 34 | 0.035 | 0.184 |
| Female mid-aged | 1 = female and 35 ≤ age ≤ 54 | 0.470 | 0.499 |
| Young children | 1 = HH has only children younger than 6 years of age | 0.092 | 0.290 |
| Married | 1 = if Household head is married | 0.658 | 0.474 |
| *Socio-economics* | | | |
| HH no car | % of housing units in a county that are more than ten miles from a supermarket or large grocery store and have no car | 0.111 | 0.524 |
| Food insecurity | Prevalence of household-level food insecurity by State relative to the national average, takes values as -1, 0, or 1, with 1 being extremely insecure and -1 being the least insecure | 0.536 | 0.709 |

**Table 1 cont.: Descriptive Statistics (N = 2,607)**

| Variable | Definition | Mean | Std. Dev. |
|---|---|---|---|
| *Food environment* | | | |
| Fast food | Average annual expenditures (in 2007 dollars) per capita on food purchased at limited-service restaurants for county residents | 740.242 | 59.214 |
| Green leafy/starchy | Ratio of the regional average price ($/gram) of dark green vegetables to the regional average price ($/gram) of starchy vegetables | 1.374 | 0.099 |
| Fruit/sweet | Ratio of the regional average price of fruit to the regional average price of packaged sweet snacks | 0.303 | 0.034 |
| Fruit/savory | Ratio of the regional average price of fruit to the regional average price of packaged savory snacks | 0.361 | 0.029 |
| Farms | Number of farms in the county that sell directly to final consumers | 182.564 | 170.875 |
| Specialized stores | Number of specialized food stores in the county per 1,000 people | 0.099 | 0.038 |

On average, the price of dark green vegetables is 37% higher than the regional price of starchy vegetables. The starchy vegetables include plain and frozen potatoes, corn, lima beans, and green peas. The average price of dark green vegetables is about 30.3% and 36.1% of the average packaged sweet snacks and packaged savory snacks. Sweet snacks include cookies and candy bars, while savory snacks include potato chips, pretzels and crackers. All the regional average prices are in $ per gram.

Variables such as the number of farms with direct sales and the number of specialized food stores are used to measure organic food accessibility. The farm count is included in our analysis to pick up the urban and rural split. According to the USDA-ERS Food Atlas (2010), specialized food stores include outlets mainly engaged in retailing specialized foods such as retail bakeries, meat and seafood markets, dairy stores, and produce markets.

Figure 2 shows the household expenditure share of organic fresh spinach in the eleven Western states that are represented in our data set. With 33.97%, Colorado has the highest organic spinach expenditures per the total spinach expenditures, while New Mexico shows the lowest organic spinach expenditure share with 9.84%.

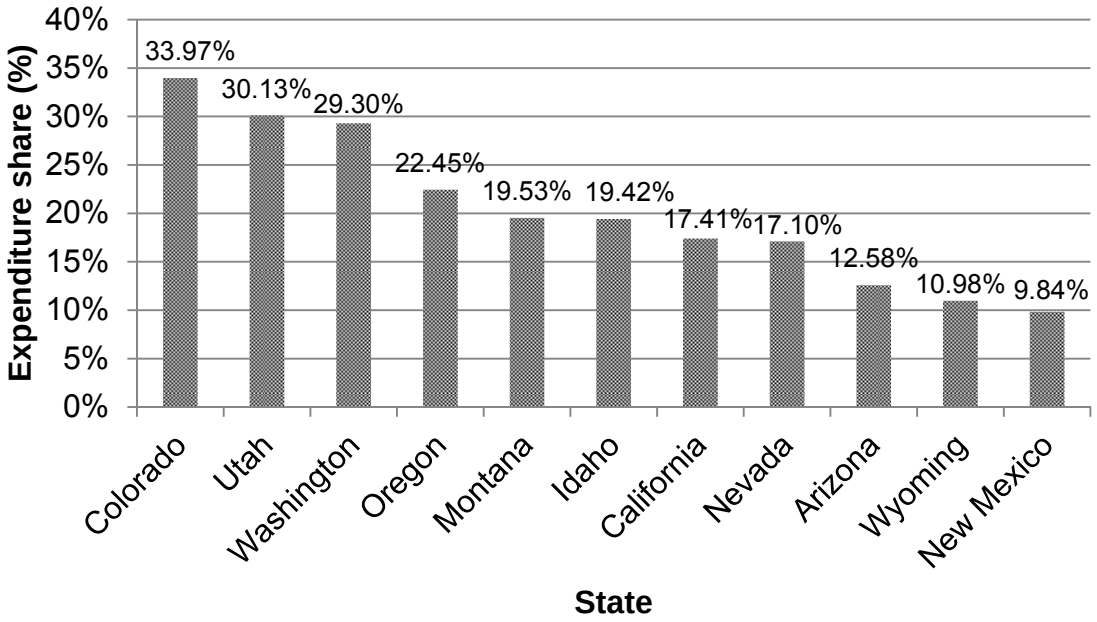


Figure 2: Organic Spinach Expenditure Share in the Western U.S., 2007 (IRI, 2011)

**Methodology**

Following Dettmann and Dimitri (2007), we are using the Heckman two-step selection model. This model generates consistent and asymptotically efficient parameter estimates compared to the standard regression methods (Heckman, 1990). The application of the Heckman estimation procedure provided deeper insights regarding the main factors that drive consumers' organic spinach purchase decisions.

There are two stages in Heckman's estimation. In the first stage, equation (1) is estimated using logistic regression in order to understand how the individual household's demographic, the socio-economic, and the food environmental variables impact the organic versus conventional spinach purchase decision. In the second stage, the organic spinach expenditure share is regressed on a group of household demographic, socio-economic and food environmental variables using a least squares estimation by taking into account the inverse Mills Ratio $\lambda$. The Mills Ratio is estimated from the first stage. It controls for the selection bias in order to provide consistent and efficient parameter estimates in the second stage.

With regard to our variable selection, there is a need for defining a profile of the organic food consumer, given the mixed findings of previous studies (e.g. Oberholtzer, Dimitri, and Green, 2008; Zhang et al., 2008). For instance, while some findings suggest that low-income households eat less produce than higher income households, other studies show that low-income households constitute more than half of the frequent organic food buyers (e.g. Hartman Group, 2002; Blisard, Steward, and Jolliffe, 2004; Dettmann and Dimitri, 2007; Zhang et al., 2008). Furthermore, consumer educational level will increase the chance of purchasing organic vegetables. Stevens-Garmon, Huang, and Lin (2007) also suggest that the heavy users of organic produce consist of college graduates.

Regarding the food environmental variables, we include the number of specialty food stores to measure access to organic produce. Although supermarkets are starting to carry more organic products, a specialized food store might be perceived as the more traditional retail outlet for organic products. This differentiation is based on the ongoing assertions that retailers, such as

Wal-Mart, are labeling conventional food products as organic (Wong, 2007). Thus, we chose specialty stores to represent the organic food accessibility.
The estimation of equation (1) is based on the individual household selection of organic spinach over conventional spinach:

$$\begin{aligned}\text{Prob}(\text{Organic}_i) = {} & \gamma_0+\gamma_1\,\text{Spinach price}_i+\gamma_2\,\text{Organic purchase}_i+\gamma_3\,\text{California}_i \\ & +\gamma_4\,\text{HHIncome}_i+\gamma_5\,\text{White}_i+\gamma_6\,\text{College}_i+\gamma_7\,\text{Post graduate}_i \\ & +\gamma_8\,\text{Male young}_i+\gamma_9\,\text{Male mid-aged}_i+\gamma_{10}\,\text{Female young}_i \\ & +\gamma_{11}\,\text{Female mid-aged}_i+\gamma_{12}\,\text{Young children}_i+\gamma_{13}\,\text{Married}_i \\ & +\gamma_{14}\,\text{Food insecurity}_i+\gamma_{15}\,\text{Fast food}_i+\gamma_{16}\,\text{Farms}_i \\ & +\gamma_{17}\,\text{Specialized store}_i+\varepsilon_{1i} \qquad (1)\end{aligned}$$

In regression equation (1), the probability of household's organic spinach purchasing behavior is a function of information regarding spinach purchases represented by the spinach price and the average total organic spinach purchase volume. The household demographic variables, such as whether the household resides in California, the household income, ethnicity, education, age, gender, and marital status are also included as independent variables. Socio-economic impacts are represented by the prevalence of household-level food insecurity. Furthermore, food environmental variables such as the annual fast food expenditures per capita, the number of farms with direct sales, and the number of specialized food stores are also included.
The share of each household's organic spinach expenditure is determined by various demographic, socio-economic, and food environmental variables and it is given by:

$$\begin{aligned}\text{Organic share}_i = {} & \beta_0+\beta_1\,\text{Organic expenditure}_i+\beta_2\,\text{Organic purchase}_i \\ & +\beta_3\,\text{Spinach purchase}_i+\beta_4\,\text{California}_i+\beta_5\,\text{HH Income}_i+\beta_6\,\text{White}_i \\ & +\beta_7\,\text{College}_i+\beta_8\,\text{HH no car}_i+\beta_9\,\text{Fast food}_i \\ & +\beta_{10}\,\text{Green leafy/Starchy}_i+\beta_{11}\,\text{Fruit/Sweet}_i \\ & +\beta_{12}\,\text{Fruit/Savory}_i+\beta_{13}\,\text{Farms}_i+\varepsilon_{2i} \qquad (2)\end{aligned}$$

The regression equation (2) includes some of the variables from the first stage. However, it expands the analysis by focusing on impacts that might directly influence organic spinach expenditures. Thus, we include three different local price indices of substitute or complement goods, such as prices of green leafy vs. starchy goods, and the ratios of the regional average price of fruit to the regional average prices of packaged sweet snacks, and savory snacks, respectively.

## Results

We estimated a Heckman's two-step regression using Stata version 10.1. The statistically significant Mills Ratio λ is the correlation coefficient between the two error terms in equations (1) and (2). We calculated the Wald statistics to test the joint significance of the model coefficients, i.e., the following hypothesis test was conducted: $H_o$: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = \beta_{13} = 0$. The null hypothesis is rejected at 1% significance level, which suggests the model variables are appropriate for jointly explaining the household organic spinach expenditure share.

Table 2 shows the marginal effect results from the logistic model in the first step. We find that with regard to spinach purchase information, a household that purchases one more pound of spinach is 3.9% point more likely to purchase organic spinach. Regarding demographics, a household with high income, high education levels, young children, and a young male or mid-aged female head, tends to purchase more organic spinach. Compared to the other races, a white household head has a 4.6% point lower chance of purchasing organic spinach.

**Table 2: Logistic Estimation Results**

| | Marginal Effect | Std. Err. | P-value |
|---|---|---|---|
| *Spinach purchase information* | | | |
| Spinach price | 0.087*** | 0.004 | 0.000 |
| Spinach purchase | 0.039*** | 0.004 | 0.000 |
| *Demographics* | | | |
| California | -0.041 | 0.025 | 0.107 |
| HH Income | 0.001* | 0.0007 | 0.091 |
| White | -0.046* | 0.026 | 0.078 |
| College | 0.130** | 0.055 | 0.019 |
| Post graduate | 0.138** | 0.064 | 0.031 |
| Male young | 0.168* | 0.091 | 0.066 |
| Male mid-aged | 0.004 | 0.022 | 0.847 |
| Female young | -0.055 | 0.051 | 0.281 |
| Female mid-aged | 0.099* | 0.052 | 0.056 |
| Young children | 0.062* | 0.038 | 0.100 |
| Married | 0.032 | 0.021 | 0.137 |
| *Socio-economics* | | | |
| Food insecurity | -0.091*** | 0.015 | 0.000 |
| *Food environment* | | | |
| Fast food | -0.0005*** | 0.0002 | 0.002 |
| Farms | 0.0001** | 0.00005 | 0.026 |
| Specialized stores | 0.863*** | 0.252 | 0.001 |
| Mills Ratio λ | 5.077** | 2.014 | 0.012 |

***p<0.01, **p<0.05, *p<0.1

The socio-economic variable household food insecurity has a negative impact on the household's organic spinach purchase. One point increase in the food insecurity index would decrease the household's probability of purchasing organic spinach by 9.1% point.
In addition, the food environmental factors significantly influence household organic spinach purchasing behavior. One more specialty store per 1,000 people would increase the household's probability of purchasing organic spinach by 86.3% point. Interestingly, one more farm with direct sales only slightly increases the chance of organic spinach purchases, which might suggest that direct farm sales only contribute a small fraction to organic spinach purchases. Increasing the per-capita fast food expenditures would decrease the consumer's selection of organic spinach by 0.05% point.

Table 3 shows our least squares estimation results from equation (2). Increasing organic spinach purchases by 1 pound would increase organic expenditure shares by 8.52% point. The total spinach purchase volume decreases the share of the organic spending by 8.91% point.

**Table 3: Least Squares Estimation Results**

| | Estimate | Std. Err. | P-value |
|---|---|---|---|
| Constant | 185.915*** | 30.299 | 0.000 |
| *Spinach purchase information* | | | |
| Organic expenditure | 0.726*** | 0.205 | 0.000 |
| Organic purchase | 8.524*** | 1.147 | 0.000 |
| Spinach purchase | -8.911*** | 0.429 | 0.000 |
| *Demographics* | | | |
| California | -5.270* | 3.102 | 0.089 |
| HH Income | 0.115** | 0.055 | 0.037 |
| White | 3.142 | 2.199 | 0.153 |
| College | 2.970* | 1.703 | 0.081 |
| *Socio-economics* | | | |
| HH no car | -0.174 | 1.464 | 0.905 |
| *Food environment* | | | |
| Fast food | -0.049*** | 0.0167 | 0.003 |
| Green leafy/starchy | -37.692*** | 12.929 | 0.004 |
| Fruit/sweet | 68.162 | 46.007 | 0.138 |
| Fruit/savory | -135.705** | 61.738 | 0.028 |
| Farms | -0.013** | 0.006 | 0.041 |

***p<0.01, **p<0.05, *p<0.1

A California household, compared to a household from other Western states, tends to have a 5.27% point lower share of organic spinach expenditures. We find that a one-dollar increase in household income increases the organic spinach expenditure share by 0.12% point. A college graduate would spend 2.97% point more on organic spinach.

The food environmental factors have a significant influence on the organic spinach expenditure share. A one-dollar increase in the fast food expenditure per capita would decrease the household organic purchase share by 0.05% point. Increasing the price ratio between green leafy and starchy vegetables and the price ratio between fruit and savory snacks would significantly decrease the organic spinach expenditure share by 37.69% and 135.71% point, respectively. Therefore, as the price of dark green vegetables decreases by 1% relative to the price of starchy vegetables, the household's spending on organic spinach would increase by 37.69% point. In addition, one more farm with direct sales would slightly decrease the household organic purchase share by 0.01% point.

## Conclusions

The current study provides a unique contribution to literature, given the limited understanding of the new organic food consumer. Our paper expands the current literature, by examining the factors that both predict the selection of organic spinach and its purchase share. Through the empirical analysis of organic spinach purchasing behavior, we find that household food choices depend on several key demographic, socio-economic and food environmental determinants. Previous studies determined consumers in Western states have more access to organic produce than those residing in other regions (e.g. Stevens-Garmon, Huang, and Lin, 2007; Zhang et al. 2008). Interestingly, our estimation finds that California households spent a smaller expenditure share on organic spinach compared to non-California residents. This suggests that

households in California either spend less on organic spinach or purchase a large volume of total spinach compared to other Western states.

Our study provides insight into the role of household demographic characteristics on organic spinach purchasing behavior. We find that a household with high income, a high education level, and young children tends to choose organic spinach over conventional spinach. Thus, marketing strategies could target higher income and higher educated households. This could be beneficial with regard to increasing the expenditure shares of current consumers and attracting new customer (Zhang et al., 2008).

The results suggest that young male and mid-aged female household heads have a higher tendency towards purchasing organic spinach. This corresponds to the findings by Lin, Reed, and Lucier (2004), who determined that women 40 years and older eat the most spinach out of all female age groups. Additionally, white household heads, compared with other races, purchase less organic spinach, which is consistent with previous similar studies (e.g. Stevens-Garmon, Huang, and Lin, 2007; Zhang et al. 2008).

The food environmental impacts present interesting results with regard to organic spinach selection. Our study suggests that higher prices of green leafy and fruits relative to starchy vegetables and savory snacks could lead to an expenditure shift from organic spinach to the other goods. We find a large substitution effect between conventional and organic produce given consumers' budget constraints.

Our study shows that increased organic spinach availability through specialized food stores is the largest contributor towards organic spinach purchase decision. This finding has been confirmed by the trend that specialty food stores are revolving around consumers seeking more variety such as environmentally friendly produce (The Food Institute, 2009).
Socio-economic and food environmental factors are playing an increasingly important role in affecting a household's food choice, along with more traditional measures of demographic impacts. In our study, out of the three factors, food environment trumped socio-economics and demographics.

The effect of context on food choice impacts consumer preference and will continue to shape future food purchase decisions, especially as organic produce transitions from niche product to mainstream food. The U.S. organic produce market has reached a level of maturity that demands new marketing strategies beyond its typical consumer base. The organic attribute is important to producers who could benefit from extracting higher premiums over the conventional good. An understanding of what factors might encourage increased consumption of healthful foods is especially important to producers and marketers for developing more effective marketing strategies. Furthermore, government agencies could build on this information to promote nutritional choices and provide education to encourage consumers to switch from fast food to healthy yet affordable food products.

**References**

Aertsens, J., Verbeke, W., Mondelaers, K., and G.V. Huylenbroeck. (2009). "Personal Determinants of Organic Food Consumption: A Review." *British Food Journal* 111:1140-1167.

Blisard, N., Stewart, H., and D. Jolliffe. (2004). "Low Income Households Expenditures on Fruits and Vegetables." Washington, DC: U.S. Department of Agriculture, Economic Research Service. Agricultural Economic Report No. AER833.

Capps, O., Jr., Tedford, J.R., and J. Havlicek, Jr. (1985). "Household Demand for Convenience and Nonconvenience Products Foods." *American Journal of Agricultural Economics* 67:862-869.

Chou, S.Y., Grossman, M., and H. Saffer. (2002). "An Economics Analysis of Adult Obesity: Results from the Behavioral Risk Factor Surveillance System." *National Bureau of Economic Research Working Paper* 9247.

Chou, S.Y., Grossman, M., and H. Saffer. (2004). "An Economics Analysis of Adult Obesity: Results from the Behavioral Risk Factor Surveillance System." *Journal of Health Economics* 23:565-587.

Dettmann, R., and C. Dimitri. (2007). "Organic Consumers: A Demographic Portrayal of Organic Vegetable Consumption within the United States." Contributed paper at the 105th EAAE Seminar, March 8-10, Bologna, Italy.

Dimitri, C., and C. Greene. (2002). "Recent Growth Patterns in the U.S. Organic Food Market." Washington, DC: U.S. Department of Agriculture, Economic Research Service. Agricultural Information Bulletin No. AIB777.

Dimitri, C., and L. Oberholtzer. (2009). "Marketing U.S. Organic Foods." Washington, DC: U.S. Department of Agriculture, Economic Research Service. Economic Information Bulletin No. 58.

European Food Information Council. (2005). "Why We Eat What We Eat: Social and Economic Determinants of Food Choice." *Food Today* 45: Retrieved from the WWW on November 9, 2005: http://www.eufic.org/gb/food/pag/food45/food451.htm

Hartman Group. (2000). *The Organic Consumer Profile.* The Hartman Group, Bellevue, WA.

Hartman Group. (2002). *Hartman Organic Research Review: A Compilation of National Organic Research Conducted by the Hartman Group*. Bellevue, WA.

Hartman Group. (2003). *Organic Consumer Evolution* 2003. Bellevue, WA.

Heckman, J. (1990). "Varieties of Selection Bias." *The American Economic Review* 80(2):313-318.

Information Resources, Inc. (IRI). (2011). *National Consumer Panel.* Chicago, IL: Symphony IRI Group.

Li, J., Zepeda, L. and B.W. Gould. (2007). "The Demand for Organic Food in the U.S.: An Empirical Assessment." *Journal of Food Distribution* 38(3):54-71.

Lin, B.-H., Reed, J., and G. Lucier. (2004). "U.S. Fruit and Vegetable Consumption: Who, What, Where, and How Much." U.S. Department of Agriculture-Economic Research Service (USDA-ERS). Agricultural Information Bulletin 792-2.

Lusk, J.L. and K. Brooks. (2011). "Who Participates in Household Scanning Panels?" *American Journal of Agricultural Economics* 93(1):226-240

Oberholtzer, L., Dimitri, C., and C. Greene. (2005). "Price Premiums Hold on as U.S. Organic Produce Market Expands." U.S. Department of Agriculture-Economic Research Service (USDA-ERS). Outlook Report No. VGS30801.

Onyango, B., Hallman, W., and A. Bellows. (2006). "Purchasing Organic Food in U.S. Food Systems: A Study of Attitudes and Practice." Selected paper at the AAEA Meeting, July 23-26, Long Beach, CA.

Organic Trade Association (OTA). (2011). Industry Statistics and Projected Growth, based on the Organic Industry Survey. Retrieved from the WWW on October 12, 2011: http://www.ota.com/organic/mt/business.html

Stevens-Garmon, J., Huang, C., and B.-H. Lin. (2007). "Organic Demand: A Profile of Consumers in the Fresh Produce Market." *Choices* 22(2):109-115.

Sturm, R., and A. Datar. (2005). "Body Mass Index in Elementary School Children, Metropolitan Area Food Prices and Food Outlet Density." *Public Health* 119:1059-1068.

The Food Institute. (2009). *Food Industry Review.* Elmwood Park, NJ: The American Institute of Food Distribution.

U.S. Census Bureau. (2011). "State and County Quick Facts." Retrieved from the WWW on October 21, 2011: http://quickfacts.census.gov/qfd/meta/long_fips.htm

U.S. Department of Agriculture-Economic Research Service (USDA-ERS). (2007). Fresh-Market Spinach: Background Information and Statistics. Retrieved from the WWW on October 14, 2011: http://www.ers.usda.gov/News/spinachcoverage.htm

U.S. Department of Agriculture-Economic Research Service (USDA-ERS). (2010). *Food Environment Atlas.* Retrieved from the WWW on August 12, 2011: http://www.ers.usda.gov/foodatlas/

Wong, G. (2007). "Wal-Mart accused of 'organic fraud'." CNN Money. January 17.

Zhang, F., Huang, C.L., Lin, B.-H., and J.E. Epperson. (2008). "Modeling Fresh Organic Produce Consumption with Scanner Data: A Generalized Double Hurdle Model Approach." *Agribusiness* 24:510-522.

Zhuang, Y., Dimitri, C., and E.C. Jaenicke. (2009). "Consumer Choice of Private Label or National Brand: The Case of Organic and Non-Organic Milk." Selected paper presented at the AAEA Annual Meeting, Milwaukee, Wisconsin, July 26-28.