Does Consumers' Preference for Organic Foods Affect Their Store Format Choices?

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Abstract

The U.S. organic food sector is rapidly increasing in the past decades and the organic food marketing has thus draw substantial research interests. However, the retailing sector, despite its key role in organic food marketing, is largely left out of current discussion. In this article, we aim to bring the retailing context back in organic food marketing research by examining whether consumer preference for organic food can affect choice of retailing format with Nielsen Homescan data in California. Our main findings are that regular organic user households are more likely to patronage organic specialty store and discount store whereas less likely to shop in warehouse club and the residual formats comprised of convenience store, dollar store and drugstore. Price, consumer loyalty and household shopping behavior also have the expected effects on household retail format choice. This finding has strong managerial implication for retailers and farmers. The current USDA programs in promoting organic agriculture can also be improved by accounting for organic retailing.

Keywords: organic, preference, retailing, store format, scanner data

Introduction

The U.S. organic sector has seen strong growth in the past decades with sales increasing from 3.6 billion dollars in 1997 to over 39 billion dollars in 2014 (OTA, 2014). Though largely driven by consumer demand, the growth in the organic sector is also boosted by government policies. On one hand, the National Organic Program was established within the USDA Agricultural Marketing Service in 2002 to regulate organic product certification and labeling at the federal level, which is essential for this credence attribute. On the other hand, developing organic agriculture becomes one main component of USDA's rural development strategies to increase farm income and mitigate the impacts of farming on the environment (Bagi and Reeder, 2012). The combined force of the private sector actors and the government has fueled the rapid growth of the organic market.

The rising organic trend drives an industry of studies on organic food demand and marketing. Identifying the profile of organic consumers and their motivations to buy organic food is the first priority. Though varies across products, regions and time under study, a typical organic consumer is characterized as being wealthy, young, educated and lives in the west region in the U.S. and the motivations for her to buy organic food include better food safety, health benefits and environmental benefits (Hughner, et al., 2007, Nasir and Karakaya, 2014, Zepeda and Li, 2007). In addition, the success of the organic sector crucially hinges on whether the price premium of organic food can be realized to compensate for the high production cost. The organic price premium thus draws intense scrutiny and its existence is confirmed for numerous organic products with both stated preference method of choice experiment and revealed preference method of

hedonic analysis (see Hu, et al., 2009 for WTP for organic blueberry jam, and Smith, et al., 2009 for organic fluid milk). Moreover, organic food demand has widely been studied, both independently or in a product group. (see Dettmann and Dimitri, 2009 for milk, and Zhang, et al., 2008 for fresh produce).

As the organic food demand increases, the organic food retailing is undergoing dramatic changes. Once available only in natural food stores or farmers markets, organic food can currently be purchased in many mainstream retailing stores (Quagliani, 2015). As a result, competition among retailers in the organic sector intensifies, leading to retailers' forming strategic marketing plans for their organic food. Whole Foods Market is historically a major seller of a wide selection of natural and organic food of high quality and high price. Facing intense competition in recent years, however, Whole Foods introduces a smaller format Whole Foods 365, aiming to offer consumers a limited selection of organic products at a lower price (Strom, 2015). Moreover, as early as 2006, Walmart announced its massive entry into the organic market with the aim to democratize the organic to the masses (Martin, 2014); its subsequent sale of the organic brand Wild Oats at prices comparable to conventional food in other retailers is seemingly supportive of its goal. Additionally, major discounter and club stores such as Aldi and Costco keep their pace with the organic trend by increasing their offering of organic food in their stores.

However, the retailing sector is largely left out yet it has an important bearing in organic food marketing. First, retailers have a better knowledge of consumer demand because they are the last actors in the food supply chain and they directly interact with consumers. With this knowledge, retailers can affect consumer demand for food including organic

food with a combination of marketing mixes in store. Moreover, the intangible store image of retailers is an essential element in affecting consumer perception of products offered in store and thus indirectly affect their demand (Lee and Hyman, 2008). Therefore, as organic food retailing going through major shifts, the current retail-agnostic approach might render an incomplete or even biased understanding of the organic food demand and marketing.

In this article, we take a small step in filling this gap by examining this question: whether consumers' preference for organic food affects their choice of retail formats. The answer to this question has direct managerial implications for the retailing sector in which stores of different formats compete intensely in the organic, and other food sectors as well. Also, for the organic food producers, this study could offer some guidance in their choosing marketing channels. Additionally, a better understanding of the organic food retailing is likely to improve the effectiveness of subsequent USDA policies and programs aiming to developing organic agriculture.

The remainder of this article is arranged as follows. Section 2 briefly reviews studies on organic preference and store choice to further motivate our research. Section 3 discusses the methodology employed followed by data description in Section 4. Section 5 demonstrates the main findings of the empirical model followed by a discussion of these results. Lastly, conclusions are made with further research suggestion.

Literature Review

We review two lines of studies. First, the studies suggesting relations between store/retail formats and consumers' preference or perception of organic food. Second, the store/store

format choice studies accounting for consumer organic preference, which lay the methodological foundation on which our study is based.

Retailer format and organic preference

Though systematic investigation is not abundant, the relation between consumer preference for organic food and store/retail format choice is frequently discussed in the literature. Thompson and Kidwell (1998) consider the possible linkage between consumers' two decisions: whether to buy organic food and whether to shop in cooperative or specialty grocery store and model the two dichotomous decisions jointly in a two-equation probit model. They find that local cooperative shoppers are more likely to buy organic foods and consumer with high propensity to buy organic food are more likely to shop from cooperatives. With the data from a consumer survey conducted in six traditional grocery stores and one specialty grocery stores spread across Ohio, Batte, et al. (2007) study the WTP for organic and other attributes of a breakfast cereal product. They find substantial sociodemographic differences between consumers patronizing these two types of stores and the WTP for 100% and 95% organic is 50% higher for specialty grocery shoppers than traditional grocery shoppers. These results may indicate that difference in organic food preference leads consumers to self-select into different store formats. Moreover, in their study of the demand character in two mature organic markets, Britain and Denmark, Wier, et al. (2008) find even though most of the organic food purchases are made in mainstream retail channels in both countries, heavy organic food consumers in Denmark express stronger confidence for organic foods bought at specialist stores, farm gates, market stalls or other direct selling channels.

From a slightly different perspective of brand choice, Ngobo (2011) models French consumers' organic food demand on a given store visit with a incidence/brand choice/purchase quantity model, and finds consumers are less likely to buy widely distributed organic brands that are generally sold in supermarkets and these brands are often perceived to be of lower quality. Therefore, French consumers associate organic products with specialty stores rather than conventional supermarkets. And Ellison, et al. (2016) further examine consumer evaluation of strawberries and cookies in Target and Walmart in an online experiment and find that Target is better at promoting organic cookies than Walmart while Walmart may only be suitable to sell organic strawberries. These results indicate that the perception of organic food is closely associated with store/store format images, which lends additional support to our hypothesized linkage between consumer organic preference and store/store format choice.

Store choice and Retail format choice

Retailers adopt distinct marketing mixes in pricing, promotion, location, product, and service to attract different segments of consumers and Arnold, et al. (1983) pioneers the studies examining the effects of retail marketing mixes on consumer store choice. However, due to their strong implications, price and promotion in store receive the most attention in this line of literature. Bell and Lattin (1998) find that large basket shoppers prefer stores with every day low price (EDLP) while small basket shoppers prefer stores with high-low pricing (HILO). This might be explained by small basket shoppers' flexibility to take advantage of price deals. Also with a scanner dataset in a medium sized French city, Volle (2001) find significant but weak short-term effect of store-level

promotions on store choice and thus called into question the practice of providing store-level promotion.

Despite the large body of literature on store/retail format choice, to the best of our knowledge, store/store format choices studies accounting for consumer organic preference are rare. Staus (2009) evaluates the effects of household attitudes towards fruit and vegetable quality, freshness, environment, advertising, organic and price on household retail format choice to buy fruits and vegetables. By estimating a mixed multinomial logit mode using Gfk German scanner data in the first six months of 2006, he finds that organic food is highly preferred in specialized stores than any other store format for households who love organic foods whereas for those households who do not love organic food, organic food in special store is similarly valued as that in large hypermarket. With Nielsen scanner data from 2005 to 2008 in an unidentified scantrack market familiar to the authors, Hsieh and Stiegert (2012) use an organic penetration ratio to proxy for the overall preference for organic food and food quality. They also model consumer store choice with a multinomial logit model and find substantial differences in the effects of relative prices of store formats on store choices between the groups of organic and non-organic consumers. Income effects also differ across the two groups whereas no differentiated effect is found for discount use.

We contribute to the meager understanding of consumer organic preference and its potential impacts on store format choice. By focusing on the largest organic market in the U.S., the Californian market in the recent years, our results are more relevant to the current U.S. organic sector which has been going through substantial changes.

Methodology

The logit-type models based on the random utility theory have long been the workhorse in modeling consumer discrete choices, two main applications in the agricultural economics literature are brand choice of packaged goods and recreational site choice. Consumers' store for grocery trips, though received less attention, can also be modeled within this framework. Extending the classic multinomial logit, González-Benito, et al. (2005) proposed a nested two-stage choice structure: consumers first choose among retail formats and then continue to choose a store within the chosen retail format. For retail format choice modeling, however, the first stage is sufficient. Staus (2009) and Dong and Stewart (2012) focused on the first stage in studying consumers' retail format choice for fresh produce and milk, respectively. We herein adopt a similar treatment.

Conditional Logit Model with Repeated Choices

We follow the conditional logit model proposed by McFadden (1974) whose original model is static and only one choice scenario is allowed for each individual. Given the panel structure of our data in which the entire grocery trips history is recorded for numerous households, the original model can be straightforwardly extended to allow for repeated individual choices.

According to the random utility theory, the utility household i derive from visiting retail format j in week t can be written as

$$u_{ijt} = V_{ijt} + \varepsilon_{ijt} \quad (1)$$

where V_{ijt} is the deterministic component whereas ε_{ijt} is the random component. Households choose the retail formats that yield the highest utility for them in each week.

Since both the attributes of the retail formats and characteristics of the households can affect household utility (Dong and Stewart, 2012), we further specify a general form of the deterministic component of household utility such that

$$V_{ijt} = \alpha_j + \boldsymbol{\beta} \boldsymbol{X}_{jt} + \boldsymbol{\gamma}_j \boldsymbol{Z}_{it} + \varepsilon_{ijt} \quad (2)$$

where $\boldsymbol{X}_{jt}$ is a vector of alternative-variant variables, representing the retail format attributes. The alternative specific intercept, α_j, captures all other attributes specific to each retail format, including product assortment and store image, etc. Note some of the variables in $\boldsymbol{X}_{jt}$ vary over time. By contrast, $\boldsymbol{Z}_{it}$ is a vector of household characteristics, most of which do not change across alternatives or over time. One exception is the loyalty variables which capture the household taste shift and other unobservable household characteristics; we will discuss more below. $\boldsymbol{\beta}$ and $\boldsymbol{\gamma}_j$ are the vectors of the unknown parameters.

Under the assumption that ε_{ijt} follow independent identical Type I extreme value distribution, it can be shown that the probability of household i visiting retail format j in week t is

$$\Pr(Y_{it} = j) = \frac{\exp(V_{ijt})}{\sum_{l=1}^{J} \exp(V_{ijt})}. \quad (3)$$

Given this derived probability and the history of households' retail format choices, we can estimate the conditional logit model of retail format choice with the maximum likelihood estimation (MLE). Denote $d_{ijt} = 1$ if household i visited retail format j in week t, and $d_{ijt} = 0$ otherwise; the log-likelihood function of consumer retail format choice can be written as

$$lnL = \sum_{i=1}^{N}\sum_{j=1}^{J}\sum_{t=1}^{T} d_{ijt} \ln \Pr(Y_{it} = j). \quad (4)$$

From the estimated coefficients, the marginal effects of the explanatory variables on consumers' probabilities of choosing each retail format are calculated for interpretation.

Model Specification

Given little theoretical works on relations between consumer preference and retail format choice, we specify our model based on prior store choice and store format choice studies, accounting for our main research interest. Four types of explanatory variables are included in our model: retailer marketing mix, consumer shopping behavior patterns, consumer sociodemographic status and consumer retail format loyalty. And the utility households derive from patronizing one retail format is explained with these variables.

First, as discussed above in Bell and Lattin (1998) and Volle (2001), price level and other marketing mixes have strong effects on consumer retail/retail format choice. And this result is further substantiated from the perspective of retail revenue (Fox, et al., 2004). Following these literatures and considering the limitation of our data, we focus on retail format pricing and control for the format price level in our model. On one hand, price level is the key consideration for households when having their grocery trips and higher price is generally associated with a disutility for the households. In addition, the competition among retail formats and the differences among them can be mostly reflected in their pricing. For example, big-box stores and other mass merchandisers offering substantially lower price than conventional grocery stores after controlling for brand, quality and package size (Leibtag, 2006, Leibtag, et al., 2010). On the other hand, some other marketing mix strategies are also of potential importance, such as store location and

store image, yet measuring these marketing mixes with our data is infeasible. Since many of these retail marketing mixes roughly stay constant over time, we thus leave them to be absorbed into the retail format dummy variables in equation (1).

A second category of explanatory variables characterize consumer shopping behavior and patterns. In particular, we are interested in the effect of organic preference on retail format choice and we define household organic preference as the percentage of organic produce and dairy products expenditure in total expenditure on these goods [1]. We expect household organic preference may influence its choice of retail format since different formats have distinct organic offerings and consumer perception about the retail formats varies substantially, as we discussed above. Moreover, the shopping cost is also an important factor in predicting household store or store format choice. A direct way to measure the shopping cost of one household involves measuring the distances between the household and the nearest store of each format. Since retailers of different formats strategically locate in different areas (grocery stores are usually near the main residential areas while warehouse clubs are generally located farther away from the residential areas), the distances and thus the shopping cost can vary substantially across retail formats. However, due to privacy reasons, we cannot explicitly measure the distance between households and retailers. Instead, we construct a variable of household shopping frequency to approximate the shopping cost one household may face under the assumption that households with higher shopping costs are likely to shop less frequently than those with lower shopping cost. In doing so, this shopping frequency is a household

[1] Produce including fruits and vegetables and dairy products are chosen due to their major shares among all organic food categories.

specific characteristic, possibly reflecting the relative location of households to the retailers. Additionally, coupon usage is another important consumer shopping behavior characteristic. Retail formats differ in their coupon offerings, resulting in two distinct pricing strategy: EDLP and HILO pricing. Thus, consumer preference for these pricing strategies may be accounted for by their coupon use frequency during their shopping trips. Besides these shopping behavior patterns, we also include key household sociodemographic variables in our model. Households with different social demographic profiles have been observed to have distinct preference in consumer choice studies and as discussed above, numerous academic and industrial research have been devoted to characterize a typical organic consumer.

Lastly, consumer choice is usually persistent in a repeated choice setting. That positive experiences from the past choices are passed down to future choice scenarios, prompting consumers to make the same choice offers some explanation to this phenomenon. Prior studies on consumer choices have extensively accounted for the choice persistence. One direct approach is to include the lagged choices in the deterministic component of the utility function (see Jones and Landwehr, 1988, Staus, 2009). After estimating the multinomial logit model, the effects of the lagged choices are revealed in the corresponding coefficients. In a dynamic utility maximization model with habit formation, Chintagunta, et al. (2001) further added theoretical foundation to the above practice by deriving the conditions under which dynamic utility maximization behavior yielded the above choice model. In the same vein, in a study of U.S. household cheese brand choice, Arnade, et al. (2008) found brand inertia for cheese brands and consumers are more likely to switch to those brands with strong brand inertia.

Alternatively and more importantly, the effect of choice persistence can also be accounted for with loyalty indexes. In their seminal study of household coffee brand and size choice, Guadagni and Little (1983) argued the history of past choices can reveal much of the consumer preference and thus proposed to use the brand loyalty variables defined as exponentially weighted sequences of previous purchases to capture the preference heterogeneity across households. Since they pooled the panel data when estimating the multinomial logit model, they further argued that the loyalty indexes also capture "a good part of the purchase-to-purchase dynamics", which can represent the household preference change during the study period. This approach has since then been widely applied in the brand choice literature and an application in store choice can be found in Volle (2001). One critique of this approach comes from Fader and Lattin (1993) who pointed out that since the variation in the loyalty variables does not distinguish between the preference heterogeneity across individuals and preference change over time, in the event of an abrupt preference change, earlier choice history reflected in the loyalty indexes could be of little relevance in predicting further choices. They thus proposed a new loyalty measure based on a Dirichlet-multinomial model which could allow abrupt preference change.

In this study, we follow the approach of Guadagni and Little (1983) and construct similar loyalty variables for each of the retail formats. In response to the criticism from Fader and Lattin, we argue that consumer preference for retail format is less likely to experience abrupt changes than the preference for brands due to the potentially higher cost of switching retail formats than switching brands. And two modeling considerations provide further justification for including the loyalty indexes. First, without the loyalty

indexes, consumer switching retail formats can only be explained by the price levels since they are the only time-variant variables in our model. This is an unlikely scenario because it rules out the possibility of a stationary preference change as discussed above. Second, it is plausible that some unobservable household characteristics beyond household shopping behavior patterns and sociodemographic status also affect household utility, and the effects of these characteristics can be captured by the loyalty indexes.

Data

We use Nielsen Consumer Panel Dataset in which a large and representative sample of U.S. households are chosen each year to record their purchases for personal and in-home uses for that year. Besides providing detailed information of the products they purchase via scanning the barcodes, panelist households are also requested to record basic information of the stores they patronize for all of their shopping trips. Though Nielsen does not provide names or the precise locations of the stores, retail formats of each store can be identified in the dataset which is sufficient for the purpose of this study.

The United States is one of the major markets for organic food globally and California is the leading state in organic production and sales in the U.S. (Klonsky, 2010). In order to avoid the possible effects of limited availability of organic food in some states on consumer retail format choice, we choose households in California in our analysis, which consists of four major scantrack markets defined by Nielsen: San Francisco, Los Angeles, San Diego and Sacramento. We further choose the latest data in 2013 and 2014 for our analysis. While the 2013 data is primarily used for initializing the retail format loyalty

variable and generating shopping behavior and pattern variables[2], only the 2014 data is used for model estimation. Additionally, to ensure that households keep recording during the study period, we include only households making grocery shopping trips at least once every month in 2013 and 2014 in the sample. Furthermore, since we are interested in main household grocery trips, we exclude shopping trips with only non-food item purchases and trips with less than five food item purchases. This results a final sample of 1236 households and 50583 main grocery trips in 2014.

Choice Set of Retail Formats

The Nielsen data contains 66 mutually exclusive retailing channels, among which grocery store, discount store, warehouse club store, convenience store, dollar store and drugstore are the mainstream retail formats. Besides these formats, direct marketing via farmers' market, pick your own, door to door and CSA is gaining momentum in organic food sale due to government policies in promoting local food. However, direct marketing is not included in the Nielsen dataset and its share is comparatively small, we therefore focus on the mainstream retail formats. Also it needs to be noted that pooling all grocery stores into one choice is unlikely to accurately reflect consumers' preference for grocery retail format because grocery stores differ substantially in their organic food offerings. For instance, stores like Whole Foods and Trader Joe's are specialized in supplying organic and natural food to their customers while other grocery stores may offer limited selections of organic food. Hence, with the assumption that organic specialty grocery stores offer more organic varieties and thus generate more revenues from organic food

[2] It is plausible for consumers who prefer to patronize a particular retail format to demonstrate certain shopping behavior, resulting in endogenous shopping behavior if the same dataset is used to generate these shopping behavior explanatory variables and estimate the choice of retail format.

sales, we divide grocery stores into two groups based on the share of organic produce and dairy sale to total sale in produce and dairy[3]: grocery stores with more than five percent of organic sale is categorized into the choice of organic specialty grocery stores and the remainder of the grocery stores are grouped as conventional grocery stores. In addition, convenience stores, dollar stores and drug stores are the marginal channels in food retailing and offers limited selection of organic food, we group these three retail formats into one choice and rename this group as the residual format. To sum, consumers in this analysis face five types of retailer formats, viz. organic specialty grocery stores, conventional grocery stores, discount stores, warehouse clubs, and residual.

Table 1 describes the basic features of the five retail formats in the Californian food retailing market in 2014. A first examination of the numbers of the retailer chains and stores reveals that the food retailing sector in California closely resembles a competitive market with numerous retailers competing within and between retail formats. With its largest number of stores, the conventional grocery store is the leading format in food retailing, accounting for 60% of the total household store visits. By contrast, the organic specialty grocery store is substantially smaller in both store visit share and store accessibility. Discounter stores and warehouse clubs have experienced strong growth during the past 15 years (Leibtag, et al., 2010) and they represent similar sizeable market

[3] Unlike our approach to categorize grocery stores based on organic sale, Hsieh and Stiegert (2012) used their own judgement to categorize stores into three types: value oriented retailers, supermarkets and high-end shops in a city with which they are familiar. While their approach may have some merits since they can use more information about the retailers, it necessarily introduces researchers' personal bias in perceiving the retailer types and it is not a systematic method that can be applied to study larger market areas, as the Californian market in this article.

share in our data. The remaining 7.6% is captured by the residual format comprised of convenience store, dollar store and drugstore.

Furthermore, product assortments differ substantially across retail formats. While most items sold in both formats of grocery stores are food, conventional grocery stores offer more choices to consumers. Like conventional grocery stores, discounters also carry a large assortment of goods, among which food only accounts for 46%. This is expected given the discounter strategy of satisfying consumer demand for one stop shopping. Warehouse clubs take a different strategy from discounter by offering a narrow product assortment yet most (76.6%) of the goods sold there are food. Since food is not the focus in the residual format, it carries a large assortment of goods while only 41.2% are food items. In terms of organic food marketing, it is hardly surprising that organic specialty grocery stores offer the most organic choices and generate the largest share of revenue from selling organic products. Though conventional grocery's organic share is half of that in organic specialty store, it is still higher than the rest of the retail formats. These results support the ongoing organic trend in the food retailing sector, especially in grocery stores. Interestingly, despite its limited selection of organic products in store, warehouse club has a 6.1% share of organic sale, only after organic specialty stores. This might be a result of the bulk purchasing in warehouse clubs.

Explanatory Variables and Measures

To operationalize the explanatory variables in the previous chapter, we discuss the construction of these variables and measures in this section. We also provide descriptive statistics for these variables.

Format Price Index To measure the price level in each of the retail format, we adopt a method similar to the one employed in constructing Consumer Price Index (CPI). A basket comprised of the twenty most frequently purchased product modules by the households (see Table 2) is first selected [4] and the total prices of this basket in each retail format and in the market are calculated. The price index is then calculated as the total price of the basket in each of the format normalized by the total price of the same basket in the market. Specifically, the price index takes the following form:

$$PI_{jmt} = \frac{\sum_{g=1}^{20} \bar{p}_{gjm}^{t} \bar{q}_{g}^{t}}{\sum_{g=1}^{20} \bar{p}_{gm}^{t} \bar{q}_{g}^{t}} \quad (5)$$

where $\bar{q}_{g}^{t}$ is the average quantity of household purchase of product g in week t in 2013. And $\bar{p}_{gjm}^{t}$ is the average price of product module g in format j in scantrack market m in week t in 2014 while $\bar{p}_{gm}^{t}$ is the average price of product module g in market m in week t in 2014. Note that the price indexes vary across format, market and change over time.

As is shown in Figure 1, the price indexes show some similar patterns in the four scantrack markets. First, the price index is the highest in organic specialty stores, indicating price level in these stores are generally 1.5 and 2 times higher than the market price level. This is consistent with their high-end store images and price premiums of the organic products. Except for the relatively low warehouse club price index in the San Francisco market, the format with the next highest price index is conventional grocery stores, followed by discount stores and other stores. Also note that price index is fairly

[4] The choice of the basket is subject to researchers' judgement. However, if too few products are chosen, it is unlikely that the calculated price index would reflect the general price level in a store format whereas if too many products are chosen, prices can be missing for some products in the basket in some store formats, rendering the calculated price index inaccurate. We choose the twenty most purchased products to maintain a balance between the two scenarios.

stable for conventional grocery stores because they have the largest share in food retailing and thus have the largest impact on the market price index used for normalizing price indexes. Similar stability is observed for the discounter, which might be a result of the every-day-low-price strategy generally adopted there. In contrast to conventional grocery and discounter, price indexes in the organic specialty store and the warehouse club have shown substantial changes over the weeks. The high-low pricing could be responsible for the fluctuation.

Household Shopping Behavior and Sociodemographic Status Table 3 summarizes the household shopping behavior and sociodemographic variables discussed above. We use the share of expenditure on organic produce and dairy products in the total expenditure on these products to measure household preference for organic food. A majority (76%) of households spent less than 3% (sample mean) on organic and we categorize them as trivial organic users. While for those households with more than 10% expenditure on organic, they are regular organic users, accounting for 8% of the total households. The remaining are referred as occasional organic users. Hence, the organic market is seemingly still a niche market. Moreover, an average of 5.95 days is between two trips and it differs substantially across households. Finally, we measure the household coupon use as the percentage of items purchased with coupons for a household during the study period and as is shown that an average of 8% household purchases are made with coupons. One caveat in the sociodemographic variables, however, is that households in our sample seem to be slightly richer and elder.

Format Loyalty Index As discussed in the previous chapter, the exponentially weighted loyalty variable for household i patronizing retail format j at week t takes the form:

$$LOY_{ijt} = \lambda LOY_{ijt-1} + (1 - \lambda)\, d_{ijt} \quad (6)$$

where λ is the smoothing parameter, following Guadagni and Little's terminology and $d_{ijt} = 1$ if i visited j in t, and 0 otherwise. As shown in equation (6), the loyalty variables are weighted averages of the past choices, and the variation of the loyalty variables across households reflect preference heterogeneity for particular retail formats. In addition, loyalty variables are updated in each week depending on consumer choices in that week so that household stationary preference change is reflected.

As mentioned above, we use the data in 2013 to initialize the price indexes and we start the indexes by setting $LOY_{ij1} = 1$ if household i patronizes format j in the first week in 2013, otherwise $LOY_{ij1} = 0$. For the smoothing parameter in the loyalty index, in their original paper, Guadagni and Little (1983) used an iterative method to choose the smoothing parameter: a trivial value of λ is first chosen to estimate the model, followed by the estimation of a new model with the loyalty variable replaced by ten dummies indicate the previous ten choices and then λ is updated with by fitting an exponential decay curve to the coefficients of the above dummy variables. Fader, et al. (1992) also proposed an iterative method by linear approximating the loyalty index with Taylor expansion. Most studies employing the loyalty indexes have their smoothing parameter set between 0.7 and 0.9. Following this, we specify $\lambda = 0.85$ to calculate the loyalty indexes and the estimation results are largely robust to the specification of λ in its neighboring range based on a grid search we performed.

Results and Discussion

To test the validity of our model specification, we estimate another two models that are nested in our full model and perform log likelihood ratio tests for model selection. First, a model without household shopping behavior and sociodemographic variables is estimated, and the LR test statistic is 386.42 with 52 degrees of freedom, rejecting the null hypothesis that all coefficients of shopping behavior and sociodemographic variables are zero. This result highlights the importance of including these variables in explaining household retail format choice, in contrast to Staus (2009)'s claim that the influence of sociodemographic variables is small. Also even though Guadagni and Little (1983) argued that their proposed price indexes can capture much of the preference heterogeneity across households and thus numerous studies applying their loyalty indexes did not control for the household characteristics, our test here shows that the influence of household shopping behavior and sociodemographic status on retail format choice is not fully captured in the loyalty indexes. A second model without loyalty indexes is estimated and the LR statistics is 42210.59 with a degree of 1, also rejecting the hypothesis that the coefficient of loyal index is zero. This result supports our use of loyalty indexes as discussed in the model specification section.

The estimated coefficients from the conditional logit model are reported in Table 4 and the marginal effects of the explanatory variables on the probability of patronizing store of each format is reported in Table 5. Our model generally performs well: the predicted probabilities are comparable to the store visit frequency shares described in Table 1, though conventional grocery store is slightly overestimated. And that our price indexes are not able to vary over individuals might explain the price index coefficient is only

significant at 15%. We focus on interpreting the marginal effects. As expected, for each format, an increase in its price index decrease the probability of patronizing that format and increase the probability of patronizing the alternative formats. The conventional grocery store is the most elastic to own-price change. By contrast, an increase in the loyal index for one format leads to increasing probability of patronage that format. This result highlights the strong effect of household preference captured in the previous purchasing history on household choosing retail format.

The household preference for organic food affects the choice of the retail formats. As expected, comparing with occasional organic users, trivial users are less likely to choose the organic specialty store whereas regular users are more likely to patronize it, other things being equal. This finding is consistent with an organic specialty store's feature of offering a wide selection of organic food. The organic preference, however, does not have significant effects on consumer choosing conventional grocery. This could be explained by the fact that conventional store is the largest retail format to buy food items for all households regardless of their organic food preference. Furthermore, the discounter's efforts in democratizing organic food may contribute to regular organic users' preference for discount stores. In addition, a nonlinear relationship could exist between organic preference and warehouse club patronage: trivial and regular organic users are less likely to shop in this format than occasional organic users. One unique feature of the warehouse club is that households need to buy wholesale quantity of products in store, and we expect this feature is against regular organic users' pursue of freshness and healthfulness embodied in organic food, thus resulting their less patronage. Additionally, regular organic users are less likely to purchase in the residual format,

which could be explained by their limited assortment of organic food and their store images that are hardly associated with the premium organic food.

This result has direct managerial implication for the retailing stores in their competition in the organic food sector. Besides increasing the organic offerings in store to cater to consumers' increasing demand for organic foods, retailers might also pay attention to influence consumer perception about their specific format, especially for warehouse club. Also this result is useful for organic food producers, processors and distributors when they plan the marketing of organic food, particularly produce and dairy products. Additionally, this result may also suggest that consumers do not understand the meanings organic food in isolation from the retailing context. Since all organic food is produced according to the same USDA standard and certified by National Organic Program, organic consumers should be indifferent where they buy their organic food. Consumer education about organic food and USDA organic programs might be needed.

As the average interval between trips increases, households are more likely to patronize conventional grocery stores while less likely to patronize organic specialty grocery stores, warehouse clubs and the residual format. As discussed above that interval between trips is used to measure the shopping cost one household faces and given the substantially smaller number of the organic specialty store and warehouse club, it is intuitive that households with higher shopping cost tend to reduce their cost by patronizing the more accessible retail format, that is, the conventional grocery store. However, it is surprising to find that longer interval also reduces the likelihood of patronage in the residual format, since it is not as difficult to access as the other two formats.

Among the sociodemographic variables, income has the most significant impacts on each format's patronage probability. Comparing with the lowest quantile, the fourth quantile households are more likely to patronage the organic specialty grocery store. This is expected given the high end market positioning of this format. Also, the income does not substantially affect conventional grocery store patronage. Similar argument as the organic preference can be made. Since grocery store has roughly 60% of the total store visits and households with various income levels have more than half of their grocery shopping in this format. Moreover, the higher the income, the more likely to shop in warehouse club and less likely in the discounter or residual format. In addition, if household head has a college degree, the household is more likely to shop in grocery stores and less likely in discount stores, this result echoes the demographic characteristics of a typical organic user.

Concluding Remarks

In this article, we examine the impact of household preference for organic food on its choice of retail format by modeling household retail format choice with an extended conditional logit model. We find that comparing with occasional organic users, regular organic users are more likely to patronize organic specialty stores and discount stores and less likely in warehouse club and the residual format comprised of convenience store, dollar store and drugstore. This finding directly supports that organic food is perceived differently in different retail format, possibly due to the store image associated with one format; and consumers' preference for organic food would affect where they do their grocery. Besides, pricing level and loyalty indexes are also important in affecting consumer retail format choice. Though the loyalty indexes proposed in Guadagni and

Little (1983) capture a large proportion of individual preference heterogeneity and change, they do not incorporate all household characteristics reflected in household shopping patterns and sociodemographic status, and thus accounting for the impacts of these variables on preference is also important.

A final note concerns the food demand analysis. Given the currently increasing product differentiation in the food sector and the evolving marketing channel, consumer food demand can be affected by a wider range of factors besides the traditional price and advertising. It is thus important not to ignore the effects of the new factors in the demand analysis.

Figures and Table

Figure 1 Price index in the main scantrack market in California

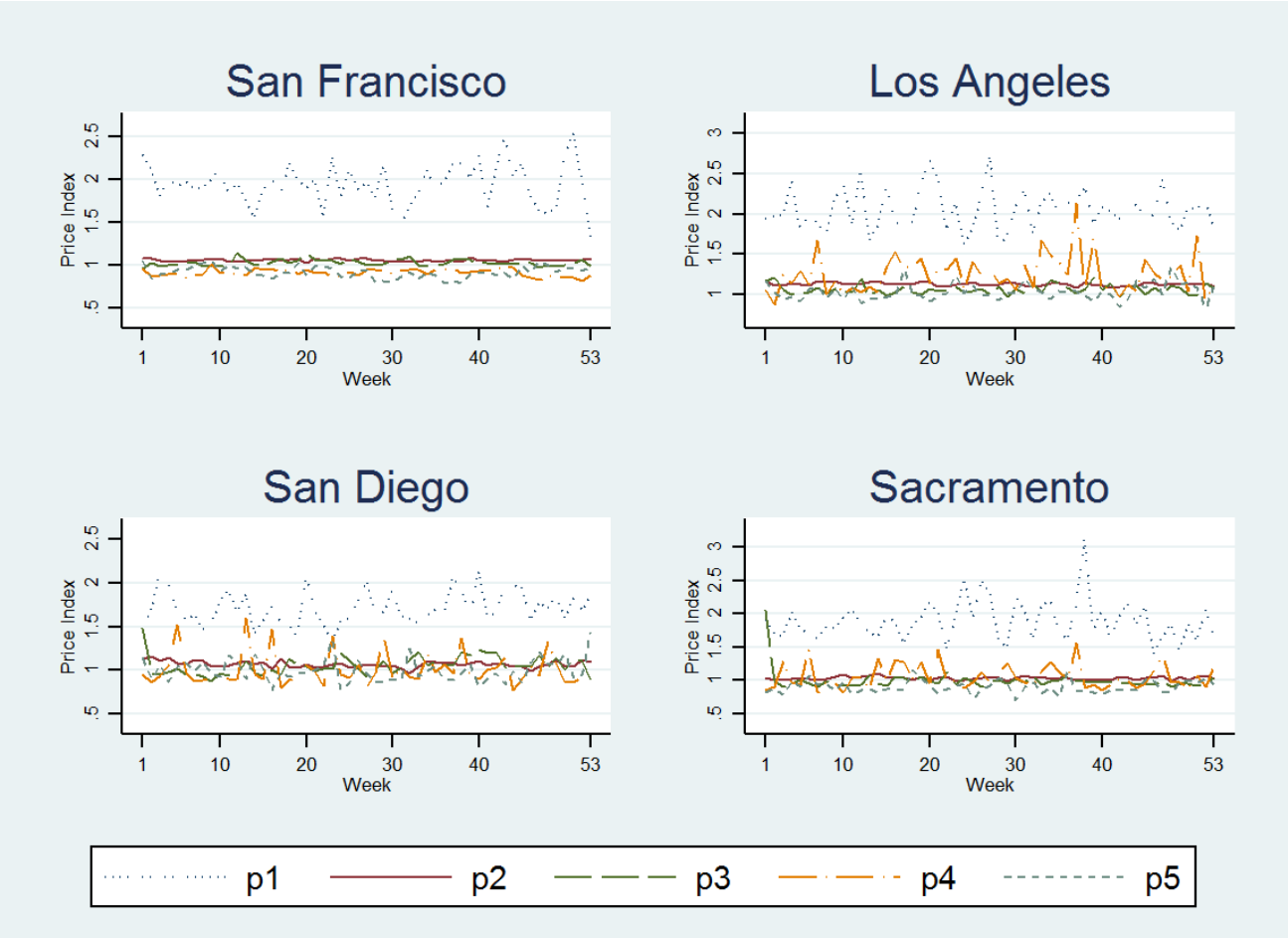

Table 1 Retail format

Retail format	Org. Specialty Grocery	Conv. Grocery	Discounter	Warehouse Club	Residual
Visits Share (count)	1.8%	59.6%	18.7%	12.2%	7.6%
Retail Chains (count)	13	69	12	6	70
Store (count)	341	2489	526	47	1493
UPC (count)	19631	110868	80108	20760	51945
Food Item (%)	88.5%	77.7%	46.2%	76.6%	41.2%
Organic Share (UPC count)	15.9%	7.7%	4.4%	4.0%	4.2%
Organic Share (Expenditure)	8.2%	2.9%	2.1%	6.1%	3.3%

Table 2 Product Module in Basket

refrigerated yogurt	bottled water
carbonated soft drinks	cookies
low-calorie soft drinks	potato chips
fresh bread	frozen Italian entrees
refrigerated milk	bulk ice cream
canned soup	precut fresh salad mix
fruit drinks	fresh eggs
ready-to-eat cereal	frozen novelties
remaining fresh fruit	frozen pizza
chocolate	pasta

Table 3 Descriptive Statistics (N= 1236)

Variable	Definition	Mean (SD)
$org1$	=1 if HH organic expenditure share of produce and dairy products is below 3%, 0 otherwise	0.76 (0.42)
$org2$	=1 if HH organic expenditure share of produce and dairy products is between 3% and 10%, 0 otherwise	0.16 (0.36)
$org3$	=1 if HH organic expenditure share of products and dairy products is above 10%, 0 otherwise	0.08 (0.27)
avg_int	average time interval between grocery trips (days)	5.95 (2.28)
$coupon$	coupon use ratio (%)	0.08 (0.12)
$inc1$	=1 if HH income is in first quantile, 0 otherwise	0.12 (0.33)
$inc2$	=1 if HH income is in second quantile, 0 otherwise	0.22 (0.41)
$inc3$	=1 if HH income is in third quantile, 0 otherwise	0.26 (0.44)
$inc4$	=1 if HH income is in fourth quantile, 0 otherwise	0.25 (0.43)
$hhsize$	household size (count)	2.45 (1.21)
$age1$	=1 if HH head age is below 40, 0 otherwise	0.05 (0.22)
$age2$	=1 if HH head age is between 40 and 64, 0 otherwise	0.59 (0.49)
$age3$	=1 if HH head age is above 65, 0 otherwise	0.36 (0.48)
$college$	=1 if HH head education is some college or above, 0 otherwise	0.55 (0.5)
$white$	=1 if HH head is white, 0 otherwise	0.73 (0.44)
$single$	=1 if single HH, 0 otherwise	0.13 (0.33)

Table 4 Estimation Result (N= 248615)

Variable	Conv. Grocery	Discounter	Warehouse Club	Residual
Alternative Variant Variables				
PI		-0.1010 ǂ (0.0693)		
loy		4.0964** (0.0257)		
Alternative Invariant Variables				
$org1$	0.634**	0.6378**	0.5345**	0.7063**
	(0.0956)	(0.1015)	(0.1007)	(0.1083)
$org3$	-0.1614	-0.0495	-0.3047**	-0.6553**
	(0.1126)	(0.1271)	(0.1252)	(0.1654)
avg_int	0.0811**	0.0596**	0.0304 ǂ	0.031
	(0.02)	(0.0208)	(0.021)	(0.0222)
$coupon$	-0.4071	-0.0477	0.2118	0.57
	(0.3666)	(0.3847)	(0.393)	(0.4118)
$inc2$	-0.1713	-0.2858**	-0.0933	-0.2773**
	(0.1318)	(0.1356)	(0.14)	(0.1405)
$inc3$	-0.1659	-0.1745	-0.0456	-0.3308**
	(0.1242)	(0.1284)	(0.1318)	(0.1345)
$inc4$	-0.5424**	-0.6187**	-0.3594**	-0.8012**
	(0.1285)	(0.1338)	(0.1367)	(0.1413)
$hhsize$	0.1657**	0.1803**	0.1647**	0.1473**
	(0.0435)	(0.0446)	(0.0451)	(0.0465)
$age2$	-0.131	-0.1657	-0.0889	0.0661
	(0.1446)	(0.1524)	(0.1595)	(0.1776)
$age3$	-0.2301	-0.2613 ǂ	-0.1069	0.0316
	(0.1583)	(0.1659)	(0.1729)	(0.1909)
$college$	-0.1554*	-0.2522**	-0.1953**	-0.1875*
	(0.0924)	(0.0955)	(0.0972)	(0.1008)
$white$	0.0769	0.0778	0.1636*	0.0755
	(0.0901)	(0.0937)	(0.0948)	(0.0997)
$single$	0.0128	-0.005	-0.121	-0.0463
	(0.132)	(0.1374)	(0.1449)	(0.145)
$const$	-0.0214	0.4492 ǂ	0.3617	0.1693
	(0.2747)	(0.2853)	(0.293)	(0.3101)
Likelihood		-33976.942		

Note: Standard errors in parentheses. **, * and ǂ indicate significant at 5%, 10% and 15% respectively.

Table 5 Marginal effect

	Org. Specialty Grocery	Conventional Grocery	Discounter	Warehouse Club	Residual
Probability	0.0150	0.702	0.1344	0.0930	0.0557
PI_1	-0.0015 (0.001)	0.0011 (0.0007)	0.0002 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)
PI_2	0.0011 (0.0007)	-0.0211 (0.0145)	0.0095 (0.0065)	0.0066 (0.0045)	0.0039 (0.0027)
PI_3	0.0002 (0.0001)	0.0095 (0.0065)	-0.0117 (0.0081)	0.0013 (0.0009)	0.0008 (0.0005)
PI_4	0.0001 (0.0001)	0.0066 (0.0045)	0.0013 (0.0009)	-0.0085 (0.0058)	0.0005 (0.0004)
PI_5	0.0001 (0.0001)	0.0039 (0.0027)	0.0008 (0.0005)	0.0005 (0.0004)	-0.0053 (0.0036)
LOY_1	0.0605 (0.0028)	-0.0431 (0.002)	-0.0083 (0.0004)	-0.0057 (0.0003)	-0.0034 (0.0002)
LOY_2	-0.0431 (0.002)	0.8571 (0.006)	-0.3866 (0.0048)	-0.2673 (0.0042)	-0.1601 (0.0033)
LOY_3	-0.0083 (0.0004)	-0.3866 (0.0048)	0.4767 (0.0059)	-0.0512 (0.0011)	-0.0307 (0.0008)
LOY_4	-0.0057 (0.0003)	-0.2673 (0.0042)	-0.0512 (0.0011)	0.3454 (0.0053)	-0.0212 (0.0006)
LOY_5	-0.0034 (0.0002)	-0.1601 (0.0033)	-0.0307 (0.0008)	-0.0212 (0.0006)	0.2153 (0.0044)
$org1$	-0.0093** (0.0013)	0.01 (0.0074)	0.0024 (0.0054)	-0.0079** (0.0038)	0.0048 ǂ (0.0031)
$org3$	0.0028* (0.0016)	0.0164 (0.0123)	0.0182** (0.0089)	-0.0112* (0.0062)	-0.0262** (0.0067)
avg_int	-0.001** (0.0003)	0.0082** (0.0013)	-0.0013 (0.0009)	-0.0036** (0.0007)	-0.0021** (0.0006)
$coupon$	0.0036 (0.0054)	-0.1168** (0.0233)	0.026 (0.017)	0.0421** (0.0143)	0.0451** (0.0107)
$inc2$	0.0027 (0.0019)	0.0081 (0.0077)	-0.0139** (0.0052)	0.0083* (0.0048)	-0.0053* (0.003)
$inc3$	0.0024 (0.0018)	-0.0023 (0.0077)	-0.0016 (0.0053)	0.0109** (0.0046)	-0.0094** (0.0031)
$inc4$	0.0081** (0.0019)	-0.0003 (0.0084)	-0.0103** (0.0059)	0.017** (0.0048)	-0.0144** (0.0035)
$hhsize$	-0.0025** (0.0006)	0.0011 (0.0024)	0.0022 (0.0017)	0.0001 (0.0014)	-0.0009 (0.001)
$age2$	0.0018 (0.0021)	-0.0085 (0.0118)	-0.0063 (0.0079)	0.0028 (0.0069)	0.0103* (0.0058)
$age3$	0.0031 (0.0023)	-0.0177 (0.0125)	-0.0076 (0.0083)	0.0091 (0.0072)	0.0132** (0.006)

college	0.0026*	0.0114**	-0.0108**	-0.0022	-0.0009
	(0.0013)	(0.0057)	(0.004)	(0.0032)	(0.0024)
white	-0.0013	-0.0049	-0.0008	0.0074**	-0.0005
	(0.0013)	(0.0061)	(0.0043)	(0.0035)	(0.0026)
single	0.0001	0.0129	0.0001	-0.0107*	-0.0023
	(0.0019)	(0.0093)	(0.0063)	(0.006)	(0.0037)

Note: Standard errors in parentheses. **, * and ǂ indicate significant at 5%, 10% and 15% respectively. The marginal effects of all price indexes are significant at 15% and the marginal effects of all loyalty variables are significant at 5%.

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