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DIPARTIMENTO DI ECONOMIA POLITICA

Piero Conforti
Pierpaolo Pierani
Pier Luigi Rizzi

Food and Nutrient Demands in Italy. Actual Behaviour and Forecast Through a Multistage Quadratic System with Heterogeneous Preferences

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Abstract: The paper employs a multistage Quadratic Almost Ideal Demand System (QAIDS) with heterogeneous preferences to calculate unconditional elasticities for a complete demand system, and to derive energy and nutrients' elasticities for a number of Italian households. A set of comparative static projections to the year 2005 is proposed both in terms of goods and nutrients; these are performed under different hypotheses about income growth and changes in relative prices of foods and other non-durables. The scenario, which includes the effects of Agenda 2000 reform of the Common Agricultural Policy, is derived from *ad hoc* impact analyses. Results indicate a generalized rigidity of food, with the only exception of animal products in young and elder singles. Given that all cross effects are taken into account, the reaction in terms of nutrients' intake to a change in prices can be independent from the nutritional value of the food whose price changes. Based on our projections, the singles and the more aged consumers are the groups whose food consumption may vary more significantly, and macroeconomic assumptions and those on the behavior of non-food prices affect both food consumption and the intake of nutrients more deeply than changes in food prices.

Keywords: QAIDS, complete demand system, multistage budgeting, heterogeneous preferences, food and nutrient elasticities, unconditional forecasting

JEL Classification: C13, D12

1. Introduction

Reliable food elasticities are crucial tools in applied work on the agri-food sector. In Italy, as well as in other developed countries, consumption appears increasingly affected by several non-economic factors, such as the demographic structure of the population and the organization of the households, and by quality and safety issues; awareness of the nutritional consequences of food appears to rank high in the concern of consumers and policy makers (Belletti and Marescotti, 1995). Recent econometric work on food demand in Italy has shown that the absolute size of income and price responses is small, especially in aggregated terms and that cross-price effects are often small within the food items, especially when they are defined in relatively aggregated terms (Patrizi and Rossi, 1991; Caiumi, 1992; Perali and Salluce, 1992; Moro and Sckokai, 1999). In order to contribute toward a meaningful explanation of consumers' behavior in Italy, thus, it seems worthwhile to work with fairly detailed data, to consider parameters differentiated by households groups, and to consider nutritional consequences of food behavior.

This paper employs a multistage Quadratic Almost Ideal Demand System (QAIDS) to calculate elasticities for food and non-food goods, and it applies the technique suggested by Huang (1996; 1999) and LaFrance **(**1999**)** to derive energy and nutrients' elasticities. The multistage formulation allows working with a detailed set of foods. Unconditional elasticities are calculated following Edgerton (1997). Data are referred to ten Italian household types. Based on these estimates, it is proposed a number of comparative static exercises to the year 2005, both in terms of goods and nutrients, under different hypotheses concerning income growth and changes in relative prices of foods and other non-durables. Regarding food prices, it has been built a scenario that includes the potential effects arising from the Agenda 2000 reform of the Common Agricultural Policy, as estimated in *ad hoc* impact analyses.

Next section describes the model, and it is focussed on the data employed, on the multistage budgeting hypothesis adopted, on the functional form of the model, on the estimation technique, and on the calculation of elasticities. Section three deals with the results obtained, which are divided into those referred to the actual behavior and to the projection exercises. Finally, section four reports some concluding remarks.

2. The Model

2.1 Separability structure and data

In this study it is employed a four–stage budgeting model, with preference structure as shown in figure 1. According to the assumed utility tree, food and beverages consumed at home is weakly separable from the remaining nonfood goods and services. The application focuses on food demand, hence the basic idea is that, when planning their budget allocation, households will first decide how much to spend on food, and then, conditional on that, will recursively proceed until reaching the least aggregated level where the choice concerns more elementary food items. The multistage budgeting leads to an approximately correct allocation under particular conditions which can be tested for or maintained as in this study (Deaton and Muelbauer, 1980; Edgerton *et al*., 1996). The complete demand system consists of twenty-two goods, sixteen of which are foods[1]. Problems inherent to the treatment of durables and semi-durables are not dealt with in this study.

The data used in the empirical analysis are derived from the survey on Italian households' monthly expenditures (ISTAT Italian Central Bureau of Statistics) over the period 1985 to 1995. The survey provides information on 4 different geographic areas and 13 demographic profiles (i.e., 52 consumption structures). To catch the presumptive basic aspects of this pooled data heterogeneity we have defined a vector of households' characteristics, which includes 10 dummy variables, $z^h \equiv \left[z_1^h,...,z_{10}^h\right]$. We consider two geographic areas (Center-North and South) and distinguish households according to size and age composition[2], as well. Average retail prices are assumed not to vary longitudinally (i.e., within a time period, they are the same across all households' types)[3].

Concerning food composition, information has been retrieved from INN (1997). This source provides data for over 1000 food items, which have been first aggregated into 62 items – the same employed by ISTAT in its survey - and further aggregated into the 16 foods considered in this study. Composition for the aggregated food groups is a weighted average of those available for the more detailed items. Weights are the shares of (physical) amounts consumed for the more detailed items, resulting from the INN-CA (1998) food survey[4]. Following the advice of expert nutritionists, 17 nutrients where selected for this application (table 1). FAFH had to be treated as a non-food item, since its composition is not available.

2.2 Functional form

The model estimated in this study is the Quadratic Almost Ideal Demand System (QAIDS) derived by Banks et al. (1997). It is a rank 3 demand system (Lewbel, 1991), which extends the popular Deaton and Muellbauer's almost ideal demand system (1980b). We take demographic and time effects[5] into account by allowing some parameter of the price aggregator functions to depend on z^h, which

[1] These are: beef; poultry; pork & other meat; milk; cheese; eggs; fish; bread; pasta & rice; flours & other cereals; fruit, vegetables & potatoes; olive & seed oils; butter & other fats; coffee & tea; wine; other alcoholic & soft beverages. The group coffee & tea also contains sugar, cocoa and confectionery. The remaining five goods are food away from home (FAFH); clothing & footwear; lodging (rent excluded); transport services; medical & health services; other nonfood goods & services.

[2] Five size classes (one to five members) and three age classes (adults between fourteen and sixty-four, adults over sixty-four, and couple with children under fourteen) are considered.

[3] The description of the data set used is reported in Rizzi and Pierani), who also provide other details on data construction.

[4] Such an aggregation procedure implies an error arising from the sum of physical amounts. However since this is done mostly for goods which are physically similar, the error is usually considered a tolerable one, even for nutritional purposes. Composition is assessed with reference to edible amounts of foods, i.e. excluding bones, skins and other parts that are discarded.

[5] They are introduced in a translating manner with interactions, i.e. parameters are linear functions of demographic and trend variables (Blundell et al., Pollack and Wales; Moschini and Rizzi; Moro and Sckokai).

represents a vector of household characteristics, and *t*. The latter may account for smooth change in consumers' preferences as well as other effects (e.g., model misspecification) correlated with the trend variable (Moschini and Moro, 1996). Thus, the *h-th* household expenditure function is given by:

(1) $$\ln C\left(p,u,z^h,t\right) = \ln A\left(p,z^h,t\right) + B\left(p,z^h\right)\cdot\left[u^{-1} - L\left(p,z^h\right)\right]^{-1}$$

where:

(1a) $$\ln A\left(p,z^h,t\right) = \alpha_0 + \sum_i\left(\alpha_i + \sum_k \alpha_{ik} z_k^h + h_i \ln t\right)\ln p_i + 0.5\sum_i\sum_j \gamma_{ij}\ln p_i \ln p_j$$

(1b) $$B\left(p,z^h\right) = \exp\left(\sum_i\left(\beta_i + \sum_k \beta_{ik} z_k^h\right)\ln p_i\right)$$

(1c) $$L\left(p,z^h\right) = \sum_i\left(\lambda_i + \sum_k \lambda_{ik} z_k^h\right)\ln p_i$$

Slutsky symmetry and linear homogeneity of the cost function are imposed on the model through the following parameter restrictions:

(2a) $$\gamma_{ij} = \gamma_{ji}$$

(2b) $$\sum_i \alpha_i = 1, \quad \sum_i \alpha_{ik} = 0\ \forall k, \quad \sum_i h_i = \sum_i \gamma_{ij} = \sum_j \gamma_{ij} = 0,$$

(2c) $$\sum_i \beta_i = 0, \quad \sum_i \beta_{ik} = 0\ \forall k$$

(2d) $$\sum_i \lambda_i = 0, \quad \sum_i \lambda_{ik} = 0\ \forall k$$

The QAIDS demand system with demographic effects can be derived from the above cost function and is given by the following expression:

(3) $$w_i^h = \alpha_i + \sum_k \alpha_{ik} z_k^h + h_i \ln t + \sum_j \gamma_{ij}\ln p_j + \left(\beta_i + \sum_k \beta_{ik} z_k^h\right)\ln\frac{y^h}{A(\cdot)} + \frac{\lambda_i + \sum_k \lambda_{ik} z_k^h}{B(\cdot)}\left[\ln\frac{y^h}{A(\cdot)}\right]^2$$

where w_i^h is the expenditure share of good *i* in household *h* at time *t*[6]. Similar expressions (with the same parameter restrictions and price aggregators) hold through the multistage budgeting process. In each stage, the demand system is derived from the cost function of the separable group, $\ln C_G\left(p_G,u_G,z^h,t\right)$, and the budget shares are conditional to the group expenditure, y_G.

Note that vegetables, beverages, and fats & oils are divided into two sub-commodities. For those items equation (3) reduces to the AI model by setting $\lambda_i = \lambda_{ik} = 0$ ($\forall$i, k), as the rank of a demand system cannot exceed the number of goods (Lewbel, 1997).

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[6] For the sake of notational simplicity the subscript *t* or the superscript *h* may be occasionally dropped.

2.3 Estimation

The ten subsystems included in the utility tree of figure 1 consist, in all, of thirty-one equations. Since one equation in each subsystem can be omitted due to the adding up property, we are left with a total of twenty-one equations to be estimated. The stochastic version of each set of equations can be thought of as a correlated system (Zellner, 1962) and can be written as $w^*_{Gt} = f^*(X_{Gt}, y_{Gt}, \mu_G) + e^*_{Gt}$, where w^*_{Gt} is a vector of (n_G-1) expenditure shares pertaining to subsystem G at time t (t=1,…, N); X_{Gt} is the matrix of the explanatory variables except the group expenditure y_{Gt}, μ_G is the parameter vector to be estimated, and e^*_{Gt} is the vector of error terms. Since we deal with group mean data, it's very likely that the condition of equal variance across the disturbances will be violated (Greene, 1993). We correct for the possible heteroskedasticity by multiplying observations by weights, which are proportional to the square root of the respective group size: $\pi_t = N\sqrt{HN_t} / \sum\sqrt{HN_t}$ (Moro and Sckokai, 1999; Moschini and Rizzi, 1997; Rizzi and Pierani, 2000). The transformed model, $w_{Gt} = f(X_{Gt}, y_{Gt}, \mu_G) + e_{Gt}$, satisfies the standard assumptions and can be estimated with ML techniques.

Looking at the complete system of figure 1, though, one can see that the group expenditures depend upon endogenous variables (i.e., previous stage budget shares), hence $E(\ln y_{Gt}\, e_{Gt}) \neq 0$, $\forall$t. If this is the case, ML estimates are biased. On the other hand, total expenditure for private consumption in the first stage might well be correlated with the stochastic term due to measurement error, or simply because it is a function of budget shares ($\ln y_t = \ln\sum y_t\, w_{it}$). To judge whether the departure from exogeneity of expenditure is significant we used the artificial regression technique (Davidson and McKinnon, 1993). Based on the Durbin-Wu-Hausman test, the null hypothesis had to be decisively rejected (Rizzi and Pierani, 2000). As consequence each subsystem parameter set was estimated with the nonlinear three-stage least squares method[7]. As instruments we used the reduced form $\ln \hat{y}_t$ in the first stage (Banks *et al.*) and previous stage fitted expenditures thereafter (LaFrance, 1991; Edgerton *et al.*, 1996).

Empirically, the concavity of the expenditure function, which implies that the Slutsky matrix is negative semidefinite, is often violated. While adding-up, symmetry and homogeneity can be imposed globally, negativity is not explicitly built into the model meaning that do not exist parameter restrictions ensuring the required curvature is satisfied at each data point. We can only impose it locally, at a point of reference (usually, where prices and expenditure are scaled to 1 and demographic effects are nil). We did so, when needed, using the semiflexible technique. This yields a demand system that is more parsimonious than standard ones while preserving a degree of flexibility and that satisfies (at least locally) the curvature property of the expenditure function (Diewert and Wales, 1988; Moschini, 1998, 1999; Ryan and Wales, 1998, 1999).

Finally, with the integrability restrictions embedded in the demand systems we checked for more parsimonious models based on Quasi-Likelihood Ratio tests (Gallant and Jorgenson, 1979). In short, the nulls of absence of demographic ($\alpha_{ik} = 0$, $\forall i, k$) and trend ($h_i = 0$, $\forall i$) effects on the intercepts are always strongly rejected. The hypothesis that the β parameters do not exhibit any exogenous demographic translation is also always rejected except for the groups of milk, cheese and eggs and, marginally, fats[8].

2.4 Demand elasticities

The parametric expressions of QAIDS conditional elasticities are given in Banks *et al*. (1997) and modified by Moro and Sckokai (1999) to include demographic variables. Letting $\mu_i^h \equiv \partial w_{Gi}^h / \partial \ln y_G^h$ and $\mu_{ij}^h \equiv \partial w_{Gi}^h / \partial \ln p_j$ denote partial log-derivatives with respect to group expenditure and prices, the h-th household expenditure and uncompensated price elasticities are defined as $\eta_i^h = \mu_i^h \big/ \hat{w}_{Gi}^h + 1$ and $\eta_{ij}^h = \mu_{ij}^h \big/ \hat{w}_{Gi}^h - \delta_{ij}$, respectively; where δ_{ij} is the Kronecker delta with values δ_{ij}=1 for i=j and 0 otherwise, $\hat{w}_{Gi}^h$ is the estimated budget share at the subcommodity group expenditure level y_G^h. The unconditional price and total expenditure elasticities are calculated as in Edgerton (1997). His results are extended by repeated substitution to the four-stage budgeting case[9] (Rizzi and Pierani, 2000).

Nutrient elasticities have been calculated following Huang (1996, 1999) and LaFrance **(**1999**)**. Given a matrix of food composition A, whose entry a_{ki} reports the content of nutrient k in food i, it is considered the percentage contribution of each food to the intake of the nutrients, within a matrix F of elements $f_{ki} = a_{ki} q_i / \sum_i a_{ki} q_i$, where q_i is the physical quantity of the *i-th* food. Given m nutrients and n foods, the matrix F(m, n) is post-multiplied by the matrix of price and expenditure elasticities E(n, n+1). This yields R=F*E, whose element r_{ki} indicates the percentage change in the intake of nutrient k due to a percentage change in the price of good i. These are weighted averages of own and cross-price elasticities of foods containing nutrient k, where weights are the relative contribution of each food to its intake. By the same token, elements r_{ky}, indicating the percentage change in nutrients intake following a percentage change in total expenditure, are weighted averages of expenditure elasticities of foods containing nutrient k, where weights are the relative contribution of each food to the intake of that nutrient.

Such an approach is conceived as an *ex-post* deduction with respect to the consumer maximization problem. In other words, consumers are assumed to maximize utility in terms of foods, without taking into account nutritional issues. Since Stigler‘s (1945) seminal contribution, it has been frequently

[7] The command used is 3SLS of TSP, version 4.4.
[8] Parameter estimates and their standard errors are not reported here. They are available upon request along with the hypothesis testing results.

observed that this is the case, at least under normal health conditions: consumers tend to discard nutrients as elements directly influencing demand. So the criterion employed mostly evaluates the consequences of demand characteristics in terms of nutritional patterns.

3. Results

In general, most coefficients are accurately estimated, direct effects are rightly signed, and socio-demographic variables are confirmed to play a relevant role in shaping demand responses[10]. According to Edgerton's approximation formulas, food expenditure elasticities change markedly when moving bottom up the utility tree; hence, the differences between total and conditional responses can be quite large: this can be of some relevance in terms of policy implications. Demand responses depend to a certain extent on both the method used to impose negativity[11] and the maintained separability structure.

For the sake of space, we report only a selection of the results, namely unconditional elasticities by household composition, the unconditional Marshallian and income elasticities as well as nutrient elasticities of a typical family, and the outcomes of the projection exercises. All elasticities are computed at the mean of both the sample period (1985-95) and the areas.

3.1. Food and nutrients elasticities

Regarding total income elasticities (table 2), all food coefficients result much smaller than unity, except for butter & other fats, which happens to be elastic or nearly so in a few cases. The result is due to the definite rigidity of food at home with respect to total expenditure, given that half of the within-group conditional expenditure elasticities are greater than one[12]. Concerning the non-food consumption, transportation is generally a necessity; the demand for lodging is about unitary, whereas all others are luxury goods, regardless of household composition. FAFH is an exception, as it adjusts less than proportionally for the over sixty-four, whereas it is about elastic for the younger singles.

The own-price columns of table 2 show a generalized rigidity of food, excluding animal products demanded by young and elder singles. Among the non-foods, clothing adjusts less than proportionally, lodging is about unitary, whereas the remaining demands are all very elastic. In this respect, the finding that health is a luxury as well as highly substitutable good is quite an unexpected result.

To give an idea of the intensities of substitution effects and income adjustments, we report the complete matrix of the unconditional Marshallian elasticities and shares of a couple with two children under fourteen (table 3). In our framework of analysis, the within-group elasticities along the main diagonal are the only ones unconstrained by the assumed separability structure. Regarding foods, the

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[9] The approximation holds under the following conditions: preferences are weakly separable and group price indexes do not vary too greatly with the utility (or expenditure) level (Edgerton, 1997; p.68). The full set of results and analytical expressions are available upon request.
[10] This finding seems to support those of Patrizi and Rossi, Moschini and Rizzi, Moro and Sckokai.
[11] Diewert and Wales (1988) and Moschini (1998) observe a tendency of the semiflexible method to reduce slightly the absolute value of price elasticities.

direct income effects are either nil or negligible, as it can be observed from the relevant unconditional share and income elasticity; there is evidence that gross complementarity relationships prevail within the block diagonal groups; the estimates confirm that the most relevant cross effects between groups are those with the non-food commodities, i.e., the upper right block of the matrix. The lower right block pertains to the non-food demand elasticities, which show important gross substitutability between FAFH and transportation, health and other nonfood goods.

Table 4 reports elasticities for energy and for the sixteen nutrients considered. Total expenditure is positively related to the content in energy and nutrients of the diet; elasticities are all smaller than unity, as it can be expected in a country in which food consumption is far beyond nutritional needs for most of the population. Among the nutrients, the relatively higher values for unsaturated fats might indicate concern for the quality of the diet as income changes; alcohol appears to react significantly to total expenditure, too, together with lipids and dietary fiber. The relatively low response of proteins is most probably a further indication of the adequacy of consumption compared to nutritional needs, since this is the nutrient with the relatively higher unit cost.

Concerning price elasticities, it can be noted that changes in intake due to food prices are generally small and definitely lower than those due to non-food prices, particularly lodging and the residual group of other expenditure. This indicates that cross-price effects between food and non-foods are strong enough to make nutritional parameters more sensitive to expenditure in non-food goods. Among these, transportation and other expenditures appear as substitutes of nutrients and energy, while medical services, clothing and, especially, lodging, appear as complement.

The nutrient elasticities with respect to food prices are mixed for different reasons[13]. The negative protein elasticities of beef, poultry, pork, cheese and fish depend on their relatively high contribution to protein intake. As expected, an increase (decrease) in prices of these foods will decrease (increase) total protein intake, since direct price effects prevail on cross price effects. The negative sign of protein elasticities for pasta and rice and for other cereals, *vice versa*, are due to cross-price effects, since these foods contribute for relatively small shares to protein consumption. The case of bread appears to be different; the negative elasticity can be explained by its relatively high contribution to total protein intake; despite the low unit content in protein, bread's contribution to total protein intake depends on the wide use of this food in Italy.

3.2 A comparative statics exercise

We have built a comparative statics exercise over a ten-year-period (1995-2005) to simulate the overall substitution and income effects on the aggregate demand structure. Any such analysis requires a

[12] For example, the household considered has an income elasticity of food at home of 0.169, with a standard error of 0.103.

[13] It is worthwhile to recall that the sign of these elasticities depend, on the one hand, on the relative contribution of foods to the intake of a given nutrient, which, in turn, is affected both by the physical quantity consumed, and by the

reference scenario against which the impact of policy, market or institutional changes can be assessed. Our purpose is threefold: a) to evaluate the impact of different rates of growth of total expenditure; b) to measure the consequences of a price behavior more favorable to food demand, as it is deemed to follow from the Agenda 2000 reform; c) to quantify the effects of an increase in relative prices of lodging and transports; this scenario is meant to qualitatively represent a worsening of energy prices.

The importance of these effects is unknown a priori and will be examined by means of unconditional elasticities. In this respect the outcome of the reference simulation oughtn't to be looked at as a forecast, rather emphasis should be put more on the rates of change and adjustments of the selected indicators. The year 1995 is the last in which exogenous variables assume their historical values; afterwards they move along the lines reported in table 5.

In the reference scenario A the inflation keeps diminishing at the observed pace so that in 2005 the average price change is about 20% and relative prices are assumed to move as in the sample period. Scenario B incorporates a faster growth, such that the total expenditure change at the end of the forecasting decade is 50%; scenario C includes, in addition, a higher change of relative prices of lodging and transports. Scenario D is aimed at simulating the likely effects of the Agenda 2000 reform on agricultural prices under the growth hypothesis of scenario A. According to the EU Commission (1998, 2000), envisaged farm-gate price changes will affect consumers prices too, both directly, through the lower costs of raw products for processing and retailing industries, and indirectly, in the case of meats, due to the lower cost of animal feed arising from the cereal price reduction. The quantitative simulations to the year 2005 suggest a reduction of prices ranging from 2 to 20%[14]. In the same impact analyses, the Commission indicates that roughly 20% of the agricultural price reduction is likely to be transmitted to consumer prices. Thus, it has been considered the 20% transmission at the consumer level, while no account has been taken of the interactions between cereal and meat sectors[15].

The percentage change of quantities demanded in year 2005 by each household and price configuration has been calculated as $\Delta q_i^h = \sum_j \eta_{ij}^h \Delta p_j + \eta_i^h \Delta y$, where the Δ indicates the discrete time approximation of relative changes (Kastens and Brester, 1996) and the elasticities are those computed at the mean of the sample period 1985-95 and areas. Similarly, for nutrients: $\Delta n_k^h = \sum_j r_{kj}^h \Delta p_k + r_k^h \Delta y$, where r_{kj}^h and r_k^h indicate the price of food *j* and total expenditure elasticities of the intake of nutrient *k*, respectively.

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unit nutrient content. On the other hand, the sign depends on the magnitude of direct and cross price elasticities of each food.

[14] For example, according to the SPEL/EU-MFSS model, the effects of Agenda 2000 on EU agricultural prices in 2005 are the following: cereals 85.0, beef 80.0, pork 93.3, poultry 97.6, milk 94.3, compared to 100 which is the status quo price level.

[15] Cereal price reductions have been applied to the groups of bread, pasta & rice, and to flours & other cereals; detailed indications on durum, soft wheat and other cereals – available for SPEL-EU/MFSS only in EU Commission (2000) – suggest a consistent price reduction for these products. Price reduction for pork meat has been applied to the entire group of pork & other meats; similarly, the price reduction for milk has been applied also to cheese and to the group of butter & other fats.

At the aggregate level[16] the reference scenario A indicates an increase for almost all goods, with the exceptions of FAFH, and cheese (table 6). Concerning foods, changes range between –0.2% and 7.5%. Oils and animal fats show the highest increase; meats, and especially poultry are also expected to increase to a significant extent, together with fruits & vegetables. Wine consumption grows significantly, too, while the group of cereal-based foods, which are traditional of the Italian consumption pattern, show only a moderate change, which is more pronounced in the case of pasta and other cereals compared to bread. Fish shows only a moderate increase. Dairy products and eggs are the groups showing the lowest increase, and cheese, among these, shows a negligible decrease at the aggregate level. Qualitatively, some of these trends are consistent with recent observed patterns in Italy; e.g., poultry, fruits and vegetables, and, to some extent, bread, pasta & flours and fish. Others, however, are not; e.g. fat consumption has been decreasing over the 1980s and the early 1990s, due to the increased acknowledgement of their negative health effects; the same is true for beef. Dairy products too, have been generally moving along a positive trend.

Most of the quantitative increase in domestic food consumption appears to be due to the aged share of the population, and especially to the single and two-component households. This is consistent with the fact that those groups have the most traditional food behavior, mostly inclined toward a rich food pattern. Meat and, to some extent, fat and oil increase more significantly, while dairy products decreases most. This is the case also for wine, and for the increase of the cereal-based foods, and especially pasta and rice.

Coming to nutrients, there is some indication of a worsening of the quality of the diet. In the aggregate the reference scenario A (table 7) suggests that total energy should increase of about 3% in 2005, and all nutrients are positively affected. Relatively high percentage increases are obtained for lipids, and especially for unsaturated fats, and for alcohol, while smaller increases can be observed for proteins, cholesterol, carbohydrates, fiber and vitamins.

Singles and adults over sixty-four undergo the wider changes, while, households younger children show mostly minor changes. This is the case for energy and lipids - with the exception of three-component households between fourteen and sixty-four – and for dietary fiber, and alcohol, with the exception of singles under sixty-four. Due to the behavior of dairy products, calcium intake is expected to decline for singles, both under and over sixty-four. The increase of saturated fats intake is rather homogeneous. Given the current nutritional indications for the population (INN, 1997a), further increases in fats, energy, alcohol and proteins intake appear to be mostly undesirable, especially for the elderly. The same is not true, though, for the increased intake of vitamins, dietary fiber, and unsaturated fats.

[16] The market or aggregate response is a weighted average, with weights given by the shares of each household expenditure over total expenditure.

Comparisons with the reference scenario A (table 8) indicate that, in general, a change in food prices affects food consumption less than a change in the price of non-food items or in total expenditure. A faster growth of total expenditure (B) implies a significant increase in domestic food consumption and a reversed sign for FAFH. This item grows even faster that domestic consumption - as it would be consistent with qualitative indications - as the condition is added that non-food prices grow relatively faster than the others do (C). Regarding domestic foods, an increased total expenditure implies a change in consumption, which is almost three times higher than the reference scenario. In scenario C, all other foods appear to show a faster increase compared to B.

Agenda 2000, as expected, influences mostly meats, dairy and cereal-based items. This is the outcome of the limited cross-price effects among foods, and of the constraints imposed by the multistage system. Altogether, changes under scenario D appear to be negligible compared to that of the other two, due to the higher elasticity shown by all non-food items compared to foods.

Also for nutrients, projection the effect of a change in the growth rate of total expenditure is by far higher than that of relative prices and of Agenda 2000. Scenarios, B - including a 50% growth of total expenditure - indicates an increase of intake of about three times compared to the reference; and the increase is about 50% higher on average, under scenario C. Alcohol intake would increase by nearly 18% under C.; several of the basic parameter of the diet show two-digit increases, something that looks unlikely given that present food intake is already judged to be excessive compared to biological requirements (INN, 1997). Compared to these, Agenda 2000 (scenario D) affects especially the intake of energy and proteins, and that of the other nutrients related to meats - such as sodium, and iron - but these would increase by 20% to 30% compared to the reference.

4. Concluding remarks

In this study we have estimated a QAI complete demand system consisting of twenty-two goods, sixteen of which are foods. To work with such a detailed model we have assumed a multistage budgeting which can be justified under the following conditions: a) preferences are weakly separable; b) the food and beverages at home component branches out in four allocation levels; c) group price indexes are good approximation of the true cost of living indexes. The multistage process has greatly simplified estimation in that it allows redefining the complete demand system as a sequence of smaller conditional systems. In estimation, we have preserved the recursive structure of the multistage budgeting keeping the group expenditure endogenous. The unconditional price and total expenditure elasticities are calculated using Edgerton's approximation formulas which take into account substitution and income effects stemming from the subsequent stages of the decisional process [17].

[17] After completion of our work, we have learnt about Carpentier and Guyomard alternative formulas of unconditional price elasticities. Those are better approximations than Edgerton's and ought to be preferred as theoretically superior. However, we feel that, given our data sample, their application wouldn't have changed the main results of the analysis due to the little importance of price effects.

The empirical analysis is based on the ISTAT survey on Italian households' monthly expenditure over the period 1985-95. The data provide information on geographic areas and demographic profiles of the consumption units. These heterogeneous characteristics have been taken care of by allowing translating effects both in the intercepts and the expenditure coefficients of the QAI demand system. Most of the socio-demographic variables turn out to be statistically significant.

The main insights provided by this study can be summarized as follows.

First, even though the elasticities obtained from the separable groups may differ strongly as compared to the unconditional ones and some difference may exist across the socio-demographic profiles, as whole the traditional components of food and beverages react very little to price and expenditure changes. This can be a relevant piece of information for policy analysis.

Second, as all cross-price effects are taken into account, the reaction in terms of nutrients' intake to a change in prices can result counter-intuitive, and, to some extent, independent from the nutritional value of the food whose price changes. E.g., a decrease of the price of bread and pasta brings about an increase in the intake of proteins. Cross price effects are even stronger if they are considered, as unconditional elasticities allow to do, in terms of non-food items; in the Italian case the price of, e.g., lodging appear to influence nutrients' intake more than the price of foods. However, it is worthwhile to recall that these results rest heavily upon the hypothesis that consumers' choice is made in terms of goods, and that nutrients do not enter their maximization problem; this allow to calculate nutrients' elasticities according to the procedure adopted here.

Third, among household types, projections show the singles and the more aged people as the groups whose food consumption may vary more significantly to price changes, and as those that may experience the highest increases in energy, fats and protein intake. Qualitatively, this may be a matter of concern on a policy ground, especially for the second group, since aging population and its consequences on social and health public expenditure are already major issues in Italy.

Finally, the comparison of the different projection scenarios tells, altogether, that macroeconomic assumption and those on the behavior of non-food prices appear to affect both food consumption and the intake of nutrients more deeply than changes in food prices. In particular, likely as the effects on food prices of the Agenda 2000 reform of agricultural policies seem to be weak compared to change in non-food relative prices. This may imply an overestimation of the economy-wide effects of that reform, which are deemed to depend to a significant extent upon changes in food consumption (EU Commission, 1998; 2000).

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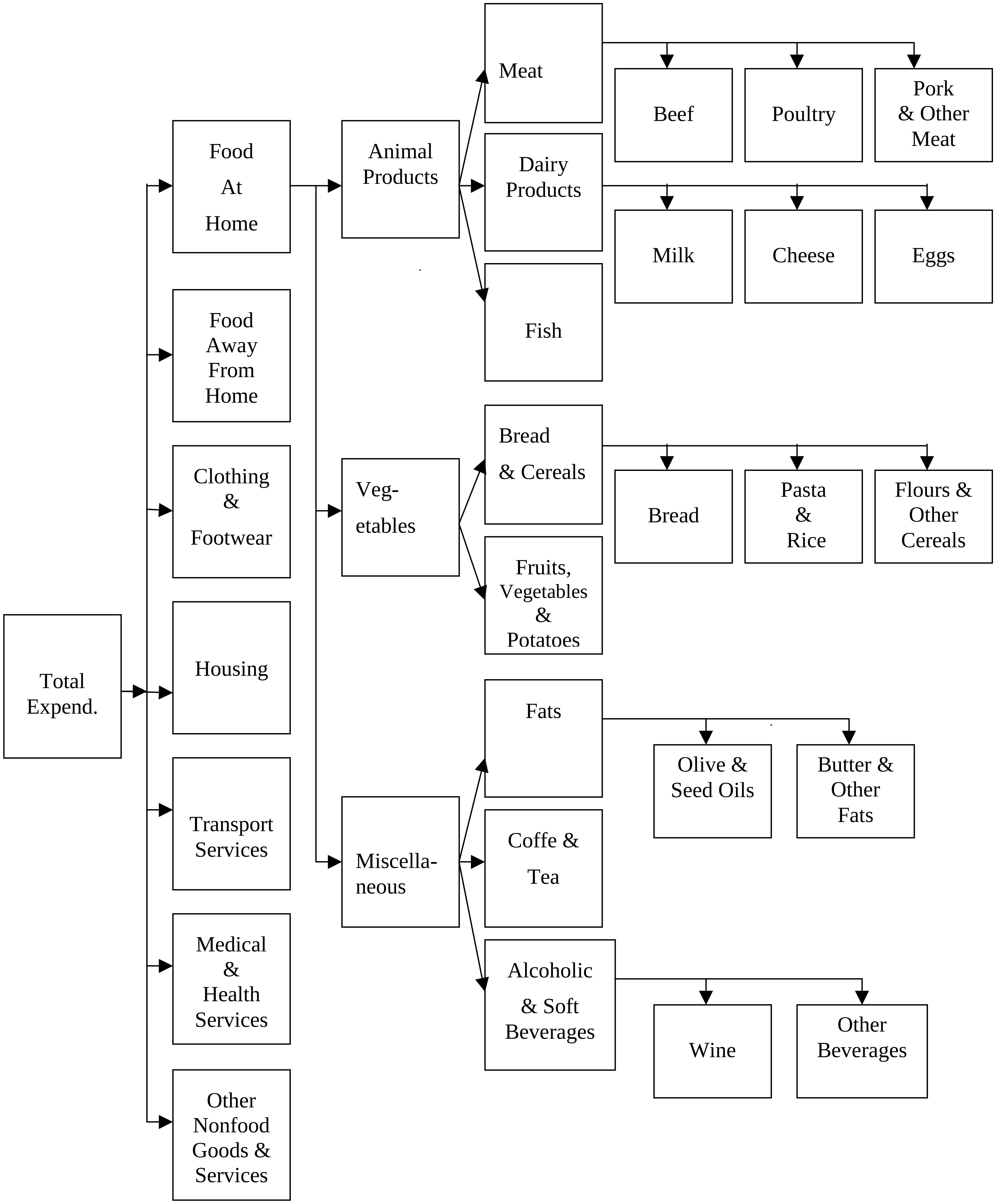

Figure 1: Preference structure of the four-stage budgeting model.

Table 1: Food share of nutrients

Nutrient	Beef	Poultry	Pork & Other Meat	Milk	Cheese	Eggs	Fish	Bread
Energy	0.04	0.03	0.03	0.05	0.10	0.01	0.02	0.29
Protein	0.15	0.11	0.06	0.07	0.17	0.03	0.07	0.20
Lipids	0.03	0.04	0.06	0.06	0.20	0.02	0.02	0.08
Carbohydrate	0.00	0.00	0.00	0.18	0.02	0.00	0.00	0.16
Dietary fiber	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55
Alcohol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium	0.02	0.01	0.09	0.03	0.13	0.01	0.02	0.47
Iron	0.12	0.04	0.04	0.02	0.03	0.03	0.05	0.28
Calcium	0.01	0.01	0.00	0.22	0.48	0.01	0.02	0.09
Phosphorus	0.10	0.06	0.04	0.12	0.24	0.03	0.07	0.13
Thiamin	0.10	0.05	0.12	0.09	0.02	0.02	0.04	0.26
Riboflavin	0.10	0.05	0.04	0.23	0.16	0.05	0.03	0.11
Retinol	0.01	0.00	0.09	0.12	0.28	0.11	0.03	0.04
Saturated fat	0.02	0.03	0.06	0.10	0.37	0.02	0.01	0.05
M-unsaturated fat	0.01	0.03	0.06	0.04	0.14	0.02	0.01	0.03
P-unsaturated fat	0.01	0.06	0.08	0.02	0.08	0.03	0.06	0.25
Cholesterol	0.13	0.09	0.05	0.04	0.14	0.21	0.09	0.01

Nutrient	Pasta & Rice	Flours & Other Cereals	Fruit, Veget. & Potatoes	Olive & Seed Oils	Butter & Other Fats	Coffe & Tea	Wine	Other Bever.
Energy	0.10	0.10	0.03	0.12	0.02	0.03	0.05	0.00
Protein	0.07	0.05	0.02	0.00	0.00	0.02	0.00	0.00
Lipids	0.01	0.09	0.01	0.32	0.04	0.03	0.00	0.00
Carbohydrate	0.04	0.29	0.22	0.00	0.00	0.07	0.00	0.01
Dietary fiber	0.12	0.07	0.22	0.00	0.00	0.04	0.00	0.00
Alcohol	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
Sodium	0.00	0.04	0.01	0.00	0.00	0.16	0.00	0.00
Iron	0.08	0.07	0.09	0.00	0.00	0.03	0.11	0.00
Calcium	0.01	0.03	0.04	0.00	0.00	0.02	0.01	0.04
Phosphorus	0.08	0.04	0.03	0.00	0.00	0.02	0.03	0.00
Thiamin	0.08	0.08	0.09	0.00	0.00	0.03	0.01	0.00
Riboflavin	0.08	0.04	0.07	0.00	0.00	0.02	0.02	0.00
Retinol	0.01	0.05	0.16	0.00	0.07	0.03	0.00	0.00
Saturated fat	0.01	0.07	0.00	0.16	0.08	0.02	0.00	0.00
M-unsaturated fat	0.00	0.02	0.00	0.60	0.03	0.01	0.00	0.00
P-unsaturated fat	0.04	0.06	0.01	0.28	0.01	0.02	0.00	0.00
Cholesterol	0.09	0.09	0.00	0.00	0.03	0.03	0.00	0.00

Source: own calculation on ISTAT and INN

Table 2: Unconditional own-price and income elasticities
(computed at the mean of 1985-95 and areas)

Commodity	Adults between fourteen and sixty-four									
	One		Two		Three		Four		Five	
	Price	Income	Price	Income	Price	Income	Price	Income	Price	Income
Beef	-2.21	0.40	-0.55	0.35	-0.55	0.47	-0.51	0.31	-0.50	0.37
Poultry	-1.46	0.43	-0.91	0.37	-0.89	0.44	-0.89	0.34	-0.89	0.36
Pork & Other Meat	-1.38	0.28	-0.41	0.19	-0.43	0.29	-0.40	0.18	-0.39	0.24
Milk	-3.72	0.61	-0.55	0.24	-0.44	0.17	-0.39	0.10	-0.39	0.17
Cheese	-1.98	0.15	-0.72	0.06	-0.65	0.04	-0.62	0.03	-0.62	0.04
Eggs	-1.47	0.51	-0.69	0.19	-0.66	0.14	-0.65	0.08	-0.67	0.14
Fish	-0.92	0.51	-0.93	0.41	-0.89	0.48	-0.88	0.37	-0.85	0.28
Bread	-0.20	0.36	-0.20	0.23	-0.21	0.29	-0.21	0.27	-0.11	0.14
Pasta & Rice	-0.84	0.55	-0.81	0.26	-0.80	0.29	-0.82	0.34	-0.80	0.24
Flours & Other	-0.48	0.63	-0.43	0.33	-0.39	0.38	-0.38	0.34	-0.38	0.41
Fruit, Veget. &	-0.59	0.58	-0.62	0.41	-0.64	0.59	-0.61	0.49	-0.59	0.40
Olive & Seed Oils	-0.23	0.81	-0.19	0.61	-0.17	0.86	-0.14	0.68	-0.12	0.62
Butter & Other Fats	0.01	1.02	0.06	0.77	0.05	1.08	0.03	0.85	-0.02	0.77
Coffe & Tea	-0.29	0.59	-0.20	0.35	-0.16	0.41	-0.13	0.28	-0.15	0.39
Wine	-0.07	0.31	-0.09	0.28	-0.13	0.60	-0.13	0.56	-0.12	0.64
Other Beverages	-0.09	0.22	-0.09	0.23	-0.10	0.39	-0.12	0.43	-0.16	0.74
Food Away From	-6.44	0.97	-9.41	1.48	-11.38	1.51	-11.58	1.93	-12.07	1.82
Clothing &	-0.79	1.54	-0.80	1.72	-0.77	1.72	-0.74	1.54	-0.72	1.60
Lodging	-0.97	1.03	-0.96	1.06	-0.95	1.07	-0.92	0.89	-0.95	1.15
Transportation	-1.66	0.55	-1.62	0.51	-1.64	0.62	-1.67	0.81	-1.68	1.02
Medical Services	-4.55	1.89	-3.97	1.54	-4.12	1.74	-4.14	1.62	-4.23	1.42
Other Expenditure	-2.35	1.46	-2.47	1.62	-2.28	1.40	-2.21	1.47	-2.16	1.29

Commodity	Adults over sixty-four				Couple with children under fourteen					
	One		Two		One		Two		Three	
	Price	Income	Price	Income	Price	Income	Price	Income	Price	Income
Beef	-2.07	0.51	-0.65	0.67	-0.58	0.28	-0.51	0.21	-0.47	0.23
Poultry	-1.26	0.35	-0.94	0.64	-0.90	0.25	-0.89	0.20	-0.87	0.19
Pork & Other Meat	-1.30	0.43	-0.44	0.39	-0.38	0.11	-0.38	0.12	-0.38	0.18
Milk	-3.19	0.35	-0.65	0.23	-0.47	0.08	-0.42	0.07	-0.48	0.24
Cheese	-1.74	0.09	-0.77	0.06	-0.71	0.02	-0.68	0.02	-0.69	0.06
Eggs	-1.33	0.29	-0.72	0.18	-0.64	0.07	-0.63	0.06	-0.67	0.22
Fish	-0.93	0.53	-0.92	0.56	-0.89	0.27	-0.87	0.24	-0.84	0.19
Bread	-0.21	0.37	-0.24	0.38	-0.19	0.23	-0.20	0.25	-0.12	0.15
Pasta & Rice	-0.84	0.49	-0.81	0.37	-0.83	0.28	-0.85	0.38	-0.84	0.31
Flours & Other	-0.44	0.48	-0.39	0.40	-0.40	0.21	-0.38	0.22	-0.42	0.32
Fruit, Veget. &	-0.62	0.56	-0.66	0.64	-0.62	0.37	-0.59	0.37	-0.58	0.35
Olive & Seed Oils	-0.24	0.72	-0.21	0.88	-0.16	0.65	-0.14	0.62	-0.14	0.65
Butter & Other Fats	0.01	0.90	0.05	1.12	0.00	0.81	-0.02	0.77	-0.08	0.79
Coffe & Tea	-0.31	0.55	-0.20	0.49	-0.20	0.31	-0.18	0.28	-0.20	0.42
Wine	-0.09	0.62	-0.17	0.82	-0.08	0.42	-0.08	0.49	-0.09	0.64
Other Beverages	-0.07	0.36	-0.11	0.54	-0.07	0.21	-0.09	0.28	-0.12	0.56
Food Away From	-14.90	0.26	-17.85	0.79	-9.69	1.50	-10.25	1.44	-11.08	1.77
Clothing &	-0.77	2.10	-0.78	2.24	-0.82	1.83	-0.80	1.77	-0.76	1.84
Lodging	-0.95	0.93	-0.99	1.16	-0.97	1.23	-0.97	1.25	-0.98	1.36
Transportation	-2.69	1.30	-1.98	0.46	-1.58	0.26	-1.62	0.41	-1.65	0.55
Medical Services	-2.98	1.55	-3.05	1.77	-4.31	1.97	-4.35	1.57	-4.56	1.64
Other Expenditure	-2.54	1.57	-2.54	1.29	-2.42	1.59	-2.40	1.66	-2.35	1.44

Source: Rizzi and Pierani (2000)

Table 3: Unconditional elasticities of a couple with two children under fourteen
(computed at the mean of 1985-95 and areas)

Commodity	Beef	Poultry	Pork & Other Meat	Milk	Cheese	Eggs	Fish	Bread	Pasta & Rice	Flours & Other Cereals	Fruit, Veget. & Potatoes
Beef	-0.51	0.05	-0.12	-0.07	-0.08	-0.02	0.03	0.06	0.03	0.06	0.13
Poultry	0.19	-0.89	0.15	-0.07	-0.08	-0.01	0.03	0.05	0.03	0.05	0.12
Pork & Other Meat	-0.04	0.10	-0.38	-0.04	-0.05	-0.01	0.02	0.03	0.02	0.03	0.07
Milk	-0.01	0.00	-0.01	-0.42	0.22	-0.23	0.23	0.02	0.01	0.02	0.04
Cheese	0.00	0.00	0.00	0.32	-0.68	0.26	0.05	0.00	0.00	0.00	0.01
Eggs	-0.01	0.00	-0.01	-1.03	1.26	-0.63	0.21	0.02	0.01	0.02	0.04
Fish	-0.02	-0.01	-0.01	0.03	0.04	0.01	-0.87	0.07	0.03	0.06	0.15
Bread	0.04	0.01	0.03	0.02	0.02	0.00	0.02	-0.20	-0.01	-0.25	-0.03
Pasta & Rice	0.06	0.02	0.04	0.03	0.03	0.01	0.03	-0.12	-0.85	0.28	-0.05
Flours & Other Cereals	0.04	0.01	0.02	0.02	0.02	0.00	0.02	-0.24	0.20	-0.38	-0.03
Fruit, Veget. & Potatoes	0.06	0.02	0.04	0.03	0.03	0.01	0.03	-0.06	-0.03	-0.06	-0.59
Olive & Seed Oils	0.01	0.00	0.01	0.00	0.00	0.00	0.00	-0.03	-0.01	-0.03	-0.07
Butter & Other Fats	0.01	0.00	0.01	0.00	0.00	0.00	0.00	-0.04	-0.02	-0.03	-0.08
Coffe & Tea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.03
Wine	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	-0.01	-0.02	-0.05
Other Bever.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.03
Food Away From Home	-0.03	-0.01	-0.02	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.03
Clothing & Footwear	-0.02	0.00	-0.01	-0.01	-0.01	0.00	-0.01	-0.01	0.00	-0.01	-0.02
Lodging	0.05	0.02	0.04	0.02	0.03	0.00	0.03	0.02	0.01	0.02	0.05
Transp.	-0.06	-0.02	-0.04	-0.03	-0.03	-0.01	-0.03	-0.03	-0.01	-0.03	-0.06
Medical Services	-0.02	-0.01	-0.02	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.02
Other Expend.	-0.11	-0.03	-0.08	-0.05	-0.06	-0.01	-0.06	-0.05	-0.03	-0.05	-0.12
Unconditional Share	0.046	0.014	0.032	0.020	0.024	0.004	0.024	0.021	0.011	0.020	0.048

Commodity	Butter & Other Fats	Coffe & Tea	Wine	Other Bever.	Food Away From Home	Clothing & Footwear	Lodging	Transp.	Medical Services	Other Expend.	Income
Beef	0.01	0.04	0.02	0.03	0.03	0.12	0.24	-0.10	0.02	-0.19	0.21
Poultry	0.01	0.04	0.02	0.03	0.03	0.11	0.22	-0.10	0.02	-0.18	0.20
Pork & Other Meat	0.00	0.02	0.01	0.02	0.02	0.07	0.13	-0.06	0.01	-0.11	0.12
Milk	0.00	0.01	0.01	0.01	0.01	0.04	0.07	-0.03	0.01	-0.06	0.07
Cheese	0.00	0.00	0.00	0.00	0.00	0.01	0.02	-0.01	0.00	-0.01	0.02
Eggs	0.00	0.01	0.01	0.01	0.01	0.03	0.07	-0.03	0.01	-0.05	0.06
Fish	0.01	0.05	0.02	0.04	0.03	0.14	0.27	-0.12	0.02	-0.22	0.24
Bread	0.00	-0.01	0.00	-0.01	0.04	0.14	0.28	-0.12	0.02	-0.22	0.25
Pasta & Rice	0.00	-0.01	-0.01	-0.01	0.05	0.21	0.42	-0.19	0.03	-0.34	0.38
Flours & Other Cereals	0.00	-0.01	0.00	-0.01	0.03	0.13	0.25	-0.11	0.02	-0.20	0.22
Fruit, Veget. & Potatoes	0.00	-0.01	-0.01	-0.01	0.05	0.21	0.42	-0.18	0.03	-0.34	0.37
Olive & Seed Oils	-0.04	-0.26	-0.15	-0.25	0.09	0.35	0.70	-0.31	0.06	-0.56	0.62
Butter & Other Fats	-0.02	-0.32	-0.19	-0.31	0.11	0.44	0.87	-0.38	0.07	-0.69	0.77
Coffe & Tea	-0.02	-0.18	-0.04	-0.06	0.04	0.16	0.31	-0.14	0.02	-0.25	0.28
Wine	-0.04	-0.15	-0.08	-0.23	0.07	0.28	0.56	-0.24	0.04	-0.44	0.49
Other Bever.	-0.02	-0.09	-0.09	-0.09	0.04	0.16	0.32	-0.14	0.03	-0.25	0.28
Food Away From Home	0.00	-0.01	-0.01	-0.01	-10.25	-0.76	-0.52	4.37	3.74	2.18	1.44
Clothing & Footwear	0.00	-0.01	0.00	-0.01	-0.41	-0.80	-0.80	-0.22	-0.35	0.93	1.77
Lodging	0.00	0.02	0.01	0.02	-0.23	-0.66	-0.97	0.12	-0.21	0.33	1.25
Transp.	0.00	-0.03	-0.01	-0.02	2.63	-0.08	0.26	-1.62	-1.29	0.12	0.41
Medical Services	0.00	-0.01	-0.01	-0.01	8.11	-1.45	-0.99	-4.92	-4.35	2.20	1.57
Other Expend.	-0.01	-0.05	-0.03	-0.04	0.63	0.54	0.16	-0.08	0.30	-2.40	1.66
Unconditional Share	0.004	0.021	0.011	0.018	0.063	0.122	0.134	0.108	0.029	0.213	

Source: Rizzi and Pierani (2000)

Table 4: Nutrient elasticities with respect to prices and income of a couple with two children under fourteen
(computed at the mean of 1985-95 and areas)

Nutrient	Beef	Poultry	Pork & Other Meat	Milk	Cheese	Eggs	Fish	Bread	Pasta & Rice	Flours & Other Cereals	Fruit, Veget. & Potatoes
Energy	0.01	-0.02	0.00	0.00	-0.04	0.01	0.02	-0.09	-0.07	-0.08	-0.03
Protein	-0.05	-0.08	-0.01	-0.02	-0.08	0.01	-0.02	-0.04	-0.04	-0.03	0.03
Lipids	0.00	-0.02	-0.01	0.01	-0.10	0.02	0.02	-0.04	0.01	-0.05	-0.01
Carbohydrate	0.03	0.01	0.02	-0.06	0.05	-0.04	0.05	-0.12	0.01	-0.15	-0.14
Dietary fiber	0.04	0.01	0.03	0.02	0.02	0.00	0.02	-0.16	-0.10	-0.15	-0.15
Alcohol	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	-0.01	-0.02	-0.05
Sodium	0.01	0.01	-0.02	0.02	-0.06	0.02	0.01	-0.10	0.00	-0.13	-0.01
Iron	-0.03	-0.02	-0.01	-0.03	0.02	-0.02	-0.01	-0.08	-0.05	-0.07	-0.04
Calcium	0.00	0.00	0.00	0.05	-0.26	0.07	0.06	-0.02	-0.01	-0.02	-0.01
Phosphorus	-0.03	-0.05	-0.01	-0.02	-0.10	0.01	0.00	-0.03	-0.05	-0.01	0.01
Thiamin	-0.03	-0.02	-0.04	-0.06	0.03	-0.03	0.01	-0.07	-0.05	-0.06	-0.03
Riboflavin	-0.03	-0.04	-0.01	-0.10	-0.01	-0.04	0.05	-0.03	-0.05	-0.01	-0.01
Retinol	0.00	0.01	-0.03	-0.08	-0.02	-0.03	0.05	-0.02	0.00	-0.03	-0.08
Saturated fat	0.00	-0.02	-0.02	0.05	-0.20	0.06	0.04	-0.03	0.01	-0.04	0.00
M-unsaturated fat	0.01	-0.02	-0.01	0.01	-0.07	0.01	0.02	-0.02	-0.01	-0.03	-0.03
P-unsaturated fat	0.02	-0.04	-0.01	-0.01	-0.01	0.00	-0.03	-0.07	-0.03	-0.07	-0.01
Cholesterol	-0.05	-0.07	-0.02	-0.20	0.17	-0.11	-0.01	-0.01	-0.05	0.01	0.05

Nutrient	Olive & Seed Oils	Butter & Other Fats	Coffe & Tea	Wine	Other Bever.	Food Away From Home	Clothing & Footwear	Lodging	Transp.	Medical Services	Other Expend.	Income
Energy	-0.03	-0.01	-0.05	-0.02	-0.04	0.04	0.16	0.32	-0.14	0.03	-0.25	0.28
Protein	0.01	0.00	0.01	0.01	0.01	0.03	0.10	0.21	-0.09	0.02	-0.16	0.18
Lipids	-0.05	-0.01	-0.10	-0.06	-0.09	0.05	0.18	0.36	-0.16	0.03	-0.29	0.32
Carbohydrate	-0.01	0.00	-0.02	-0.01	-0.01	0.03	0.14	0.27	-0.12	0.02	-0.22	0.24
Dietary fiber	-0.01	0.00	-0.02	-0.01	-0.01	0.04	0.16	0.33	-0.14	0.03	-0.26	0.29
Alcohol	-0.16	-0.04	-0.15	-0.08	-0.23	0.07	0.28	0.56	-0.24	0.04	-0.44	0.49
Sodium	-0.01	0.00	-0.03	-0.01	-0.01	0.03	0.11	0.23	-0.10	0.02	-0.18	0.20
Iron	-0.02	0.00	-0.02	-0.01	-0.02	0.04	0.15	0.30	-0.13	0.02	-0.24	0.27
Calcium	0.00	0.00	0.00	0.00	0.00	0.01	0.06	0.12	-0.05	0.01	-0.09	0.10
Phosphorus	0.00	0.00	0.00	0.00	0.00	0.02	0.10	0.19	-0.09	0.02	-0.15	0.17
Thiamin	0.00	0.00	0.00	0.00	0.00	0.03	0.12	0.25	-0.11	0.02	-0.20	0.22
Riboflavin	0.00	0.00	0.00	0.00	0.00	0.02	0.10	0.20	-0.09	0.02	-0.16	0.17
Retinol	-0.01	0.00	-0.02	-0.01	-0.02	0.03	0.10	0.21	-0.09	0.02	-0.17	0.19
Saturated fat	-0.04	-0.01	-0.06	-0.04	-0.06	0.03	0.13	0.26	-0.11	0.02	-0.21	0.23
M-unsaturated fat	-0.09	-0.03	-0.16	-0.10	-0.15	0.06	0.25	0.49	-0.22	0.04	-0.39	0.44
P-unsaturated fat	-0.04	-0.01	-0.07	-0.04	-0.07	0.05	0.18	0.37	-0.16	0.03	-0.29	0.32
Cholesterol	0.00	0.00	0.00	0.00	0.00	0.03	0.10	0.20	-0.09	0.02	-0.16	0.18

Table 5: Commodity prices and expenditure under alternative scenarios
(% change 1995-2005).

Commodity	Reference scenario A	B	C	D
Beef	18.00	18.00	18.00	**14.00**
Poultry	17.00	17.00	17.00	**16.50**
Pork & Other Meat	18.90	18.90	18.90	**17.60**
Milk	21.60	21.60	21.60	**20.50**
Cheese	19.50	19.50	19.50	**18.40**
Eggs	15.80	15.80	15.80	15.80
Fish	20.40	20.40	20.40	20.40
Bread	21.50	21.50	21.50	**18.50**
Pasta & Rice	19.10	19.10	19.10	**16.10**
Flours & Other Cereals	18.40	18.40	18.40	**15.40**
Fruit, Veget. & Potatoes	18.10	18.10	18.10	18.10
Olive & Seed Oils	18.60	18.60	18.60	18.60
Butter & Other Fats	19.10	19.10	19.10	**18.00**
Coffe & Tea	18.70	18.70	18.70	18.70
Wine	23.20	23.20	23.20	23.20
Other Beverages	20.20	20.20	20.20	20.20
Food Away From Home	23.20	23.20	23.20	23.20
Clothing & Footwear	20.00	20.00	20.00	20.00
Lodging	18.70	18.70	**28.70**	18.70
Transportation	18.70	18.70	**28.70**	18.70
Medical Services	19.80	19.80	19.80	19.80
Other Expenditure	21.90	21.90	21.90	21.90
Food	19.16	19.16	19.16	**17.82**
Nonfood	20.44	20.44	**24.05**	20.44
Total	20.01	20.01	**22.43**	**19.60**
Expenditure	30.00	**50.00**	**50.00**	30.00

Note: The unconditional shares used to calculate the aggregate price change in the table pertain to the couple with two children under fourteen. Bold figures mark differences with respect to the reference scenario.

Table 6: Percentage change in quantities by households' composition in year 2005 under reference scenario 'A'.

Commodity	Adults between fourteen and sixty-four				
	One	Two	Three	Four	Five
Beef	10.1	3.9	5.0	3.4	4.0
Poultry	12.2	5.3	5.9	4.9	5.0
Pork & Other Meat	6.8	1.7	2.7	1.6	2.2
Milk	-9.2	2.7	2.1	1.4	2.1
Cheese	-2.5	0.3	0.1	-0.1	0.0
Eggs	-7.1	2.4	2.0	1.5	2.2
Fish	3.1	3.0	3.6	2.5	1.7
Bread	3.2	1.9	2.5	2.2	1.2
Pasta & Rice	5.0	2.2	2.6	2.9	2.0
Flours & Other Cereals	5.6	2.6	3.1	2.6	2.8
Fruit, Veget. & Potatoes	6.0	4.4	6.1	5.0	4.1
Olive & Seed Oils	7.3	5.1	7.5	5.7	5.3
Butter & Other Fats	9.3	6.6	9.6	7.2	6.6
Coffe & Tea	5.4	3.1	3.7	2.5	3.4
Wine	2.6	2.3	5.2	4.7	5.5
Other Beverages	1.8	1.9	3.4	3.6	6.3
Food Away From Home	-11.9	-16.6	-22.9	-19.3	-22.1
Clothing & Footwear	17.1	19.1	19.3	17.5	18.1
Lodging	11.2	11.4	11.4	9.6	12.2
Transportation	16.9	15.9	17.2	19.2	21.2
Medical & Health Services	59.7	49.8	53.5	52.5	51.7
Other Nonfood Expenditure	12.4	14.1	11.9	12.7	10.9

Commodity	Adults over sixty-four		Couple with children under fourteen			Aggregate
	One	Two	One	Two	Three	
Beef	11.0	7.4	3.1	2.4	2.6	4.5
Poultry	8.7	8.3	3.9	3.4	3.3	5.4
Pork & Other Meat	8.9	4.0	0.9	1.0	1.7	2.5
Milk	-9.6	2.1	0.8	0.7	2.5	0.6
Cheese	-2.6	0.2	-0.1	-0.1	0.2	-0.2
Eggs	-7.4	2.2	0.9	0.9	2.7	0.9
Fish	3.5	4.9	1.6	1.3	0.9	2.4
Bread	3.6	3.5	1.8	2.0	1.2	2.1
Pasta & Rice	4.8	3.5	2.2	3.0	2.5	2.8
Flours & Other Cereals	4.6	3.6	1.7	1.8	2.4	2.8
Fruit, Veget. & Potatoes	6.2	7.0	3.9	3.9	3.7	4.8
Olive & Seed Oils	7.0	8.4	5.3	5.1	5.6	6.0
Butter & Other Fats	8.8	10.7	6.7	6.3	6.9	7.5
Coffe & Tea	5.4	4.7	2.8	2.4	3.8	3.5
Wine	6.2	7.7	3.5	4.1	5.7	4.7
Other Beverages	3.8	5.1	1.6	2.2	4.9	3.6
Food Away From Home	-47.9	-52.4	-17.3	-19.8	-19.3	-22.7
Clothing & Footwear	23.4	24.9	20.1	19.6	20.6	19.5
Lodging	10.3	12.4	13.1	13.2	14.3	12.0
Transportation	38.1	20.1	13.3	15.1	16.7	18.3
Medical & Health Services	38.3	41.1	57.8	54.5	57.7	52.8
Other Nonfood Expenditure	13.7	10.7	13.8	14.6	12.4	12.7

Table 7: Percentage change in nutrients by households' composition in year 2005 under refernce scenario 'A'.

Nutrient	Adults between fourteen and sixty-four				
	One	Two	Three	Four	Five
Energy	3.6	2.7	3.5	2.8	2.5
Protein	3.6	2.6	3.0	2.3	2.2
Lipids	3.8	3.2	4.3	3.2	3.1
Carbohydrate	2.4	2.9	3.5	2.8	2.7
Dietary fiber	4.3	2.6	3.4	2.9	2.1
Alcohol	2.6	2.3	5.2	4.7	5.5
Sodium	3.0	2.1	2.5	2.0	1.7
Iron	4.3	2.7	3.6	3.0	2.7
Calcium	-2.2	1.5	1.6	1.2	1.4
Phosphorus	1.7	2.3	2.7	2.1	2.1
Thiamin	4.0	2.7	3.3	2.6	2.5
Riboflavin	0.8	2.5	2.9	2.2	2.3
Retinol	0.5	2.5	3.0	2.2	2.2
Saturated fat	1.5	2.5	3.2	2.3	2.4
M-unsaturated fat	5.0	4.0	5.5	4.1	4.0
P-unsaturated fat	4.6	3.2	4.2	3.2	2.9
Cholesterol	2.2	2.8	3.1	2.4	2.5

Nutrient	Adults over sixty-four		Couple with children under fourteen			Aggregate
	One	Two	One	Two	Three	
Energy	3.7	4.4	2.3	2.4	2.5	2.9
Protein	3.5	4.1	1.8	1.7	1.9	2.5
Lipids	3.6	5.0	2.8	2.7	3.2	3.4
Carbohydrate	2.1	4.1	2.1	2.2	2.6	2.7
Dietary fiber	4.4	4.3	2.3	2.5	2.1	2.9
Alcohol	6.2	7.7	3.5	4.1	5.7	4.7
Sodium	3.4	3.4	1.7	1.7	1.8	2.1
Iron	4.8	4.9	2.3	2.4	2.5	3.1
Calcium	-2.1	2.0	0.8	0.8	1.4	0.9
Phosphorus	1.7	3.6	1.6	1.6	1.9	2.1
Thiamin	4.2	4.4	2.0	2.0	2.2	2.8
Riboflavin	0.7	3.7	1.7	1.6	2.2	2.1
Retinol	0.5	3.5	1.7	1.6	2.3	2.1
Saturated fat	1.4	3.7	2.0	1.9	2.4	2.4
M-unsaturated fat	4.7	6.3	3.8	3.6	4.1	4.4
P-unsaturated fat	4.5	5.1	2.7	2.7	2.9	3.4
Cholesterol	1.9	4.1	1.8	1.7	2.3	2.4

Table 8: Percentage change in quantities in year 2005 under different scenarios
(aggregated households types)

	A	B	C	D
Commodity				
Beef	4.5	11.6	12.9	7.1
Poultry	5.4	12.2	13.5	5.4
Pork & Other Meat	2.5	6.8	7.6	3.5
Milk	0.6	4.5	5.2	-0.4
Cheese	-0.2	0.8	0.9	-0.1
Eggs	0.9	4.1	4.7	-0.4
Fish	2.4	9.4	10.7	1.9
Bread	2.1	7.0	7.9	3.0
Pasta & Rice	2.8	9.3	10.7	4.1
Flours & Other Cereals	2.8	9.9	11.2	4.2
Fruit, Veget. & Potatoes	4.8	13.9	15.7	4.9
Olive & Seed Oils	6.0	19.9	22.6	6.2
Butter & Other Fats	7.5	24.9	28.4	7.7
Coffe & Tea	3.5	11.1	12.6	3.5
Wine	4.7	15.6	17.8	4.9
Other Beverages	3.6	12.0	13.7	3.8
Food Away From Home	-22.7	7.3	50.0	-22.4
Clothing & Footwear	19.5	54.5	43.7	19.7
Lodging	12.0	34.6	26.3	11.5
Transportation	18.3	31.0	16.5	19.0
Medical & Health Services	52.8	85.9	30.4	53.0
Other Nonfood Expenditure	12.7	42.1	43.3	13.6
Nutrient				
Energy	2.9	9.6	10.9	3.5
Protein	2.5	7.6	8.6	3.2
Lipids	3.4	11.3	12.9	3.7
Carbohydrate	2.7	9.3	10.5	3.2
Dietary fiber	2.9	9.1	10.3	3.7
Alcohol	4.7	15.5	17.7	4.9
Sodium	2.1	7.1	8.1	2.8
Iron	3.1	9.7	10.9	3.9
Calcium	0.9	4.3	4.9	0.9
Phosphorus	2.1	6.9	7.8	2.5
Thiamin	2.8	8.6	9.7	3.5
Riboflavin	2.1	7.2	8.1	2.4
Retinol	2.1	7.4	8.4	2.1
Saturated fat	2.4	8.4	9.5	2.6
M-unsaturated fat	4.4	14.6	16.6	4.6
P-unsaturated fat	3.4	11.1	12.6	3.8
Cholesterol	2.4	7.8	8.8	2.7