UNIVERSITÀ CATTOLICA del Sacro Cuore

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ABSTRACT

This paper analyses the impact of the economic crisis on the nutritional quality of the diet, using budgetary shares obtained by the Italian Household Budget Survey (HBS). First, we construct an index of nutritional quality at the household level based on actual budgetary shares and their compliance with nutritional guidelines. Working on a time-series of cross-section for the period 2006-2012, we are able to individuate some interesting paths across demographic groups and to detect the effect of the economic crisis on diet quality. The analysis shows that people in the North tend to eat healthier than people in other geographical areas; families with more than three members have a better diet quality; singles tend to have a less balanced diet; elderly people are the one having less healthy diet among different age groups. Further, the economic crisis has (unexpectedly) positively impacted the overall nutritional quality of Italian population.

1. INTRODUCTION

One open question is the role of economic crisis on diet quality. Income inequalities have been put forward as determinants of the quality of diet. The Engel's law states that the share of food expenditure over total consumption expenditure decreases as income rises, although the level of expenditure grows. This implies that high-income groups buy 'better' foods, in terms of quality and nutritional content, but also that low-income groups may be more sensitive to the economic situation. It is a common wisdom that the economic crisis may negatively impact on food consumption and diet quality, thus worsening some of the problems related to the diet, with a stronger impact on the most vulnerable socio-demographic groups. However, the simple observation of a reduction or stagnation of food expenditure does not provide sufficient evidence, since individuals may adopt strategies to reduce this negative impact (i.e., lower quality, more attention to the retailing format, attention to price, etc.).

Nevertheless, one of the major problem linked to nutrition both in developing and developed countries is due to the 'too much eating'. Currently a range of different health issues related to a bad diet along with a sedentary life is rising worldwide. Obesity, in particular, is widespread and it is considered a major cost for healthcare. Every year around 3.4 million of adults died for causes related to overweight and/or obesity (WHO, 2014). In addition, the excess of weight is the direct cause of diabetes for 44% of the patients, of ischemic and hearth disease (23%) and it contributes (7-44%) on the onset of certain types of cancer (WHO, 2014). In Italy the annual cost for obesity has been estimated to be up to 8.3 billion, which is 6.7% of public health expenditure (Turchetti, 2009), while in U.S. it accounts for 10% of medical costs (Finkelstein et al., 2009).

In 2013, more than one third of the Italian adult population (35.4%) has an overweight problem, while 1 in 10 people (10.2%) is obese, with higher rates in the southern part of the country. People heavily affected are those in the range between 55 and 64 years old: 15.1% people between 18-24 years are overweight and 2.5% obese, while the rates increase to 46.4% for overweight and 16.4% for obese when considering the population between 65-74 years (Liguori, 2015). The male population is more affected than the female: 1 every 2 adult

men and 1 every 3 adult women are overweight (OECD, 2015). If compared to the other OECD countries, the Italian rate of overweight people is below the average; however, when looking only at the young population, this rate increases. Therefore, it would also be possible that during economic and financial crisis people would pay more attention to their expenditure and would follow a more balanced diet; as such, we may find that nutritional quality of diet is improving during a period of recession (see, e.g., Valero-Gil and Valero, 2018).

Adapting the approach proposed by Volpe et al. (2013) for the USA households, we compute an index of the healthfulness of the food grocery basket for a sample of Italian households. We first compute the "ideal" food consumption patterns among 29 different products, within six different food categories (meat, vegetables, grains, fruit, dairy, and other food), referring to the guidelines provided by the U.S. Department of Agriculture (USDA) in the document named "The Low-Cost, Medium-Cost and Liberal Food Plans, 2007" (Carlson et al., 2007). The "ideal" food consumption is computed for ten different classes: child 1-5 years old, 6-13 years old, and 14-17 years old; male and female 18-34 years old, 35-64 years old, and more than 65 years old; not married, married, and separated adult. With reference to the actual household composition of the Household Budget Survey (HBS) from the Italian Institute of Statistic (ISTAT) for the period 2006-2012, we compute the "ideal" basket for each household, and then we translate it in food categories expenditures using prices collected at the regional level by ISTAT for the computation of the Consumer Price Index (CPI). An index of the nutritional quality of the diet is obtained as an aggregate measure of the distance between ideal and actual categories' expenditures. The index is then used in an empirical econometric model, applied to a time-series of cross sections.

2. DATA AND METHODS

In our analysis we use three major data sources: (i) "The Low-Cost, Medium-Cost and Liberal Food Plans, 2007" (Carlson et al., 2007), (ii) the HBS from the Italian Institute of Statistic (ISTAT) for the period 2006-2012, and (iii), for the same period, the monthly CPI at the province and food category level also provided by ISTAT.

The first data source contains recommendations on balancing diets given by the USDA to American citizens. Specifically, the USDA propose, for different ages and food categories, three different diet plans (Low-Cost, Medium-Cost, and Liberal) which are in compliance with the nutritional guidelines. For 15 age-gender groups, each plan provides food consumption baskets that reflect current dietary recommendations, food composition data, food prices, and actual consumption patterns. The market baskets of the Low-Cost, Moderate-Cost, and Liberal Food Plans are important as national standards that illustrate how a nutritious household diet based on various budgets can be attained. Past research has found that, regardless of income level, most people do not consume a healthful diet. Therefore, the market baskets of the three food plans are useful as guides in educational programs and as references for policies designed to assist families in efficiently budgeting their food expenditures and improving their diets.

For each plan proposed by the USDA and each of the household i present in the HBS dataset, we compute an "ideal" composition of the household diet depending on its composition for six different food categories j (meat, vegetables, grains, fruit, dairy, and other food): the ideal basket is computed for each of the three proposed plans. The ideal basket should be compared with actual consumption, but unfortunately the Italian HBS does not provide information on quantities, but only on food expenditures, and therefore we translate the ideal basket into ideal expenditures, using nominal food prices for a base month, and then reconstructing a monthly price series using the monthly CPI per province. We compute, for each of the household and food category, an "ideal" food expenditure shares (w_{ij}^{ideal}), to be compared with the actual shares obtained from HBS (w_{ij}^{real}).

The Healthy Food Basket (HFB) index is then computed for each of the household i; it approximates the healthiness of the food basket comparing the ideal (w_{ij}^{ideal}) to the real (w_{ij}^{real}) expenditure shares provided by the HFB database:

$$(1) \quad HFB_i = \frac{\sum_j (w_{ij}^{\text{ideal}} - w_{ij}^{\text{real}})^2}{\sum_j (\overline{w}_{ij} - w_{ij}^{\text{real}})^2}$$

where $\overline{w}_{ij}$ is a binary variable equal to one if $w_{ij}^{ideal} < w_{iz}^{ideal} \; \forall z \neq j$, and zero otherwise. Hence, $\overline{w}_{ij}$ attributes the value one to the share of the food category with the lowest ideal expenditure share for a given household i. The HFB index ranges between 0 and 1, with the value of 0 representing the optimal situation when ideal and real expenditure shares are equal. Therefore the households with smaller HFB index are choosing a food basket that better approximates the USDA diet recommendations, and thus they have a better diet.

Given that, we use the guidelines from the USDA. Because we are not able to select which of the three propose plans should be applied to every household, we decided to reduce the bias by computing the index for each plan and selecting for each household the lowest value, assuming that each household will, in fact, choose the plan that allows the best nutritional outcome.

Then, we run an econometric model where the HFB index is function of some household demographic variables as follow:

(2) $\quad HFB_{it} = \beta_0 + \beta_h \cdot X_{hit} + \varepsilon_i$

The matrix X_{hit} is composed by a set of demographic variables, which are described in Table 1.

TABLE 1. Descriptions of the Demographic Variables (X_{hi}) used in Equation (2)

Description	Name of variables
Dummies on geographical locations: 1 if South or Islands; 0 otherwise	South-Islands
Dummies on geographical locations: 1 if Center; 0 otherwise	Center
Dummies on geographical locations: 1 if North; 0 otherwise	North
Dummy to identify if a person leave by its own: 1 if yes; 0 otherwise	Alone
Dummy to identify if there are children within the household: 1 if yes; 0 otherwise	Child
Dummy if the head of the household have an university degree: 1 if yes; 0 otherwise	University
Dummy if the head of the household highest degree is a diploma: 1 if yes; 0 otherwise	Diploma
Dummy if the number of components within the household is > 3: 1 if yes; 0 otherwise	NC: 3 or more
Dummy on the age of the head of the household equal to 1 if age=18-34, 0 otherwise	Age 18-34
Dummy on the age of the head of the household equal to 1 if age=35-64, 0 otherwise	Age 35-64
Dummy on the age of the head of the household equal to 1 if age=65 or more, 0 otherwise	Age:65 or >
Dummy if head of the house is not married: 1 if yes; 0 otherwise	Not married
Dummy if head of the house is married: 1 if yes; 0 otherwise	Married
Dummy if head of the house is separated: 1 if yes; 0 otherwise	Separated
Dummy if head of the house is not widower: 1 if yes; 0 otherwise	Widower
Dummy to identify the economic crisis: 1 if the year is 2007-2012; 0 otherwise	Crisis

The HFB does not trace households through the years, therefore we do not have a panel, but a time-series of cross-sections. We also control for each year in the period and we introduce a trend, to account for information/preference structural change. Finally, to account for the

impact of the economic crisis, we introduce a dummy variable for the economic crisis (2007-2012). After cleaning our dataset to eliminate any inconsistency, our final sample consists of more than 120,000 observations.

Summary statistics are reported in Table 2; we can see from our sample of 13,577 households, around 44.6% are resident in the North, 36.9% in the South and Islands, and 18.5% in the Centre. Moreover, 8.6% of the households are single-person households (singles), while 39.8% have at least one child. Regarding education, 39.3% of the household's heads in the sample have at least a diploma (10.1% a university degree), 50.2 are between 35-64 years old, and 62.2% are married.

TABLE 2. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
HFB	127725	0.128	0.065	0.001	0.698
Crisis	127725	0.614	0.487	0	1
NC: 3 or more	127725	0.181	0.385	0	1
South-Islands	127725	0.369	0.483	0	1
North	127725	0.446	0.497	0	1
Alone	127725	0.286	0.452	0	1
Child	127725	0.398	0.489	0	1
University	127725	0.101	0.302	0	1
Diploma	127725	0.292	0.455	0	1
Age 18-34	127725	0.076	0.265	0	1
Age 35-64	127725	0.502	0.500	0	1
Not married	123820	0.142	0.349	0	1
Married	123820	0.622	0.485	0	1
Separated	123820	0.051	0.221	0	1

3. RESULTS AND CONCLUSIONS

The results are presented in Table 3. We have estimated three models, differing for the set of demographics added. Given that a reduction in *HFB* indicates an improving in the quality of the diet, a negative sign of the coefficient stands for a positive effect on diet.

We first look at the demographic determinants. The three models do not provide differences in the quality of the results. Recalling that the reference household lives in the Centre of Italy, with two components and no children, with an education degree lower than a diploma, more than 65 years old, and widowed, we first see that people in the southern part of Italy have overall a better diet (the coefficient is negative and significant).

TABLE 3. OLS Estimates of Equation (2) for Different Model Specifications

Variables	(1) HFB	(2) HFB	(3) HFB
Crisis	-0.030***	-0.032***	-0.033***
	(0.004)	(0.004)	(0.004)
Trend	0.000***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
NC: 3 or more	-0.004***	-0.002***	-0.001***
	(0.001)	(0.001)	(0.001)
South-Islands	-0.009***	-0.009***	-0.009***
	(0.001)	(0.001)	(0.001)
North	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.001)
Alone	0.008***	0.008***	0.004***
	(0.000)	(0.000)	(0.001)
Child	-0.007***	-0.005***	-0.007***
	(0.000)	(0.000)	(0.000)
University	-0.012***	-0.008***	-0.007***
	(0.001)	(0.001)	(0.001)
Diploma	-0.008***	-0.005***	-0.004***
	(0.000)	(0.000)	(0.000)
Age 18-34		-0.013***	-0.009***
		(0.001)	(0.001)
Age 35-64		-0.010***	-0.006***
		(0.000)	(0.000)
Not married			-0.013***
			(0.001)
Married			-0.012***
			(0.001)
Separated			-0.009***
			(0.001)
2006	-0.004***	-0.004***	-0.005***
	(0.001)	(0.001)	(0.001)
2007	-0.015***	-0.016***	-0.016***
	(0.001)	(0.001)	(0.001)
2008	0.007***	0.009***	0.009***
	(0.003)	(0.003)	(0.003)
2009	0.001	0.002	0.002
	(0.002)	(0.002)	(0.002)
2010	0.000	0.001	0.001
	(0.001)	(0.001)	(0.001)
2011	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)
Constant	0.133***	0.136***	0.145***
	(0.001)	(0.001)	(0.001)
Observations	127,725	127,725	123,820
R-squared	0.030	0.034	0.038

Standard errors in brackets; ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

The household composition has a relevant effect on diet: singles show a poorer diet, whereas in families with more than three members we register a better diet; this is somewhat related also to sign of the variable child, showing a bigger positive effect on diet quality. As we expected, education improves diet quality, while widowers and elderly

people show the worst level of the HFB. The positive sign of the trend coefficient (significant although very low), indicates that diet quality is worsening during the period, and it is probably related to the worsening of some food-related health issues discussed in the introduction.

A quite surprising result comes from the crisis variable: given that this variable takes a value of 1 for the period 2007-2012, the negative and significant sign of this variable indicates that during the economic crisis the overall quality of the Italian diet has been improving. Therefore, it seems that the prevailing effect of economic crisis is through an increase of consumers' attention, and probably a reduction of the imbalance due to an excess of nutrition.

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