



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Is Environmental Consciousness Associated with Organic Consumption?  
– A Revealed Preference Approach

Sungeun Yoon, University of Florida, sungeunyoony@ufl.edu

Lisa House, University of Florida, lahouse@ufl.edu

Zhifeng Gao, University of Florida, zfgao@ufl.edu

Kelly Grogan, University of Florida, kellyagrogan@ufl.edu

Conner Mullally, University of Florida, connerm@ufl.edu

***Selected Paper prepared for presentation at the 2019 Agricultural & Applied Economics Association  
Annual Meeting, Atlanta, GA, July 21 – July 23***

*Copyright 2019 by S. Yoon, L. House, Z. Gao, K. Grogan, C. Mullally. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.*

# **Is Environmental Consciousness Associated with Organic Consumption? – A Revealed Preference Approach**

## **Abstract**

Much research has been conducted to analyze consumer behavior with regards to purchases of organic food and purchases of other “green” and environmentally friendly products. Previous studies found that health and environmental concerns are the two primary purchasing motives behind organic consumption. However, the results are based on surveys expressed on the Likert scale and rely on participants’ imperfect retrospective memory of past organic purchases. Unlike previous work, in this study, we investigate the environmental motivation found in prior survey-based studies behind organic consumption by utilizing the revealed preference data, Nielsen panel data. In general, consumers buy organic products to avoid pesticides and chemicals for health reasons and/or to support more environmentally friendly agriculture. The level of disposable product consumption is used to represent one’s environmental concern. Due to the presence of reverse causality of organic consumption and disposable product consumption, we employ a control function method to eliminate the endogeneity issue. Our result shows a significantly negative causal effect of disposable product consumption on organic consumption, indicating that organic consumption arises from care for the environment. It is found that a 10% increase in disposable product expenditure share causes an 8-percentage point decrease in the proportion spent on organic consumption.

# 1 Introduction

The amount of municipal solid waste has significantly increased over the past decades. Most of the waste is accumulating on land or possibly is sloughing off into the oceans. Geyer et al. (2017) estimated that 8.3 billion tons of plastic had been made over the past decades; most of it ended up as trash and litter and only 9% of it has been recycled. Plastics take more than 400 years to decompose, and its presence in the sea causes harm to marine organisms such as fish. Savoca et al. (2016) demonstrated that the smell of marine plastic debris attracts the northern anchovy. Schools of which were observed responding to the debris as if they were searching for food. These results suggest that humans may inadvertently consume fish that ate plastics in the ocean. To prevent and mitigate this phenomenon, consumers can assist by avoiding single-use plastic products and recycling them after use.

Agriculture is closely related to the environment since crops are planted and harvested from the soil and seafood is collected mainly from the sea. Therefore, keeping the environment clean with less burden of trash can be an indirect way to support sustainable agriculture. Organic agricultural practices can be regarded as a direct way to promote environmentally-friendly production. The USDA organic seal is given to “agricultural products that have been produced using proper practices that support the cycling of farm resources, promote ecological balance, and conserve biodiversity by the USDA organic regulations” (USDA 2016). Organic operations must maintain or enhance natural resources such as soil and water quality, while also conserving the natural system. Synthetic fertilizers and genetic engineering may not be used (USDA 2016).

In this study, we investigate the existence of environmental motivation in organic food purchasing behaviors using actual consumption data. Specifically, the purpose of the study is to clarify and/or supplement the known motivations behind organic consumption found in prior studies by utilizing revealed preference data, specifically Nielsen panel data. Consumers buy organic food to avoid pesticides and chemicals for health reasons and/or for environmental reasons. The motives for

organic are not explicitly stated in the purchase data, so I make use of disposable product consumption as a proxy variable of one's environmental concern. It is expected that if consumers care about the detrimental effects of disposable items on the environment, then they may reduce the use of them. A complementary survey is executed to support this assumption; the existence of correlation between people's environmental concern and their consumption of disposable products such as plastic or paper cups, dishes, utensils, and bottled water. In the main study, a significant negative causal effect of disposable product purchases on organic purchases would indicate that organic consumption, at least in part, arises from environmental concern. However, the organic consumption variable could also explain one's environmental concern if the organic consumption arises from the idea of environmental protection. The model following will account for the possibility of reverse causality.

Consumers can play significant roles in sustainable agriculture and improving the natural environment by consuming fewer disposable products, recycling them after use, and purchasing organic products. For this reason, a plethora of research has discussed the determinants of organic food consumption decisions (Aertsens et al. 2009; Magnusson et al. 2001). Consideration for one's health and the environment are the two most commonly stated motives for purchasing organic products with concerns for healthiness being a stronger motive than the one for the environment (Chen 2009; Magnusson et al. 2003). Health and environmental motives are different in the sense that care about one's own health can be regarded as egoistic while concerns for the environment are more altruistic (Magnusson et al. 2003).

The objective of our study is to examine whether environmental concern motivates consumers to purchase organic food. Similar studies have been conducted but use less accurate data. Magnusson et al. (2003) investigate the correlation between environmentally-friendly behaviors (EFBs) and organic consumption behaviors. Pro-environment practices are found to be significantly positively correlated with buying intentions and purchase frequency of organic products. Thus, it seems that we can expect consumers who care about the environment would use fewer disposable products and recycle more products from the result. However, the result is based on a survey asking respondents' purchase intentions or frequencies expressed on the Likert scale which is commonly found in

existing studies (Magnusson et al., 2001; Magnusson et al., 2003; Thøgersen, 2007). Respondents assess their consumption behaviors by the seven-point scale from ‘never’ (1) to ‘always’ (7) to the question of each food consumption amount. In the study of Thøgersen (2007), participants are asked to recall their past 10 times they purchased tomatoes. In those surveys, people should recall their past choices but there is a possibility of inaccuracy in retrospective data. Furthermore, the scale expression has its limitation to represent the exact amount of consumption.

These survey methods are useful in the identification of consumer behaviors in the absence of real scanner data in the way that it provides a general picture of consumer behaviors. However, using the actual spending data is expected to reduce those errors found in these previous studies dramatically. This work contributes to the knowledge of organic food consumption by using revealed spending data to identify consumer behaviors for sustainable agriculture and the environment. Nielsen panelists record their purchases weekly in the format of UPC, so it enables us to minimize the error resulting from retrospective data and the inaccuracy of the amount consumed from surveys which were the shortcomings of previous studies (Magnusson et al. 2003; Chen 2009). It is worth noting that Nielsen data is from only grocery stores so that it does not fully represent one’s consumption behaviors resulting from online shopping and other types of shopping outlets.

In the following sections, we present the previous literature on measuring an individual’s concern for the environment and finding motivations for organic consumption, describe the revealed preference data, illustrate our approach to resolve the reverse causality problem using the control function, and discuss the results.

## 2 Background

### 2.1 Environmental Concern

Environmental concern in this study is referred to “the affect (i.e., worry) associated with beliefs about environmental problems” defined by Schultz et al. (2004). Another study defines it as “the degree to which people are aware of problems regarding the environment and support efforts

to solve them and/or indicate a willingness to contribute personally to their solution” (R. E. Dunlap and Michelson 2002, p.485) which includes both attitude and behavior aspects. Environmental attitude (EA) is often used interchangeably with the term of environmental concern (EC), but considered to embrace EC. EA refers to “a psychological tendency expressed by evaluating the natural environment with some degree of favor or disfavor (Milfont and Duckitt 2010). EA is the preferred term in psychological research (Gifford 2016), but we use EA and EC interchangeably in this study as both of them basically represents individuals’ perceptions about the environment.

Abundant research has been done in the search of antecedents/determinants on ecological behaviors. Many researchers have developed various scales to measure individuals’ environmental related values, attitudes, knowledge, and behaviors. Initially, Maloney and Ward (1973) have designed a tool called the Measurement of Ecological Attitudes and Knowledge Scale (MEAK). This scale is comprised of four subscales and the revised version is publicly available (Michael P. Maloney, Ward, and Braucht 1975). It consists of four subscales measuring an individual’s verbal commitment, actual commitment, affect, and knowledge regarding to environmental issues. The first subscale is a verbal commitment which measures an individual’s willingness to do for the pollution-environment issue. The actual commitment measures what a person actually does for the issues and the third scale, affect, measures the level of emotionality to such issues. Lastly, they measure a person’s knowledge of ecological problems. The New Environmental Paradigm (NEP) is the most widely used scale in the measurements of one’s environmental attitude (Dunlap & D. Van Liere, 1978; R. E. Dunlap, Liere, Mertig, & Jones, 2000). The scale measures the extent to which an individual views humans as a component of nature described as “spaceship earth” (Dunlap & D. Van Liere, 1978). However, as pointed in the paper, this general environmental attitude would show a weak link to behaviors which are not congruent with their attitudes (Dunlap & D. Van Liere, 1978).

Following studies find that there is a gap between consumers’ environmental concerns and their actual behaviors as mentioned in the study of Mostafa (2007). To have better predictability on actual behaviors, several studies emphasize the importance of ‘specificity’ in measuring values,

attitudes, intentions, and behaviors (Kaiser, Wolfing, and Fuhrer 1999). In other words, a specific product purchasing behavior is better predicted by the values, attitudes, and intentions defined in the same context of the specific product. Follows & Jobber (2000) use baby diapers as an example of environmentally responsible purchase behavior while Barbarossa & De Pelsmacker (2016) design their survey questionnaire in the context of purchasing eco-friendly tissue paper products.

The survey designed for our study includes both NEP and a specific environmental concern scale for disposable products based on Follows & Jobber (2000) and Barbarossa & De Pelsmacker (2016). It also contains measures of perceived personal inconvenience and actual disposable products consumption behavior according to occasions such as daily life, general and special gatherings.

## 2.2 Determinants of Organic Consumption

The consumption of disposable products is closely connected with the generation of refuse as the disposable products considered in this study are usually used once and then thrown out. Previous studies mainly focused on the impacts of specific variables on municipal solid waste (MSW). Much of the literature demonstrates that income is positively related with the amount of waste because a higher income usually brings more consumption (Richardson and Havlicek, 1978; Johnstone and Labonne, 2004). Other socio-demographic variables at the household level such as household size, races, the number of working age people, and the number of children are also used in their studies. Mccollough (2011) explores other factors that influence the amount of disposable products purchased utilizing an international dataset made up of OECD countries. He uses working hours, income savings rate, education, urbanization, age, and so on to explain the consumption of disposable products. Disposable products are heavily used due to their convenience, so working hours is found to be positively correlated to the amount of consumption.

In the analysis of organic food consumption behavior, most research has been approached from the perspective of psychology, heavily focusing on the investigation of the links between values, personal norms, emotions, beliefs, and experiences (Aertsens et al., 2009; Nuttavuthisit and Thøgersen, 2017). Aertsens et al. (2009) developed a framework integrating all the personal factors



found in previous studies to explain individuals' organic food consumption behaviors. The authors of this paper structure the relevant research papers on this topic into 11 categorized determinants: "values as motivators for organic consumption", "attitude", "cognitive and affective components of attitude", "emotions as the strongest affective response", "attitude influencing intention", "subjective norm or social norms", "personal norm or moral norm", "perceived behavioral control", "from intention to behavior", "socio-demographic factors", and "macro-level factors".

Among the several psychological motives, concerns for health and the environment are of value to my research interests. Health concerns are often expressed as the value of 'security,' 'safety,' and 'egoism' while environmental reasons are considered as the value of 'universalism' and 'altruism.' Schwartz (1992) incorporates the concept of values from previous studies in the following way: "Values (1) are concepts or beliefs, (2) pertain to desirable end states or behaviors, (3) transcend specific situations, (4) guide selection or evaluation of behavior and events, and (5) are ordered by relative importance." People assign various levels of values to things and objects and their prioritizations lead to relevant decisions and behaviors. The various literature explains organic food buying behaviors by using the value approach.

During the past several decades, researchers concluded that health reasons are found to be the most influential factor influencing organic food consumption in different countries and places. Bryła (2016) seeks to find the principal motives of organic food consumption in Poland. Healthiness is found to be the key characteristic of organic food indicated by over three fourth of the sample. The environmental motive is also one of the reasons for organic product consumption (Padilla Bravo et al. 2013). Wandel and Bugge (1997) suggest that most consumers prioritize the taste and freshness of produce in their choices, but 15% of them choose ecology as their first priority, while most Danish respondents rate "improved animal welfare and environmental protection" as the two most crucial factors (Wier et al., 2008). From these studies, we can infer the reasons for organic consumption might differ across people and places.

Many studies have shown that consumers place a heavier weight on health concerns than environmental concerns (Tregear, Dent, and McGregor 1994; Yadav 2016; Chen 2009). Yadav (2016) targets young Indian consumers and finds that egoistic and altruistic values significantly affect the attitude towards organic purchases. In this analysis, the association between health concern and attitude of buying organic food is 6 times higher than the one between environmental concern and the attitude. Chen (2009) also presents the consistent result, health concern exceeding the environmental motive in the degree of attitude toward organic food of Taiwanese consumers. A similar result is also found in the study of the British people and organic consumptions (Tregear et al., 1994).

Abundant research has been conducted in findings of motives and reasons of organic consumption, but little research has investigated the links between organic consumption and environmental friendly behaviors (EFBs). In the study of Magnusson et al., (2003), significant relations between EFBs and organic consumption are found across all the analyzed products in each multiple regression models. Thøgersen (2007) also demonstrates that individuals' level of universalism attitude is positively correlated with consumption levels of organic food.

However, the previous studies have their limitations in the representation of real world as the results are based on rather stated preference surveys measured by the Likert scale or on respondents' memories. Yadav (2016) designs a questionnaire consisting of questions on attitude, health concern, environmental concern, and purchase intention and those questions are assessed by the five-point Likert scale. Magnusson et al., (2001) also construct a questionnaire comprised of a frequency of organic food purchases, attitude and beliefs towards organic foods and the questions are all measured by the Likert scale as well. Two problems might arise from using this type of data. First, the actual consumption behaviors might be different from the intention indicated in the surveys. Second, there might be a discrepancy between the answers based on retrospective memory and actual purchases. Accordingly, reinvestigation of the existence of environmental concern in organic consumption using actual consumption data will provide more reliable information, which is especially useful for organic marketing strategy.

### 3 Data

In this study, we utilize the Nielsen consumer panel data. The panel year used in this analysis is 2015 consumption data. It consists of approximately 60,000 U.S. representative households' demographic information and includes the records of their food and non-food purchases. The panelists use in-home scanners to report all their purchases. Nielsen data provides panelists' demographics with their shopping lists, which enables the identification of people's consumption behaviors.

As discussed before, the relationship between organic consumption and environmentally friendly behaviors may have the reverse causality in which environmentally minded consumers do the both activities, thus, they all could be representative of one's level of environmental concern. In other words, the level of disposable products consumed may affect that of organic consumption and vice versa. Thus, we remove the simultaneous causality by using an instrumental variable. Control function method is implemented in the way that the residual from the first stage regression of endogenous variable on the instrumental variable is included with the endogenous variable as explanatory variables in the second stage regression (Wooldridge 2015). The key to the control function approach is that the error term in the original model is independent of the endogenous variable conditional on the error term obtained from the first stage regression of the endogenous variable on instrument variables and exogenous variables (Petrin and Train 2010).

$$D_i = \omega_0 + \omega'Z_i + \beta'X_i + v_i$$

$$y_i = \alpha + \beta'X_i + \gamma D_i + \hat{v}_i + \varepsilon_i$$

$D_i$  is an endogenous variable i.e. disposable product consumption ratio. One's disposable consumption is measured as the expenditure amount of paper products and wrapping materials/bags out of non-food grocery items (Table 2).  $Z_i$  is an instrumental variable, the ownership of a dishwasher which is related to the endogenous variable, disposable consumption, but not related to organic consumption. It is chosen as people with dishwashers are less inclined to use disposable products as the ownership of dishwasher provides convenience as well.  $y_i$  is the share of expenditure

spent on organic fresh fruits and vegetables among total fresh fruits and vegetables. We assume that the instrument is uncorrelated with the dependent variable, organic consumption, conditional on exogenous explanatory variables.

The other exogenous explanatory variables ( $X_i$ ) are summarized in the Table 1. Socio-demographic variables such as income, age, gender, education, marriage status, and the presence of children are included. Previous research has shown inconsistent results about the effect of socio-demographic factors on the consumption of organic food (Aertsens et al. 2009). Bryła (2016) also mentioned that socio-demographic characters have a weak relationship with purchases of organic products and a larger role is contributed to psychological factors.

Table 1. List of dependent variables

	Variables	Definition
Dependent variable	Organic consumption	The ratio of organic fresh fruits and vegetables consumption out of total fresh fruits and vegetable consumption
Explanatory variables	Household income	Household income is the midpoint of each income level.
	Married	1 if married, 0 otherwise
	Presence of children under 6	1 if there is a child under 6 years old in the household, 0 otherwise
	Education High school or less*	1 if the male or female head of a household has a high school education or less
	Some college	2 if the male or female head of a household has attended some college
	College degree and beyond	3 if the male or female of a household has acquired a college degree or more
	Age <35 years*	1 if the male or female head of a household is less than 35 years old
	35-54 years	2 if the male or female head of a household is between 35 and 54 years old
	55 years or older	3 if the male or female head of a household is older than 54
	Region	Northeast*, North Central, South, West
Race	White*, African, Hispanic, Asian, Others	

	Disposable product consumption	The ratio of paper products and wrapping materials/bags consumption out of non-food grocery expenditure.
Instrumental Variables	Ownership of dishwasher	1 if a household owns a dishwasher, 0 if not. This variable is connected to the use of disposable products, but not organic consumption

\* indicates the reference category.

Table 2. Categories of disposable products in the Nielsen data

Department	Product group	Product module
Non-food grocery	Paper products	Disposable cups
		Disposable dishes
		Disposable lids
	Wrapping materials and bags	Bags-Trash/Trash compactor
		Tall kitchen
		Bags-Waste

Households that record their shopping lists less than 6 months during the one-year period are dropped out of the sample for consumption behavior reliability (6.33% loss). The average organic fresh fruits and vegetable consumption is \$12.6, accounting for 4.1% of total fresh fruits and vegetable consumption on average. 68% of households are married with 2.45 members of family, but the percentage of households with children under 6-year-old takes up only 7% out of the sample. The average income of households is \$59,471 and 52% of the sample acquired college degree and beyond. The age of female or male head in households is generally over 54 years old.

Table 3. Sample Means of Household Characteristics in 2015

Variable	Mean	Std. Deviation	Min	Max
Organic consumption (fresh fruits/vegetables)	0.04	0.08	0	1
Disposable product Consumption	0.03	0.04	0	0.72
Ownership of dishwasher	0.76		0	1
Household income (\$)	59,471	29,165	2,500	100,000
Fresh fruits and vegetable Expenditure (\$)	266	250	0.02	5458

Non-food grocery Expenditure (\$)	1,181	1,131	1.79	30,468
Household size	2.45	1.30	1	9
Married	0.68		0	1
Children under 6 years	0.07		0	1
Education (%)				
High school or less <sup>a</sup>	0.19		0	1
Some college	0.29		0	1
College and beyond	0.52		0	1
Age				
Under 35 years <sup>a</sup>	0.05		0	1
35-54 years	0.34		0	1
Above 54 years	0.61		0	1
Region				
Northeast <sup>a</sup>	0.17		0	1
North Central	0.26		0	1
South	0.37		0	1
West	0.19		0	1
Race (%)				
White <sup>a</sup>	0.79		0	1
African	0.10		0	1
Hispanic	0.06		0	1
Asian	0.03		0	1
Other	0.02		0	1
Sample Size	53,729			

Note: a indicates the reference group.

## 4 Identification Strategy

In this study, the dependent variable (organic consumption) and the endogenous variable (disposable products consumption) are represented as fractions ranging from 0 to 1. Papke and Wooldridge (1996) suggest using the Bernoulli quasi-maximum likelihood estimator (QMLE) for fractional data to solve non-linearity and heteroscedasticity problems resulted from using a proportion response variable. The linear regression might predict the expected value of  $y$  conditioning on  $x$  to fall outside of the true intervals between 0 to 1. Following Papke and Wooldridge (1996),  $G(\cdot)$  is a logistic function or the standard normal cumulative distribution function (cdf) satisfying  $0 < G(z) < 1$  for

all  $\mathbf{z} \in \mathbf{R}$ , ensuring that the predicted values of a fractional response variable lie in the interval (0,1). The beta coefficients are estimated by maximizing the Bernoulli log-likelihood function (2).

$$E(y_i|\mathbf{x}_i) = G(\mathbf{x}_i\boldsymbol{\beta}) \tag{1}$$

$$l_i(\mathbf{b}) = y_i \log[G(\mathbf{x}_i\mathbf{b})] + (1 - y_i)\log[1 - G(\mathbf{x}_i\mathbf{b})] \tag{2}$$

$$\max_{\mathbf{b}} \sum_{i=1}^N l_i(\mathbf{b}) \tag{3}$$

Since the endogenous variable is a fractional variable as well, we use the fractional logit estimation method in the first stage to acquire the residual value. As recommended in Petrin and Train (2010), we use the bootstrap replications to obtain correct standard errors since we use the estimated error term from the first step, not the true error term, in the second stage estimation.

## 5 Results

The estimated coefficients results and their corresponding standard errors are presented in Table 5. The sign of disposable product consumption is found to be significantly negative with the organic consumption (organic fresh fruits and vegetables), implying that an increase in disposable product consumption discourages organic consumption. It indicates that one of the organic buying reasons is attributed to consumers' environmental consciousness. Prior to this second stage estimation, the ownership of the dishwasher is found to be significantly negatively associated with disposable product consumption at  $\alpha = 0.01$  at the first stage regression. One of the advantages of using the control function approach is being able to easily test the exogeneity of variables (Wooldridge 2015). In our result, we reject the null hypothesis of zero coefficient of the generated residual term, which means the disposable product consumption is not exogenous.

Table 4. Coefficients Estimation Result of Fractional Logit for Organic Consumption

Explanatory Variables	Coefficients	Bootstrap Standard Errors
Disposable product consumption	-21.68586***	7.48195
Household size	0.01776	0.02699

Married	-0.11733***	0.02779
Under 6-year-old children	0.11118***	0.04124
Income	0.00583***	0.00040
North Central	-0.05004	0.04206
South	0.01474	0.03172
West	0.329739***	0.04889
Between 35 and 54	-0.22517***	0.04457
Older than 54	-0.51715***	0.04457
Some college	0.09071**	0.03833
College degree or more	0.24716***	0.04838
African	0.05499	0.04862
Hispanic	0.04010	0.03590
Asian	0.06297	0.69710
Others	0.13071**	0.06333
Residual	22.52297***	7.47781
Constant	-2.67729***	0.23516

Note: Bootstrap standard errors in parentheses.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

In nonlinear models such as a fractional logit model, a regression coefficient does provide information on the direction of a variable's effect, but not provide the size of effect. Thus, we present the average marginal effect of each variable on organic consumption in Table 5. Average marginal effect is the mean of all marginal effects computed at each observation in the sample.

Table 5. Average Marginal Effects on Organic Consumption

Explanatory variables	dy/dx	Standard Errors
Disposable product consumption	-0.848015***	(0.29252)
Disposable product consumption +0.01	-0.008***	
Household size	0.000694	(0.00105)



Married	-0.004588***	(0.00108)
Under 6-year-old children	0.004348***	(0.00161)
Income (1,000 dollars)	0.000228***	(0.00002)
Income +10,000	0.002***	
North Central	-0.001796**	(0.00152)
South	0.000545	(0.00117)
West	0.014112***	(0.00208)
Between 35 and 54	-0.011189***	(0.00239)
Older than 54	-0.022706***	(0.00235)
Some college	0.003169	(0.00130)
College degree or more	0.009292***	(0.00173)
African	0.002178**	(0.00197)
Hispanic	0.001577	(0.00143)
Asian	0.002502	(0.00285)
Others	0.005358*	(0.00275)
Residual	0.880750***	(0.29237)

---

Note: Standard errors in parentheses.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The marginal increase in disposable product consumption will lead to 84 percentage point decrease in the proportion spent on organic consumption. In another way, a 10% increase in the disposable product consumption ratio causes 8 percentage point decrease in the organic expenditure share. For household income, extra 10,000 dollars increase will cause a 2% percentage point increase in organic consumption, indicating that households with higher income consume more organic products. The same trend is also shown for the household with young children suggesting parents care more about food safety when their babies are relatively young (Smith, Huang, and Lin 2009). We also find a significant effect in the age variable revealing that younger households consume more organic food than older households. Previous studies have shown inconsistent effects of age.

With respect to educational attainment, households with a college degree or post-college degree consume more organic fruits and vegetables than households with a high school diploma or less. The education level is closely related to the level of income, thus, providing similar positive effects. We observe significant difference in organic consumption between African Americans and white Americans, but no difference between other races. This result is not identical to what Smith, Huang, & Lin (2009) found that Hispanic-American households are more likely to purchase organic fruits and vegetables. The regional variable also has significant effects on a household's purchasing organic food. In particular, households residing in the West consume more on organic food compared with households in North-East.

## 6 Conclusion

The purpose of this study is to examine the underlying motivations of organic food consumption by identifying the relationship between disposable consumption and organic consumption. Specifically, this study is to prove or supplement the well-known motive, the environmental concern, behind organic consumption found in the past research, but with revealed preference data. Health and/or environmental reasons are the most referred motivations of organic food consumption. However, the two reasons are different, as denoted in the study of Magnusson et al., (2003), in the way that one's own health concern can be regarded as egoistic while concerns for the environment are more altruistic. In this perspective, this study can be seen as an effort of figuring out whether people practice altruism in their consumption or not.

The level of disposable product consumption is used as a representation variable of an individual's environmental concern. My finding shows a significant negative causal effect of disposable product purchases on organic purchases. It implies that one of the organic consumption motives comes from the concern for the environment. Organic buyers less purchase environmentally harmful products such as single-use items to protect the environment. This finding is consistent with the results from previous studies (Magnusson et al., 2003; Thøgersen, 2007) which found significant relations between environmental friendly behaviors/universalism attitude and organic consumption

by using survey method based on Likert scale questions. Our result also suggests that organic consumption arises from several reasons rather than only one health reason which is picked as the strongest one in previous studies (Tregear, Dent, and McGregor 1994; Yadav 2016; Chen 2009).

In this study, only fresh fruits and vegetable consumption is utilized to measure the level of organic purchases. Even though fresh fruits and vegetables consists of the largest sales in organic products, this study needs to be extended to other food products such as meats, dairy, and eggs. The inclusion of other products is expected to provide more ample explanation about organic consuming behaviors. We can implement multiple hypotheses testing for several types of dependent variables such as organic fresh fruits and vegetables consumption, organic meat consumption, and organic dairy consumption.

This study is differentiated with previous studies by using actual consumption data, however, this data does not fully represent people's consumption behaviors. Especially online shopping is incredibly general nowadays for both perishable and non-perishable products. Therefore, there is a possibility that complete consumption behaviors might be slightly different from the behaviors shown in this data. Nonetheless, the Nielsen data is considered as a proper source of buying behaviors as it not only covers broad products but is also composed of over 50,000 households.

This study provides an informative implication to the government and organic industry stakeholders that consumers' environmental concerns lead to organic consumption. People are more informed of benefits related to health such as less or no chemical residue on produce, but less aware of that how organic practice enriches the diversity of organisms in nature and soil health. This study implies that environmental effect of organic food production should be emphasized as a way of promotion of organic sales in the response of increasing awareness of environment in consumption behaviors.

## References

- Aertsens, Joris, Wim Verbeke, Koen Mondelaers, and Guido Van Huylenbroeck. 2009. "Personal Determinants of Organic Food Consumption: A Review." *British Food Journal* 111 (10): 1140–67. <https://doi.org/10.1108/00070700910992961>.
- Barbarossa, Camilla, and Patrick De Pelsmacker. 2016. "Positive and Negative Antecedents of Purchasing Eco-Friendly Products: A Comparison Between Green and Non-Green Consumers." *Journal of Business Ethics* 134 (2): 229–47. <https://doi.org/10.1007/s10551-014-2425-z>.
- Bryła, Paweł. 2016. "Organic Food Consumption in Poland: Motives and Barriers." *Appetite* 105: 737–46. <https://doi.org/10.1016/j.appet.2016.07.012>.
- Chen, Mei-Fang. 2009. "Attitude toward Organic Foods among Taiwanese as Related to Health Consciousness, Environmental Attitudes, and the Mediating Effects of a Healthy Lifestyle." *British Food Journal* 111 (2): 165–78. <https://doi.org/10.1108/00070700910931986>.
- Dunlap, Riley, and Kent D. Van Liere. 1978. "The New Environmental Paradigm." *Journal of Environmental Education* 9 (2008): 10–19. <https://doi.org/10.3200/JOEE.40.1.19-28>.
- Dunlap, Riley E., and William Michelson. 2002. *Handbook of Environmental Sociology*. Westport, Conn.: Greenwood Press. [https://www.google.com/search?q=handbook+of+environmental+sociology&rlz=1C1CHBD\\_enUS779US779&tbm=isch&source=iu&ictx=1&fir=-gjUU91OUoGgIM%253A%252CajmzOwaxPtfgZM%252C%252Fg%252F12bmgxm\\_w&vet=1&usg=A14\\_-kT8gtRnbhBRARMXLqsR2\\_CMCPMjkg&sa=X&ved=2ahUKEwWij6eq\\_n](https://www.google.com/search?q=handbook+of+environmental+sociology&rlz=1C1CHBD_enUS779US779&tbm=isch&source=iu&ictx=1&fir=-gjUU91OUoGgIM%253A%252CajmzOwaxPtfgZM%252C%252Fg%252F12bmgxm_w&vet=1&usg=A14_-kT8gtRnbhBRARMXLqsR2_CMCPMjkg&sa=X&ved=2ahUKEwWij6eq_n).
- Follows, Scott B, and David Jobber. 2000. "Environmentally Responsible Purchase Behaviour: A Test of a Consumer Model." *European Journal of Marketing* 34 (5/6): 723–46. <https://doi.org/10.1108/03090560010322009>.
- Geyer, Roland, Jenna R Jambeck, and Kara Lavender Law. 2017. "Production, Use, and Fate of

All Plastics Ever Made.” *Science Advances* 3 (7).  
<http://advances.sciencemag.org/content/advances/3/7/e1700782.full.pdf>.

Gifford, Robert, ed. 2016. *Research Methods for Environmental Psychology*. Chichester, UK: John Wiley & Sons, Ltd. <https://doi.org/10.1002/9781119162124>.

Johnstone, Nick, and Julien Labonne. 2004. “Generation of Household Solid Waste in OECD Countries: An Empirical Analysis Using Macroeconomic Data.” *Land Economics* 80 (4): 529–38. <http://www.jstor.org/stable/3655808>.

Kaiser, Florian G, Sybille Wolfing, and Urs Fuhrer. 1999. “ENVIRONMENTAL ATTITUDE AND ECOLOGICAL BEHAVIOUR.” *Journal of Environmental Psychology*. [www.idealibrary.com](http://www.idealibrary.com).

Magnusson, Maria K, Anne Arvola, Ulla-Kaisa Koivisto Hursti, Lars Åberg, and Per-olow Sjöden. 2001. “Attitudes towards Organic Foods among Swedish Consumers.” *British Food Journal* 103 (3): 209–26. <https://doi.org/10.1108/00070700110386755>.

Magnusson, Maria K, Anne Arvola, Ulla-Kaisa Koivisto Hursti, Lars Å Berg, and -Olow Sjöden. 2003. “Choice of Organic Foods Is Related to Perceived Consequences for Human Health and to Environmentally Friendly Behaviour.” *Appetite* 40: 109–17. [https://doi.org/10.1016/S0195-6663\(03\)00002-3](https://doi.org/10.1016/S0195-6663(03)00002-3).

Maloney, Michael P., Michael P. Ward, and G. Nicholas Braucht. 1975. “Psychology in Action: A Revised Scale for the Measurement of Ecological Attitudes and Knowledge.” *American Psychologist* 30 (7): 787–90. <https://doi.org/10.1037/h0084394>.

Maloney, Micheal P., and Michael P. Ward. 1973. “Ecology: Let’s Hear from the People. An Objective Scale for the Measurement of Ecological Attitudes and Knowledge.” *American Psychologist* 28: 583–86. <https://doi.org/10.1037/h0034936>.

Mccollough, John. 2011. “Determinants of a Throwaway Society – A Sustainable Consumption Issue.” *The Journal of Socio-Economics* 41: 110–17.

<https://doi.org/10.1016/j.socec.2011.10.014>.

Milfont, Taciano L, and John Duckitt. 2010. "The Environmental Attitudes Inventory: A Valid and Reliable Measure to Assess the Structure of Environmental Attitudes." *Journal of Environmental Psychology* 30 (1): 80–94. <https://doi.org/10.1016/j.jenvp.2009.09.001>.

Mostafa, Mohamed M. 2007. "A Hierarchical Analysis of the Green Consciousness of the Egyptian Consumer." *Psychology and Marketing* 24 (5): 445–73. <https://doi.org/10.1002/mar>.

Nuttavuthisit, Krittinee, and John Thøgersen. 2017. "The Importance of Consumer Trust for the Emergence of a Market for Green Products: The Case of Organic Food." *Journal of Business Ethics* 140: 323–37. <https://doi.org/10.1007/s10551-015-2690-5>.

Padilla Bravo, Carlos, Anette Cordts, Birgit Schulze, and Achim Spiller. 2013. "Assessing Determinants of Organic Food Consumption Using Data from the German National Nutrition Survey II." *Food Quality and Preference* 28 (1): 60–70. <https://doi.org/10.1016/j.foodqual.2012.08.010>.

Papke, L.E., and J.M. Wooldridge. 1996. "Econometric Methods for Fractional Response Variables with an Application to 401 (K) Plan Participation Rates." *Journal of Applied Econometrics* 11 (6): 619–32. <https://doi.org/10.2307/2285155>.

Petrin, Amil, and Kenneth Train. 2010. "A Control Function Approach to Endogeneity in Consumer Choice Models." *Journal of Marketing Research* XLVII: 3–13. <http://journals.ama.org/doi/pdf/10.1509/jmkr.47.1.3>.

Richardson, Robert A, and Joseph Havlicek. 1978. "Economic Analysis of the Composition of Household Solid Wastes." *Journal of Environmental Economics and Management* 5: 103–11. [https://ac.els-cdn.com/0095069678900074/1-s2.0-0095069678900074-main.pdf?\\_tid=7e5954aa-d7a4-11e7-91a6-00000aacb35d&acdnat=1512248895\\_61abfa523219d190008ffeed67353c66](https://ac.els-cdn.com/0095069678900074/1-s2.0-0095069678900074-main.pdf?_tid=7e5954aa-d7a4-11e7-91a6-00000aacb35d&acdnat=1512248895_61abfa523219d190008ffeed67353c66).

- Savoca, Matthew S, Martha E Wohlfeil, Susan E Ebeler, and Gabrielle A Nevitt. 2016. "Marine Plastic Debris Emits a Keystone Infochemical for Olfactory Foraging Seabirds." *Science Advances* 2 (11). <http://advances.sciencemag.org/content/advances/2/11/e1600395.full.pdf>.
- Schultz, P Wesley, Chris Shriver, Jennifer J Tabanico, and Azar M Khazian. 2004. "Implicit Connections with Nature." *Journal of Environmental Psychology* 24 (1): 31–42. [https://doi.org/10.1016/S0272-4944\(03\)00022-7](https://doi.org/10.1016/S0272-4944(03)00022-7).
- Schwartz, Shalom H. 1992. "Universals in the Content and Structure of Values: Theoretical Advances and Empirical Tests in 20 Countries." *Advances in Experimental Social Psychology* 25. <http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=E9604BC2B239BC6963BBB2DDCCDD7881?doi=10.1.1.220.3674&rep=rep1&type=pdf>.
- Smith, Travis A., Chung L. Huang, and Biing-Hwan Lin. 2009. "Does Price or Income Affect Organic Choice? Analysis of U.S. Fresh Produce Users." *Journal of Agricultural and Applied Economics* 41 (3): 731–44.
- Thøgersen, John. 2007. *Traditional Food Production and Rural Sustainable Development*. [http://ebooks.narotama.ac.id/files/Traditional Food Production and Rural Sustainable Development/Chapter 11 Consumer Decision-Making With Regard To Organic Food Products.pdf](http://ebooks.narotama.ac.id/files/Traditional%20Food%20Production%20and%20Rural%20Sustainable%20Development/Chapter%2011%20Consumer%20Decision-Making%20With%20Regard%20To%20Organic%20Food%20Products.pdf).
- Tregear, A, J B Dent, and M J McGregor. 1994. "The Demand for Organically-Grown Produce." *British Food Journal* 96 (4): 21–25. <https://doi.org/10.1108/00070709410061032>.
- Wandel, Margareta, and Annechen Bugge. 1997. "Environmental Concern in Consumer Evaluation of Food Quality." *Food Quality and Preference* 8 (1): 19–26. [https://ac.els-cdn.com/S0950329396000043/1-s2.0-S0950329396000043-main.pdf?\\_tid=8b038e76-d7d8-11e7-b87b-00000aab0f02&acdnat=1512271250\\_ee552ebb7cea7378fd2e59d8c56b04e3](https://ac.els-cdn.com/S0950329396000043/1-s2.0-S0950329396000043-main.pdf?_tid=8b038e76-d7d8-11e7-b87b-00000aab0f02&acdnat=1512271250_ee552ebb7cea7378fd2e59d8c56b04e3).
- Wier, Mette, Katherine O 'doherty Jensen, Laura Mørch Andersen, and Katrin Millock. 2008. "The

Character of Demand in Mature Organic Food Markets: Great Britain and Denmark Compared.” *Food Policy* 33: 406–21. <https://doi.org/10.1016/j.foodpol.2008.01.002>.

Wooldridge, Jeffrey M Wooldridge. 2015. “Control Function Methods in Applied Econometrics.” *The Journal of Human Resources* 50 (2): 420–45.

Yadav, Rambalak. 2016. “Altruistic or Egoistic: Which Value Promotes Organic Food Consumption among Young Consumers? A Study in the Context of a Developing Nation.” *Journal of Retailing and Consumer Services* 33: 92–97. <https://doi.org/10.1016/j.jretconser.2016.08.008>.