What Is Special About Marketing Organic Products?

How Organic Assortment, Price, and Promotions Drive Retailer Performance

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July 24, 2012

The authors thank the managers at two large northeastern United States retail chains for providing valuable insights into the issues addressed in this paper. They also thank the Center for Relationship Marketing at the School of Management and the Baldy Center for Law and Social Policy at the State University of New York, Buffalo, for the data and support. They thank JM's editors and reviewers, seminar participants at the University of Groningen; and the 2008 BBCRST and INFORMS 2009 Marketing Science conferences for constructive comments.

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Abstract

Higher sales and margins are key goals for retailers promoting emerging products, such as organics, but little is known about their marketing effectiveness and their cross-effects on conventional product sales. Extant research reports conflicting results about price and promotional sensitivity for organic products and does not address the impact of organic assortment. This article calculates long-term own- and cross-elasticities of organic and conventional product sales in response to changes in assortment, price, and promotions. Using a rich data set of 56 categories, the authors test hypotheses on how different costs and benefits of organic products affect these elasticities. They find that enduring actions, such as assortment and regular price changes, have a higher elasticity for organics than for conventional products. In contrast with common wisdom, even "core" organic consumers are sensitive to these actions. Increasing organic assortment and promotion breadth yields higher profits for the total category, as do more frequent promotions on conventional products. Our category comparison yields specific advice as to where larger assortment, lower prices versus more and deeper promotions are most effective.

Keywords: organic products, food marketing, empirical generalizations, cross-category, assortment, marketing mix, vector autoregressive models

Faced with intense competition and razor-thin margins on mature products, retailers are constantly searching for the "next big thing"—that is, groups of products that attract customers to the store and also generate higher margins (CesIfo 2011). Such "emerging" product groups include deli, ready-to-serve entrées, health and wellness products (e.g., food supplements, weight loss bars), organic and natural foods (e.g., organic milk, natural yogurt), and private labels (*Beverage Industry* 2010; *Drug Store News* 2008; Food Marketing Institute 2009). Often, these product groups are first bought by a small group of devoted customers and then spread to the general shopper population. This creates challenges for the retailer because emerging and mature products are often substitutes in the same category. Apart from assessing the effectiveness of emerging categories for their marketing programs, retailers need to understand the intracategory cross-effects of promotion activities and their impact on overall category and store performance (*Progressive Grocer* 2008).

Nowadays, many retailers perceive a key opportunity in organic products, whose U.S. sales have grown 17%–21% each year, compared with 2%–4% growth in nonorganic (hereafter "conventional") product sales (*Progressive Grocer* 2009). The Great Recession has not dampened this growth (*Brandweek* 2009), which may be furthered by the appointment of an organics expert to the U.S. Agriculture Department's No. 2 post with a budget allocation of $50 million specifically to fund new organic initiatives. The majority of U.S. consumers eat organic products at least occasionally, and organic products are now available in over 70% of traditional supermarkets, such as Kroger and Safeway (The Hartman Group 2008).

Retailers hope that promoting organic products will increase total category margins and store revenues, in addition to enhancing stores' long-term image, equity, and differentiated positioning (*Chain Store Age* 2009). Our interviews with retail managers of two large northeastern United States supermarkets revealed their belief that organic products will become more established, thus generating tangible benefits for retailers that are willing to

invest in them. However, key questions remain on where such investments pay off most and how they affect conventional product sales and retailers' category and store performance.

Current marketing literature is rich in how consumers make trade-offs among different conventional products in a category and how price and promotions affect such trade-offs (e.g., Bijmolt, Van Heerde, and Pieters 2005; Sethuraman and Srinivasan 2002). However, retailers are unsure about how these general findings apply to organic products, given the mixed evidence on price elasticity (from –9.73 in Glaser and Thompson [2000] to –.001 in Kiesel and Villas-Boas [2007]), the surprising recent findings on promotional elasticity (negative in Ngobo [2011]), and the absence of research on how organic assortment benefits organic sales, category margin, and store revenues. Conceptually, some studies predict higher own marketing elasticities for organics because of the high price premium over conventional products (Glaser and Thompson 2000; Verhoef 2005). In contrast, Ngobo (2011) postulates lower own marketing elasticities (even of an opposite sign to conventional products) because consumers associate low prices and promotions with low-quality and "popular" products, jeopardizing the special status of organics. Indeed, research has not even established that cross-elasticities with conventional products are asymmetric in favor of (higher-priced) organic products (e.g., Blattberg and Wisniewski 1989; Sethuraman and Srinivasan 2002). Violating this general rule, the only econometric analysis on the subject reports asymmetry in favor of conventional products (Glaser and Thompson 2000). Finally, survey-based research indicates that consumer response to organic product marketing may differ by category and consumer segment. What is lacking is a large-scale study of what this means for the effectiveness of marketing organic products in driving organic sales and retailer performance.

Why might organics be "special" compared with other expensive products? Consumers state different motivations for buying and consuming organics, such as health, environment, and animal welfare concerns (Bourn and Prescott 2002; Fotopoulos and Krystallis 2002;

Makatouni 2002; Zanoli and Naspetti 2002). Consumers have also expressed skepticism whether these motivations can be fulfilled in mainstream supermarket chains, and researchers have questioned the use of traditional marketing actions to promote organics (Ngobo 2011). In this context, our specific research questions are as follows:

1) What is the long-term own-effect of assortment, regular price, discount breadth and depth, and price specials for organic products versus conventional products?
2) How does the marketing of organic products stimulate purchases across different levels of consumer organic usage (i.e., "core" organic vs. "noncore")?
3) How large are the cross-effects of organic product marketing activities on conventional product sales, and vice versa?
4) Which types of conventional products (i.e., top-tier and second-tier national brands, private labels) are affected the most by marketing actions of organics, and vice versa?
5) What is the effect of marketing organic products on category and store performance?

On the basis of the perceived benefits and costs of organics, we propose that enduring retail actions (assortment and regular price) generate higher consumer response for organics than for conventional products, but temporary actions do not. Our analysis across 56 categories identifies and quantifies how consumer response differs, which yields concrete insight for retailers into where and how to devote their marketing resources to increase category and store performance. In contrast with recent advice that retailers should keep organic prices high and avoid point-of-purchase promotions (e.g., Ngobo 2011), we find that organic sales increase strongly with lower regular prices, even for consumers with high intrinsic value for organics (the core organic segment). We also find substantial benefits of increasing organic assortment to overall category margin, especially in produce categories. In contrast with Glaser and Thompson (2000), we find that (price) promotions of conventional

products do little harm to organic product sales, thus offering specific guidelines to retailers on how to strike a balance between emerging and mature products.

More generally, this article contributes to the burgeoning literature on the marketing and consumer adoption of sustainable/ethical products (e.g., Henderson and Arora 2009). Recently, issues pertaining to sustainability have received considerable attention not only from governmental agencies (e.g., U.S. Environmental Protection Agency green product programs) but also from firms (e.g., Clorox Green Works), which are investing considerable resources into the design and marketing of products or initiatives that create long-term societal value (e.g., Kotler 2011). Thus, implications from our research are germane to the design of programs that influence public policy, resource management, and health behavior.

Research Background

Organic Food Products at Conventional Retail Outlets

Currently, consumers in the United States buy more organic products in traditional supermarkets than in other outlets (*TABS 2012*). At the same time, traditional supermarkets are increasingly promoting organic products through various in-store marketing programs (e.g., increasing variety, displays). Because organics have higher gross margins—30%–50% versus 20%–25% for conventional products (Oberholtzer, Green, and Lopez 2006; Roheim and D'Silva 2009)—promoting them should enhance total category profits and store revenues. However, academic literature has yet to verify such performance effects of marketing actions for organics, as it has focused instead on other supply-side and demand-side issues (Thompson 1998).

On the supply side, Dmitri and Oberholtzer (2009) find that organic farmers sometimes struggle to provide sufficient supply to keep up with the rapid growth in demand, and Ciu (2008) reports that some farmers have struggled to obtain the necessary certification to

market produce as organic. Finally, Tondel and Woods (2006) find that organic supply is becoming more competitive and efficient, lowering prices throughout the supply chain.

On the demand side, previous research falls into three broad categories: (1) self-report surveys and interviews that uncover the motivations for consumers to buy organic products, and the category factors that favor organic adoption, (2) studies on product health claims and labeling, and (3) econometric analyses of how individual household characteristics and retail prices affect panelist demand for organic products and their reaction to marketing for organic products. We discuss these in turn.

Why do Consumers buy Organic versus Conventional Products?

Motivations for buying organics include health reasons, environmental concerns, nutritional value and taste (e.g., Bourn and Prescott 2002; Fotopoulos and Krystallis 2002; Zanoli and Naspetti 2002) as well as considerations regarding ethics and animal welfare (Makatouni 2002). Some consumers also acknowledge that social approval plays a role in them buying organic products (Grunert and Juhl 1995). Self-reported obstacles inhibiting the purchase of organic products are their low availability / distribution, their price premium and consumer lack of knowledge (Bonti-Ankomah and Yiridoe 2006). Consumers often start with organics in categories such as produce, meat, and dairy, where they perceive higher benefits from going organic (Oberholtzer, Green and Lopez 2006; OTA 2009a).

How Does Product Labeling Affect Consumers Responses to Organic Products?

Studies in marketing have analyzed the role of product/nutrition claims in consumer food choices. Kozup, Creyer, and Burton (2003) report that consumers' positive attitudes toward products are enhanced when favorable nutritional (e.g., fortified with vitamins) or health (e.g., heart healthy) claims appear on the packaging. In the context of our study, organic product labeling and certification logos have been shown to play an important role in stimulating consumer appeal for organics. Using Rokeach's (1968) theory of value and halo

effects (Han 1989), Bauer, Heinrich, and Schafer (2012) report that organic labeling results in a higher level of perceived healthfulness, hedonism, environmental friendliness, and food safety. Janssen and Hamm (2012) hypothesize that because organic products are credence goods, a high degree of uncertainty is associated with them, and appropriate labeling might mitigate this uncertainty. Given this, third-party certification is superior because consumers have greater trust in independent certifiers than private manufacturers. However, not all types of labels are perceived to be the same by consumers. Generic organic labels, which typically list the word "organic" on either the brand or the product description, do not elicit the same kind of trust that organic certification logos do (e.g., the USDA seal). Moreover, Janssen and Hamm (2012) find that well-known and trusted certification logos command the highest price premiums. Similar findings are reported by Kiesel and Villas-Boas (2007), who find that consumer response in the milk category is higher for certification (USDA) logos than for organic labels or other markers (e.g., rBGH free), especially after the National Organic Program went into effect.

In this study, we consider organic products with the USDA seal (certification logo) and organic products without the USDA seal but with generic organic labels on the packages.

How Do Consumers React to Retail Marketing Actions for Organic Products?

A handful of studies use revealed data (typically scanner panel) to analyze how organic consumers react to retail prices. Glaser and Thompson (2000) report large price elasticity (between –3.63 and –9.73) for U.S. organic milk in the late 1990s. In contrast, Kiesel and Villas-Boas (2007) report small price elasticity (between –.001 and –.003) for U.S. organic milk in the 2000s. In the most recent study, based on French data, Ngobo (2011) finds that lower prices and wide distribution make shoppers *less* likely to buy organics up to a point; and concludes that organic products may be a poor fit for the typical marketing actions of

traditional retailers. In summary, the magnitude, and even the sign, of organic price elasticity remains an empirical question.

An issue with these studies is their representativeness for all the shoppers at a mainstream retailer. Relying on a panel of households, they further restrict the panel to account for the paucity of organic purchase observations as opposed to the conventional ones. Thus, they focus on the core organic consumer segment while ignoring the noncore segment, whose purchase of organics represents a key opportunity and challenge for retailers. Moreover, most of the previous studies analyze a few, mostly similar categories. Finally, they do not analyze the effects of increasing organic assortment, which is a relatively costly and enduring decision for retailers. These limitations impede actionable insights into what marketing actions retailers can undertake and in which categories to increase overall retail performance (e.g., by increasing organic sales without decreasing conventional sales).

This article contributes to this research stream by quantifying the long-term own- and cross-elasticities of organics and conventional product groups using store data across 56 categories spanning seven years. We next develop our hypotheses.

Hypotheses Development

We develop our hypotheses on the basis of consumers' perceived benefits and costs of buying organic versus conventional products. Perceived benefits of buying organics include health, nutritional value, taste, animal welfare, ethics and environmental protection (e.g., Bourn and Prescott 2002; Fotopoulos and Krystallis 2002; Makatouni 2002; Zanoli and Naspetti 2002). However, buying organic products represents a cost to a mainstream retailer's consumers because organic products are typically (1) more expensive than conventional products and (2) more difficult to find in the exact form, flavor, and quantity the consumer prefers (Michelsen et al. 1999). The former represents an out-of-pocket monetary cost, and the latter denotes a transaction cost to the consumer. Our key assertion is that consumers weigh the potential

benefits of organics by these costs, which are likely to endure throughout their future purchases of organic products. Indeed, assortments and regular prices are "sticky" compared with temporary actions such as displays, features, and promotions (Pauwels 2004). This assertion is grounded in previous literature on organics.

A regular, diverse, and accessible supply of organic products is vital for inducing higher organic sales (Silverstone 1993). The wider the assortment of organics, the greater is the likelihood of the availability of specific flavors and/or package sizes, which creates more opportunities for customers to buy them (Aertsens, Mondelaers, and Huylenbroeck 2009). Reduced distribution would create more transaction costs, making it less worthwhile for the typical retailer's consumer to buy them (Campo, Gijsbrechts, and Nisol 2000). Likewise, if consumers perceive the price of organics as high, they will be less willing to purchase them (Michelsen et al. 1999; Verhoef 2005; Zanoli and Naspetti 2002). Thus, organics capture a larger category share when their price premium over conventional products is relatively low (Wier et al. 2003).

Would temporary actions such as price promotions, feature, and display have the same effect? They may if they represent a buying incentive as strong as assortment and regular price changes, with less potential for perceived quality erosion (Delvecchio, Henard, and Freling 2006). However, we assert that temporary actions will be less effective for organic products, which represent a more enduring involvement. Previous research has shown that consumers choose organics as a means of achieving important life values (Makatouni 2002). Therefore, consumers are likely to consider not just the costs and benefits at the current purchase situation (for which an organic product may be available at a low promotional price) but also the future likelihood that they can buy a suitable organic product at a reasonably low price. In sum, enlarging assortments and decreasing (regular) prices, but not increasing temporary promotions, should be more effective for organics than for conventional products.

H_1: The long-term own-elasticity of sales to (a) assortment and (b) regular price is higher for organic products than for conventional products.

The extent to which such enduring costs represent obstacles to buying organics should depend on the strength of a consumer's conviction regarding the benefits of organic products. Although it is typically not cost-effective for mainstream retailers to survey all shoppers on this matter, they can infer such conviction from revealed preferences (i.e., the consumer's general purchase patterns of organic products). Core organic consumers frequently buy organic products, revealing a higher intrinsic value for organic over conventional products. Previous research has shown that such consumers tend to be socially conscious (e.g., show higher environmentally orientation) and also exhibit a greater concern for their health (Zanoli and Naspetti 2002). Consumers with such values should be less sensitive to the enduring costs of limited assortment and the high price of organic versus conventional products in any specific category. In contrast, noncore organic consumers have little experience with organics in general. A limited assortment and/or high regular price may be key deterrents for buying a specific organic product. Thus, the lower intrinsic value of organics should translate into a higher sensitivity to regular price and assortment.

H_2: The long-term own-elasticity of organic product sales to (a) assortment and (b) regular price is lower for core organic consumers than for noncore organic consumers.

Next to their intrinsic preference for organics, consumers' sensitivity to organic marketing may also depend on the perceived cost/benefit trade-off in a specific *category*. Category-specific costs include the category's expensiveness and share of the consumer's wallet and the organic price premium (over conventional products). Moreover, perceived costs of trying new, expensive products are lower in impulse purchase categories, which should stimulate organic sales. Perceived benefits from buying organic are greater for products with higher purchase frequency and products that are directly related to taste,

environmental, animal welfare, and local farmer concerns (Fotopoulos and Krystallis 2002; Makatouni 2002). Such direct-from-the-farm categories include produce, dairy, meat, and poultry products (Davies, Titterington, and Cochrane 1995; Verhoef 2005). The health benefits of organic products are also more congruent with virtue products (connected with self-control goals) than with vice products, which provide immediate gratification (Wertenbroch 1998). Finally, storable products are visible longer at home to consumers (and their friends and family), which increases the salience of organic benefits. Note that previous literature has discussed the impact of such category characteristics only on organic appeal and sales (i.e., a main effect), not on consumer response to marketing in such categories. We expect that greater organic appeal in a category may also translate into higher consumer reactions to organic marketing in that category.

When organic marketing activities succeed in raising organic sales, how will this affect the *sales of conventional products* in the same category? Consumers may simply add the organic product to their shopping basket (e.g., when a newly introduced organic product adds a salient attribute to the category) (Boatwright and Nunes 2001). Impulse-buy categories are especially prone to this behavior. In general, however, such "free lunch" for the retailer is unlikely: Consumers tend to focus on the perceived value of organic *versus* conventional products and thus substitute the conventional product with the organic product (Durham and Andrade 2005; Kiesel and Villas-Boas 2007). Thus, successfully promoting organic products should reduce demand for conventional products in the same category.

Cross-elasticities with conventional products should be asymmetric in favor of *higher-priced organic products* if, as we believe, the asymmetric price competition literature applies (Allenby and Rossi 1991; Blattberg and Wisniewski 1989; Kamakura and Russell 1989; Sethuraman and Srinivasan 2002; Sivakumar and Raj 1997). In addition, if organic products bestow intrinsic quality benefits to the consumer (e.g., provide health benefits, taste better),

switching back to conventional product would represent a loss in those benefits, which consumers aim to avoid (Bronnenberg and Watthieu 1996).

H_3: Long-term cross-effects are asymmetric; organic marketing activities hurt conventional products sales more than vice versa.

Finally, which type of conventional products should experience most harm from organic marketing activities? In addition to the price-tier effect (e.g., Nowlis and Simonson 2000), previous literature has shown that brands whose prices are closer have higher cross-price effects than brands that are priced farther apart (Sethuraman and Srinivasan 2002; Sethuraman, Srinivasan, and Kim 1999). Thus, we maintain that organic marketing activities will hurt sales most for brands that are more similar to organic brands in terms of expense — first top-tier national brands, followed by second-tier national brands and private labels.

Methodology

Our research questions suggest a methodology for analyzing marketing effects on sales and aggregate retailer performance (sales revenues and profits), while accounting for potential marketing endogeneity. Therefore, we choose the persistence modeling approach (Dekimpe and Hanssens 1995), which has previously been applied to long-term marketing effectiveness for conventional products (e.g., Nijs et al. 2001; Pauwels, Hanssens, and Siddarth 2002), offering a basis for comparison. This approach involves four steps. First, unit root and cointegration tests investigate whether the performance and marketing variables are stationary, evolving, or cointegrated (Enders 2004; Johansen, Mosconi, and Nielsen 2000). Second, based on the test results, we estimate a vector autoregressive (VAR) model or a vector error correction (VEC) model (Dekimpe and Hanssens 1999). Third, we compute impulse response functions, which track the effect of a marketing variable on the performance variables of interest over time (Pesaran and Shin 1998). Fourth, we perform a

weighted least squares regression of the estimated long-term elasticities on the product category factors, using the inverse of their standard errors as weights (Srinivasan et al. 2004).

The econometric specifications are well documented in previous literature (e.g., Trusov, Bucklin, and Pauwels 2009). The researcher chooses (1) the endogenous variables that are explained by the model, (2) the exogenous variables that may affect the endogenous variables but are not themselves affected, and (3) the lag length (p), based on the Bayesian information criterion, which trades off prediction accuracy and model complexity. After model estimation, we perform the required diagnostic checks on the residuals (Franses 2005) and report on the explanatory power of each model. The VAR model has the general specification shown in Equation 1 for each category (e.g., Srinivasan et al. 2004):

$$Y_t = A + \sum_{i=1}^{P} \Phi_i Y_{t-i} + \Psi X_t + \Sigma_t,\ t = 1, 2....T \quad (1)$$

where Y is the vector of endogenous variables explained by its own past (thus, the term "vector autoregression"), A is the matrix of intercepts, X is the vector of exogenous variables (seasonal dummies, holiday[1] dummies, and a time trend) to control for factors unrelated to marketing, and Σ is the full variance–covariance matrix of residuals. To address our research questions and run validation checks, we estimate VAR models with different variables in the Y vector of endogenous variables, as detailed in the Appendix.

We assess H_1 and H_3 in our sales model, which connects organic and conventional product sales with their respective marketing actions. Thus, the endogenous variables in the model are (1) the logarithm of assortment size, unit price, promotion breadth, promotion depth, and price specials, respectively, for organic and conventional products (marketing variables) and (2) the logarithm of volume sales for organic and conventional products (performance variables).

[1] The holidays are Easter, Memorial Day, Independence Day, Labor Day, Halloween, Thanksgiving and the week after Thanksgiving, Christmas, and New Year's.

We assess H_2 by replacing the two performance variables with organic and conventional sales from the core organic and noncore organic segments. We assess which conventional brands are hurt most by replacing conventional sales and marketing variables with the corresponding variables of first-tier national brands, second-tier national brands, and private labels. To avoid overparameterization in this model, we use price and assortment and promotion breadth and depth separately as endogenous variables, while including the remaining marketing variables as exogenous. Finally, to analyze store performance, we replace the performance variables with category profits and store revenues. Further models investigate the robustness of our findings to, respectively, quadratic price effects, social influence, different definitions of "organic" products, and store heterogeneity.

After VAR model estimation, we obtain long-term marketing elasticities through generalized impulse response functions (Pauwels, Hanssens, and Siddarth 2002). We calculate the "long-term marketing elasticity" (because we have a log-log model specification) as the cumulative effect (i.e., summing up all significant impulse response coefficients). Note that we do not recalibrate the model for insignificant impulse response values, as these are derived from the estimated coefficients (Pauwels 2004). In the final step, we use the estimated long-term marketing elasticities (LTE) in the weighted least squares regression (using the inverse of their standard errors as weights) to investigate how they are related to the category characteristics (Nijs et al. 2001; Srinivasan et al. 2004):

$$\mathrm{LTE}_i = \beta_{0i} + \beta_1 VIRTUE + \beta_2 DMP + \beta_3 PRODUCE + \beta_k Z_i + \eta_i \quad (2)$$

We include in Equation 2 the virtue nature of the product (*VIRTUE*) and whether the category is of the type corresponding to dairy, meat, and poultry (*DMP*) or produce (*PRODUCE*). In addition, we include the characteristics related to category purchase frequency, storability, impulsivity, category expensiveness, market concentration, category share of consumer wallet, organic price premium (over conventional price), organic penetration (current base)

and organic growth rate, which may capture unobserved category-specific factors. We collectively refer to these variable as (the vector) Z_i in Equation 2. Our operationalization of the category drivers appears in Table 1.

---------- *Insert Table 1 about here* ----------

In addition to persistence modeling, we examine the relations of interest with the Koyck model (Franses and Van Oest 2007), which allows for all same-week effects specified in the VAR model and for some dynamic marketing effects through autoregressive and moving average terms. Equation 3 shows the Koyck model for organic sales (Org_Vol_t):

$$\begin{aligned} Org\_Vol_t = {} & \mu + \delta_1 Org\_GP_t + \delta_2 Org\_PB_t + \delta_3 Org\_PD_t + \delta_4 Org\_PS_t + \delta_5 Org\_Ast_t + \delta_6 Con\_GP_t \\ & + \delta_7 Con\_PB_t + \delta_8 Con\_PD_t + \delta_9 Con\_PS_t + \delta_{10} Con\_Ast_t + \lambda_1 Org\_Vol_{t-1} + \xi_t - \lambda_2 \xi_{t-1} \end{aligned} \quad (3)$$

The independent variables in the equation—Org_GP_t, Org_PB_t, Org_PD_t, Org_PS_t, Org_Ast_t and Con_GP_t, Con_PB_t, Con_PD_t, Con_PS_t, Con_Ast_t—refer to regular price, promotion breadth, promotion depth, price specials, and assortment for organic and conventional products, respectively. We estimate the same Koyck model specification with conventional product sales as the dependent variable. Maximum likelihood estimation yields the coefficient estimates for the models (Franses and Van Oest 2007). Compared with the VAR model, the Koyck model is more parsimonious but imposes exponential decay (versus more flexible dynamic effects, such as wear in and wear out), and the feedback effects among the performance and marketing variables are absent. The presence of such feedback effects is investigated with Granger causality tests (Granger 1969).

Data

The data come from a large retail chain in the northeastern United States that operates 75 stores. The store-level data contain purchase transactions for volume sales, actual prices, and retailer/manufacturer discounts for each stockkeeping unit (SKU). In addition, we have data pertaining to the costs (or wholesale prices) for each SKU for the entire chain, which enables

us to calculate retailer gross profits. Using this information, we compile a data set that spans 355 weeks (January 2004 to October 2010) across the 49 food and 7 nonfood categories (for detailed data description, see the Appendix).

We analyzed all food and nonfood categories in which the retailer had at least two organic SKUs. All food organic SKUs have the USDA seal, which is permitted for two classes of products: 100% Organic and (at least 95%) Organic (the seal is not permitted for two other classes, "Made with Organic Ingredients" and "Less than 70% Organic Ingredients"). In the case of nonfood products, USDA labeling is mostly absent, so we use the Organic and Made with Organic Ingredients classification instead.

Because the focal retailer follows a chain-level strategy with respect to assortment, pricing, and promotions, we decided to aggregate the data from the store level to the chain level, as well as from the SKU level to the product group (organic vs. conventional) level in each category. We operationalize weekly assortment as the number of unique SKUs the retailer carries. Price is operationalized as price per unit calculated for each SKU and then share weighted by the SKU market share using constant weights for each store (Pauwels and Srinivasan 2004). We define promotion breadth as the percentage of SKUs that are promoted in a given week for a given store. To obtain the promotion depth variable, we first calculate the per unit dollar discount, which is the difference between the promotion price and the regular price. We define the regular price as the average of the previous four nonpromoted prices (see Hendel and Nevo 2006). We then obtain the promotion depth as a percentage by dividing the unit dollar discount by the unit regular price. Price specials capture the feature and display activities and are set to 1 if a particular SKU is on a price special; we then aggregate them to the category level using constant weights for each store. We aggregate all the variables to the chain level using store sales as weights.

In our analysis, we considered all organic and conventional SKUs. The focal retailer has actively marketed organics since 2004. The organic products are stocked both near the conventional products and in specially designated sections of the store (the retailer uses a mix of integration/separation strategies with respect to organics). Moreover, store features contain advertising for both organic and conventional products, and displays are used for both types of products throughout the store. Thus, consumers are exposed to the marketing activities of both organics and their conventional counterparts.

Marketing activity differs substantially for organic versus conventional products, but also across categories at the focal retailer. We find that product assortment for organics is 25% of that for conventional products, on average, with their largest assortment (both absolute and relative to conventional products) being in processed food categories (e.g., cereal, cracker, jams /jellies) and the smallest in produce. The gross prices for organics are higher than those of conventionals in each category, but this price premium varies substantially. Notably, conventional products experience more promotional activity: promotion breadth, depth, and frequency of price specials. Again, the differences between categories are striking; for example, organic products are on price specials quite often for dairy, produce, cereal, salad dressing, and jams/jellies. Retail margins are, on average, 25.18% higher for organics; this difference is the highest for frozen pizza and the lowest for grapes. Average annual growth rates for organic products are approximately 17.85% versus 2%–3% for conventional products, in line with U.S. trends during the analysis period (Organic Trade Association 2009b). Organic penetration ranges from a high of 27.71% (greens: salad/others) to a low of .35% (cheese), while organic premium ranges from a high of 182.30% (eggs) to a low of 5.72% (tomatoes). In general, organic premiums are high for dairy, meat, and poultry categories (e.g., eggs, beef, milk) and low for produce categories (e.g., tomatoes, lemons, grapefruits), which are dominated by generic rather than branded organics.

Although store-level data have the benefit of covering all purchases, they do not allow us to distinguish between consumers who frequently buy organic products (the core organic segment) and those who do not (the noncore organic segment). To this end, we obtained *panel data*, which record individual transactions covering 95.4% of all purchases made at the retailer. The panel data cover the same period and categories as the store-level data. We group consumers into core and noncore segments according to their individual organic purchase histories. Our two classification alternatives are (1) a median split based on organic volume purchases in the category over the entire data duration and (2) a median split based on overall organic purchases at the retailer during the last 12 months (with four purchases as the threshold). We also use a nested logit model that consists of category incidence and product choice to differentiate between core and noncore organic consumers (see the Appendix). We randomly select 700 consumers in each category who make at least two purchases of organics for analysis. From the intercept term of product choice, which can be interpreted as consumers' organic intrinsic preference, we classify them as belonging to core (higher than the mean intercept) or noncore (lower than the mean intercept) segments. Using these classifications and relevant variables, we conduct the VAR analysis separately for each segment. We calculate the long-term assortment and price elasticities on the basis of the segment-level VAR estimates. On comparison, we find that the elasticities obtained through the segment-level analysis using the nested logit and organic volume purchases are similar.

Results

We first relate the key variables in a median split for organic products sales share, the correlation matrix of main variables, and the analysis results of the Koyck model. We then discuss the analysis pertaining to the Granger causality, unit root, and cointegration tests. After reviewing model specifications and estimation, we present the substantive findings of the VAR models, which relate back to the hypotheses.

Figure 1 compares organic premium, organic growth rates, category expensiveness, and frequency of purchase in a median split by organic sales share in the category. Categories with above-median organic sales share have a lower organic premium (47.06% vs. 51.84%) but a higher annual purchase frequency (9.89 vs. 7.28). We report both the overall and the specific correlations between top-tier and second-tier national brands, private labels of conventional products, and organic products in Table 2. As the table shows, conventional top-tier brands have a higher correlation in sales and marketing actions with organic products than second-tier national brands and conventional private labels. This is consistent with our classification of organic products as top tier in the category.

------- *Insert Figure 1 around here* -------

We begin with the Koyck model results (Table 3). We focus on the coefficients of interest: own- and cross-elasticities of organic versus conventional products for the five analyzed marketing actions. First, organic products have a higher own price elasticity (–3.00) than conventional products (–1.95), and the same holds for own assortment elasticity (2.63 vs. 1.69). In contrast, own promotional elasticies are not significantly different for organic than conventional products. Second, the cross-elasticities indicate that promotional breadth and depth on organic products hurt conventional product sales more than vice versa. Other differences are not significantly different from zero. We next investigate dual causality in our data to gauge the need for a more complicated VAR model.

---------- *Insert Tables 2 and 3 about here* ----------

Granger Causality Tests

We focus on the Granger causality among organic and conventional product sales and retail marketing actions. First, the results (available on request) show that virtually all marketing activities Granger cause sales for the intended products (e.g., organic price on organic sales). Second, organic marketing actions Granger cause conventional product sales in 44% of

categories, while conventional marketing actions Granger cause organic product sales in 70% of categories. Third, organic marketing activities Granger cause conventional marketing in 14% of all cases (43% for organic price Granger causing conventional price), while conventional marketing activities Granger cause organic marketing in 16% of all cases (52% for conventional price Granger causing organic price). Thus, the retailer shows some evidence of coordinating marketing across product groups. Finally, we find several cases of performance feedback (i.e., sales are Granger causing marketing for the same product group). In summary, the Granger causality tests confirm the dual causality loops among organic marketing, conventional marketing, and retailer performance captured by the VAR model.

Model Specification Choices and Model Estimation

Conventional product sales are evolving in only 3.6% of cases, consistent with previous research (Nijs et al. 2001; Srinivasan et al. 2004). In contrast, organic sales are evolving in 8.9% of all cases. Moreover, sales are trend stationary (i.e., only stationary after we account for a deterministic time trend) for 33.9% of organic cases (16.07% of conventional cases). Such time trend may capture gradual gains in awareness/appeal of organics because of factors outside the retailer's control (e.g., health concerns). In all cases of organic sales evolving or trending, the sales series is growing, while 41.6% of the conventional sales with evolution and time trend are declining. Thus, our data reflect the stronger growth in organic versus conventional product sales observed in the business press, but also indicate that such growth is not self-evident: Most organic sales series are mean stationary.

Cointegration is present among organic marketing and performance in 2.67% of cases and among conventional marketing and performance in .89% of cases. This rare occurrence of a long-term equilibrium between marketing and performance is consistent with previous research (e.g., Bronnenberg, Mahajan, and Vanhonacker 2000; Nijs et al. 2001; Srinivasan et al. 2004). We use the VEC specification in the case of cointegration and the VAR

specification either in levels or first differences otherwise. The optimal lag length of 1, selected by the Bayesian information criterion, yields a good model fit for all models/categories (average R^2 = .80 and adj. R^2 = .78) and is superior to that of the Koyck model in all cases. For example, in the case of organic and conventional volume sales, the adjusted R-squares for the VAR and Koyck models are .84 versus .72 and .81 versus .69.

Substantive Findings from Impulse Response Analysis

We focus on the long-term elasticities (Pauwels, Hanssens, and Siddarth 2002), observing that only 1.04% (organic) and .59% (conventional) of marketing–sales effects are permanent.[2]

Long-term own sales elasticities. Table 4 displays the average elasticities across the 56 analyzed categories, either without weighting ('simple average') or weighting the category results by the respective category's contribution to the overall store revenues.

------ *Insert Table 4 and Figure 2 about here* -----

In support of H_1, the sales elasticities for assortment and regular price are significantly higher for organic than conventional products. In contrast, organic products do not enjoy higher sales elasticities for promotional activities. Figure 2 shows the impulse response graph for a representative category, tortilla chips. Note that product assortment effects show a similar over-time pattern for organic and conventional products, with a long wear out of approximately 30 weeks. The key difference is the size of the effect: three times as large for organic as for conventional products. In contrast, consumer reactions to regular price changes differ in both magnitude and pattern for organic versus conventional products. A regular price decrease only significantly benefits the average conventional tortilla chip product for 1 week, while it benefits the average organic tortilla chip for 28 weeks (four months). This pattern is

[2] To compare them with cases that show only temporary effects, we calculate the net present value of the permanent effect by using a weekly discount rate of .15%, after discussion with the retailer. We then add this net present value to the immediate and adjustment effects to calculate the total, long-term elasticity of the performance variable to the marketing action. We verify that our substantive results remain the same when ignoring these infrequent and small permanent effects.

consistent with our argument that consumers perceive a more enduring commitment to organic products; lowering the regular price induces higher sales for several months.

How does the higher regular price elasticity for organics differ across segments? Table 5 reports our results for the segment-level model based on organic loyalty, which we define using a median split of organic volume purchases. We obtain similar results when using other operationalizations. In support of H_2, we find that the elasticities for the enduring activities are higher and significantly different for the noncore than the core segment.

---------- *Insert Table 5 about here* ----------

As for category-specific costs and benefits, our second-stage analysis finds a higher sensitivity to organic promotions for products with high purchase frequency, of a virtue nature, and that come directly from the farm (produce, dairy, meat, and poultry). Second, product storability and impulsivity increase consumer sensitivity to product assortment. While deep promotions induce higher consumer response in storable and impulse-buy categories, regular price reductions are less effective. Third, expensive categories show lower consumer sensitivity to regular price and price specials for organic products. This indicates that the higher price of organics is not such an obstacle for buying organics in categories in which prices are generally high. Likewise, regular price sensitivity is lower in categories with a high organic price premium, indicating a higher willingness to pay for organics. Plausibly because of this high willingness to pay consumers are more responsive to assortment additions in categories with high price premium. Fourth, high organic penetration is associated with higher sensitivity to assortment and price, consistent with our finding of high sensitivity to these enduring actions by noncore consumers (who tend to constitute a larger part of organic buyers in categories with high organic penetration). Finally, retailers obtain higher organic sales benefits with promotions and price specials when organics are already growing strongly in the category.

Long-term cross sales elasticities. We report the cross sales elasticities in the bottom panel of Table 4. In support of H_3, we observe an asymmetry: Organic marketing activities hurt conventional product sales more than vice versa. These differences are significant at the 5% level for promotion breadth and promotion depth. In Table 6, we report elasticities across the different combinations of conventional products and organics. As expected, we find that promoting organic products hurts top-tier national brands the most, followed by second-tier national brands and private labels of conventional products.

---------- *Insert Table 6 about here* ----------

Overall retailer performance. In light of the large own- and small cross-elasticities of enlarging the organic assortment, this activity seems desirable if the retailer wants to increase sales of organics without hurting conventional product sales. Even in the case of cannibalization, the higher unit margin on organics may still increase overall category and store performance. Table 7 reports the results of our overall performance model.

---------- *Insert Table 7 about here* ----------

Considering the long-term performance elasticities, we find that organic assortment and organic and conventional promotion breadth have a significant, positive effect on gross category profits. The long-term elasticities in this case are .47, .41, and .20, respectively. Compared with the same actions for conventional products, we find a significant category margin advantage for higher assortment and more frequent promotions on organic products (last column of Table 7). Do these activities also improve overall store revenues? We find few significant effects, consistent with previous promotion studies for conventional products (e.g., Srinivasan et al. 2004). The two exceptions are enlarging the organic assortment and decreasing organic regular prices in the category, which yield a long-term elasticity on store revenues of .19 and –.36, respectively. Again, these actions have higher store revenue elasticity for organic products than for conventional products. Regarding category-specific

factors driving overall retailer performance variables, we find that the gross category margin elasticity is significantly higher in *produce* categories for changes in organic assortment, regular price, and price specials.

Long-term elasticities and organic product labeling. Given previous research on the importance of organic product labeling, we compare our results on products with the organic USDA seal with those labeled "organic" without the USDA seal and with those labeled "natural" (i.e., products that do not contain any artificial flavoring, color ingredients, chemical preservatives, or artificial or synthetic ingredients). We find that our substantive results hold when we combine organic products with and without the USDA seal as "organic product" in the analysis, with a similarly high power explaining sales (this model: $R^2 = .815$; the main model for food categories: $R^2 = .790$). However, using only the organic products *without* the USDA seal yields a lower explanatory power ($R^2 = .695$) and effect estimates that, while directionally similar in many cases, are substantially lower than those for the organic product with the USDA seal (our main model). Finally, using "natural" products yields an even lower model fit ($R^2 = .515$) and shows hardly any significant differences in own- and cross-elasticities between natural and conventional products (without any organic or natural claim). From these results, we conclude that organic labeling is quite important across categories, consistent with consumer decision-making literature on organic labeling.

Additional analyses. We perform several additional analyses to gain further insight into our main results. We check for quadratic price effects (as in Ngobo 2011) and find that they fail to improve model fit. We include a social influence variable from sampled consumers' self-reports of such influence on their organic buying decisions. We find that the social influence variable is significant and improves the model fit, implying that it is a driver of organics. However, our substantive results hold after we control for social approval.

Our final robustness checks consider aggregation bias, store trade area characteristics, and changes over time. First, to check whether our results are sensitive to aggregation bias, we estimate the models on a store-by-store basis and compute the weighted mean using stores' sales as weights; we find that the results are substantially similar. Second, to check the sensitivity of the results to store trade area characteristics, we conduct the same analyses for another chain operating in a geographically distinct area catering to a different clientele.[3] We find similar results. Third, to check for changes over time, we estimate our main models on semiannual periods and fit a local trend model through the time variation in the estimates. No discernible over-time pattern appears, while regular price elasticity varies between –3.17 and –4.01 for organic products and –1.75 and –2.2 for conventional products. Thus, we find no evidence that our findings are sensitive to these potential issues.

Discussion and Implications

Buying organics represents a rather enduring commitment, which involves both transaction costs (finding organic products with the right flavor, size, and so on) and out-of-pocket costs (the price of organics). Therefore, *lowering transaction and monetary costs* by increasing the organic assortment and decreasing organics' regular prices represents the enduring marketing actions most likely to induce consumers to buy organics. Our findings offer new insights into the ongoing debate on the place of organic products on the (mainstream) retail shelf. We distinguish implications for shopper response, manufacturer strategy, retailer marketing strategy, and policy makers and organics advocates.

First, we find that shoppers react differently to enduring marketing actions for organic versus conventional products. We observe these differences for both organic products with and without the USDA seal but not for "natural" products. Thus, labeling and branding do seem to play an important role, as both the USDA seal and organic branding yield sales

[3] This chain operates 90 stores in the Mid-Atlantic United States and does not compete with our focal chain. The clientele for this chain differs in terms of income, education, and ethnic composition and average store size.

benefits. Our distinction among consumer organic usage levels reveals that increasing assortments and reducing the regular price for organics is especially effective for noncore organic consumers but also stimulates purchase by core organic consumers. Such core organic consumers should therefore not be taken for granted: Although they have much experience buying and consuming organics, the greater perceived benefits do not mean that they will buy organics at any cost. A strategy of first getting consumers "hooked" on organics with low prices and then increasing prices seems ill-advised in light of our findings.

Second, manufacturers of top-tier national brands have the most to lose from organic product growth and thus should be the first in line to either develop their own organic products with brand names that are distinct from their own or acquire organic brands of smaller companies. The latter is advised for minimally processed products (produce, milk, yogurt, cereal), for which we find a higher sales impact for small/independent than large manufacturer brands in an additional analysis.

Third, mainstream retailers should consider increasing assortment and lowering regular prices, especially for the noncore organic segment, but also for the core organic segment. The highest return for such actions materializes for products with high purchase frequency, of a virtue nature, and that come directly from the farm (produce, dairy, meat, and poultry). In contrast, regular price reductions are less effective than deep promotions in storable and impulse-buy categories. Thus, retailers can keep the regular price a bit higher in such categories, while offering deep promotions to induce impulse buying and stockpiling.

Our study also has implications for policy makers, sustainability proponents, and advocates of organic products. In contrast with Ngobo (2011), we find that typical actions of mainstream retailers, such as broadening assortments and lowering prices, substantially increase sales of organics. However, these are enduring actions for the retailer, which thus are unlikely to be swayed by temporary subsidies. The full supply system should be considered:

It is easier for retailers to increase organic assortment and reduce regular prices if manufacturers of organic products do the same. Transparent certification is important in this regard: The USDA seal increases consumer response to marketing actions for organic products.

Conclusion

What makes marketing organics special in mainstream U.S. retail settings? Not as much as Ngobo (2011) implies: Reducing price and increasing price promotions and assortment strongly increase organic product sales in our large-scale analysis over 56 categories. Moreover, reducing prices on organic products hurts conventional product sales more than vice versa, consistent with the asymmetric price competition literature (Sethuraman and Srinivasan 2002). However, marketing organic products is special to the extent that retailers need enduring actions (assortment and regular price) to overcome the perceived costs of going organic, especially for shoppers with currently low intrinsic value for organic products. Increasing organic assortment is also superior to increasing conventional assortment in terms of category margin and store revenues.

In light of recent contradictory findings, we note the large (negative) price elasticity of organic products in each of our 56 analyzed product categories. What might explain the difference between some of the results of our study and those of previous research? First, we base our analysis on data that also include transactions by customers who (almost) never buy organic products, whereas other studies focus solely on the core organic consumer. Indeed, we find that the core organic consumer is not as price sensitive as the noncore organic consumer. Second, we use more recent data in which the organic penetration is around 5%. Thus, we believe we are capturing a more current state of organic demand and supply characteristics. Industry reports confirm that organic sales have remained strong during the

recession, mostly because manufacturers and retailers decreased organic prices (*Supermarket News* 2011).

Limitations of the current study include the absence of data on competing retailers' marketing, actions by suppliers of organic products, category advertising, and consumer perceptions of the store and its organic offering. As in any econometric study, our focus was on the sign and size (i.e., the "what" and "how much") of consumer purchase actions, not on the "why." Further research should unravel the motivations behind these observed actions and generalize our findings to other retail settings. For example, we find little evidence that marketing organics can increase store revenues at the studied retailer. A more focused repositioning, even fully converting to organic products (e.g., Whole Foods), may be needed to achieve this.

This study represents an important step forward in resolving the "balancing act between the old and the new" for conventional retailers (*Progressive Grocer* 2008). Our analysis implies that organic products *are* compatible with conventional retailers and marketing actions. With the inspiration from high-profile role models (e.g., Michelle Obama starting a White House organic garden) *and* the practical support of mainstream retailers, the future of organics looks healthy indeed.

References

Aertsens, Joris, Koen Mondelaers, and Guido Van Huylenbroeck (2009), "Differences in Retail Strategies on the Emerging Organic Market," *British Food Journal*, 111 (2), 138–54.

Ailawadi, Kusum L., Karen Gedenk, Christian Lutzky, and Scott A. Neslin (2007), "Decomposition of the Sales Impact of Promotion-Induced Stockpiling," *Journal of Marketing Research*, 44 (3) 450–67.

Allenby, Greg M. and Peter E. Rossi (1991), "Quality Perceptions and Asymmetric Switching Between Brands," *Marketing Science*, 10, 185–204.

Bauer, Hans H., Daniel Heinrich, and Daniela B. Schafer (2012), "The Effects of Organic Labels on Global, Local, and Private Labels: More Hype Than Substance?" *Journal of Business Research*, forthcoming.

Beverage Industry (2010), "Protein Appeals to the Masses," 101 (2), 14–20.

Bijmolt, Tammo H.A., Harald J. van Heerde, and Rik G.M. Pieters (2005), "New Empirical Generalizations on the Determinants of Price Elasticity," *Journal of Marketing Research*, 42 (May), 141–56.

Blattberg, Robert and Kenneth Wisniewski (1989), "Price-Induced Patterns of Competition," *Marketing Science*, 8 (4), 291–309.

Boatwright, Peter and Joseph C. Nunes (2001), "Reducing Assortment: An Attribute-Based Approach," *Journal of Marketing*, 65 (3), 50–63.

Bourn, Diane and John Prescott (2002), "A Comparison of the Nutritional Value, Sensory Qualities and Food Safety of Organically and Conventionally Produced Foods," *Critical Reviews in Food Science and Nutrition*, 42 (1), 1–34.

Bowman, Douglas and Hubert Gatignon (1995), "Determinants of Competitor Response Time to a New Product Introduction," *Journal of Marketing Research*, 32 (1), 42–53.

Brandweek (2009), "Despite Economic Dip, Organic Food Sales Soar," 49 (23), 6.

Bronnenberg, Bart, Vijay Mahajan, and Wilfried R. Vanhonacker (2000), "The Emergence of Market Structure in New Repeat-Purchase Categories: The Interplay of Market Share and Retailer Distribution," *Journal of Marketing Research*, 37 (1), 16–31.

——— and Luc Wathieu (1996), "Asymmetric Promotion Effects and Brand Positioning," *Marketing Science*, 15 (4), 379–94.

Bucklin, Randolph E. and James M. Lattin (1991), "A Two-State Model of Purchase Incidence and Brand Choice," *Marketing Science*, 10 (1), 24–39.

Campo, Katia, Els Gijsbrechts, and Patricia Nisol (2000), "Towards Understanding Customer Response to Stockouts," *Journal of Retailing*, 76 (2), 219–42.

CesIfo (2011), "Ifo Industry Analysis: Organic Produce Still Has High Growth Potential," (April 8), (accessed July 23 2012), [available at http://www.cesifo-group.de/portal/page/portal/ifoHome/e-pr/e1pz/_generic_press_item_detail?p_itemid=15495283]

Chain Store Age (2009), "Forty Under 40: Small Chains Flourish," 85 (1), 22–27.

Ciu, Lina (2008), "Growing Naturally in Alabama: Needs and Possibilities," doctoral dissertation, Auburn University.

Davies, Anne, Albert J. Titterington, and Clive Cochrane (1995), "Who Buys Organic Food? A Profile of the Purchasers of Organic in Northern Ireland," *British Food Journal*, 97 (10), 17–23.

Dekimpe, Marnik and Dominique Hanssens (1995), "The Persistence of Marketing Effects on Sales," *Marketing Science*, 14 (1), 1–21.

——— and ——— (1999), "Sustained Spending and Persistent Response: A New Look at Long-Term Marketing Profitability," *Journal of Marketing Research*, 36 (4), 397–412.

Delvecchio, Devon, David H. Henard, and Traci H. Freling (2006), "The Effect of Sales Promotion on Post-Promotion Brand Preference; a Meta-Analysis," *Journal of Retailing*, 82 (3), 203–213.

Dimitri, Carolyn and Lydia Oberholtzer (2009), *Marketing U.S. Organic Foods: Recent Trends from Farms to Consumers*, Economic Information Bulletin, EIB-58. Washington, DC: Economic Research Service, United States Department of Agriculture.

Drug Store News (2008), "As Green Movement Grows, Organic Product Standards Emerge," (April 21), 53.

Durham, Catherine A. and Diego Andrade (2005), "Health vs. Environmental Motivation in Organic Preferences and Purchases," paper presented at the American Agricultural Economics Association Annual Meeting, Providence, RI (July 24–27).

Enders, Walter (2004), *Applied Econometric Time Series*. New York: John Wiley & Sons.

Food Marketing Institute (2009), *Shopping For Health*, Arlington, VA: Food Marketing Institute.

Fotopoulos Christos and Athanasios Krystallis (2002), "Purchasing Motives and Profiles of the Greek Organic Consumer: A Country Survey," *British Food Journal*,104 (9), 730–65.

Franses, Philip H. (2005), "Diagnostics, Expectations and Endogeneity," *Journal of Marketing Research*, 42 (February), 27–29.

——— and Rutger van Oest (2007), “On the Econometrics of the Geometric Lag Model,” *Economics Letters*, 95 (2) 291–96.

Glaser, Lewrene K. and Gary D. Thompson (2000), “Demand for Organic and Conventional Beverage Milk,” paper presented at the Western Agricultural Economics Association Annual Meetings, Vancouver, BC (June 29–July 1).

Granger, C.W.J. (1969), “Investigating Causal Relations by Econometric Models and Cross-spectral Methods,” *Econometrica*, 37 (3), 424–38.

Grunert Suzanne C. and Hans Jørn Juhl (1995), “Values, Environmental Attitudes, and Buying of Organic Foods,” J*ournal of Economic Psychology*, 16 (10), 39–62.

Han, Min C. (1989), “Country Image: Halo and Summary Construct*?” Journal of Marketing Research*, 26 (May), 222–29.

The Hartman Group (2008), *The Many Faces of Organic Goods*. Bellevue, WA: The Hartman Group.

Hendel, Igal and Aviv Nevo (2006), “Sales and Consumer Inventory,” *The RAND Journal of Economics*, 37 (3), 543–61.

Henderson, Ty and Neeraj Arora (2010), “Promoting Brands Across Categories with a Social Cause: Implementing Effective Embedded Premium Programs,” *Journal of Marketing*, 74 (6), 41–60.

Hui, Sam K., Eric T. Bradlow, and Peter S. Fader (2009), “Testing Behavioral Hypotheses Using an Integrated Model of Grocery Store Shopping Path and Purchase Behavior,” *Journal of Consumer Research*, 36 (3), 478–93.

Janssen, Meike and Ulrich Hamm (2012), “Product Labeling in the Market for Organic Food: Consumer Preferences and Willingness-to-pay for Different certification Logos,” *Food Quality and Preference*, 25, 9–22.

Johansen, Soren, Rocco Mosconi, and Bent Nielsen (2000), “Cointegration Analysis in the Presence of Structural Breaks in the Deterministic Trend," *Econometrics Journal*, 3 (2), 1–34.

Kamakura Wagner A. and Gary J. Russell (1989), “A Probabilistic Choice Model for Market Segmentation and Elasticity Structure*,” Journal of Marketing Research*, 26 (4), 379–90.

Kiesel, Kristin and Sofia B. Villas-Boas (2007), “Got Organic Milk? Consumer Valuations of Milk Labels after the Implementation of the USDA Organic Seal,” *Journal of Agricultural & Food Industrial Organization*, 5 (4), 1–38.

Kotler, Philip (2011), “Reinventing Marketing to Manage the Environmental Imperative,” *Journal of Marketing*, 75 (4), 132–135.

Kozup, John C., Elizabeth H. Creyer, and Scot Burton (2003), "Making Healthful Food Choices: Influence of Health Claims and Nutrition Information on Consumers' Evaluations of Packaged Food Products and Restaurant Menu," *Journal of Marketing*, 67 (April), 19–34.

Makatouni, Aikaterini (2002), "What Motivates Consumers to Buy Organic Food in the UK? Results from a Qualitative Study," *British Food Journal*, 104 (3–5), 345–52.

Michelsen, Jahannes, Ulrich Hamm, Els Wynen, and Eva Roth (1999), "The European Market for Organic Products: Growth and Development," *Organic Farming in Europe: Economics and Policy*, Vol. 7. Stuttgart: University of Hohenheim.

Narasimhan, Chakravarthi, Scott A. Neslin, and Subrata K. Sen (1996), "Promotional Elasticities and Category Characteristics," *Journal of Marketing*, 60 (2), 17–31.

Ngobo, Paul-Valentin (2011), "What Drives Household Choice of Organic Products in Grocery Stores?" *Journal of Retailing*, 87 (1), 90–100.

Nijs, Vincent, Marnik Dekimpe, Jan-Benedict Steenkamp, and Dominique M. Hanssens (2001), "The Category-Demand Effects of Price Promotions," *Marketing Science*, 20 (1), 1–22.

Nowlis, Stephen M. and Itamar Simonson (2000), "Sales Promotions and the Choice Context as Competing Influences on Consumer Decision Making," *Journal of Consumer Psychology*, 9 (1), 1–16.

Oberholtzer Lydia, Catherine Green, and Enrique Lopez (2006), "Organic Poultry and Eggs Capture High Price Premiums and Growing Share of Specialty Markets," Research Report LDP-M-150-01, United States Department of Agriculture.

Organic Trade Association (2009a), Organic Industry Survey. Greenfield, MA: Organic Trade Association.

——— (2009b), U.S. Families' Organic Attitudes and Beliefs Study. Greenfield, MA: Organic Trade Association.

Pauwels, Koen (2004), "How Dynamic Consumer Response, Competitor Response, Company Support and Company Inertia Shape Long-Term Marketing Effectiveness," *Marketing Science*, 23 (4), 596–610.

———, Dominique M. Hanssens, and S. Siddarth (2002), "The Long-Term Effects of Price Promotions on Category Incidence, Brand Choice and Purchase Quantity," *Journal of Marketing Research*, 34 (November), 421–39.

——— and Shuba Srinivasan (2004), "Who Benefits from Store Brand Entry?"*Marketing Science*, 23 (Summer), 364–90.

Pesaran, Hashem H. and Yongcheol Shin (1998), "Generalized Impulse Response Analysis in Linear Multivariate Models," *Economics Letters*, 58 (1), 17–29.

Progressive Grocer (2008), "Outside the Bubble," 87 (2), 44–47.

——— (2009), "Evolving Organics," 88 (7), 58–62.

Raju, Jagmohan (1992), "The Effect of Price Promotions on Variability in Product Category Sales," *Marketing Science*, 11 (Summer), 207–220.

Roheim, Cathy A. and Ronald D'Silva, (2009), "Illustration of the U.S. Organic Agricultural Produce Price Premiums: Implications for Eco-labeled Sea-food Price premiums," working paper, URI Sustainable Seafood Initiative, University of Rhode Island.

Rokeach, Milton (1968), "The Role of Values in Public Opinion Research," *Public Opinion Quarterly*, 32 (4), 547–59.

Sethuraman, Raj and V. Srinivasan (2002), "The Asymmetric Share Effect: An Empirical Generalization on Cross-Price Effects," *Journal of Marketing Research*, 39 (August), 379–86.

———, ———, and Doyle Kim (1999), "Asymmetric and Neighborhood Cross-Price Effects: Some Empirical Generalizations," *Marketing Science*, 18 (1), 23–41.

Silverstone, Rob (1993), "Organic Farming: Food for the Future?" *Nutrition and Food Science*, 93 (5), 10–14.

Sivakumar K. and S.P. Raj (1997), "Quality Tier Competition: How Price Change Influences Brand Choice and Category Choice," *Journal of Marketing*, 61 (3), 71–84.

Srinivasan, Shuba, Koen Pauwels, Dominique Hanssens, and Marnik Dekimpe (2004), "Do Promotions Benefit Retailers, Manufacturers, or Both?" *Management Science*, 50 (5), 617–29.

Supermarket News (2011), "Moving Ahead", November 29th,12-17.

TABS (2012), "Organic Products on the Rise", January 30th, (accessed July 17th 2012) [Available at: http://www.tabsgroup.com/2012/01/organic-products-on-the-rise/]

Thompson, Gary D. (1998), "Consumer Demand for Organic Foods: What We Know and What We Need to Know," *American Journal of Agricultural Economics*, 80 (5), 1113–18.

Tondel, Fabien and Timothy Woods (2006), "Supply Chain Management and the Changing Nature of the US Organic Produce Markets," Paper presented at the AAEA Annual Meeting, Long Beach, California, July 23-26.

Train, K. (2003), *Discrete Choice Methods with Simulation*. Cambridge, MA: Cambridge University Press.

Trusov, Michael, Randolph E. Bucklin, and Koen Pauwels. (2009), "Effects of Word-of-Mouth Versus Traditional Marketing: Findings from an Internet Social Networking Site," *Journal of Marketing*, 73 (September), 90–102.

Verhoef, Peter C. (2005), "Explaining Purchases of Organic Meat by Dutch Consumers," *European Review of Agricultural Economics*, 32 (2), 245–67.

Wertenbroch, Klaus (1998), "Consumption Self-Control by Rationing Purchase Quantities of Virtue and Vice," *Marketing Science*, 17 (4), 317–37.

Wier, Mette, Lars G. Hansen, Laura M. Anderson, and Katrin Millock (2003), "Consumer Preferences for Organic Foods," in Organic Agriculture: Sustainability, Markets and Policies, OECD Publishing, Paris, France, 257–71.

Zanoli, Rafaele and Simona Naspetti (2002), "Consumer Motivations in the Purchase of Organic Food: A Means-End Approach," *British Food Journal*, 104 (8), 643–53.

TABLE 1

Variable Operationalization for Long-Term Marketing Elasticities Regression Equation

Variable	Operationalization
Virtue	The virtue versus vice nature of the product category was labeled according to the classification in Hui, Bradlow, and Fader (2009), who use three independent judges for this purpose.
Dairy, meat and poultry(DMP)	A dummy variable that takes the value of 1 for the categories of milk, creams, yogurt, eggs, butter, cheese, beef, chicken, and turkey and 0 otherwise.
Produce	A dummy variable that takes the value of 1 for the produce categories of tomatoes, oranges, grapefruits, strawberries, peaches, potatoes, apples, carrots, ready-to-eat (packaged) salads, greens (unpackaged salad and others), onions, mushrooms, grapes, lemons and blueberries and 0 otherwise.
Category frequency	The average number of times per year the category is purchased. Using the procedure outlined previously, we select the households that buy in a category (h). For these households, we calculate the purchases made each year and then average across households and years.
Storability	A dummy variable indicating whether the product is considered perishable or storable (e.g., Narasimhan, Neslin, and Sen 1996).
Impulsivity	A dummy variable indicating whether a product is typically associated with an impulse versus a planned purchase (e.g., Narasimhan, Neslin, and Sen 1996).
Category expensiveness	We first compute the regular price (using the method described in the main text) of each brand. The category-level measure is calculated by the market share weighted average of the regular prices of the brands in the category (see Raju 1992).
Market concentration	We measure the category's competitive structure by market concentration, following previous work in industrial organization and marketing (Bowman and Gatignon 1995), as the sum of the shares of the top-three brands in the category.
Category wallet share	This variable denotes the relative amount of money a consumer spends on a category and is calculated from the household basket data. We first randomly select a sample of 10,000 households that have a high loyalty to the chain. For these households, we extract all their basket transactions for the years 2004–2007. From these baskets, we calculate the dollars spent on the category and the total dollar value of the baskets. The total wallet share is then obtained as the ratio of this.
Organic premium	The difference of the average organic and conventional price divided by the conventional price.
Organic growth rate	The percentage growth rate of the organics is calculated each quarter as the difference in the current quarter's dollar sales and the previous quarter's dollar sales divided by the previous quarter's dollar sales. We then average across the data period.
Organic penetration	The dollar sales of the organic products divided by the total dollar sales of the category.
Assortment	The number of unique SKUs carried by the retailer. We begin from a chain-level file, which contains the comprehensive listing of all SKUs across all stores each week. We infer assortment additions by identifying new SKUs that have been added to the chain-level file each week and which obtained positive unit sales in any of the stores in the subsequent four weeks. To identify SKU deletions, we require that the SKU is dropped from this list and not have any sales in any of the

	stores in the subsequent quarter.

TABLE 2
Correlation Results

A: Overall Organic and Conventional Sales (Share Weighted)

	Con. Vol.	Con. R.P.	Con. P.B.	Con. P.D.	Con. P.S.	Con. Ast.	Org. Vol.	Org. R.P.	Org. P.B.	Org. P.D.	Org. P.S.	Org. Ast.
Con. Vol.	1	-0.62	0.47	0.32	0.35	0.58	-0.23	0.18	-0.41	-0.31	-0.29	-0.03
Con. R.P.		1	0.40	0.31	0.38	0.33	0.10	0.19	-0.20	-0.16	-0.30	0.18
Con. P.B.			1	0.19	0.48	0.32	-0.20	0.42	-0.09	-0.04	-0.23	-0.14
Con. P.D.				1	0.21	-0.03	0.15	0.24	-0.15	-0.07	-0.09	-0.10
Con. P.S.					1	0.33	0.22	0.35	-0.06	-0.01	-0.09	-0.08
Con. Ast.						1	-0.20	-0.18	-0.08	0.06	-0.13	0.17
Org. Vol.							1	-0.70	0.09	0.45	0.16	0.65
Org. R.P.								1	-0.04	-0.25	-0.21	0.51
Org. P.B.									1	0.29	0.56	0.07
Org. P.D.										1	0.45	0.15
Org. P.S.											1	0.12
Org. Ast.												1

B: Overall Sales for the Different Type of Conventionals and Organics (Share Weighted)

	T.T. NB Vol.	T.T. NB RP	T.T. NB Ast.	S.T. NB Vol.	S.T. NB RP	S.T. NB Ast.	PL Vol.	PL RP	PL Ast.	Org. Vol.	Org. RP	Org. Ast.
T.T. NB Vol.	1	-.63	.56	-.23	.21	-.20	-.18	.14	-.16	-.30	.28	-.25
T.T. NB RP		1	.39	.23	.12	-.22	.16	.11	-.10	.27	.22	.24
T.T. NB Ast.			1	-.16	-.17	.14	-.13	-.10	.09	-.24	-.20	.23
S.T. NB Vol.				1	-.58	.47	-.23	.20	-.21	-.15	.12	-.18
S.T. NB RP					1	.33	.21	.20	.25	.20	.19	.16
S.T. NB Ast.						1	-.20	-.21	.16	-.17	-.18	.19
PL Vol.							1	-.61	.53	-.13	.10	-.08
PL RP								1	.14	.20	.12	.13
PL Ast.									1	-.13	-.11	.17
Org. Vol.										1	-.70	.65
Org. RP											1	.51
Org. Ast.												1

Notes: NB = national brand, PL = private label, Org = organic, TT = top-tier, ST = second-tier, Vol = sales volume, RP = regular price, and Ast. = assortment.

TABLE 3
Organic and Conventional Long-Term Elasticities Using Koyck Model for Overall Sales

Own Sales Elasticities					
Variable	**Organic**	**Conventional**	**Difference**	**95% Confidence Interval of Difference**	**Percentage of Categories Significant**
Assortment	2.63	1.69	0.94	**(0.68, 1.21)**	62.5
Regular price	-3.00	-1.95	-1.05	**(-1.39, -0.71)**	71.4
Promotion breadth	1.08	0.64	0.44	(-0.09, 0.97)	21.4
Promotion depth	0.59	0.50	0.09	(-0.32, 0.50)	14.2
Price specials	0.68	0.75	-0.07	(-0.25, 0.10)	23.2
Cross Sales Elasticities					
	Organic Marketing on Conventional Volume Sales	**Conventional Marketing on Organic Volume Sales**	**Difference**	**95% Confidence Interval of Difference**	**Percentage of Categories Significant**
Assortment	-0.161	0.105	-0.27	(-0.56, 0.02)	33.9
Regular price	0.795	0.568	0.227	(-0.12, 0.57)	39.2
Promotion breadth	-3.135	-1.735	-1.40	**(-1.79, 1.00)**	89.2
Promotion depth	-1.861	0.693	-2.550	**(-2.34, -1.83)**	75.0
Price specials	-0.937	-0.836	-0.10	(-0.31, 0.11)	25.0

Notes: The values in bold indicate that zero does not belong to the 95% confidence interval. Thus, the elasticities are significantly different from each other at the 5% level.

TABLE 4
Organic and Conventional Long-Term Elasticities for Overall Sales

Own Sales Elasticities											
Variable	**Organic**				**Conventional**				**Weighted Difference**	**95% C.I. of Difference**	**Percent of Categories Significant**
	Weighted Mean	***Simple Mean***	***Min***	***Max***	***Weighted Mean***	***Simple Mean***	***Min***	***Max***			
Assortment	3.17	3.03	-0.71	5.76	2.09	1.95	-0.98	4.57	1.08	**(0.28, 1.88)**	66.07
Regular price	-3.57	-3.46	-7.94	1.02	-1.95	-1.86	-4.15	1.93	-1.62	**(-2.24, -0.99)**	75.00
Promotion breadth	1.56	1.65	-0.17	2.61	0.94	1.02	-0.36	2.91	0.62	(-3.37, 4.51)	19.64
Promotion depth	0.69	0.78	-0.06	2.92	0.62	0.77	-0.19	2.25	0.07	(-4.62, 4.76)	17.85
Price specials	0.92	0.81	-0.35	1.90	1.73	1.81	-0.79	3.16	-0.81	(-7.62, 6.00)	25.00
Cross Sales Elasticities											
	Organic Marketing on Conventional Volume Sales				**Conventional Marketing on Organic Volume Sales**				**Weighted Difference**	**95% C.I. of Difference**	**Percent of Categories Significant**
	Weighted Mean	***Simple Mean***	***Min***	***Max***	***Weighted Mean***	***Simple Mean***	***Min***	***Max***			
Assortment	-0.05	-0.16	-3.45	1.35	0.24	0.35	-0.12	0.94	-0.29	(-0.64, 0.056)	32.14
Regular price	1.07	1.20	-0.91	3.92	0.18	0.28	-0.95	1.52	0.89	(-0.44, 2.22)	35.71
Promotion breadth	-5.01	-6.07	-12.04	2.92	-1.88	-1.93	-4.67	1.68	-3.13	**(-4.90, -1.35)**	85.71
Promotion depth	-1.53	-1.76	-3.86	0.48	0.39	0.51	-1.64	2.65	-1.92	**(-2.91, -0.93)**	71.43
Price specials	-1.51	-1.67	-4.48	2.28	-1.04	-0.38	-3.73	2.87	-0.47	(-0.98, 0.04)	21.43

Notes: C.I. = confidence interval. The values in bold indicate that zero does not belong to the 95% confidence interval. Thus, the elasticities are significantly different from each other at the 5% level.

TABLE 5
Elasticities for Organic Usage Segments

Variable		Core Segment						Noncore Segment						
	Weighted Mean	Simple Mean	Min	Max	% +	% -	Weighted Mean	Simple Mean	Min	Max	% +	% -	**Weighted Difference**	**95% Confidence Interval of Difference**
Price elasticity	-2.08	-1.94	-4.03	1.42	10.7	50.0	-4.01	-3.76	-9.15	1.58	8.9	80.3	-1.93	**(-2.49, -1.37)**
Assortment elasticity	1.29	1.18	-1.75	3.85	48.2	12.5	3.18	2.96	-0.98	7.07	82.1	5.4	1.89	**(1.48, 2.29)**

Notes: The standard deviations are in parentheses. The values in bold indicate that zero does not belong to the 95% confidence interval. The percentages positive (% +) and negative (% –) are the percentage of categories in which the positive and negatives are significant, respectively.

TABLE 6
Cross Elasticities Between Different Conventional Types and Organics

Variable		**Top-Tier National Brands**						**Second -Tier National Brands**					**Conventional Private Labels**				
	Wtg. Mean	Simple Mean	Min	Max	% +	% -	Wtg. Mean	Simple Mean	Min	Max	% +	% -	Wtg. Mean	Simple Mean	Min	Max	% +	% -
Organic assortment	-0.17 (0.08)	-0.18	-0.67	0.08	0.0	46.4	-0.04 (0.02)	-0.05	-0.10	0.02	0	5.3	-0.02 (0.005)	-0.024	-0.039	0.005	0	58.9
Organic regular price	1.14 (0.49)	1.45	-0.82	2.09	62.5	5.4	0.76 (0.24)	0.87	-0.70	1.98	64.2	10.7	0.58 (0.22)	0.67	-0.59	2.35	12.5	66.1
Organic promotion breadth	-5.31 (1.46)	-5.09	-9.05	2.89	10.7	75.0	-4.07 (0.97)	-3.86	-5.45	2.21	12.5	73.2	-3.26 (0.84)	-2.98	-5.35	1.67	16.1	80.3
Organic promotion depth	-1.73 (0.43)	-1.65	-2.92	0.72	1.7	67.8	-1.25 (0.53)	-1.03	-3.02	1.87	14.3	60.7	-0.85 (0.39)	-0.75	-2.26	0.92	17.8	71.4

Notes: The standard deviations are in parentheses. The percentages positive (% +) and negative (% –) are the percentage of categories in which the positive and negatives are significant, respectively.

TABLE 7
Organic and Conventional Long-Term Elasticities of Overall Retailer Performance

Own Sales Elasticities on Gross Category Profits											
Variable	**Organic**				**Conventional**				**Wtg. Diff.**	**95% C.I.**	**% Significant**
	Weighted Mean	***Simple Mean***	***Min***	***Max***	***Weighted Mean***	***Simple Mean***	***Min***	***Max***			
Assortment	0.47 (0.20)	0.40 (0.17)	-0.25	1.19	0.22 (0.23)	0.18 (0.20)	-0.30	0.90	0.25	**(0.17, 0.33)**	42.8
Regular price	-0.19 (0.28)	-0.17 (0.23)	-0.95	0.32	-0.16 (0.26)	-0.13(0.22)	-0.75	0.45	-0.03	(-0.25, 0.19)	3.6
Promotion breadth	0.41(0.18)	0.37(0.16)	-0.13	0.97	0.20(0.08)	0.17(0.10)	-0.13	0.71	0.21	(**0.16, 0.26)**	37.5
Promotion depth	0.10 (0.26)	0.08 (0.29)	-0.10	0.27	0.12 (0.22)	0.11(0.19)	-0.16	0.45	-0.02	(-0.11, 0.07)	5.3
Price specials	-0.005(0.19)	-0.003(0.22)	-0.05	0.09	0.003 (0.13)	0.004(0.11)	-0.04	0.07	-0.008	(-0.07, 0.05)	0.0
Own Sales Elasticities on Store Revenues											
Assortment	0.19 (0.07)	0.17(0.05)	-0.27	0.85	0.09 (0.06)	0.05(0.05)	-0.08	0.18	0.10	**(0.08, 0.12)**	17.8
Regular price	-0.36 (0.16)	-0.31(0.14)	-1.97	0.61	-0.20 (0.15)	-0.17(0.13)	-1.35	0.30	-0.16	**(-0.21, -0.10**)	39.2
Promotion breadth	0.07(0.22)	0.05(0.24)	-0.11	0.15	0.09(0.20)	0.07 (0.18)	-0.03	0.25	-0.02	(-0.10, 0.06)	1.7
Promotion depth	0.09 (0.13)	0.07(0.15)	-0.05	0.17	0.10 (0.17)	0.09 (0.16)	0.01	0.28	-0.01	(-0.07, 0.05)	1.7
Price specials	0.003(0.11)	0.001(0.12)	-0.02	0.08	0.003 (0.09)	0.002(0.10)	-0.00	0.07	0.00	(-0.04, 0.04)	0.0

Notes: The standard deviations are in parentheses.

FIGURE 1

Category Characteristics by Median Split of Organic Sales Share

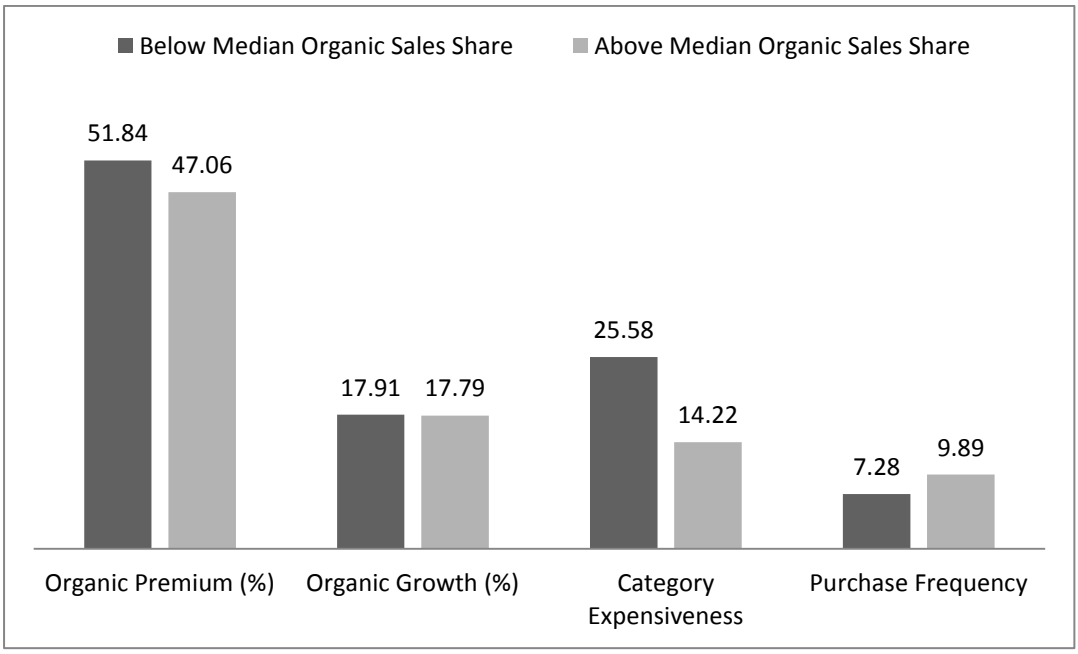
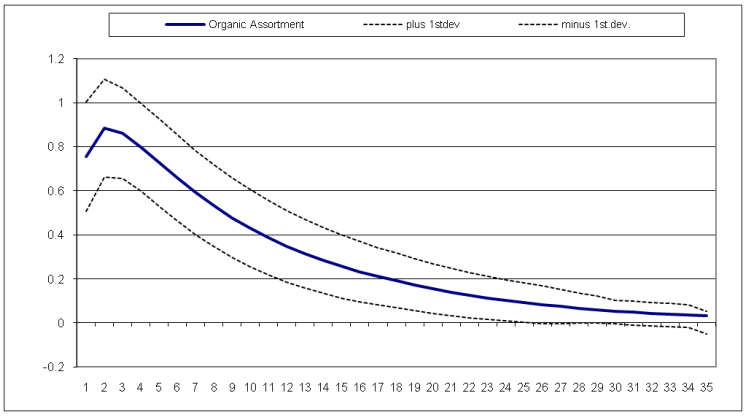
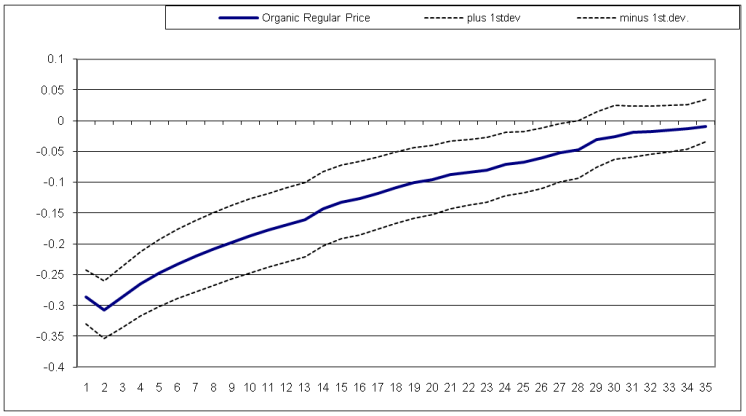
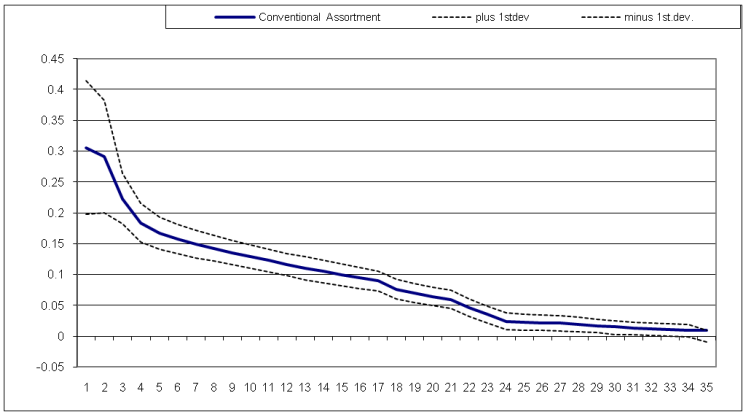
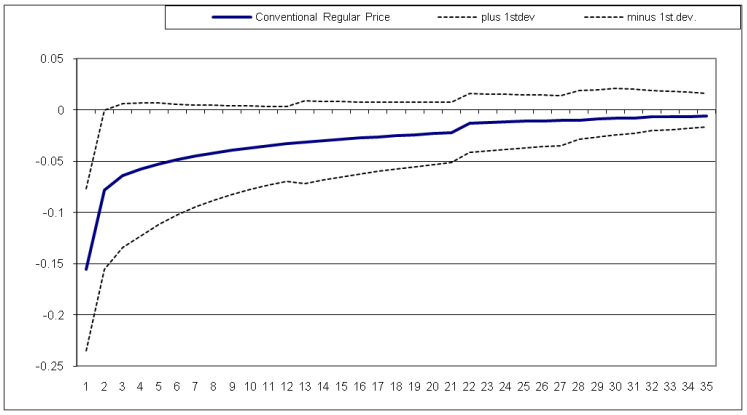


FIGURE 2
Sales Response to Assortment and Price Changes for Organic Versus Conventional Products in the Tortilla Chips Category









APPENDIX
Appendix A: Elasticity Calculations for Core and Noncore Consumers Based on Organic Intrinsic Preference

We formulate the organic buying process using a nested logit model in which the consumer first decides to buy in the category and then decides to buy either the organic or the conventional product.

Category Incidence

Consumer *h* at time *t* is faced with the decision of whether to purchase in category *k* or not (i.e., category incidence), the utility of which is given as (e.g., Bucklin and Lattin 1991):

$$U_{kht} = \theta_{1h} + \theta_{2h} Inv_{ht} + \theta_{3h} IncVal_{ht} + \theta_4 \bar{C}_h + \varepsilon_{kht}, \qquad \text{(A1)}$$

where Inv_{ht}, $IncVal_{ht}$, and $\bar{C}_h$ are the inventory, inclusive value, and the consumption rate, respectively. We calculate inventory and consumption rates using the formula (e.g., Ailawadi et al. 2007)

$$Inv_{ht+1} = Inv_{ht} + q_{ht} - C_{ht} \text{ and } C_{ht} = Inv_{ht}\left[\frac{\bar{C}_h}{\bar{C}_h + (Inv_{ht})^f}\right],$$

where q_{ht} denotes the quantity purchased, C_{ht} is the consumption of the household *h* at time *t*, and *f is* the parameter associated with the consumption flexibility.

Product Choice

Given incidence, consumer *h* at time *t* is faced with the choice of buying product *i* (organic or conventional), the utility of which is given by

$$V_{iht} = \beta_{1ih} + \beta_{2ih} RP_{it} + \beta_{3ih} Assort_{it} + \xi_{iht}, \qquad \text{(A2)}$$

where β_{1ih} is the intrinsic preference of the consumer to purchase the organic or the conventional product and RP_{it} and $Assort_{it}$ are regular price and assortment of the respective organic and conventional products. We use the standard identification restrictions to estimate the model using the no-buy and conventional category as the base case in the category incidence and product choice equations.

Estimation

We incorporate individual-level parameters whenever possible and use the simulated maximum likelihood estimation technique with Halton draws (Train 2003) for estimation. We run this estimation for 30 draws for each of the individual-level parameters.

We randomly select 700 consumers in each category to estimate the aforementioned model. Note that the consumers in each category are distinct because different consumers exhibit different purchase patterns across the categories. On obtaining the estimates, we classify consumers by their organic intrinsic preference parameter (β_{1ih}) in each of the 56 categories. Thus, consumers with above-mean values of β_{1ih} constitute the core segment, and those with below-mean values are the noncore segment. We obtain the individual-level parameters by making draws from the mean estimates and standard deviations (Train 2003) and averaging them. We use 10,000 draws for this purpose.

Using this classification and relevant variables, we conduct the VAR analysis separately for each segment across all 56 categories. We calculate the price and assortment elasticity using the impulse response functions. We compare our original approach of classifying consumers simply by their purchases (as we describe in the main part of the article) with the more involved method of classifying them by their organic intrinsic preference parameter (as we describe herein). We report in Table A1 the overall elasticity (simple average across 56 categories used for analysis) as well as elasticities for some prototypical categories. As the table shows, the elasticities using either method do not significantly differ from each other.

Table A1: Elasticities for the Core and Noncore Segments Based on Nested Logit and Number of Organic Volume Purchases

Price Elasticity						
Category	**Nested Logit**			**Organic Volume Purchases**		
	Overall Elasticity	***Core Segment Elasticity***	***Noncore Segment Elasticity***	***Overall Elasticity***	***Core Segment Elasticity***	***Noncore Segment Elasticity***
Overall Price Elasticity	**-3.15**	**-2.21**	**-3.90**	**-3.22**	**-2.27**	**-3.97**
Milk	-3.45	-2.37	-4.35	-3.57	-2.29	-4.58
Yogurt	-2.48	-1.87	-3.03	-2.59	-1.84	-3.35
Pasta sauce	-2.31	-1.61	-3.23	-2.25	-1.50	-3.31
Crackers	-1.97	-1.31	-2.59	-2.07	-1.43	-2.67
Pizza: Frozen	-2.98	-2.02	-3.96	-2.96	-2.08	-3.85
Cereal	-2.85	-1.92	-3.82	-2.90	-2.01	-3.78
Oats	-2.37	-1.48	-3.17	-2.43	-1.62	-3.25
Carrots	-3.68	-2.76	-4.75	-3.83	-2.74	-4.99
Strawberries	-4.01	-2.79	-5.49	-4.19	-2.90	-5.61
Laundry detergent	-1.52	-1.15	-2.27	-1.75	-1.21	-2.25
Assortment Elasticity						
Overall Assortment Elasticity	**2.31**	**1.32**	**3.07**	**2.40**	**1.35**	**3.12**
Milk	3.12	1.46	3.95	3.25	1.84	4.32
Yogurt	3.29	1.87	4.66	3.43	1.90	4.97
Pasta sauce	2.32	1.08	2.69	2.21	1.02	2.78
Crackers	2.19	1.55	4.03	2.23	0.92	4.24
Pizza: Frozen	2.15	1.06	2.31	2.42	1.29	3.08
Cereal	1.62	0.98	2.54	1.74	1.09	3.03
Oats	1.74	1.27	3.09	1.83	1.31	3.26
Carrots	1.37	0.70	1.89	1.59	0.77	2.15
Strawberries	1.35	0.87	1.96	1.39	0.95	2.33
Laundry detergent	1.44	0.78	2.09	1.61	0.97	2.38

Appendix B: Data and Model Specifics

TABLE B1: Data Summary Statistics

Category	Mean Values of the Variables														
	Assort Size (Number)		*Gross Price (Cents/Unit)*		*Promo. Breadth (Percent)*		*Promo. Depth (Percent)*		*Price Sp. Freq. (Percent)*		*Retail Margins (Percent)*		*Org. Grow. (%)*	*Org. Pen. (%)*	*Org. Pre-mium (%)*
	O	**C**	**O**	**C**	**O**	**C**	**O**	**C**	**O**	***C***	**O**	***C***			
Apple juice	10	52	16.17	9.03	34	66	9	23	13	23	61.9	56.05	16.7	6.35	79.07
Apples	10	46	13.18	11.20	14	23	5	10	3	29	40.56	21.72	23.4	2.34	17.68
Beef	14	50	72.37	43.71	11	27	7	35	6	33	35.54	32.9	58.1	2.01	65.57
Blueberries	3	6	102.11	73.16	48	69	5	20	5	12	60.14	50.97	23.3	3.05	39.57
Mac and cheese	9	23	23.61	18.79	52	75	8	17	2	17	44.96	38.27	22	13.79	25.65
Butter	11	26	33.02	23.14	27	59	7	25	2	17	47.95	41.58	6	1.33	42.70
Canned chick peas	5	17	11.08	7.14	28	42	6	11	4	9	43.56	30.82	16.7	4.62	55.18
Canned green beans	5	13	11.14	8.14	15	33	7	22	1	3	55.12	52.56	25.2	1.65	36.86
Canned kidney beans	4	8	9.60	7.96	36	38	6	13	1	7	38.02	35.32	20.3	7.51	20.60
Canned tomato paste	5	27	10.20	7.87	25	55	3	17	1	7	39.4	31.12	14.5	1.59	29.61
Carrots	8	18	13.35	11.46	24	28	16	25	9	11	55.54	41.64	45	18.13	16.49
Cereal	99	346	31.29	24.25	31	39	5	18	18	55	53.7	40.8	14	3.44	29.03
Cheese	23	100	53.31	29.15	12	16	3	17	1	29	46.07	32.25	23	0.35	82.88
Chicken	8	41	30.16	16.13	31	27	17	37	2	36	55.16	34.7	32	1.57	86.98
Conditioners	9	61	39.42	26.92	11	44	3	13	1	11	55.8	33.01	12.5	1.02	46.43
Cookies	25	170	27.68	22.07	25	43	7	22	5	27	49.1	39.3	14.3	2.92	25.41
Crackers	27	149	42.69	25.31	29	39	5	20	3	42	56.5	45.44	13.7	2.63	68.67
Creams (dairy based)	7	19	40.60	27.85	22	30	10	37	2	9	96.78	85.42	7.5	1.95	45.78
Diced tomatoes	9	44	11.25	7.06	27	47	4	15	12	38	39.79	35.11	9.2	1.55	59.35
Dish detergent	7	29	12.71	10.41	9	37	5	15	1	12	45.51	30.03	5.7	2.85	22.09
Eggs	8	27	17.22	6.10	54	33	4	11	27	20	60.6	50.17	7.9	2.38	182.30
Fabric softener	8	28	14.70	11.97	6	21	3	16	1	10	39.33	30.83	6.1	1.97	22.81
Grapefruits	3	11	8.73	7.48	3	13	3	8	1	6	49.34	45.89	55	1.48	16.71
Grapes	5	20	20.76	18.67	30	65	10	30	7	25	53.47	51.78	18	1.44	11.19
Greens: Salad/others	10	20	17.12	15.90	31	56	9	19	3	5	56.97	39.4	10.4	27.71	7.67
Jams/jellies	37	89	23.15	10.82	17	19	8	10	11	34	66.01	52.05	15	1.9	113.96
Ketchup	15	69	15.26	6.99	26	38	10	14	4	23	79	62.26	10	2.01	118.31
Laundry detergent	19	75	10.65	7.92	22	47	9	20	2	17	43.8	29.2	8.4	3.07	34.47
Lemons	2	5	60.02	49.97	12	33	17	17	2	15	56.12	45.27	21	4.54	20.11
Milk	18	54	6.02	2.57	34	32	9	28	26	69	146.6	109.6	12	2.93	134.24
Mouthwash	10	61	27.14	16.12	14	36	3	10	1	13	38.57	36.26	4.8	1.25	68.36
Mushrooms	3	16	24.45	19.10	4	16	3	10	2	13	77.52	50.2	36	1.49	28.01
Oats	29	76	22.55	17.47	17	32	6	16	7	41	76.05	56.83	18	1.92	29.08
Onions	3	9	7.31	6.35	7	18	4	15	4	14	97.21	85.57	21	1.75	15.12
Oranges	7	11	9.40	7.81	8	24	13	16	6	12	106.5	98.33	28	5.01	20.36
Orange juice	7	59	6.27	5.19	26	31	19	25	6	43	102.2	82.56	18	7.64	20.81
Pasta	36	142	12.47	8.56	18	26	12	20	2	19	71.9	65.9	6	1.26	45.68
Pasta sauce	25	118	19.68	11.85	25	28	15	17	10	28	81.85	69.7	28	2.1	66.08
Peaches	2	11	12.87	10.21	17	59	3	26	2	14	60.96	50.13	19	2.42	26.05
Peanut butter	9	71	31.93	13.86	42	38	7	10	11	34	79.6	72.5	13	4.17	130.38
Pizza: Frozen	17	79	44.42	25.14	14	19	7	17	3	33	143	87.46	4	1.75	76.69
Potato chips	27	113	48.43	27.20	21	25	9	25	18	67	91.97	64.37	9	3.01	78.05
Potatoes	7	50	6.67	5.12	13	34	4	20	9	17	51.46	48.08	16	2.03	30.27
RTE Pack. salads	11	23	28.70	23.96	21	31	8	18	10	34	192.6	142.9	19	22.4	19.78
RTD teas	37	107	15.92	13.37	19	29	15	27	11	24	45.34	39.78	12	3.57	19.07
Salad dressing	29	134	27.45	16.93	25	27	17	21	14	33	56.77	53.2	18	1.59	62.14
Sauces: Canned	37	116	31.65	22.69	20	33	12	17	10	26	82.79	62.27	22	1.39	39.49
Shampoo	27	203	38.40	20.18	12	35	3	15	2	31	51.4	36.3	7.2	1.69	90.29
Soup: Canned	49	254	16.93	12.04	21	27	7	29	9	52	44.06	41.31	8	0.75	40.61
Soymilk	25	34	7.51	5.26	40	38	3	7	12	35	53.77	48.53	20	8.9	42.78
Strawberries	3	13	26.12	24.70	47	53	12	31	16	34	47.97	45.48	53	3.06	5.75
Toothpaste	26	136	95.98	52.95	11	38	8	18	2	41	45.81	31.35	8	1.37	81.27
Tomatoes	5	11	19.76	18.69	19	22	11	20	19	29	87.9	78.43	19	3.89	5.72
Tortilla chips	25	58	27.92	16.89	26	28	10	18	13	35	81.5	72.22	9	3.45	65.30
Turkey	3	15	259.05	139.2	3	17	2	12	1	23	26.27	18.82	7	1.62	86.10
Yogurt	28	71	13.64	10.17	37	22	7	20	17	26	51.23	26.66	10	2.67	34.12

TABLE B2: Description of the VAR/VEC Models Estimated

Model No.	Model Description	Endogenous Variables	Exogenous Variables	Comments
PV=Performance Variables, MV=Marketing Variables, RP=Regular Price, PB=Promotion Breadth, PD=Promotion Depth, A=Assortment, PS=Price Specials, NB=National Brand, PL=Private Label, TT=Top Tier National Brands, ST=Second Tier National Brands, Org=Organics, Con=Conventionals (C is used in some cases as well) , CPL=Conventional Private Label).				
Models Used for Main Results				
1	Overall sales interactions between Org vs. Con	PV: Org Vol., Con. Vol. MV: Org RP, Org PB, Org PD, Org A, Org PS, Con RP, Con PB, Con PD, Con A, Con PS	Seasonal and Holiday Dummies, Time Trend	Store-level data on 56 categories
2	Sales interactions between Org vs. Con for *Core and Noncore Organic Segments***.**	PV: Core Seg. Org Vol., Con. Vol. MV: Org RP, Org PB, Org PD, Org A, Org PS, Con RP, Con PB, Con PD, Con A, Con PS	Seasonal and Holiday Dummies, Time Trend	Panel data on 56 categories
3	Overall sales interactions between top-tier NBs, second-tier NBs, Con PLs and Org for Price and Assortments	PV: TT Vol., ST Vol., CPL Vol., Org Vol. MV: (either) TT RP, TT A, ST RP, ST A, CPL RP, CPL A, Org RP, Org A(**or)** TT PB, TT PD, ST PB, ST PD, CPL PB, CPL PD, Org PB, Org PD MV: TT PB, TT PD, ST PB, ST PD, CPL PB, CPL PD, Org PB, Org PD	(either)TT PB, TT PD, TT PS, ST PB, ST PD, ST PS, CPL PB, CPL PD, CPL PS, Org PB, Org PD, Org PS (**Or**) TT RP,TT A,TT PS,ST RP, ST A, ST PS,CPL RP, CPL A, CPL PS, Org RP, Org A, Org PS Seasonal and Holiday Dummies, Time Trend	Store-level data on 38 categories. No branding information for produce. The two models are estimated separately.
4	Overall retailer performance effects vis-à-vis Org and Con	PV: Store Revenues, Store Margins (Profits) MV: Org RP, Org PB, Org PD, Org A, Org PS, Con RP, Con PB, Con PD, Con A, Con PS	Seasonal and Holiday Dummies, Time Trend	Store-level data on 56 categories
5	Overall sales (performance) between Org vs. Con analyzed ***with quadratic price gap***	PV: Org Vol. , Con. Vol. (Store Revenues, Store Margins) MV: Org RP, Org PB, Org PD, Org A, Org PS, Con RP, Con PB, Con PD, Con A, Con PS, $(OrgRP - ConRP)^2$	Seasonal and Holiday Dummies, Time Trend	56 categories used.
6	Overall sales interactions between Org vs. Con analyzed ***with social influence for survey consumers***	PV: Org Vol. , Con. Vol. MV: Org RP, Org PB, Org PD, Org A, Org PS, Con RP, Con PB, Con PD, Con A, Con PS	Seasonal and Holiday Dummies, Time Trend, *Social Influence*	56 categories used.
7	Overall sales interactions between Org vs. Con with all types of organic products including 100% Organic and organic (at least 95%)	PV: Org Vol. , Con. Vol. MV: Org RP, Org PB, Org PD, Org A, Org PS, Con RP, Con PB, Con PD, Con A, Con PS	Seasonal and Holiday Dummies, Time Trend	49 food categories used. The USDA seal is prominent only for foods.
8	Overall sales interactions between Org vs. Con for Org. with less than 70% organic ingredients and "Made with organic ingredients"-No USDA Seal	PV: Org Vol. , Con. Vol. MV: Org RP, Org PB, Org PD, Org A, Org PS, Con RP, Con PB, Con PD, Con A, Con PS	Seasonal and Holiday Dummies, Time Trend	49 categories used.
9	Overall sales interactions between only natural products vs. Con	PV: Nat Vol. , Con. Vol. MV: Nat RP, Nat PB, Nat PD, Nat A, Nat PS, Nat RP, Nat PB, Nat PD, Nat A, Nat PS	Seasonal and Holiday Dummies, Time Trend	49 categories used.
10	Overall sales (performance) interactions between Org vs. Con analyzed ***store-by store***	PV: Org Vol. , Con. Vol. (Store Revenues, Store Margins)	Seasonal and Holiday Dummies, Time Trend	56 categories used.