

Research Paper

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Author for correspondence:

Danhong Chen,
E-mail: dchen@shsu.edu

Price promotion of organic foods and consumer demand

Danhong Chen¹ , Edward C. Jaenicke², Ji Yan³, Kun Tian⁴
and Rodolfo M. Nayga⁵

¹School of Agricultural Sciences, Sam Houston State University, Huntsville, TX, USA; ²Department of Agricultural Economics, Sociology, and Education, The Pennsylvania State University, State College, PA, USA; ³Durham University Business School, Durham University, Durham, UK; ⁴Norwich Business School, University of East Anglia, Norwich, UK and ⁵Department of Agricultural Economics, Texas A&M University, College Station, TX, USA

Abstract

Existing studies have examined the demand elasticities for organic products only in select categories, and their results for consumers' sensitivity to price changes are inconsistent. Evidence regarding the effects of price promotions on the demand for organic foods vs non-organic foods is scarce. This study aims to (1) examine the own-price elasticities of organic foods vs non-organic counterparts both with and without a promotion in a variety of product categories, and (2) investigate how the distinctive promotion effects between organic and non-organic counterparts depend on food category features. Using purchase data for 36 food categories from the 2015 Nielsen Consumer Panel, we find differential own-price elasticities for organic and non-organic foods, regardless of whether the product is purchased with a promotion. When the products are purchased with a promotion, we find stronger price promotion effects of organic virtues than non-organic virtues and weaker price promotion effects of organic vices than conventional vices. Price promotions of organic foods are more likely to induce health-conscious consumers to switch from conventional purchases to organic purchases in virtues.

Introduction

The US organic industry has seen rapid growth nearly every year since the 1990s, organic food sales reached \$50.1 billion in 2019, accounting for 5.8% of total food sales (OTA, 2020). A multitude of studies have investigated the organic price premiums and demand elasticities for organic foods (Yiridoe *et al.*, 2005; Jaenicke and Carlson, 2015). However, their results are mixed regarding consumers' sensitivity to price changes of organic foods (Rödiger and Hamm, 2015; Aschemann-Witzel and Zielke, 2017).

Existing studies have estimated the demand elasticities for organic products only in select product categories (Rödiger and Hamm, 2015). The estimated own-price elasticities for organic milk are much higher in magnitude among certain studies (Jonas and Roosen, 2008; Lopez and Lopez, 2009) than others (Bernard and Bernard, 2009; Schröck, 2012). Glaser and Thompson (2000) find that the demand for organic milk is highly elastic, but it declined over the study period from November 1996 to December 1999. This concurs with another finding of elastic demand for organic milk, based on retail scanner data from March 1997 to February 2002 (Dhar and Foltz, 2005). Compared with private label milk, the own-price elasticity for organic milk is higher in magnitude, and the demand for more expensive specialty milk is more elastic, indicating that consumers may abandon the pricy milk options when their prices rise (Lopez and Lopez, 2009). While two studies show more elastic demand for organic fruits and vegetables than their non-organic counterparts (Fourmouzi *et al.*, 2012; Kasteridis and Yen, 2012), another study finds that this conclusion does not always hold for organic vegetables (Zhang *et al.*, 2011).

The variation in product features may be a contributing factor to the inconsistent demand elasticities for organic foods (Aschemann-Witzel and Zielke, 2017). However, to our knowledge, evidence regarding such moderating factors is scarce. Based on store-level data for multiple product categories, Bezawada and Pauwels (2013) find that the sales elasticity to regular price change is greater for organic than conventional foods. They also show that consumer sensitivity to regular price changes is greater in categories that have higher purchase frequencies, are so-called virtue products, and are less processed (produce, dairy, meat and poultry), but it is lower for categories with higher organic price premiums.

Due to inconsistent findings of demand elasticities and the lack of evidence regarding consumers' responses to price promotions of organic foods vs non-organic foods, the first objective of this study is to investigate the own-price demand elasticities of organic foods vs non-organic counterparts both with and without a promotion in a wide range of product

categories. The second objective of this study is to examine how consumers' differential responses to price promotions of organic foods vs non-organic counterparts depend on food category features, including the vice/virtue classification, whether the food is in a fresh category, the organic price premiums and purchasing shares of organic foods in a product category. These factors are discussed in detail in the literature review section.

Literature review

Relative vices refer to products that offer immediate hedonic experience but may lead to adverse long-term consequences (e.g., negative health problems). Relative virtues are products that provide less gratifying experience in the short-run but contribute to less negative outcomes in the future (Werthenbroch, 1998). Past studies have applied the concepts of vices and virtues in two ways. One line of studies describes pairs of foods as relative vices and virtues (Parreño-Selva *et al.*, 2014; Yan *et al.*, 2017). For example, alcohol-free beer and alcoholic beer are considered relative virtues and vices, respectively, in Parreño-Selva *et al.* (2014). The other line of studies defines healthy and unhealthy food categories as relative virtues and vices (Mishra and Mishra, 2011; van Doorn and Verhoef, 2011; Liu *et al.*, 2015). For instance, baby carrots and potato chips represent pure virtues and pure vices, respectively, in Liu *et al.* (2015).

Consumers buy organic products because of their perceived benefits, such as nutrition value, taste and environmental protection (Paul and Rana, 2012; Pino *et al.*, 2012). In a previous experimental study, 115 participants were asked to evaluate the nutrition and taste of three paired food samples, including cookies, potato chips and yogurt (Lee *et al.*, 2013). One group of foods in the pair was labeled as 'regular' and the other group was labeled as 'organic', even though the two groups were actually identical, and both of them were organically produced. Participants perceived the foods with organic labels to be more nutritious, have a higher level of fiber, and have lower levels of fat and calorie than the foods labeled as 'regular'. Although organic foods are perceived to be healthier than their non-organic counterparts, whether an organic label induces higher food consumption may depend on the food type, especially the vice/virtue classification. Lee *et al.* (2018) find that an organic label is associated with increased consumption of a relative vice food but reduced intake of a relative virtue food.

Consumers' perceptions of quality, healthfulness and environmental benefits may differ between virtues and vices, leading to differential willingness-to-pay (WTP) for vice and virtue foods. Based on multiple studies, van Doorn and Verhoef (2011) find that an organic claim's positive effect of prosocial benefits on WTP is stronger for vices than virtues, whereas the positive effect of quality perception on WTP is stronger for virtues than vices. There is also evidence showing that consumers are willing to pay a higher premium in fresh categories such as fruits and vegetables (Gil *et al.*, 2000).

Previous studies have found distinct price promotion effects in relative vices and virtues. Parreño-Selva *et al.* (2014) show that consumers are more sensitive to price promotions of vice products (alcoholic beer) than virtue products (non-alcoholic beer). Consistent with this finding, Yan *et al.* (2017) also find that the price promotion effects are stronger for relative vice products than virtue products (i.e., 'low fat', 'low sugar', 'low calorie') in crisps and beer. However, this finding is reversed in different food categories. That is, the price promotion effects are stronger for relative virtue products than vice products in baked beans and fresh fruit juices (Yan *et al.*, 2017).

In addition to the vice/virtue nature, whether consumers are more sensitive to price changes of organic foods than non-organic counterparts may also depend on a number of other food category factors such as price premium and share of purchases (Bezawada and Pauwels, 2013). For example, Sridhar *et al.* (2012) find that the share of organic purchases varies across product categories, with less processed categories being the highest, and Van Doorn and Verhoef (2015) find that consumers are more likely to purchase organic foods in fresh and virtue categories.

Three review studies unequivocally conclude that price is the major barrier to organic purchases (Hughner *et al.*, 2007; Aertsens, 2009; Aschemann-Witzel and Zielke, 2017). There are only a few studies that find other factors such as availability, information/knowledge and product assortment as the primary inhibitors, but they rely on data from markets in early stages of development or from habitual consumers in mature markets (Aschemann-Witzel and Zielke, 2017). Organic price premiums and promotion intensity are negatively associated with shares of organic purchases (Van Doorn and Verhoef, 2015).

Studies of WTP for organic products have yielded varied estimates ranging from 0 to over 100% (Aschemann-Witzel and Zielke, 2017). The great variation can be attributed to several factors, including product category (product-specific features), consumer segment (consumer-specific characteristics) and labeling practice. For instance, a higher percentage of consumers in Greece are willing to pay a price premium of 30% or more for organic fruits and vegetables compared to other product categories (Krystallis, 2005). Hamzaoui-Essoussi and Zahaf (2012) divide consumers into three segments, including true organic food consumers, sporadic organic food consumers and inexperienced organic food consumers. They find that true organic food consumers are willing to pay for the highest price premiums, whereas inexperienced organic food consumers are willing to pay for the lowest for all product categories (Hamzaoui-Essoussi and Zahaf, 2012). Consumers are willing to pay more for jams labeled as '100% organic', but the '95% organic' seal is not significantly associated with a price premium (Hu *et al.*, 2011).

Socio-demographic characteristics rarely fall in the scope of the primary research question, but they are also important predictors for organic food purchases. Studies that are based on large sample sizes (e.g., consumer panel data) and rigorous research methods tend to confirm a positive relationship between household income and organic food choices (Jonas and Roosen, 2008; Smith *et al.*, 2009a; Ngobo, 2011; Schröck, 2012). Educational attainment has been considered simultaneously with the income level to measure social class (Loureiro and Hine, 2002). A higher level of education is often associated with a higher propensity to shop for organic foods (Wier *et al.*, 2008; Smith *et al.*, 2009a; Ngobo, 2011). The presence of children is not always found to increase the probability of patronizing organic foods (Jonas and Roosen, 2008), but it tends to have a positive impact among families with young children (Wier *et al.*, 2008; Smith *et al.*, 2009a). On the one hand, parents perceive organic foods as healthier alternatives to conventional counterparts (Smith *et al.*, 2009a). On the other hand, a larger number of children and household size may impose a budget constraint that hinders organic food purchases (Schröck, 2012).

Data and modeling approach

The Nielsen Consumer Panel data track all the food and non-food purchases of a panel of households representative of the

population in the USA. The households use in-home scanners to record their purchases from anywhere. Using data from the 2015 Nielsen Consumer Panel, we analyze consumer responses to price promotions of organic and non-organic products in 36 food categories. Similar to previous studies (Mishra and Mishra, 2011; Liu *et al.*, 2015), relatively healthy and unhealthy foods are considered as relative virtues and vices, respectively, in this study. A total number of 17,494,986 purchases (observations) are included in our analysis.

To estimate the own-price demand elasticities of organic vs non-organic foods both with and without a promotion (objective 1), we use the following model specification:

$$\begin{aligned} \ln Q_{ijt} = & \beta_0 + \beta_1 \ln PRICE_{ijt} + \beta_2 OR_{ijt} \\ & + \beta_3 PRO_{ijt} + \beta_4 \ln PRICE_{ijt} \times OR_{ijt} + \beta_5 \ln PRICE_{ijt} \\ & \times PRO_{ijt} + \beta_6 OR_{ijt} \times PRO_{ijt} + \beta_7 \ln PRICE_{ijt} \times OR_{ijt} \times PRO_{ijt} \\ & + \beta_8 COLLEGE_j + \beta_9 FULLTIME_j + \beta_{10} INCOME_j \\ & + \beta_{11} SIZE_j + \beta_{12} CHILDREN_j + \beta_{13} MARRIED_j + \varepsilon_{ijt} \end{aligned}$$

$$Price\ Elasticity = \begin{cases} \beta_1 & \text{if } OR_{ijt} = 0 \text{ and } PRO_{ijt} = 0 \\ \beta_1 + \beta_4 & \text{if } OR_{ijt} = 1 \text{ and } PRO_{ijt} = 0 \\ \beta_1 + \beta_5 & \text{if } OR_{ijt} = 0 \text{ and } PRO_{ijt} = 1 \\ \beta_1 + \beta_4 + \beta_5 + \beta_7 & \text{if } OR_{ijt} = 1 \text{ and } PRO_{ijt} = 1 \end{cases}$$

$\ln Q_{ijt}$ refers to the natural logarithm of the quantity of product i purchased at time t for household j , measured as ounces. Each regression is conditional on a positive purchase of the product. OR_{ijt} is a dummy variable indicating whether the product is organic. $\ln PRICE_{ijt}$ indicates the natural logarithm of the unit price of product i at time t , measured as dollars per ounce. For each purchase, coupon value is deducted from the total price paid by consumers to generate the final price that consumers pay. We then calculate the unit price per ounce by dividing the total price by the total number of ounces. PRO_{ijt} indicates if a coupon is used or if there is an in-store sale for the purchase. $COLLEGE_j$ indicates whether the household head has a college degree. $FULLTIME_j$ is a dummy variable indicating whether the household head is employed fulltime. $INCOME_j$ is a categorical variable showing the income level of a household. $SIZE_j$ represents the household size. $CHILDREN_j$ and $MARRIED_j$ are both dummy variables indicating whether a household has children and whether the household head is married, respectively. ε_{ijt} is the residual term. The regression is estimated by OLS, and the standard errors are clustered by the household identifier.

Corresponding to the first objective, β_1 and $\beta_1 + \beta_4$ represent the own-price elasticities of organic foods and non-organic foods without a promotion. The own-price elasticities of organic foods and non-organic foods with a promotion are represented by $\beta_1 + \beta_4 + \beta_5 + \beta_7$ and $\beta_1 + \beta_5$, respectively. The differential price promotion effects are captured by $\beta_4 + \beta_7$. When $\beta_4 + \beta_7 < 0$, the own-price elasticity of organic foods is higher (in magnitude) than that of non-organic foods, suggesting stronger price promotion effects of organic products. When $\beta_4 + \beta_7 > 0$, the price promotion effects of organic foods are weaker than non-organic foods. Corresponding with the second objective, the sign of $\beta_4 + \beta_7$ is expected to be dependent on a number of product category features that are reviewed in the literature review section.

Following Van Doorn and Verhoef (2015), we classified the 36 food categories into 15 virtue foods, 13 vice foods and eight categories that are neither virtue nor vice. Two-sample t -tests are used to examine how the sign of $\beta_4 + \beta_7$ differs among virtue/vice/neutral food categories, and fresh/non-fresh food categories. Pearson's correlations are used to investigate the association between differential promotion effects and organic price premiums, and the association between differential promotion effects and share of organic purchases. Organic price premium is measured as the percentage difference in unit price between organic and conventional products in a product category. Share of organic purchases is calculated as the number of organic purchases relative to the total number of purchases in a food category.

Results and discussions

Table S1 in the Supplementary materials presents the characteristics of the 36 food categories. In most food categories, organic versions of the product enjoy price premiums ranging from 5.49% (baby food) to 297.67% (carbonated beverage). Our calculated price premiums are consistent with previous studies. For example, the price premium of organic milk is approximately 64%, which is similar to the numbers estimated (60% for manufacturer brands and 75% for store brands) in Glaser and Thompson (2000). But it is lower than the price premium estimated in Smith *et al.* (2009b). Using a hedonic model with baby food and store characteristics as the explanatory variables for price, Maguire *et al.* (2004) find that consumers are willing to pay 3 or 4 cents more per ounce for organic baby food, almost identical to our calculation of 4 cents per ounce. Surprisingly, consumers pay lower prices for the organic versions of the product in certain food categories such as canned seafood and desserts, after deducting coupons from each purchase.

Almost all the purchasing shares of organic food are below 10%, except for baby food. Thirteen out of the 36 food categories have organic purchasing shares below 1%. Consumers are most likely to buy the organic versions of two food categories—baby food and fresh produce, with organic purchasing shares equal to 17.56% and 9.97%, respectively. The shares of organic purchases are generally higher in virtue categories than vice categories.

Table S2 in the Supplementary materials demonstrates a series of coefficients estimated by OLS with clustered standard errors. The volume of each food purchase is significantly influenced by household demographic characteristics. Having a college degree, higher household income, larger household size and being married are positively associated with the volume of each transaction in most of the food categories. In contrast, having a full-time job or children is significantly associated with smaller transaction volumes for most of the food categories.

As expected, the signs of β_4 and $\beta_4 + \beta_7$ vary across the 36 food categories, indicating differential responses to price changes between organic products and non-organic products in various food categories, regardless of whether the product is purchased with a promotion or not. When $\beta_4 + \beta_7 < 0$, the demand elasticity for organic food is higher (in absolute value) than that for non-organic food with a promotion. For instance, consumers are more responsive to price promotions of organic fresh produce than non-organic fresh produce. When $\beta_4 + \beta_7 > 0$, the demand elasticity for organic food is lower (in absolute value) than that for non-organic counterparts with a promotion. For example, consumers are less sensitive to the price promotions of organic candy than non-organic candy.



Fig. 1. Differential promotion effects between organic foods and non-organic foods in virtue and vice food categories

Table 1. Differential promotion effects between organic foods and non-organic foods by category features

Category features	Mean of $\beta_4 + \beta_7$	Standard deviation	Minimum	Maximum
Virtue	-0.076	0.150	-0.311	0.254
Vice	0.105	0.132	-0.127	0.396
Neither	0.060	0.210	-0.183	0.518
Fresh	0.011	0.199	-0.311	0.254
Non-fresh	0.022	0.173	-0.262	0.518

The differential promotion effects ($\beta_4 + \beta_7$) between organic and non-organic foods by the virtue/vice status are depicted in Figure 1. $\beta_4 + \beta_7$ is negative for most virtue foods, but it is positive for most vice foods. The mean of $\beta_4 + \beta_7$ for virtue foods is -0.076 (Table 1), indicating stronger price promotion effects of organic virtues than non-organic virtues. In contrast, the mean of $\beta_4 + \beta_7$ for vice foods is 0.105 (Table 1), suggesting stronger price promotion effects of non-organic vices than organic vices. The two means are significantly different from each other ($P = 0.002$ from a two-sample t -test). Other comparisons (virtue vs neither, vice vs neither and fresh vs non-fresh) do not show statistical significance. Our findings are consistent with a previous study showing a higher sensitivity of organic promotions in virtue food categories (Bezawada and Pauwels, 2013) and with two studies (Fourmouzi *et al.*, 2012; Kasteridis and Yen, 2012) that find higher own-price demand elasticities for organic fruits and vegetables than non-organic counterparts.

Our results are also likely consistent with prior research, Yan *et al.* (2017), that shows price promotion effects are stronger for relatively healthier alternatives (i.e., 'low fat', 'low sugar', 'low calorie') than the original products in the virtue food categories (i.e., baked beans and fresh fruit juices), and that the price promotion effects are weaker for the relatively healthier options in the vice food categories (i.e., crisps and beer). While our results do not

specifically account for healthiness attributes, a previous experimental study shows that consumers perceive organic foods to be lower in fat and higher in fiber, or relatively healthier than their non-organic counterparts (Lee *et al.*, 2013). Therefore, our study lends further evidence in this regard.

The differential responses may be associated with the motivations of purchases in a virtue vs a vice food category. A relative virtue food category tends to offer long-term benefits, but a less gratifying consumption experience. Because the organic attribute affects consumers' taste perception (Fillion and Arazi, 2002), the level of gratification, and therefore the relative virtue vs vice distinction, may be affected by the attribute itself. For instance, sensory analysis indicates that organic orange juice tastes better than conventional orange juice (Fillion and Arazi, 2002). A more intense flavor in organically grown tomatoes has been reported in another sensory analysis (Zhao *et al.*, 2007). Organic yogurt is perceived to be more flavorful and has a better taste than regular yogurt (Lee *et al.*, 2013). Besides, organic foods are often perceived to be healthier than their conventional counterparts. Individuals may underestimate the caloric content of organic foods (Lee *et al.*, 2013), leading to less guilty in overconsumption. This 'health halo' effect of organic foods is reinforced in a virtue food category. In contrast, people consume relatively vice food to get the immediate hedonic experience, with less emphasis on the negative health effects in the long run. Wertenbroch (1998) suggests that the self-control mechanism prevents consumers from buying large quantities of vice products in response to price changes. As such, the health halo effect of an organic label may not work on a vice product, since individuals who shop for vice foods are less concerned about the health benefits.

A previous study, Bezawada and Pauwels (2013), shows higher sensitivity to organic promotions in food categories with higher purchase frequencies. However, Pearson's correlations in this study do not show significant associations between differential promotion effects and organic price premiums, and between differential promotion effects and share of organic purchases. Nevertheless, price is one of the most important factors that

prevent consumers from buying organic products in all food categories (Vega-Zamora *et al.*, 2014). As such, price promotions may act as a catalyst that induces consumers to switch from conventional products to organic products in virtues.

Conclusion

While many studies have estimated the demand elasticities of organic foods in selected product categories, this study compares the own-price elasticities of organic foods with those of their conventional counterparts both with and without a promotion in a wide range of product categories. Rather than making an undiscriminating conclusion that consumers are less or more reactive to prices of organic products than those of conventional products, we conclude that it depends on a number of product category features.

We find that the price promotion effects of organic foods are stronger than non-organic counterparts in categories of virtue nature. Consumers are more likely to have a higher price sensitivity for organic foods than non-organic counterparts in virtue categories. As reflected in the higher organic purchase shares of virtue foods than vice foods, consumers are generally more interested in purchasing organic foods in virtue categories. However, price is one of the most important factors that prevent consumers from buying organic products, making a price discount enticing for health-conscious consumers. They tend to perceive organic foods as healthier and underestimate the caloric content of organic foods. This health halo effect of organic foods may be reinforced in virtue categories, making the demand for organic virtues more price elastic. Because of the negative health effects of vices, consumers tend to impose quantity constraints and resist the temptation to consume more organic vices in response to price discounts.

The findings from this study may help shed some light on the distinctive price promotion strategies for organic virtues and vices. As the price promotion effects of organic foods are stronger than non-organic counterparts in categories of virtue nature, intensive organic price promotions may help convert conventional shoppers to organic consumers in such categories.

Statement

Researcher(s) own analyses calculated (or derived) based in part on data from Nielsen Consumer LLC and marketing databases provided through the NielsenIQ Datasets at the Kilts Center for Marketing Data Center at The University of Chicago Booth School of Business. The conclusions drawn from the NielsenIQ data are those of the researcher(s) and do not reflect the views of NielsenIQ. NielsenIQ is not responsible for, had no role in, and was not involved in analyzing and preparing the results reported herein.

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