



# Sustainability of Italian families' food practices: Mediterranean diet adherence combined with organic and local food consumption



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## ABSTRACT

The present research intends to contribute to the literature on sustainable food consumption by investigating the present-day dietary patterns of Italian households to assess the degree of adherence to the Mediterranean diet together with the level of organic and local food consumption. The analysis is based on data from the Italian National Institute of Statistics survey “Aspects of Daily Life” for the year 2014; this is a Multipurpose Survey conducted in Italy with 44,984 individuals across 18,864 households. A Heckman two-step probit model was implemented to estimate equations to assess the impact of Italian household composition and adherence to the Mediterranean diet upon organic and local food consumption. The study's findings show that both those households with children and those with a higher degree of adherence to the Mediterranean diet have higher probabilities of buying both organic and local products, while increasing household size reduces the likelihood of buying local products. Furthermore, good economic status and a higher level of education increase the probability of consuming organic food. Some of the differences highlighted are of low amplitude; however, these results offer novel and original insights for Italy and support the need to for both policy makers and marketers to implement a wide range of initiatives aimed at educating consumers about, and facilitating access to sustainable food products.

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## 1. Introduction

Sustainable consumption is growing in importance on the international agenda, as confirmed by Agenda 2030 (goal 12), and food consumption is recognized as a major sustainability issue due to its impact on individual and public health, natural resources, social cohesion and the economy (De Boer et al., 2007; Thøgersen, 2017).

The Food and Agriculture Organization of the United Nations (FAO) defines sustainable diets as those “with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. They are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy, while optimizing natural and human

resources” (FAO, 2012, p.7). In the literature, the Mediterranean diet, broadly defined as the extremely varied dietary patterns of Mediterranean populations, especially as represented by the mainframe of the new revised Mediterranean diet pyramid (Bach-Faig et al., 2011), is often considered a paradigm for healthy and sustainable diets (CIHEAM/FAO, 2015; Dernini and Berry, 2015; Dernini et al., 2017). Indeed, “the new revised Mediterranean diet has been presented as an example of a sustainable diet in which nutrition, local food production, biodiversity, culture and sustainability are strongly interconnected, generating a lower impact on the environment. The concepts of seasonality, fresh and locally grown products, culinary activities, biodiversity, traditional, local and eco-friendly products, variety of colors for fruit and vegetables were introduced together with main meals, conviviality and physical activity” (CIHEAM/FAO, 2015, p. 10–11). Additionally, since 2010, the Mediterranean diet has been listed as part of the intangible cultural heritage of humanity by the United Nations Educational, Scientific and Cultural Organization (UNESCO), under the following description that recognized its multiple socio-cultural dimensions: “The Mediterranean diet constitutes a set of skills,

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knowledge, practices and traditions ranging from the landscape to the table, including the crops, harvesting, fishing, conservation, processing, preparation and, particularly, consumption of food. However, the Mediterranean diet encompasses more than just food. It promotes social interaction, since communal meals are the cornerstone of social customs and festive events.” (CIHEAM/FAO, 2015, p.8). In this regard, the Mediterranean diet is part of Mediterranean culture and is conceptualized as an equivalent of the Mediterranean Cultural Food System (Medina, 2009; Renna et al., 2015). Moreover, the combination of organic food consumption and Mediterranean diets is considered a promising model for sustainable diets (Strassner et al., 2015; Seconda et al., 2017). At the same time, it has to be stressed that, in recent years, Mediterranean countries' dietary patterns are moving away from the Mediterranean diet, mainly as a consequence of food chain modernization and globalization of food behavior (Bottalico et al., 2016; Grosso and Galvano, 2016).

Extensive research indicates that sustainable food choices are influenced by many determinants, including positive attitudes toward sustainable food, social and personal norms, knowledge and involvement with food, and the social context, especially the household (Verain et al., 2015, 2016). Family is considered the most important area where individuals (especially children and young adults) socialize, and engage with sustainability issues and shape their attitudes and behaviors (Grønhøj and Thøgersen, 2012; Francis and Davis, 2015); thus, family is recognized as a central domain in steering food choices (Pedersen et al., 2015; Symmank et al., 2017).

The present research offers a contribution to the literature on sustainable food consumption, investigating the influence of the structure of contemporary Italian families on the sustainability of dietary patterns with particular reference to their adherence to the Mediterranean diet and organic and local food consumption. The paper is structured as follows: first the literature background and the research objectives are presented. The next section describes the analytical method used, including data sources and a description of the variables concerned. After the presentation of economic results, conclusions are drawn and implications for both policy makers and marketers are discussed.

## 2. Literature background and research objectives

Sustainable food consumption has received a great deal of attention from academic researchers in recent years. Several papers focus on organic and local food as a more sustainable alternative because they are considered both healthier or fresher than conventional products and also more environmentally friendly and supportive of the local economy (Strassner et al., 2015; Verain et al., 2015; de-Magistris and Gracia, 2016). Some of the literature suggests that consumers of organic and local food appear to have similar attitudes and motivations behind their purchasing decisions, which are mainly related to family structure, health and environmental concerns (Pelletier et al., 2013; Denver and Jensen, 2014).

Regarding family structure, several studies conclude that family size and composition, as well as the presence of children in the household, are associated with an increased likelihood of purchasing sustainable food (Aertsens et al., 2009; Paul and Rana, 2012; Dimitri and Dettmann, 2012; Lee, 2016). In addition, the presence of children in the household appears to be related to major changes in the family's dietary patterns, with greater attention to healthier food products (Ricciuto et al., 2006; Casini et al., 2013). Hence the age of children seems a crucial situational factor that determines intentions to buy organic food (Loureiro et al., 2001; Lee, 2016). Moreover, the literature suggests that families

with children buy local products more frequently than childless couples (Racine et al., 2013; Feldmann and Hamm, 2015).

Beyond the variables related to family structure, most studies in the literature tend to consider health and environmental concerns as being more explanatory of sustainable food consumption (Aertsens et al., 2009; Bravo et al., 2013; Lee, 2016). Extensive research suggests that health concerns and health-related motives appear to be the main drivers of organic and local food purchases (Hughner et al., 2007; Pino et al., 2012; Pugliese et al., 2013). Organic and local food are often described as healthier than conventional counterparts because they are perceived to be less processed, more natural, contain more nutrients and are expected to be free from residues of pesticide and technologies used in production and processing (Dickson-Spillmann et al., 2011; Onozaka and Mcfadden, 2011; Cranfield et al., 2012; Feldmann and Hamm, 2015). Indeed, the literature suggests that organic and local food consumption is influenced by a holistic healthy lifestyle overall, including a healthy diet (Goetzke et al., 2014; Baudry et al., 2017b). In particular, individuals who are more involved in organic consumption, who according to the findings of Kesse-Guyot et al. (2013) are better educated and more physically active, are more willing to invest in their health in general (Kriwy and Mecking, 2012) and exhibit better diet quality (Kesse-Guyot et al., 2013; Pelletier et al., 2013; Eisinger-Watzl et al., 2015; Baudry et al., 2017a). In this regard, recent studies highlight the importance of promoting the Mediterranean diet combined with organic and local food consumption as promising sustainable food models that confer benefits upon both individual health and the environment (Baudry et al., 2017b; Seconda et al., 2017).

With regard to environmental concerns, there is substantial scientific evidence that different levels of concern among consumers significantly affect their attitude to purchasing organic and local food (Shafie and Rennie, 2012; Agovino et al., 2017; Laureti and Benedetti, 2018). In particular, conservation of biodiversity and natural resources and lower energy consumption play key roles in influencing consumer attitudes to organic and local foods (Aertsens et al., 2009; Cranfield et al., 2012; Denver and Jensen, 2014; Hemmerling et al., 2015). At the same time, reducing the environmental impact linked to transportation, associated with shorter distances between producers and consumers, is considered a prominent factor affecting attitudes to consuming locally produced food (Aprile et al., 2016; Feldmann and Hamm, 2015). In addition, it is well-documented that parents' behavior and norms exert a significant influence on families' pro-environmental attitudes and behavior (Grønhøj and Thøgersen, 2017).

Recent research shows that participation in cultural and social activities has a positive impact on the inclination to purchase sustainable food products, to an extent that depends on the social orientation of each activity (Welch and Warde, 2015; Agovino et al., 2017; Sharma and Jha, 2017).

Finally, consumers' understanding and use of labels influence attitudes to sustainable food. As shown in some studies, labels represent a crucial element in recognition of sustainable food and generating trust in its attributes, as they give consumers the opportunity to take environmental and ethical considerations into account when making food choices (Janssen and Hamm, 2012; Grunert et al., 2014).

Based on this background, the following research objectives were developed: 1. to investigate the influence of the structure of contemporary Italian families on organic and local food purchasing behavior; 2. to detect if family dietary patterns in terms of adherence to the Mediterranean diet have an impact on the consumption of organic and local products; and 3. to verify to what extent family variables influence environmental concerns and may thus promote sustainable food choices.

### 3. Empirical strategy

To examine the research objectives, the decision to consume organic and local products (dependent variable) is considered as the result of a dichotomous choice: consume at least once, or not consume at all, an organic and local product. The available data detail the frequency of purchase of organic or local products (habitually, occasionally, rarely, never). This dichotomization could generate a heterogeneity bias problem. Furthermore, as supported by the literature, the intention to consume organic and local products is linked to consumers' environmental concerns, which give rise to a self-selection problem (Agovino et al., 2017).

To overcome these two problems, namely, heterogeneity bias and self-selection, the Heckman two-step procedure (Heckman, 1979) was applied. This methodology allows an assessment of the impact of the structure of Italian households on organic and local food consumption after accounting for the possibility of selection due to the dichotomization of dependent variables and respondents' sensitivity to environmental issues (Mannering and Bhat, 2014; Kaplan et al., 2016; Mannering et al., 2016). In particular, the Heckman two-step procedure allows two equations, the selection equation and an observation equation (one for organic and another for local products), to be estimated simultaneously. The Heckman two-step procedure is summarized in Fig. 1.

From a conceptual point of view, in the first step of the Heckman procedure, the selection process (which is responsible for selection bias and heterogeneity problems) is studied using the so-called selection equation. Biases may be caused by the following differences: 1) the differences among consumers in terms of the frequency of purchase of organic and local products (heterogeneity bias); and 2) the difference between consumers of organic and local products who are either concerned about the environment or are not concerned about the environment (self-selection bias). Heterogeneity bias and self-selection bias are addressed simultaneously. In particular, two groups of consumers – concerned and unconcerned about the environment – are compared to determine what the differences are. For this purpose, a probit model is estimated in order to know if unmeasured characteristics of the respondents influence the concern or lack of concern for the

environment. Information on the effects of these unmeasured characteristics is not available in the coefficients of the explanatory variables but can be found in the residuals obtained from the probit analysis. After all, the variation that remains in the dependent variables after removing the effect of the known factors can only be caused by the influence of unknown factors. In the Heckman procedure, the residuals of the selection equation are used to construct a selection bias control factor, called Lambda ( $\lambda$ ), which is equivalent to the inverse Mills ratio. This factor is a summary measure that reflects the effects of all unmeasured characteristics related to being concerned or not about the environment. The value of this Lambda for each respondent is saved and added to the data file as an additional variable.

In the second step of the Heckman procedure the selection bias control factor Lambda is used as an additional independent variable. Because this factor reflects the effect of all the unmeasured characteristics related to being or not being concerned about the environment, the coefficient of this factor in the observation equation captures the part of the effect of these characteristics that is related to the decision to consume organic or local products.

From an empirical point of view, the proposed model is a bivariate probit that takes the following form:

$$\text{selection equation : } \Pr(D_j = 1|Z_j) = \alpha + \mu Z_j + \varepsilon_j \quad (1)$$

$$\text{observation equation : } \Pr(Y_j = 1|X_j, L_j) = \alpha + \beta X_j + \delta L_j + \lambda_j + u_j \quad (2)$$

$$\begin{pmatrix} \varepsilon_j \\ u_j \end{pmatrix} \sim i.i.d. \left( \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_\varepsilon^2 & \rho_{\varepsilon u} \\ \rho_{\varepsilon u} & \sigma_u^2 \end{pmatrix} \right)$$

where  $D_j$  is the dichotomous variable of the selection equation, which equals 1 if the individual is highly concerned about environmental issues and 0 otherwise; and  $Z_j$  is the set of covariates.

$Y_j$  is the dichotomous variable of the observation equation; it is equal to 1 if the respondent consumes organic (or local) products, and zero otherwise, for each  $j$ -th respondent.

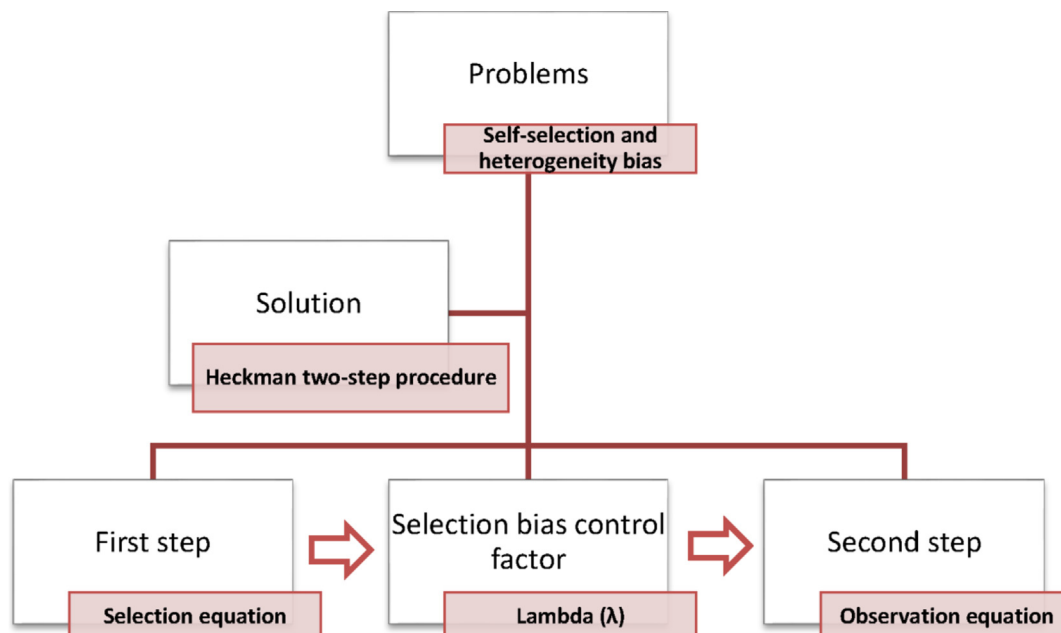


Fig. 1. Graphic summary of the Heckman two-step procedure.

$X_j$  is a set of socio-demographic, economic and cultural variables, and  $L_j$  is a set of variables related to the structure of Italian households and their adherence to the Mediterranean diet;  $\lambda_j$  (the inverse Mills ratio), obtained by first-stage regression, allows the self-selection problem to be taken into account.

Both equations are estimated by maximum likelihood as two independent probit models.

The Heckman two-step procedure assumes that the errors of the two equations are normally distributed with zero mean and variance and are correlated among themselves. It is possible to test the null hypothesis that the two errors are not correlated,  $H_0: \rho = 0$ , with a specific Wald test. Rejecting the hypothesis  $H_0$  of zero correlation, it can be stated that in the model there is no problem of self-selection and the estimators are not biased. Finally, for the goodness of the estimates, as suggested by Heckman (1979), in the selection equation there has to be at least one variable included in  $X_j$  or  $L_j$  and not present in  $Z_j$  of the first-stage equation.

### 3.1. Data source and variables description

The analysis is based on data gathered from the latest annual survey “Aspects of Daily Life” for the year 2014 conducted by the Italian National Institute of Statistics. It is a multipurpose survey of 18,864 households and 44,984 individuals, aimed at collecting fundamental information on lifestyle habits and problems faced in everyday life, i.e., all the features that affect the perceived and actual quality of life (Agovino et al., 2017). Among the many dimensions considered, those relevant to the present research are the following: food consumption, the degree of satisfaction with one's own economic situation, the evaluation of environmental problems and participation in cultural and social activities. As the present paper addresses the study of organic and local food purchase habits, analysis is restricted to adult individuals (aged 18 or over). Tables 1 and 2 report, respectively, the definition and descriptive statistics of the variables used in the econometric analysis.

As for the observation equations, the dichotomous dependent variables (organic\_prod and local\_prod) are given a value of 1 when the respondent purchases (habitually, occasionally or rarely) organic and local products, 0 otherwise (never). Details on the frequency of consumption of organic and local products in the survey data used are shown in Table 3 and discussed in the next section. The problem of heterogeneity bias due to the distributions of the frequency has been overcome through the Heckman two-step procedure as previously reported.

Explanatory variables include controls for: i) the socio-demographic characteristics of the respondents (gender, age, education and residence); ii) family structure and household economic status; iii) dietary patterns in terms of adherence to the Mediterranean diet; and other relevant variables that may affect the attitudes of respondents, such as participation in cultural (iv) and social activities (v) and other attitudinal variables (vi).

With regard to adherence to the Mediterranean diet, the Mediterranean Diet Index (MDI) suggested by Benedetti et al. (2016a and 2016b)<sup>1</sup> is used. The MDI was built according to the Mediterranean pyramid recommendations (Bach-Faig et al., 2011) with reference to 12 selected food types. A score from 0 to 4 is assigned to the consumption frequency of each food component according to the degree of adherence to the Mediterranean diet (Benedetti et al.,

2016a, 2016b). In addition, regarding the use of cooking oils and fats, the highest score was assigned to olive oil, 2 points were assigned to vegetable oils while scores of zero were assigned to butter and lard, whether in the case of raw or cooked food. Finally, the index was transformed into a polynomial variable: “very low” adherence to the Mediterranean diet (the 1st quartile of the MDI); “low” adherence to the Mediterranean diet (2nd quartile); “medium” adherence (3rd quartile); or “high” adherence (4th quartile).

In the selection equation, the dependent variable consists of an environmental concern index (env\_concern2) built as suggested by Agovino et al. (2017) using 15 different environmental issues included in the ISTAT questionnaire.<sup>2</sup> Two steps are followed: first, to calculate the index by summing the scores of questions; and second, to transform the index into a binary variable. Specifically, an index score of 5 (highest concern for environmental problems) is assigned the value 1, while zero is assigned to other scores (<5). This procedure allowed the sample to be split into two parts: 56% of respondents (21,011 people) showed great concern about environmental problems and 44% of respondents (16,533) showed little concern. A statistical summary of the single components of the Environmental Concern index is reported in Table B in the Appendix.

### 3.2. Descriptive statistics

The descriptive statistics of the sample population are reported in Tables 2 and 3. As regards socio-demographic variables, males constitute approximately 48% of the sample, more than 27% of the respondents are over 64 and nearly 50% have attained at least a high school qualification. With regard to family composition, 49% of respondents have a traditional family composition (couple with children), 23% of respondents are in a relationship without children, almost 2% of the sample is formed by single fathers, while 7.5% by single mothers. As regards the degree of adherence to the Mediterranean diet, Table 2 shows that on average respondents have a medium-low level of adherence (1.56).

With regard to organic food consumption, it is worth noting that, as reported in Table 3, of those who state they consume organic food, the occasional consumption category is the largest (32%), while 24% rarely buy such products and only 9% are habitual consumers. This pattern of organic food consumption is confirmed by other market research which shows that in Italy, despite the significant growth of the organic market in recent years, the incidence of regular organic consumers is still low (SINAB, 2017). By contrast, as regards the frequency of local food consumption, although it too is dominated by occasional consumption (37% of cases), the incidence of habitual consumers is higher than for organic products (20% of cases).

## 4. Econometric results

The results obtained by Heckman's two-step estimation model are shown in Tables 4 and 5, reporting respectively the environmental concerns equation (selection equation) and the organic and local food equation (observation equation). Both tables also report the marginal effects, which are useful for a more immediate

<sup>1</sup> The ISTAT questionnaire devotes a specific section to exploring individuals' food consumption habits in which the respondents are questioned about their frequency of intake of various types of food and are asked to self-report the frequency of such intake in terms of times per day, week or less often.

<sup>2</sup> The ISTAT questionnaire poses the same question “Are you concerned by the following environmental problems?”, namely global warming, extinction of some animal and plant species, climate change, waste production and disposal, noise, air pollution, soil pollution, pollution of seas and rivers, earthquakes and floods, man-made disasters, forest destruction, electromagnetic pollution, landscape destruction, depletion of natural resources, and other environmental problems. Each question is accompanied by a binary response (assigned a value of 1 when the respondent is concerned and zero otherwise).



**Table 1**  
Definitions of variables.

| Variables                                   | Definition   |
|---|--|
| <b>Dependent variables</b>                  |  |
| organic_prod                                | Purchase frequency of organic products. 1 = rare, occasional or habitual. Reference group: none.   |
| local_prod                                  | Purchase frequency of local products. 1 = rare, occasional or habitual. Reference group: none.   |
| env_concern2                                | See Section 3.1 for its construction. See Table B in the Appendix for the descriptive statistics of its components.  |
| <b>Socio-demographic variables</b>          |  |
| Male  | This is a dummy variable equal to 1 if the respondent is male.   |
| age35_44                                    | Age of the respondent. 1 = age between 35 and 44. Reference group age 18–34.   |
| age45_54                                    | Age of the respondent. 1 = age between 45 and 54.  |
| age55_64                                    | Age of the respondent. 1 = age between 55 and 64.  |
| age64                                       | Age of the respondent. 1 = age > 64.   |
| munic_low                                   | Municipalities with less than 10,000 inhabitants. Reference group: metropolitan areas.   |
| munic_high                                  | Municipalities with more than 10,000 inhabitants.  |
| area_center                                 | Central Italy. Reference group: Northern Italy.  |
| area_south                                  | Southern Italy and islands.  |
| high_school                                 | Education level of the respondent. 1 = High school qualification attained. Reference group: no education, primary school qualification attained and lower secondary school qualification attained. |
| bachelor's_degree                           | Education level of the respondent. 1 = University degree or postgraduate education   |
| <b>Family structure variables</b>           |  |
| ncomp                                       | Number of household members  |
| Couples with children                       | respondent's family type. 1 = couples with children. Reference group: no family  |
| Childless couples                           | respondent's family type. 1 = childless couples.   |
| single_father                               | respondent's family type. 1 = single father.   |
| single_mother                               | respondent's family type. 1 = single mother.   |
| Household_econ_sit_good                     | Availability of economic resources for the needs of the family. 1 = Excellent or adequate. Reference group: scarce or totally inadequate.  |
| <b>Adherence to the Mediterranean diet</b>  |  |
| <b>Participation in cultural activities</b> |  |
| archaeo                                     | Archaeological site visited over the last 12 months. 1 = At least once. Reference group: never.  |
| books                                       | Have read books over the last 12 months. 1 = Yes. Reference group: no.   |
| cinema                                      | Cinema attendance over the last 12 months. 1 = At least once. Reference group: never.  |
| museums_exhib                               | Museum attendance over the last 12 months. 1 = At least once. Reference group: never.  |
| newspaper                                   | Frequency of reading daily newspapers during the week. 1 = At least once. Reference group: never.  |
| opera_classic                               | Classical music concerts attended over the last 12 months. 1 = At least once. Reference group: never.  |
| other_music                                 | Other music concerts attended over the last 12 months. 1 = At least once. Reference group: never.  |
| theater                                     | Theater visits over the last 12 months. 1 = At least once. Reference group: never.   |
| <b>Participation in social activities</b>   |  |
| ecological                                  | Participation in meetings held by ecological associations.   |
| volun                                       | Voluntary activities taken on over the last 12 months. 1 = Yes. Reference group: no.   |
| sport                                       | Doing one or more sports with continuity. 1 = Yes. Reference group: no.  |
| politics                                    | Participation in meetings with political parties over the last 12 months. 1 = Yes. Reference group: no.  |
| <b>Other attitudinal variable</b>           |  |
| labels                                      | Frequency of reading ingredients on food labels. 1 = Habitual. Reference group: Occasional, rare or none.  |
| neighbor_trust                              | Trust people living in the neighborhood. 1 = Very or fairly trusting. Reference group: not very trusting or not at all trusting.   |

Note: all the variables are dichotomous (min: 0; max: 1), except ncomp (min: 1; max: 10) and adherence to the Mediterranean diet (min: 0; max: 4).

interpretation of the estimated coefficients by comparing them as a lower or higher percentage probability, and the z-value that allows verification of whether a parameter is statistically significant.

#### 4.1. Environmental concerns equation

Table 4 suggests that environmental concerns are lower among men and tend to diminish with advancing age: the probability of worrying about the environment decreases by approximately 9% among those aged over 64. Differences also emerge with regard to the macro-area of residence: respondents living in southern (central) Italy are approximately 8% (3%) less concerned about environmental problems than those in northern Italy. Education promotes knowledge about and fosters sensitivity to environmental problems. In particular, sensitivity to environmental problems of a respondent with a high school diploma and one with a bachelor's degree is 12% and 18% higher, respectively, than that of a respondent with a lower level of education (compulsory schooling).

Results also show that concern about environmental problems is influenced by variables related to family structure. For example, couples with children display a higher environmental concern (6%) than couples without children (5%). Single fathers have a higher environmental concern than single mothers (5.6% and 3%,

respectively). In addition, good economic status has a positive effect on a household's sensitivity to environmental problems: it is 3.4% higher than those of a poor economic status.

Participation in social activities is an important factor in determining the Environmental Concern Index. In particular, participation in political meetings and ecological associations increases the probability of worrying about environmental problems by 10% and 16%, respectively. Finally, trust in neighbors has a positive effect on the probability of worrying about environmental problems (approximately 6%).

#### 4.2. Organic and local consumption equations

In Table 5 the column *organic\_prod* (I) shows estimates of the consumption equation of organic products and the column *local\_prod* (II) shows estimates of the consumption equation of local products.

The Wald test reported at the bottom of Table 5 verifies that the null hypothesis is rejected with a significance of 1% for both regressions. It may thus be concluded that the errors are significantly correlated among themselves, as required by Heckman's hypothesis. Furthermore, the Mills ratio coefficient is negative and significant at 1% for both the organic and local consumption equations.

**Table 2**  
Descriptive statistics.

| Variables   | Observations | Mean   | Standard Deviation |
|---|--------------|--------|--------------------|
| <b>Dependent variables</b>                              |              |        |                    |
| organic_prod  | 36,498       | 0.6487 | 0.4774             |
| local_prod  | 36,407       | 0.7621 | 0.4257             |
| env_concern2  | 37,544       | 0.5596 | 0.4964             |
| <b>Socio-demographic variables</b>                      |              |        |                    |
| male  | 37,544       | 0.4782 | 0.4995             |
| age35_44  | 37,544       | 0.1739 | 0.3790             |
| age45_54  | 37,544       | 0.1902 | 0.3925             |
| age55_64  | 37,544       | 0.1584 | 0.3651             |
| age64_  | 37,544       | 0.2740 | 0.4460             |
| munic_low   | 37,544       | 0.3490 | 0.4767             |
| munic_high  | 37,544       | 0.4500 | 0.4975             |
| area_center   | 37,544       | 0.1759 | 0.3808             |
| area_south  | 37,544       | 0.3988 | 0.4897             |
| high_school   | 37,544       | 0.3648 | 0.4814             |
| bachelor's_degree                                       | 37,544       | 0.1275 | 0.3336             |
| <b>Family structure variables</b> Couples with children |              |        |                    |
| Childless couples                                       | 37,544       | 0.4865 | 0.4998             |
| ncomp   | 37,544       | 0.2293 | 0.4204             |
| single father   | 37,544       | 2.8574 | 1.2898             |
| single mother   | 37,544       | 0.0173 | 0.1306             |
| Household_econ_sit_good                                 | 37,309       | 0.0755 | 0.2643             |
| <b>Adherence to the Mediterranean diet</b>              | 37,309       | 0.5380 | 0.4986             |
| <b>Participation in cultural activities</b>             | 37,544       | 1.5651 | 1.1612             |
| archaeo   | 36,662       | 0.2115 | 0.4084             |
| books   | 36,769       | 0.4060 | 0.4911             |
| cinema  | 36,721       | 0.4312 | 0.4952             |
| museums_exhib   | 36,617       | 0.2606 | 0.4390             |
| newspaper   | 36,940       | 0.5351 | 0.4988             |
| opera_classic   | 36,606       | 0.0961 | 0.2947             |
| other_music   | 36,587       | 0.1903 | 0.3926             |
| theater   | 36,682       | 0.1701 | 0.3757             |
| <b>Participation in social activities</b>               |              |        |                    |
| ecological  | 36,350       | 0.0172 | 0.1299             |
| sport   | 37,441       | 0.1827 | 0.3864             |
| volun   | 36,636       | 0.1078 | 0.3102             |
| politics  | 36,509       | 0.0368 | 0.1882             |
| <b>Other attitudinal variable</b>                       |              |        |                    |
| labels  | 36,579       | 0.3730 | 0.4836             |
| neighbor_trust  | 36,641       | 0.7317 | 0.4431             |

Note: the variables are in the range [0; 1]. For a description of the variables see [Table 1](#).

**Table 3**  
Frequency of consumption of organic and local products, number of respondents and percentage.

| Respondents who consume | organic products |        | local products |        |
|-------------------------|------------------|--------|----------------|--------|
|                         | number           | %      | number         | %      |
| habitually              | 3379             | 9.26   | 7641           | 20.99  |
| occasionally            | 11,576           | 31.72  | 13,533         | 37.17  |
| rarely                  | 8720             | 23.89  | 6573           | 18.05  |
| never                   | 12,823           | 35.13  | 8660           | 23.79  |
| Total number            | 36,498           | 100.00 | 36,407         | 100.00 |

This means that the probability of consuming organic and local products is an overestimation if the selective problem of people sensitive to environmental concerns is not considered.

Regarding the socio-demographic variables, the results show that among men the probability of consuming sustainable food, in terms of both organic and local products, decreases (by 6.2% and 3.8%, respectively). People in the over-64 age group also have a lower probability of consuming both organic and local food than younger individuals, such as those aged 35–44 for organic (3% versus 6%) and those aged 55–64 for local (5% versus 7%).

With regard to residence, southern Italians are most likely to consume organic and local products. In particular, living in southern Italy increases the probability of consuming organic products

by 5% and local products by 9%. In addition, people living in less populous towns (up to 10,000 inhabitants) have a higher probability of consuming both organic products (6%) and especially local products (10%).

Interestingly, the probability of consuming organic products is positively correlated with educational qualifications. Respondents with high school diplomas are 1.6% more likely to consume organic products than those who left school at the minimum age. However, this correlation does not hold for local food products.

As regards the variables connected to household structure, the results show the higher sensitivity of families with children toward sustainable food. Couples with children are more likely to consume both organic and local products (5% and 8%, respectively) than couples without children (4% and 6%, respectively). Families with single parents do not statistically differ from the reference group (no family) for organic products, while household size reduces the likelihood of buying local products (–1%).

In addition, for respondents from a household with good economic status the probability of buying organic products is 2.3% higher than for those from poorer households, while the same effect is not confirmed for local products.

With regard to the influence of dietary patterns, these results show that respondents with high adherence to the Mediterranean diet are more likely to buy organic products (7%) compared to respondents with low adherence (4.6%). In the same way, but to a

**Table 4**  
Results from the selection equation of the Heckman two-step procedure.

| Variables   | Marginal effects | z-value | sign |
|---|------------------|---------|------|
| <b>Socio-demographic characteristics</b>                              |                  |         |      |
| male  | −0.009           | −1.91   | *    |
| Age 35–44 (Reference group: 18–34)                                    | 0.007            | 0.95    |      |
| Age 45–54   | 0.042            | 5.16    | ***  |
| Age 55–64   | 0.014            | 1.59    |      |
| more than 64  | −0.091           | −10.35  | ***  |
| Central Italy (Reference group: North Italy)                          | −0.030           | −4.23   | ***  |
| Southern Italy  | −0.080           | −14.03  | ***  |
| municipalities up to 10,000 inhabitants (Reference group: metropolis) | −0.012           | −1.49   |      |
| municipalities with more than 10,000 inhabitants                      | −0.005           | −0.85   |      |
| High school diploma (Reference group: completed compulsory education) | 0.122            | 20.97   | ***  |
| Bachelor's degree   | 0.179            | 21.07   | ***  |
| <b>Family structure variables</b>                                     |                  |         |      |
| Couples with children (Reference group: no family)                    | 0.064            | 8.59    | ***  |
| Childless couples   | 0.052            | 6.60    | ***  |
| single father   | 0.056            | 2.79    | ***  |
| single mother   | 0.033            | 2.92    | ***  |
| good household economic status  | 0.034            | 6.46    | ***  |
| <b>Participation in social activities</b>                             |                  |         |      |
| Political parties   | 0.105            | 7.24    | ***  |
| Ecological associations   | 0.162            | 7.21    | ***  |
| Neighbor trust  | 0.058            | 10.21   | ***  |
| Number of observations  | 35,670           |         |      |

Notes: The standard errors are corrected for heteroskedasticity. Column 2 shows the marginal effects (dy/dx). With binary independent variables, marginal effects measure discrete change, i.e., how predicted probabilities change as the binary independent variable changes from 0 to 1. Column 3 shows the z-value returned by the pattern analysis tools, which tells whether the null hypothesis can be rejected or not. Column 4 shows the significance level: the symbols \*\*\*, \*\* and \* denote that the coefficient is significantly different from zero at 1%, 5% and 10%, respectively.

lesser extent, the first group has a higher probability of buying local products (3%) compared to the second (2.5%).

With regard to participation in cultural activities, the results show a significant positive relationship with the likelihood of consuming both organic and local products for all the various activities except listening to opera and classical music. Among cultural activities, the results show that going to a museum has a higher incidence of increased likelihood of consuming both organic and local food (7.2% and 5.6%, respectively). In addition, reading newspapers correlates with a probability of buying organic products increased by 6% and local by 6.5%.

With reference to social activities, participation in voluntary activities increases by 1.4% the probability of buying organic products and by 5.4% the probability of buying local products. Participating in sports also increases the probability of consuming organic (1.8%) and local products (2%).

Finally, the results show that the frequency of reading food labels affects the probability of consuming sustainable food. Indeed, regularly reading food labels increases the likelihood of consuming organic products by 17% and local food by 13%.

## 5. Discussion

Overall, the results of this research provide insights into the sustainability of food practices among Italian households, considering both the degree of adherence to the Mediterranean diet and the consumption of organic and local food, although in some cases significant differences obtained are of low amplitude. As regards the influence of socio-demographic variables, these findings show that organic and local food are consumed less among men and older individuals, confirming the argument that women are more likely to buy organic food as they tend to be responsible for household food shopping and are more aware of food safety and health issues (Baudry et al., 2017a), as are younger consumers (Dumortier et al., 2017). By contrast, with regard only to organic products, the present results also show a positive relationship between higher levels of education and organic food consumption,

confirming that higher education is associated with greater awareness regarding food-related issues, as highlighted elsewhere (Kesse-Guyot et al., 2013).

Considering variables related to family structure, the presence of children is shown to be a factor influencing individual environmental concerns as well as increasing the consumption of both organic and local food. This confirms findings from previous research (Freyer and Haberkorn, 2008; Riefer and Hamm, 2008, 2011; Racine et al., 2013; Feldmann and Hamm, 2015).

In addition, households with a good economic status have a higher propensity to consume organic food, highlighting the key role of income level in organic purchasing behavior and confirming that premium prices are barriers to sustainable food choices (Aschemann-Witzel and Zielke, 2015; Eisinger-Watzl et al., 2015).

With reference to the influence of family dietary patterns on the propensity of consuming sustainable food, families showing greater adherence to the Mediterranean diet display a higher frequency of buying organic food and local food (albeit to a lesser extent for the latter). Thus, in accordance with previous research, it may be stated that a high level of sustainable food consumption is combined with a healthier dietary profile (Eisinger-Watzl et al., 2015; Baudry et al., 2017a; Seconda et al., 2017). This could be related to the fact that the Mediterranean diet seems to be part of an overall orientation to sustainability, rather than being just seen as a healthier and more sustainable diet (Seconda et al., 2017; Cavaliere et al., 2018). However, it is important to stress that, in line with results from other studies carried out in Italy, on average the degree of adherence to the Mediterranean diet is low (Benedetti et al., 2016a; Bottalico et al., 2016; Cavaliere et al., 2018). According to the literature, this could be linked to the economic crisis that has negatively influenced the Italian population's food patterns, with income playing a key role in adherence to the Mediterranean diet (Bonaccio et al., 2017; Cavaliere et al., 2018).

With reference to the influence of adherence to the Mediterranean diet and local food, some interesting results emerge. The frequency of buying local food between families with a high and low adherence to the Mediterranean diet is not as different as

**Table 5**  
Results from the observation equations of the Heckman two-step procedure.

| Dependent variables<br>Variables                                      | Organic product (I) |         |      | Local product (II) |         |      |
|---|---------------------|---------|------|--------------------|---------|------|
|   | Marginal effects    | z-value | sign | Marginal effects   | z-value | sign |
| <b>Socio-demographic characteristics</b>                              |                     |         |      |                    |         |      |
| Male  | −0.062              | −12.56  | ***  | −0.038             | −8.33   | ***  |
| Age 35–44 (Reference group: 18–34)                                    | 0.060               | 7.58    | ***  | 0.056              | 7.79    | ***  |
| Age 45–54   | 0.047               | 5.82    | ***  | 0.054              | 6.82    | ***  |
| Age 55–64   | 0.055               | 6.10    | ***  | 0.069              | 8.25    | ***  |
| Age over 64   | 0.030               | 2.94    | ***  | 0.051              | 5.74    | ***  |
| Central Italy (Reference group: North Italy)                          | 0.010               | 1.56    |      | 0.021              | 3.36    | ***  |
| Southern Italy  | 0.054               | 8.77    | ***  | 0.086              | 15.02   | ***  |
| Municipalities up to 10,000 inhabitants (Reference group: metropolis) | 0.057               | 8.44    | ***  | 0.107              | 17.81   | ***  |
| municipalities with more than 10,000 inhabitants                      | 0.019               | 3.06    | ***  | 0.079              | 14.07   | ***  |
| High school diploma (Reference group: completed compulsory education) | 0.016               | 2.19    | **   | −0.003             | −0.56   |      |
| Bachelor's degree   | 0.014               | 1.27    |      | −0.012             | −1.14   |      |
| <b>Family structure variables</b>                                     |                     |         |      |                    |         |      |
| Number of members   | −0.003              | −1.41   |      | −0.011             | −4.36   | ***  |
| Couples with children (Reference group: no family)                    | 0.053               | 5.57    | ***  | 0.078              | 8.73    | ***  |
| Childless couples   | 0.040               | 5.19    | ***  | 0.059              | 8.05    | ***  |
| Single father   | 0.029               | 1.52    |      | 0.030              | 1.67    | *    |
| Single mother   | 0.004               | 0.45    |      | 0.015              | 1.43    |      |
| Good household economic status  | 0.023               | 4.64    | ***  | 0.001              | 0.40    |      |
| <b>Adherence to the Mediterranean diet</b>                            |                     |         |      |                    |         |      |
| Low (Reference group: very low)                                       | 0.046               | 6.83    | ***  | 0.025              | 4.13    | ***  |
| Medium  | 0.059               | 8.82    | ***  | 0.028              | 4.63    | ***  |
| High  | 0.070               | 10.48   | ***  | 0.031              | 4.10    | ***  |
| <b>Participation in cultural activities</b>                           |                     |         |      |                    |         |      |
| Cinema  | 0.059               | 9.89    | ***  | 0.026              | 4.70    | ***  |
| Theater   | 0.025               | 3.05    | ***  | 0.024              | 3.08    | ***  |
| Opera and classical music   | 0.015               | 1.48    |      | 0.007              | 0.78    |      |
| Other music   | 0.040               | 5.43    | ***  | 0.024              | 3.45    | ***  |
| Museum and exhibitions  | 0.072               | 8.88    | ***  | 0.056              | 7.47    | ***  |
| Archaeological sites and monuments                                    | 0.054               | 6.50    | ***  | 0.082              | 10.36   | ***  |
| Newspapers  | 0.060               | 11.77   | ***  | 0.065              | 13.89   | ***  |
| Books   | 0.063               | 11.09   | ***  | 0.034              | 6.44    | ***  |
| <b>Participation in social activities</b>                             |                     |         |      |                    |         |      |
| Voluntary activities  | 0.015               | 1.72    | *    | 0.054              | 6.36    | ***  |
| Sport   | 0.018               | 2.73    | ***  | 0.020              | 3.14    | ***  |
| <b>Other attitudinal variable</b>                                     |                     |         |      |                    |         |      |
| Labels  | 0.177               | 35.56   | ***  | 0.129              | 26.72   | ***  |
| Number of observations  | 34,074              |         |      | 34,003             |         |      |
| Mills ratio   | −0.184              | −7.52   | ***  | −0.121             | −5.47   | ***  |
| Wald test (p-value)   | 0.0003              |         |      | 0.000              |         |      |
| Log-likelihood  | −18971.871          |         |      | −16600.357         |         |      |

Notes: the dependent variables consumption of organic products and local products take the value 1 if the respondent has consumed an organic product and a local product at least once. The standard errors are corrected for heteroskedasticity. Column 2 shows the marginal effects (dy/dx); with binary independent variables, marginal effects measure discrete change, i.e., how predicted probabilities change as the binary independent variable changes from 0 to 1. Column 3 shows the z-value: the z-value returned by the pattern analysis tools indicates whether the null hypothesis can be rejected or not. Column 4 shows the significance level: the symbols \*\*\*, \*\* and \* denote that the coefficient is significantly different from zero at 1%, 5% and 10%, respectively.

might be expected. This could be explained by the fact that although families try to respect the principles of the Mediterranean diet in the composition and type of food, elements other than the types of food that define the Mediterranean diet such as the concepts of seasonality or fresh and locally grown products (Bach-Faig et al., 2011) do not seem to be applied in purchase choices. Furthermore, household size seems to reduce the likelihood of buying local products, suggesting that the limited time available to consider food purchases could be a hindrance. Reasonably, in large families, the availability of time to spend on food purchases tends to decrease. Overall, procuring local products, which are generally not marketed through large-scale retailers, is more difficult and time-consuming. In this regard, the increasing share of food sales from large-scale retailers is considered one of the external factors that has led to the shift away from the Mediterranean diet (Botalico et al., 2016).

On the other hand, the results show that the frequency of reading food labels is positively related to sustainable consumption, increasing the likelihood of buying both organic and local food. This confirms the key role of labeling as a mechanism to improve

people's diets and to promote sustainable food consumption (Magnier et al., 2016; Pettigrew et al., 2017).

The results also confirm, in line with Agovino et al. (2017), that participation in both social and cultural activities affects the consumption of sustainable food and the same holds also for subjects involved in sport (Kesse-Guyot et al., 2013). This suggests the importance of cultural and social capital as determinants of sustainable food consumption. Indeed, previous research has demonstrated that cultural and social participation fosters pro-social activities and practices (Crociata et al., 2014).

Finally, the major limitations in generalizing the current results should be underlined. As already reported, some of the differences highlighted, although statistically significant, are of low amplitude and thus limited impact. In addition, the present research considered respondents from only one country, Italy, where traditional family models still prevail in society and the Mediterranean diet has long represented a reference model. It would be useful to replicate this type of analysis in other countries where family structures appear more fragmented and where eating habits are further removed from the model of the Mediterranean diet.



Moreover, for the present research we used Italian National Institute of Statistics data from a multipurpose survey related to aspects of daily life, which do not provide additional indications about food seasonality, freshness or sources. It would therefore be useful to carry out a specific survey focused on exploring factors affecting organic and local food choices and adherence to the Mediterranean diet as well as analyzing the influence of environmental concerns on Mediterranean diet adherence.

## 6. Implications

A number of implications for both policy makers and marketers may be suggested in the light of the results described, with a view to defining strategies, campaigns or initiatives to promote sustainable consumption patterns among Italian households. First, policies and practices need to take into account the central influence of the variables related to family structure and dietary patterns. In particular, given the influence of the presence of children on both organic and local consumption and more generally on environmental concerns, the environmental and health benefits of these sustainable products should be further disseminated by promoting sustainable consumption cultures in collaboration with educational institutions. In this regard, for example, the widespread use in school meals of organic and local food may be promoted, as might family participation in community or urban gardens. Thanks to public regulations, a significant proportion of food served in school meals in Italy is organic, but this detail is poorly communicated (Strassner et al., 2015).

Considering the influence of adhering to the Mediterranean diet on organic and local food consumption, policy makers should implement educational campaigns for families that promote combining the two models as a favorable approach to food sustainability, public health and environmental preservation. Such campaigns would be particularly useful given that, as also confirmed by these results, consumers in Italy, as in other Mediterranean countries, are replacing their traditional Mediterranean diet with other less healthy eating habits, especially among households with lower socio-economic statuses (Bottalico et al., 2016; Bonaccio et al., 2017; Cavaliere et al., 2018). However, it would also be necessary to educate consumers to respect all the dictates of the Mediterranean diet in terms of choice of food but also in relation to seasonality and local origin. In this regard, given that education plays a key role in promoting sustainable food choices, as suggested by Dernini et al. (2017), school curricula should be implemented to build skills such as Mediterranean-style cooking, taste testing and food basket planning, ideally involving the family.

With specific reference to organic food and income barriers, as suggested by Aschemann-Witzel and Zielke (2015), companies could introduce promotional initiatives targeting families with different income levels and with different life-stage compositions by introducing, for example, discounts on family packages or targeted coupons. In addition, companies could implement marketing campaigns to provide more information about the higher costs of organic production and the consequent price gaps between conventional and organic foods. This action could be very effective, given that the scant and somewhat vague knowledge of the actual organic premium price has been shown to limit the purchase of organic food, with consumers often still applying a “high-price image” to organic even if the market situation has changed considerably (Janssen and Hamm, 2012; Aschemann-Witzel and Zielke, 2015).

With regard to local food, a possible strategy to promote consumption also among families with significant time pressure during food purchases could be to encourage local food sales in large-

scale retailers, including discount stores. In addition, families should be informed about alternative food purchasing initiatives, such as box schemes or solidarity purchasing groups, which allow provision of local and organic food more simply and at lower prices. Likewise, local producers should take advantage of the opportunities offered by selling through dedicated e-commerce platforms to reach (mainly urban) consumers under time pressure conditions.

Lastly, given that results show that the frequency of reading food labels is positively related to sustainable consumption, companies could invest in voluntary labeling programs to, in easy-to-read-and-understand formats, explain the environmental and social benefits of sustainable products (organic and local), thereby supporting consumers in food choices.

## 7. Conclusion

The present research extends the previous literature by providing insights into the influences of the structure of contemporary Italian families and their dietary patterns on purchasing behavior of sustainable food, in particular organic and local food, and the link with the adherence to the Mediterranean diet. The findings show that households with a higher degree of adherence to the Mediterranean diet and with children have a higher probability of buying both organic and local products. Higher levels of education foster sensitivity to environmental problems and increase the probability of consuming organic food, while income level and time constraints reduce the likelihood of buying organic and local products. The study's results support the need for policy makers and marketers alike to implement a wide range of initiatives mainly aimed at education and facilitating access to sustainable food products. In particular, education and information campaigns could be effective in combating the erosion of the Mediterranean diet pattern that is currently in progress in Italy and in supporting confidence in organic food products. In this regard, it is notable that Italy is the main organic producer in the EU, although up to now a large share has been exported (Filb-IFOAM, 2017). Indeed, promoting organic food could be easily combined with encouraging local supply (sources), reinforcing messages about the environmental and social sustainability of local organic production. Finally, to increase access to sustainable food products, family income and time constraints could be approached through wider diffusion of alternative food purchasing initiatives and e-commerce platforms.

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## Appendix

**Table A**  
Descriptive statistics of the single components of the Mediterranean Diet Index.

| Variables             | Mean   | Standard Deviation | Observations |
|-----------------------|--------|--------------------|--------------|
| pasta, rice and bread | 3.0745 | 0.7401             | 36,942       |
| leafy vegetables      | 2.6156 | 0.9288             | 36,839       |
| vegetables            | 2.5209 | 0.8551             | 36,694       |
| fruit                 | 3.0882 | 0.9622             | 36,362       |
| milk                  | 2.4708 | 1.6191             | 36,556       |
| fish                  | 2.9554 | 1.2487             | 36,823       |
| white meat            | 3.4585 | 1.0071             | 36,843       |
| red meat              | 2.5507 | 1.0696             | 36,687       |

Table A (continued)

| Variables                 | Mean   | Standard Deviation | Observations |
|---------------------------|--------|--------------------|--------------|
| pork                      | 3.7501 | 0.7275             | 36,505       |
| processed meat            | 2.0063 | 1.4703             | 36,314       |
| eggs                      | 3.4150 | 0.8212             | 36,753       |
| dairy products and cheese | 3.1940 | 1.1309             | 36,717       |
| cooking food              | 3.7154 | 0.8488             | 36,854       |
| dressing food             | 3.8946 | 0.5302             | 36,827       |

Note: the different numbers of observations is due to the lack of response from respondents.

Table B

Descriptive statistics of the single components of the environmental concern variable, number of observations 37,544.

| Variables   | Mean  | Standard Deviation |
|---|-------|--------------------|
| global warming  | 0.330 | 0.470              |
| extinction of some animal and plant species                 | 0.165 | 0.371              |
| climate change  | 0.419 | 0.493              |
| production and disposal of waste                            | 0.477 | 0.499              |
| noise   | 0.119 | 0.324              |
| air pollution   | 0.485 | 0.499              |
| soil pollution  | 0.286 | 0.451              |
| pollution of seas and rivers                                | 0.373 | 0.483              |
| earthquakes and floods                                      | 0.298 | 0.457              |
| man-made disasters  | 0.332 | 0.471              |
| forest destruction  | 0.161 | 0.368              |
| electromagnetic pollution                                   | 0.136 | 0.343              |
| landscape destruction (excessive construction of buildings) | 0.167 | 0.373              |
| depletion of natural resources                              | 0.182 | 0.386              |
| other environmental problems                                | 0.009 | 0.095              |
| Environmental Concern Index (ECI)                           | 0.559 | 0.496              |

## References

- Aertsens, J., Verbeke, W., Mondelaers, K., Van Huylenbroeck, G., 2009. Personal determinants of organic food consumption: a review. *Br. Food J.* 111 (10), 1140–1167. <https://doi.org/10.1108/00070700910992961>.
- Agovino, M., Crociata, A., Quaglione, D., Sacco, P., Sarra, A., 2017. Good taste tasted good. Cultural capital as a determinant of organic food purchase by Italian consumers: evidence and policy implications. *Ecol. Econ.* 41, 66–75. <https://doi.org/10.1016/j.ecolecon.2017.05.029>.
- Aprile, M.C., Caputo, V., Nayga Jr., R.M., 2016. Consumers' preferences and attitudes toward local food products. *J. Food Prod. Market.* 22 (1), 19–42. <https://doi.org/10.1080/10454446.2014.949990>.
- Aschemann-Witzel, J., Zielke, S., 2015. Can't buy me green? A review of consumer perceptions of and behavior toward the price of organic food. *J. Consum. Aff.* 51 (1), 211–251. <https://doi.org/10.1111/joca.12092>.
- Bach-Faig, A., Berry, E.M., Lairon, D., Reguant, J., Trichopoulos, A., Dernini, S., Serra-Majem, L., 2011. Mediterranean diet pyramid today. Science and cultural updates. *Publ. Health Nutr.* 14 (12A), 2274–2284. <https://doi.org/10.1017/S1368980011002515>.
- Baudry, J., Allès, B., Péneau, S., Touvier, M., Méjean, C., Hercberg, S., Kesse-Guyot, E., 2017a. Dietary intakes and diet quality according to levels of organic food consumption by French adults: cross-sectional findings from the NutriNet-Santé Cohort study. *Publ. Health Nutr.* 20 (4), 638–648. <https://doi.org/10.1017/S1368980016002718>.
- Baudry, J., Péneau, S., Allès, B., Touvier, M., Hercberg, S., Galan, P., Kesse-Guyot, E., 2017b. Food choice motives when purchasing in organic and conventional consumer clusters: focus on sustainable concerns (the nutri-net-santé cohort study). *Nutrients* 9 (2), 88. <https://doi.org/10.3390/nu9020088>.
- Benedetti, I., Biggeri, L., Laureti, T., Secondi, L., 2016a. Exploring the Italians' food habits and tendency towards a sustainable diet: the Mediterranean eating pattern. *Agric. Sci. Proc.* 8, 433–440. <https://doi.org/10.1016/j.aaspro.2016.02.040>.
- Benedetti, I., Laureti, T., Secondi, L., 2016b. Exploring the Italians' food habits and tendency towards the Mediterranean diet. *Riv. Econ. Agrar.* LXXI (1), 218–228. <https://doi.org/10.1016/j.aaspro.2016.02.040>.
- Bonaccio, M., Bonanni, A.E., Di Castelnuovo, A., Pounis, G., Costanzo, S., Persichillo, M., Cerletti, C., Donati, M.B., de Gaetano, G., Iacoviello, L., 2017. High adherence to the Mediterranean diet is associated with cardiovascular protection in higher but not in lower socioeconomic groups: prospective findings from the Moli-sani study. *Int. J. Epidemiol.* 46, 1478–1487.
- Bottalico, F., Medina, X., Capone, R., El Bilali, H., Debs, P., 2016. Erosion of the mediterranean diet in apulia region, south-eastern Italy: exploring socio-cultural and economic dynamics. *J. Food Nutr. Res.* 4 (4), 258–266.
- Bravo, C.P., Cordts, A., Schulze, B., Spiller, A., 2013. Assessing determinants of organic food consumption using data from the German National Nutrition Survey. *Food Qual. Prefer.* 28 (1), 60–70.
- Cavaliere, A., De Marchi, E., Banterle, A., 2018. Exploring the adherence to the mediterranean diet and its relationship with individual lifestyle: the role of healthy behaviors, pro-environmental behaviors, income, and education. *Nutrients* 10 (2), 141.
- Casini, L., Contini, C., Marone, E., Romano, C., 2013. Food habits. Changes among young Italians in the last 10 years. *Appetite* 68, 21–29. <https://doi.org/10.1016/j.appet.2013.04.009>.
- CIHEAM/FAO, 2015. Mediterranean Food Consumption Patterns: Diet, Environment, Society, Economy and Health. A White Paper Priority 5 of Feeding Knowledge Programme, Expo Milan 2015. Ciheam-lamz, Bari/FAO Rome.
- Cranfield, J., Henson, S., Blandon, J., 2012. The effect of attitudinal and sociodemographic factors on the likelihood of buying locally produced food. *Agribusiness* 28, 205–221. <https://doi.org/10.1002/agr.21291>.
- Crociata, A., Agovino, M., Sacco, P.L., 2014. Cultural access and mental health: an exploratory study. *Soc. Indic. Res.* 118 (1), 219–233.
- De Boer, J., Hoogland, C.T., Boersema, J.J., 2007. Towards more sustainable food choices: value priorities and motivational orientations. *Food Qual. Prefer.* 18 (7), 985–996. <https://doi.org/10.1016/j.foodqual.2007.04.002>.
- de-Magistris, T., Gracia, A., 2016. Consumers' willingness-to-pay for sustainable food products: the case of organically and locally grown almonds in Spain. *J. Clean. Prod.* 118, 97–104. <https://doi.org/10.1016/j.jclepro.2016.01.050>.
- Denver, S., Jensen, J.D., 2014. Consumer preferences for organically and locally produced apples. *Food Qual. Prefer.* 31, 129–134. <https://doi.org/10.1016/j.foodqual.2013.08.014>.
- Dernini, S., Berry, E.M., Serra-Majem, L., La Vecchia, C., Capone, R., Medina, F.X., Aranceta-Bartrina, J., Belahsen, R., Burlingame, B., Calabrese, G., Corella, D., Donini, L.M., Lairon, D., Meybeck, A., Pekcan, A.G., Piscopo, S., Yngve, A., Trichopoulos, A., 2017. Med Diet 4.0: the Mediterranean diet with four sustainable benefits. *Publ. Health Nutr.* 20 (7), 1322–1330. <https://doi.org/10.1017/S1368980016003177>.
- Dernini, S., Berry, E.M., 2015. Mediterranean diet: from a healthy diet to a sustainable dietary pattern. *Front. Nutr.* 2, 15. <https://doi.org/10.3389/fnut.2015.00015>.
- Dickson-Spillmann, M., Siegrist, M., Keller, C., 2011. Attitudes toward chemicals are associated with preference for natural food. *Food Qual. Prefer.* 22, 149–156. <https://doi.org/10.1016/j.foodqual.2010.09.001>.
- Dimitri, C., Dettmann, R.L., 2012. Organic food consumers: what do we really know about them? *Br. Food J.* 114 (8), 1157–1183. <https://doi.org/10.1108/00070701211252101>.
- Dumortier, J., Evans, K.S., Grebitus, C., Martin, P.A., 2017. The influence of trust and attitudes on the purchase frequency of organic produce. *J. Int. Food & Agribus. Mark.* 29 (1), 46–69.
- Eisinger-Watzl, M., Wittig, F., Heuer, T., Hoffmann, I., 2015. Customers purchasing organic food – do they live healthier? Results of the German national nutrition survey II. *Eur. J. Nutr. Food Saf.* 5 (1), 59–71.
- FAO, 2012. Sustainable diets and biodiversity. Directions and solutions for policy, research and action. In: Proceedings of the International Scientific Symposium: “biodiversity and Sustainable Diets United against Hunger”, 3–5 November 2010. FAO Headquarters, Rome, Italy, 2010. Available at: <http://www.fao.org/docrep/016/i3004e/i3004e.pdf>. accessed on January 2014.
- Feldmann, C., Hamm, U., 2015. Consumers' perceptions and preferences for local food: a review. *Food Qual. Prefer.* 40, 152–164. <https://doi.org/10.1016/j.foodqual.2014.09.014>.
- Filb-IFOAM, 2017. The World of Organic Agriculture. Statistics and Emerging Trends available online at: <http://www.organic-world.net/yearbook/yearbook-2017/pdf.html>.
- Francis, J.E., Davis, T., 2015. Adolescents' sustainability concerns and reasons for not consuming sustainably. *Int. J. Consum. Stud.* 39 (1), 43–50. <https://doi.org/10.1111/ijcs.12150>.
- Freyer, B., Haberkorn, A., 2008. Influence of young children (3–6 years) on organic food consumption in their families. In: Paper Presented at 16th IFOAM Organic World Congress. Cultivating the Future Based on Science, Modena. Available on –line at: <http://orgprints.org/12130>.
- Goetzke, B., Nitzko, S., Spiller, A., 2014. Consumption of organic and functional food. A matter of well-being and health? *Appetite* 77, 96–105. <https://doi.org/10.1016/j.appet.2014.02.012>.
- Grønhoj, A., Thøgersen, J., 2012. “Action speaks louder than words: the effect of personal attitudes and family norms on adolescents' pro-environmental behavior”. *J. Econ. Psychol.* 33 (1), 292–302. <https://doi.org/10.1016/j.joep.2011.10.001>.
- Grønhoj, A., Thøgersen, J., 2017. “Why young people do things for the environment: the role of parenting for adolescents' motivation to engage in pro-environmental behavior”. *J. Environ. Psychol.* 54, 11–19. <https://doi.org/10.1016/j.jenvp.2017.09.005>.
- Grosso, G., Galvano, F., 2016. Mediterranean diet adherence in children and adolescents in southern European countries. *NFS J.* 3, 13–19. <https://doi.org/10.1016/j.nfs.2016.02.004>.

- Grunert, K.G., Hieke, S., Wills, J., 2014. Sustainability labels on food products: consumer motivation, understanding and use. *Food Pol.* 44, 177–189. <https://doi.org/10.1016/j.foodpol.2013.12.001>.
- Hemmerling, S., Hamm, U., Spiller, A., 2015. Consumption behaviour regarding organic food from a marketing perspective—a literature review. *Organ. Agric.* 5 (4), 277–313.
- Heckman, J.J., 1979. Sample selection bias as a specification error. *Econometrica* 47, 153–161.
- Hughner, R.S., McDonagh, P., Prothero, A., Shultz, C.J., Stanton, J., 2007. Who are organic food consumers? A compilation and review of why people purchase organic food. *J. Consum. Behav.* 6 (2–3), 94–110. <https://doi.org/10.1002/cb.210>.
- Janssen, M., Hamm, U., 2012. Product labelling in the market for organic food: consumer preferences and willingness-to-pay for different organic certification logos. *Food Qual. Prefer.* 25 (1), 9–22. <https://doi.org/10.1016/j.foodqual.2011.12.004>.
- Kaplan, S., Nielsen, T.A.S., Prato, C.G., 2016. Walking, cycling and the urban form: a Heckman selection model of active travel mode and distance by young adolescents. *Transport. Res. Transport Environ.* 44, 55–65.
- Kesse-Guyot, E., Péneau, S., Méjean, C., Szabo de Edelenyi, F., Galan, P., Herchberg, S., Lairon, D., 2013. Profiles of organic food consumers in a large sample of French adults: results from the nutrinet-santé cohort study. *PLoS One* 8 (10), 1–13. <https://doi.org/10.1111/j.1470-6431.2011.01004.x>.
- Kriwy, P., Mecking, R.A., 2012. Health and environmental consciousness, costs of behaviour and the purchase of organic food. *Int. J. Consum. Stud.* 36 (1), 30–37. <https://doi.org/10.1111/j.1470-6431.2011.01004.x>.
- Lauret, T., Benedetti, I., 2018. Exploring pro-environmental food purchasing behaviour: an empirical analysis of Italian consumers. *J. Clean. Prod.* 172, 3367–3378. <https://doi.org/10.1016/j.jclepro.2017.11.086>.
- Lee, H.J., 2016. Individual and situational determinants of US consumers' buying behavior of organic foods. *J. Int. Food & Agribus. Mark.* 28 (2), 117–131. <https://doi.org/10.1080/08974438.2015.1035471>.
- Loureiro, M.L., McCluskey, J.L., Mittelhammer, R.C., 2001. Assessing consumer preferences for organic, eco-labeled, and regular apples. *J. Agric. Resour. Econ.* 26 (2), 404–416.
- Magnier, L., Schoormans, J., Mugge, R., 2016. Judging a product by its cover: packaging sustainability and perceptions of quality in food products. *Food Qual. Prefer.* 53, 132–142. <https://doi.org/10.1016/j.foodqual.2016.06.006>.
- Mannering, F.L., Bhat, C.R., 2014. Analytic methods in accident research: methodological frontier and future directions. *Anal. Meth. Accid. Res.* 1, 1–22.
- Mannering, F.L., Shankar, V., Bhat, C.R., 2016. Unobserved heterogeneity and the statistical analysis of highway accident data. *Anal. Meth. Accid. Res.* 11, 1–16.
- Medina, F.X., 2009. Mediterranean diet, culture and heritage: challenges for a new conception. *Publ. Health Nutr.* 12 (9A), 1618–1620.
- Onozaka, Y., McFadden, D.T., 2011. Does local labeling complement or compete with other sustainable labels? A conjoint analysis of direct and joint values for fresh produce claim. *Am. J. Agric. Econ.* 93 (3), 693–706. <https://doi.org/10.1093/ajae/aar005>.
- Pedersen, S., Grønhoj, A., Thøgersen, J., 2015. Following family or friends. Social norms in adolescent healthy eating. *Appetite* 86, 54–60. <https://doi.org/10.1016/j.appet.2014.07.030>.
- Paul, J., Rana, J., 2012. Consumer behavior and purchase intention for organic food. *J. Consum. Market.* 29 (6), 412–422. <https://doi.org/10.1108/00070701211252101>.
- Pelletier, J.E., Laska, M.N., Neumark-Sztainer, D., Story, M., 2013. Positive attitudes toward organic, local, and sustainable foods are associated with higher dietary quality among young adults. *J. Acad. Nutr. Diet.* 113 (1), 127–132. <https://doi.org/10.1016/j.jand.2012.08.021>.
- Pettigrew, S., Talati, Z., Miller, C., Dixon, H., Kelly, B., Ball, K., 2017. The types and aspects of front-of-pack food labelling schemes preferred by adults and children. *Appetite* 109, 115–123. <https://doi.org/10.1016/j.appet.2016.11.034>.
- Pino, G., Peluso, A.M., Guido, G., 2012. Determinants of regular and occasional consumers' intentions to buy organic food. *J. Consum. Aff.* 46 (1), 157–169. <https://doi.org/10.1111/j.1745-6606.2012.01223.x>.
- Pugliese, P., Zanasi, C., Atallah, O., Cosimo, R., 2013. "Investigating the interaction between organic and local foods in the Mediterranean: the Lebanese organic consumer's perspective". *Food Pol.* 39, 1–12. <https://doi.org/10.1016/j.foodpol.2012.12.009>.
- Racine, E.F., Mumford, E.A., Laditka, S.B., Lowe, A.E., 2013. Understanding characteristics of families who buy local produce. *J. Nutr. Educ. Behav.* 45 (1), 30–38. <https://doi.org/10.1016/j.jneb.2012.04.011>.
- Renna, M., Rinaldi, V.A., Gonnella, M., 2015. The Mediterranean Diet between traditional foods and human health: the culinary example of Puglia (Southern Italy). *Int. J. Gastron. Food Sci.* 2 (2), 63–71.
- Ricciuto, L., Tarasuk, V., Yatchew, A., 2006. Socio-demographic influences on food purchasing among Canadian households. *Eur. J. Clin. Nutr.* 60, 778–790. <https://doi.org/10.1038/sj.ejcn.1602382>.
- Riefer, A., Hamm, U., 2008. Changes in families' organic food consumption. In: Paper Presented at 12th Congress of the European Association of Agricultural Economists. EAAE, Ghent, 2008. Available on-line at. <https://core.ac.uk/download/pdf/6449407.pdf>.
- Riefer, A., Hamm, U., 2011. Organic food consumption in families with juvenile children. *Br. Food J.* 113 (6), 797–808. <https://doi.org/10.1108/00070701111140124>.
- Seconda, L., Baudry, J., Allès, B., Hamza, O., Boizot-Szantai, C., Soler, L.G., Kesse-Guyot, E., 2017. Assessment of the sustainability of the Mediterranean Diet combined with organic food consumption: an individual behaviour approach. *Nutrients* 9 (1), 61. <https://doi.org/10.3390/nu9010061>.
- Shafie, F.A., Rennie, D., 2012. Consumer perceptions towards organic food. *Proc. Soc. Behav. Sci.* 49, 360–367. <https://doi.org/10.1016/j.sbspro.2012.07.034>.
- Sharma, R., Jha, M., 2017. Values influencing sustainable consumption behaviour: exploring the contextual relationship. *J. Bus. Res.* 76, 77–88. <https://doi.org/10.1016/j.jbusres.2017.03.010>.
- SINAB, 2017. Report Bio in Cifre. Available online. <http://www.sinab.it/sites/default/files/share/Anticipazioni%20Bio%20in%20cifre%202017.pdf>.
- Strassner, C., Cavoski, I., Di Cagno, R., Kahl, J., Kesse-Guyot, E., Lairon, D., Lampkin, N., Løes, A.-K., Matt, M., Niggli, U., Paoletti, F., Pehme, S., Rembialkowska, E., Schader, C., Stolze, M., 2015. How the organic food system supports sustainable diets and translates these into practice. *Front. Nutr.* 2, 19.
- Symmank, C., Mai, R., Hoffmann, S., Stok, F.M., Renner, B., Lien, N., Rohm, H., 2017. Predictors of food decision making: a systematic interdisciplinary mapping (SIM) review. *Appetite* 110, 25–35. <https://doi.org/10.1016/j.appet.2016.11.023>.
- Thøgersen, J., 2017. Sustainable food consumption in the nexus between national context and private lifestyle: a multi-level study. *Food Qual. Prefer.* 55, 16–25. <https://doi.org/10.1016/j.foodqual.2016.08>.
- Verain, M.C., Onwezen, M.C., Sijtsema, S.J., Dagevos, H., 2016. The added value of sustainability motivations in understanding sustainable food choices. *Appl. Stud. Agri. Bus. Commerce* 10 (2–3), 67–76. <https://doi.org/10.19041/APSTRACT/2016/2-3/8>.
- Verain, M.C., Dagevos, H., Antonides, G., 2015. Sustainable food consumption. Product choice or curtailment? *Appetite* 91, 375–384. <https://doi.org/10.1016/j.appet.2015.04.055>.
- Welch, D., Warde, A., 2015. Theories of practice and sustainable consumption. In: Reisch, L., Thøgersen, J. (Eds.), *Handbook of Research on Sustainable Consumption*. Cheltenham, 2015. Edward Elgar Publishing, UK, pp. 51–69.