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# The Consumption Choice of Organics: Store Formats, Prices, and Quality Perception – A Case of Dairy Products in the United States

Ming-Feng Hsieh and Kyle W. Stiegert  
*University of Wisconsin-Madison*  
USA

## 1. Introduction

Consumers choose to purchase organic foods for a variety of reasons. Some of the commonly cited perceptions among consumers are that a) organic foods are grown without pesticides or other toxic chemicals and so they are healthier for them and their families, b) organic farming relies on more sustainable natural biological systems, which are better for the environment, c) practices and standards have evolved in the U.S. to improve the treatment of organically raised livestock. However, cropping and livestock systems used in organic farming tend to have higher costs per unit of output than in conventional farming. When these costs are successfully passed downstream, it ultimately means higher retail prices for those products that use the organic label. The price of organic food is typically 30-40%, and sometimes over 100%, more than conventional (non-organic) alternatives. The hefty price premium of organic food has been one of the major reasons for consumers to choose conventional over organic foods (Kavilanz, 2008). Wal-Mart in 2006 launched an aggressive "going green and organic" campaign that would greatly increase the number of organic products they offered with a price target of only 10% above the price for conventional counterparts. This market expansion and low pricing strategy has not only enhanced competition among food retailers in the United States but also encouraged consumers to rethink whether and where to buy organic foods: i.e. the choice of product type, organic or conventional, and the format of store in which the products were purchased.

Much research focuses on the rationales of how consumers make their store format choice (Bell et al., 1998; Bell & Lattin, 1998; Bhatnagar & Ratchford, 2004; Briesch et al., 2010; Ho et al., 1998; Hsieh, 2009; Hsieh & Stiegert, 2012; Messinger & Narasimhan, 1997; Tang et al., 2001). The studies show that the consumption in some product categories has stronger impacts on certain store format than the others when they are searching where to buy. In this research, we center our analysis on the other side of the question, that is, whether and how households patronizing different store formats would have different price sensitivities in making decision between organic and conventional alternatives for two dairy-case products. In particular, we examine the role of store format choice in households' consumption choice between organic and conventional alternatives for milk and eggs, two products that are purchased frequently by a large share of households and regarded as gateway goods for grocery retailers to attract consumers into stores.

Three major store formats are considered: A) value-oriented retailers (e.g. supercenters and price clubs) representing a super-cheap nontraditional shopping format characterized by low-pricing, broad assortment overall and especially in nonfood categories and low service; B) a format represented by traditional supermarkets and grocery stores, generally featuring promotional (HiLo) pricing, broad assortment in food categories and some service; C) high-end specialty stores (e.g. natural food supermarket chains) providing consumers with high-priced upscale product offerings and a higher level of service. To address the choices over all formats of retail outlets, we use a unique dataset collected by A.C. Nielsen, which covers the household purchases at any retail outlets including the retailers, such as Wal-Mart Inc. and Whole Foods Market Inc., that do not provide data to scanner data service firms. Our study is for a single large metropolitan area in a non-coastal U.S. city for a pair of two-year weekly samples, 2005-06 and 2007-08.

The remainder of the chapter is organized as follows. The next section contains an overview of the market background and trends, including the data, the consumer and retailer profiles and the consumption patterns of dairy products. Section 3 presents the model setup, estimation procedure and regression results for the consumption choice of organics. The last section contains a summary of our findings and their implications for marketing and farming decisions.

## **2. The market: Background and trends**

### **2.1 The U.S. organic food market**

Organic market has been one of the fastest growing markets in recent years. Aggregate organic food sales in the U.S. have maintained a 15-20% annual growth rate over the past decade. The report by (Organic Trade Association, 2009) indicates that the US sales of organic foods totaled nearly \$23 billion in 2008, which marks a 15.8% increase compared to sales in 2007 and is over 6 times of the sales in 1997. The organic penetration rates, defined as organic food as a percent of total U.S. food sales, have increased from 0.97% in 1997 to 3.59% in 2009 (see figure 1). According to (The Hartman Group, 2008), over two-third of U.S. consumers buy organic products at least occasionally and about 28 percent of these organic consumers are weekly organic users.

Figure 1 also shows that the traditional supermarkets and value-oriented retailers have become more important outlets where consumers shop for organic food as their market shares combined have increased from 30% to 46% over the past decade. On the contrary, sales of organic foods through natural food chains, such as Whole Foods Market and Wild Oats, and other independent natural food stores peaked at 68% of total organic sales in 1995. By 2005, the market share of natural food channels had however dropped to 47% of sales.

### **2.2 The data**

We use a multi-outlet panel dataset (Homescan by A.C. Nielsen) for a non-coastal U.S. city that covers a 208-week period between December 26, 2004 (hereafter January, 2005) and December 27, 2008. The dataset contains detailed purchase information for 6 food product departments (dry goods, frozen, dairy, deli, meat, and fresh produce) and over 600 product categories of food and non-food items sold in grocery stores or other retail outlets. The households report their purchases weekly by scanning either the Uniform Product Code (UPC) or a designated code for random weight products of all their purchases from grocery

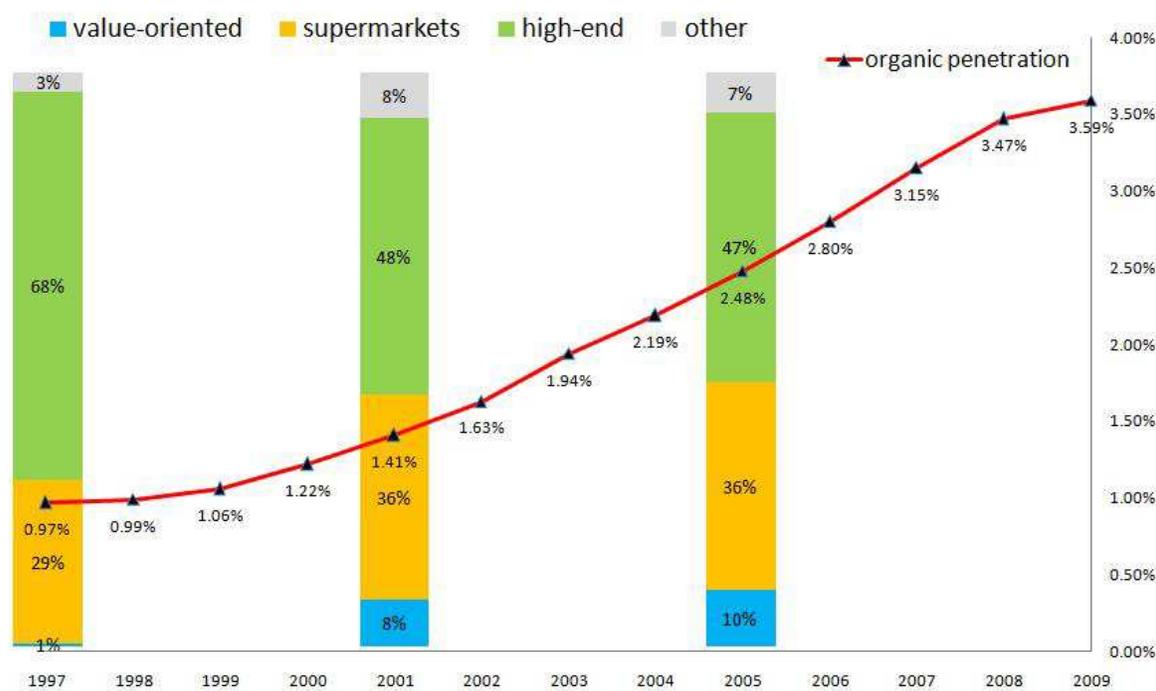


Fig. 1. The U.S. Organic Food Market, 1997-2009 (Organic Trade Association, 2007, 2009)

stores or other retail outlets. These purchase data include price, quantity, promotional information, and product characteristics. One of the product characteristics contained in the data is the identifier for organic products. For UPC-coded products, organic products can be identified by the presence of the USDA organic seal or with organic-claim codes created by A.C. Nielsen. For random-weight purchases, we use product descriptions to identify organic products.

	2005-06		2007-08	
	Mean	St Dev	Mean	St Dev
Number of households	710		942	
Number of shopping trips	161.34	101.80	137.83	86.75
Average spending per trip	23.06	24.67	18.40	20.44
Organic penetration rate (frequency)	1.20%	0.07	1.84%	0.10
Organic penetration rate (spending)	1.24%	0.08	1.93%	0.10
Household size	2.36	1.26	2.40	1.36
Income (\$0000s)	6.33	3.64	6.86	4.12
Some college educated	87.9%	0.326	88.1%	0.324
Married	57.9%	0.494	58.0%	0.494
Preschool children (age <6)	5.8%	0.233	9.8%	0.297
School-age children (age 6-18)	21.2%	0.409	21.8%	0.413
Elderly (age >65)	22.5%	0.417	22.3%	0.417

Table 1. The Consumer Profile, 2005-2008

Due to the inconsistency on the coverage of random weight items over the analyzed period, we separate the four-year period into two, i.e. 2005-2006 and 2007-2008. The shopping-duration criterion was applied to ensure that each panelist was faithful in recording purchases and remained in the panel for the entire period. The resulting dataset had 710 households with a total of 45,877 shopping trips in 2005-06 sample and 942 households with 48,469 trips in 2007-08 sample. The selected retail chains for our analysis include 2 value-oriented retail chains consisting of 29 (37) stores, 4 traditional supermarket chains featuring 172 (147) stores, and 1 high-end specialty supermarket chain with 6 (7) stores in our 2005-06 (2007-08) sample.

### 2.3 The consumer profile

Descriptive statistics of the consumer profile are provided in table 1. The statistics show that there were significant reductions in shopping frequency and basket size over the two sample periods, which may indicate a greater reliance on food away from home during the latter period. Our data may also pick up some impact from the economic downturn for the U.S., particularly in the latter half of 2008 when the housing related credit crisis began to pick up steam. In this trend of consumption reduction, organic food is however relatively less affected as its share to total food consumption has increased from 1.20%/1.24% to 1.84%/1.93% in terms of frequency/spending (dollar amount). We observe no significant changes in household demographics, with an exception that the percentage of household with pre-school children (age<6) had increased from 5.8% (2005-06) to 9.8% (2007-08) on average.

### 2.4 The retailer profile

Table 2 depicts the characteristic differences among the retailers of three store formats. Location or network wise, high-end specialty stores are much less accessible compared to the other two formats as shown in number of stores, share of trips, share of spending, as

	2005-06			2007-08		
	value-oriented	super-markets	high-end	value-oriented	super-markets	high-end
Number of stores	29	172	6	37	147	7
Ave. travel distance (miles)	9.02	8.87	16.96	8.74	9.54	14.45
Share of trips	19.32%	79.46%	1.21%	21.47%	78.11%	0.43%
Organic% in total trips	0.27%	0.78%	25.07%	0.80%	1.38%	35.07%
Share of spending	18.49%	79.69%	1.81%	21.34%	78.01%	0.64%
Organic% in total spending	0.32%	0.96%	21.91%	1.02%	1.66%	29.99%
<b>Pricing &amp; Discount</b>						
Price index (selected basket)	0.968	1	1.505	0.919	0.929	1.373
Organic PI (selected basket)	0.977	1	1.357	1.046	1.039	1.449
% discount (overall)	12.81%	40.12%	11.69%	10.25%	35.99%	9.51%
% discount (organics)	0.05%	0.29%	4.06%	0.08%	0.43%	3.42%
<b>Breadth &amp; Depth of Assortments</b>						
Ave. breadth (# UPCs) per store	2038	1505	659	1557	1517	201
Organic% in total breadth	0.79%	2.28%	25.84%	1.35%	3.62%	31.84%
Ave. variety per category	33.98	63.72	9.07	32.86	57.78	4.68
Organic% in variety	7.47%	8.35%	49.54%	8.91%	10.52%	61.03%

Table 2. The Retailer Profile, 2005-2008

well as by the average travel distance from consumer’s home to the store. However, it is documented that these high-end specialty stores are the major outlets for organic food, as their organic shopping rates are by far higher than those of the other two formats. In our selected sample market, traditional supermarkets remain the most important outlets among the three formats, although increasing market shares of value-oriented stores are observed in the data.

Regarding to pricing factors, we observe no significant price difference between value-oriented retailers and supermarket chains, but much higher prices at high-end specialty stores in both organic and non-organic alternatives. The data of discount use rates suggest that unlike the other two, traditional supermarkets promote promotional pricing. However, interestingly, we observed a much higher discount use rate applied to organic purchases at high-end stores than elsewhere. As to the coverage of product assortments, value-oriented retailers have broadest coverage but supermarket chains offer more varieties per category on average. The high-end specialty stores carried a much higher percentage of organic products in terms of both broadness and variety, but with a much small scale of assortments in general.

**2.5 The consumption of dairy-case products**

We select two staple dairy-case products, milk and eggs, as the center of our study. In our analyzed sample, milk was the most frequently purchased item in grocery shopping trips in both organic and conventional categories with shares of purchase frequency being about 20% and 3% respectively, while eggs ranked 9th (organic) and 10th (conventional) among all categories. In terms of dollar amount, the data (table 3) show that the expense shares were 5.5%~9.5% for milk and 1%~2.3% for eggs. As shown in table 3, we observe an increasing trend of organic penetration on both products – the share of organic food to total food expense increased from 6.0% to 10.3% for milk and from 0.6% to 1.3% for eggs. In addition, we observe significant drops in price premium of organic between the two periods of sample, which are likely to be associated with the market transitions that may have occurred due to Wal-Mart’s market expansion in 2006.

**3. The analysis: Consumption choice of organics**

**3.1 Data overview of consumption choice**

Figure 2 depicts the consumption choice for milk and eggs based on actual purchase data recorded in our analyzed market during the period of 2005-2008. The data show a fast-growing consumption pattern of organics in the case of milk and eggs. 7.68% of milk

	milk		Eggs	
	2005-06	2007-08	2005-06	2007-08
Ave. share in total expense per trip	5.5%	9.5%	1.0%	2.3%
Ave. product expense per trip	0.93	1.24	0.18	0.30
Ave. % organic in total product expense	6.0%	10.3%	0.6%	1.3%
Ave. price premium (milk \$/gallon, eggs \$/dozen)	2.76	2.26	1.69	1.33
Ave. % discount used for purchase	22.8%	17.9%	27.6%	13.8%

Table 3. The Shopping Patterns of Milk and Eggs, 2005-2008

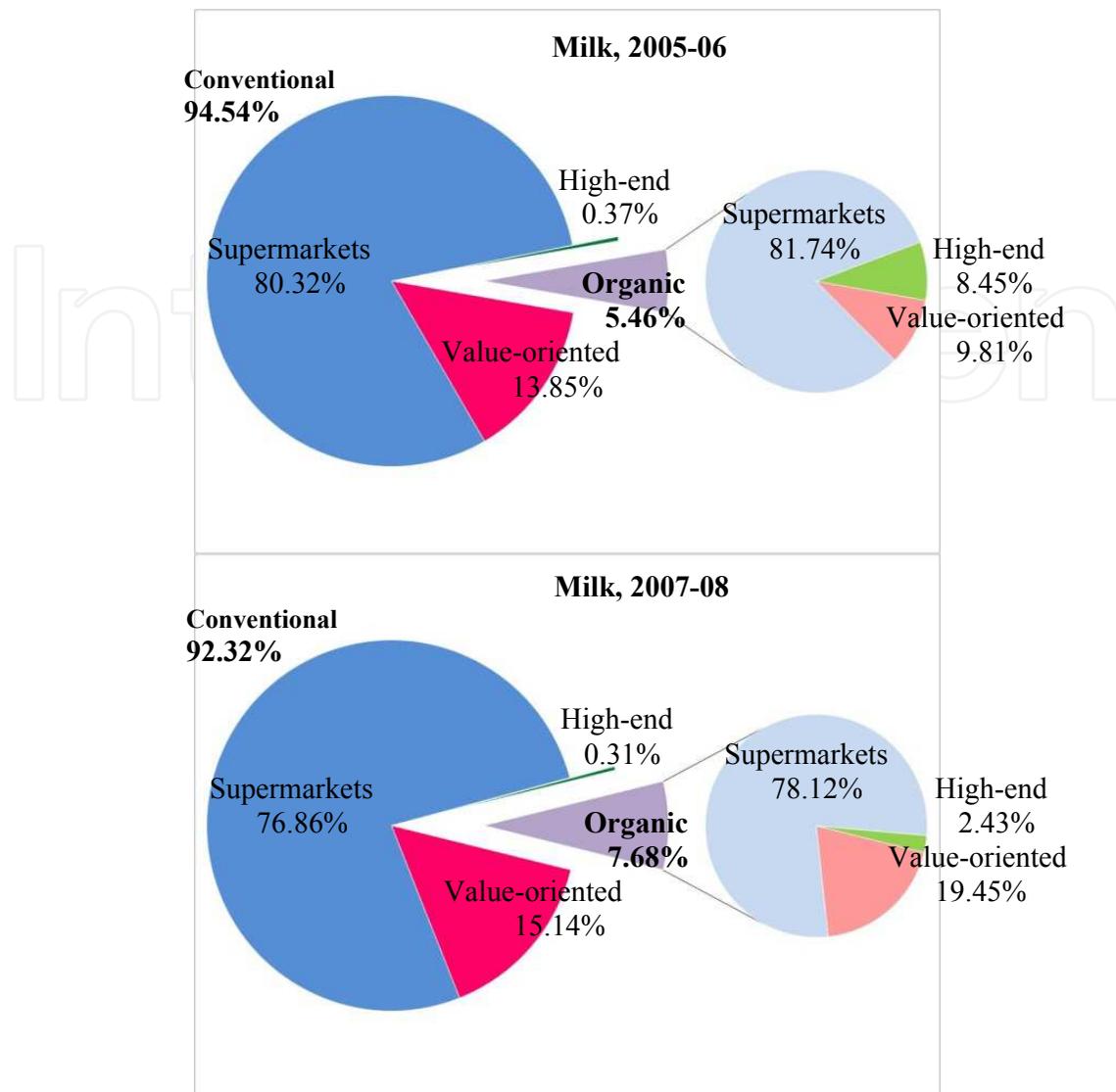


Fig. 2a. Consumption Choice by Store Format and Product Type for Milk, 2005-2008

purchase was organic in 2007-08, while organic milk purchase was only 5.46% out of total in 2005-06. In the case of eggs, organic choice though still accounts for only a small portion of egg purchase, its share has grown from 1.42% to 2.31%, which is over 60% of growth.

In terms of outlet choice, supermarket was the dominant store format of which consumers purchased their milk and eggs, accounting for 59.70% to over 80% of total number of transactions in all categories for both periods. We however observe a trend of market transition, in which consumers are switching their organic purchases from high-end specialty stores to value-oriented stores or supermarkets. In the case of milk, the value oriented retailers' share of organic milk doubled (increased from 9.81% to 19.45%) mainly at the expense of the high-end stores' sales: their share dropped from 8.45% to 2.43% between the two periods. This change reflects the marketing strategy by Wal-Mart and others to expand on organic offerings in 2006. The impacts are even more apparent in the market of organic eggs, as around 30% of consumers switched from high-end's to value-oriented stores and supermarkets for organic eggs purchase.

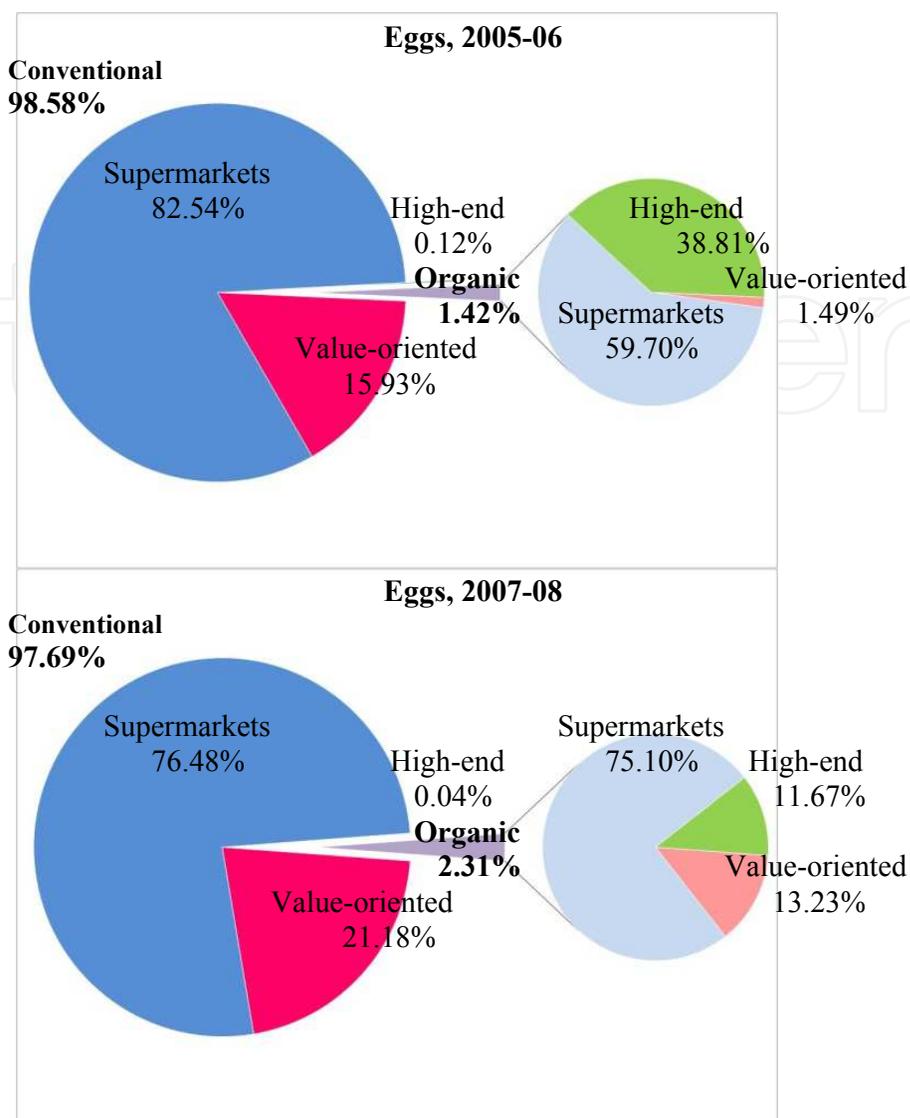


Fig. 2b. Consumption Choice by Store Format and Product Type for Eggs, 2005-2008

### 3.2 Econometric model specification

The choice between an organic versus a conventional food product is a typical binary discrete choice problem. Let  $U^o$  denote the utility of organic consumption and  $U^c$  that of conventional consumption. A common formulation of this kind of binary choice is the linear random utility model,

$$U^o = x' \beta_o + \varepsilon_o \text{ and } U^c = x' \beta_c + \varepsilon_c. \quad (1)$$

$$\text{Prob}[Y = 1 | x] = \text{Prob}[U^o > U^c] = \text{Prob}[x' \beta + \varepsilon > 0 | x], \quad (2)$$

where we denote by  $Y=1$  the consumer's choice of organic product ( $o$ ),  $x$  is a vector of the exogenous variables,  $\beta \equiv \beta_o - \beta_c$  is a vector of parameters (organic against conventional), and  $\varepsilon$  is a random error. In this chapter, we adopt the logit model setup, i.e. assuming that the probability follows the logistic distribution,

$$\text{Prob}[Y = 1 | x] = e^{x'\beta} / (1 + e^{x'\beta}) + \varepsilon = \Lambda(x'\beta) + \varepsilon, \quad (3)$$

where  $\Lambda$  denotes the logistic cumulative distribution function.

The elements of exogenous variable set ( $x$ ) include the price premium of organic versus conventional products in the store at trip  $t$  (price premium), the discount use rate (% discount), days between trips, distance between consumer's home and store (distance), number of stores within the shopping range by format, total spending and organic percentage in other items purchased in the same trip, income and household demographics. The set of demographic characteristics includes household size and dummy variables identifying the percentages of 1) college educated householder, 2) married householder, 3) family with preschool children, 4) family with school-aged children, and 5) the elderly. In addition, we include household's format loyalty to three formats alone and their interaction terms with price premium variable to allow for differential price sensitivity and fixed component of utility to differ among households with differentiated preferences over formats. In addition, we employ the same set of demographics described above for preference heterogeneity.

In sum, the complete empirical specification of organic choice model is as follows:

$$\begin{aligned} \text{Prob}[Y = 1 | x] = & \Lambda(\sum_f \beta_{1f} \text{loyalty}_f + \sum_f \beta_{2f} (\text{price premium} * \text{loyalty}_f) \\ & + \beta_3 \% \text{discount} + \beta_4 \text{days between trips} \\ & + \beta_5 \text{distance} + \beta_6 \text{total spending of the trip} \\ & + \beta_7 \% \text{organic in other items of the trip} \\ & + \beta_8 \text{income} + \beta_9 \text{household size} \\ & + \beta_{10} \text{college educated} + \beta_{11} \text{married} \\ & + \beta_{12} \text{preschool children} + \beta_{13} \text{school - age children} \\ & + \beta_{14} \text{elderly}) + \varepsilon. \end{aligned} \quad (4)$$

Definitions and measures of variables are summarized in table 4 and further discussed in next subsection.

### 3.3 Estimation procedures and measures

Within each set of two years, we use the first 26 weeks as our "initialization" period to identify shopper types and format-specific indexes to avoid potential endogeneity between quality and store format choices. The remaining 78 weeks were used as the "estimation" sample. The estimation is based on every shopping trip of households with shopping duration being no longer than 30 days during the estimation period at seven major retail chains in the market.

*Format Loyalty.* The format-specific loyalty for a household is represented by the percentage of trips that the household made to the format during the initialization period. Specifically, we use the following standard measure of loyalty ( $FL$ ) used also by (Bell, Ho, and Tang 1998; Briesch, Chintagunta, and Matzkin 2010):

$$FL_{h,f} = (NV_{h,f} + 0.5) / (\sum_f NV_{h,f} + 1) \text{ for } f = A, C \quad (5a)$$

and

$$FL_{h,B} = 1 - FL_{h,A} - FL_{h,C} \tag{5b}$$

where  $NV_{h,f}$  is the number of visits to format  $f$  stores by household  $h$  during the initialization period. This index reveals the shopper’s preference toward a specific format due to probably the familiarity about the store layout, the general prices and assortments, and the convenience and quality of service, based on his/her past shopping experience.

*% Discount.* We use household discount use rates, calculated from the household purchase information during the initialization period, to capture their preference between promotional pricing (HiLo) and everyday low pricing (EDLP). We expect a household with a high rate would prefer the format in which stores/chains use HiLo pricing instead of EDLP, and otherwise for low-discount-use households.

Variable	Definition	2005-6	2007-8
Milk			
Y (choice)	1 if organic, 0 if conventional	1.94	1.92
price premium	organic price – conventional price (\$)	0.01	0.01
%discount	1 if any discount (sale or coupon) applied, 0 otherwise	0.23	0.18
%organic in other	% of organic/total expense in other items of the trip	0.23	0.19
Eggs			
Y (choice)	1 if organic, 0 if conventional	1.98	1.98
price premium	organic price – conventional price (\$)	0.23	0.19
%discount	1 if any discount (sale or coupon) applied, 0 otherwise	0.27	0.15
%organic in other	% of organic/total expense in other items of the trip	0.29	0.29
loyalty (value-oriented)	% of trips that household made to the format (value-oriented, supermarkets, high-end) during the initialization period	0.18	0.22
loyalty (supermarkets)		0.81	0.77
loyalty (high-end)		0.01	0.01
days between trips	number of days between two shopping trips	5.05	5.63
distance	the distance between consumer's home and store	9.16	9.39
total spending	total transaction amount recorded for the shopping trip	23.10	16.99
income	household income (in \$1,000)	6.38	6.89
household size	number of persons in the household	2.34	2.39
college educated	1 if householder is college educated, 0 otherwise	0.89	0.89
married	1 if married householder, 0 otherwise	0.57	0.57
preschool children	1 if family has child(-ren) aged <6, 0 otherwise	0.06	0.11
school-age children	1 if family has child(-ren) aged 6 ~18, 0 otherwise	0.23	0.24
elderly	1 if householder is aged 65 and above, 0 otherwise	0.24	0.23

Table 4. Description of Variables for Consumer Panel Households, 2005-2008

Rank	Description of Product Category
1	DAIRY-MILK-REFRIGERATED
2	BAKERY - BREAD - FRESH
3	CEREAL - READY TO EAT
4	SOFT DRINKS - CARBONATED
5	YOGURT-REFRIGERATED
6	FRUIT
7	SOUP-CANNED
8	COOKIES
9	VEGETABLES
10	EGGS-FRESH
11	PRECUT FRESH SALAD MIX
12	CANDY-CHOCOLATE
13	FRUIT DRINKS-OTHER CONTAINER
14	WATER-BOTTLED
15	BEEF
16	SNACKS - TORTILLA CHIPS
17	FRESH CARROTS
18	FRESH STRAWBERRIES
19	FRESH FRUIT-REMAINING
20	RICE - MIXES
21	FRUIT JUICE - APPLE
22	FRUIT JUICE-REMAINING
23	PREPARED FOODS
24	YOGURT-REFRIGERATED-SHAKES & DRINKS
25	FROZEN FRUITS
26	VEGETABLE JUICE AND DRINK REMAINING
27	MEAT PRODUCTS-IMITATION & ADDITIVES
28	FISH
29	WHIPPING CREAM
30	SEAFOOD-SHELLFISH

Table 5. Base Basket for Price Comparison among Store Formats

	Store Format	Value-oriented		Supermarkets		High-end	
	Shopper Type	Organic	Conv.	Organic	Conv.	Organic	Conv.
Milk	2005-06	18.81%	31.67%	38.07%	50.59%	56.46%	70.69%
	2007-08	19.92%	24.80%	30.03%	39.52%	51.51%	59.49%
Eggs	2005-06	275%	282%	265%	286%	290%	175%
	2007-08	106%	118%	132%	138%	233%	139%

Table 6. Organic Price Premium by Store Format and Shopper Type of Actual Purchase for Milk and Eggs, 2005-2008

*Price Index.* To generate the format-specific price index, we first select a comparable basket of items (30 product categories, see table 5 for the details) available for all three formats. After the basket is constructed, we then calculate the average household consumption pattern for the selected product categories in the basket from the initialization sample. Using these base quantities together with the format-specific category price indexes, we estimate the cost at each format, which we refer as overall price index.

*Price Premium.* Since we observe only the prices for the products chosen by the household, we use the following procedure to recover the “missing prices,” i.e. the ones for the alternative choice, and then construct the price premium of organic based on the price difference between the two. First, we look for the prices for the alternative at 1) the same store, 2) the top 3 stores that the household most frequently visited in the past, 3) the same store chain, and 4) the format of the specific store. We then use the average prices from the most relevant group of stores (i.e. in the above order) as the proxy for the missing prices of the alternative choice.

Table 6 summarizes the average price premium of organic versus conventional product (milk and eggs) by store format and shopper type based on the actual purchase of each transaction. The data show that price premium varies among stores of different formats and between organic and conventional shoppers. In particular, we observe that organic price premiums are at minimum in value-oriented stores, while high-end stores feature much higher organic price premiums. In addition, consumers who purchased organic products in general face the lower organic price premium compared to those who purchased conventional alternative at the outlets of the same store format, except for the case of eggs at high-end stores. We also observe sizably diminishing organic price premiums for all outlets over the two periods. For example, in the case of eggs, the organic price premiums in the value-oriented stores dropped from 275% to 106%, which is less than half of the former. The only exception is the case of organic milk purchased in the value-oriented stores, the price premium was 18.81% in 2005-06 and 19.92% in 2007-06. It likely indicates that organic price premium for milk may have reached the low-end retailers’ pricing constraint bounded by a certain level of markup above the high production costs of organics.

### 3.4 The regression results

Table 7 presents the parameter estimation results from maximum likelihood estimation (MLE) regression. Several key findings emerge from our analysis. The first three rows of table 7 reveal the statistical association between store loyalty and the likelihood of purchasing organics. The results are quite mixed yielding no clear conclusion about a discernable pattern of behavior. For example, consumers with higher loyalty to value-oriented stores were less likely to purchase organic milk in both periods. However, for eggs increasing loyalty did not affect the probability of purchasing organic in the early period (insignificant parameter estimate) but increased the probability of purchasing organics in the latter period. For supermarkets, increased loyalty is associated with a lower likelihood of purchasing organics in all periods for both milk and eggs. For high-end stores, increased loyalty led to an increased likelihood of purchasing organic milk in the early period but decreased probability in the latter period. Increased loyalty to high-end stores had no impact on organic egg purchasing.

When we look at loyalty with respect changes across the two time periods, there is a general pattern of increased organic purchasing in formats that have increased their organic offerings. Note that in the case of value-oriented formats and supermarkets, the parameters

	Milk		Eggs	
	2005-06	2007-08	2005-06	2007-08
loyalty (value-oriented)	-2.8573** (0.3431)	-1.2704** (0.2358)	-4.5387 (5.6458)	3.9902** (1.4506)
loyalty (supermarkets)	-1.8855** (0.1720)	-2.2079** (0.1708)	-3.7655** (0.9297)	-2.8702** (1.0625)
loyalty (high-end)	9.3185** (0.9229)	-4.8025** (1.1015)	-7.3624 (5.2753)	-4.8729 (3.5255)
price premium* loyalty (value-oriented)	-40.5001** (8.9784)	-4.1765 (6.0441)	-5.9651 (24.8313)	-32.2421** (9.4999)
price premium* loyalty (supermarkets)	-7.8783** (2.9340)	-3.3919 (3.7701)	4.8699 (3.8133)	11.6465** (3.3894)
price premium* loyalty (high-end)	105.6417* (44.9088)	76.3539* (35.2421)	43.8518 (23.4916)	16.6296 (11.7079)
% discount	-0.1066 (0.1436)	-0.2957* (0.1385)	-0.4048 (0.5430)	-1.7209* (0.7652)
days between trips	-0.006 (0.0118)	0.0179* (0.0074)	-0.0651 (0.0456)	0.0254 (0.0203)
distance	0.0018 (0.0024)	0.0060** (0.0021)	-0.0884** (0.0303)	-0.0305** (0.0118)
total spending of the trip	-0.0075** (0.0022)	-0.0021 (0.0018)	-0.0045 (0.0041)	-0.0260** (0.0073)
% organic in others items of the trip	0.1871** (0.0302)	0.2725** (0.0323)	0.3118** (0.0650)	0.4334** (0.0512)
income	0.0179 (0.0148)	0.0025 (0.0106)	0.2926** (0.0781)	0.0498 (0.0276)
household size	0.1850** (0.0618)	-0.0918 (0.0498)	-1.4851** (0.4480)	-1.0755** (0.2403)
college educated	-0.9139** (0.1410)	-0.0951 (0.1386)	1.0390* (0.5193)	-0.8338* (0.3437)
married	0.0433 (0.1174)	0.2235 (0.1254)	-0.8613 (0.5706)	0.2264 (0.3853)
preschool children	0.2939 (0.2139)	0.3032 (0.1585)	2.7129** (0.7454)	0.6898 (0.3979)
school-age children	-0.4939* (0.2209)	-1.0582** (0.1936)	-0.2508 (0.4016)	0.0025 (0.5546)
elderly	-1.6509** (0.2563)	-1.7207** (0.1736)	-2.4469** (0.6518)	-2.1501** (0.4944)
number of observation	13206	15685	4732	6750
log likelihood	-2895.0943	-4149.0844	-336.5629	-563.9128
Wald statistics (Prob> $\chi^2$ )	2080.53 (<0.001)	2680.72 (<0.001)	776.76 (<0.001)	989.14 (<0.001)
Pseudo R <sup>2</sup>	0.6837	0.6184	0.8974	0.8795

Note: The "conventional" is the base outcome for all variables. Robust standard errors in parentheses; \*, \*\* denote statistical significance at 5% and 1%, respectively.

Table 7. MLE Parameter Estimates for Choice of Organic Milk and Eggs

on loyalty are a) higher in the latter period compared to the former and b) statistically significant. This result seems to suggest a pattern of increasing acceptance among loyal shoppers that previously may not have sought out organics in the high-end stores. Additionally, increased loyalty in milk purchases in high-end store was highly associated with increased organic purchase in the early period while highly associated with decreased organic milk purchases in the latter period. This result suggests that shoppers loyal to high-end stores are either increasing the purchase of non-organic milk in the latter period or have shifted organic milk purchases to different formats.

As a second finding, we observe a differential pattern associated with the impact of price premiums that interact with loyalty. As the price premium for organic eggs rise, it significantly mitigates the impact of loyalty on purchases in the value-oriented format. However, we observe the exact opposite pattern on the impact of loyalty within the supermarket format: higher price premium correlate to an enhanced impact of loyalty on the likelihood of purchasing organic. The results suggest strongly the presence of quite different consumer attitudes about organic eggs across formats. In the value-oriented stores, loyalty and price consciousness seem to go “hand-in-hand” whereas in supermarkets, loyal consumers appear to have “switched” to perceive premiums as a measure of egg quality and are willing to pay the extra funds to obtain the brands with highest actual or perceived qualities. A similar pattern is noted for milk but the switch now occurs between the supermarket and the high-end store format: price premiums in the value-oriented and supermarket (high-end) formats mitigate (enhance) the impact of loyalty on the likelihood of purchases. Note, however, that this switching pattern tends to disappear in the latter period for milk while it is only present in eggs during the latter period. These different patterns are reflective of the rapid changes occurring in organic offerings and in the various rates of acceptance about organics across the entire food-at-home market.

Figure 3 and table 8 provide some examples to demonstrate the differences in fixed tendency (constant term) and in price sensitivity among households with different format loyalty tendency. Among the extreme cases of (A, B, C), i.e. households with 100% loyalty to single store format, A(value-oriented) is most price sensitive, while C(high-end) is least price sensitive. Type D(value-oriented+supermarkets) households feature negative price sensitivity for both milk and eggs in both periods, while other combinations do not necessarily yield negative price sensitivity. Using the mean values of format loyalty from our 2005-06 (H1) and 2007-08 (H2) samples, we find that the average household’s fixed tendency (constant term) to purchase organic over conventional milk was -1.90 in 2005-06 and -2.03 in 2007-08, implying conventional milk was the dominant choice with about 7.389 odds ratio versus organic alternative.<sup>1</sup> This average household has negative price sensitivity -12.12 in 2005-06 and -2.67 in 2007-08, meaning that a unit of price premium increase would reduce the odds ratio of organic over conventional by a larger amount in 2005-06 than that in 2007-08. For this average household, we however find a positive price coefficient in the case of eggs consumption, suggesting the higher price premium, the more likely the household would purchase organic eggs. This may be a result of differentiated perceived product quality. As already discussed, consumers may see the higher price of organic eggs as an indicator of better quality (i.e. Cadillac pricing).

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<sup>1</sup> The odds ratio of organic over conventional milk is about  $\exp(-2)=0.1353$ , of which the inverse ratio is 7.389.

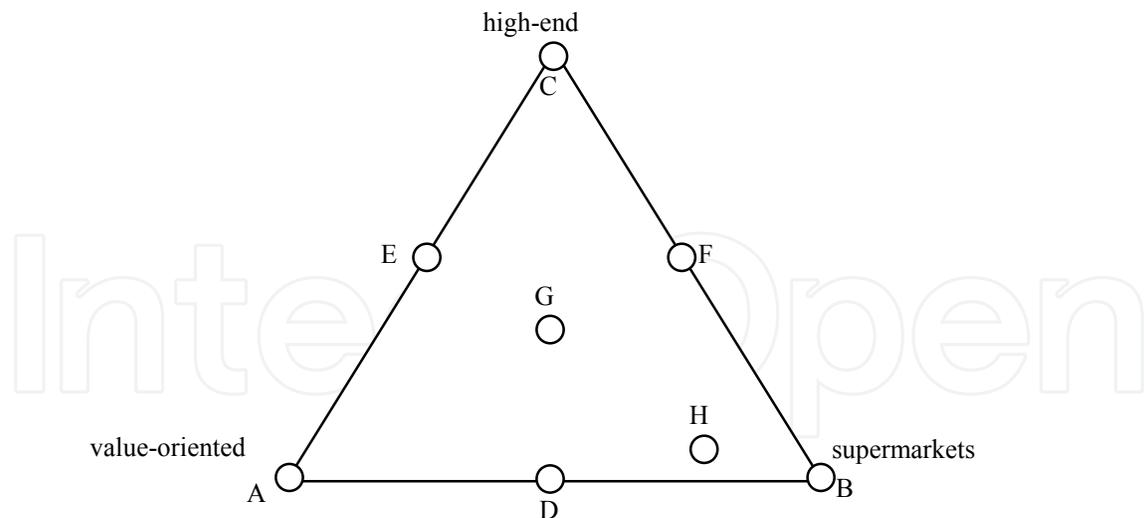


Fig. 3. Example Households with Specific Format Loyalty Tendency Combination

	Loyalty			milk				Eggs			
	value-oriented	super-markets	high-end	2005-06		2007-08		2005-06		2007-08	
				$\beta_1$	$\beta_2$	$\beta_1$	$\beta_2$	$\beta_1$	$\beta_2$	$\beta_1$	$\beta_2$
A	1	0	0	-2.86	-40.50	-1.27	-4.18	-4.54	-5.97	3.99	-32.24
B	0	1	0	-1.89	-7.88	-2.21	-3.39	-3.77	4.87	-2.87	11.65
C	0	0	1	9.32	105.64	-4.80	76.35	-7.36	43.85	-4.87	16.63
D	0.5	0.5	0	-2.37	-24.19	-1.74	-3.78	-4.15	-0.55	0.56	-10.30
E	0.5	0	0.5	3.23	32.57	-3.04	36.09	-5.95	18.94	-0.44	-7.81
F	0	0.5	0.5	3.72	48.88	-3.51	36.48	-5.56	24.36	-3.87	14.14
G	0.33	0.33	0.33	1.53	19.09	-2.76	22.93	-5.22	14.25	-1.25	-1.32
H1	0.18	0.81	0.01	-1.90	-12.12			-3.96	3.48		
H2	0.22	0.77	0.01			-2.03	-2.67			-1.37	1.96

Table 8. Differences in Fixed Tendency and Price Sensitivity among Example Households

Returning to table 7, we find that the households who prefer “discounts” or with larger basket sizes tended to purchase more conventional milk and eggs. Unsurprisingly, we find higher likelihoods for households that purchase other organic foods and with higher incomes to purchase organic milk and eggs. We did not find a clear indication for the impact of days between trips on organic choice. Households that traveled further to shop for food tended to favor the purchase of conventional eggs.

The coefficients of the remaining demographic variables show mixed results in general. Those consumers with a college degree tended to purchase fewer organic milk and eggs except in the first period for eggs. The consumers’ marital status shows no statistical impact as being a differentiating factor in their consumption choice of organics. We however find that organic eggs are more attractive to small households. In addition, families with preschool children are more likely to buy organics, while families with school-age children and the elderly households are more likely to choose conventional over organic milk or eggs. This is an interesting finding as it seems to suggest that the younger generation (parents) are more likely to consume organics, which is consistent with findings in many studies and marketing efforts focusing on organic infant foods and foods to attract the younger generation.

#### 4. Conclusion

In this chapter, we study the determinants of consumption choice between organic and conventional alternatives for two staple foods, milk and eggs. In addition to prices, consumer shopping behavior and demographic characteristics, we incorporate store format choice into our analysis to reflect variation in consumption choice among households patronizing different store formats. Using A.C. Nielsen Homescan data, we examine three store formats, value-oriented, supermarkets and high-end, for the duration of periods of recent major market transitions in the U.S. organic food markets.

The Homescan data recorded from our analyzed market confirm three common observations on consumption choice of organics for milk and eggs: 1) a rapidly growing demand for organics, 2) a trend of organic market transition from high-end specialty stores to general store formats, especially value-oriented stores, and 3) a sizable reduction in organic price premium for all retail outlets. Several key findings emerge from our regression analysis. First, we find much statistical support that the degree of loyalty within each format matters in terms of making organic choices. However, the patterns of association are very different and depend critically on the product, the time-period, the format being studied, and the sensitivity of price premiums on organic products. Our results strongly suggest that the market for organic foods remains very dynamic and inherently risky for upstream suppliers trying to gauge proper levels of commitments to organic supply. Unsurprisingly, we observe considerable price sensitivity to organics in the value-oriented formats suggesting that low price premiums are required to stimulate demand in these stores. Additionally, we found evidence of “Cadillac pricing” in the latter period for eggs: higher organic price premiums are associated with an increased likelihood of an organic purchase. We also find income, families with preschool children and organic penetration rate in other items purchased at the same shopping trip have positive impacts on choosing organic milk and eggs over their conventional alternatives. Finally, we find mixed results from other demographic factors, except that the elderly prefer conventional to organic on milk and eggs consumption.

In sum, we have presented a close connection between store format choice and consumption choice of organics. We show that store format choice, prices, as well as quality perception are important to consumer’s choice between organic and conventional food products. We have also documented the evidence from the actual purchase data on the impacts of recent economy down turn as well as marketing expansion made by Wal-Mart and others. These results provide useful insights for farmers and retailers in their marketing and developing decisions on organic agriculture.

#### 5. Acknowledgment

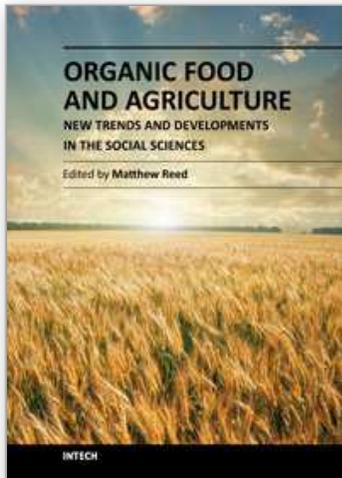
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## **Organic Food and Agriculture - New Trends and Developments in the Social Sciences**

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The global phenomenon of organic food and farming, after three decades of progress, faces new challenges as markets mature and the impacts of the global recession start to change consumers and farmers' expectations. This global survey of the organic food and farming considers how the social sciences have come to understand in what way consumers make their choices as they shop, and how new national markets evolve. It also surveys how established organic sectors in North America and Europe are changing in response to the changes, that in part, the organic movement has created. Moving from a wide range of social science disciplines, methodologies and perspectives, this book represents an excellent starting place for new readers, and offers innovation to those already familiar with the literature.

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Unit 405, Office Block, Hotel Equatorial Shanghai  
No.65, Yan An Road (West), Shanghai, 200040, China  
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元  
Phone: +86-21-62489820  
Fax: +86-21-62489821

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