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Consumer behaviour in Italy. Who spends more to buy a Mediterranean Diet?

Silvia CODERONI*, Maria Angela PERITO**, Concetta CARDILLO***

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Abstract

Mediterranean diet is a term used to describe the traditional eating habits of people around the Mediterranean and that refers to a healthy eating model, with significant nutrition and health benefits. However, many studies have emphasised an increasing erosion of the Mediterranean diet heritage, also in Italy. Starting from the assumption that evolution of human nutrition, if it occurs rapidly, can only be conceptualised as a social phenomenon, this study intends to explore the relationship between purchase behaviour for typical Mediterranean diet food and some socioeconomic and geographic characteristics of the Italian households.
Italy's food purchase microdata in 2013 were used to describe three different purchasing behaviours among households and a multinomial logit model was applied to model nominal outcome variables in relationship with socioeconomic variables. Results suggest that families with older and more educated respondents have a higher probability to purchase Mediterranean diet food, while spending more on out-of-home eating or living far away from an urban area, seems to reduce this probability.

Keywords: *Mediterranean diet, households' purchase, multinomial logit model*

Résumé

La diète méditerranéenne est un terme utilisé pour décrire les habitudes alimentaires traditionnelles des populations autour de la Méditerranée et qui désigne un modèle d'alimentation saine, avec des bienfaits significatifs pour la nutrition et la santé. Toutefois, de nombreuses études ont mis en évidence une érosion croissante du patrimoine que constitue le régime alimentaire méditerranéen, même en Italie. En partant de l'hypothèse selon laquelle l'évolution de la nutrition humaine, si elle se produit rapidement, ne peut être conceptualisée que comme un phénomène social, cette étude vise à analyser la relation entre les comportements d'achat pour les produits alimentaires typiques de la diète méditerranéenne et certaines caractéristiques socio-économiques et géographiques des ménages italiens.
Des micro-données sur les achats alimentaires en Italie en 2013 ont donc été utilisées pour décrire trois comportements d'achat différents au niveau des ménages et un modèle logit multinomial a été utilisé pour modéliser les variables des résultats nominaux en relation avec les variables socio-économiques. Les résultats suggèrent que pour les familles où les répondants sont plus âgés et plus instruits, la probabilité d'acheter des aliments typiques de la diète méditerranéenne est plus élevée, alors que dépenser davantage pour les repas hors domicile ou vivre loin d'une zone urbaine semblent réduire cette probabilité.

Mots-clés: diète méditerranéenne, consommation familiale, modèle logit multinomial.

1. Introduction

The food system is an interconnected network of actors located in a specific geographical area and participating in the creation of goods and services to meet the consumer food needs locally and outside that area (Rastoin and Ghersi, 2010). On these grounds, many studies have shown the relationship between economic development, food system and changes in eating habits (Cépède and Langelle, 1953; 1970). Some studies on economic history suggest that food diets evolve under the influence of nutritional determinism and economic power (Bairoch, 1997). In advanced economies, the agricultural revolution has enabled a considerable reduction of cost and price for food calories and this has led to a change in the daily diet with positive consequences for public health, longevity and quality of life. In the last decades, this transition has also had a substantial impact on human health, with a significant growth of obesity (Mazzocchi *et al*., 2008).

Many studies indicate a dramatic increase in obesity over the last thirty years and suggest that in some countries the number of obese individuals even exceeds 33% of the total population (Flegal *et al*., 2011). WHO (2011) and OECD (2010) showed that obesity has a substantial role in the development of several chronic diseases (diabetes, cardiovascular disease, etc.) and estimated a significant increase in the number of obese people worldwide. Moreover, obesity seems also to increase in connection with food choices of people who are less tied to traditional diets, passed on over generations.

In many countries around the world, people are moving away from traditional diets, like the Mediterranean diet (MD), characterised by low caloric intake.

The Mediterranean diet is a term used to describe the traditional eating habits of people around the Mediterranean. This food diet includes a very large number of "different cuisines" typical of many countries and populations that do not necessarily share the same lifestyles, cultures and religions. However, these different cooking habits have certain common characteristics which bring them closer. This heterogeneity explains why the definition of Mediterranean diet (MD) is not always consensual. However, the traditional MD is characterised by a high intake of fruit, nuts, vegetables, and cereals; a moderate intake of fish and

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poultry; a low intake of dairy products, red meat, processed meats, sweets and fats; olive oil in substitution for other fats and wine in moderation, consumed with meals (Estruch *et al*., 2013).

The literature indicates that the MD is a healthy eating model, with significant nutrition and health benefits (Mendez *et al.*, 2008; Trichopoulou *et al.,* 2003). However, as stated by CIHEAM and FAO (2015), current data show a "decline in adherence to the Mediterranean dietary pattern in northern as well as in southern and eastern Mediterranean countries that is critically eroding the Mediterranean diet heritage, recognised in 2010 by UNESCO as an intangible cultural heritage of humanity".

The changes in food habits raise concern also in Italy. However, to our knowledge, there are no studies on microdata that analyse adherence to a healthy diet in Italy resulting from socioeconomic and geographic characteristics of households. Therefore, in this paper we intend to investigate the adherence to the MD -as a healthy diet- in Italy, by analysing ISTAT (Household Budget Survey) microdata on food expenditure choices within Italian households, in relation to their socioeconomic and geographic characteristics. The paper is organised as follows. Section 2 reviews the relevant research on this topic, Section 3 analyses food expenditure behaviour of Italian families, mostly over the last 20 years. Section 4 describes data and the methodology and presents the relevant results and Section 5 summarizes some conclusions.

2. Literature review: food purchasing behaviour towards healthy diet

Many research studies pointed out the increasing westernization of countries that traditionally had the highest adherence to the MD and are now showing the sharpest decline rate, while some countries in Northern Europe, which originally had a very low adherence to the MD, exhibit a small adherence increase (da Silva *et al*., 2009).

As Lacirignola and Capone stated (2009), it is a paradox that while the MD is "becoming more popular in the world and increasingly recognised by the international scientific community, the Mediterranean populations are moving further and further away from this model". For example, da Silva *et al*. (2009) report an increase in vegetable oil, sugar and sweeteners as well as meat consumption over the past several decades in many Southern European countries.

These changes in eating habits are occurring despite the well-documented health and environmental benefits of the MD (CIHEAM/FAO, 2015, Dernini *et al.,* 2013)). This happens because food consumption is affected by a range of factors including food availability, food accessibility and food choice, which in turn may be influenced by geography, demography, available income, urbanization, globalization, marketing, religion, culture and consumer attitudes. Some of these drivers are specifically related to the nutrition transition (Pollard *et al*., 2002).

Several studies explored factors affecting food choice. It has been found that individuals with higher education, income and social status consume a larger amount of healthy food, like fruit and vegetables (Johansson and Andersen, 1998; McClelland *et al*., 1998).

Age, gender and smoking status can also affect fruit and vegetable consumers (Thompson *et al.,* 1999; Irala-Estevez *et al*., 2000). These demographic characteristics reveal that women consume more fruit and vegetables than men and older adults more than the younger generations (McClelland *et al*., 1998).

Young adults, especially university students, usually do not acquire sufficient aptitude and experience to make appropriate decisions and they tend to develop unhealthy eating habits (Papadaki *et al*., 2007; Rakicioglu and Yildiz, 2011; Shimbo *et al*, 2004). This is also true for the MD. In fact, García-Meseguer *et al*. (2014) demonstrate that the university population has a low-quality diet, with low or intermediate adherence to the MD, and although their sample mostly consists of normal weight subjects, they show a high fat consumption. Unfortunately, it seems that the Mediterranean countries are replacing the traditional MD with other less healthy eating habits (Hebestreit and Ahrens, 2010). This is especially true for the younger populations (Serra-Majem *et al.*, 2004). The progressive globalisation of food products has contributed to decreased consumption of traditional healthy foods (Royo-Bordonada *et al.*, 2006).

A substantial body of evidence indicates that parenting has a powerful impact on child body weight, food choices, and physical activity (Sleddens *et al*., 2011). There is therefore a need to promote traditional Mediterranean dietary habits during school age since this is a critical stage for habit acquisition. However, habits of young people can be determined by individual (e.g. age, gender, food preferences, nutritional knowledge, attitudes), collective (e.g. food pricing, education, family employment) and social factors (e.g. cultural factors, family factors, peers and product marketing/mass media) (Taylor *et al*., 2005). One of the most influential factors young people habits was the family's socioeconomic status. Arriscado *et al*. (2014) found that only 35.8% of school children with a medium to low socio-economic family status reported high adherence to the MD, compared with 50.8% amongst those from families with medium to high incomes.

The nutritional quality of dietary intake is strongly patterned from a socioeconomic point of view, also for older people (Davey Smith and Brunner, 1997; Baxter *et al*., 1999; Fiscella and Williams, 2004). Joliffe (2011) showed that severity of over-weight and obesity is much higher for the poor than for the non-poor. The higher social class is more likely to consume healthier food (Contoyannis and Jones 2004).

The impact of geographic location has also been highlighted in relation to some health issues and to dietary style. Some studies suggested that there is a higher prevalence of

overweight or obese (especially children) in rural areas (Phillips and McLeroy, 2004; Davis *et al*., 2005). This finding represents a change compared to the past, when people from large metropolitan areas were at greater risk of being overweight than rural children. Lutfiyya *et al*. (2007) have suggested that in the USA not only is rural residency a risk factor for overweight in children, but also overweight rural children show additional risk factors like poverty, no health insurance, no preventive care in the past year, and little physical activity.

Hence, it seems that evolution of human nutrition and well-being cannot be explained by genetic factors because it has occurred too rapidly, but it must be conceptualised as a social phenomenon (Philipson and Posner, 2008).

3. Some trends in evolution of food expenditure behaviour of Italian families

Expenditure of Italian families on food (including beverages and excluding tobacco) has declined from 35.9% to 19.5% of total expenditure in 40 years (from 1973 to 2013)[1]. The decline rate has been variable over time. For the first twenty years, a decline of 14.4% has been recorded, but from 1994 to 2013 only a 0.8% decline rate has been reported, with an increase of 0.4% since 2008, maybe due to the effects of the economic crisis on purchasing (ISTAT, 2012).

Food expenditure has decreased in parallel with a growth in average monthly expenditure for consumption of food away from home. This increase has occurred almost gradually and constantly over the last twenty years, but following different trend in the last period: the average expenditure on meals away from home grew, in fact, from 38 euros in 1985 to 72 in 2004 (Peta, 2009) and from 75 to 77 euros between 2005 and 2013[2]. Looking at geographical differences, this trend is more evident in North than in South Italy: in 2004, the average monthly expenditure of families in northern Italy is about 90 euros, while in the South it is below 50 euros (Peta, 2009). In 2013, it amounts to 100 euros in the North, 79 euros in the Centre and only 46 euros in the South[3].

Regarding the categories of food purchased, the composition of the families' shopping basket has changed, showing a decrease in the consumption of meat, milk and dairy products, beverages and olive oil and fats, in general, over the years. At the same time, the share of purchased MD food like fish, bread and cereals, fruit and vegetables has increased (figure 1). From 1973 to 1996, the consumption of bread and cereals and fish has increased by almost 4%, and that of fruit, vegetables and potatoes by2%, while meat expenditure has dropped by 8% (ISTAT, 2012).

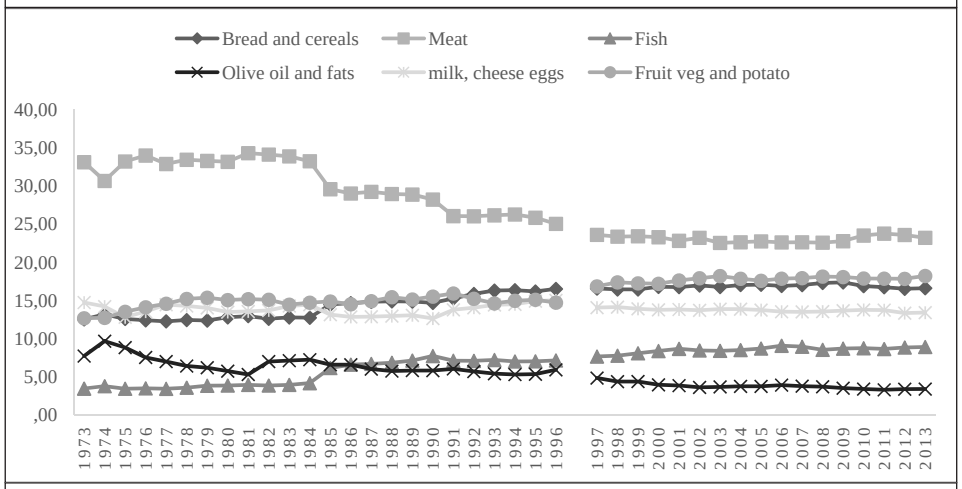
Considering the most recent - and directly comparable[4]-years, table 1 shows average spending in real values in Italy for some food products and the total amount. Spending in real terms has been determined by applying Consumer Price Index (CPI) for each food in the different years.[5] The overall decline in average household food expenditure is confirmed also in this period (-21%).[6] Taking into account each product category, among the foods associated with the Mediterranean diet, white meat, fruit and vegetables, milk, olive oil[7] and pasta, show the sharper drop.

In the generalised declining trend, different rates are recorded in the three (though not homogeneous) periods reported in the table: at first, a 5% decline, followed by a slow increase from 2002 to 2006, and finally, a sharp drop in the last period.

Focussing on different sub-periods, in the first 5 years (1997-2001), the purchase of products that are not associated with the MD (fats, other meats, sugar, wine and alcohol) exhibits the shaper decrease (together with olive oil), while expenditure on fish and other cereals increases.

During the second period (from 2002 to 2006), the purchase of foods not included in the MD (fats, olive oil, other meats, sugar, wine and alcohol) still decreases, whereas an increase in foods suggested (in different proportions) by the MD starts to be recorded. However, the purchase of oth-

Figure 1. *Percentage of average monthly expenditure for household food and drink consumption per product category - Years 1973-2013.*



Source: ISTAT, 2012.

[1] http://dati.istat.it/
[2] http://dati.istat.it/
[3] http://dati.istat.it/
[4] Following a significant change of the survey design and instruments, data for the years 1997-2013 are not directly comparable with those of the previous years (Istat, 2012).
[5] Here the index for the whole resident population (i.e. NIC) has been used; the index provides more detailed information for specific food items. Source: http://dati.istat.it/.
[6] In absolute terms, the food expenditure value has increased over the years, but this is due to the effect of price increase; only the purchase of olive oil and sugar has decreased even in absolute values.
[7] Olive oil, even if recommended by the diet, must be used in moderation, and thus, in general, a lower consumption can be beneficial provided that the use of other fats not included in the MD is not increased.

Table 1 - *Percent changes in average food expenses in Italy from 1997 to 2013 (specific food categories and total).*

	1997-2013	1997-2001	2002-2006	2007-2013
Pasta	-37.7	-5.4	3.4	-34.0
Bread	-20.4	-7.8	-2.1	-13.1
White meat	-11.1	-4.8	-14.8	20.7
Other Meats*	-23.8	-11.6	2.3	-18.4
Fish	-7.0	2.9	6.0	-7.6
Other cereals	-8.9	7.9	9.7	-18.6
Fruit and Vegetables	-14.9	-4.6	6.6	-9.9
Eggs	-12.3	-6.5	3.6	-7.4
Dairy products	-23.8	-5.0	5.9	-20.0
Milk	-19.4	-6.7	0.2	-14.1
Wine	-21.6	-9.1	6.1	-15.6
Olive oil	-37.0	-11.8	-1.0	-21.4
Fat	-32.2	-16.9	-3.6	-2.4
Sweets	-19.1	-2.0	4.7	-19.5
Sugar	-43.3	-9.9	-2.4	-33.4
Beer	4.9	-3.9	3.5	4.7
Alcohol	-12.8	-9.1	-11.8	11.0
Drinks with sugar	-16.6	-0.8	2.5	-20.4
Total Food (including other foods)	-20.8	-5.3	2.4	-15.5
Meals away from home**	-10.8	6.7	3.4	-18.5

* meat other than white
** excluded in the total food figure
Source: own elaboration based on ISTAT data.

er foodstuffs not related to the MD like beer, sweets and drinks with sugar, grows as well.

In the last period, a high decline is almost generalised. Looking at the MD food, the purchase exhibits ambiguous results. While white meat consumption increases, fruit, vegetables, and fish decrease more slightly and bread, pasta, and olive oil more rapidly. Meanwhile, foods not included in the MD and not healthy, decline slowly (other fats) or even increase (beer and other alcohol beverages).

Despite some emerging signals, national data does not allow to reveal all fundamental regional or even micro differences that exist in food consumption and that often reflect cultural heritage, differences in income and demographical structure. Therefore, the evaluation of purchase data at micro level could lead to better detect consumption determinants for specific food of interest here, by fully exploiting data heterogeneity.

4. A multinomial logit model for food purchase microdata

4.1. Sample and methodology description

The study was carried out by analysing a survey conducted by ISTAT (Household Budget Survey) on a sample of 20,680 households in Italy in about 470 municipalities. The Household Budget Survey provides information on household expenditure for consumption and it describes, analyses and explains expenditure behaviours of the households based in Italy. In 1997, the survey was completely revised.

For the purpose of this study, we used microdata from the 2013 survey to analyse the relationship between expenditure behaviour towards some typical MD food and the families' socioeconomic and geographic characteristics. Consumers in the sample were questioned about their food expense level for some specific food categories. The characteristics of the participants in the samples are illustrated in table 2. The break-down by household composition, education level, and geographic location indicates that the sample covers a wide range of individuals.

The personal characteristics refer to the respondent that is supposed to be the person of the family in charge of the expenditure, a woman in 32% of the cases. The respondent's average age is 59 years (14.9% were from 18 to 40 years old, 39.1% were between 41 and 60 years old, and 46% were over 60) and 62.3% of the sample is highly educated.

It goes without saying that the geographic characteristics refer to the family. These consumers live mainly in Northern Italy (45.1%). 36.7% of the sample live in Southern regions and only 18.2% in the Centre.

As ISTAT provides also information about the household's location, we used this finding to classify a family as "rural" or "urban" based on the relevant definitions. In particular, ISTAT classifies a site as a town, a core[8] or as scattered houses[9]. According to these definitions, the term rural is used here to identify families living in both a core and in scattered houses. Families in the sample live mainly in ur-

Table 2 - *Socio-demographic characteristics of the participants.*

Variable	Number	Percentage
Female	6,331	*32.0*
Age categories		
18–40 years	3,089	*14.9*
41–60 years	8,082	*39.1*
60 + years	9,507	*46.0*
Regions		
North	**9,335**	*45.1*
Centre	**3,747**	*18.2*
South	**7,598**	*36.7*
Education		
Low (Primary education)	*2,040*	*9.9*
Medium (Secondary education)	*5,747*	*27.8*
High (Higher education)	*12,893*	*62.3*
Urban areas	*16,356*	*79.7*

Source: own elaboration based on ISTAT data.

[8] According to ISTAT definition, a core is the dwelling place, characterised by the presence of adjacent or neighboring houses with at least five families and with roads, trails, open spaces, courtyards, etc., provided that the distance between the houses does not exceed 30 meters and is lower than the distance between the core itself and the closest scattered house. Besides, it must not be provided with a collection site, which is a distinctive feature of a town.
[9] Scattered houses are dwelling places in the municipality, located at such a distance from one another that makes them neither a core nor or a town.

Table 3 - *Average monthly unit expenditure data in euros (food categories and total).*

	Mean	Std. Deviation
Pasta	5.97	8.27
Fruit	21.41	19.53
Vegetables	21.76	20.09
Bread	15.06	11.84
Red meat	39.61	35.67
White meat	12.27	14.83
Cold cuts	11.51	13.55
Sugar and sweets	18.78	19.83
Fish	20.54	25.64
Olive oil	5.70	10.95
Eggs	3.25	4.17
Other fats	2.49	4.48
Milk	8.91	9.82
Milk derivatives	18.12	18.15
Wine	5.86	14.36
Rice	1.93	3.64
Meals away from home	39.06	71.86
Total food expenditure	273.55	181.42
Total food expenditure*	234.50	152.18
Total expenditure	1,204.90	979.33

*excluding out- of- home meals.
Source: own elaboration based on ISTAT data.

ban areas (79.7% of the sample) only 4,172 families live in "rural" areas.[10]

As regards the purchase data, table 3 shows a high monthly expenditure, in our sample, for red meat, fish and sugar/sweets, but also for healthy food as fruit and vegetables.[11]

To analyse expenditure choices using these micro purchase data, families were grouped according to spending behaviours more or less oriented towards the MD food.

To determine whether a family buys more than average of a specific food item, the difference between unit expenditure data and the national average was used (table 3).

Families were grouped according to spending levels for two different food categories: those that are associated with the MD and those which are not. Table 4 reports in each row the families that spent more than the national average to buy (from zero to four) food associated with the Mediterranean diet, regardless of the product. The columns report the families that spent more than average (from zero to five) on food not associated with the MD. More specifically, the MD foods considered were fish, white meat, fruit and vegetables. We excluded pasta, bread and olive oil from the MD food, because their consumption is already quite high in Italy (table 3) and it shows lower variability than other MD food in the analysed sample, so that purchasing behaviour towards this food could hardly help distinguish between different dietary habits. As regards food not associated with the MD, we considered red meat, sugar and sweets, fats other than olive oil, cold cuts and coke or other sugar beverages (excluding fruit juices). As a result, the first section includes families that did not spend more than average for either food associated with the MD or food not associated. While the last section reports families that spent more than others for 4 MD foods and 5 foods not included in the Mediterranean dietary patterns.

Table 4 indicates that three categories of family expenditure were obtained by grouping families according to their different attitude towards MD food as follows. Families that spent more for MD foods (from 1 to 4) than for other foods (from 1 to 2), were classified as families that spend more for Mediterranean dietary patterns (in white in the table). This group included 5,300 families (26% of the sample).

Families that spent more than average for zero to four products, both associated and not associated with the MD, were considered "neutral" because they did not show any peculiar expenditure preference. The same holds true for families that spent more for 3 or 4 products both associated and not associated with the MD, and vice versa. This group included 7,605 families (37% of the sample) (light grey in table 4).

Finally, families that spent more than average on items not suggested by the MD compared to MD food were considered to have "less healthy" dietary habits. They represented 38% of the sample, i.e. 7,775 families (dark grey in table 4).

Once families' expenditure behaviour was classified, we modelled the different food expenditure choice in relationship with some socioeconomic characteristics of the families.

To model nominal outcome variables, we used a multinomial logit model (Nerlove and Press, 1973) because of the presence of multiple (more than two) choice categories that could not be ordered in any natural way (Greene, 2012). These kinds of models have been quite extensively used to

[10] In the rest of the paper, the term rural will therefore be used according to this definition and not following the most widespread OECD (2006) and EUROSTAT (2010) urban-rural typologies that both refer to a demographic criterion (i.e.: population density and presence of major urban centre).

[11] Unit expenditure data were obtained by dividing family expenditure per family component, considering only children in school age. Children not in school age (2,225 in the analysed sample) were not considered in this study for two types of reasons. Firstly, the amount of food expenditure for them is lower than that for older family members, and hence, considering also children in the breakdown of the total family expenditure would lead to underestimate the unit family expenditure. Secondly, according to the literature, school age is a critical stage in habit acquisition (see paragraph 2), and children in this age could then start affecting more directly the family food purchasing choices.

Table 4 - *Number of families belonging to the three different choice categories based on expenditure on different foods.*

No. of food in the MD	No. of foods in an unhealthy diet 0	1	2	3	4	5	Families
0	1049	827	501	285	102	30	2,794
1	723	935	840	735	368	107	3,708
2	413	848	1097	1096	763	251	4,468
3	163	518	1012	1435	1341	544	5,013
4	66	253	625	1352	1568	833	4,697
Families	2,414	3,381	4,075	4,903	4,142	1,765	20,680

Source: own elaboration on ISTAT data.

describe consumer food choices (Kim and Geistfeld, 2003; Beldona *et al*., 2010). However, there are few studies on Italian consumer behaviour surveys and they mostly refer to some specific products or regions. For example, Denver *et al.* (2012) use multinomial logit model to analyse households' panel data categorised according to their levels of organic consumption and Gracia and de Magistris (2008) use discrete choice model to analyse the demand for organic food in South Italy.

In a multinomial logit model, each category is compared to one selected basic category, thus it is equivalent to simultaneous estimation of multiple logits. However, if we estimate them separately, we would lose information, as each logit would be estimated on a different sample constituted by the selected category and basic category and no other categories. A multinomial logit model, instead, can simultaneously estimate all relationships. The general form of a multinomial logit model is (Greene, 2012) the following:

$$Prob\ (choicej) = P_{ij} = \frac{\exp\ (x_i'\ \beta_j\ )}{\sum_{k=1}^{J} \exp\ (x_i'\ \beta_m\ )}, \qquad for\ j = 0, 1, \dots, J$$

where *i* indicates the observation, families in this case; *J* indicates the choices; *Pji* is the predicted probability of households selecting the jth food expenditure alternative; x*i* is a vector of explanatory variables and *βj* are vectors of unknown parameters. This model is typically employed for individual data, in which x variables are the characteristics of the observed individuals, not the choices. In our model, these variables are socioeconomic characteristics of the families (table 5). The economic variables considered are the percentage of food expenditure over the total family expenditure and the percentage of expenditure for meals away from home, over the food expenditure. The social variables are the education level (expressed in years of schooling) and the age (expressed in differences compared to the average), these variables indicate the respondent's characteristics, as this is the person that should be in charge of purchase, and thus, should influence spending at most. Finally, geographic data are dummy variables indicating whether a family lives in a northern or in a southern region or in a rural area (footnote 8).

Table 5 - *List of the explanatory factors included in the regression models.*

Explanatory factors	Type of variable
Age	Continuous
Education	Categorical
Food expenditure/total household expenditure	Continuous
Expenditure/total food expenditure	Continuous
Northern region	Dichotomous
Southern region	Dichotomous
Rural site	Dichotomous

The dependent variable is the three-category variable comprising the three groups obtained as described before and conceptualised in table 4.

As there is no natural ordering of the possible outcomes, 3 in our cases, what number goes with what category is arbitrary. We decided the following:

j = 1 "Mediterranean diet", if a family chooses to spend more on food associated with the Mediterranean diet;

j = 2 "transition diet", if a family choice reflects a somehow "transition diet", with neutral preference for one diet or another (i.e. the MD or not);

j = 3 "less healthy diet", if a family chooses to spend more on a less healthy diet (i.e. preference for foods that are not suggested by the MD).

Results of the multinomial logistic regression, however, are not so easy to interpret, as they tell us how a one-unit change in the regressor effects the log of the odds when the other variables in the model remain constant. Therefore, to estimate the effects on the dependent variable for a given change in a particular regressor, while keeping the other regressors at their sample means, marginal effects are then estimated.

These are obtained from the logit regression results by the following equation (Greene 2012):

$$\frac{\partial P_{ij}}{\partial X_j} = P_j \left(\beta_j - \sum\nolimits_{k=0}^{j} P_k \beta_k \right), \qquad for\ j = 0, 1, .., J$$

where β represent the parameter and P the probability of one of the three outcomes.

4.2. Results analysis

Table 6 shows the coefficient of the multinomial logistic estimation of the model[12]. Results indicated a significant model with key differences between the three groups. The

[12] The Independence of Irrelevant Alternatives (IIA) assumption inherent in multinomial logit models is most frequently tested with a Hausman-McFadden test (Hausman and McFadden, 1984). In one case, the Hausman-McFadden test performed here cannot reject the null hypothesis of not systematic difference in coefficients. However, in another case, as is confirmed by many findings in the literature, model fitted on the data fails to meet the asymptotic assumptions of the test of the 2 distribution of the variance matrix (and leads to negative value). Seemingly unrelated estimation test (SUEST) (Weesie, 1999) is used here for a generalised test of the IIA assumption. SUEST test does not reject the hypothesis of common coefficients.

basic group (transition diet expenditure) represents the reference category against which the remaining groups have been compared. The coefficient values project the differences based on the predictors listed in the first column. If the sign of the coefficient is negative, it means that the comparison group is likely to be less important on the specific parameter when compared with the basic group. The opposite is true if the sign is positive.

Interestingly, families that choose to buy Mediterranean diet food more than average are more likely to have an older and more educated respondent than families that have a "neutral" way of spending. Both regional dummies reduce the shift from neutral to Mediterranean spending families, indicating no relative difference. On the contrary, families that choose not to buy Mediterranean diet food -more than average- are more likely to have a younger respondent than families that have a "neutral" way of spending. They probably spend more and are located more in North than in South Italy and live in "rural" sites.

Table 6 - *Multinomial logit estimates of the model.*

Age	0.014***	-0.004***
	(0.001)	(0.001)
Education	0.027***	3.6E-04
	(0.004)	(0.004)
Alimentary exp/total exp	0.133	0.240
	(0.190)	(0.174)
Exp. out of home/total alimentary exp.	-0.104	0.239**
	(0.130)	(0.113)
Northern region	-0.108**	0.290***
	(0.050)	(0.046)
Southern region	-0.107**	-0.123**
	(0.051)	(0.048)
Rural site	-0.061	0.140***
	(0.046)	(0.040)
Constant	-0.556***	-0.186**
	(0.085)	(0.078)

- Source: Our elaboration. Base category: Transition diet. Single, double and triple asterisks (*) denote significance at the 10%, 5% and 1% levels, respectively. Multinomial logistic regression: Number of obs = 20,524; LR chi2(200) = 462.85; Prob > chi2 = 0.0000. Standard error in parenthesis. Number of observations differs from the whole sample because families that did not report all socioeconomic or geographic information required have been excluded.

As mentioned earlier, multinomial regression coefficients are not so easy to interpret, thus marginal predictor effects on dependent variables were estimated (Table 7).

Findings highlight significant and coherent differences between spending behaviours. Families with an older than average or more educated respondents are more likely to spend more on Mediterranean diet products, as demonstrated by many studies in the literature (Johansson and Andersen, 1998; McClelland *et al*., 1998). Conversely, younger and less educated family's respondents are more likely to spend in a neutral way or to spend more on food not associated with the Mediterranean diet. This indicates that the younger people's distance from MD is maybe due to the influence of westernization habit. This result is in line with many studies in the literature on other Mediterranean populations: for example, according to Rakicioglu and Yildiz (2011), young people in Turkey tend to have higher unhealthy eating habits and University students in Greece have shown a significant decrease in the weekly consumption of fresh fruit and cooked and raw vegetables (Papadaki *et al*. 2007).

Geographic variables give coherent, but not immediately interpretable results. Apparently, families living in North Italy seem to have less probability to spend more on Mediterranean diet food, while living in the South increase the probability to follow MD suggestions, and reduces the probability to spend more on a less healthy diet.

Living in a less central area, seems to negatively affect expense behaviour towards healthier Mediterranean food, while this increases the chance to buy other (less healthy) foods. This finding could confirm some research studies (Phillips and McLeroy, 2004; Davis *et al*., 2005; Lutfiyya *et al*., 2007) that suggested a higher prevalence of overweight or obese (especially children) in rural areas, or other studies (Denver *et al*., 2012) that found a high organic consumption in Italy mainly among better-off households in urban areas. However, two issues must be emphasised to substantiate this result. Firstly, as we are analysing expenditure data, and not food consumption, we should consider that people leaving far away from the centre, have the possibility to grow some food like fruit and vegetables on their own, so they do not need to buy them even if they consume large amounts of these products. Secondly, the definition of a rural site is questionable (see paragraph 4) and conclusion on this topic should need further and more specific analysis.

Marginal effects of food expenses are not significant in terms of influence on spending choices; in other words, one could say that spending more does not mean spending better (but even worse, actually).

The different amount of expenditure out of home (related to the total food expenditure), instead, seems to suggest an interesting relationship with spending behaviour. Indeed, families that spend more on meals away from home, significantly reduce spending for the Mediterranean diet, while they are more likely to buy other foodstuffs. This finding could prove to be somehow unfavourable, if we consider the increasing trend of expenditure on meals away from home, described before.

Table 7 - *Marginal effects.*

	Mediterranean diet	**Transition diet**	**Less healthy diet**
Age	0.003***	7.8E-04***	-0.002***
Education	0.005***	-0.003***	-0.002***
Food exp/total exp	0.002	-0.046	0.043
Exp. Out of home/total food exp.	-0.042*	-0.023	0.065***
Northern region	-0.047***	-0.030***	0.077***
Southern region	-0.009	0.027***	-0.018*
Rural site	-0.024***	-0.014	0.038***

Source: own elaboration. Single, double and triple asterisks (*) denote significance at 10%, 5% and 1% levels, respectively.

5. Concluding remarks

This paper contributes to expand literature on food purchasing behaviour by proposing a study on micro purchase data within Italian households in 2013. The study analyses adherence to the MD related to socioeconomic and geographic characteristics of the households. We investigated three different groups: (*i*) families with MD eating habits; (*ii*) families in transition who do not adhere to the MD but whose diet is not "completely bad"; (*iii*) families with a less healthy diet.

According to this definition, in 2013, almost 26% of the Italian families adhered to the MD, 37% to a more transition neutral diet, and 38% to a less healthy diet.

The estimated multinomial logit model provides interesting results concerning Italian households' spending behaviour. Families with an older and more educated respondent have a higher probability to spend more on Mediterranean diet products. Conversely, families with a younger and less educated respondent are more likely to spend on the so-called "less healthy diet".

Results from our case study provide useful suggestions for policy actions to promote traditional Mediterranean dietary habits, especially in school age, as younger people seem to have lost more adherence to this eating tradition. In fact, the real risk lies in families that adopt a "transition" behaviour diet as they could move to unhealthy eating behaviours, with possible effects on public health and related increase of public costs. This dangerous trend could be strengthened by the increasing expenditure on meals away from home, that reflects a decrease in households' spending on the MD.

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