

YEDİ ANA GIDA KATEGORİSİNDE HANEHALKI DEMOGRAFİSİ VE ORGANİK ÜRÜN TERCİHİ

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Öz

Endüstriyel olarak işlenmiş tüketici ürünleriyle ilgili sağlık endişelerinin artmasıyla birlikte, yakın dönemde organik ürünlere olan talep artmıştır. Bu çalışma, organik ürün tercihini belirleyen hanehali demografik özelliklerini ortaya koymak amacıyla, 60 binin üzerinde ABD hanehalkının gıda alımlarına ilişkin verisini kullanarak, yedi ana gıda grubu temelinde organik ürünlerin tüketici profillerini incelemektedir. Regresyon analizlerinden elde edilen sonuçlar, organik ürünlere olan talebin gelir ve eğitim düzeyi ile arttığını ortaya koymaktadır. Organik ürün tercihi genç hanelerde daha yüksek olup, 30-34 yaş grubunda en yüksek seviyeye çıkmakta, buna karşın dört ve daha çok birey içeren geniş haneler için düşüş göstermektedir. Küçük çocuklu evlerde, özellikle yumurta ve süt ürünleri gibi tipik olarak çocuk beslenmesinde önemli yeri olan gıda kategorilerinde organik ürünlerin payı artmaktadır. Bu bulgular, organik ürün pazarlamasında, demografik etmenlerde yaş ve hanehalkı büyüklüğüne göre ve ürün kategorisine göre oluşabilen tercih farklarının gözönünde bulundurulması gerektiğine işaret etmektedir.

Anahtar Kelimeler: Organik Tüketim, Gıda Pazarlaması, Gözlemsel Veriler, Ampirik Yöntemler

JEL Kodları: C55, D12, M31

HOUSEHOLD DEMOGRAPHICS AND PREFERENCE FOR ORGANIC PRODUCTS IN SEVEN MAJOR FOOD CATEGORIES

Abstract

Amid increasing health concerns about industrially processed packaged consumer products, demand for organic products has risen in recent decades. Using rich panel data on food purchases of more than 60 thousand U.S. households, this study examines consumer profiles of organic products in seven major food groups with the aim of identifying household characteristics that predict preference for organic product options. The results of the regression analyses show that demand for organic products increases with income and education level. The preference for organic products is higher in younger households and peaks in the 30-34 age group, while it decreases in large households with more than four members. At the same time, the results show that consumption of organic products increases in households with a young child, especially in categories that typically form an important part of a young child's diet, such as eggs and dairy products. These results suggest significant nonlinearities in the effects of age and household size, as well as differences in the effects of demographic variables by product category, that should be taken into consideration in the marketing of organic products.

Keywords: Organic Consumption, Food Marketing, Observational Data, Empirical Methods

JEL Codes: C55, D12, M31

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INTRODUCTION

In light of health concerns about industrially processed packaged foods, consumption of organic foods is increasing around the world. Research shows that the chemicals used in mass agriculture may be harmful, especially to children (Eskenezi, Bradman, and Castorina, 1999) and "organic foods are higher in certain nutrients and lower in pesticides and may offer health benefits to consumers" (Crinnion, 2010). As a result, households are increasingly opting for natural, chemical-free options in their diets. To address this important demand trend, it is important for both marketers and policy makers to better understand the factors that influence the choice of organic options. The goal of the study is to study the demographic profile of organic consumers based on actual purchase data. The questions the study aims to answer can be summarized as follows: How does preference for organic products vary across food categories? How do age, education, income level, and the presence of children of different ages in the household affect preference for organic options? Does the influence of these demographic characteristics differ by product category? Answers to these questions can be useful for marketers of organic products and for retailers to better target the relevant consumer segments.

To examine these research questions, this study uses consumer panel data from Nielsen Analytics, provided by the Kilts Center for Marketing at the University of Chicago Booth School of Business. The data comes from the year 2018, which is recent enough to reflect current trends. Also, it predates the outbreak of the Covid pandemic and therefore reflects consumer choices regardless of the impact of the pandemic. Nielsen provides product information for the items purchased, including whether the product is labeled as "organic". The ratio of organic purchases is calculated as the share of organic product purchases within the household's total category purchases. The final dataset captures purchase history of more than 60000 individual U.S. households in seven major food categories, including cereals, eggs, fresh meat, fresh produce, milk, pasta, and yogurt. The data also include demographic information about the panel households, such as age, income level, number of members, and age of children, the effects of which on the likelihood of buying organic are examined in a regression analysis. Market fixed effects are employed to control for geographic differences in the supply of products.

The results of the study show that organic consumption increases with income and education and is higher among younger consumer groups. The effects of these factors are strongest for staple animal-based foods such as milk, and eggs. Having a large household that includes more than four individuals has a negative effect on organic preference. The presence of a young child under the age of five increases the likelihood of purchasing organic options especially for dairy products, an important part of the young child's diet. Models that allow flexible specifications of the respective independent variables suggest nonlinear



effects of these demographic factors. For example, the effect of age on organic consumption is non-monotonic; organic consumption peaks in the 30-34 age group and declines thereafter. Regarding income, whereas households with incomes below the median (i.e., the two lowest quintiles) do not purchase organic products at all, the proportion of organic purchases increases linearly in the higher income groups. Finally, increases in household size do not affect organic consumption up to a household size of four individuals, as of this level the share of organic purchases drops linearly with each additional household.

The remainder of the paper is organized as follows. The next section provides an overview of the literature that uses actual demand data to examine organic product purchase behavior. The following sections introduce the Nielsen Homescan data used in the study, describe the empirical model, and present the results. The final section provides a summary and discussion of the findings.

LITERATURE REVIEW

While the criteria for classifying a product as "organic" may vary from country to country, it generally refers to a product that has been grown and/or processed without using artificial chemicals. (Pearson, and Henryks, 2008). The United States Department of Agriculture National Organic Standards Board (2012) requires that a product must be (i) free of genetic modification, (ii) grown without conventional fertilizers and pesticides, and (iii) processed without food additives or ionizing radiation in order to receive a certified organic label. Organic products are available in most major food categories alongside the conventional versions of the product. (Pearson, Henryks, and Jones, 2011) and it is estimated that the global organic food market has reached a total size of \$63 billion (Chassy, Tribe, Brookes, and Kershen, 2014).

In general, consumer perceptions of organic labels can be subjective and have no objective basis (Janssen, and Hamm, 2012). For most consumers, "organic" as a product attribute represents quality and a healthier lifestyle. (Chinnici, D'Amico, and Pecorino, 2002; Padel, and Foster, 2005; Demeritt, 2006). Compared to conventional foods, organic products are considered more nutritious (Pino, Peluso, and Guido, 2012) and tastier (Lee, Shimizu, Kniffin, and Wansink, 2013).

Most of the existing research examining preference for organic products relies on qualitative methods and survey data to understand the drivers of organic consumption (see Hughner, McDonagh, Prothero, Shultz, and Stanton, 2007 and Rana, and Paul, 2017) for comprehensive reviews of this literature). In this line of research, the reasons identified for preferring organic products revolve around environment, health, and quality issues. (Makatouni, 2002; Zanolli, and Naspetti, 2002).



Because survey data may not adequately reflect consumers' actual purchasing behaviour, recent literature (Ngobo 2011; Van Doorn, and Verhoef, 2011; 2015; Bezawada, and Pauwels, 2013) has reported findings based on panel data on actual purchases. The current study contributes to this line of research. As part of this literature, Ngobo (2011) studies a panel dataset with of actual organic purchases in two U.S. markets, from over 4,500 households in 25 stores for the period between January 2004 and June 2009. The author finds that high-income families, university-educated families, and older families are more likely to purchase organic products. Bezawada, and Pauwels (2013) study consumer responses to changes in assortment, price, and promotions of organic and conventional products using data from a regional retail chain in the United States that operates 75 stores in the northeast region. They show that organic consumers are sensitive to assortment and price changes. Van Doorn, and Verhoef (2011; 2015) use data from the Dutch GfK household panel that tracks purchases of 4,000 households, focusing on food categories including fruit and vegetables, meat, coffee, cereals, and dairy products. The authors find that, in vice products consumed for immediate satisfaction, which can impact long term health outcomes for the household negatively, organic products are less popular. They find a similar result in categories with high promotional intensity, and also in processed as opposed to fresh food categories.

The current study contributes to this line of literature, using a rich, recent dataset that includes more than 60,000 households coming from a diverse set of markets across the U.S. The results complements the previous research findings by studying the differences in the role of demographic characteristics in the propensity to buy organic options in different product categories, with a focus on nonlinear effects, the effect of household structure, the presence of kids and their ages.

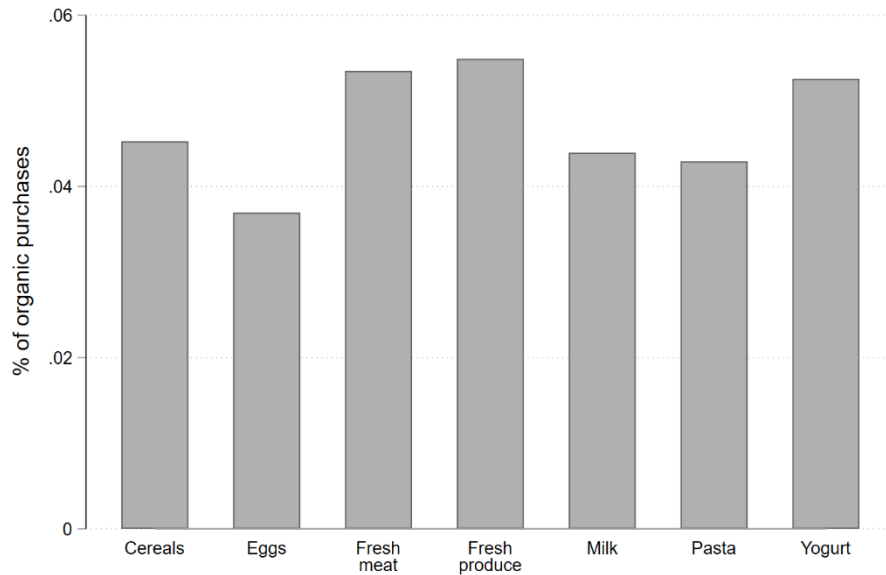
DATA

The data used in this study comes from the 2018 AC Nielsen Homescan consumer panel which is available to academic researchers through a partnership between the Nielsen Company and the James M. Kilts Center for Marketing at the University of Chicago Booth School of Business. To collect this data, panel households are asked to use an optical scanner in their homes to scan the bar codes of all consumer packaged goods items they purchase at supermarkets, convenience stores, mass merchandisers, club stores and drugstores. Nielsen uses a stratified sampling method used by Nielsen to increase the representativeness of the Homescan panel.

Table 1: Variable means and standard deviations by product category

| | Cereals | Eggs | Fresh meat | Fresh produce | Milk | Pasta | Yogurt |
|--|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|
| \$ share of organic purchases | 0.0453 (0.144) | 0.0369 (0.143) | 0.0535 (0.185) | 0.0549 (0.179) | 0.0439 (0.152) | 0.0429 (0.170) | 0.0526 (0.0996) |
| Young (Age younger than 40) | 0.488 (0.500) | 0.471 (0.499) | 0.488 (0.500) | 0.491 (0.500) | 0.485 (0.500) | 0.475 (0.499) | 0.496 (0.500) |
| Univ. graduate | 0.556 (0.497) | 0.557 (0.497) | 0.556 (0.497) | 0.555 (0.497) | 0.577 (0.494) | 0.552 (0.497) | 0.558 (0.497) |
| Yearly income (in 1000\$) | 61.98 (29.37) | 62.72 (29.13) | 62.03 (29.37) | 61.94 (29.39) | 63.43 (29.11) | 62.73 (29.17) | 61.85 (29.42) |
| Household size | 2.477 (1.331) | 2.527 (1.330) | 2.458 (1.323) | 2.455 (1.325) | 2.530 (1.345) | 2.543 (1.334) | 2.437 (1.323) |
| Has child(ren) age 5 or younger | 0.124 (0.329) | 0.128 (0.334) | 0.121 (0.326) | 0.121 (0.326) | 0.135 (0.341) | 0.133 (0.339) | 0.118 (0.323) |
| Has child(ren) aged 6-12 | 0.106 (0.308) | 0.109 (0.312) | 0.103 (0.305) | 0.103 (0.304) | 0.114 (0.317) | 0.112 (0.315) | 0.102 (0.302) |
| No. obs. | 57,224 | 52,410 | 57,201 | 59,273 | 50,363 | 41,647 | 60,562 |

Notes: The figures indicate the mean values for the ariables used in the study, Standard deviations are indicated in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 1: Organic purchases by product category

The current study focuses on purchase data from the year 2018 in seven main food categories that make up a large majority of households' food purchases. These include fresh meat, fresh produce, milk, yogurt, pasta and cereals. Nielsen provides information for products labeled as organic. In each product category, the household's dollar purchases are aggregated over the year, separately for organic and regular purchases. Summary statistics for the data are provided in Table 1. Purchase data from approximately 40000 to 60000 households are available in different product categories. The average share of organic purchases is in the range of 3.7 to 5.5% for these categories. Figure 1 compares category-specific averages in the share of organic consumption. The categories with highest share of organic purchases are fresh meat, fresh produce, and yogurt, where the share levels are above 5%. For cereals, eggs, milk and pasta the share levels are lower, around 4% of category dollar sales.

EMPIRICAL MODEL

To examine the effects of household characteristics on demand for organic products, the following regression model is taken as basis:

$$share_{hp} = \beta_y young_h + \beta_i income_h + \beta_u univ_h + \beta_l large_h + \beta_{yk} youngkid_h + \beta_{ok} olderkid_h + \beta_{m(h)} + \varepsilon_{hp} \quad (1)$$

In this equation *share* denotes the dollar share of organic purchases within household *h*'s yearly purchases from the product category *p*. Among the explanatory variables, *young* is a dummy variable that takes the value of 1 if the household head is below the age of 40, *income* denotes households' yearly income level, *univ* is a dummy variable indicating if the household head has university degree and *large_h* is an indicator variable that takes the value of one for households with more than four individuals. To measure the effect of the age of children, two demographic variables are included. The variable *youngkid* is an indicator variable for the presence of a kid below the age of 5, and *olderkid* captures the presence of an older kid, between the ages of 5 and 7. To control for the differences in supply characteristics of organic options across the different markets that households are sampled from, the model includes a market fixed effect $\beta_{m(h)}$, where *m(h)* denotes the market household *h* resides in. These fixed effects control for variations in relative prices, availability, and marketing activity for these goods, by constraining the regression model to a comparison of households (of different demographic characteristics) residing within the same market. Finally, ε_{hp} is the regression error term that accounts for the household-specific deviations from the mean predictions suggested by the explanatory variables.



When the outcome is restricted to values between 0 and 1 such as a share value, the standard approach to estimation is to use nonlinear modeling strategies such as logit or probit. On the other hand, econometricians recently support the view that OLS generally should be the preferred strategy for estimating the causal effects of treatments, also for the limited dependent variable case (Angrist, and Pischke, 2009, p. 102-107). Accordingly, the equation is estimated using the linear probability model, via OLS, and check robustness of these results to Logit and Probit models.

RESULTS

I present the results of the study in three subsections focusing on the main results, the category-specific results, and results examining nonlinearities in the effects, in that order.

Main Results

The results of the main model are presented in Table 2. Table 2 reports the results of the OLS, logit, and probit models to show the robustness of the results to the choice of econometric model. The coefficient estimates are generally consistent across the models.

The choice of organic products increases with education. Having a university degree increases the share of organic purchases by 1.95% on average. Similarly, an income level above the median predicts a higher propensity to consume organic, by about 1.60%. Relatively younger households, where the head of household is younger than 40, are also more likely to consume organic products, by about 1.05%. A large household size is negatively associated with organic consumption. The coefficient estimate for this indicator variable suggest a drop of 1.33% in the propensity to consume organic for households more than four members. The last two variables examine the effect of having children in different age brackets. The results suggest that having a young child under the age of 5 has a positive effect on organic consumption. For these households, organic consumption is higher by an average of 1.37%. Considering that the average share of organic purchases in the different product categories is about 4%, these estimated effects are significant in terms of magnitude. Accordingly, the demographic variables considered here appear to account for a large percentage of the decision to buy organic products.

Table 2: Main results

| | OLS | Logit | Probit |
|--|-------------------------|-----------------------|------------------------|
| Univ. graduate | 0.0195*** (0.000937) | 0.435*** (0.0138) | 0.243*** (0.00739) |
| Income above median | 0.0160*** (0.00136) | 0.377*** (0.0150) | 0.209*** (0.00877) |
| Age 39 or younger | 0.0105*** (0.000935) | 0.0370** (0.0162) | 0.0261*** (0.00931) |
| Large household | -0.0133*** (0.00160) | -0.142*** (0.0185) | -0.0792*** (0.0104) |
| Has child(ren) age 5 or younger | 0.0137*** (0.00217) | 0.385*** (0.0247) | 0.214*** (0.0146) |
| Has child(ren) aged 6-12 | 0.00124 (0.00205) | 0.0527** (0.0261) | 0.0306** (0.0148) |
| No. obs. | 377,969 | 377,969 | 377,969 |
| (Pseudo) R² | 0.0185 | 0.1535 | 0.1886 |

Notes: Coefficient estimates from the indicated regression models. The dependent variable is the household's dollar share of organic purchases. Models include market and product category fixed effects. R2 value for the OLS model and Pseudo- R2 values for the logit and probit models are provided at the bottom row. Standard errors clustered at the market level are indicated in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table 3: Category-level results

| | Cereals | Eggs | Fresh meat | Fresh produce | Milk | Pasta | Yogurt |
|--|--------------------------|-------------------------|-------------------------|--------------------------|-------------------------|-------------------------|-------------------------|
| Univ. graduate | 0.0188*** (0.00118) | 0.0242*** (0.00250) | 0.0172*** (0.00178) | 0.0161*** (0.000785) | 0.0235*** (0.00153) | 0.0200*** (0.00146) | 0.0157*** (0.00140) |
| Income above median | 0.0115*** (0.00136) | 0.0236*** (0.00235) | 0.0170*** (0.00293) | 0.0149*** (0.00121) | 0.0243*** (0.00255) | 0.00970*** (0.00133) | 0.0104*** (0.00146) |
| Age 39 or younger | 0.00837*** (0.00119) | 0.0148*** (0.00211) | 0.00421** (0.00199) | 0.0103*** (0.000799) | 0.0121*** (0.00157) | 0.0111*** (0.00152) | 0.00975*** (0.00155) |
| Large household | -0.0134*** (0.00178) | -0.0166*** (0.00459) | -0.00529** (0.00261) | -0.00741*** (0.00143) | -0.0290*** (0.00350) | -0.00275 (0.00192) | -0.0159*** (0.00322) |
| Has child(ren) age 5 or younger | 0.000285 (0.00196) | 0.0121*** (0.00315) | 0.0130*** (0.00383) | 0.00653*** (0.00134) | 0.0291*** (0.00487) | -0.00105 (0.00169) | 0.0376*** (0.00438) |
| Has child(ren) aged 6-12 | -0.00723*** (0.00181) | 0.00449 (0.00318) | 0.00103 (0.00374) | 0.00537*** (0.00189) | 0.0100** (0.00393) | -0.000345 (0.00202) | -0.00448* (0.00252) |
| No. obs. | 57,181 | 57,162 | 41,574 | 60,558 | 59,261 | 52,233 | 50,000 |
| R² | 0.0157 | 0.0270 | 0.0187 | 0.0357 | 0.0294 | 0.0159 | 0.0210 |

Notes: Coefficient estimates from OLS models. The dependent variable is the household's dollar share of organic purchases for the indicated product category. All models include market fixed effects. Standard errors clustered at the market level are indicated in parentheses. * p<0.10, ** p<0.05, *** p<0.01



Category-level Estimates

Table 2 presents estimates from category-level models. In all categories, education and income level appear to be important factors influencing organic consumption, with large relative effects on the propensity to consume organic options. In the eggs and dairy categories, for example, a college degree and income above the median predict that the share of organic purchases will increase by nearly 5%. For fresh meat and fresh produce, the suggested increase is over 3%.

In all categories, younger households are generally more likely to consume organic products. The magnitude of this effect ranges from 0.42% in the meat category to 1.48% in eggs. The negative effect of household size on organic consumption also varies by product category. With a household size of more than four people, the percentage of organic purchases is 2.9% lower for milk, 1.66% lower for eggs, and 1.59% lower for yogurt.

The presence of children in the household has a positive effect on organic consumption, especially if there is a young child under the age of five. In these households, organic consumption is higher especially for dairy products and eggs, which are an important part of the diet of young children. The presence of a child between the ages of 6 and 12 leads to an increase in organic purchases in the fresh produce and milk categories, but these effects are much smaller than in the case where the youngest child is 5 years old or younger.

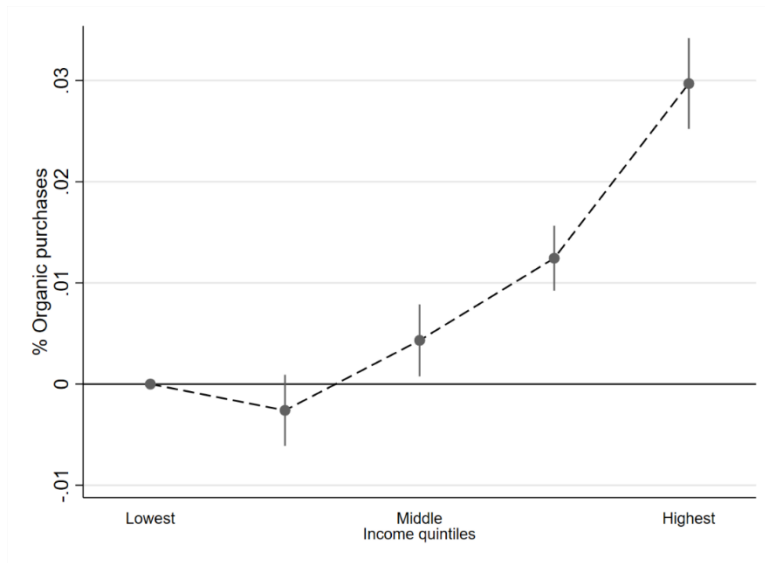
Allowing Nonlinear Effects of Key Demographic Variables

The regression model in Equation 1 assumes the effects of the demographic variables on organic consumption to be linear. This assumption may not hold, for example, if there is a threshold level of income below which consumers would not begin to consider organic options. Likewise, income increases at different levels may not result in uniform increases in the share of organic purchases, and the same may be true for other demographic variables such as age and household size. To address these concerns, this subsection presents results from model specifications that allow for nonlinearities in the effects of these key demographic variables.

Figure 2 shows the change in the likelihood of consuming organic at increasing income quintiles. Here income is represented as a categorical variable, and the model allows different coefficients for each level of income quintile. The estimates indicate that an income increase from the first to the second quintile has no effect on organic consumption. Moving from the second to the third quintile, organic consumption begins to display an increasing trend, and then follows a roughly linear path for further income increases.

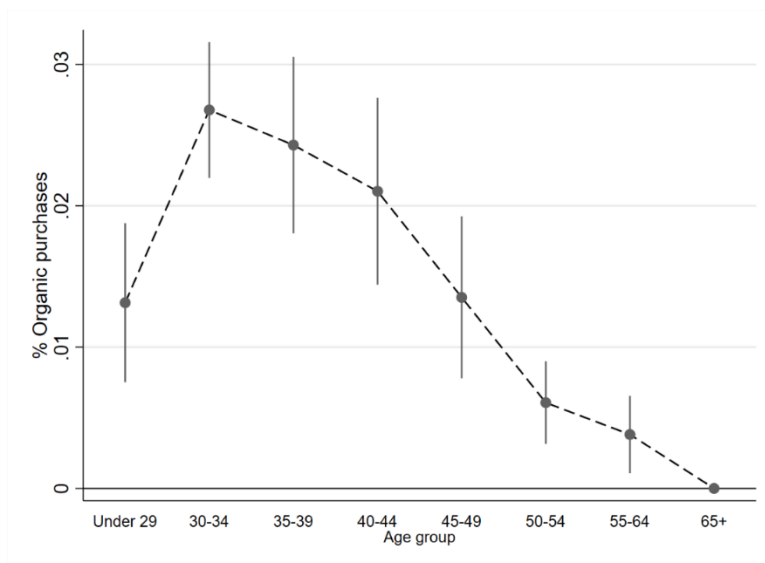
This pattern suggests a minimum level of income between the second and third income quintiles, below which households would not consider buying organic.

Figure 2: Organic purchases by income quintile



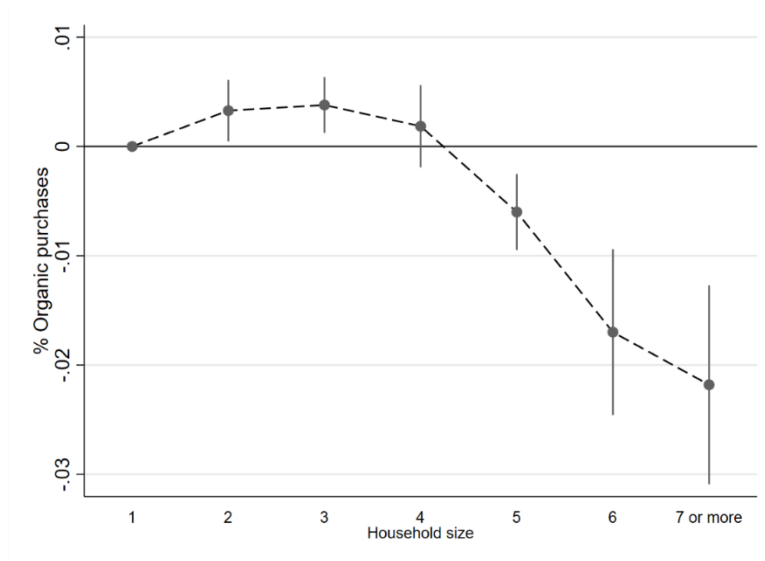
Notes: Bars indicate the %95 confidence intervals.

Figure 3: Organic purchases by age group



Notes: Bars indicate the %95 confidence intervals.

Figure 4: Organic purchases by number of people in the household



Notes: Bars indicate the %95 confidence intervals.

Nonlinearities in the effect of age are allowed for in a similar manner, by allowing the model to have different coefficients for each increasing age bracket. For this specification, eight age brackets are defined, including "below 29," "29 to 34," "35 to 39," "40 to 44," "45 to 49," "50 to 54," "55 to 64," and "65 and above." The results shown in Figure 3 indicate a non-monotonic relationship in which organic consumption first increases and then decreases with age. Specifically, from the 20s to the early thirties, the likelihood of organic consumption increases, and the highest proportion of organic purchases is observed in the 30-34 age group. After that, the effect becomes negative, suggesting lower propensity to consume organic products at each increasing age bracket.

Finally, Figure 4 shows the effect of household size on organic consumption. The results once again suggest a non-monotonic relationship. Going from a household of one individual to a household with two members, organic consumption increases and remains relatively flat up to a household size of four people. With each additional household member after this level, the proportion of organic purchases decreases steadily. Compared to a four-person household, the proportion of organic purchases is 1.0% lower for a five-person household, and 2.0% lower for larger households.

CONCLUSION



This study uses actual purchase data from a large sample of U.S. households to examine household characteristics that influence organic product choices across food categories. The results provide an overview of the role of demographic characteristics in organic purchases.

Overall, organic consumption increases with income and education and decreases with household size. The link with income and household size is consistent with theory, as a high income should allow the household to more easily afford the cost of organic products, and a large household size would imply a lower per capita income (Bezawada, and Pauwels, 2013). The positive association with education level is also expected, as higher education levels indicate greater exposure to environmental and health issues through the education system and a better ability to grasp their importance (Dietz, Stern, and Guagnano, 1998). These findings contribute to the literature on organic consumption because in previous research, attempts to classify organic food shoppers by income and education based on survey data have yielded mixed results (Hughner et al., 2007).

In previous literature, empirical evidence on the effects of age on sustainable behavior, which may include preference for organic foods, is also mixed (Thompson 1998). The current study provides an explanation to these mixed results by suggesting a nonlinear effect of age, with organic consumption peaking in the younger age group between 30 and 34 years. This differs from Ngobo (2011) who found that organic consumption increases in older age groups. The difference between the results could be due to the fact that Ngobo's linear model does not capture the non-monotonic relationship between age and organic consumption. This difference highlights that organic food preference may exhibit significant nonlinearities in relation to demographic variables, which should be considered by researchers and practitioners. In addition, the data used by Ngobo (2011) were from an earlier time period, 2004 to 2009, and the difference in results may indicate changes in organic consumption habits over time. Future studies can examine the evolution of organic consumption preferences to uncover such trends that show how the profile of organic consumers changes over time.

YAZAR BEYANI / AUTHOR STATEMENT

Araştırmacı(lar) makaleye ortak olarak katkıda bulunduğunu bildirmiştir. Araştırmacı(lar) herhangi bir çıkar çatışması bildirmemiştir.

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