Households Food Expenditures Behaviours And Socioeconomic Welfare In Italy: A Microeconometric Analysis

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Abstract. The paper aims to investigate food expenditure behaviours and dynamics of Italian households, by identifying the main characteristics of different socioeconomic groups. In particular, the study focuses on relevant food categories in terms of healthy diet to investigate different food styles consumers. In this framework, the paper stresses the linkages between food demand behaviours and socioeconomic characteristics to give some insights on the difference between wealthy/not wealthy consumers.
The analysis uses the 2000 and 2006 Consumption Expenditure Surveys at household level, implemented by the Italian National Statistical Institute (ISTAT), that provide useful data on households socioeconomic conditions and consumption expenditures dynamics on a cross-sectional population sample of about 24000 units.
In a first step, the work analyses food expenditures characteristics and dynamics across different consumers classes in order to describe demand profiles. In a second step, the work directly investigates relations between socioeconomic characteristics (*e.g.* income, age, household size, education) and households food expenditures, by adopting advanced econometric methods, *e.g.* quantile regression methods, to identify existing differences across socioeconomic groups.

Keywords: Food expenditures determinants, econometric methods

1.   Introduction

Starting from the exam of the First Engel's Curve, the work in hand aims to investigate existing relations between food consumption expenditures dynamics and households socioeconomic characteristics in Italy during the years 2000 and 2006. In particular, the analysis stresses the role played by households economic endowments on food consumption preferences further proceeding to study relevant food items to examine the characteristics of different consumers and, as a consequence, to give some insights on the difference between wealthy/not wealthy consumers.

Two main points characterize the present work. The first one concerns the data used to develop the analysis. In fact, the study uses the 2000 and 2006 Consumption Expenditure Surveys data at household level, implemented by the Italian National Statistical Institute (ISTAT), that provide useful data on households socioeconomic conditions and consumption expenditures dynamics on a cross-sectional population sample of about 24000 units. The second point refers to the econometric methods adopted to investigate food consumption behaviour. In that, in order to take account of the specific characteristics of different socioeconomic groups, advanced econometric instruments as quantile regression method are used. Results suggest the opportunity to proceed to further analyzing characteristics of food consumption preferences by distinguishing for different socioeconomic groups and verify as conclusions derived by adopting OLS methods can be misleading because of relevant gaps recorded among population quantiles.

2.   Literature review

Empirical research on Engel's curves for food consumption expenditures are widely developed in the international economic literature. In this framework, the robustness of different statistical methodologies and econometric approaches is deeply investigated, by proceeding to include different explanatory variables to detect the effect of disparities among households characteristics and by taking into account different analytical and political final goals, *i.e.* descriptive, methodological, normative.

Starting from the studies aimed to investigate the existing relation between food consumption expenditure and income, as formulated by Engel (1857), food consumption expenditure, as well as some related

indexes, can be considered as an important proxy of welfare level and allows to identify welfare level differences among households.

These conclusions are particularly interesting if the analysis of food consumption expenditure level is supported by the investigation of other households characteristics, as for example the household size and composition.

Indeed, starting from the Second Engel's Law that assumes the existence of a negative relation between number of members and share of income spent on food, existing relations between households demographic characteristics and food consumption are widely analyzed in the economic literature as they are not always immediately clear.

Barten (1964) proposes a model based on the existence of exclusively two consumption goods: a private good, *i.e* food, and a public good, *i.e.* housing. Differently from the public good, given per capita total expenditure, household size elasticity of food consumption is positive, because of lower substitution effects (*i.e.* low absolute value of price elasticity) and lower economy of scale. Furthermore, the work highlights as food consumption elasticity to income and price level respectively increases and decreases if poorest households/countries are observed. On the contrary, Deaton and Paxson (1998) discuss the Barten analysis suggesting completely different conclusions. In fact, they indicate that increases in the number of household members decrease the share of total economic resources devoted to food consumption, Furthermore, the authors highlight as the income elasticity of food expenditure decreases as economic endowments decreases, either at micro or at macro level.

Kinsey (1994) investigates existing relations between food expenditure dynamics and households socioeconomic characteristics. The author examines U.S. households data in 1960, 1970, 1980 and 1990 years, confirming the existence of an inverse relation between income and the proportion of income spent on food. Furthermore, the existence of interesting differences between domestic and extra domestic food consumption as well as between different income groups is emphasized. In particular, first of all, the paper stresses the existence of different temporal dynamics. Indeed, the increase in households income during the period comes together with an increase of food away from home expenditure definitely bigger than the increase recorded in terms of food at home expenditures. Secondly, results indicate as the First Engel's Law seems not to be verified for the poorest population quantile, as the proportion of income spent on food records an increase during the period. Furthermore, a positive relation between income and healthy diet is recorded, highlighting the importance of welfare level in the definition of food consumption preferences. Finally, the author stresses as conclusions on the relations between food expenditure and household demographic characteristics have to be carefully considered. In fact, in terms of food consumption preferences, household composition and structure result to be more relevant than the pure household size. Indeed, as for example in terms of domestic and extra domestic food consumption, the analysis demonstrates as increases in the number of household members that are able to produce income decrease the share of economic resources devoted to food consumption.

McDowell *et al.* (1997) analyze food expenditures dynamics in U.S. by discriminating for different population income groups. Thus, by adopting *tobit* models in order to deal with zero consumption issues, they proceed to define three income levels, respectively representative of low, middle and high endowments of economic resources, to test the existence of relevant differences in terms of food expenditure preferences (*i.e.* total food expenditures, domestic and extra domestic food expenditure). They highlight the consistency of the Engel's Law as well as verify as higher income classes tend to devote a bigger part of total food expenditures to extra domestic food consumption than their counterparts. Furthermore, they find evidence of important differences in terms of diet. In fact, groups endowed by higher economic resources result to spend more of their budget for fresh vegetables. Finally, the work finds out as educational attainments result to be not particularly relevant in terms of food consumption preferences, in particular the consumption patterns for particular food items is investigated. Differently, number of households member as well as age and civil status of the head of household result to play a different role among the three different income classes and between the two food categories, *i.e.* at home and away from home[1].

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[1] For further details on extra domestic food consumption, see Kinsey (1997). More recently Yeong-Sheng *et al.* (2008) verify the opportunity to extend the First Engel's Law to the consumption expenditures devoted to food away from home in Malaysia. They apply Heckman's two-step estimation in order to address the missing data issues, *i.e.* zero consumption. Furthermore, they test the existence of a positive relation between income level and extra domestic food expenditure and a negative relation between income level and its share spent on extra domestic food expenditure by adopting different specification models, *i.e.* Working-Leser model (Working, 1943; Leser, 1963), Semi-Logarithmic, Double-Logarithmic and Quadratic.

3. Data

The work in hand uses the cross sectional data provided by the 2000 and 2006 Consumption Expenditure Surveys at household level[2], implemented by ISTAT. The analysis uses mainly four categories of explanatory variables to investigate relations between food consumption preferences and households socioeconomic characteristics:

i) <u>Food consumption expenditure variables</u>. The work proceeds to analyze either the per capita average food expenditure at household level (thousands of current euros - TE) or[3], mainly in the econometric analysis section, the dynamics characterizing the share of consumption expenditure assigned to food consumption at household level (*Relative consumption expenditure for food* – FE/TE). Furthermore, information on domestic (total and disaggregated in 9 items groups) and extra domestic (total and disaggregated in 3 items groups) food consumption are investigated, respectively Food At Home (FAHE) and Food Away From Home (FAFHE) expenditures.

ii) <u>Total consumption expenditure variable</u> (*Total consumption expenditure* in thousands of current euros - TE). It can be considered as a proxy of household income and, as a consequence, as a proxy of household economic welfare level.

iii) <u>Demographical variables</u> which synthesize the structure of the family, *i.e.* size and typology of households (number of adults - age between 15 and 64 years -, kids and elderly individuals). The last two variables could be considered as a proxy of the dependency ratio[4].

iv) <u>Household head socioeconomic characteristics</u>, *e.g.* gender, age, education, economic activity. These variables are commonly considered as the main determinants of the households economic welfare.

v) <u>Geographical variables</u>, representing the different areas where the households live. These variables allow to detect existing differences across Regions (Italian NUTS1 areas) as well as across their macro aggregation (North, Centre and South)

4. Statistical methods

The econometric analysis proceeds to adopt two different estimation approaches:

    i)   The Ordinary Least Square (OLS) linear model
    ii) Quantile Regression method[5]

The OLS method assumes that the share of total expenditure devoted to food consumption is a linear function of a set of socioeconomic households characteristics and proceeds to minimize the sum of squared residuals from the mean.

Simplifying, the econometric specification can be formally represented as:

$$FE/TE=\alpha+X\beta+\varepsilon \qquad\qquad (1)$$

where

- *FE/TE* is an $n\times 1$ vector where the *i-th* element represent the ratio *FE/TE* recorded by the *i-th* household;
- α represents the constant term;
- *X* is an $n\times k$ matrix where *k* represents a set of observable household characteristics, *i.e.* (logarithm of) total consumption expenditure, geographical areas, household head education and participation to the labor market;
- β is a $k\times 1$ column vector of coefficients associated to the *k* factors;
- ε represents the error term and it is an $n\times 1$ column vector where each element is independently and identically distributed with $E(\varepsilon_i)=0$, $Var(\varepsilon_i)=\sigma^2$, *i.e.* $\varepsilon\approx IID(0; \sigma^2 I_n)$ and I_n.

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[2] The sample includes 23718 in 2000 and 23639 in 2006. Or further details see Manuale d'uso produced by ISTAT 2000 and 2006

[3] Though adult equivalence scales improve the investigation of intra households distribution of economic resources (Lazear and Michael (1980), Deaton and Muellbauer (1986)), as the present analysis mainly concentrates on the exam of the share of total expenditure devoted to food consumption, per capita values are computed not allowing for a non-homogeneous distribution of households resources across members.

[4] The dependency ratio is defined as the ratio between the number of household members with either less than 15 or more that 64 years and the number of individuals with age between 15 and 65. It provides a weighted measure of the effect of increases in the number of economically not active. Clearly, increases in the number of individuals that do not produce income are expected to decrease the level of household economic resources. For further details, see Jarvis e Jenkins (1999).

[5] The econometric analysis will be further developed in the future and adoption of models able to represent non-linear relations will be proposed. Cfr. Hausman *et al.* (1995), Banks *et al.* (1997).

As discussed in Koenker and Bassett (1978), the Quantile Regression can be considered as an extension of the conditional mean model above illustrated, *i.e.* the Ordinary Least Squares model. In fact, if the OLS method represents a pure location model that assumes invariance of the error distribution, further specified as Gaussian, the Quantile Regression substitutes to the mean the different quantiles values and proceeds to minimize the weighted sum of the absolute residuals. In that, the median regression estimator can be considered as a central special case (Koenker and Hallock, 2000, 2001).

Formally, it is possible to demonstrate that, given a random sample $\{y_1, y_2, ..., y_n\}$, the sample mean, $\overline{y}$, represents the solution to the problem of the absolute squared residuals minimization in an unconditional model:

$$\min_c \sum_{i=1}^n (y_i - c)^2 \Rightarrow c = \overline{y} \tag{2}$$

Similarly, it is possible to verify as the solution of the problem of minimizing absolute residuals is represented by the median:

$$\min_c \sum_{i=1}^n |y_i - c| \Rightarrow c = y_{0.5} \tag{3}$$

Koenker and Bassett (1978) demonstrate as these procedure can be extend to other distribution quantile simply proceeding to introduce a weighted form of the residuals in order to address the asymmetry issue:

$$\min_c \sum_{i=1}^n \rho_\tau (y_i - c) \tag{4}$$

Where τ represents the value recorded by the selected population quantile, *e.g.* once again $\tau = 0.5$ represents the median.

In this framework, if the term c is substituted by a parametric function $c(x, b)$, the solution to the minimization problem in the expression (2) is represented by the conditional expectation function $E(Y|x)$. By following exactly the same procedure, it is possible to substitute the scalars term in the expression representing absolute residuals in quantile regression. Generalizing:

$$\min_c \sum_{i=1}^n \rho_\tau (y_i - c(x, b)) \tag{5}$$

As in Koenker and Hallock (2000, 2001), if $c(x, b)$ is a linear function the minimization problem can be solved as in the Least Square model by adopting linear programming models.[6]

Concluding, the quantile regression method results to be particularly relevant in case of covariates influencing the conditional distribution of the examined sample characteristic not exclusively in terms of its "location", *e.g.* Gaussian error framework, but also in terms of dispersion as in case of heteroscedasticity and multimodality models. Indeed, in these cases, it can allow to deeply investigates non Gaussian stochastic distribution (Koenker and Hallock (2000, 2001)).

5.   A Glance on Food Styles and Socioeconomic Status

The descriptive analysis aims to investigates relations between food styles characteristics and households socio economic status. Standard statistical measures are implemented, postponing to the development of the econometric analysis a more rigorous and in depth examination. Thus, after having discussed some descriptive statistics of socioeconomic and food variables, the analysis provides an investigation of population different quantiles defined using either total consumption expenditure or its share devoted to food consumption.

5.1.   An overview on food expenditures

In a first step, the analysis provides a description of the dynamics characterizing the share of total economic resources spent on food by considering its aggregated form (FE) as well as by distinguishing between domestic (FAHE) and extra domestic (FAFHE) food consumption.

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[6] For implementation examples and further, see Abrevaya (2001), Buchinsky (1994, 1998), Koenker and Bassett (1978), Koenker and Hallock (2000, 2001).

As in Table 1, the ratio FE/TE is on average equal to 25%, where 22% is constituted by FAHE and the remaining 3% is represented by the FAFHE component. Values are substantially constant in the period 2000-2006, as it is possible to record only a slight decrease in the value of FE/TE and FAHE/TE indicators and not relevant increase in the FAFHE/TE indicator. The coefficient of variation, as expected, indicates as the highest levels of variability are observed in the distribution of FAFHE/TE.

The analysis of per capita food consumption levels highlights improvements in households conditions during the 2000-2006 period, with increases in the food per capita expenditures in both components, FAHE and FAFHE.

Table 1. Some statistics on food indicators

Food indicators	2000		2006	
	Mean	**CV**	**Mean**	**CV**
Food expenditure/ total expenditure (FE/TE)	0,2534	0,4423	0,2496	0,4372
Food at home/ total expenditure (FAHE/TE)	0,2264	0,4948	0,2224	0,4909
Food away from home/ total expenditure (FAFHE/TE)	0,0270	15,051	0,0272	15,233
Per capita food variables				
Food expenditure/ total expenditure (FE/TE)	195,7	0,7	243,8	0,7
Food at home/ total expenditure (FAHE/TE)	168,7	0,7	209,6	0,7
Food away from home/ total expenditure (FAFHE/TE)	27,0	1,9	34,2	1,9

By considering the distribution of percentages of FAHE and FAFHE among ordered increasing quantiles of total per capita expenditure (Figure 1) the First Engel's Law results to be verified[7]. Furthermore, it is interesting to notice the increasing trend characterizing the share of total expenditure devoted to FAFHE.
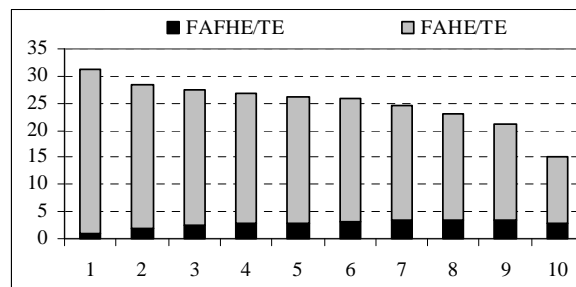

Figure 1. FAHE/TE and FAFHE/TE distribution on quantiles of TE, 2006

If ordered increasing quantiles of population are defined in terms of FE/TE, Figure 2 shows how the mean value of per capita expenditures varies according to the different groups in 2006. In a context of decreasing total expenditure the value of the food consumption increases. It is important to notice as the highlighted increase results to mainly determined by the food at home component (FAHE) instead of the food away from home (FAFHE) component: the mean value of FAFHE expenditure does not change very much among quantiles, declining from the 37% to the 22% of the total FE. Results are confirmed also in 2000, even if all the variables have a lower value than in 2006.
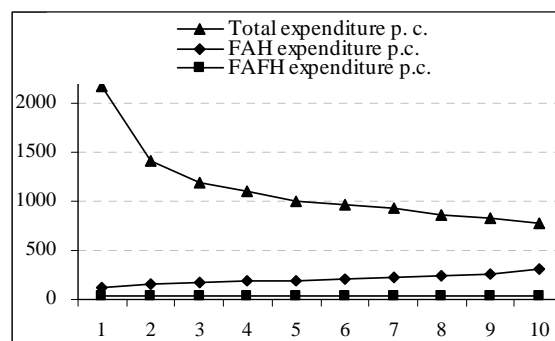

Figure 2. TE, FAHE e FAFHE in *per capita* terms, 2006

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[7] Furthermore, such a relation is confirmed by analysing households geographical distribution as the proportion of economic resources spent on food is higher in the South part of Italy, characterised by a low level of income per capita (Forleo and Zampino, 2009).

5.2. Household characteristics and quantiles of relative food expenditure

As discussed in the previous section, household size is one of the most investigated variable in the framework of food consumption dynamics study. The results on the relation between household demographic characteristics and food consumption choices are particularly interesting, referring to both the classical literature on the economic development[8] and the studies on food consumption[9].

As in Figure 3, by considering different ordered increasing quantiles of FE/TE, results on the distribution of different households structures are not immediately clear. In fact, despite of the expectations of an increase of the household size (according to the Second Engel's Law), it is possible to record a not homogeneous trend of the number of household members across the different classes in both years, though they result to be on average less numerous in the first quantiles.

Same conclusions are derived by analysing the distribution of the number of adults and kids. In fact, the number of adult members seems to increase from the first to the 8th quantile, then showing a strong decrease. Similarly, in the 2000, the number of kids presents increasing values till to the median and then follows an irregular trend, increasing and decreasing in the groups with a higher importance of FE/TE. In this framework, differences between 2000 and 2006 data on number of kids have to be highlight.

Differently, more intuitive are the results on the distribution of the number of elderly individuals as it is possible to record a clear increasing trend moving from the first to the last quantile[10].
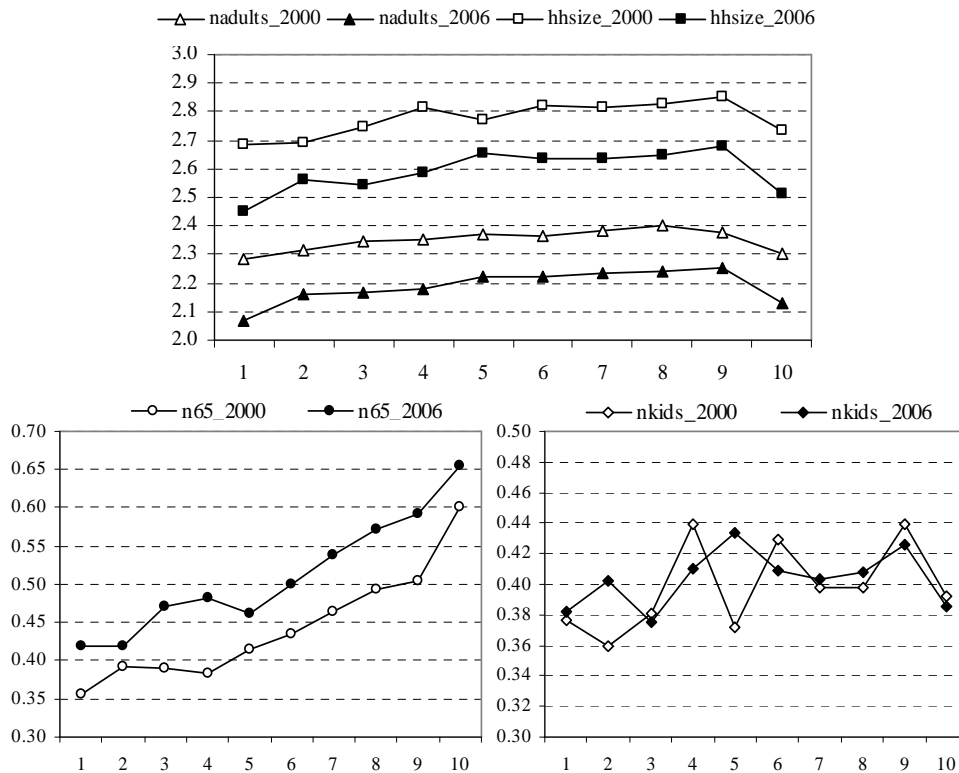

Figure 3. Household dimension indicators in the quantiles of FE/TE

Considering the characteristics of the household head, it can be argued that:

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[8] Bane and Ellwood (1986), Stevens (1995), Jarvis and Jenkins (1999), Jenkins (2000), Cappellari and Jenkins (2002, 2004).

[9] Barten (1964) and Deaton and Paxson (1998).

[10] These results are confirmed by the analysis of household typologies: one component households are mainly in the present in first FE/TE groups and in the last two quantiles; the number of couples without children declines while large families are more numerous in the last quantiles. Moreover, couples with elderly head prevail in the quantiles with the higher FE/TE, showing an increasing tendencies along the ten partition. For further details see Forleo and Zampino (2009).

- age: the number of households headed by elderly individuals are steadily relevant in the higher quantiles;
- education of heads: the results highlight strong differences between individuals endowed by low educational attainments (no schooling and primary and secondary education) and highly educated individuals, showing as the two groups are more numerous respectively in the last and in the first quantiles.
- head participation to the labour market: the main evidence is that the number of households headed by employed individuals decreases with the increasing weight of FE/TE, while households headed by retired individuals become more numerous; for the remaining activities, even with some irregularities, it could be said that households headed by either unemployed individuals or individuals looking for a job are more numerous in the highest quantiles.

Concluding, results highlight as moving along quantiles, relative food expenditures increases and, as a consequence, decreases in economic welfare levels, seem to characterize households endowed by low potentialities and opportunities of income production.
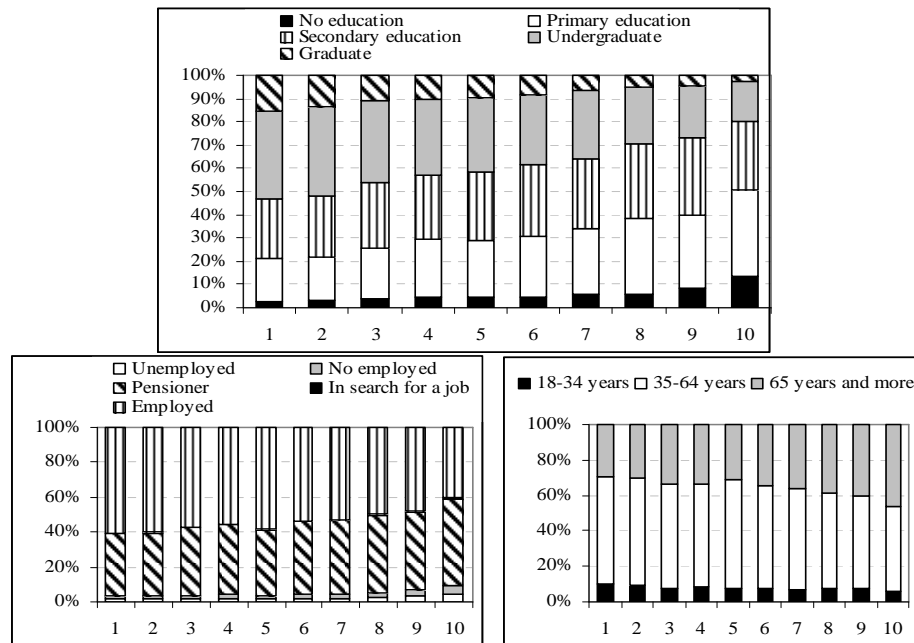

Figure 4. Household head characteristics in the quantiles of FE/TE

5.3.   Consumer styles and quantiles of relative food expenditure

Figure 5 shows the distribution of food expenditures across different main food items in 2000. Even if different level of aggregation are taking into account, the analysis reveals the importance of cereals (among which bread counts for roughly half of the weight). Results are confirmed by 2006 data, though a slight increase in the weight of fish and a decrease in the weight of white meat are recorded.
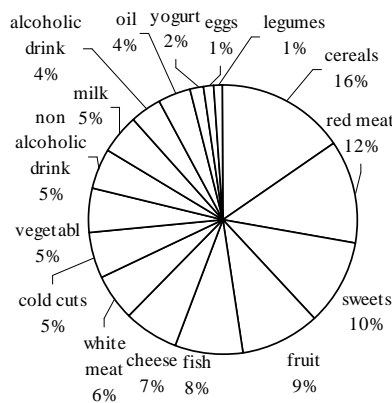

Figure 5. The Italian Food Style: % mean distribution of foodstuffs, 2000

Considering the percentage of single foodstuffs expenditures on total food expenditure in the ten percentile of FE/TE (Figure 6) and observing the relative weight of each item moving from the first to the other quantiles, results can be summarized as follows:
- some items lose importance: cereals, cold cuts, milk and derivates, vegetables, fruit, non alcoholic drink;
- other items acquire importance: red and white meat, fish, oil, alcoholic drink.
Remembering that the quantiles reflect a growing value of FE/TE, that also per capita food expenditure grows while the total per capita consumption decreases, results seems to be paradoxical in the growing importance of some food items and in the reduction of other items in households apparently with low spending capacity.
Giving that the per capita FE grows with quantiles, the reduction in the relative weight of an items can be due to the following alternative situations: i) the item expenditure does not change; ii) the items expenditure goes down; iii) the item expenditure grows but less than the increase in the FE. For all items, the last possibility seems to be the more reliable as recorded values show increases in per capita expenditures along the different quantiles. The direction in which moves the value of foodstuffs expenditure with FE/TE, that represents the elasticity of item expenditure with respect to relative food expenditure (and indirectly the level oh household economic resources) is a product of two effects in quantity and in price, so that increases of its value can be determined either by quantity increases in presence of constant/reducing prices, or by increases in the price levels, *ceteris paribus*, or by increases in both variables.
So moving towards the quantiles with high FE/TE which represents households with less spending resources, when the relative expenditure of an item goes down, *i.e.* when it's value grows relatively lower than do the FE, for some items it can be supposed that is more an effect of increasing quantity (*e.g.* cereals, bread), for other items more the effect of relative price (*e.g.* vegetables and fruit).
On the other side, again moving towards the quantiles with high FE/TE which represents households with less spending resources, when the relative expenditure of an item go up, that is when it's value grows relatively higher than do the FE, for some items it can be supposed is mainly an effect of relative price (meat, fish). That could eventually determine an effect on quantity –mainly via substitution between high quality product and low quality products- but the price effect remain more relevant.
So considering all the possible changes with the increase of FE/TE, households with less resources compared to households endowed with a higher level of economic resources are twice disadvantaged. In fact, analysing the food baskets, they seem to substitute some foodstuffs commonly considered important in a healthy diet (e.g. fruit, vegetables[11], cereals, etc.) with items that could be not particularly healthy (mainly if over consumed, e. g. red meat) and are rather expensive.
Nevertheless, these conclusions have to be carefully considered as the survey data the analysis relies on is characterised by a level of accuracy on food consumption information that cannot suffice to fully demonstrate the assumption above discussed.
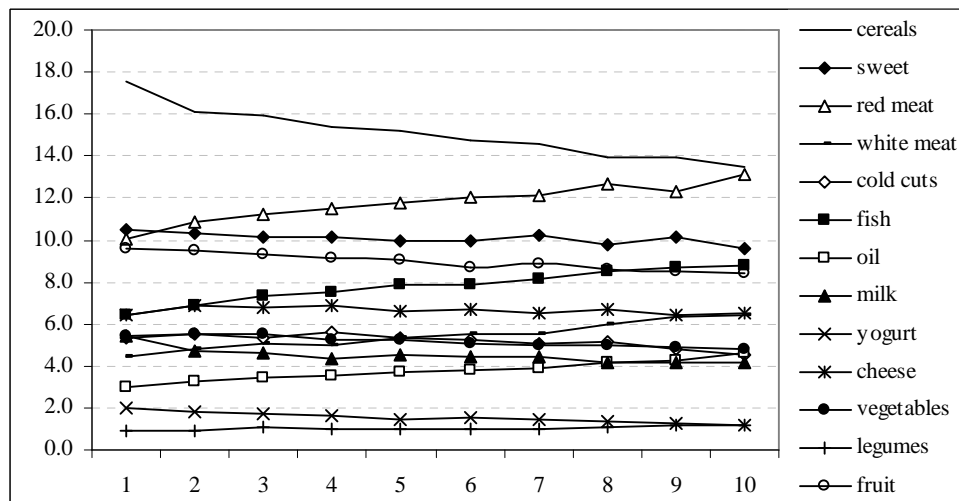

Figure 6. The relative weight of food items expenditure in percentile of FE/TE.

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[11] For a reference to the effect of sociodemographic factor on household expenditures on fruit and vegetables refers to Nayga R. M. Jr (1995), Inglis, V. et al (2009).

6.   Econometric analysis

The development of the econometric analysis highlights the existence of relevant differences in terms of food consumption behaviours among socioeconomic groups. In that, coherently with Koenker and Bassett (1978), it is possible to observe strong discrepancies between estimations provided by adopting standard linear regression models, that rely on the hypothesis of Gaussian error distribution, and the results obtained by using quantiles regression models.

In a first step, results obtained by adopting both OLS method and quantile regression models to test the First Engle's Law are presented. In Figures 7a and b and Figures 8a and b, the solid line represents the 19 coefficients estimated by adopting the quantile regression model with τ ranging from 0.05 to 0.95. Differently, the dashed line represents the OLS estimated coefficient.

In general, as in Engel (1857), findings confirm the existence of a negative relation between households total consumption expenditures and proportion of consumption expenditures devoted to food, suggesting as increases in the total amount of economic resources assigned to consumption expenditures is inversely related to the amount of resources spent on food consumption, *i.e.* poor units result to spent on food relatively more than their counterparts represented by richer households.

In this framework, it results to be particularly interesting the discussion of the differences recorded either between estimates obtained by applying different econometric methods or among different consumption groups. In fact, as in Figure 7a, coherently with the conclusions discussed in Koenker and Hallock (2000, 2001), it is possible to observe as the OLS coefficient, representing how the mean of the variable *Relative consumption expenditure for food* varies with the values recorded by the covariate *Total consumption expenditure*, is in general higher than most of the quantile regression coefficients. Given the procedure adopted in the least square estimation, it is plausible to argue that the mean value is affected by the food consumption level recorded by some observational units. These observations can be considered as outliers and provide to increase the value recorded by the sample mean.

In fact, as shown in Figure 8, by plotting the Italian households 2000 survey data, it is possible to observe the high density characterizing the observations that seems to be scarcely dispersed around the median of the variable representing FE/TE. *Vice versa*, by observing the highest and the lowest level of total consumption expenditure it is possible to notice a definitely higher dispersion and a wider spacing across units. This is represented by the lower absolute values of the coefficients estimated by conditioning for the level of the food expenditure relatively to total consumption recorded by the extreme quantiles.

Furthermore, results seem to suggest as peculiar food consumption preferences may be recorded in the extreme quantiles. In fact, coefficients calculated by adopting the values corresponding to the extreme quantiles are in absolute value lower than the coefficients calculated using the level recorded by the central quantiles. These indications suggest as it may be possible to conclude that in correspondence of the first and the last quantiles, respectively representing the groups endowed by the highest and the lowest amount of economic resources, increases in the level of total consumption expenditure determine lower decreases of the share of resources spent on food. In other words, total expenditures elasticity of the share of economic resources assigned to food consumption seems to be lower than the one observed in the central quantiles, suggesting the existence of interesting characteristics of the marginal propensity to food consumption and, as a consequence, the opportunity of a further and a more accurate analysis of the issue. These conclusions are confirmed either introducing the logarithm of total consumption expenditure as a covariate (Figure 7b) or by using the 2006 survey data (Figure 9a and 9b).
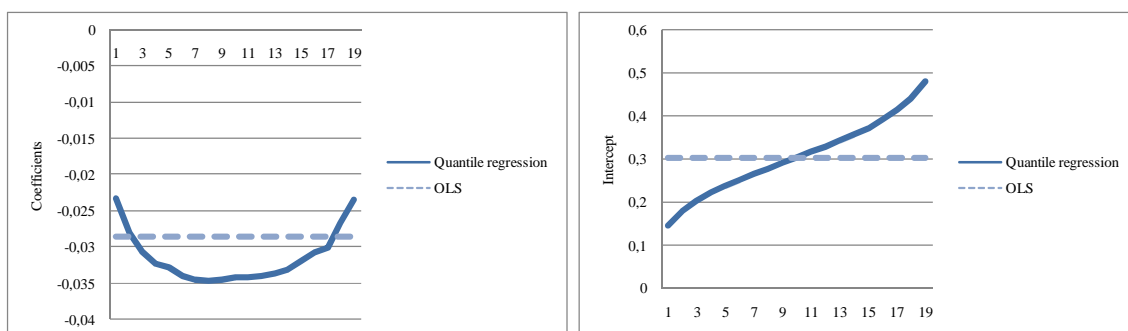

Figure 7a. Engel's curve for food: relations between TE and the FE/TE, 2000
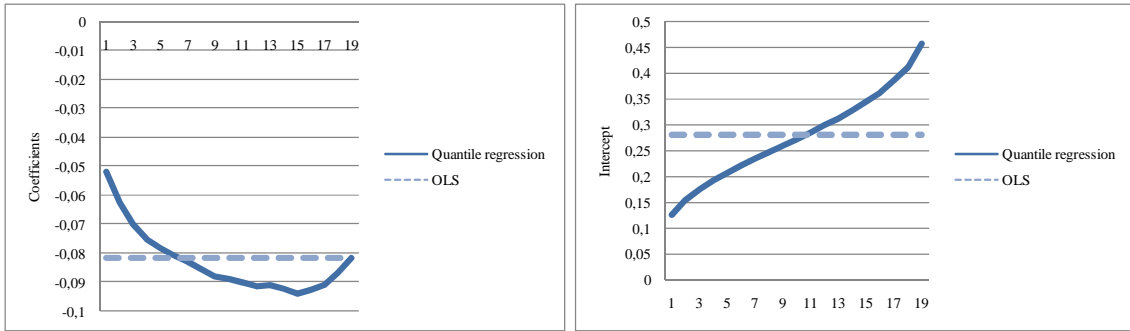
Figure 7b. Engel's curve for food: relations between the logarithm of TE and the FE/TE, 2000
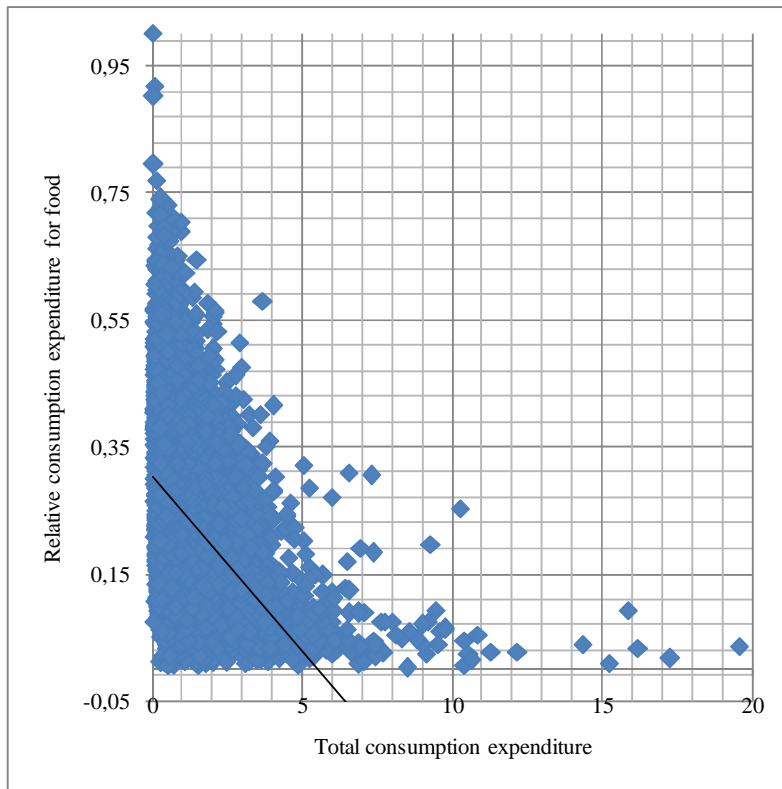

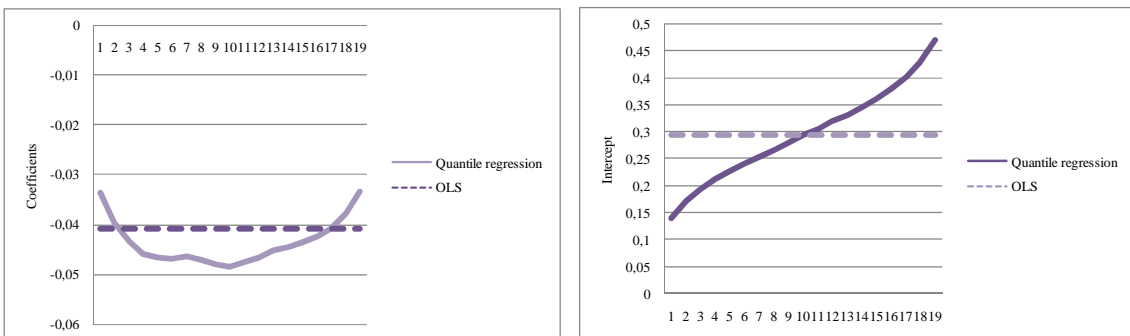Figure 8. Relative consumption expenditure for food versus total consumption expenditure, 2000

Figure 9a. Engel's curve for food: relations between TE and the FE/TE, 2006
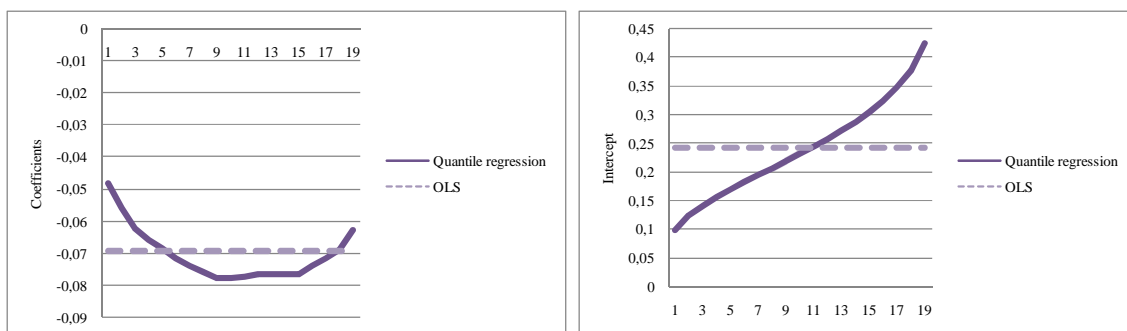
Figure 9b. Engel's curve for food: relations between the logarithm of TE and the FE/TE, 2006

Nevertheless, it should be specified as differences between the results obtained by adopting the two estimation procedures, though relevant, are not extremely wide as, for example, in the analysis developed by Koenker and Hallock (2000, 2001), using data from 235 European working class households, to test the Engel's Law. In this case, by plotting observations on food consumption expenditures and households income, the authors highlight as increases in the level of income determine increases of the dispersion of food expenditures, describing a conditional distribution of food skewed to the left. As a consequence, OLS method, *i.e.* conditional mean estimate, results to provide a not robust fit, in particular in correspondence of the poorest households in the sample.

In a second step, the work proceeds to analyze determinants of food consumption behaviour at household level by further specifying the factors that may affect expenditures preferences in terms of households socioeconomic characteristics.

Thus, geographical, social and economic variables describing the different groups are introduced.[12] It is important to notice as, in this framework, differently from the classical economic literature on consumption, in the econometric specifications variables representing either the households size or the demographic characteristics of the household head, *i.e.* sex and age, are not introduced because they result to be strongly collinear with the variable representing the household total consumption expenditure.

In general, for the two analysed periods, results are coherent with the First Engel's Law and confirm expected findings. As a consequence, though findings obtained by using 2006 data are presented in Figure 10, the discussion focuses exclusively on the 2000 year (Figure 11).

As before, the solid line represents the coefficients estimated by adopting the quantile regression method, while the OLS fit is plotted as the dashed line.

Results show as households characterized by high total consumption levels, residence in areas different from the South regions, headed by an educated and employed individuals devote a small share of economic resources to food consumption with respect to their counterparts denoted by opposite characteristics.

In this framework, similarly to the previous analysis, it is worth noting the existing gaps between OLS and quantile regressions estimates, as they result to be interestingly different.

In particular, results obtained by introducing the geographical variables, *i.e. North Regions* and *Central Regions*, indicate as living in areas different from the South decreases the share of expenditure assigned to food consumption. Results highlight as such a relation varies according to the conditional quantile function used. Indeed, the negative effect produced by living in the North and Central areas results to be stronger if the value recorded for the last quantiles is adopted to calculate absolute residuals, *i.e.* the effect increases moving toward the right of the distribution.

As expected, the educational attainments of the household head determine increases in the economic welfare standard[13] and, consequently, a decreases of the share of consumption assigned to food. In fact, if individuals with university education are considered the control group, coefficients associated to variables representing lower schooling degree presents positive signs, *i.e.* low schooling levels determine increases of the FE/TE ratio. Furthermore, similarly to the geographical variables case, coefficients absolute values increases on the right of the distribution, *i.e.* the effect of education increases results to be stronger if the value of relative food expenditure recorded by the last quantiles is used to calculate absolute residuals.

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[12] Forleo and Zampino (2009). For further details see Bane and Ellwood (1986), Jarvis and Jenkins (1999), Jenkins (2000), Lanjouw and Ravallion (1995), Rodgers (1990, 1994), Stevens (1995), Cappellari and Jenkins (2002, 2004).
[13] See Checchi (1997), Devicienti and Gualtieri (2004), Psacharopoulos (1985, 1994).

Same conclusions has to be derived by taking into account the dummy variable representing households headed by employed individuals, though in this case all the coefficients present a negative sign and values have to be examined in absolute terms.
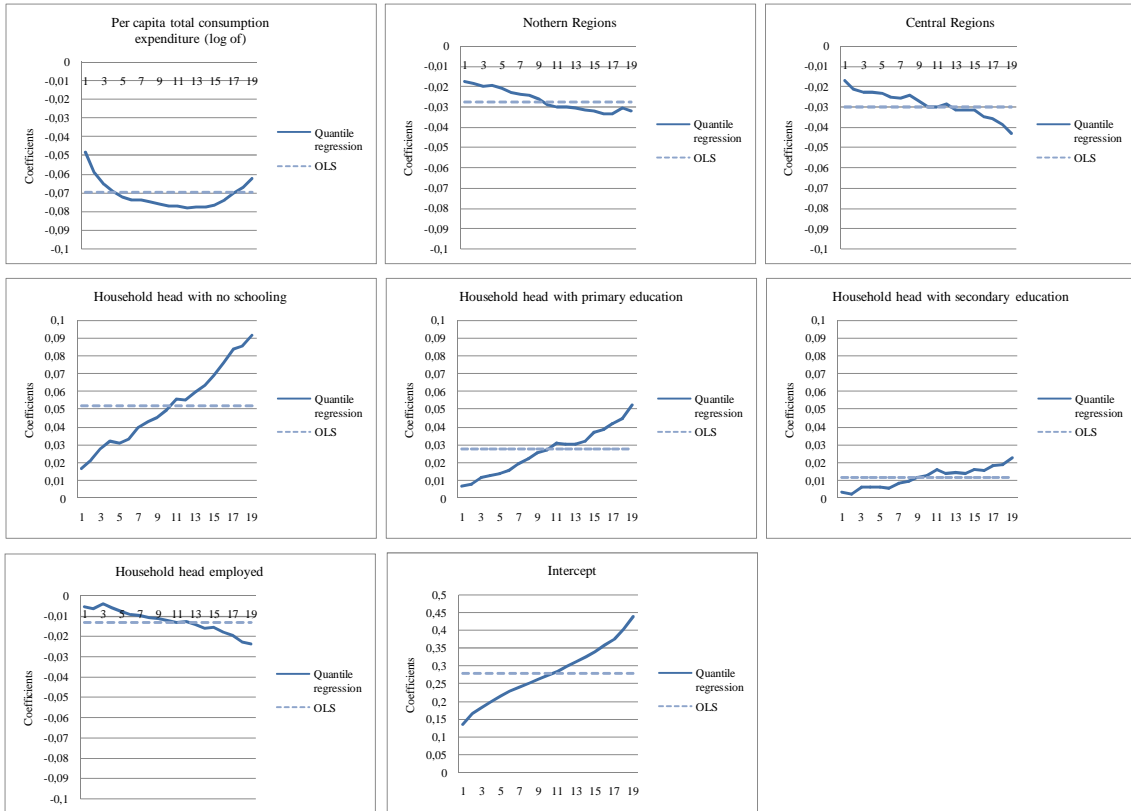
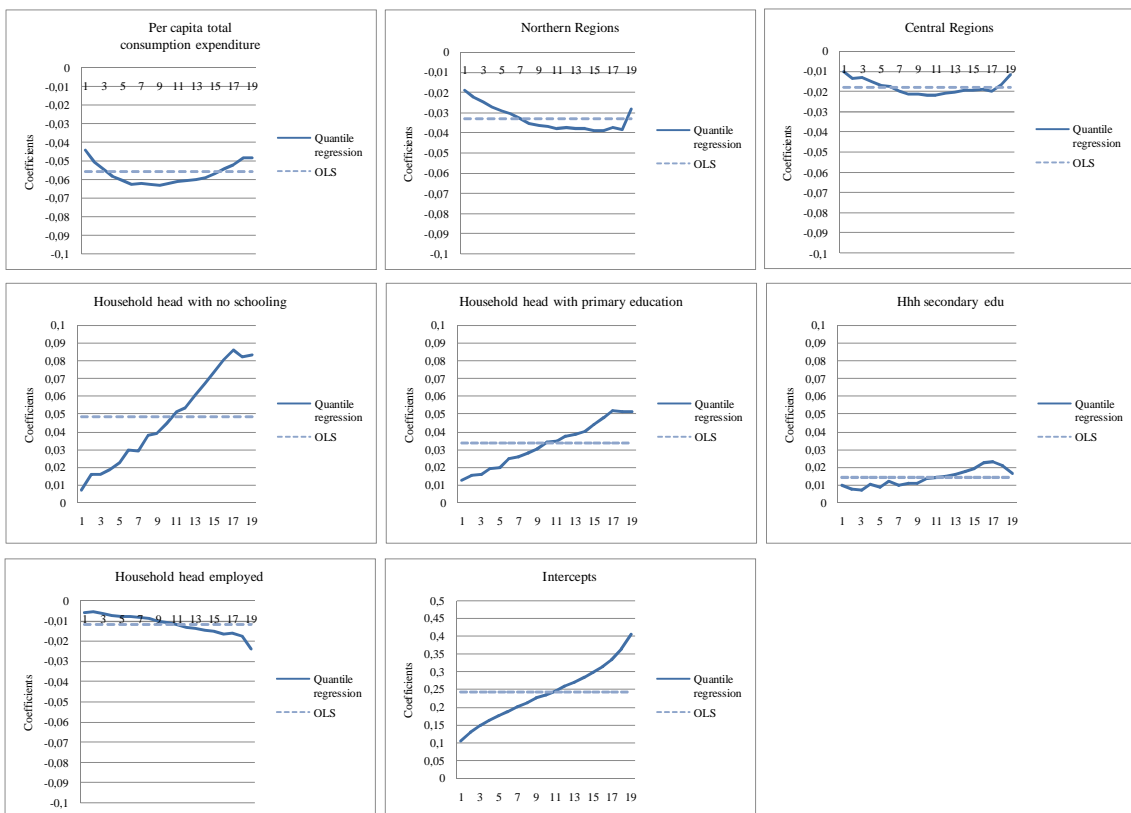Figure 10. Determinants of relative food consumption expenditure, 2000

Figure 11. Determinants of relative food consumption expenditure, 2006

7.   Conclusion

Starting from the exam of the First Engel's Curve the work in hand has investigated existing relations between food consumption expenditures dynamics and households socioeconomic characteristics in Italy during the years 2000 and 2006. In particular, the analysis stresses on the role played by households economic endowments on food consumption preferences further proceeding to the study of relevant food items to examine the characteristics of different consumers and, as a consequence, to give some insights on the difference between wealthy/not wealthy consumers.

Results confirmed the existence of a negative relation between relative food expenditure and total households endowments of economic resources. This conclusions are emphasized by observing FAHE and FAFHE, both in absolute values than in relation with the TE.

This found out relations are further highlighted if socio-demographic household features (as demographic structure and household characteristics)   are considered. In fact, households headed by elder, not employed and endowed with low education level individuals result to be characterised by higher level of relative food expenditure and, as a consequence, low economic welfare levels.

Finally, the implementation of OLS and Quantile Regression methods, though confirming the Engel's relation, stresses the existence of relevant discrepancies among different population quantiles. In fact, considering the resulting gaps either among the quantile model estimates or between those estimates and results derived by adopting OLS approaches, it is interesting to notice the existence of relevant levels of dispersion around the mean, in particular, if extreme quantiles are analysed.

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