What Would Popeye Choose: Trends of U.S. Western Organic vs. Conventional Spinach Purchases

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Introduction

Recent data shows that Western states account for more than half of the total production value of vegetables in the U.S. (USDA ERS 2014). Of all vegetables, one of the fastest growing segments is triple-washed cello-packed spinach (USDA ERS 2007), given its convenience and top rank in the list of "Super Foods." Spinach is full of vitamins, minerals, and the phytochemical lutein (University of Wyoming 2009). In the U.S., 85% of the spinach is grown in two Western states- California and Arizona. In particular, California accounts for about three-fourths of the value of both the fresh and processing spinach crops.

Over time, organic pre-packaged spinach has increased in popularity, given the easing of the recession and consumers' increasing desire for convenience products (Smith 2012). Between 2007 and 2010, organic spinach sales increased by 250%, while conventional spinach sales increased by 26% (Information Resources, Inc. (IRI) 2011). Figure 1 shows the sales trend of conventional and organic bagged spinach in all of the Western U.S. states from 2007 to 2010.

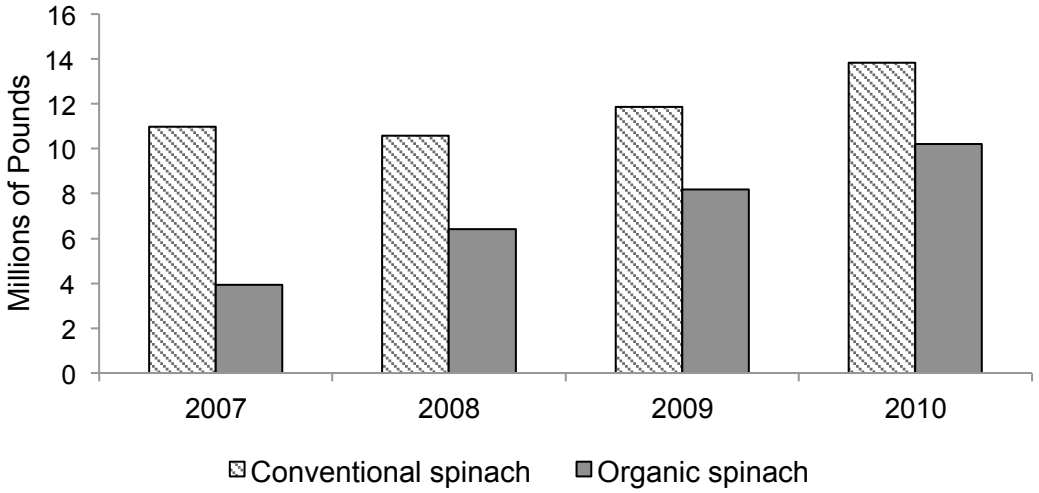

Figure 1: Bagged Conventional and Organic Spinach Sales in the Western U.S., 2007-2010 (Information Resources, Inc. (IRI) 2011)

The rapid sales growth of organic fruit and vegetables has been reflected in the increased availability of this product category at a variety of retail formats. Multiple retail venues offer an increasing variety and selection of organic produce, which lowers search costs (Stevens-

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Garmon, Huang, and Lin 2007). In particular, the 2006 entrance of Wal-Mart into the organic food retail market has increased the market share held by supercenters (Li, Zepeda, and Gould 2007). This share supplements the traditional sources of organic food, such as specialized food stores (Warnier 2006). Consequently, the customer base of organic produce has changed. As such, it is important to investigate a broad spectrum of food retail outlets in order to assess a more complete profile of the organic produce consumer.

The purpose of our study is to investigate factors explaining consumers' choice of organic spinach in the Western United States in 2007 and 2010. Current economic studies that focus on organic food consumption have presented limited information about the profile of the organic spinach consumer. The range of factors has been limited to either demographic or socio-economic determinants. Our hypothesis is that food environment variables such as store proximity, food prices, and food access might have a larger impact on consumers' organic spinach purchasing behavior than demographic or socio-economic factors. For example, Sturm and Datar (2005) found that the number of grocery stores may have an increasingly important effect on a household's produce choice. In addition, a previous cross-sectional study by Schroeter and Cai (2011) showed that food environment, such as information about the number and types of grocery stores, trumps socio-economic and demographic factors in explaining organic food choices. Thus, we will update and expand previous literature by adding a longitudinal aspect that is rarely available in studies of this nature.

Data

We use the Symphony IRI Group of Information Resources Inc. (IRI) National Consumer Network Panel (NCP) on individual households' pre-packaged spinach purchases in years 2007 and 2010 (IRI 2011). For both of these years of analysis, the Food Environment Atlas provides the food environmental information. The atlas assembles statistics on food choices, community health characteristics, along with a variety of food environmental variables (USDA ERS 2014).

Table 1 shows an overview of the three groups of independent variables that might impact organic purchasing behavior. The 2007 sample contains 2,607 households and the 2010 sample contains 3,075 households in the U.S. West. With regard to the dependent variables, of all Western spinach buyers, 28.9% of the households purchased organic spinach during 2007, where organic spinach represents a 21.2% expenditure share of total spinach purchase. In 2010, 35.8% of households purchased organic spinach at least once with an increased organic spinach expenditure share of 26.8%.

The average household purchase volumes of organic spinach are 0.40 and 0.65 pounds per purchase occasion in 2007 and 2010, respectively. Averaging across all purchase occasions, Western U.S spinach consumers spend $5.33 per pound of organic spinach in 2007 and $6.01 per pound of organic spinach in 2010. This cost increase has been discussed in previous literature (Haghiri, Hobbs, and McNamara 2009; Voon, Ngui, and Agrawal 2011). As such, Voon, Ngui, and Agrawal (2011) suggest that affordability may be a concern for people who only purchase organic food occasionally.

Table 1: Descriptive Statistics

Variable	Definition	2007 (N = 2,607)		2010 (N =3,075)	
		Mean	Std. Dev.	Mean	Std. Dev.
Dependent variables					
Organic	1 = if Hh has purchased organic spinach	0.289	0.453	0.358	0.480
Organic expenditure share	Organic spinach expenditure/total	0.212	0.369	0.268	0.400
Spinach purchase information					
Total expenditure	Average Hh total expenditures in $ for spinach	8.207	10.823	9.661	13.920
Organic expenditure	Average Hh total expenditures in $ for organic spinach	2.978	7.192	3.745	10.225
Total purchase volume	Average Hh total spinach purchase volume, lbs	1.830	2.493	1.823	2.563
Organic purchase volume	Average Hh total organic spinach purchase volume, lbs	0.402	1.352	0.653	1.885
Spinach unit price	Unit price of spinach, $/lb	5.325	2.766	6.011	2.875
Food environment					
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	0.817	2.733	4.571	3.690
Grocery stores	Number of grocery stores in the county per 1,000 people	0.186	0.070	0.188	0.072
Supercenters and club stores	Number of supercenters and club stores in the county per 1,000 people	0.011	0.009	0.014	0.012
Specialized stores	Number of specialized stores in the county per 1,000 people	0.099	0.038	0.154	0.244
Demographics					
College graduate	1 = if Hh main shopper has a post-college degree or a post-college degree	0.488	0.500	0.496	0.500
Female	1 = if Hh main shopper is female	0.934	0.249	0.936	0.245
Hh with children	1= if Hh has ≥ one child younger than 18 years	0.219	0.414	0.228	0.419
Married	1 = if Hh main shopper is married	0.658	0.474	0.670	0.470
Family income/member	Mean of each annual Hh income category per Hh 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	28.222	15.592

We use four different variables to measure the impact of the food environment. Table 1 shows that in both years, there are 0.19 grocery stores in the county per 1,000 residents, while there

are 0.01 supercenters and club stores in the county per 1,000 residents. The table indicates an increase in the number of specialized stores from 0.1 to 0.15 between 2007 and 2010.

The Food Access Research Atlas[2] describes a variety of ways to measure food store access for individuals and for neighborhoods (USDA ERS 2014). In our study, food accessibility is measured by the variable 'Hh no car', which indicates the percentage of households per county that live more than 10 miles from the nearest supermarket or large grocery store but have no car. In the two samples, this variable ranges from 0.01-8.17%. In addition, we found a strong positive correlation between the regional percentage of low-income households that live more than 10 miles from the closest major grocery store and the regional percentage of households without cars that live more than 10 miles from the closest major grocery store.

Further variables of interest include household demographic variables. Table 2 shows how the demographic information from our sample compared against the average U.S. consumer. We compared several of the variables from our sample with data from the U.S. Census, which represents the average U.S. household: a) household with children, b) married, c) median household income, d) household size, and e) educational level of respondents in our sample with the U.S. average household. We found that our sample is rather similar to the U.S. Census data. Therefore, we can conclude that the households in our sample do provide a good representation of the average U.S. household.

Table 2: Comparison between our 2010 data set and 2010 U.S. Census data

	2010 Own data set	2010 U.S. Census data
Household with children	0.23	0.29
Married	0.67	0.66
Median household income	57,678	53,046
Household size	2.45	2.58
College graduate	0.35	0.29
Post graduate school	0.14	0.10

Previous studies determined the impact of education, gender, and income influence consumer's organic food purchase behavior (e.g. Dettmann and Dimitri 2007; Li, Zepeda and Gould 2007). In both samples, over 93% of the main household grocery buyers that purchased any spinach are female. About half of the main household grocery buyers have a college or post-college degree. This is consistent with previous studies (Vega-Zamora et al. 2013). The majority, more than 65% of the household heads, is married. Table 1 also shows that 23% of the households have at least one child that is younger than 18 years. The mean annual household income is $57,072 in 2007 and $57,678 in 2010. According to popular perception, organic consumers are wealthy, and have young children (Stevens-Garmon, Huang, and Lin 2007).

Methodology

In our model, consumers make the sequential decisions of whether to choose organic or conventional pre-packed spinach, and how much to spend on organic spinach purchase. Empirically, a household's organic spinach purchase decision is first estimated using a binary logit regression and then using a least-squares regression to understand how the individual household's spinach purchase information, demographics, and food environmental variables impact the organic vs. conventional purchasing behavior.

[2] The Food Access Research Atlas (FARA) is different from the Food Environment Atlas, as it provides selected food access information at the census-tract level (USDA ERS 2014).

In regression equation (1), the probability of household's selecting organic spinach (OS) over conventional spinach is a function of information regarding household spinach purchases represented by the unit price of all spinach purchases and purchase quantity. With regard to food environmental variables, we included the numbers of grocery stores, supercenters/club stores, and specialty food stores in the neighborhood in the first step of the model.

$$\begin{aligned}\text{Prob}(OS_i) = {} & \gamma_0 + \gamma_1 \text{Total purchase volume}_i + \gamma_2 \text{Spinach unit price} \\ & + \gamma_3 \text{Grocery stores}_i + \gamma_4 \text{Supercenters/club stores}_i \\ & + \gamma_5 \text{Specialized stores}_i \\ & + \gamma_6 \text{College}_i + \gamma_7 \text{Female}_i + \gamma_8 \text{Hh with children}_i \\ & + \gamma_9 \text{Married}_i + \gamma_{10} (\text{Family income /member})_i + \varepsilon_{1i} \qquad (1)\end{aligned}$$

The share of each household's organic spinach expenditure (OS share) is also determined by various spinach purchases, local food environmental variables, and household demographics, and is given by:

$$\begin{aligned}\text{OS share}_i = {} & \beta_0 + \beta_1 \text{Total purchase volume}_i + \beta_2 \text{Organic purchase volume}_i \\ & + \beta_3 \text{Hh no car}_i + \beta_4 \text{College}_i + \beta_5 (\text{Family income/member})_i + \varepsilon_{2i} \qquad (2)\end{aligned}$$

Equation (2) includes some of the variables from the logit organic selection estimation. We expand the analysis by focusing on impacts that might directly influence organic spinach expenditures, such as the percentage of households per county that live more than 10 miles from the nearest supermarket or large grocery store but have no car.

To deepen this analysis, we checked the correlations between the total spinach purchase volume, the organic spinach purchase volume, and the organic expenditure share. Our 2010 data shows that the total spinach purchase volume and the organic spinach purchase volume are uncorrelated, with a low correlation coefficient of 0.18. In addition, the correlation coefficient between the total spinach purchase volume and the organic expenditure share is -0.50. Lastly, the correlation between the organic spinach purchase volume and the organic expenditure share is 0.69.

Results

We estimated equations (1) and (2) with Stata 12.0 for the 2007 and 2010 samples. The statistically significant Mills Ratio indicates that the two error terms from equations (1) and (2) are correlated with each other. Table 3 shows the Heckman (1990) two-step estimation results.

In 2007, a higher organic spinach purchasing likelihood is observed by households in which the main grocery shopper has a high family income, is a college graduate, married with children, and lives in a region with a high density of specialty stores and supercenters/club stores. In 2010, organic spinach is more likely to be purchased by households in which the main grocery shopper is female, married, and holds at least a college degree. These households tend to reside in a region with a high density of grocery stores. Confirming the results by Li, Zepeda, and Gould (2007), family income was not found to be significantly affecting the decision to buy organic spinach in 2010.

Our second-stage results show that a household in which the main grocery shopper has at least a college degree increases the expenditure share of organic spinach by 2.95% and 1.94% in 2007 and 2010, respectively. A $1,000 increase in household per-member income increases the organic spinach expenditure share by 0.12% in 2007.

It is important to note that in 2010, a lower organic spinach expenditure share is observed in regions with a larger percentage of households that do not own cars and live more than 10 miles from the nearest grocery store. Our data shows that households without cars that do not live in close proximity to a grocery store tend to belong to the lower-income group. Therefore, our finding suggests that consumers on a tight budget may be less likely to spend much on organic spinach given their price-sensitive behavior.

Table 3: Heckman Two-step Estimation Results

	2007		2010	
First stage: Organic selection	Coefficient	Std. err.	Coefficient	Std. err.
Total purchase volume	0.124***	0.012	0.158***	0.011
Spinach unit price	0.277***	0.012	0.148***	0.009
Grocery stores	0.584	0.491	0.605*	0.400
Supercenters and club stores	11.919***	3.500	3.471	2.826
Specialized stores	2.857***	0.873	0.120	0.108
College graduate	0.116*	0.060	0.075*	0.051
Female	0.026	0.130	0.186*	0.113
Hh with children	0.154**	0.080	0.050	0.065
Married	0.143**	0.071	0.106*	0.058
Family income/member	0.004*	0.002	0.001	0.002
Constant	-3.148***	0.211	-1.690***	0.525
Second stage: Organic expenditure share				
Total purchase volume	-9.020***	0.426	-11.653***	0.444
Organic purchase volume	8.968***	1.112	14.350***	0.461
Hh no car	-0.061	0.288	-0.490***	0.162
College graduate	2.954*	1.712	1.935*	1.295
Family income/member	0.118**	0.055	0.004	0.040
Constant	68.482***	3.081	73.806***	3.264
Mills Ratio	4.281***	1.977	7.597***	2.388

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

Table 4 presents the marginal probabilities of choosing organic spinach. With regard to spinach purchase information, a one-dollar increase in spinach unit price increases the probability to purchase organic spinach by 8.57% and 5.45% in 2007 and 2010, respectively. Our result shows that if the price of the overall spinach category increases, then organic spinach is becoming more attractive for a consumer. Given the limitation of our current IRI data set, only the combined spinach price information is available. Thus, the average spinach price is a weighted average. Hence, there are three possibilities with regard to the average spinach price increase: 1) organic prices increase more significantly; 2) conventional prices increase more substantially; 3) both organic and conventional prices grow. According to USDA ERS (2015), conventional spinach prices grew 32% in 2013 from 2012, while organic spinach prices rose only by 8%. In this case, consumers purchased more organic spinach given that the price difference had decreased between organic and conventional spinach.

Table 4: Marginal Effects from Heckman Estimation

	2007		2010	
Probability (Organic= 1)	Marginal (% change)	Std. err.	Marginal (% change)	Std. err.
Total purchase volume	3.829***	0.370	5.829***	0.393
Spinach unit price	8.569***	0.373	5.448***	0.328
Food environment				
Grocery stores	18.069	7.920	22.336*	14.763
Supercenters and club stores	368.536***	107.934	128.111	104.308
Specialized stores	88.349***	26.987	4.442	3.990
Demographics				
College graduate	3.387*	1.892	2.770*	1.871
Female	0.795	3.957	6.633*	3.851
Hh with children	4.920*	2.612	1.841	2.434
Married	4.344**	2.131	3.882*	2.106
Family income/member	0.117*	0.069	0.049	0.068

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

With regards to the food environmental variables, one more grocery store per 1,000 people would increase the household's probability of purchasing organic spinach by 22.34% point. One potential driver for this outcome might be that more organic produce becomes available at conventional retailers. According to the Organic Trade Association (OTA) (2011), conventional retailers have surpassed specialty natural food stores. This trend is responsible for 54% of organic food sales in 2010. Natural retailers brought in 39% of total organic food sales in 2010 (OTA 2011; Benbow 2012).

Table 4 shows that adding one more supercenter/club store per 1,000 people would increase the household's probability of purchasing organic spinach by 370% point in 2007. One more specialty store per 1,000 people would increase the household's probability of purchasing organic spinach by 88.35% point in 2007.

Surprisingly, adding one more supercenter/club store or specialized stores has no impact on the consumer's organic spinach choice in 2010. Based on previous research, this outcome can be explained through two trends: 1) Retail management research has shown the closure of U.S. supercenters and club stores between 2007 and 2009, given the consumer demand for small-format stores. Retailers such as Wal-Mart are focusing in reaching consumers in large metropolitan areas with smaller format stores, such as conventional neighborhood supermarkets (Bustillo and Martin 2010).

The second trend encompasses the fact that between 2007 and 2010, there was a shift towards offering more organic produce at conventional grocery stores. In fact, conventional supermarkets accounted for nearly half of the organic sales (Dimitri and Oberholtzer 2009). Thus, this increased availability suggests a driving factor in increasing the likelihood of purchasing organic spinach at conventional supermarkets.

Our demographic variables show the difference between the organic spinach consumer profiles. Consumers with college/post-college degrees are more likely to purchase organic spinach. This increased probability is 3.39% point in 2007 and 2.77% point in 2010. Female shoppers have a 6.63% point higher chance of purchasing organic spinach in 2010. Households with children

have a 4.92% point higher chance of purchasing organic spinach in 2007. In addition, married shoppers tend to purchase more organic spinach by 4.34% and 3.88% point in the two study years, respectively.

Conclusions

Given that organic produce has increased its market share significantly in recent years, the food environment, along with the traditional measures of household demographic and food purchase information, is becoming increasingly important in affecting a household's food choice. A 2013 survey shows that the fruit and vegetable category in the organic food sector continues to lead with $11.6 billion in sales. Of all fruits and vegetables sold in the United States, the organic produce category represents 46% of the organic sector's total sales (PR Newswire 2014).

Our findings suggest that consumers' organic spinach purchasing decisions are influenced by food access in their respective residential areas. Specifically, households that do not have a car and live more than 10 miles from a grocery store are less likely to purchase organic spinach. Thus, lack to food retail access could be a driving factor for explaining this decreased purchasing likelihood. In addition, our correlation analysis shows that the majority of these households belong to the lower-income bracket in our study, which might suggest that price consciousness may lead to their lack of purchasing organic food. A recent study on poverty and food retail access (Wilde, Llobrera and Ver Ploeg 2014), suggests to first recognize and assess population density, vehicle availability, and the proximity of other supermarkets before determining locations for new supermarkets.

As supermarkets are starting to carry more organic products, they might take market share from specialized food stores, which could be perceived as the more traditional retail outlets for organic products. Therefore, compared to 2007, supercenters do not play an important role in organic spinach selection in 2010. However, our data does not contain any information regarding promotional pricing strategies such as coupons or club-cards, which could additionally classify organic purchasing behavior with regard to the different food retail outlets and their respective promotional tactics.

With regard to demographic characteristics, consumer educational level increases the chance of purchasing organic spinach. Stevens-Garmon, Huang, and Lin (2007) suggest that the heavy users of organic produce consist of college graduates. Thus, marketing strategies could target higher-educated households based on their residence close to grocery stores. This could be beneficial with regard to increasing the expenditure shares of current consumers and attracting new customer (Zhang et al. 2008).

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