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Three Essays on Nutrition and Economic Growth. The Case of Italy: 1880-1960

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THREE ESSAYS ON NUTRITION AND ECONOMIC GROWTH. THE CASE OF ITALY: 1880-1960.

Three Essays on Nutrition and Economic Growth. The Case of Italy: 1880-1960.

Introduction[1]

Content of the thesis

The thesis studies the standards of living of Italians from the nutritional point of view through the use of micro and macro data on family expenditure. The thesis is composed by three papers:

1. 'The Evolution of food consumption in Italy, 1861-2001. Analysis of macro data' which studies the trend of macro variables related to the families' nutrition and food consumption;
2. 'Food Expenditure as a measure of the Italian Standards of Living, 1890-1960' analyses the evolution of food expenditure in Italy through the use of micro data coming from family budgets;
3. 'Expenditure Pattern in Italy, 1875-1960. A complete quadratic demand system estimation with demographic variables' studies how family expenditure choices depend on a set of variables related to the prices of goods, to the total expenditure and to family size and composition.

Diet as a welfare indicator

The beginning of Italy's 'modern economic growth' (*à la* Kuznets) can be dated to around the middle of the 19th century. Between the last decade of the 19th century and the first half of the 20th gross domestic product (GDP) per capita increased by 3.3 times and private consumption by 1.3 times (constant prices 1938). Over the same period of time, the Italian economy began to catch up with other advanced European countries. A comparison to the United Kingdom (UK) shows that in 1880 Italy's GDP per person was only 45% of the UK's but eighty years later (in 1930) it was 80%.

[1] I would like to express my deep and sincere gratitude to my supervisors, Professor Gianni Toniolo and Professor Giovanni Vecchi. Their wide knowledge and their logical way of thinking have been of great value for me. Their understanding, encouraging and constant personal guidance have provided an excellent basis for the present thesis.
I thank Prof. Albert Carreras, Prof. Stefano Fenoaltea, Prof. Nicholas T. Longford and Dr. Valentina Nigro for extremely helpful discussions and comments on various aspects of this thesis.
I wish to express my sincere thanks to the editors of this work, Michael Barbour, Fabienne Gousset and Brent Larson, to my family and to all the people who have supported me during this period of time.
All views expressed in the thesis are my own.

This thesis will explain how this economic success impacted on the nutrition of Italians, and how these nutritional improvements were distributed. A study on the standard of living of a country requires computing if growth has been equal among all the social classes or if it produced gains only for some classes and losses for others.

Standards of living are a hot topic among historians, economists and economic historians. They all have all been working on new approaches to measure and assess the welfare of given populations. Body height, life expectancy at birth, literacy and aggregated indicators such as the human development index have all been used as indicators of the quality of life. In this thesis, the standard of living of Italians is discussed by considering per capita total expenditure and per capita food expenditure.

The importance of considering indicators related to nutrition is a pre-requisite in order to assess the standard of living of a country in its developing phase,. This point is clearly stated by Baudet and Van der Meulen (1982): *"The consumption of principal foodstuffs and stimulants (except alcohol), insofar as this can be established with sufficient certainty, is without doubt one of the most important data from which conclusions can be drawn about tendencies in national prosperity over a specified period of time. A nation is more prosperous the more amply it is able to provide for its need"*.

Massimo Livi Bacci (1987) identified a very high correlation between a person's nutrition and the occurrence of diseases such as cholera, diarrhoea, herpes, leprosy, breath infection, measles, tuberculosis, whooping cough and intestinal parasitosis.

The studies of McKeown (1979) continue in the same vein that arguably, in Europe and America, "*the mortality rate dropped off in the 18th and 19th century primarily thanks to the increasing availability of food which leads to better nutrition"*. Thus, "*from the second half of the 19th century, an individual's nutritional improvement has reduced the exposition to infectious diseases"*.

Nutrition has always been a controversial and fleeting topic: always revealing new suggestions and approaches to understanding it better. This is the case because studies on nutrition have economic implications which merge with sociological, anthropological and religious matters and the researchers always needs to face the tri-dilemma about what is eaten, why it is eaten and what is available to be eaten.

The nutrition issue is made more complex by the fact that official statistics on food consumption are often imprecise as they do not take into consideration objective factors which often have an influence on the diet and do not specify how each family allocate food within its members. In addition to that, official statistics on the level of nutrition very rarely take into account

the part of the diet deriving from self-consumption or consumption of groceries cultivated in the State demesne and who did not eat at home because they were daily employed in the fields where it was impossible to return home to eat.

Macro data versus micro data

One of the novel aspects of the thesis consists of the use of micro data regarding family budgets, a relatively new source of data in Italy.

On the contrary, data on average per capita food expenditures, which represents the base for macro series, are easier to find. Data on food production, changes in their inventories and net exports have been collected in a more continuous way.

Italian Macro series on food expenditures cover only the whole of the country, while - as it is well known– marked regional differences in income are a strong feature of Italy's long-term growth pattern. Moreover, macro series on food consumption:

1. are currently challenged for 1861 and 1911;
2. there are methodological inconsistencies across periods;
3. allow only the study of mean values (whereas variance is particularly relevant).

These problems have led most economic historians interested in nutrition to focus on rather short periods of time, thus missing the long run view.

The recent use of family budgets, as in Rossi, Toniolo Vecchi, aims at gaining a more detailed view of consumption than is possible by aggregate statistics alone. Family budgets if sufficiently numerous, and comparable over time:

1. allow a check on the aggregate statistics;
2. allow for geographical and sectoral disaggregation;
3. may provide more detailed information about specific components of the diet.

Micro data on family consumption can be considered the optimal source of data in order to avoid vagueness and imprecision. Valeri (1977) insisted that micro data in their self do give a truncated image of the food consumption phenomena if the right mix of statistical methodologies are not used. '*Many historians pretend to study nutrition of Italians taking into consideration isolated groups of people such those living in convents, noble houses and ships, thus failing to represent the diversity of the Italian population'*.

The household budget database

Before 1970, Italian researchers missed the use of various aspects of economic history in their statistical analysis and preferred to study only the social and political aspects of life in Italy. Starting from approximately 1970, analysis regarding the Italian economic history has been enriched by studies based on the trends of 'macro' variables and their comparison with other European economies. Such studies used the trend of GDP per sector of activity and that of expenditure (Rossi et al., 1993), kilocalories (Federico, 2003), the standard of living in a circumscribed period (Fenoaltea, 2002) and nutrition and expenditure choices in the long run (Zamagni, 1998).

Quantitative micro data based analysis on the standard of living and nutrition of Italians started in the last decade and are, thus, in a very initial phase. Those analysis are concentrated on some particular aspects of the welfare: income distribution, consumption pattern and the relationship between nutrition and growth (Vecchi, 1999; Rossi, Toniolo and Vecchi, 2001; Vecchi and Coppola, 2006). To be in line with the previous analysis, the current thesis represents an attempt to study one aspect of the standards of living, quantifying and analysing the total family expenditure for distinct categories of households over the long run.

The current thesis enjoys the findings and the researches of a group of scholars based in the university of Tor Vergata. Their works, as well as all the data previously collected, constitute the basis of the analysis presented here. The research of new data regarding family budgets, their reclassification in a homogeneous dataset and part of the statistical analysis, which is the core of the thesis, has the origin and uses tools previously applied in the papers cited above. It must be said that the experience acquired by the previously named senior economists, in more than ten years of work devoted to such issues, has been a constant and robust source of help in developing this thesis. It is not intended that the studies to date represent an end to the historic study of the Italian standard of living. They rather constitute a new starting point for those who wish to enrich and pursue such an interesting and alive issue.

The fulfilment of the thesis on the Italian standard of living is based on the analysis of micro data that has required several steps which can be summed up in the following four phases:

1. conduct of 'field work' in order to look for new data on Italian family budgets in different archives in the main Italian cities;
2. design of a *Questionnaire* which was meant ad hoc to organize the data;
3. compilation of data including data entry and quality control;
4. analysis of data and explanations of the results.

Compared to the other works based on data on Italian family budgets, this research can boast a larger number of observation (approximately 50 per cent more than other studies to date). The sources of the additional data is not unique and has its derivation from many types of sources since '*learned men such as anthropologists, nutritionists, chemists, social scientists, politicians, intellectuals, and philanthropists practiced the art of compiling household budgets'* (Vecchi and Coppola, 2006). 'Field works' consisted of intensive researches in public and private archives and libraries in Italy.

The total number of family budgets collected and used for this research is 8,918. For a detailed geographical distribution of the family budgets see Table 1. Table 1 also indicates whether the head of the household is employed in the agricultural sector or in other sectors of activity.

New and 'old' data have been organized in a data set, later called a '*Questionnaire*', in order to have an homogeneous organization to the data. The structure of the *Questionnaire* takes the form of a survey known as 'Living Standards Measurement Study' (LSMS) which was established by the World Bank in 1980 in order to monitor the standard of living for households in developing countries (Grosh and Gelwwe, 1995). When entering data regarding families into the *Questionnaire,* we pretended the interviewee was alive answering to the survey. It is worth to notice that all the interviewees were deceased when the survey was designed and when data were entered into the *Questionnaire.*

The main feature of LSMS survey is the presence of multi-topic questionnaires designed to study multiple aspects of household welfare and behaviour. Accordingly to LSMS surveys, the *Questionnaire* was designed to collect data on many dimensions of a household's well-being, including expenditure, income, savings, employment, health, education, fertility, nutrition, housing and migration.

The *Questionnaire* designed for use in this study is divided into three specific sections each containing appropriate questions (Table 2):

1. the first is directed to the head of the household and collects aggregated data about the family;
2. the second is directed to each family component in order to collect detailed information on different aspects of each component's life and
3. the third is again directed to the head of the household and aimed at surveying the presence of community infrastructures.

Several features of the *Questionnaire* help to minimize 'interviewer' or 'interviewee' errors. For example, the *Questionnaire* makes extensive use of 'controls' especially in the expenditure or income modules so that mistakes are automatically highlighted. Decision making during the data collection phase has been limited to circumstances in which the value of a variable did not match with the sum of all its components. This happens very infrequently and all mistakes, which were clearly obvious, have been corrected or the data was rejected.

There are two other issues that tend to compromise the quality of expenditure data. Both are associated with the fact that a majority of the families 'interviewed' were employed in the agricultural sector and families did not differentiate production and consumption. The first problem is that some households, especially small plot owners, hire some workers (as domestic servants or agricultural workers) and supply them with food. Food expenditure will therefore include food expenditures for items that are not consumed by the family. When food expenditures were not clearly consumed by just the family, the data was not considered.

The second problem relates to consumption of items produced by the family, typically food grown or raised on the farm. Such items, often referred to as auto or self consumption, are properly recorded although auto consumption is difficult to be valued. Some measurement errors might occur in this situation.

Other problems encountered were with regards to missing values and how the sample is related to the entire Italian population. The 'missing values problem' has been resolved by using two procedures called the 'Missing Imputation by Chained Equations' (MICE in the following text, Royston 2005) and the 'Hotdeck Imputation Method'. MICE has proved to be an imputation technique superior to 'hotdeck' especially when many missing values are numerous (Royston, 2005).

The representativeness problem arises when sample units have not been chosen following a sample design. This happened here since it was not possible to design a sample strategy; the observations, i.e. families, were surveyed randomly. In order to let the sample represent the entire Italian population we follow the post stratification strategy (Holt and Smith, 1979 and Rossi and al. 2001) which gives different weights to different observations of the sample.

Nutrition as a measure of the standard of living?

In order to measure the standard of living, there is strong evidence in favour of using measures based on consumption and not on income. The standard argument, that by the permanent income hypothesis consumption is a better indicator of the welfare than current income, is much weaker than arguments based on practicality and data (Deaton, 2000). There is no doubt that households

smooth their consumption over shorter periods, days, months and seasons, and to some extent over a number of years, while incomes, especially agricultural ones, might be extremely variable over a few months or years. Farmer's income in any month is a poor indicator of the standard of living in that month. A better case can be made for annual income, but if farmers can smooth out their incomes over good and bad years then consumption will be the better measure. At a practical level, the difficulties of measuring income are much severe than the one of measuring consumption, since the former might derive from self employment in agriculture and in many cases the salary is represented by goods rather than by money (Deaton, 2000).

Family budgets surveys in Italy look more at nominal expenditures rather than on consumption. The conversion of expenditure into consumption requires the use of retail prices. In some surveys, households were asked to report both quantities and expenditures on goods, especially on food, and this data can be used to calculate unit values. Although unit values might be used to replace prices, accurate price indexes for each region cannot be obtained from these unit values.

Italian statistics at the moment do not offer regional retail prices which are essential in catching regional and rural-urban differences. This explanation represents the main reason why household expenditures have been preferred to household consumption.

In the eye of many economists, the standard of living is closely related to whether or not people can get enough to eat so that documenting the welfare of people becomes a question of counting calories or assessing the food basket purchased by a household. Although we do think that food and non food household expenditures are good measures of the standard of living of a family, we will supplement the analysis with other measures of well being, both quantitative (mainly regarding the nutritional status) and qualitative (coming from the historiography).

The most straightforward way to measure the standards of living is a purely statistical one: the mean, the median and the inter-quartile range of total expenditure represent the most common methods used in welfare studies.

One of the most traditional uses of household survey data was the one made by Prais and Houtakker's (1955) in one of their more known classic studies. That literature shows the distribution of the budget over goods, how the allocation changes with levels of living and the behaviour of the Engel curve. This Engel curve analysis has been an important ingredient in understanding how the structure of the families' spending changes as the economy strengthens. Many of the works regarding the link between household size and expenditure choices have been motivated by attempts to understand the 'food puzzle', which is an economic paradox observed in many economies.

Great importance will be then given to theoretical approaches such as those regarding the pattern of the Engel curve (Paper 2) or those studying the demand system (Paper 3). Such analysis will be pursued trying to identify differences between the 4 groups of households (strata). Family diversification comes from the sample division into 4 strata depending on 2 geographical macro areas, North-Centre or South-Islands, and two sectors of activity in which the head of the household is engaged in, the Agricultural Sector or the Industrial and Service Sector. The analysis will be pursued dividing the time spam of approximately 80 years into 5 sub periods of 15 years each on average. These sub periods allow us to characterize the different phases in Italian history.

Content of the three papers

The Evolution of food consumption in Italy, 1861-2001. Analysis of macro data

The paper analyses the standard of living of Italians in the long run through the use of macro data. The welfare of Italians is studied taking into account indicators on food and non food expenditure, per capita kilo calories and per capita food consumption. This study is conducted for the period between 1861 and 1997.

The first step has been the computation of a food expenditure series for the period going between 1861 and 1911 since the existing one, estimated by Istat, is not considered reliable (Fenoaltea, 2002). The new series has been computed using two benchmark estimations regarding food consumption in 1891 and 1911 (Federico, 2003) and the prices for food categories (Istat, 1958 and Barberi, 1961). The other series are considered with the remaining years and are computed by Barberi (1961), Golinelli-Monterastelli (1990) and Rossi-Sorgato-Toniolo (1993).

The findings can be summed up briefly in the following statements:

1. a high and constant share of the budgets are devoted to food purchases until World War I (approximately 60 per cent over 50 years). After World War I, this percentage decreased until approximately from 1920 to the end of the World War II. Between 1950 and 1960, the size of food budget share in Italy did not present any remarkable differences with other countries having approximately the same level of per capita GDP;
2. the usual dynamic of the Engel law was not verified in the Italian experience. The growth of per capita GDP and that of total expenditure was not followed by a substantial decreased in food budget share. The values of the total expenditure elasticity range from a maximum of 0.86 in the period between 1861 and 1880 to a minimum of 0.47 between 1950 and 2001;

3. the quality of food consumed in the Italian diet improved constantly. Cereal consumption, cheap carbohydrates, has been gradually complemented and substituted for more expensive protein and fat (especially those of animal origin). The consumption of meat as well as that of fats, sugar and coffee has noticeably increased.

No pattern of consumption between different households living in distinct areas developed studying the trend of macro series and this limitation has been addressed in Paper 2 thanks to the use of micro data.

Food Expenditure as a measure of the Italian Standards of Living, 1890-1960

In the second paper, we derive some conclusions on the behaviour of families expenditures differentiating for the 4 strata, over the period between 1890 and 1960. this paper investigates the quality of the diet in part of the 19th and 20th century. Economic historians have stated that changes in diet were the driving force of economic growth in the past, with dietary changes explaining as much as 50% of economic growth (Fogel 1994). It is important, then, to investigate the precise type of dietary change that took place in Italy.

Special attention is given to the evolution of the food budget shares. The paper focuses on changes in food budget shares in response to changes in total expenditure. We will show how the quality of the diet improved over years.

The overall conclusions coming from micro data partially match with evidences of paper 1, which were based on macro series. The common evidences refer to the following facts:

1. food budgets shares in the four strata stay constantly above the 50 per cent level for the period between 1890 and 1940 (higher for agricultural based families and for households living in the South). This percentage represents the upper limit of food budget share for some countries (USA, Canada, Norway, Sweden, Germany; Deaton, 1976) which had a level of GDP per capita close to Italy;
2. an high portion of food expenditures was devoted to cereal purchases until World War II. An improvement to the variety of food purchased was indicated by the purchases of meat, vegetables and wine. Almost no fats, animal nor vegetable, were at the beginning added to the meals. The complete shift from a cereal based diet to a protein based one was delayed in Italy compared to other developed countries and occurred just after World War II;
3. the pattern of the total expenditure elasticity follows the same path showed by macro data. High values of elasticity, close to the unit value, stayed until the beginning of the 20th

century; then the values of the elasticity showed a slow decrease (-20%) over the next 40 years and a faster decrease (-25%) between 1940 and the post World War II period.

The assumption made by Fogel (1994) who assumes that income increases lead workers' diets to shift 'from grains and food with high fibre content to sugar and meats' is verified in Italy. Households in the 20th century did substitute among different food groups, preferring dairy and meat to cereals as their incomes increased.

The strata analysis leads to other interesting evidences which are:

1. the variance in terms of total expenditure is larger between households employed in the agricultural sector and those working in the other two sectors (industry and services). The standard of living of people employed in agriculture was, on average, much lower than that of people employed in the industry or services sectors (total expenditures were 20 per cent less on average for the entire period). In addition, families living in the North and Centre of Italy were better off than families living in the Islands and South of Italy (the amount of total expenditures were 10 per cent more). Differences between peasants living in the North and those living in the South, computed at constant 1938 lire, were remarkable at the end of the 19th century (families living in the south purchased less meat, 145 lira versus 27 lira, less vegetables, 154 versus 21, less fats, 46 versus 16, and alcoholic drinks, 92 versus 46);
2. expenditures on non food goods do not show any divergence pattern among strata until 1946;
3. the Engel curve does not follow the usual pattern for the poorest 75 per cent of Italian families. This means that increases in total expenditure availability for richest families were devoted to buy extra food as well as non food items. Poorer households used extra money to buy extra food;
4. after World War II, Italians had a weighted diet guaranteed by a good mix of cereal, proteins and fats. Differences between the 4 strata only show up in the pattern of expenditure regarding non food items.

Engel's law, which says that there is an inverse relationship between the food share and total household expenditure, or sometimes income, does not apply to the poorest Italian family until the end of World War II. The reasons for this suggested in the paper, briefly, these are of two different kinds. The first is based on the evidence that the Italian diet improved from a qualitative and

quantitative point of view from the last decade of the 19th century up to the 1950s. This means that households kept spending a higher share of their disposable income for food purchases, although the total expenditure rose. The second explanation lays in the fact that food for Italians mattered more than other needs. As soon as the Italian diet reached an adequate level, from the kilocalories intake point of view, it seemed more urgent to ensure a higher qualitative standard for nutrition rather than certifying their improved standard of living by buying non food items such as nicer clothes and bigger houses.

Previous explanations solve this dilemma questioned by the Engel's second law, which claimed that the food share constitutes an inverse indicator of welfare across households. According to the previous law, the standard of living of Italian households would be lower compared to that of households in other economies which devoted a sensible lower share of their money towards food purchases. But, are we sure that the quality of the food basket was the same in Italy as in the other countries? The higher quality of the Italian food, which made the Italian *'cuisine'* well known in the world, could pose a problem on the effectiveness of the Engel's second law.

Expenditure Pattern in Italy, 1875-1960. A complete quadratic demand system estimation with demographic variables

In Paper 3 we explore two related issues: the estimation of a complete system of demand equations using household budget data and the incorporation of demographic variables into such a system. The estimation of a demand system's parameters will help us understanding the pattern of Italians expenditures and its evolution over time. The study of the effects of household size and composition on demand is more than a simple academic curiosity. The introduction of demographic variables into the model is meant to enlighten the 'food puzzle' paradox which is still a controversial issue in both theoretical and applied economics. When household size increases, the presence of economies of scale connected to intra-household public goods should free resources and generate savings that may be channelled towards the purchase of private goods like food. The economic intuition for that is straightforward: the family is now bigger and these extra people need to be fed. The result should be an increase in the food budget. The empirical evidence is exactly the opposite and it appear to be consistent among rich and poor countries such as the United States, Britain, France, Taiwan, Thailand, Pakistan and South Africa. This type of theoretical framework is still a virgin territory in regards to Italy.

The analysis is carried out taking into consideration the same 4 strata introduced while the time spam is now slightly longer, between 1875 and 1960.

The first interesting result is in the fact that the impact of household size on food expenditure is surprisingly negative for many food items. This means that an increase in the number of children or adults, reduces a family's expenditures for some food categories. There are systematic differences in expenditure choices related to the presence of an extra child or an extra adult:

1. an additional adult has a smaller negative effect on the food budget share compared to that of an additional child's effect;
2. in the two sub periods 1913-1929 and 1946-1960, an additional adult increases the food budget share while an additional child did not;
3. an additional adult leads the household to substitute more expensive foods with cheaper groceries. In particular the budget share for cereals increases while that for fats and dairy products decreases;
4. when an additional child is added to the household, such a substitution effect does not apply (apart in the post World War II period).

The unusual behaviour of the share of the budget for food is in response to the fact that the enlargement of a family deepens the 'food puzzle' paradox. Our explanation is based on the differentiation between children and adults' nutrition within the same household.

There is a large amount of literature documenting that, at least in some areas of the today's world, the allocation of household resources favours some members rather than others.

In Italy too, the nutritional treatment that each family member received is proved to be heavily based on the sex and on the age of the household member. That behaviour has to do mainly with food scarcity, the less food there is, the less you give to people who are unable to work and thus to produce. The other reason of that regularity is that in 'old times' the head of the household and adult men in the family had a predominant role over women and children. Nutrition within the family reflects that distinction.

Proofs that diet within family members depended on the age of the person have been found both in the trends of variables related to nutrition and in the reports and surveys that statisticians and historians used to make in order to study and document poverty. This paper gives the reader a large variety of evidences to consider.

The analysis of the total expenditure elasticity reveals a trend towards greater consumption of meat, fats and clothing as soon as total expenditure increases. For these goods the elasticity in the total expenditure is constantly higher than the one (luxury goods). An increase in families incomes

yields a new set of consumption decisions and a shift in expenditure towards more expensive calories. There is no negative total expenditure elasticity which indicates an inferior good.

Within this classification, cereals based foods and vegetables represent the base of the Italian diet. The change in diet, which may be inferred from the values of elasticity, suggests a slow but regular increase in cereal consumption during all the years considered.

If on one side expenditures on meat, fats and clothing rapidly increased when income improved then on the other hand the same expenditures quickly retreated when these goods became more expensive.

Conclusion

The aim of the thesis was to study the nutrition of Italians in the long run. In particular, we were concerned about the nutrition of Italians and the evolution of their food expenditure between the last decades of the 19th century and the fifteen years after the end of World War II.

Studies on this topic in Italy concentrated more on the analysis of the trend of macro variables. This thesis represents a way to strengthen the importance of micro data when analysing the welfare of a country. The combination of micro and macro data seems preferable to one or to the other measure because it allows to study the phenomena from a more complete point of view.

The fulfilment of the thesis has required the collection of the micro data on family budgets through intensive researches in private and public archives. The organization of the data in a dataset has just preceded the analysis of them.

The main conclusions regard the pattern of the food share, which has been almost constant between 1880 and 1920. Food budget share for Italians started to assume the same size as those in foreign countries just after World War II. Paper 2 tries to answer to the question- Why food budget share were so high in Italy compared to other countries in Europe? That weird behaviour of the food budget share makes the Engel curve not applied in the Italian context.

Other findings concern the relationship between the food budget share of a family and the family size and composition. It seems obvious that family enlargement leads the household to devote a bigger share of its money to buy food. In Italy, as in other economies, that does not happen. Has it any link with the presence of children or adults in the household? Is the family diet sensible to the presence of children? Paper 3 mainly deals with the fact that nourishment within a family was differentiated between children and adults and that the formers were nutritionally penalized.

Appendix I

Table 1
Geographical and sectorial distribution of family budgets in Italy

Region	**Sector of economic activity**		
	Agriculture	**Industry & Other**	**Total**
Piemonte	17	92	109
Lombardia	180	870	1,050
Trentino Alto Adige	9	0	9
Veneto	96	7	103
Friuli Venezia Giulia	42	3,297	3,339
Liguria	4	12	16
Emilia Romagna	466	62	528
Toscana	213	882	1,095
Umbria	57	23	80
Marche	4	0	4
Lazio	4	210	214
Abruzzo	5	0	5
Molise	84	106	190
Campania	157	324	481
Puglia	466	15	481
Basilicata	83	29	112
Calabria	398	27	425
Sicilia	111	465	576
Sardegna	29	72	101
Totale	2,425	6,493	8,918

Table 2
Modules, unit respondent and subject of the modules in the *Questionnaire*

Modules in the Questionnaire		
Module	*Respondent*	*Subject*
	Head of the Household Part	
Household composition	Head of the household	Household roster, demographic data
Consumption Modules		
Food Expenditures	Head of the household	Food expenditures in the past 12 months, consumption of home production in the past 12 months
Non-Food expenditures	Head of the household	Expenditures in the past 12 12 months
Housing	Head of the Household	Type of dwelling, housing structure and facilities
Durable goods	Head of the household	Inventory of durable goods and their prices
Income- related Modules		
Family income	Head of the household	First job and second job income, income from other sources, remittances, public and private transfers
Farm activities	Head of the household	Size of plots, crops, income and expenditure from raising crops and animals; livestock and farm equipment inventory
Non farm activities	Head of the household	Income and expenditure for household businesses
Assets	Head of the household	Value of property and savings
Credit	Head of the household	Credit facilities, characteristics of loans

Family Component Part		
Household composition	Each component	Age, sex, working condition
Education	Each component	Years of schooling
Health	Each component	Medical situation
Migration	Each component	Any move in the last 5 years
Fertility	Each woman	Number of pregnancy, number of abortion
Anthropometrics	Each component	Height and weight measures
Labour	Each component	Labour condition, type of Employment, number of working hours, salary
Community Questionnaire		
Economy and Infrastructure	Head of the Household	Access to roads, electricity, water, public services
Education	Head of the household	Location of schools in the community
Health	Head of the household	Location of health facilities in the community

The Evolution of food consumption in Italy, 1861-2001. Analysis of macro data

Introduction

The study of a nation's diet is beginning to be a preferred method of measuring the economic development of a country and its inhabitants' quality of life.

This article proposes to examine the evolution of the dietary standard of living in Italy in the 150 years since Unification.

In order to make comparisons over such a long period it is necessary to adopt a system which is both consistent throughout the period under consideration and, at the same time, a valid measure of dietary and nutritional standards. To this end, a range of indicators will be considered, such as the elasticity of spending on food to income, the average quantity of calories consumed daily, the extent of consumption and of spending on food and we shall examine the evolution of these indicators during the period from 1861 to 2001.

In the recent literature on the subject of calories and income debate has arisen around the relationship between per capita income and spending on food, and whether and to what measure this latter variable is reactive to variations in income. To the extent to which the demand for calories increases with an increase in income, the economic growth of a country ends up being a necessary means of overcoming malnutrition. In other studies conducted by Behrman and Deolalikar (1988), Bouis and Haddad (1992), Bouis (1994), it has been shown, instead, how the values of the elasticity, even in situations of malnutrition, are so close to zero as to imply that an increase in income does not lead unequivocally to a substantial change in diet[2]. If this proposition were to be verified also in Italy, a large part of the discussion on the well-being of the country based on the various measurements of the per capita GDP would have to be widely reconsidered.

The analysis of the dietary standards of the Italians, hereunder presented, will be supported as much by quantitative evidence as by qualitative material, in such a way as to provide strength to the results derived from statistical measurements.

The data analysed in this study have been collected by the 'ISTAT', which represents the Italian Statistical Office, and published in the 'Sommario di statistiche storiche italiane'. Where a reliable historical sequence is not available the author proposes one *ex novo*, calculated in a preliminary manner with the sole purpose of filling the gap as necessary to describe the progression of a phenomenon over a long period. The modern historical Italian quantitative documentation,

[2] See Behrman, J. R. and Deolalikar, A. B. (1988). On the debate as to the best indicator of well-being among income and other social indicators, see Aturapane, H., Glewwe, P. and Inseman, P. (1994).

thanks to the work of Rossi, Sorgato and Toniolo (1993) and of Fenoaltea, Federico e Zamagni (1992), even beyond providing a valid alternative to the statistics of ISTAT, has filled the gaps for the period before the World War I. In those years, the statistical information, provided by individual scholars and municipal offices of the principal cities, relative to taxes, to supplies policy, to agricultural production, to immigration statistics, to salary changes, did not reach adequate standards of reliability[3].

The first fifty years of the history of nutrition in Italy is marked as a period of slow but continuous growth. Some regions of Italy which, in the late 19th century were living in largely pre-industrial conditions of widespread poverty and undernourishment (Zamagni, 1998), pulled themselves out of the slough of malnutrition although without managing to achieve a recognisable and unequivocal level of well-being. The improvements observed from the beginning of the Giolittian period were instead, interrupted by the great crisis of the 1930s, the Fascist period and the World War II.

Unlike the majority of the countries which form the developed area of the world, Italy reached the daily 3000 calories per capita only in relatively recent years[4], starting from 1960. There had been earlier years in which that threshold had been reached but they were sporadic episodes rather than long term cycles.

The percentage of spending on food remained anchored at a very high level of about 65 per cent of total spending until the late twentieth century. If account is taken of the other primary necessities such as habitation and clothing, one realises how limited were the resources destined to those things which were then considered non-essentials : expenses on transport and communication, on personal hygiene and beauty products, and on education and entertainment.

The situation in Italy differed from that observed in most of the countries of continental Europe where, in the same years the level of spending on food consumption was below 50 per cent of total spending, a demonstration that higher levels of income made resources available to spend on exigencies other than food (Deaton, 1976).

The structure of demand changed irreversibly only at the start of the decade following World War II. A major diversification in food spending was accompanied by doubled consumption of meat, while consumption of sugar and coffee increased fourfold. There is too an increase in the

[3] Lenti, (1906) writes, apropos pre-World War I statisticians:]not only did they proceed with different criteria, the one from the other, often rendering uncomparable the data calculated, but they did not always have at their disposal the basic documentation sufficient to reach plausible results.

[4] The reference to 3000 calories a day per capita comes from the benchmark established by the FAO, and other international organisations consider it as the minimum threshold separating conditions of poverty from those of affluence.

resources given over to the purchase of goods, services, pastimes and entertainment, considered until then the prerogative of only a few classes of the population.

The slow change observed even from the first years of Unification in both the number and quality of the calories consumed, ratified a growing consumption of products of animal origin and the consistent reduction in those of vegetable origin.

This article is structured thus: in Section 1 the analysis of both food and non-food consumption in the long term gives an overview of the evolution of the indicators which are subsequently analysed in detail and for briefer periods: 1861-1911 (Section 2), 1912-1950 (Section 3), 1950-1997 (Section 4). The period divisions correspond mainly to the exigencies of comparisons of the data notwithstanding it being a necessary step to individualising the different phases of the evolution of the Italian diet. The conclusions are contained in Section 5. Appendix I reports all the tables and the figures. In Appendix II is a clarification of the method of estimating spending on food in the period 1861 to 1911.

Section 1. Food consumption in the long term

Figure 1 shows the trend of the budget shares, calculated at current prices, for five aggregates of expenses for the period from 1861 to 1997.

The items of major interest which are revealed in the graph, can be summarised by four points:

1. for the first forty years an average of 65 per cent of the total expenditure was assigned to food, while 15 percent was spent on household goods and 11 percent on clothes;
2. spending on food in Italy undergoes its first significant changes only from 1911. For thirty years, until 1940, the percentage of spending on food diminishes, never, however, falling below the level of 50 per cent of the total spending;
3. during the period of the World War II spending on food returns to the level of the previous century, over 60 percent;
4. from 1950 a consistent fall in the percentage is registered.

An important element is the absence of a significant dynamic in the Engel curve for at least 50 years: while there was a steady growth in the per capita GDP (average annual increase of 1 percent between 1861 and 1914, Fenoaltea (2005)) the amount spent on food remained stable. In other countries in Europe spending on food consumption widely shows a level below 50 percent (Table 1).

Considering the same data, we can estimate the elasticity of food spending to total expenditure to be about 0.86 before 1920, 0.57 between 1921 and 1950, and equal to 0.47 in the following

years. A part of the decrease in the value of the elasticity between the first and second periods and between the first and third periods is neutralized if the changes in relative prices is taken into consideration. There is no doubt that the relative price of food diminished in the period for reasons attributable to the major increases in agricultural and industrial production. Nevertheless, the values shown above imply unequivocally, an inverse proportion between income and elasticity, suggesting the existence of a saturation level of food consumption after 1920, beyond which the elasticity to income became noticeably less than 1.

An initial breakdown of spending on food is presented in Table 2. The high spending on cereal is immediately evident in relation to the lesser expenditure on fruit, vegetables, and legumes and on meat. The consumption of coffee and sugar are limited while there is a high consumption of wine and tobacco within the same category. Spending on meat remained stable until after the World War II when it then doubled: this increase together with a decrease in the relative price testifies to the importance which it held in the Italian diet after 1950. The budget share of food spending remains constant but the figures record the process of substituting cereals, a food which costs little and is of high calorie content, with vegetables and fats whose place in the Italian diet increased considerable already in the second period (more than 50 percent and 82 percent respectively).

It is opportune to remember that the values of the budget share do not adequately measure the average consumer's pattern of consumption. In fact, the value of each quota, being determined by the relationship between the expenditure on an aggregate and the total spending, assigns a greater weight to the pattern of spending of the rich consumers who spend much more than the poor consumers. Luxury goods therefore have a weightier role than goods of primary necessity for which reason the pattern of spending calculated is representative of the consumer who has an income level higher than the average (Deaton, 1976).

The indicators shown in Table 3 refer to the nutritional status of the Italian population. The first shows the daily average consumption of calories per capita, while the other categories show average quantities of nutrients consumed daily by the Italians.

The increase in the calories indicator follows the same phases as seen in describing the budget share while the course of the consumption of nutrients follows the composition of the food budget.

1. the average of 2,500 calories available to the Italians already recorded from 1861 makes of them a population sufficiently fed, for as much as the statistics used say nothing about the distribution of the calories and therefore about the undernourishment of a section of the population;
2. the glucides represent a considerable part of the diet which seems to be unbalanced in favour of substances of vegetable origin;

3. the low quota of lipids reflects the limited consumption of meat and dairy products, with an adequate protein intake of about 80 percent being of animal origin;
4. the increase in animal protein, as of lipids, continues throughout the period with the exception of the decade corresponding to the World War II;
5. in the last decades for which estimates are available, the glucides, while still representing a considerable portion of the diet, are joined by an adequate protein intake. Animal protein by now overtakes that of vegetable origin while the consumption of lipids has increased by 225 percent since 1861.

Given the aggregated nature of the data it is not possible to observe any substitution of 'cheap calories food' such as the inferior cereals and foods with a source of major protein content and for the same reason aspects of the quality of food are not accounted for. What is clear however, is the substitution of cereal based food and food with a major concentration of protein. The transition from a diet based primarily on carbohydrates to one which is based on animal nutrients will be analysed within the present article.

Section 2. A revisitation of the theories of consumption in the first fifty years of Italian Unification

The debate between optimists and pessimists about the standard of living in Italy during its first half-century seems, for the moment, to be on the side fo the former. The discussion, even though addressing a longer period, is focussed on the 1870s and 1880s, precisely coinciding with what became known as the 'agrarian crisis'.

The new data on the GDP per capita presented by Fenoaltea (2005) and that on calories by Federico (2003); the indications of growth in the consumption of luxury and non-luxury goods (beer, coffee, sugar, textiles, cotton and wool; Fenoaltea, 2003); the increase in real wages of about 17 percent for unskilled male workers and of 10 percent for female semi-skilled textile workers (Fenoaltea, 2002); the fall in the number of undernourished in Italy (Vecchi and Coppola, 2004) all constitute ample support, both statistical and theoretical, in favour of the optimists' thesis.

Nevertheless the data, since they provide no analysis of the geographical subtleties nor sectorial differences, don't allow for inferences on malnutrition, nor on the distribution of welfare and income, criteria which are fundamental for the evaluation of the quality of a growth process (Toniolo, 2003). An ideal macro series in fact, should be capable of showing a significant representation not only of the average population but also of the richest and poorest parts thereof (Mokyr, 1988).

The figures on calorie intake presented by Federico (2003) seem preferable to those of Barberi not only because they interpret the modern optimist ideas, but also for methodological reasons. The same methodological problems are to be noticed in the macro series on food consumption and therefore on spending on food, calculated by Barberi for the period from 1861 to 1911.

It is as well to specify that the level of consumption in the long term is determined by the national production modified by the disinvestment in the stockpile and the net imports (offset by exports). From a methodological viewpoint, Barberi's figures reflect the statistical errors on agricultural production, furnished by ISTAT, on which his reconstruction of consumption is based. Production statistics are not always available and when they are, they are erroneous. The figures regarding cattle are based on five benchmarks, three of which are simply conjecture. Moreover there are no data on the production of fruit and vegetables before 1910. Continuing on the methodology adopted to estimate the value of production, ISTAT used weighted means to evaluate those goods whose 1861 prices were not available[5].

Furthermore to reconstruct the historic data on food prices ISTAT has used the statistics gathered in only two cities, Milan and Rome (Barberi, 1961). Finally, the prices refer to the whole year and no longer to the harvest period with the result that any price variations of the short term are negated[6].

The author here proposes a new data series on the food budget constructed by a re-extrapolation of the consumption figures calculated in the benchmark years 1891 and 1911 by Federico and taking account of the data on food prices calculated by Barberi and by ISTAT. The results, notwithstanding the limited methodology are consistent with the per capita calorie consumption values calculated by Federico and with those regarding the per capita GDP calculated by Fenoaltea. Appendix II shows the method of these calculations.

The disaggregated consumption figures in Table 4 allow for a comparison with corresponding data presented by Barberi and show that:

1. the consumption of cereals while remaining high, is a minor percentage of the diet. Moreover the figures for cereal consumption are largely dependable in as much as they present no sharp decreases and no sudden increases but have a steady growth[7];

[5] The items in question are cheese the price of which is available from 1870, ham (1890), cornflour and vegetables (1900), wheat flour (1912), fresh fruit (1914) and fresh fish (1938).

[6] It would be as well to consider, by means of an opportune weighting, the difference between the various markets based on the characteristics of their centres of production, consumption and importation. It's most likely that the prices in the importation and/or production markets are lower than in the consumption markets (Federico, 1984).

[7] Barberi's data on the consumption of cereals presents a decrease of 20 percent at the beginning of the 1980s and in 1895 followed by an increase of 50 percent at the turn of the century.

2. the consumption of potatoes and vegetables assumes a major part in the diet, at more than about 20 kg for each of the years in the period with respect to Barberi's figure. With minor differences the same goes for the fresh and dried fruit aggregates;
3. a major contribution of animal derived calories from a higher consumption of meat, milk and eggs;
4. the diet of the Italian family underwent great changes in terms of what it ate during the period described, as shown by the different compositions of the basket at the beginning and at the end of the period.

What the data do not reveal is that there were entire areas where the dietary conditions were worse than those so far discussed and where people were existing faithfully on polenta (White, 1877), corn flour or bread, accompanied, only on feast days, by wild herbs and lard (Jacini, 1984). One can say that an adult in a family like this would eat a kilo of polenta a day for eight months of the year and an onion and a piece of cheese would sometimes 'pretend' to serve to enhance it. For the other four months the polenta gave place to bread, they bought eggs, and even meat would put in an appearance (Albertoni and Novi, 1984).

Vecchi and Coppola (2006), using Fogel's method (Fogel, 1997)[8], measured how undernourishment in Italy moved between 25 and 30 percent in the first thirty years after Unification, then declined evenly to arrive at 16.8 percent in 1911.

However, the inequality of consumption is notable to the detriment of the peasant families. The consumption of meat, estimated at around 22 kilograms per capita for the fifty years in question, is clearly higher in the city, with a maximum of 89 kg in Sardinia and a minimum of 31.5 kg in Sicily (Toniolo, 1988), and largely precluded peasant families. The farm labourers of southern Italy, according to Bodio, consumed about 10 kg of meat a year, substituting it with salted fish and lard (Bodio, 1979).

In England the annual ration of meat increased from 40 kg in 1851 to 52 kg in 1887, while in France in the same period it rose from 31 to 32 kg (Toniolo, 1988).

The low consumption of meat is partially explained by the duty on the slaughter of pigs, introduced in 1868. The burdensome tax on slaughter had to be paid on every pig slain by the peasants and farm workers, and over and above being simply unpopular, was absolutely unbearable. It takes little to understand that a poor country family that scarcely manages to buy and feed a pig, whose meat provides the best and perhaps only addition to its poor and insipid polenta, absolutely cannot pay the sixteen lire that, incredibly, is asked by the consumption duty agent (Zangheri 1977)

[8] Fogel's method consists in estimating the incidence of undernourishment using macroeconomic data and assuming the normality logarithm of the per capita distribution of calories and values of the coefficient of variation between 0.2 e 0.4.

Again: in the first decade of the twentieth century the diet in many rural areas remained that which it had always been, based on the prevalent use of maize (yellow bread and polenta in the north; in the south, black bread with the addition of poorer cereals) and of poor foods, while the consumption of wheat (white bread, flour, pasta etc) and quality food such as meat was found only among the working classes (Barbagli, 1988).

In spite of the notable increase in agricultural production in the first thirty years of Unification[9], the social and productive structure in Italy meant that this increase benefited not the farm workers but only the owner and capitalist classes in the form of income and profits. If one speaks of a restraint in consumption, then this refers above all to the spending of the rural classes who shared in only a reduced measure, the increased agricultural income produced by themselves. The shortage of quantitative sources does not help demonstrate what has been stated. It seems that agricultural wages registered a small increase or remained stationary in the regions of the Centre-South, Lazio, Umbria, Marche and Campania, and notable but rare increases in some provinces of Piedmont (33 percent more in the decade 1870-1880), of Mantua (25 per cent between 1854 and 1874) and of Liguria (50 percent) (Arcari, 1936). The price increases of the major share of foodstuffs (Table 5), were partially absorbed when wages were paid in kind, but the imposition of the tax increases on flour and salt, give however, the idea of a vast rural mass whose dietary conditions remained still critical.

The tax on flour and that on salt sharpened the difference between those who were able to pay a further tax and those who couldn't. An income-diet investigation among various northern Italian families reported the case of a farming family in the province of Ferrara comprising 12 persons. Estimating an average consumption of 48 'sacks' of wheat and corn a year, it was calculated that the family was paying a flour tax of 60 lire, on an income which altogether amounted to 1,200 lire. For the right to eat bread, therefore, the family was paying 5 percent of its income. If one then considers that the tax on salt was 4 lire per person, it can be calculated that for just salt and bread the Ferrara farmer was paying 10 percent of his income (Pepoli, 1874).

With the flour tax abolished there were the protectionist tariffs of 1887 to limit consumption; there was a levy on foreign grain which rose from 30 lire a tonne to 75 lire in 1894. To this tax were added the local duties on grain and flour which varied from town to town and which were generally heavier in the towns of the South.

[9] Proof of the progress in agricultural production is evidenced by the export of Italian agricultural products during the two decades after Unification. The increase in exports, writes Romeo (1959), reflects effectively Italian economic fortunes: slower and floundering until 1866, then more rapid and turned towards more decisive progress" thanks to the sustained development in agriculture. The presumed stagnation of agriculture which derives from analysis of the ISTAT data, due mainly to an overvaluation of the agricultural production, particularly cereals, in the early years of Unification, and a substantial undervaluation of the performance of agriculture in the '80s and '90s (Federico, 2002).

The elasticity of the spending on food to total spending calculated using least ordinary squares and assuming a constant function of elasticity for the period, gives an adequate measure of the average level of hunger in Italy in the period. The model is expressed by the function:

(1) $ln(PCFE)=a+b\ ln(PCTE)+e$

where *PCFE* stands for per capita food expenditure and *PCTE* represents the per capita total expenditure; *a* is the constant term and *e* is the error term.

The logarithmic transformation has been used because the joint density function represents a good compromise for the joint bivariate normality; in this way the regression function is linear (Deaton 1996).

The values of the elasticity are here interpreted as the percentage increase in spending on food which would result from an increase of 1 percent in total spending. From the lessons of economic theory in the subject of consumer demand, we expect to observe a decline in the values of the elasticity for growing levels of income.

Table 6 shows the estimates of the elasticity of food spending in the total budget for the period from 1861 to 1911 and three sub-periods. The elasticity for the three shorter periods have values very close to one another and a little less than 1. It reaches its maximum in the years 1861-1880 even if the difference over the other two periods is very limited. The values of the elasticity suggest how the average Italian would have liked to spend a large part of the increased food budget.

Section 3. The Two Wars and the Fascist Period

Benedetto Barberi (1961) maintains that from the so-called Giolittian period up to 1950 consumption of food by the Italians is not distinguished by a quantitative increase but by a better, even though minimally better, level of nutrition due to a more balanced rapport between animal and vegetable foods. The experts, writes Barberi, let it be clearly understood that, at least in a large part of our country, the environment, climate, etc. impose upon the diet a prevalently vegetable character (Barberi, 1963).

Actually, such study of the elasticity as much as that of the quantity of food, demonstrates how the diet underwent clear improvements as much quantitative as qualitative, continuing that process which had been partially observed in the previous period. Furthermore, even the budget share analysis seems to arrive at the same sort of conclusion: the percentage of the budget spent on food undergoes the first decline in the early ‘20s liberating resources which would be spent on domestic items, hardware and transport.

Other indicators also furnish proof of this increased well-being (Table 7):

1. the per capita GDP estimated by Rossi, Sorgato and Toniolo grows in the period 1915-1926 by 7.2 percent (estimates at constant prices 1938) and total consumption reveals a growth that double that;
2. spending on food reaches a level never attained in the preceding years;
3. the calorie intake figures are partially comforting; in fact there is no series available for the years 1911-1920, but only an average for the decade. The rate of growth within this period is, however, 9 percent, a growth rate never before seen in a span of ten years.

What surprises is how, even during the World War I, through extensive imports from the United States (Porri, 1920), a high demand for food which Italy would not otherwise have been able to guarantee because of the fall of food supplies, was able to be satisfied[10]'.

The climate of prosperity of the decade assumes a major relief if compared with the stagnation of the previous period, 1911-1915, and with the decline that set in from the '20s to the beginning of the '50s.

Toniolo (1980) pinpoints the period 1922-25 as the last period of that thirty years of growth that began with the new century. Agriculture remained a slave to its own backwardness and was incapable of carrying out a transformation towards stock raising for lack of a political base but also for the weakness of consumer demand for more expensive food because of the low wage level. Fascism impoverished agriculture by obstructing its modernisation, by proposing the 'battle of the wheat', the reclamation of the marshes, which, *ex post* didn't have much effect on income and the level of unemployment. And not least, it encouraged an increase in births at a time when emigration was the only safety valve to the growing poverty (Toniolo, 1980).

Of the three classes of worker whose wages increased in the period after the World War I, farm workers, industrial workers and railway workers, only the latter maintained the favour acquired, although their numbers were cut as soon as the Fascists came to power (Zamagni, 1993).

The reduction of wage rates began in October 1927, following agreement drawn up by various trade associations which meant reductions of between a minimum of 10 and a maximum of 20 percent, in contractual wages (Vannutelli, 1958) giving the start to the phase of a regression in consumption. In December 1930 workmen's wages were again reduced by 8 percent and those of white collar workers by 8 percent up to a wage of 1000 lire and of 10 percent for higher wages. A further reduction was imposed in 1934 to the extent of 7 percent. Between 1928 and 1934 the

[10] Zamagni maintains that the rationing system might be criticised, in as much as it led to an increase in consumption, because many people who previously did not eat certain foods, finding themselves with these items on their ration cards ended up wanting to buy them, perhaps even only to resell them.

overall reduction was 16 percent (Vannutelli, 1958). At the same time the cost of living was falling and the buying power of the hourly wage in 1934 was higher than it had been in 1928 but the buying power of the monthly wage ended up diminished because of the fewer hours worked (Table 8).

The Fascist trade unions unable to intervene directly in the wages, contributed to alleviating the workers' lives with the institution of prizes and end-of-year bonuses, paid holidays and family allowances. The procedure required that the request for the allowance should pass the chief of police who certified the income status of the family. Before then passing the request to the prefect for the final decision, the chief of police proposed the amount to be allocated, which would vary from family to family. The prefect also required information about the supposed behaviour of the head of the family and his participation in the War and Fascist campaigns. The arbitrariness of the granting of the allowances, let alone the scarcity of funds allocated for the scheme, ensured its failure[11.]

Zamagni sees the cause of the stagnation of individual consumption in the economic and demographic characteristics of the nation in the period between the Wars: restrictive emigration laws (Sori, 1979), the rearmament process which implied lower wages, the decline of savings because of inflation first and then unemployment (between 1929 and 1933 the number of unemployed rose from 300,000 to over 1,960,000 in 1934, or between 11.4 and 15 percent of the entire work force; Toniolo, 1980).

In his study of the Italians' diet in the Fascist period, Messedaglia asked town governors and doctors of 93 communes in the Verona area to clarify whether the farm workers' diet had deteriorated in these last years 1927- 1929, such unhappy years because of the adverse weather. Some courageous town governor replied that the food situation for the rural class has worsened, more or less markedly. This is a thesis which, in spite of the agricultural revival and the battle of the wheat, is dragged up with excessive frequency by technicians and politicians to hide the fragility of the Italian agricultural system (Messedaglia, 1932).

The consequences of the diminished productivity, both industrial and agricultural, the increased unemployment connected to the harsh fall in wages, were not slow in making their effect felt on the consumption of food and other goods which, measured at 1938 constant prices, did not register any prominent increase between the years 1927 and 1941, as shown in the estimates of Barberi (1963) and those of Rossi, Sorgato, Toniolo (1993).

[11] The request forms, with much demographic information about the family as well as analytic information about income, comments from the head of police and the prefect, have been seen and partly brought together by the author in the Archivio Comunale di Milano.

Barberi's figures for consumption and those of ISTAT for calories, which, for some years have been calculated as a five-year average, highlight the following (Table 9):

1. between 1926 and 1930 there was a net decline in all categories of consumption;
2. the greatest cuts in the Italian diet were those items which were more costly, 'elitist' and less important to survival: consumption of coffee and sugar fell by 15 percent each, vegetable and fats by 12 percent**,** meat by 24 percent;
3. calorie intake, with a fall of 15.4 percent from 1927 to 1936, returned to level of the years following Unification; in the years of the World War II with a fall to 1747 the calorie intake reaches its lowest value per capita ever recorded since 1861;
4. the elasticity of calories to spending and to income confirm fully the evidence of the data series with values of 1.02 (1927-1945);
5. the process of regression, although in a different way, lasts until the end of World War II.

What happened in practical terms in the '30s and '40s is quickly described. At the Italian table the consumption of legumes, tomatoes, vegetables, fruit, pork and mutton, animals fats, wine, coffee and, contrary to what might be expected, cereals, declined. The consumption level of beef and olive oil remained unchanged, but with notable geographical and social differences,. Consumption of those foodstuffs favoured by the propaganda of the regime increased: milk, sugar, fish, poultry and potatoes.

From the population sample examined in 1942 by Luzzatto Fegiz it was seen that 40 percent had less than the daily requirements. Meanwhile a year later, by which time the war had probably damaged economy's productive and distributive mechanisms even further, this figure stands at about 25 percent. If the first figure fully confirms the dimension of the phenomenon, the second highlights a process which is anything but rectilinear and indicates the passage from a phase in which the diet is based principally on the foodstuffs and quantity distributed by the official market, to a period in which the products bought on the black market cease to be simply integrative and become substitutes for those provided by rationing (Luzzato Fegiz, 1948). The existence of the black market was no secret. In 1944, the newspaper 'Il Tempo' of Roma wrote that the way in which 'thousands of workers and workmen managed to make ends meet was a mystery which perhaps no one will be able to explain' (Lombardo, 1985). To give credence to the official statistics, the average calorie consumption would follow a constant and progressive decline during the War years until it reaches the minimum limit of 1700 calories in 1945. Average consumption, even

following the course described by the official statistics, found compensatory systems in the black markets.

The severity of the years 1945 and 1946, from the dietary point of view the worst in Italian history, is summed up by Volpi who describes them as the hardest years: two years of hunger, documented not only by the alarming reduction in average calories but also by the fall in the consumption of all food products, which brought nourishment to a level even much lower than that of the pre-War period (Volpi, 1989). The situation was exacerbated by the inefficiency of the regime to guarantee the provision of necessary fresh supplies and the presence of a black market tolerated by the Fascist government. To prices 'astronomically high' (Zamagni, 1993), but for which there are no dependable statistics, wage increases certainly did not follow and the decline of the buying power reached 60 percent of the pre-War level (Polarizzi, 1993).

Section 4. Consumption in the modern epoch

Per capita consumption began to grow again from 1947. Consumption in all categories of food grew, although at the end of the 40s and for the first years of the 50s the quantities consumed remained below the pre-War level.

The improvements of these years did not involve the entire Italian population, still burdened by the costs of reconstruction with almost two million houses completely destroyed and more than five million seriously damaged (Zamagni, 1993). 'The Inquiry into Poverty in Italy (1951-1952)', commissioned by the Italian parliament to investigate the phenomenon of poverty, found that 11.8 percent of Italian lived below the minimum subsistence level while 11.6 percent were considered poor and that:

1. only 10 percent of private houses had an internal bathroom with running water and just a little more than half of those had a bath;
2. it introduced the inherent question of the gap between the North and the Centre on the one hand and the South of Italy on the other, a debate which until then had been treated with only marginal importance among economists and statisticians (Zamagni, 1993).

The year 1958 can be defined as the beginning of that which is commonly called 'the Italian Miracle', marked by an acceleration in industrial production which put Italy at the top of world in annual growth of the GDP and which pushed food consumption to a 30-year growth without interruption. In these years the food level exceeded the standards of before the War and the population on average, reached a well-being never before known.

Comparison between some observed variables in the pre- and post-War years and later, gives a vision of the great food revolution in action (Table 10).

The quotas of food consumption, decreased now to more contained values, together with the increases in actual food consumption, reflect the increased per capita income which affected all professional classes from 1950 (Rossi, Toniolo e Vecchi, 2001). The law governing food expenditure to total income, known as Engel's Law, suggests the existence of a saturation level of food consumption beyond which the elasticity of food spending to income becomes appreciably inferior to 1.

Part of the fall in the percentage is also explained by the lower cost of living connected to the increased agricultural and industrial productivity and the minor costs of transport (Table 11 shows the percentage variations of the cost of living indicator and of the hourly wage rate for some branches and classes of economic activity from 1956 to 1970). Kuznets (1962) instead, maintaining that it was only the food cost per se that diminished but not the cost of the final goods for reasons connected to transportation, to packaging and to some new goods and services connected generally to economic development, invites prudence in drawing conclusions on Engel's law when applied to an economic system which is studied over time (Vecchi, 2002).

In the end almost everyone could eat more and better; between 1951 and 1972 the average height of the Italians rose from 170 to 174 centimetres. Contemporaneously the family spending on food declines strongly in favour of more sophisticated and unnecessary social needs (Shivelbusch, 1999). In just six years from 1958 to 1963, motor car production rose from 369,000 to more than a million, that of refrigerators from 500,000 to 2,200,000 and of washing machines from 100,000 to 1,200,000 (ISTAT, 1986). There was also a profound transformation in leisure time usage: from 1956 to 1965 hotel occupancy doubled and that in camping grounds increased by 400 percent (Crainz, 1996).

The increased well-being is shown by assessing the parameters a and b in the following log linear equation:

$$(2) \qquad log(y_i) = a_i + log(b_i x) + e_i$$

where y_i indicates spending per capita on the product i while x is the income per capita[12].

The positive value of a indicates the necessity to consume the product i even in a situation of zero income; negatives values on the other hand are associated with "elite" goods (in this case fuels, motor cars, health services, entertainment and leisure activities). The positive value of the parameter b assumed in all the equations, bears witness to the absence of lesser goods. The elasticity values which result are in line with what logic suggests; elasticity below 1 for daily essential foodstuffs (bread, fruit, lard, eggs) and above 1 for food and services considered luxuries such as meat, milk, fish, entertainment, eating out and hotels.

[12] In the data presented by Golinelli and Monterastelli, expenditure on goods and income follow a linear relationship and not a quadratic one as Cao Pinna maintains (Cao-Pinna, 1958).

The elasticity of non-food items confirm the existence of goods such as cars, medical expenses and entertainment, still not available to many people.

The North-South divide, thanks also to the 'Commissione di Povertà in Italia (1951-1952)', gained such importance that 'ISTAT, within the 'Sommario di Statistiche Storiche, 1925-1985' (1986), gives ample space to the differentiated statistics for four distinct geographical areas (North-West, North-East, Centre and South-Islands) for the period 1973-1985.

The available data show how the divide existing between North and South from the viewpoint of spending on food, was eliminated in the mid 1980s: the difference in non-food consumption, however, is shown to have widened. In summary it can be asserted that (Figure 2 and Figure 3, Table 11):

1. the level of spending in 1973 testifies that the South and the Islands are the areas with a low level of food resources but a high quota of total spending. The 15 percent gap with respect to the Centre had been reduced to 1 percent in 1985, by which time the North-East was the area with the lowest level of food spending (12 percent less than the Centre in 1985)
2. the major differences in the level of spending are in the spending on meat, beverages and dairy products, while those for cereals and fats are much less accentuated. Spending on fish was greatest in the South for the whole period analysed. The diet of the South is shown to be richer in cereals, fish and fats and poorer in meat, fruit and vegetables, and dairy products. The difference rounds itself out at the end of the period;
3. the gap in non-food spending remains constant and high between the region with the highest spending, the North-East, and the South, while it increases between the Nord-Est and the other two areas. The biggest differences are in spending connected to the house (on average 20 percent less in the South), to health (50 percent less), to transport and communications (58 percent less) and to entertainment (60 percent less);
4. from a dietary point of view the values of the budget shares for food spending are reassuring (Table 13). The percentage of resources given over to food diminishes constantly over the period even if it remains much higher in the south. Spending on bread is limited to between 12 and 14 percent of the food budget (in the south it reaches 15 percent) while the biggest share of the food budget goes on meat. In the South the percentage is minor but the diet is nevertheless compensated for by an ample consumption of fish, decidedly lower in the other three areas;
5. the dietary picture sees an Italy fundamentally unified in all its components. In spite of there being no regional statistics before 1972, many indices indicate a substantial diversity

in the nutrition of families belonging to different geographical areas; this 'food puzzle' became uniform only in the last thirty years;

6. the values of the budget share indicate how the areas of Central Italy and the South favour spending on food and goods connected to the house. The North instead shows a profile of greater spending on decoration of the house, transport and communications and clothes.

The great feast which generations of farm workers had dreamed of and cherished was finally at hand. However, in reality they continued to eat precariously and to miss meals even if the motivation now had roots quite different from those which compelled our ancestors to eat frugally. It is no longer a deficiency of food that we are dealing with but an abundance, with a different rhythm, dietary habits and medical conceptions. Well-being has quickly imposed other influences and passed from a period in which not to eat meant illness and death to a time in which having too much to eat re-proposes the same agonising problems. Satisfying the appetite with taste and pleasure lasted the period of one generation. In place of the dream of food has followed the anxiety of not satisfying the appetite for fear of illnesses associated with a diet that is too abundant and fatty.

Section 5. Conclusions

The aim of the present article is to describe the progress of food consumption in Italy from 1861 to 2001 through the use of macro data series.

The difficulties in approaching this subject arise from the lack of a single historic data series which covers the whole period under consideration and is capable of presenting the aspects of dietary and nutritional problems in all their diverse nuances. The difficulties are more acute for the absence of reliable statistics for the period from 1861 to 1890.

Although in the last ten years the fervour of the economic historians, the so-called revolution in action (Toniolo, 2003), has led to the revision of some statistics and theories which seemed to form the basis of Italian economic history, it has never re-examined such a long historical period. The panorama, above all quantitative, which exists today, although rich in reference to some circumscribed periods, suffers the absence of a long term view.

The lack of an adequate historic data series for spending on food for the period 1861-1911 has been met by the use of a new series of historic estimates as produced from the series on per capita food consumption and that for corresponding prices. The data thus obtained has the merit of

describing the progress of spending in a more coherent manner than Barberi's series which is the only one existing at present that deals with food expenditure in the period 1861-1890.

The author has, therefore sought to work out a single historic data series on food expenditure and per capita food consumption for the entire period in question, 1861-1997.

The analysis which has been followed has been based on the evolution of the budget share for food, of the per capita consumption, of the daily calorie intake and of the elasticity of spending to income.

The picture which emerges from this is of a nation, on average, well nourished since 1861, thanks also to the use of more than 60 percent of available resources for the purchase of food. From the early years there is an improvement, quantitative but above all qualitative, in the Italian diet, connected with the growth of the per capita GDP. The evidence of a nutritional standard improving continually derives from the increasing per capita calorie intake and from the greater availability of high protein foods like meat and dairy products in the place of foods rich in glucides.

The evolution of the Italian diet reflects the changes observed in the course followed by average wages. In all the countries which experienced the process of industrialisation and a growth of pro capita wages, the following dynamic is observed: the diet biased towards foods of vegetable origin (from 1861 to 1900), registers an increase of animal calories and those from vegetable sources. The first however have a greater growth rate than the second (the Giolittian period). Subsequently the consumption of vegetable foods reaches a saturation level while the animal-origin foods continue to increase (the post World War II period).

The continuous evolution of the diet does not eliminate the conviction that poverty and undernourishment reigned in diverse and vast areas of the peninsula right from 1861. Qualitative studies prove this, more than analysis of the official historic data, as do written inquiries about circumscribed areas of the country. The official figures do not provide a view of the distributive aspect of the phenomenon.

The growth of dietary well-being showed some acceleration, as during the Giolittian period and between the years 1916 and 1926, and some slowing down, between 1881 and 1887, and slump (the end of the 20s and the period of the World War II).

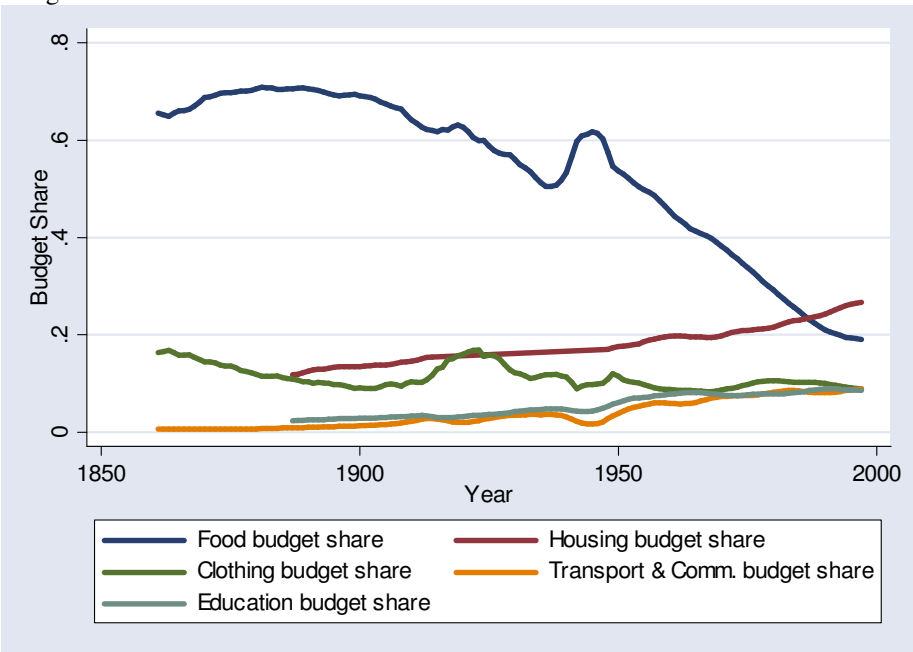
The food crisis of the World War II was, however, the last negative episode which delayed the definitive arrival at adequate nutrition standards. The number of calories, which, for the entire duration of the World War II lined up at the levels of the previous century, reached a standard worthy of a developed country in 1953. The values of the elasticity of calories to income and the decrease of the budget share for spending on food demonstrates this tendency. The values of the

elasticity of food spending to total budget, which were very close to 1 until the 1950s, falls well below 1 immediately after World War II.

In the years before 1970 Italy maintained no official statistics regarding the level and composition of the diets in the different regions of the peninsula and among families of different social classes. The economic growth observed from the beginning of the 'economic miracle' had had the merit of abrogating the dietary differences between the better fed areas, the centre and the North, and the lesser fed areas in the South. On the other hand the differences in spending on non-food products widened. This tendency demonstrates how, in a nation with a high per capita income, the difference between the social classes no longer manifests itself through different diets, but by the ownership of material goods.

Appendix I

Figure 1
Budget share for Italian families from 1861 to 1996.



Notes: for food and non food expenses we considered the estimation of Barberi for the sub period from 1861 to 1911, Rossi-Sorgato-Toniolo from 1912 to 1950 and Golinelli-Monterastelli from 1951 to 1997. For the food expenses in the period from 1861 to 1911 we considered author's estimation. Appendix II will deal with the procedure adopted to estimate the new series.

Table 1
Food budget share in Italy and other countries

Countries/Period	**1861-70**	**1871-80**	**1881-90**	**1890-99**	**1900-09**
Us	38.5	35.6	35.9	35.2	34.4
Canada	40.4	.	35.2	.	36.9
UK	.	.	48.4	45.8	45.2
Germany	63.5	60.9	57.6	54.8	54
Norwey	53	51.5	50.8	.	47.8
Sweden	.	38.7	36.1	35.4	35.9
Italy	*65*	*69*	*70*	*69*	*67*

Notes: data regarding other countries come from Deaton (1976).

Table 2
Composition of the food budget share

Period	Cereals	Fruits, vegetables and legumes	Sugar and drinkings	Meats	Fish	Milk, cheeses and eggs	Oil and fats
1861-1911	29.5	10	28	12	4.4	12	4.1
1912-1950	22	15	27	12	2.5	12	7.5
1951-1997	13	19	22	23	4	12	5

Notes: author's estimation. For homogeneity reasons, three different sub periods have been created. Data regarding the first sub period, 1861-1910, are those computed by the author. Data regarding the second sub period, 1911-1950, are those from Barberi (1961) while data for the last sub period, 1951-1997, are those from Golinelli e Monterastelli (1990).

Table 3
Calories intake and nutrients, 1861-1981

Indicator	1861	1871	1881	1891	1901	1911	1921	1931	1941	1951	1961	1971	1981
Calorie	2506	2545	2673	2719	2882	2715	2833	2640	2170	2410	2843	3243	3190
Proteine ani.	15	14	15	16	19	21	21	22	16	25	37	46	57
Proteine veg.	73	70	71	72	73	74	76	70	57	46	48	49	52
Lipidi	39	43	50	54	57	55	67	59	43	60	89	114	127
Glucidi	404	392	402	410	420	430	444	413	355	380	414	435	418

Notes: data are those coming from Federico (2003) until 1911 and from ISTAT (1986) for the remaining years. Nutrients intake are expressed in grams.

Table 4
Calories intake and food consumption, 1861-1911

	Calories	% animal calories	Cereals	Vegetables	Fruits	Meat	Milk&Egg	Coffee
1861-1870	2500	0.081	189	96	34	18	67	0.23
1871-1880	2558	0.080	188	104	36	19	66	0.30
1881-1890	2667	0.084	189	113	38	22	68	0.39
1891-1900	2742	0.091	190	122	40	24	75	0.66
1901-1911	2900	0.102	192	133	43	28	84	0.66

Notes: data expressed in the table are ten years average. Data regarding calories and the percentage of calories having an animal origin come from Federico (2003). Data on food consumption are expressed in Kilograms and are the results of the retropolation made on the benchmark consumption computed for the years 1891 and 1911 (Federico, 2003)

Table 5
Prices for some categories of food

Period	Bread	Pasta	Rice	Potatoes	Cow meat	Pork meat	Eggs	Milk
1861-65	0.36	0.52	0.46	0.11	0.89	1.15	0.062	0.24
1866-70	0.41	0.66	0.43	0.13	0.97	1.36	0.066	0.23
1871-75	0.48	0.76	0.52	0.15	1.21	1.68	0.08	0.27
1876-80	0.47	0.67	0.56	0.17	1.2	1.66	0.08	0.31
1881-85	0.38	0.56	0.49	0.14	1.31	1.75	0.072	0.31

Notes: data on prices come from Barberi (1961) and refer to price per Kilogram.

Table 6
Calorie elasticity to per capita expenditure

Period	1861-1911	1861-1880	1881-1895	1896-1911
Value of elasticity	0.87	0.86	0.83	0.84

Notes: data on calories intake come from Federico (2003). Data on per capita total expenditure come from the author's estimation.

Table 7
Macro economic indicators, 1915-1926

Years	Food budget share	Food expenditure	Per capita calories intake	Per capita GDP
1915	0.58	2556	2694	3459.14
1920	0.53	2813	2694	3501.48
1926	0.51	2955	2975	3710.82

Notes: data on variables related to expenditure come from Barberi (1961), those related to calories intake and to per capita GDP come from ISTAT (1978) and from Rossi, Sorgato, Toniolo (1993) respectively. Monetary values are expressed at constant prices 1938.

Table 8
Cost of living index, monthly and hourly salary index and average number of hours worked, 1929-1939

Year	Cost of living index (base year 1928)	Monthly salary index for blue collars workers (base year 1928)	Hourly salary index for blue collars workers (base year 1928)	Average of the total amount of hours monthly worked by the blue collar workers
1929	101.6	100.6	97.9	182
1930	98.4	95.8	100.2	175
1931	88.9	87.7	104.5	170
1932	84.9	84.9	107.1	168
1933	85.6	85.6	108.8	174
1934	81.9	81.9	111	172
1935	74.5	74.5	107.6	159
1936	78.1	78.1	106.3	157
1937	91	91	109	163
1938	95.1	95.1	108.3	159
1939	104.6	104.6	113.4	160

Notes: sources Vannutelli (1958).

Table 9
Calories intake and food consumption

	Calories	Cereals	Fruits&Vegetables	Meat	Dairy	Oil & Fats	Coffee
1911-1916	2730.5	210	204	17.65	43.85	9.25	0.875
1922-1926	2885	228	194	22	48.05	11.42	1.14
1941-1945	2120	170	165	13.58	37.8	7.22	0.62

Notes: data come from Barberi (1961) and from ISTAT (1978). Food consumption is expressed in Kilogram.

Table 10
Comparison of macro variable in two distinct period of time: 1940-45 vs 1960-65

	Calories	Food budget share	Consumption of: Cereals	Meat	Veg.	Fish	Sugar	GDP
40-45	2060	61	170.26	13.58	116.34	2.74	6.92	1,958,525
60-65	2750	32	196.34	24.04	189.54	6.94	18.34	6,865,896

Notes: data regarding calories intake come from ISTAT (1978), those regarding food budget share and food consumption are from Barberi (1961) and from Golinelli e Monterastelli (1990). Data on per capita GDP come from Rossi, Sorgato e Toniolo (1993). Data on food consumption are expressed in Kilogram.

Table 11
Percentage variation in monthly salary for people employed in the agricultural and industrial sector. Cost of living index for clerks and workers, 1956-1970

People employed in:	**Agriculture**	**Industry**	**Cost of living**
1956-1960	3.1	4.3	3.5
1961-1965	11.7	9.9	4.6
1966-1970	8.1	9.2	2.8
1956-1970	7.9	7.8	3.5

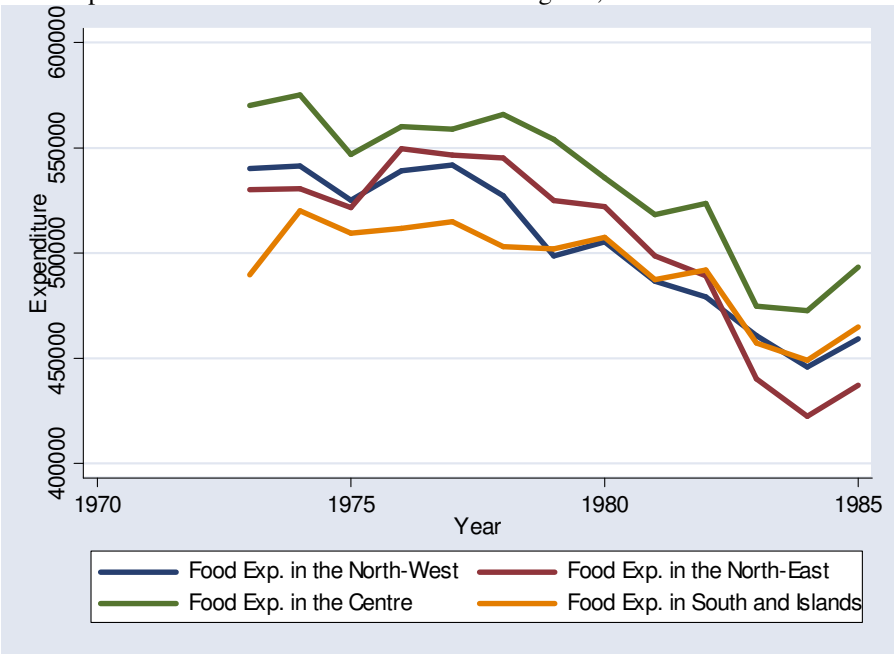
Notes: sources ISTAT (1986).

Table 12
Consumption function and elasticity values for some categories of food and non food items, 1960-1997

Consumption categories	**Consumption function**	**Elasticity**
Food items		
Bread and cereals	$y = 1361 + 0.021x$	0.87
Meat	$y = 4476 + 0.045x$	0.86
Fish	$y = 167 + 0.011x$	0.95
Dairy	$y = 1326 + 0.025x$	0.90
Oil	$y = 862 + 0.006x$	0.81
Fruits and vegetables	$y = 2609 + 0.035x$	0.86
Sugar	$y = 299 + 0.021x$	0.85
Coffee and the	$y = 351 + 0.004x$	0.88
Light drinks	$y = -115 + 0.004x$	0.99
Other food	$y = 301 + 0.002x$	0.86
Food items and tobacco	$y = 10,175 + 0.19x$	0.87
Non food items		
Clothing	$y = 972 + 0.93x$	1.01
Housing	$y = -3978 + 0.13x$	1.12
Fuel	$y = 74 + 0.03x$	1.04
Vehicles	$y = -175 + 0.054x$	1.76
Health	$y = -175 + 0.054x$	1.51
Entertainment	$y = -1843 + 0.06x$	1.21

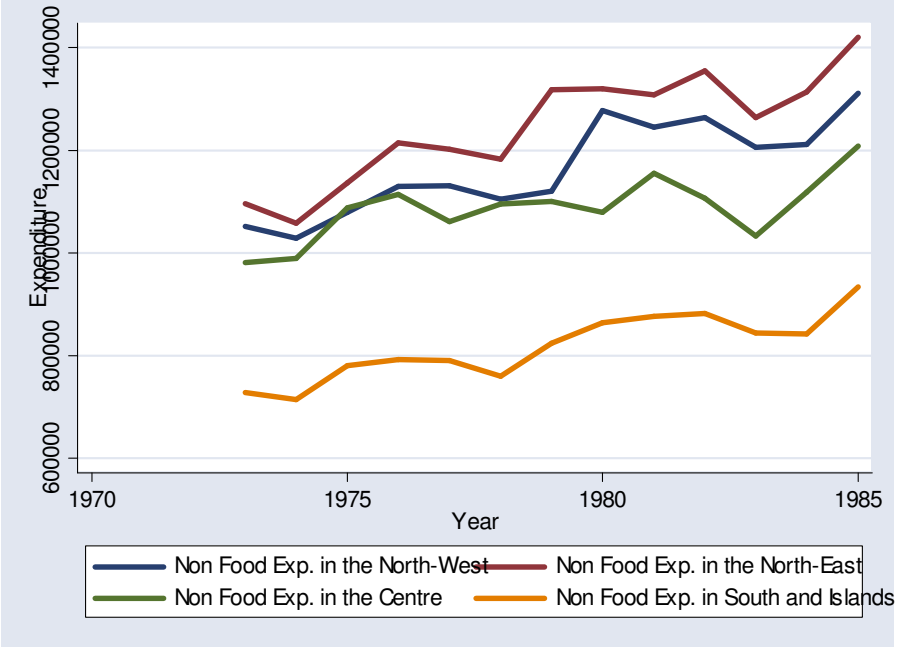
Notes: parameters values are the results of the OLS estimation of the function $y_i = a_i + b_i x + e_i$. Data sources Golinelli-Monterastelli (1990).

Figure 2
Food expenditures in four distinct Italian macro regions, 1972-1985



Notes: food expenditures are expressed at constant prices, 1985 (ISTAT, 1986).

Figure 3
Non food expenditures in four distinct Italian macro regions, 1972-1985



Notes: non food expenditures are expressed at constant prices, 1985 (ISTAT, 1986).

Table 13
Food and non food budget share in 1973 and 1985

	Bread	Meat	Fish	Food	Housing	Forniture	Transport&Comm.	Clothing
North-West								
1973	11	34	2	34	12	9	9.4	11
1985	14	30	4	25	12	11	14	8.5
North-East								
1973	12	34	2.4	32	9.3	11	11	11
1985	14	28	4.5	24	13	11.8	15	9
Centre								
1973	11	36	3.5	36	13	10	9.5	11
1985	12	32	6.3	28	13	10.6	14	8.2
South-Islands								
1973	14	28	5.5	40	13	8.5	8.4	11
1985	15	27	8.6	33	13	9	12	9

Notes: budget shares for food components are computed using total food expenditure for food. Budget shares for non food items are computer using total expenditure.

Appendix II

Macro series on food consumption for the period from 1861-1911 has been computed using data on per capita food consumption in two benchmark years, 1891 and 1911(Federico, 2003). For what concerns prices, we used price series from Barberi (1961) and from ISTAT (1958, 1966, 1978 and 1986). Food items and relative food prices are shown in Table 1.

Table 2 shows the new estimate of the food expenditure series and that one computed by Barberi (1961). Both the series are expressed at current prices and constant 1938 prices. Their trends are shown in Figure 1 and Figure 2.

Figure 3 shows the trend of the per capita GDP (Fenoaltea, 2003) and that of food expenditure (new estimates) both at constant 1938 price.

Figure 4 shows the trend of food and non food expenditure for the period from 1861-1997. Data sources is shown in Table 3.

Table 1: food items, price sources and price availability needed for the estimation of the new series on food expenditure, 1861-1911

Item	**Price source**	**Price availability**
Cereals	ISTAT	Average between the prices of hard and tender wheat
Barley	ISTAT	Price of barley
Rice	Barberi	Price of rice
Maize	ISTAT	Price of maize
Other cereals	ISTAT	The lower price between hard and tender wheat
Broad bean	ISTAT	Price of broad bean
Bean	Barberi	Price of bean
Grass pea	ISTAT-Barberi	Average between the prices of broad bean, lentils and bean
Lentil	ISTAT	Price of lentils
Lupine	ISTAT-Barberi	Average between the prices of broad bean, lentils and bean
Pea	ISTAT-Barberi	Average between the prices of broad bean, lentils and bean
Vetch	ISTAT-Barberi	Average between the prices of broad bean, lentils and bean
Potato	Barberi	Price of potato
Fresh legumes	ISTAT	Average between the prices of broad bean, lentils and bean
Tomatoes	ISTAT-Barberi	Price of potato until 1892, price of tomatoes from 1893 onwards
Asparagus	ISTAT-Barberi	Price of potato until 1892, average between the prices of potato and tomatoes from 1893 onwards
Artichoke	ISTAT-Barberi	Price of potato until 1892, average between the prices of potato and tomatoes from 1893 onwards
Thistle	ISTAT-Barberi	Price of potato until 1892, average between the prices of potato and tomatoes from 1893 onwards
Fennel	ISTAT-Barberi	Price of potato until 1892, average between the prices of potato and tomatoes from 1893 onwards
Cauliflower	ISTAT-Barberi	Price of potato until 1892, average between the prices of potato and tomatoes from 1893 onwards
Onion and garlic	ISTAT-	Price of potato until 1892, average between the prices of potato and tomatoes

	Barberi	from 1893 onwards
Watermelon	ISTAT-Barberi	Price of potato until 1892, average between the prices of potato and tomatoes from 1893 onwards
Other vegetables	ISTAT-Barberi	Price of potato until 1892, average between the prices of potato and tomatoes from 1893 onwards
Olive	-	-
Wine	Barberi	Price of wine
Grapes	ISTAT	Price of grape
Oil	Barberi	Price of oil of olive
Orange and mandarin	ISTAT	Price of citrus fruit
Lemon	ISTAT	Price of citrus fruit
Other citrus fruit	ISTAT	Price of citrus fruit
Apple	ISTAT	Price of apple
Pear	ISTAT	Price of apple
Peach	ISTAT	Price of plum
Apricot	ISTAT	Price of plum
Cherry	ISTAT	Price of cherry
Plum	ISTAT	Price of plum
Quinte and pomegranate	ISTAT	Price of plum
Green fig	ISTAT	Price of plum
Almond	ISTAT	Price of hazelnut
Hazelnut	ISTAT	Price of hazelnut
Walnut	ISTAT	Price of hazelnut
Carob	ISTAT	Price of carob
Chestnut	ISTAT	Price of carob
Pistachio	-	-
Prickly pear	ISTAT	Price of plum
Date plum	ISTAT	Price of plum
Cowpat meat	Barberi	Price of cowpat meat
Horsemeat	-	-
Pork meat	Barberi	Price of pork meat
Mutton	ISTAT	Price of mutton
Poultry	ISTAT	Price of poultry
Rabbit	ISTAT	Price of poultry
Buffalo milk	Barberi	Price of milk
Sheep milk	Barberi	Price of milk
Goat milk	Barberi	Price of milk
Fish	Barberi	Price of fish
Egg	Barberi	Price of egg
Sugar	Barberi	Price of sugar
Coffee	Barberi	Price of coffee

Table 2: food expenditures at current and constant 1938 (new estimates and Barberi's estimates)

Year	Food expenditure, 1861-1911			
	New estimates, current prices	**Barberi, current preces**	**New estimates, constant prices 1938**	**Barberi, constant prices 1938**
1861	217.3012	245.7517	953.2209	1231
1862	216	245.5156	1041.131	1234
1863	217.7717	243.4158	1035.4	1219
1864	219.155	243.5525	1020.308	1231
1865	219.1115	242.3586	1007.364	1234
1866	220.7841	239.8986	1008.921	1262
1867	221.9193	238.0546	1092.294	1213
1868	227.0775	241.0491	1042.248	1171
1869	233.7608	246.9546	1060.343	1167
1870	241.7139	253.0287	1165.827	1192
1871	247.6127	253.3347	1119.572	1228
1872	250.7539	256.2468	1155.074	1221
1873	255.5385	260.9025	1128.988	1234
1874	259.9635	264.9845	1160.054	1242
1875	262.6651	268.2588	1220.331	1265
1876	266.0525	271.6238	1225.356	1279
1877	265.7547	270.7924	1140.549	1266
1878	264.7254	266.6242	1102.738	1268
1879	263.5008	261.1488	1192.361	1249
1880	263.9915	260.5439	1216.348	1229
1881	263.981	260.7672	1255.543	1212
1882	262.4911	257.8438	1221.329	1179
1883	261.4681	255.0746	1335.92	1189
1884	259.7559	252.1469	1385.664	1187
1885	261.5591	251.5411	1247.009	1223
1886	265.3577	252.3935	1250.271	1175
1887	268.7647	253.8187	1278.302	1185
1888	269.1351	254.2346	1260.24	1156
1889	266.9299	253.9485	1403.412	1158
1890	265.5668	251.6685	1428.844	1200
1891	265.1555	250.0377	1449.496	1188
1892	266.6252	249.7982	1394.176	1169
1893	267.8908	249.9892	1343.049	1148
1894	265.6305	249.2147	1362.857	1132
1895	262.3309	247.4353	1361.991	1135
1896	260.0722	247.0229	1397.161	1145
1897	260.6988	247.8595	1409.449	1116
1898	263.7803	249.4622	1414.443	1140
1899	267.3209	252.7126	1368.739	1157
1900	270.0701	254.5563	1315.675	1189
1901	272.7088	257.4892	1354.288	1214
1902	275.5424	262.7872	1392.647	1234
1903	278.2172	266.9814	1432.127	1252
1904	282.7592	272.3033	1518.122	1253
1905	287.4422	277.0005	1513.29	1284
1906	291.7016	283.5302	1441.875	1283
1907	299.4304	293.2926	1348.011	1349
1908	302.3371	296.4831	1438.893	1369
1909	305.5949	301.4068	1472.1	1366
1910	308.8014	306.8306	1506.502	1292
1911	313.5068	310.9442	1499.033	1370

Table 3: summary of the macro series sources for the computation of food and non food series, 1861-1997

Period	Food expenditure, pc e pk 1938	Period	Non food expenditure, pc e pk 1938
1861-1911	New estimates	1861-1890	Barberi
1912-1950	Barberi	1891-1950	Rossi, Sorgato, Toniolo
1961-1997	Golinelli, Monterastelli	1951-1997	Golinelli, Monterastelli

Figure 1 and Figure 2: food expenditure at current and constant 1938 prices: new estimates and barberi's estimates

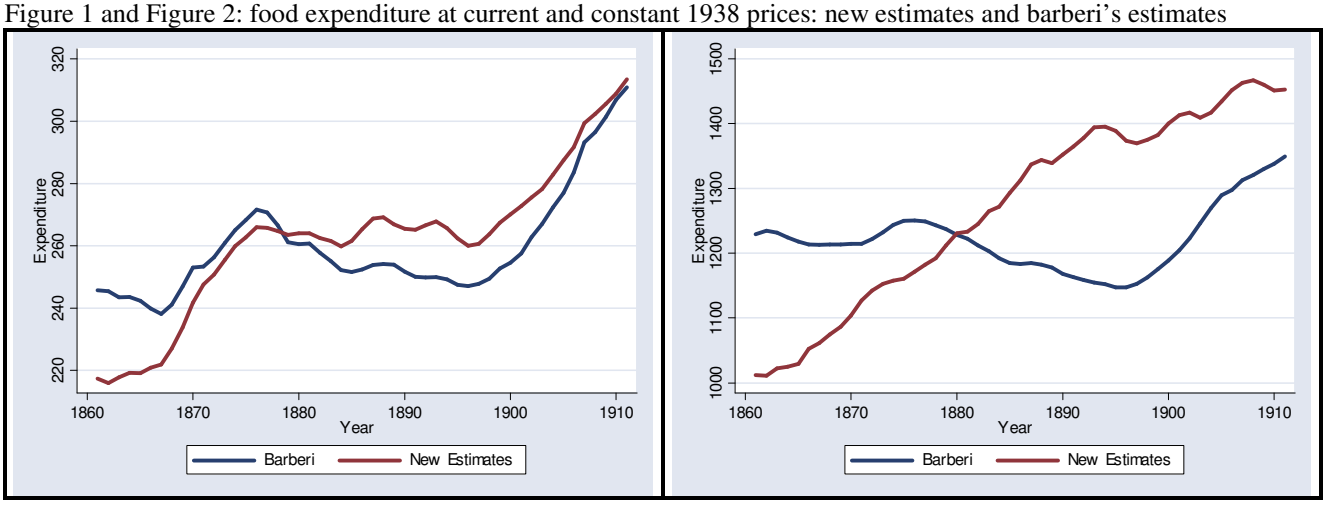
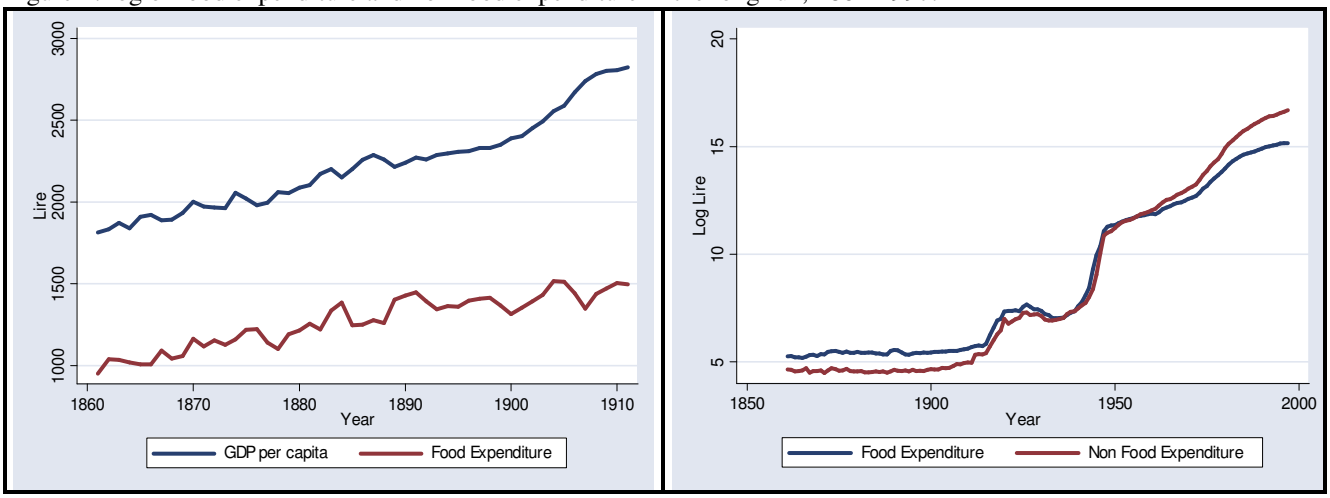


Figure 3: GDP per capita (Fenoaltea, 2005) and food expenditure, both expressed at constant 1938 prices, 1861-1911
Figure 4: log of food expenditure and non food expenditure in the long run, 1861-1997.



Food expenditure as a measure of the Italian standard of living, 1890-1960

Abstract

In this study the Italian standard of living is determined by considering per capita expenditures coming from family budgets between 1890 and 1960; the study is carried out looking at both the total expenditure and the composition of the food basket.

Micro data on expenditures of 8,183 households were harvested from several surveys of Italian family budgets. Data have been organized in a homogeneous manner and weighted using Italian census data in order to represent the entire Italian population through these decades. To ensure the observations are representative of the whole country, the approach introduced by Holt and Smith (1979), based on post-stratification, has been adopted.

Detailed and complete budgets on food and non food expenditures are only available for a portion of the total number of households examined. To compensate for this, the missing value imputation method has been used and is based on both the most modern imputation routine, the Multivariate Imputation by Chained Equation method, developed by Royston in 2005, and on a procedure developed to deal with the probability that the missing value is zero.

The analysis on per capita expenditures is then carried out by differentiating the observations in the sample between four strata, coming from the matrix between two macro-regions of Italy (North/Centre and South/Islands) and the occupation of the head of the household (agricultural and non-agricultural). The time span is divided into five different periods.

The picture that comes out of the data describes a low rise of the Italian per capita total expenditures over the long run; this process has not been homogeneous and has alternated rapid increases (1913-1927 and 1946-1960) with moderate downturns (which were concentrated in the period when the fascist party was ruling Italy). The level of food expenditures definitely reached a high just after World War II. During the period between 1890 and 1940 the disparity of food expenditure between the richer and poorer strata, although decreasing, was still wide. During the 1950's, this disparity between the four strata decreased. As soon as the food expenditure gap between richer and poorer families became smaller, the disparity transferred to non-food expenditures. In addition, as soon as the gap decreased, the types of food purchased changed and slowly switched from cereals to foods richer in proteins.

These findings attempt to enliven the debate about the historical performance of the Italian economy and try to highlight the importance of micro data in studying the standard of living in the

past, which can be considered a complementary perspective to the traditionally used macro data series. The paper shows how the Engel's law, which applies to a number of developing countries of that period, does not work in Italy until a certain quality and quantity in food expenditure is reached. The last statement is biased by the fact that the poorest part of the population presents high values of the food expenditure elasticity. Quintile regressions show how just the richest 25 per cent of Italian families has expenditure patterns more similar to those in other developing countries.

Introduction

The beginning of Italy's *'modern economic growth'* (*à la* Kuznets) can be dated around the middle of the 19th century. Between 1890 and 1950 the Gross Domestic Product (GDP) per person grew 3.3 times and private consumption 1.3 times[13] (estimates computed at constant prices 1938). Over the same period of time, the Italian economy caught up with that of the most advanced European countries: Italy's GDP per person was 45% of the UK's in 1880 and 80% in 1960 (Maddison, 2001). How did this economic success impact standard of living of the average Italian, and how were welfare gains distributed? Overall human economic welfare in the context of modern economic growth sometimes produces winners and losers (Mokyr, 1988). A study to show that the overall standard of living of a country has increased requires computing if there has been equal growth amongst all the social classes in a society or if the growth produced gains for some classes and losses for others.

Over the last few years historians and economists have been working on new and innovative approaches aimed at measuring the level of standard of living in developing economies. Body height, life expectancy at birth, literacy and aggregated indices such as the human development index have all been taken indicators of the quality of life. In this paper, standards of living of Italians are measured by taking into account evidences coming from per capita total expenditure and per capita food expenditure.

This paper is concerned with the relationship between the economic status of families, represented by total expenditure, and their nutritional status, here represented by the expenditure on food. In development literature, there are two kind of inquiries when studying such a topic. The first one, on efficiency wages (Leibenstein, 1957; Mirrless, 1975, Stiglitz, 1976), states that work productivity depends on nutrition in a non linear way. It assumes that those who do not get enough to eat are insufficiently productive and thus will be unemployed since it is not profitable for employers to hire him. The second line of inquiry assumes that quantity and quality of food

[13] The gross national product estimates are from Rossi, N., Sorgato. A. and Toniolo, G. (1993) and are expressed at constant 1938 price. The reference to food and non food consumption derives from author's estimates based on Barberi (1961), Golinelli-Monterastelli (1990) and Rossi-Sorgato-Toniolo (1993).

purchased are influenced by the level of income and the main result of those researches has been the study of the Engel curve (Deaton, 1996). The behaviour of the Engel curve using micro data on Italian family budgets is one of the main topics of this paper. In the recent literature on the Engel curve, there is debate on the extent to which food share responds to movement in the level of income. Conventional wisdom would suggest that hunger will be eliminated by economic growth. Food quantity and quality will rise with income with an elasticity substantially greater than zero. In contrast, some other studies (Behrman and Deolalikar, 1987; Bouis and Haddad, 1992; Bouis, 1994), have argued that elasticity between food expenditure and income might be close to zero, so that an increase in money availability 'will not result in substantial improvement in nutrients intake' (Behrman and Deolalikar, 1987, p. 505). If this position turns out to be true, economic growth does not imply the elimination of hunger and policies which increase the incomes of the poorest might not increase their level of nutrition.

In this paper we also look at the composition of food expenditure. Most authors take total expenditure to be a better indicator of welfare than food expenditure alone (Deaton 2000). We shall therefore first consider the evolution of total expenditure per capita. However, in the early stages of economic growth, food expenditure per capita is a useful measure of well-being, when considered together with total expenditure per capita.

Researchers who have been working on nutritional topics know the explanatory power of basic needs. Food scarcity has heavily conditioned all the societies throughout history. It has often increased mortality which is commonly considered a plague that hits a population when the food supply is no longer able to feed that population. Again, 'the expenditures on the principal foodstuffs and stimulants ….., insofar as this can be established with sufficient certainty, is without doubt one of the most important data from which conclusions can be drawn about tendencies in national prosperity over a specified period of time. A nation is considered to be more prosperous when it is more amply to provide for its needs' (Baudet and Van der Meulen, 1982).

Quantitative data relating to the demand for consumers' items are of two very different kinds: time series and family budgets surveys (Tobin, 1950). Time series are generally aggregated data: observations in successive years of the total national consumption of a commodity. A family budget survey is a set of observations, over a period of time, of the expenditures on the goods by families who differ in income, size and other characteristics.

In this paper we use micro data of household budgets. Micro data regarding total expenditures of Italian families in the 19th century and in the first part of the 20th century, are not easily available. Information on average per capita expenditures, on the other hand, is easier to find: reliable data

exist on production of items, changes in inventories and net exports[14]. Such series do not allow studies of consumption patterns by regions and by sectors of activities of the family. Moreover, aggregate consumption between 1861-1911 is not as reliable as that regarding the years that follow. Consumption series for the period between 1861-1911 is currently subject to revision and index number problems make it difficult to compare consumption time series over the long term.

Micro data on Italian family budgets have been gathered from a large variety of sources. Data has been organized to allow all the information regarding different families to be comparable. Each unit, i.e. family, of the sample has been weighted with the Italian census data in order to gain an understanding of the Italian population through the decades. Per capita expenditures will be analysed taking into considerations four types of households.

The picture that comes out of this data describes a low rise in the Italian total expenditures in the short run opposed to a very sharp increase in the 1950. Between 1880 and 1960 total expenditure per person grew 1.36 times (constant prices 1938). Food expenditure grew 0.7 times while non food expenditure grew 3.2. Thus the levels of food expenditure between four representative households, which showed striking differences for the 19th and part of the 20th century, almost flattened after 1950 thanks to different growth rates. The decade after WORLD WAR II represents the period of time in which food expenditures differences started to converge.

The composition of food expenditures switched from a concentration on cereals to foods richer in protein. The variety of food was enhanced by increasing the ratio of food expenditures to food such as meats, fats, dairy products and luxury food items such as coffee and sugar. From a nutritional point if view, an adequate ratio between animal fats and vegetables was reached immediately after the World War II although the substitution process has started back in the Giolittian period (1903-1914).

The high percentage of poor people living in Italy offsets the well-known pattern of the Engel's curve which does not emerge until after the end of the World War II and which is showed just in the richest 25 per cent of the population. The relationship between food expenditure and total expenditure is observed to be different from that of other developed countries.

As soon as differences in the level and in the composition of food expenditures in the 4 strata started to decrease, the levels of non food expenditure show a divergent pattern between the strata. This behaviour is very often observed in developing countries; once people are able to purchase an adequate level and a good variety of food, their interests switch into non primary needs, such as housing goods, transportation and entertainments (Houthakker, 1952). Again, people who seem to

[14] See for example ISTAT (1986), Golinelli and Monterastelli (1990), Rossi, Sorgato and Toniolo (1993.)

benefit more seem those employed in the industrial sector and in the services. Among these families, those living in the North and in the Centre spent more for non food goods.

The introduction is followed by five sections. Section 1 presents the sources of the data and the way data have been organized in a dataset. The methods used to ensure the sample is representative of the entire nation are dealt with in Section 2, and the imputation method for missing values in Section 3. Section 4 discusses the main results. The paper ends with the customary concluding remarks (Section 5).

Section 1. 1890-1960, micro data: sources and their storage

Data on family budgets, which are essential to study the pattern of expenditures from a micro economic point of view, have not been easily available and required a variety of intensive research both in public and private archives. The data collected for various reasons and purposes come from different family budget surveys that have been conducted in Italy between 1890 and 1960. Family budget survey are considered to be surveys which display information on i) family composition (Table 1 in the Appendix); ii) the head of the household's activities (Table 1); iii) annual or monthly family's expenditures, both food and non food (Table 2) and iv) annual or monthly family income (Table 3). We will refer to these data as to the "basic information" since it will constitute the core of the analysis.

This paper draws upon and supplements a database of household budgets compiled by Rossi, Toniolo and Vecchi (2001) and used in various papers (Vecchi, 1994 and 2000; Vecchi and Coppola, 2006). Data was reorganized to help gathering additional information regarding different aspects of each household: assets and properties owned by the family, family income and features connected with every family's members, such as health and working condition, and mobility variables. There are approximately 500 variables regarding aspects of family life. All this information has been divided into distinct section.

Approximately 50 per cent of the total amount of data regarding families' expenditures and incomes has never been used before while other information is completely new and has never been analysed in any other economic history investigation.

The information collected has been organized in a dataset designed in order to arrange all the data, coming from various sources, into a common structure and that will facilitate the analysis. The dataset is formed into 20 different sections, each of which shows a precise aspect of family life. A sum of all the sections, which will be called worksheets in the following text, is shown in Table 4 in the Appendix. Table 4 gives the details for all the worksheets, the number of questions in each worksheet and the unit respondent.

The total number of families whose data have been collected are 8,183 with 60% of the data coming from single family budget surveys. In this situation, we surveyed all the family members which result in a high percentage of missing answers in some of the worksheets[15]. The total number of people represented in the survey is 33,915. The remaining part of the data, 40%, comes from surveys presenting aggregate data on more than one family. The observations are geographically distributed in Italy in the following way: 5823 in the North and Centre and 2360 in the South including the two islands (Sardinia and Sicily).

In Italy, previous attempts to create a dataset containing data on families were done by Niceforo (1933), Somogy (1959), Vecchi (1994) and Rossi, Toniolo e Vecchi (2001). Their works collected data on demographic, food and non food expenditures and income variables. In Europe such an effort was pursued by Horrel and Humpries (1992). To our knowledge a number of surveys directed to families in the 19th and 20th centuries were conducted in Europe and in America and a few in Africa and Asia (see Houthakker, 1957). There are several differences between data collected through the above surveys and data presented here (Table 5 in the Appendix may provide the reader with a better understanding). Some of the main differences which makes this dataset unique are:

1. data collected from the above surveys do not represent the entire population but just a limited portion of the population while data analysed here tries to represent the entire population;
2. the surveys mentioned above are limited to a short time span, up to 2 years, while data presented here covers a period of over 70 years;
3. the variables in the above mentioned surveys are referring to family expenditure, income and consumption. There are several additional variables collected in this study.

The official collection of family budgets started relatively late in Italy: the first survey which was thought to cover all the country was performed by ISTAT in 1953-1954 although the representativeness of the population surveyed was limited to the 'non agricultural families' (ISTAT, 1958). The two years period between 1963 and 1964 is considered as the point for which family budget data began to be collected on a regular basis in Italy: the representativeness of the entire population was guaranteed both by the inclusion of families employed in a variety of economic activities and by the increasing number of families in the sample (ISTAT, 1968).

For the period prior to 1953, the Italian government did not collect family budgets in a systematic way with the following exceptions:

[15] In the current paper, we just provide the reader with some general indications. This happens because we do not want the description of the dataset to be too technical in those parts which are not completely used in the paper.

1. Inchiesta Montemartini, commissioned by the Italian Ministry of Agriculture, Industry and Trade (MAIC), which collected 257 budgets of rural families living in Puglia (MAIC-Ufficio del lavoro, 1909);
2. a survey undertaken by the National Institute of Agrarian Economy (INEA) in 1928 which gather data on around 217 families living mostly in central Italy and working in the agricultural sector;
3. a survey commissioned by the Italian Government to study poverty in Italy. 148 families were surveyed. These families were working in the agricultural sector and were equally distributed in the North and South of Italy (Commissione Parlamentare di inchiesta sulla miseria e sui mezzi per combatterla, 1953);
4. a survey designed by the statistical office of Trieste which between 1952 and 1962 surveyed 2,138 families living in that city and working in activities connected to the industry and to the service sector.

The sources of data on family budgets in Italy is diverse and is derived from many different surveys and reflects Vecchi and Coppola's (2006) statement that *'learned men such as anthropologists, nutritionists, chemists, social scientists, politicians, intellectuals, and philanthropists practiced the art of compiling household budgets'* (Vecchi and Coppola, 2006). The purposes and methods of these researchers in compiling family budgets were different. On one hand the complexity of sources of data in this study increases the difficulty in comparing data while on the other hand such a diversity may be used to solve the problem that such data does not exist for the entire Italian population nor for all the Italian regions. The scientific proof of the previous statement will be largely discussed in Section 2. The following statement is the evidence that the coverage of the population is in effect guaranteed by the attention that people interested in family budgets had in studying different social classes. While official inquiries were typically concerned with the conditions of the working class families, employed either in the industrial or agricultural field, private researchers were interested in the standard of living of families belonging to the Italian middle class such as small field owners, salesmen and craftsmen. Many families belonging to the upper class, on the other hand, had a habit of keeping records on their expenditures and incomes, as well as other information about their properties, debits, credits and financial assets and were commonly called *'libro mastro'* which literally means 'book keeper'.

Section 2. How data represents the population

As expected, working with this type of material seems to involve three specific problems that have to be solved in order to perform any quantitative analysis: the first is related to the sample size and to its representativeness, the second is related to the quality of data collected and third is related to the presence of missing values. The first two are dealt within the current section while the latter is dealt within section 3.

The number of budgets is relatively small in certain periods and their representativeness can be legitimately questioned. The scarcity of data is not a problem since Italian archives are rich in family budgets and the relative scarcity here manifested is a result of time constraints[16] .

More critical could be the doubtful reliability of the budgets and the quality of data collected in them.

The agricultural and the working class families were not skilled at filling in and, more importantly, at keeping records of household budgets. The accuracy of individual food diaries and household consumption surveys depends on the memory of people surveyed and it relies heavily on people's precision. It can be argued that the degree of carefulness needed to record all the expenditures and all the incomes for one year or for a part of that year would have been too taxing, and therefore the data are not entirely reliable.

These drawbacks have been limited by a careful check of every single record and every single variable; family budgets which did not present reliable numbers about incomes or expenditures have been disregarded. Other records have been corrected when values were not plausible but the correct values could be easily deducted from the text.

More important, neither the income variables nor the expenditures variables present the 'heaping problem' that is the habit that some people have to declare a precise value instead of the real value (let's say that most of the people declare a salary of 50 when in reality the salary is 48.7; this phenomena is also a concern in dealing expenditures variables). The presence of the heaping problem has been checked for all the food and non food expenditure categories as well as for all the variables used to calculate income. The analysis has been carried out taking into consideration the expenditures expressed on both a monthly and a yearly base and at current prices. The results do not show any particular pattern connected with the 'round off' habit above discussed.

[16] The majority of public and private archives as well as libraries in the South of Italy haven't been explored yet, but more than one sign has led us to believe there is a 'fortune' in terms of family budgets in these archives.
Many of the biggest archives and libraries in the north of Italy, on the other hand, have been consulted, but all the 'big company books', which are documents recording the salary of their employees and the welfare of their families compiled by the biggest industries (Ansaldo and Fiat among others), have not yet been discovered. It is reasonable to believe that once these questionnaires are discovered, the number of units in the sample will increase.

The other issue to be solved is the one regarding how the sample represents the entire population. This issue always arises when sample units have not been chosen using a sample design strategy that is set in order to mimic the population but comes from other sampling schemes, as we did here.

In order to make the observations be representative of the entire Italian population, the approach introduced by Holt and Smith (1979) based on post-stratification has been adopted. Post stratification is a statistical technique aimed at *'offering protection against unfavourable sample configurations'* (Holt and Smith, 1979). The same technique was used by the pioneers Rossi, Toniolo e Vecchi (2001) and by Vecchi and Coppola (2006) in order to make the sample used reflect the entire Italian population.

Post stratification consists of two different phases. The first one, that is common to both the sample units and the real population, consists of partitioning the sample of n units (i.e. the population of N individuals) into different strata h. Strata correspond here to macro geographical areas, North-Centre and South-Islands, and to the type of work of the head of the household (employed in the agricultural sector or having some other type of job). For this study we have created four strata which are later defined. The ratio between Nh/nh will then represent the weight that has to be associated with every observation in the sample in the *h-esima* strata. Equal weights are assigned to observations belonging to the same stratum, and different weights to observations in different ones although, by chance, it may happen that units in different strata receive the same weights. The lower is the stratum size, the larger is the weight associated to each unit.

The second step consists of dividing the time spam into sub periods, which are approximately of the same length, and all the units in each sub periods will represent a different sub sample. Family budgets are allocated to one of the five sub periods according to the year the data was collected. Family budgets whose data have been collected between 1890 and 1903 were brought together in order to create the '1895 sample'. The mechanism works in the same way for the remaining four periods: 1907, 1921, 1933 and 1953.

We create 20 strata using two different areas of geographical origin of Italy, North and Centre and South and Islands (Sicily and Sardinia), two different type of sectors of activity depending on the head of household's job, agricultural jobs or any other job, and five different time periods[17]. Table 6 in the Appendix shows the beginning and the end of each sub period, the number of available observations for each of the 20 strata and the 'minimum strata size[18]', MCS, that is

[17] We will refer to the different period as Period 1, Period 2, etc…We will sometimes refer to the four strata as CN-O, CN-A, SI-O and SI-A where CN stands for Centre and North of Italy, SI for South and Islands, A refers to people working in the agricultural sector while O indicates people working in other sectors.
[18] The minimum size for each strata is obtained by the following:

required in order to have a representative sample. Table 6 shows how no strata present either the noncoverage or the undercoverage problem, that is respectively the completely un-representation or the misrepresentation of some categories of the population. We do not have any data for the strata regarding people living in the South and in the Islands and working in industrial and other sectors for the period going from 1902 to 1913, 2nd sub period, and for people living in the same area but working in agricultural activities in the period 1946-1960, 5th sub period.

The following statements fix some important issues about sub periods and their choice:

1. the first year of the analysis, 1890, has been chosen mainly for a technical reason; many families budgets are available starting from this year. The analysis stops in 1960 as ISTAT started the collection of family budgets in the 1963 and in 1964 so data on food expenditures at a micro level in the following decades can be drawn from these data;
2. we do not create a sample for the post unification period, 1861-1887, because of the paucity of data referring to the first three decades of the unified Italy. The period between 1940 and 1946 has not been analyzed for reasons connected to the lack of data and to the poor quality of existing family budgets. There is only a small sample of family budgets for this period which cannot guarantee the representativeness of the sample. The occurrence of the World War II introduces the bias in the expenditures computation, especially those regarding food purchases. This is due to the presence of the black market which raised food prices in all of Italy;
3. the number of years referring to each of the five sub periods is approximately the same for all of them (around 13). The size of the time span of each sub period has been decided considering ways to: enlarge as much as possible the size of the sample in order to meet the MCS requirements above explained and to try to create sub periods in which, for each strata, the variance of food and non food expenditures between units is the lowest (Golder and Yeomans, 1973). The following algorithm is then used: a) create five different sub periods, with sliding border years. Some sub periods overlap in order to allow all the strata to meet the MCS condition; b) for each strata, the variance of food and non food expenditure has been computed including or excluding units surveyed in border years as the formula suggests:

$$MCS = \left(\frac{r^2}{z_\alpha^2 \gamma^2} + \frac{1}{n}\right)^{-1}$$

where r indicates the maximum allowable relative error between the estimate and the true value (here it is set equal to 15 per cent), α is the confidence level (0.85 for the first three period and 0.95 for the remaining two) and γ represent the coefficient of variation of the population (1.5).

(1) $$[\sum_{i=1}^{4}\sum_{t=1902}^{1913}\text{var}(food\ \text{exp}+nonfood\ \text{exp}.)_{i,t}]<[\sum_{i=1}^{4}\sum_{t=1901}^{1912}\text{var}(food\ \text{exp}.+nonfood\ \text{exp}.)_{i,t}]$$

Where *i* refers to the strata and thus goes from 1 to 4 while *t* indicates the time spam considered. The above formula says that the sum of the variance of food expenditures and non food expenditures for the period 1902-1913, computed for all the four strata, is the minimum of all the other variances computed for the other samples built with sliding border years (in formula (1) it is indicated just the sample referring to the period 1901-1912 for brevity). The same formula is applied to all the other 4 samples in the 4 different time periods;

4. each sample has been centred in the average year of the sample. Some periods overlap; that means that 2 per cent of the entire number of observations are used in two different samples (163 units). This happened in order to meet the MCS requirement;

5. each unit in each strata receive a weight; the weighting system is computed according to the Italian population present at that time, whose data come from the Italian Census. When the centre year of each sub period does not coincide with the census year, the Italian population has been computed through linear interpolation between the two nearest Italian Censuses[19].

How the families in each cell represent the real Italian population in not shown yet; in order to meet this requirement, we need to show that the units in the sample mimic in some way the people living in Italy in each of the four strata in the five periods.

The quality of representativeness of each cell is then checked using the number related to the average size of the family for each of the four strata created in the five periods, both for the sample and for the census data. A comparison of these two measures could give us an idea of how families in the sample well represent the totality of families living in Italy. The comparison of the two numbers, Table 7, highlights two aspects: i) there is not a huge gap between the 'true value' and the value coming from the sample in all the 20 cells and ii) the differences between the value coming from the census and the one obtained by the sample do not express any kind of pattern that can let us to think that the sample under estimates or over estimates in a systematic way the average family size in the four strata for the five period.

[19] The Italian Censuses we are referring to were done in the following years: 1861, 1871, 1881, 1901, 1911, 1921, 1931, 1936, 1951. The centre years for each samples are the following: 1895, 1907, 1921, 1933 and 1953. Apart from the sample whose centre year is '1921', the centre years for the other samples do not coincide with any Italian Census. In order to compute the weights, the Italian population in 1895 has been computed by interpolating the results coming from the Italian census in 1881 and 1901, those in 1907 using the 1901 and 1911 Italian Census and so on.

Section 3. Non responses and data imputation

The number of budgets analysed is 8,183. Complete budgets[20] constitutes just a small amount of the total budgets, around 2 per cent. The percentage increases to 12 per cent if we just consider food expenditure variables and to 25 per cent if we restrict the analysis to the variable referring to income. Demographic variables present a percentage on missingness equal to zero.

The missing value problem is part of the ongoing debate and the perfect solution is still far to be discovered; the problem is particularly important in the current analysis, since family budgets here collected come from surveys which are different in purposes by definition and then gather a kaleidoscope of information which differ among all the surveys.

Common methods do not work in the current situation. The strategy that suggested to only consider complete budgets does not seem the best one since it implies that the majority of the budgets should be disregarded. Missing values imputation technique must take into consideration the fact that one and just one missing value out of the 119 variable referring to the expenditures may cause the total expenditure aggregate to be missing as well. This happens because all the voices are linked together by formulas which here are called 'edits'; an example to illustrate the above concept is shown below:

(1) *Bread and Cereals= Bread+ Biscuits+ Flour+ Rice+ Pasta*

(2) *Total food expenditure=(Bread and Cereals)+ (Meat)+….+ (Alcohol)*

(3) *Total expenditure= Total Food Expenditure+ Total Non Food Expenditure*

All the terms in the formula refer to the amount of lira spent purchasing the item. If one term on the right hand side of formula (2) is missing, let's say '*Bread'*, the aggregate called, '*Bread and Cereals'*, is going to be missing as well and so do the aggregates '*Total food expenditure'* and *'Total expenditure'* as follows from the formula (3) and (4). This means that the lack of a marginal expenditure variable, let's say *'Sweets'* forces *'Total Food Expenditure'* and *'Total Expenditure'* variables to be missing as well. These 'edits' work in the same way for all the other groups of food (see Table 2).

A previous screening of all the family budgets has been done during the data entry period in order to detect any possible pattern in the expenditures worksheet of missing values which may be considered with an high percentage 0 values. The ratio of the previous statement lays in the fact that either the interviewer and the interviewed were not good statisticians and, probably, they did not

[20] 'Complete budgets' stands for budgets for which we do have information about all the demographics, all the 49 variables referring to food expenditures and 70 variables referring to non food expenditures.

know the difference between *'0'* and a missing value: when some expenditures were in reality '0', they chose indifferently between filling the appropriate cell with a '0' or leaving it empty.

The procedure then took into account the fact that a missing value can be either zero or any other value different from zero. The imputation technique that was used here is based on the following three steps; the first two were performed at a data entry level while the last one was carried out later on:

1. we screened all the surveys to see whether values are missing as a consequence of forgetfulness of the interviewer or of the interviewed;
2. if the statement 1. is proved to be true, the value '0' was imputed;
3. if the statement 1. is proved to be false, the missing value was imputed later on using another procedure.

The iii) step imputes missing values by using a technique called 'Multiple Imputation by Chained Equation (MICE) (Royston, 2004) that consists of an iterative multivariable regression technique.

The basic idea of MICE is to create a small number of copies of the data each of which has the missing values suitably imputed. Estimates of parameters of interest are averaged across the *m* copies to give a single estimate (Royston, 2004). Missing values are assumed to be missing at random. MICE procedure has been preferred to the 'hotdeck' method because this last technique 'may perform poorly when many rows of data have at least one missing values', as in the current dataset happens (Royston, 2004).

The idea of multiple imputation is to create multiple imputed data sets with missing values replaced by imputed values computed in a way that is later explained. Conceptually, to create multiple imputed dataset for multiple variables $x_1, x_2, \ldots, x_k$, with missing observations, MICE does the following:

1. ignore units for which every variable of the list $x_1, x_2, \ldots, x_k$ presents a missing value. This step eliminate families for which it is impossible to impute any values;
2. for each variable with any missing value in $x_1, x_2, \ldots, x_k$, MICE randomly order that variable and replicate its observed values across the missing cases. This step initializes the iterative procedure by filling in missing data at random;
3. for each of $x_1, x_2, \ldots, x_k$, MICE imputes missing values by applying a routine which imputes a single variable given a set of predictor variables. Here the sample has been divided according to the 20 strata defined above. Missing values have been imputed for the following expenditure variables: *'Bread and Cereals'*, *'Meat'*, *'Fish'*, *'Oil and Fats'*, *'Cheese, Dairy Products and Eggs'*, *'Vegetables and Fruits'*, *'Alcohol'* and *'Total non*

Food Expenditure'. *'Total Food Expenditure'* results from the summation over all the food expenditures categories while *'Total Expenditure'* is the sum of *'Total Food Expenditure'* and *'Total non Food Expenditure'*. The OLS regressions used to impute missing has been run using information coming from the following set of variables: *'Total Expenditure'*, *'Total Food Expenditure'*, *'Total Family Income'*, *'Number of Family Members'* and *'Number of Working Components'*.

4. the step above is repeated ten times.

This algorithm imputes missing values on one variable, *y*, using information from both this variable and others variables, x_i, according to the following steps:1) estimates the vector of coefficients, *beta*, and the residual variance by regressing the non-missing values of *y* on the completed" version of x_i. Predict the fitted values, *etaobs,* at the non-missing observations of *y*; 2) draw at random a value, *sigma star*, from the posterior distribution of the residual standard deviation; 3) draw at random a value, *beta star*, from the posterior distribution of *beta*, allowing, through *sigma star*, for uncertainty in *beta*; 4) use *beta star* to predict the fitted values at the missing observations of *y*; 5) for each missing observation of *y* with prediction *etamis*, find the non-missing observation of *y* whose prediction, *etaobs*, on observed data is closest to *etamis*. This closest non-missing observation is used to impute the missing value of *y*.

MICE creates one single data set with multiple copies of imputed data inside. The value for each variable is then computed with the sample mean between all the 10 different values.

The end result is a sample of 8,183 completed budgets providing information on the expenditures on different areas of food and on the total non food expenditures.

The visual results for the imputed values and for the original non missing values are in the appendix. Figures 1 to 7 show the pattern of imputed and original values for the categories in which food expenditure is composed by: expenditures on cereals, meat, oil and fats, dairy products, fruits and vegetables, sugar and coffee and alcohol. The figures illustrate how the imputed values reflect the pattern of the original data, not increasing the original variance of food expenditures.

How well does the current sample represent features of the Italian population? There cannot be a precise answer to this question since the feature in itself, food and non food expenditure, is a result of estimates. It is worthy to mention that a comparison between two benchmark-estimates, Barberi (1961) and Rossi, Sorgato and Toniolo (1993), and the data coming from the current sample has been made. The discrepancies in term of percentage are shown in Table 8. What is worth noting is that the current sample always underestimates total food expenditures, -14 and -22 respectively. The contribution of the underestimation comes randomly from all the categories in

which total food expenditures is composed by which let us think there is not a pattern of underestimation or overestimation in the sample. The same analysis cannot be carried out taking into consideration Rossi, Sorgato and Toniolo since they do not show estimates of the different food expenditure categories. The comparison of non food expenditures shows different results depending on the benchmark considered: estimates coming from the current sample are positioned half a way between the one of Barberi and the one Rossi, Sorgato and Toniolo until 1929, then they underestimate non food expenditures.

Section 4. Food expenditure in the family budget in Italy: 1890-1960

Income is the most obvious measure of welfare among families and the principal cause of differences in the level and quality of food consumption; in addition income is considered the central factor in all family budgets analysis (Houthakker, 1952). Its use is limited as its influence may be lagged over time and as it requires some consideration about savings that are not always feasible with family budgets data (Tobin, 1950). Thus one may have to work with total and food expenditure instead as it is done in the current analysis. 'The gain in statistical precision probably outweighs any theoretical difficulties this may cause: it might even be argued that total expenditure fits much better into a theoretical scheme which effectively ignores savings' (Houthakker, 1952).

According to a 1890 survey conducted by the Countess Maria Pasolini (1890), a day labourer employed in a farm in the Centre of Italy used to earn about 587 lire, current price, adding both the salary and the income in kind. The nutrition of his family, composed by himself, his wife, unemployed, one son and two daughters, took 73 per cent of the available money; the remaining was split among the expenditures for housing, heating and lightening (17 per cent) and for clothing and taxes (10 per cent). The greatest expenditure in the family budgets was then the one regarding food. Diversification of the diet was not ensured considering the large amount of cereals purchases.

Same indications come from a budget share at the end of the 19th century of a family of a 'non specified industrial worker' based in Milan composed by the father, its wife, their two sons and a sixteen years old daughter. Daily salary was approximately of 7 lire and 25 cents; 4 lire and 50 cents, 60 per cent of the total income, were spent on food. The purchase of bread was the most relevant expenditure in the family budget.

The former descriptions fits well within the Italian reality; the situation in other developing countries, having approximately the same level of GDP per capita, was completely different (Table 9). Food budget shares in the table are computed to the net of the expenditures related to lighting and heating in order to minimize the effects of different weather conditions in different countries. The use of food budgets share is a particularly suitable feature that allow to compare demand

systems in different countries without having problems connected with exchange rate or unit of measurement (Deaton, 1976).

Such comparisons lead to a couple of interesting observations:

1. Italian food budgets shares in the four strata stay constantly above the 50 per cent level. That percentage represents the upper limit for the foreigner budget share;
2. the differences between the Italian food budget share and other countries' food budget shrunk in the period following World War II.

A general view of per capita food expenditure availability for the four strata, measured with a constant price 1938[21], Figure 8, allows us to detect three different levels of food expenditure. It is clear how:

1. people employed in industries and in other sectors have the highest level of food expenditures (1,043 and 1,052 for the North-Centre and for the South-Islands);
2. people employed in agriculture in the North-Centre and in the South-Islands have lower food expenditure levels (-22% and -44% respectively, respect to the highest level);
3. the high difference between the two groups of strata lowered in the period between 1913 and 1929; after this point in time, changes in food expenditure availability move in the same direction and with the same intensity for the four strata, although the levels are different.

One remark has to be done: it is impressive the high level of per capita food expenditure in the South-Islands/Other sector strata especially if we consider that the main Italian industries were not located there. We must say that the variance of the aggregate 'food expenditure' is higher in this stratum than everywhere else although this feature is going to shrink beginning from the fascist period[22]. The same evidence applies to the per capita total expenditure. This suggest that welfare was concentrated in the hands of few families rather to be equally spread among all the families.

Differences between peasants living in the North and those living in the South are striking when we look at the food basket composition in lire: the south purchased less meat (145 versus

[21] All the estimations presented in the paper are computed at constant prices 1938. The same analysis has been run using constant prices 1911 with no particular distinction from the former. We here do not report this last analysis.
[22] The food expenditure ratio between the 90th and the 10th percentile for the stratum SI-O, 3.381, is higher compared to the same ratio in the other strata, that is 2.79 in CN-O, 3.00 in CN-A and 2.075 in SI-A. The same analysis cannot be carried out in the second period since we lack data for the SI-O stratum but in the third period the values are very close denoting a similar distribution of food expenditure in all the strata.

27[23]), vegetables (154 versus 21), fats (46 versus 16) and alcoholic drinks (92 versus 46[24]). The common part of their diets was the very rare presence of meat.

Differences regarding the amount of money spent on different categories of food traced a distinctive diet for agricultural based families living in the North/Centre and those living in the South/Islands. Maize, in all its form, was purchased and eaten especially from people in the Centre and North while agricultural based families in the South based their diet more on grain, vegetables and legumes (Celli, 1894).

The diet of the poorest, wherever they lived, was more homogeneous since it was constituted by bread made with grain flour and broad bean flour. It is clear how this meal, although very poor from the nutritionist point of view, has the great advantages of making people feeling full (Ghepardi, 1904).

Differences in the economic status of peasant in the North/Centre and those in the South/Islands represented the focus of a lively debate. On one hand, some historians indicate the protectionist tariffs, in 1878 and in 1887, as the principal cause of the backwardness of agriculture in the South while others point the finger toward some political choices rather than economic policies. In this context, we justify the above difference explaining the different structure of the agricultural sectors in the two macro regions and pointing some decision of the agrarian policy:

1. the '*mezzadro*[25]', which was the common agricultural worker in the North and in a portion of the Centre of Italy, lived in a economic condition certainly safer than the one of a daily worker employed in a '*latifondo'*. The agriculture itself was more productive in the North thanks to mechanization and the introduction of agricultural chemicals, both of which were still absent in the South (Salvatori, 1976);
2. the agrarian policy that was set in the 'Giolittian era', whose main features were duties, agrarian credit, professional education and the drainage of lands, had its impact mostly in the North where those stimulus were better acknowledged (Toniolo, 1988).

Per capita food expenditures in the South and in the Islands for people employed in agriculture did not experience any raise in the period 1902-1913 and increased by 77 per cent in the

[23] Low meat expenditure for people working in the agricultural sector in the South and Islands is in fact true. Data used in this analysis do not underestimate the effective expenditure on meat for peasants working in the South and in the Islands since self consumption, as well as consumption of food purchased via market, is computed. The cause of such a low expenditures is twofold: high relative price of meat and presence of the tax on slaughtering.

[24] Wine purchases are not a big expenditure in family budgets. It must be said that the access to wine was restricted to most and peasants were not used to consuming large volumes of wine. Most of the time the quality of wine was fairly low. In addition to its price, which was reasonably prohibitive, the Italian government set a flat rate duty on wine purchases. A confirmation to this is derived from the fact that wine consumption, deriving from the Italian statistics, started to decreased in 1891 and coffee, beer and vermouth slowly took its place.

[25] The activities of a *'mezzadro'* is regulated by a contract which states that he has to share the harvest and all the products coming from the land with the real owner of the land.

period starting in 1913. The reason of the delay lays in the migration flow that occurred between 1890 and 1910. The migration rate raised from 10 per thousand at the beginning of the 20th century to 24 per thousand in 1913 in all Italy but 45 per cent of emigrants came from the South of Italy and the islands (Toniolo, 1988)[26]. The outflow freed job positions and allowed foreign remittances[27]. In addition, in the period between 1908 and 1911, the annual growth rate of the agricultural output was of about 5 per cent (Fuà, 1981).

Higher level of money availability, although it guaranteed greater variety and more food substitution compared to poorer strata, did not mean an adequate level of nutrition for the richer strata, at least until the 1950s. Proofs of the above statement follow:

1. high level of food expenditures were devoted to cereal purchases. Bread, flour, polenta, pasta and rice remained the main ingredients of every day nutrition all over Italy. This remains true until the end of the World War II. The variety in food purchases was ensured by the limited purchases of meat and of vegetables. Little wine and almost no fats, both animal or vegetal, were added to meals (Figure 9 in the Appendix);
2. the relation between food budget share and total expenditure shows how a rise in total expenditure is mostly used to buy food items till the 1940s (Figure 10);
3. the saturation level was reached for cereals, whose consumption had been high in each period of the analysis, but not for meat, dairy products and sugar and coffee. This means that Italians tried to spend additional coin of lira on any food rather than cereals. Food such as coffee, sugar and cakes were perceived as for the elite until the 5th period (Figure 11, 12, 13, 14).

It can be argued that in the first 20 years of the 20th century something changed and Italy started to catch up with other more developed European economies. The growth regarded the broad sector of the economy from the GDP per capita, to consumption, from real wages to schooling.

The mix of food expenditures slightly changed too thanks to a rise in money availability in all the strata considered. The hypothesis that the World War I and the immediate post-war era caused an egalitarian impact on household expenditures is supported by the data (Zamagni, 1983). The main features of the 1913-1927 period are a decrease in cereal and vegetable expenditures and a rise

[26] The outflow in the agricultural sector was so big that Toniolo computes that for each Italian worker leaving one agricultural activities for an industrial one, there are two who leave Italy and decide to go to work in the industrial sector abroad.

[27] The government survey aimed to study the condition of peasants in the South and Islands collected the thoughts of these people about the migration phenomena; the common belief there was that without migration they would have starved and that if people had not moved away they would have been obliged to kill them in order not to be killed by hunger (Bordiga, 1909). The positive consequences in term of nutrition came not only from migration but even from the death of 600 thousands soldiers during World War I and from the death of 300 thousands people for the so called Spanish disease (considered a direct consequence of the war) (Mortara, (1925).

in the expenditures of goods considered prohibitive for most of the Italian population of that period: meat, fish, fats, sugar and coffee among the others. Expenditures on meat was still one of the lowest in the western Europe.

In the cereal group, polenta and flour started to lose their main roles while pasta and bread made with wheat started to have an increased importance in the average diet. The diet, still based on 'poor' food, started to vary and to be richer in protein. Soup with rise, potatoes, cabbage and beans was not a rarity anymore in the midday lunch and milk started to be present in every day's breakfast (Serpieri, 1910).

Surveys made about living conditions of workers in Abruzzo and Molise, in the centre and south of Italy respectively, showed how the wheat was slowly taking the place of grain. Pasta, which was rarely consumed previously, showed up more often in the everyday meal. In Campania, wheat bread was slowly substituting melic, nut and lupin bread (MAIC, 1909).

Meat consumption was still one of the lowest in western Europe although with some striking regional differences. In the period from 1890 to 1901 in Lazio, where all the political and bureaucratic offices increased the value of average consumption, the average meat purchase was of approximately 29 kilos per person; it was 12 in Piedmont and in other regions in the North and in the Centre of Italy. Meat consumption was lower in Sicily, Umbria and Marche (from 7 to 11 kilos) and it was minimum in Puglia, Basilicata and Calabria (5 kilos).

As it has arisen from the analysis of family budgets, meat consumption was higher for family whose head was employed in the industrial sectors or in the services. 80 per cent of people working in agriculture did not eat any meat, although the official statistics might not considered the underground slaughter of poultry, rabbit and game (Maic, 1909).

This great impulse, as it has been defined by Toniolo (1978), observed that expenditures were driven to a good extent by a reduction in the wage gaps (Rossi, Toniolo and Vecchi, 2001; Zamagni, 1984; Zamagni 1989). Other sectors, although not really linked to consumption, help explaining the increased welfare of the Italian people: an increase in schooling, the amount of savings, and in the number of newspapers bought (ISTAT, 1958).

The period between 1927 and 1940 can be considered one of the most disruptive periods: food and non food expenditures lowered and the diet lost the variety it had achieved in the years before. Evidences come from the reduction in the GDP per capita and in the level of wages, which decreased by 34 per cent between 1928 and 1934 (Vannutelli, 1958).

Total expenditure levels came back to those of the turn of the century, as well expenditures for different type of food: vegetables, meat, fats, drinking, sugar and coffee and even cereals returned

to their former levels. Nevertheless, standard of living in the rural area worsen more than the one of people living in cities; this fact is confirmed by the increasing migration towards urban areas and stresses the failure of the agricultural policy (Toniolo, 1980).

Mussolini policy in term of agriculture and nutrition, the so called "grain battle", was in reality an attempt to promote consumption of cereals in the Italian diet rather than foods rich in protein which were too costly for the Italian balance of payments. Cereals plantations were protected by tariffs and pasture land was forcibly converted to crop land even in hilly side area which notoriously does not have a comparative advantage in that type of cultivation (Giannetti and Rustichini, 1978). Not considering oil of olive production, which totally collapsed, the most critical feature of agriculture regarded the cattle-breeding activity that is considered the most valuable sector in a modern agriculture (Toniolo, 1980).

Two European nutritional revolutions can be placed at some point in between the 14th and the 19th century (Braudel, 1895). The first one consisted of an increase in calories intake although the amount of cereals in the diet stayed the same; the second one changed the ratio between animal and plant proteins increasing the portion of food having animal origins. This second revolution took place in different years: in France at the end of the 19th century while in UK at the beginning of the following century though the process started a couple of decades before.

The shift from a cereal based diet to a meat based one was delayed in Italy and occurred just after the World War II.

Actually food expenditures and then nutrition started to rise even before the end of the World War II. Some surveys made in Rome and in other big Italian cities show how quality and quantity of nutrition increased gradually starting from 1942 when the war had hypothetically damaged the industry and stolen workers from the agricultural sector. 1942 marks the passage from an economy based on the official markets to one in which foods purchased on the black market becomes substitutes for those provided by the rationing system (Luzzatto Fegiz, 1984). It is still questionable whether the black market system has been able to cause the shift for all the Italian population or, more reasonable, just for a part of it, i.e. the richest one.

Micro data here analyzed are unable to explain this feature and this is part of the reason why the period between the 1940 and 1946 is not considered.

Data shows a clear increase in food expenditures in the last period considered here, from 1946 to 1960. Here the increase in regards to the totality of the population is represented by the four strata.

The last period sees a reduction in the food expenditures differentials between the richest and the poorest strata. The distance between the lower and the higher strata goes down by 30 per cent with respect to the first period.

The convergence process showed here by micro data on family budgets continues in the 60s and 70s as shown by the Italian official statistics presented by Istat in which four geographical areas and three types of families are taken into account (ISTAT, 1986).

Differences between the strata started to be showed in non food expenditures (Figure 15). This means that when nutrition reached a fairly good level for everyone thank to the increase in per capita food expenditure, food budget share obviously decreases and at the same time differences between different strata can be measured with per capita non food consumption. As a proof of the increasing welfare, for the first time non food expenditure are higher than food expenditures; in addition Italian car production rose from 369,000 in 1958 to 1,000,000 six years later; that of refrigerators from 500,000 to 2,200,000 and that of washing machine from 100,000 to 1,200,000 (Storchi, 1999).

The pattern that non food expenditures show from 1890 until 1960 is straightforward: the level is low and almost equal for all the four strata. Divergence between strata appears after the World War I but it explodes in the 50s when the richer strata, people living in the South-Islands and employed in industry and other sectors, spent 2.5 times more on non food items than the poorer strata, people living in the North-Centre and employed in agriculture.

Section 5. Engel curve and the pattern of the budget share

The most remarkable feature of this long and slow process regarding the diet's changes is the lack of the Engel's curve dynamic. While in other countries higher per capita income allowed people to eat better and to enrich their consumption basket with non food goods, Italians still spent a considerably high amount on food. The Engel curve for countries other than Italy is showed in Figure 16.

The values of food expenditure elasticity are consistent with the above statement. Table 10 shows the OLS estimates for the following model:

(5) $$FE_t = \alpha_{0t} + \alpha_{1t} TE + \alpha_{2t} HSIZE + \alpha_{3t} SOUTH + \alpha_{4t} AGR + \varepsilon_t$$

where $t=1,\ldots, 5$.

FE represents family food expenditure (in log), *TE* is total family expenditure (in log), *HSIZE* the number of family's members, *SOUTH* is a dummy variable taking the value 1 if the household lives in the South or in the Islands of Italy and *AGR* is another dummy variable taking value 1 if the

household works in the agricultural sector. The regressions are carried out considering the 5 different periods.

The most valuable result which come from the comparison of the 5 regressions is that the value of the elasticity of food expenditure to total expenditure is decreasing constantly through the years (from 0.6 in 1895 to 0.3 in 1955). What is more interesting is that the value of the elasticity dropped of just 30 per cent between 1890 and 1940 and of 31 per cent in a twenty years period, between 1940 and 1960 although total expenditure did increase between 1890 and 1940 (+47%). This evidence confirm the belief that the usual pattern of the Engel curve does not apply to Italy before WORLD WAR II.

The sign coefficients associated to the other variables in the regression set are straightforward: living in the South and in the two Islands and working in activities connected to the agricultural sector lower food expenditure.

Quintile regressions show different patterns of the Engel curve. Equation (5) has been estimated differentiating the poorest 75 per cent of the population from the remaining 25 per cent. The poorest 75 per cent of the population results to spend an higher percentage of their expenses on food thus altering the final results on Engel curve. The richer part of the population, the last 25 per cent, on the other side, seems to behave in line with the general Engel curve findings. These results, which are showed in Table 11, enlighten us for two reasons:

1. previous high values of Engel curve in Italy are representative of a big part of the population but not of the entire one;
2. 25 per cent of the Italian families shows a Engel curve pattern that is closer to the one showed in the other developed countries.

To better understand the salient features regarding food and non food budgets share in Italy we propose a statistical summary (Tables 12). Within each of the five sub periods, we propose budgets shares regarding three groups of families according to one of the three quintiles they belong to. Quintiles have been computed taking into consideration the amount of total expenditure. The differentiation is needed in order to show how the patterns of expenditures choices in the long run has not been homogeneous among families differently endowed as it has been showed by the quintile regression above explained.

Food share does present striking differences between poorer and richer families. In the first period, 1890-1902, the higher food budgets shares were the one regarding the poorer strata of the population (lower 33 per cent). Food budget share for them has been computed to be approximately

of 71 per cent; on the contrary, richer families used to devote 65 per cent of their total expenditure to purchase food. In the last period, 1945-1960, differences in food budget share are less striking. Poorer families still devote a higher share of their budgets to purchase food, 55 per cent, but the distance in term of food share between richer and poorer household is now very little (3 per cent). To better understand the previous dynamic, we provide the trend of the Engel curve over time:

1. food budgets share declined by just 6.5 per cent in the period going from 1875 to 1940 (pooled sample) and by 32 per cent in the last 10 years of the period analysed. Previous percentages stress the fact that food budget share did not react to the total expenditure increase in the period going from 1890 to 1940. Same evidence was showed in the Engel curve study;
2. poorer (richer) families experienced a percentage decline in food share of 3.4 (6) per cent between the first and the forth sub period, and of 50 (22) per cent between the forth and the last sub period[28]. This finding stresses the fact that poorer household did not reduce their food budget share until the nutrition level reached by their diet was adequate. Higher decrease of food budget share for richer families between 1890 and 1940 indicates that they could devote an higher part of their budget to non food items.

The composition of food expenditures has similarly undergone dramatic changes, although the main changes have been taken place in the last sub period of the analysis. The most remarkable features are:

1. the decline in the share of cereals. Comparison between the first and the last period shows how on average cereal share declined from 33 to 14 per cent. This is a predictable aspect of nutrition in the growth process of a country. As one might expect, the share of cereals, the cheapest source of calories, has been always higher for the poorest families.
2. the substitution effect, which involves the passage from cheap calories to more expensive protein based food (milk derivatives and meat). The switch from cereals to milk and milk products, meat, fats, and other foods, is consistent with the Bennet's Law[29] (Penders and al., 2000). The substitution process has occurred among both the richest and poorest quintiles. To be precise, the decrease in cereal share has been slightly higher for the richer (minus 62 per cent) than for the poorer (minus 52 per cent);

[28] The previous numbers give the reader an idea of how, in Italy, the substitution away from food into non food items would appear to occur more rapidly when income levels were high. This underlines the need for a functional form that incorporates non-linear income effects, as it will become clearer in the next session.
[29] Bennet's Law states that households switch from less to more expensive calorie consumption, such as from cereals to meats and fresh fruits and vegetables, as incomes rise.

3. the substitution process, although more dramatic after the end of World War II, has been continuous for the remaining years considered (1890-1940). Proofs in that direction come from the decreasing share for cereals, and the increasing shares for fats, meat and dairy products. The substitution process presents differences according the category of families we are referring to (richer or poorer households);
4. changes in the allocation of food expenditures, rather than in the cereal category, have been more pronounced among the poorer families than among the richer. Indeed, the composition of food expenditures for the richest household has been more stable.

Non food shares follow a fairly different pattern. Differences between the top and the low quintile are in the range of 10 per cent. This difference holds for almost one century and started to face a severe change just after World War II. Differences in non food shares get bigger in the '50. Richer families started to devote a bigger amount of money to purchase non food items compare to poorer families although the share of money devoted to non food items were the same for the two categories of household.

Section 6. Conclusions

This paper represents an attempt to describe the living standard in Italy through the use of micro data on expenditures. It takes the inheritance of other papers which deal with Italy using micro data as well. The current paper develops different strategies from the previous researches which can be summed in the following three points: it analyses a time spam longer than the one studied by Vecchi and Coppola (2006) and it tries to characterize different levels of per capita expenditure taking into consideration four different strata, representing distinct households, rather than considering the country as a whole as in Rossi, Toniolo and Vecchi (2006). In addition, the sample considered is constituted by a larger number of families.

The study has been carried out considering two Italian macro regions and two sector of activities and the results come from the analysis of per capita food and non food expenditure. The results show a country presenting the main differences among the households working in different sectors rather than living in different places. This means that differences in term of expenditure availability did not regard people just living in the North and in the Centre on one side and people in the South of Italy on the other; it rather tells us that the standard of living of people working in the agricultural was, on average, way lower than the one of people working in other sector. Inside this frame we can add the fact that the North was better off than the South. Differences among strata regard mostly the expenditures on food, since expenditure on non food items do not show any

divergence pattern among strata at least until 1946. This is the reason why food expenditures received more importance in this paper; the situation nowadays would be completely the opposite. Differences between families in 2006 would take into account non food expenditure since nutrition and food consumption has already reach an high level for everyone so that inequality has transferred to other indicators.

The analysis has shown other interesting points. We would like to mention here the fact that the Engel curve does not have the common trend until 1950. This means that a big part of the increase in total expenditure was still devoted to buy food. Italian food budget shares were one of the higher in other European or American countries of that time. This led to a couple of observations that, rather to be the explanation of the 'non applicability of the Engel curve', would give some hints useful to understand the peculiarity of Italy in issues connected to food. The first is that Italians in the forty years after the country unification used to eat in a very poor way both from the nutritional and from the quantity point of view. The modification of this 'steady state' obviously took some decades. The second one is that Italians tried to reach a better nutritional standard, which means better quality and a wider spectrum of variety in food consumption, even when the minimum amount of calories was finally guaranteed, around 1920. All the other needs, which are not strictly basic but certainly important for a high quality life, such as clothing, expenditures connected with the house and its furniture, entertainment, appeared in a consistent way in the average Italian budget just when the food need was totally satisfied.

Appendix I

Table 1
List of the demographic variables collected in the sample

Family demographic variables	Individual demographic variables
• Age of the head of the household; • Gender of the head of the household; • Number of family component; • Work of the head of the household.	• Age of each components • Gender of each component • Work or activity of each component

Notes: the percentage of response regarding these variables is approximately 100% and the unit respondent is the head of the household, first column, and all the family components, second column.

Table 2
List of the variables regarding food expenditures

Aggregated variables	Disaggregated variables
Cereals	• Total expenditures on cereals; • bread; • biscuits and pastries; • flour; • rice; • pasta.
Meat	• Total expenditures on meat; • veal; • beef; • poultry; • rabbit and turkey; • pork; • mutton; • horse meat; • other meats; • cured pork meats.
Fish	• Total expenditures on fish; • fresh and frozen fish; • processed and prepared fish.
Oil and fats	• Total expenditures on oil and fats; • oil; • oil of olive; • other oils; • animal fats; • other vegetables fats; • butter; • other animal fats.
Diary products and eggs	• Total expenditures on diary products and eggs; • milk and milk products; • cheese; • eggs.
Vegetables	• Total expenditures on vegetables; • potatoes; • fresh tomatoes; • tomato sauce; • preserved vegetables.

Legumes	• Total expenditures on legumes; • fresh bean; • broad bean; • peas; • other fresh legumes; • preserved legumes
Fruits	• total expenditures on fruits; • fresh fruits; • dried fruits; • preserved fruits
Sugar, coffee and sweetie	• total expenditures on sugar, coffee and sweetie; • sugar; • Sweets; • tea; • coffee.
Drinks	• Total expenditures on drinks; • mineral water; • other non alcoholic drinks; • total expenditures on wine and vinello; • wine; • vinello; • beer; • liqueur.
Non food expenditure	• non food expenditure

Notes: the unit respondent is the head of the household.

Table 3
List of the variables regarding family incomes

Aggregated variables	**Disaggregated variables**
Income from employment	• Take home pay; • income in kind.
Pensions and net transfer incomes	• Public transfer (pension and arrears, public study grants, other public transfers); • private transfers (remittances from emigrants, private study grants, other private transfers)
Gross self-employment income	• Self employment income; • depreciation
Capital income	• Rental income (real rents from houses, imputed rents from houses, real rents of lands, imputed rents of lands); • financial rental (interest rate on bank deposit, interest on government securities, other securities yields)
Income from other sources	• Income from other source

Notes: the unit respondent is the head of the household, referring about the patrimonial situation of the family, and each working components. The first information is stored in the "Head of the Household Section" of the survey while the second in the "Family's Component Section".

Table 4
Structure of the dataset

Structure of the Dataset	
List of Sections	***Unit respondent and number of variables***
Demographic variables	Head of Household (9) each component (5)
Housing variables	Head of Household (31)
Expenditure variables	Head of Household (156)
Income variables	Head of Household (27); all the working component (14)
Asset	Head of Household (26)
Durables variables	Head of Household (30)
Credits variables	Head of Household (13)
Agriculture variables	Head of Household (56)
Household enterprise	Head of Household (13)
Community services variables	Head of Household (28)
Education variables	Each component aged more than 5 (11)
Health variables	Each component (9)
Labour	Working component (28)
Mobility variables	Head of Household and her/his wife/husband (31)
Fertility variables	Women older than 14 (11)
Anthropometric variables	Each components aged less than 6 (3)
Time use variables	Each components aged more than 14 (27)
Personal Information's' variables	Each components aged more than 14 (15)

Notes: the first column shows the topic of the questions asked; the second one shows what is meant to be the respondent and the number of questions regarding each topic (in brackets).

Table 5
Surveys collecting data on families' income and expenditures in European countries

History of families survey			
Country	***Period***	***Sample size***	***Families surveyed***
Austria	1954-1955	6,038	City dwellers
Belgium	1853	199	Industrial workers
France	1951	2,579	City dwellers
Germany	1907 1928 1951	852 1,422 910	City dwellers Manual workers City dwellers
Ireland	1951-1952	2,880	City dwellers
Italy	1952-1953	1,574	Entire country
Latvia	1936-1937	170	Urban and rural workers
Netherlands	1951	1,938	Manual and white collars workers
Norway	1952	197	City dwellers
Poland	1927	192	Working class
Sweden	1955	388	Entire country
Switzerland	1919	277	Entire country
United Kingdom	1937-1938 1938-1939	2,219 1,361	Industrial workers Middle class

Note: the Table shows how the surveys are concerned on short period and how just a part of the entire population is represented (Houthakker, 1955).

Table 6
Strata, sample size and minimum cell size

Sector of activity	**Number of observation and minimum cell size**		**Total number of observation**
	North-Centre	**South-Island**	
1895 *(1888-1903)*			
Agriculture	76 *(57)*	78 *(46)*	154
Other	63 *(63)*	46 *(44)*	109
Total	139	124	263
1907 *(1902-1913)*			
Agriculture	56 *(55)*	240 *(45)*	296
Other	65 *(66)*	0 *(44)*	65
Total	121	240	361
1921 *(1913-1929)*			
Agriculture	66 *(53)*	164 *(43)*	230
Other	*249* *(75)*	569 *(40)*	818
Total	315	733	1048
1933 *(1927-1940)*			
Agriculture	302 *(162)*	341 *(127)*	643
Other	957 *(251)*	631 *(125)*	1588
Total	1259	972	2231
1953 *(1946-1960)*			
Agriculture	475 *(152)*	0 *(114)*	475
Other	3682 *(273)*	291 *(125)*	3973
Total	4157	291	4448

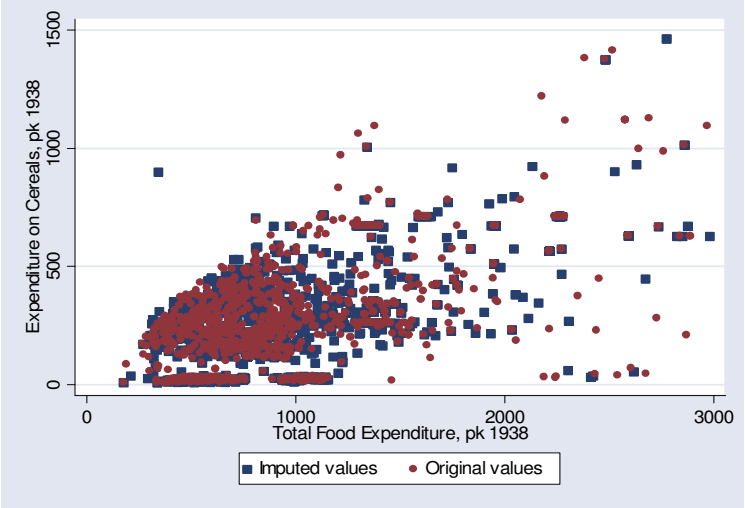
Notes: here it is shown the sample size of each stratum and the minimum cell size, in brackets, required to have representative sample. The year in bold represent the average year of the sample period, showed in the brackets. When the average year coincide with the Italian census interpolation was not needed. Since some samples overlap, some units, around 2 per cent, are used both in one sample than in the following one.

Table 7
Average family size in census data and in sample data for the five periods and the four strata

Sector of activity	**Average family size in the census and in the sample**	
	North-Centre	**South-Island**
1895 *(1888-1903)*		
Agriculture	5.4 *(3.8)*	4.7 *(5.9)*
Other	4.1 *(5.3)*	4.1 *(5.0)*
1907 *(1902-1913)*		
Agriculture	5.4 *(6.4)*	4.7 *(5.8)*
Other	4.1 *(3.7)*	4.1 */*
1921 *(1913-1929)*		
Agriculture	5.6 *(7.7)*	4.9 *(5.4)*
Other	*3.9* *(5.2)*	3.8 *(5.6)*
1933 *(1927-1940)*		
Agriculture	4.3 *(5.9)*	4.9 *(5.4)*
Other	4.7 *(4.3)*	3.8 *(5.6)*
1953 *(1946-1960)*		
Agriculture	4.8 *(4.6)*	4.6 *(4.95)*
Other	3.4 *(3.3)*	3.6 */*

Notes: the number in the brackets expresses the average family size in sample while the other number expresses the average family size as it comes from the census data. The distance between the two number is very small and the deviation between the two numbers doesn't highlight any particular pattern in under or over estimation of family size.

Figure 1
Plot of imputed values and original values on cereals purchases, 1890-1960



Notes: the figure is intended to show how the imputation method here adopted respects the distribution of the original data not altering their pattern and their variance.

Figure 2
Plot of imputed values and original values on meat purchases, 1890-1960

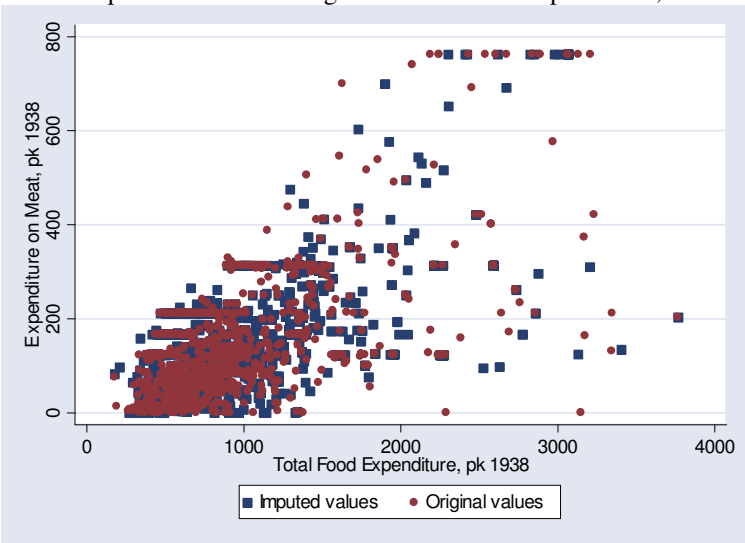


Figure 3
Plot of imputed values and original values on oils and fats purchases, 1890-1960

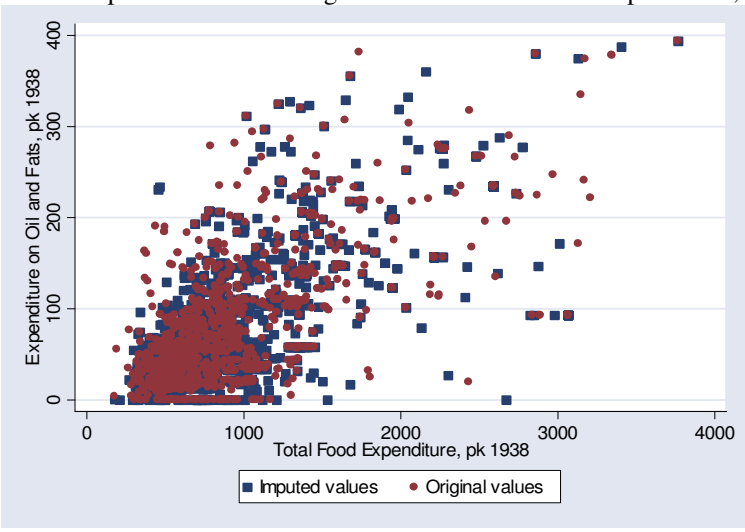


Figure 4
Plot of imputed values and original values on dairy products purchases, 1890-1960

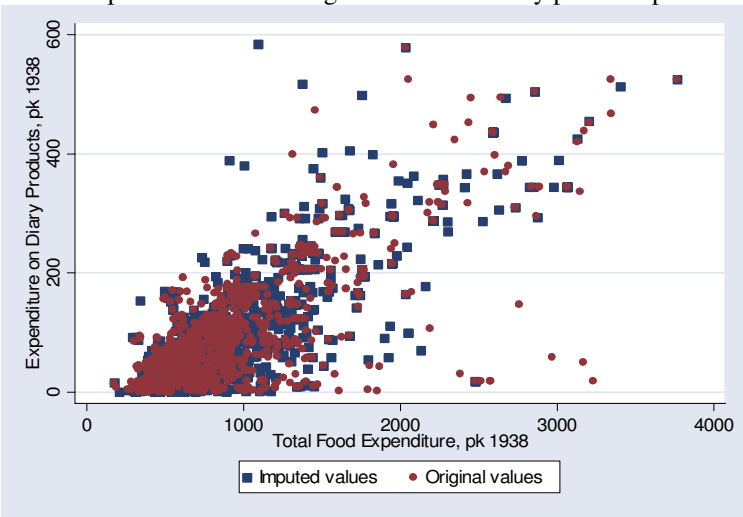


Figure 5
Plot of imputed values and original values on vegetables and fruits purchases, 1890-1960

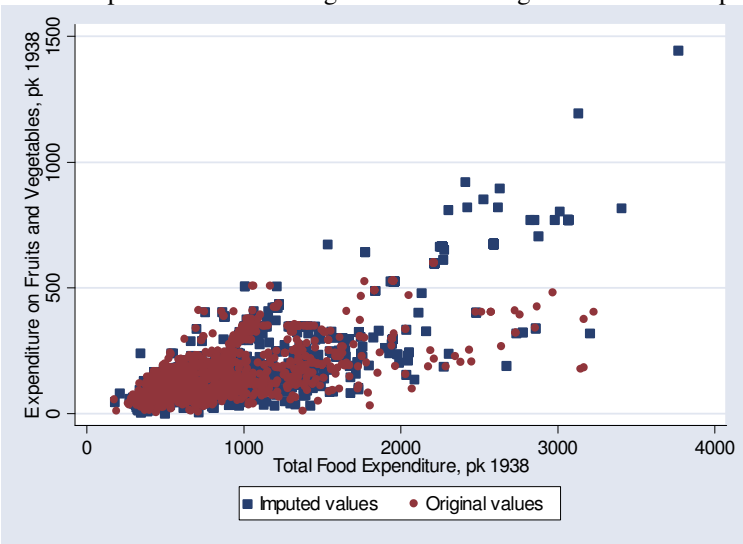


Figure 6
Plot of imputed values and original values on sugar and coffee purchases, 1890-1960

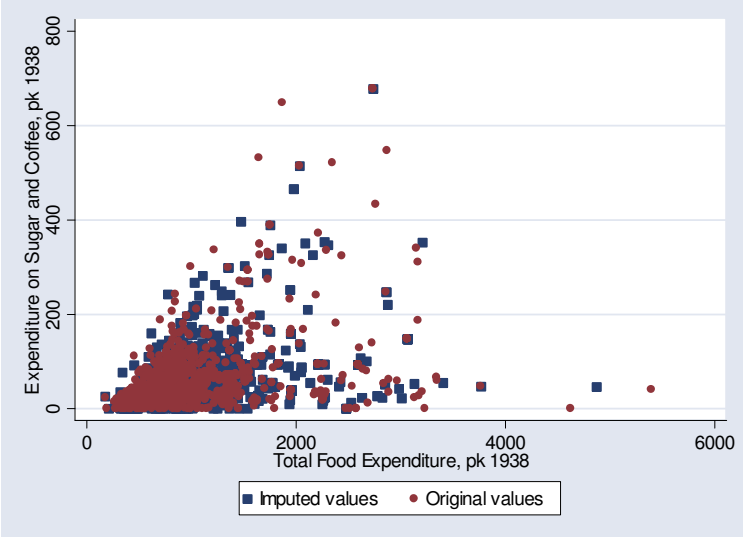


Figure 7
Plot of imputed values and original values on alcohol purchases, 1890-1960

Table 8
Percent deviation between sample values and benchmark values

Period	Expenditures categories								
	Barberi							Rossi-Sorgato-Toniolo	
	Food	Cereals	Meat	Oil & Fats	Dairy Product & Eggs	Veg. & Fruits	Non food	Food	Non food
1890-1903	10	-14	9	-7	6	-2	-7	27	23
1902-1913	9	-10	-19	-4	20	-2	-13	27	28
1913-1929	14	4	-3	-13	-7	14	-21	30	24
1927-1940	18	8	19	-8	20	-9	8	29	29
1946-1960	19	14	2	10	-7	12	42	-0.6	8

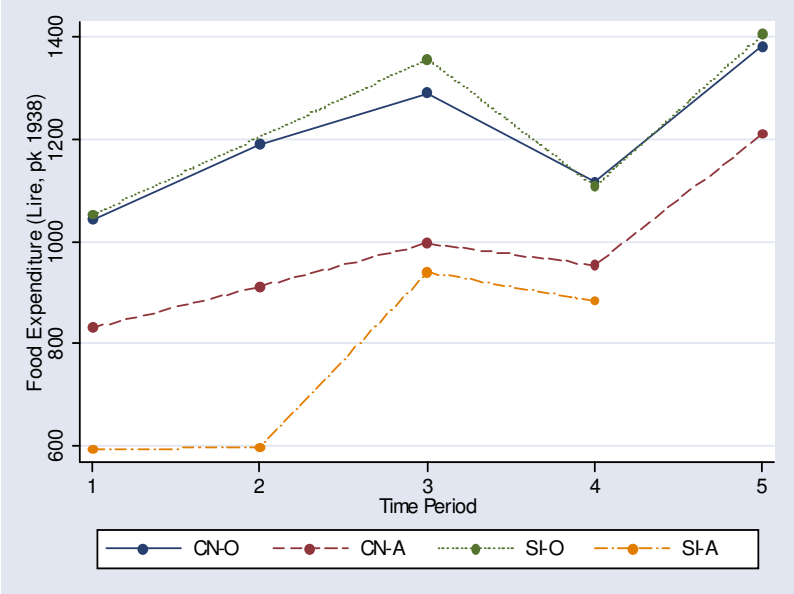
Notes: the benchmark estimates are those from Barberi and of Rossi, Sorgato and Toniolo. The calculations have been computed taking into consideration expenditures at constant price 1938. The comparison between Barberi and current estimates regard total food , cereals, meat, oil and fats, dairy products, vegetables and fruits and non food expenditures. The comparison between Rossi, Sorgato and Toniolo and our estimates is limited to food and non food expenditures.

Table 9
Food budgets share in Italy and in foreign countries

Area/ Country	Period				
	1890-1903	1902-1913	1913-1929	1927-1940	1946-1960
CN-O	63	60	57	61	46
CN-A	72	66	66	69	54
SI-O	60	n.a.	50	59	55
SI-A	76	70	62	70	n.a.
Italy	67	64	58	65	53
Italy	65	64	63	66	55
UK	31	34	35	31	31
Germany	41	41	n.a.	n.a.	n.a.
Sweden	36	35	30	n.a.	n.a.
Norway	60	55	56	45	39
USA	35	34	30	30	30
Canada	40	36	37	33	33

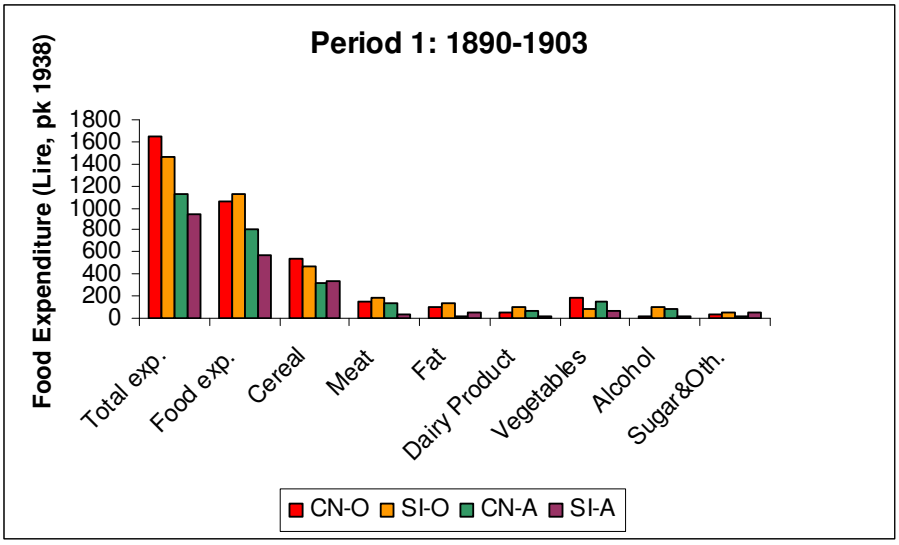
Notes: food budget share in the 4 strata in which Italy is divided, in Italy and in other developed countries. The percentages expressed in the first 5 rows come from author's estimates; the others come from Kuznets. On average, Italian GDP per capita is the 50 per cent of that one in UK, 76 of the German's, 74 of the Swedish's, 88 of the Norwegian and 50 of the US's.

Figure 8
Pattern of food expenditure in Italy, 1890-1960, constant prices 1938



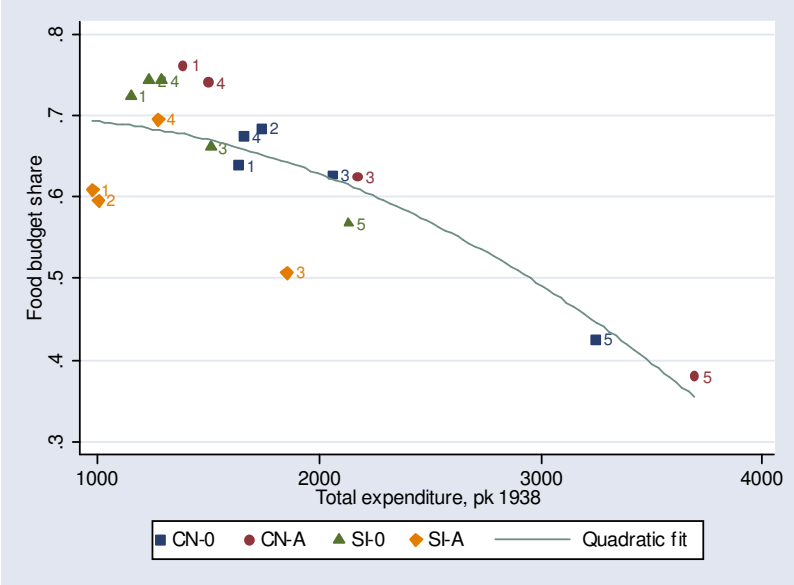
Notes: CN stands for the North and Centre of Italy, SI for South and Islands of Italy; O stands for Industrial and Third Sector while A represent the Agricultural sector. The same approximation holds in the following Tables and Figures. Estimates for SI-O in the second period and for SI-A are not available.

Figure 9
Total and food expenditure for the 4 strata in the period 1890-1903



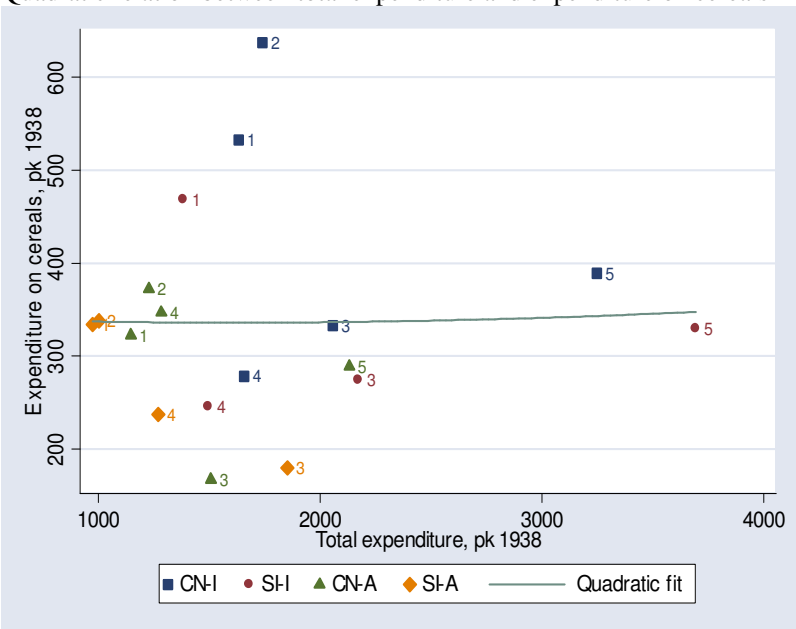
Notes: estimates refer to constant price 1938. The figure shows how food expenditure accounts for the higher part of total expenditure and how cereals purchases are the biggest component of food expenditure.

Figure 10
Engel curve for the period 1890-1960 for the 4 strata



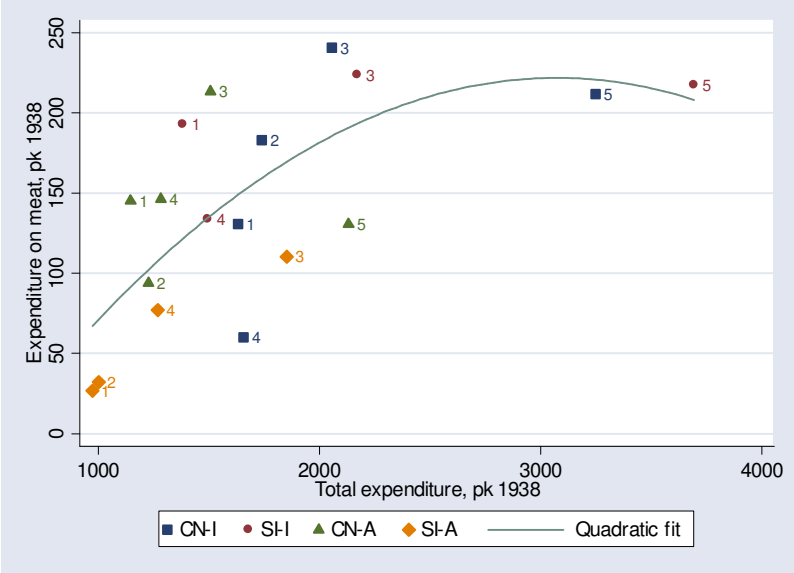
Notes: the quadratic fit is done an all the 8,183 units of the sample, although just the mean for each stratum is represented in the figure. The expenditures and the budget share refer to 1938 constant prices. The Figure shows how increases in total expenditure does not decrease significantly food budget share before the 5th period is reached.

Figure 11
Quadratic relation between total expenditure and expenditure on cereals



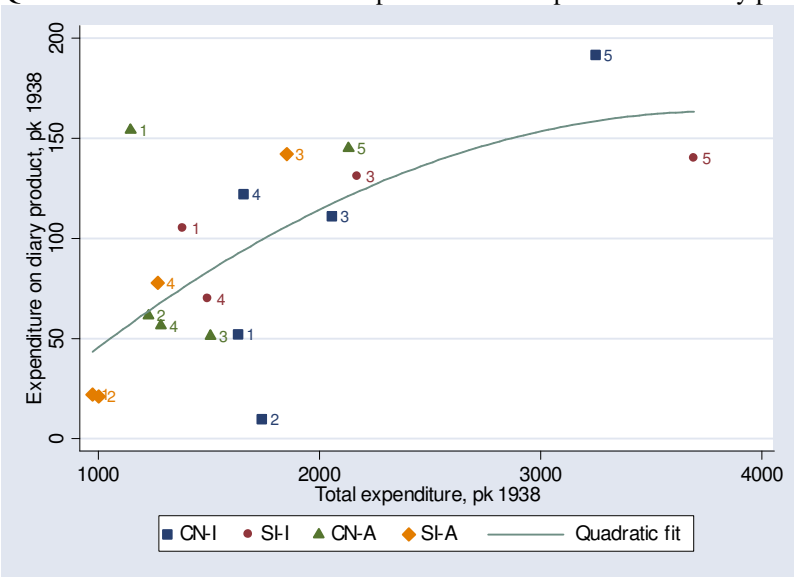
Notes: the quadratic fit is done an all the 8,183 units of the sample, although just the mean for each strata is represented in the figure. The expenditures and the budget share refer to 1938 constant prices. The quadratic fit shows how expenditure on cereals stays constant when total expenditure increases although the leverage effect is here high.

Figure 12
Quadratic relation between total expenditure and expenditure on meat



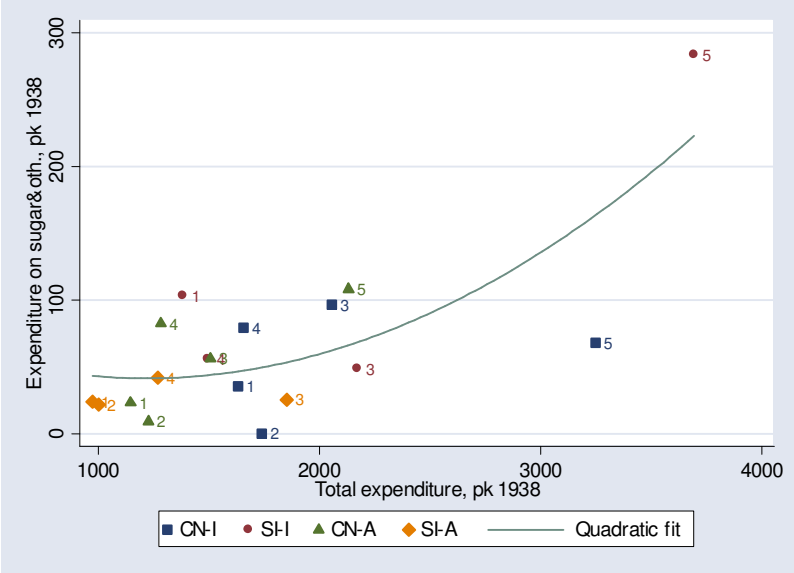
Notes: the quadratic fit is done an all the 8,183 units of the sample, although just the mean for each strata is represented in the figure. The expenditures and the budget share refer to 1938 constant prices. The quadratic fit shows how expenditure on meat increases when total expenditure increases denoting low meat purchases in the first four period of the analysis.

Figure 13
Quadratic relation between total expenditure and expenditure on dairy products



Notes: the quadratic fit is done an all the 8,183 units of the sample, although just the mean for each strata is represented in the figure. The expenditures and the budget share refer to 1938 constant prices. The quadratic fit shows how expenditure on diary products increases when total expenditure increases denoting low purchases of these foods in the first four period of the analysis.

Figure 14
Quadratic relation between total expenditure and expenditure on sugar and coffee



Notes: the quadratic fit is done an all the 8,183 units of the sample, although just the mean for each strata is represented in the figure. The expenditures and the budget share refer to 1938 constant prices. The quadratic fit shows how expenditure on this category of foods does not increase with increases in total expenditure denoting how sugar and coffee were still considered luxury items in the period analysed.

Figure 15
Pattern of non food expenditure in Italy, 1890-1960

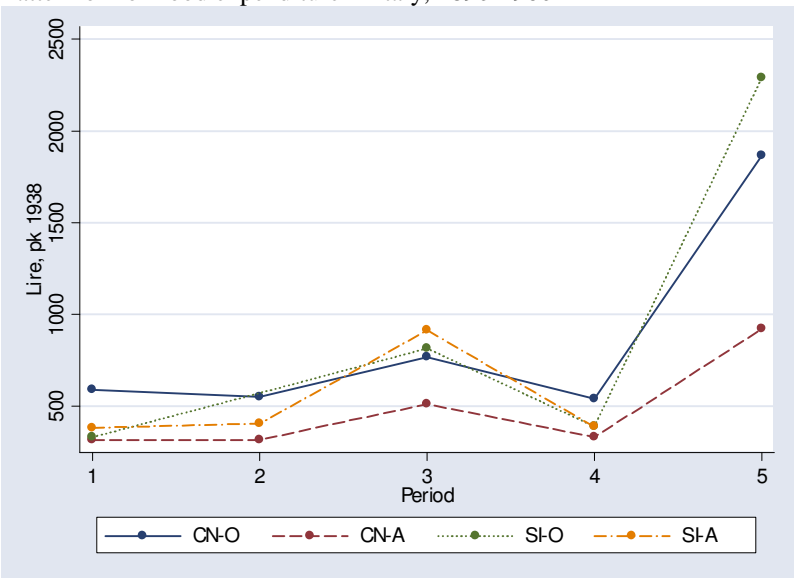
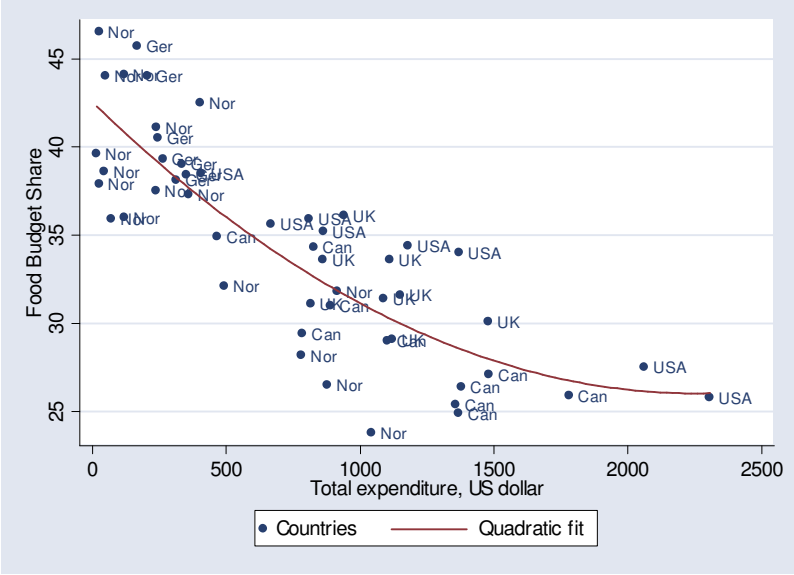


Figure 16
Quadratic relation between the food budget share and the total expenditure in foreign countries (1861-1950)



Notes: the figure highlights the fact that increases in total expenditure decrease the food share. Total expenditures are expressed in dollar. Data are from Kuznets and the countries labels stand for Norway, Sweden, United Kingdom, Germany, Canada and USA.

Table 10
Food expenditure elasticity to total expenditure: parametric estimates for the 5 periods

Dependent variable: per capita food expenditure					
	Period 1	***Period 2***	***Period 3***	***Period 4***	***Period 5***
Per capita total expenditure	.6 (3.23)*	.41 (3.57) *	.48 (3.02) *	.43 (6.51) *	.36 (3.87) *
Geographical dummy	Negative impact	Negative impact	Negative impact	Negative impact	Negative impact
Number of family components	Negative impact	Negative impact	Negative impact	Negative impact	Positive impact
Activity dummy	Negative impact	Negative impact	Negative impact	Negative impact	Negative impact
Number of obs.	262	346	479	2009	3201
Adj. R^2	.91	.85	.84	.75	.52

Notes: t statistic in parenthesis; * significant at 1%. The values of the elasticity goes down as we move from 1890 to 1960 although the major decrease is observed between the Period 4 and the Period 5. Living in the South and in the Islands, measured by the geographical dummy, and working in the agricultural sector, activity dummy, diminishes food expenditure availability. Family size has the opposite effect.

Table 11
Food expenditure elasticity to total expenditure: quintile parametric estimates for the 5 periods

Dependent variable: per capita food expenditure					
	Period 1	***Period 2***	***Period 3***	***Period 4***	***Period 5***
Poorest 75%	0.63* (2.13)	0.45* (3.15)	0.52* (4.51)	0.46 (1.97)	0.40* (3.85)
Richest 25%	0.49* (2.72)	0.42* (3.03)	0.36 (1.78)	0.40* (3.21)	0.34* (2.75)

Notes: t statistic in parenthesis; * significant at 1%. The values of the elasticity goes down as we move from 1890 to 1960 and if we consider just the richest families. The major decrease, no matter which is the group considered, is always observed between the Period 4 and the Period 5.

Table 12
Budgets share for Italian families for three different percentile

Expenditure Aggregate	Percentile	Period 1	Period 2	Period 3	Period 4	Period 5
Cereal	*25*	.37	.38	.36	.32	.18
	50	.32	.35	.31	.29	.13
	75	.29	.31	.33	.27	.11
Meat	*25*	.06	.03	.06	.07	.10
	50	.09	.05	.08	.07	.11
	75	.09	.05	.14	.07	.13
Fats	*25*	.04	.05	.11	.10	.07
	50	.05	.05	.08	.08	.08
	75	.05	.05	.08	.09	.08
Dairy	*25*	.07	.02	.03	.09	.07
	50	.07	.02	.08	.06	.07
	75	.06	.02	.05	.05	.06
Vegetables	*25*	.10	.09	.08	.11	.13
	50	.07	.10	.09	.13	.13
	75	.08	.09	.06	.11	.12
Non food	*25*	.29	.35	.39	.30	.45
	50	.33	.32	.43	.36	.48
	75	.35	.40	.42	.37	.48
Clothing	*25*	.11	.13	.13	.10	.17
	50	.13	.13	.12	.12	.18
	75	.12	.15	.16	.11	.16
Housing	*25*	.10	.11	.10	.10	.16
	50	.15	.13	.13	.13	.17
	75	.15	.18	.15	.13	.18
Entertainment	*25*	.02	.03	.04	.03	.08
	50	.03	.04	.04	.06	.10
	75	.03	.03	.04	.07	.11

Notes: family budgets shares for five food aggregate and three non food aggregates. For each of the four strata, budgets shares for six sub periods are showed so that all the time spam is covered. The percentages have been computed taking into consideration three classes of families, computed taking into consideration three percentile of total expenditure. This is to show how within the same stratum, differences in the pattern of expenditure still remain. For the strata South-Islands / Other in Period 3 and South-Islands / Agriculture, data are not available.

Expenditure pattern in Italy, 1875-1960.

A complete quadratic demand system estimation with demographic variables

Abstract

This paper explores two related issues: the estimation of a complete system of demand equations using household budget data and the effect that demographic variables have in family expenditure choices. A complete system of demand equations is intended to describe a household's allocation of expenditures among an exhaustive set of consumption categories. Variables related to the household's demography are expected to affect the allocation of household expenditures among goods, mainly because of economies of scale and because families of different size and composition have different needs (Blow, 2003).

The analysis uses the 'Quadratic Almost Ideal Demand Model' (Banks et al., 1997) and in addition, following Pollack and Wales (1981), some parameters of the model depend on demographic variables.

The demand system is estimated using a set of seven categories of items (five food and two non food). The idea of the paper is to study the expenditure pattern in Italy and to identify the factors that mostly influenced Italians' purchases. The demand system also accounts for demographic variables in order to find out if the 'food puzzle' paradox applies in Italy as well. The inclusion of demographic variables is meant to study whether the expenditure choices of a family also depend on the age of the person. Data used in the following analysis refer to a sample composed of approximately 8,300 Italian families over 85 years, between 1875 and 1960. Final results show the importance of cereal and vegetables in every day's diet; meat and fats, for what regards food, and clothing, for the non food category, were perceived as luxury goods. Budget shares for food categories decrease with family enlargement thus confirming the 'food puzzle' paradox. It is remarkable that, while an additional adult increases the share of cereal purchase, an additional child does not increase the share of money spent on food, denoting the difference of diet profiles for family members of different age.

Section 1. Introduction

Econometric studies of household expenditure are of considerable importance for several key issues. In the current paper, the estimation of demand system's parameters will help us understand the pattern of Italians' expenditures and its evolution over time. The study of the effects of household size on demand is more than a simply academic curiosity. It is important to understand and estimate the welfare of families, and the cost of an additional child and an additional adult in the past. A clear understanding of the effects of household size on families expenditure choices is a prerequisite for the accurate assessment of household welfare, for the design of effective poverty alleviation programs and for the construction of more accurate consumer forecasting models (Horowitz, 2002).

A complete demand system has been estimated over time series based on national accounts data (macro data). In contrast, a demand system analysis based on household budget data (micro data) ignored price variation as well as family size or composition. Barten (1964) pioneered the estimation of demographically-extended complete demand systems on household budget data allowing price and family size variation.

Most of the demand system studies have been conducted taking into consideration developed countries[30]. Currently there are relatively few demand system analyses of consumer expenditure patterns for developing countries, with the exception of India. There are even fewer analyses for developing countries in the 19th and in the first seventy years of the 20th century.

It is not difficult to explain the relative scarcity of the empirical demand estimation and literature for the 19th and part of 20th century in developing countries. These do not have the necessary micro data on food and/or non food expenditure needed to allow sophisticated demand estimation. In addition very few developing countries have reliable data on prices.

The situation for Italy is similar to that depicted above. Collection of micro data on families' expenditure in a systematic and homogeneous way began in 1963-1964, one century after Italian unification. Series of retail prices for food and for most non food items are available starting from 1861, although only on a national basis.

The lack of retail price data at a regional level means that demand studies for Italy had to ignore regional differences in spending habits, especially in the estimation of the price parameters. Failure to take regional differences into account in the calculation of the demand behavioural parameters can set a severe constraint on their usefulness in the context of a country with clear diversity between regions.

[30] See Muellbauer (1977), Pollack and Wales (1981), Ray (1983, 1996) for UK; Jorgensen and Slesnick (1987), Nelson (1988) for USA; Llunch (1971) for Spain; Chatterjee, et al. (1994) for Australia and New Zealand.

This study tries to provide evidence on the estimated demand parameters in Italy between 1875 and 1960 using the Quadratic Extension of Deaton and Muellbauer's (1980) Almost Ideal Demand Model (AI). Quadratic Almost Ideal Model (QAI, Banks et al., 1997) is more general than the AI model since, unlike the latter, it allows non-monotonic behaviour between the budget share of an item and the logarithm of total expenditure.

Studies on demand system in some European countries show the expected elasticity pattern for the main categories of items. The elasticity of food to total expenditure is significantly less than one, thus confirming the Engel's law. The range varies from the highest figure for Poland (0.731) and the lowest for British middle class (0.344). For clothing, the elasticity is greater than one in all the countries studied. In this sense, clothing is seen as a luxury item. For housing, the elasticity is mostly below one. Very small values are observed again for British middle class and higher values for Northern and central European countries (Norway, Sweden, Germany and Poland).

The other significant feature of the current paper is the explicit role played by household size and its composition in explaining the observed differences in household expenditure pattern. Welfare, living standards and poverty are all characteristics of individuals, not of households, and although households are often the units for which we study consumption, we cannot be indifferent to the fact that different members in a family get different endowment.

In order to take account of the previous distinction, we follow the `translation' approach proposed by Pollak and Wales (1981), which demographically extends a complete demand system by allowing a subset of its parameters to depend on family size or composition. The demand for food, clothing, education, etc., depends on the age and sex composition of a family, and since these items have a large share in total expenditure, the resulting effect is considerable (Houthakker, 1952).

The 'translation' approach help us enlightening the 'food puzzle' paradox which is still a controversial issue in both theoretical and applied economics (Deaton and Paxson, 1998).

When household size increases, the presence of economies of scale connected to intra-household public goods should free resources and generate savings that may be channelled towards the purchase of private goods. For private goods that are not shared among family components, income and substitution effects will operate in opposite directions. However, for private goods that are not easily substitutable, the income effect will probably dominate the substitution effect, and per capita consumption of the good will increase. The most obvious candidate as a non easily substitutable private good is food, especially in poor households. With per capita resources held constant, food consumption per person should rise with household size.

In their paper, Deaton and Paxson demonstrate that the empirical evidence is exactly the opposite of theoretical suggestions. With per capita resources held constant, food budget share per person decrease as the number of individuals in the family increases. These results appear to be consistent between countries such as United States, United Kingdom, France and, more surprisingly, Taiwan, Thailand, Pakistan and South Africa. In their words: 'Such a result is paradoxical'.

In the period we are analyzing, between 1875 and 1960, there were fewer substitutes for food expenditure than there are today and households were much closer to nutritional subsistence than now. These facts suggest that food consumption should be positively related to household size, even if the food puzzle suggested by Deaton and Paxson holds for poor countries and for the past as well. Compared to Deaton and Paxson's paper, we try here to distinguish the effect of an additional child and an additional adult on the expenditure share.

At first sight, household survey data on consumption does not appear to be the best source of data for determining who gets what in a family. Data on consumption relate to the household as a whole, not to individual members. Even so, surveys on family budgets tell us about household composition, number of household members, their age and gender, so that it is certainly possible to study the relationship between household composition and household consumption.

Barten (1964) has developed a model which has proved to be useful for those who have attempted to resolve the puzzle or other dilemmas regarding public and private goods in the household. The Barten model predicts that holding per capita expenditure constant:

1. the share of the budget devoted to a private good will increase with the household size if the good has few substitutes;
2. the increase in private goods purchases will be greater for poorer households, if it is true that poorer people have fewer substitutes for private goods;
3. the share of the budget devoted to public goods will decrease with household size.

Demographic factors were considered in the past too, as pointed out by Simon Kuznets (1976) in one of the first systematic studies on the subject: 'These characteristics of size and age of the household units, changing in a systematic way through the lifetime span of the unit, are what we mean by the demographic aspects of the size distribution of income'. When people within a household are treated differently but we actually assume the opposite, the true distribution of welfare among family members can underestimate true inequality and, at the same time, overestimate true social welfare.

With these ideas in mind, the paper has three related goals: 1) to estimate the parameters' coefficients of the demand system model and study how the expenditure choices change in response to changes in prices or in total expenditure; 2) to estimate the effect of the household size and household composition on the purchase of private and public goods identifying which expenditure categories are consistent with the theoretical predictions and which are not. Does an additional child or an additional adult have the same consequence on the family expenditure pattern? 3) to study the differences in expenditure purchases for four representative households.

Section 2 introduces the demand model and Section 3 deals with the data and with problems connected to them. Section 4 and Section 5 present some descriptive results and the main results from the demand system analysis. The last section, Section 6, is dedicated to conclusions.

Section 2. Theoretical framework

The goal of demand analysis is to model households' expenditure patterns on a group of items in order to obtain estimates of price and total expenditure elasticities. In some applications, broad categories of goods, such as food, clothing, housing, and transportation are used. Other applications study the demand only for various goods within the food category.

Since Stone's (1954) linear expenditure system, there has been widespread interest in choosing an estimable system of equations to represent household demand for various goods. Two of the most well-known include the translog system of Christensen et al. (1975) and the Deaton and Muellbauer (1980a) almost ideal demand system (AI). Of these two approaches, the AI has proven to be more popular, because it permits exact aggregation over households and because it is easier to estimate. More recently, Banks et al. (1997) have presented a generalization of the AI model that includes a quadratic expenditure term, and they called their model the QAI. This paper discusses the results from the estimation of the last demand system. The QAI is an extension of the widely used Almost Ideal (AI) demand system, which allows for a non-monotonic relationship between the marginal budget share and total expenditure. Though the AI has been widely used in analysing consumption in developing countries, there is now evidence to suggest that the linearity of budget shares in the logarithm of household expenditure makes it a very restrictive model (Meenakshi and Ray, 1999). 'Since total expenditure varies considerably across individuals and total expenditure elasticities varies across goods, the total expenditure effect for individuals at different points of its distribution must be fully captured in order to estimates demand system parameters' (Banks et al., 1997).

The study on the relationship between commodity expenditure and total expenditure, known as Engel curve, has been at the centre of micro econometric analysis since the studies of Engel

(1895), Working (1943) and Leser (1963). An important contribution was the one by Working (1943) who proposed the linear budget specification $w_i=a_i+b_i log(y)$ which is known as the Working-Leser model. Leser (1963) found that this functional form fits better than some alternatives.

More recent studies found nonlinearity in Engel curves. Motivated by this nonlinearity, recent studies found Engel curve for some goods to be close to Working-Leser, while others display considerable curvature, including quadratic or *S* shapes. For many commodities there is increasing evidence that the Working-Leser form does not provide an accurate picture of individual behaviour. A series of empirical Engel curve studies indicate that further terms in total expenditure are required for some expenditure share equations, since consumer demand patterns vary considerably with different level of expenditure. Banks et al. (1997) derive a new class of demand system that has the logarithm of income as the leading term in an expenditure share model and additional higher order logarithm income terms. The quadratic logarithmic class nests both the AI model of Deaton and Muellbauer, and the exactly aggregable 'Translog model' of Jorgenson et al. (1982). However, unlike these demand models the quadratic logarithmic model permits goods to be luxuries at some income levels and necessities at others.

Demand systems are typically specified with expenditure shares as the dependent variables. A household's expenditure share for good *i* is defined as

(1) $$w_i \equiv p_i q_i / m$$

where p_i is the price paid for good *i* (or for the category of good *i*), q_i is the quantity of good *i* purchased or consumed, and *m* is the total expenditure on all goods. The following constraint applies to w_i:

(2) $$\sum_{i=1}^{K} w_i = 1$$

where *K* represents the number of goods in the system.

In the QUAIDS model, expenditure share equations have the form:

(3) $$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \log p_j + \beta_i \log\left\{\frac{m}{P(p)}\right\} + \frac{\lambda}{b(p)}[\log\left\{\frac{m}{P(p)}\right\})^2$$

where *p* is the vector of prices and *b(p)* is defined as

(4) $$b(P) = \beta_0 \prod p_K$$

and *logP(p)* is a price index defined as:

(5) $$\log a(P) = \alpha_0 + \sum \beta_i \log p_i + \frac{1}{2} \sum \sum \gamma_{ij} \log p_i \log p_j \ .$$

We will refer to the term $\frac{m}{P(p)}$ as the real expenditure μ.

Finally α, γ, β, λ are the demand system parameters.

The following restrictions are imposed to the model:

Adding up $\sum \alpha_i = 1$, $\sum \beta_i = \sum \gamma_{ij} = 0$

Homogeneity $\sum \gamma_{ij} = 0 \quad \forall \; j$

Symmetry $\gamma_{ij} = \gamma_{ji}$

The expressions for expenditure and own price elasticity, under the QAI demand system, are given by:

(6) $$e_i = 1 + \frac{\beta_i}{w_i} * (1 + 2\lambda \log \mu)$$

(7) $$e_{ii} = \frac{1}{w_i}[\gamma_{ii} - \alpha_i \beta_i (1 + 2\lambda \log \mu)] - 1$$

The QAI model is normally estimated using a sample in which observations with different demographic profiles are combined, forcing the parameters of the system to be equal across families having different demographic profiles.

The above procedure does not seem appropriate for our purposes. Demographic variables have traditionally played a major role in the analysis of household budget data (Houthakker, 1952). Instead of assuming that all the households in the sample have identical tastes, only those with the same demographic profiles are assumed to have the same demand functions. Family size and its composition have all been used as demographic variables in demand studies, although seldom in the context of complete system of demand equations.

There are 5 different general procedures for incorporating demographic variables into classes of demand system (Pollack and Wales, 1981).

The first one, called demographic scaling, implies the use of a model as the one expressed in equation (3), although the sample needs to be divided in different sub samples composed by households with identical or similar demographic profiles (one child and two adults, two children and two adults, etc…). This approach allows all the parameters of the model to depend on the demographic variables and thus it does not require any specification regarding the form of the relationship between these parameters and the demographic variables. The originally demand system $w_i = f(p_i, \log X, \log (X\text{^}2))$, which depends on a set of prices p_i and on the total expenditure X, is scaled and becomes $w_i = m_i * f(p_i, \log X, \log (X\text{^}2))$ where the m's are scaling parameters which depends on the demographic variables.

The second approach, demographic translating, assumes that the behaviour of the household is related to the different demographic profiles in the sense that some parameters in the model linearly

depend on some set of demographic variables, while the remaining parameters are independent of the demographic variables. Under this set of assumption we can gather information on the behaviour of households with different profiles, a type of inference which is not possible using the first approach. Demographical effects can be introduced by allowing a subset of the parameters to depend on demographic variables in the way that is showed below.

More specifically, with this operation, the original demand system $w_i=f(p_i, \log X, \log (X^{\wedge 2}))$ is replaced and translated into $w_i=d_i+ f(p_i, \log X, \log (X^{\wedge 2}))$, where d is a parameter depending on a vector of demographic variables. If the original demand system is theoretically plausible, then the modified system is also plausible.

Gorman's specification proposed a method that replaces the original demand system in the following: $w_i=d_i+m_i f(p_i, \log X, \log (X^{\wedge 2}))$ where the d's and the m's depend on the demographic variables.

The 'reverse Gorman' specification can be obtained by first translating and then scaling yielding the following demand system: $w_i=mi(d_i + f(p_i, \log X, \log (X^{\wedge 2}))$)

The 'modified Prais-Houthakker procedure' replaces the original demand system by $w_i=s_i f(p_i, \log(X/s_0), \log(X^{\wedge 2}/s_0))$. The s_i factors are specific scales for commodities, which depend on the demographic variables, while s_0 is an income scale factor which is a function of all prices as well as demographic variables. This procedure, unlike the others proposed so far, yields a theoretically plausible demand system only in very special cases.

'Demographic translating', that is the procedure assumed here to incorporate demographic variables into the demand system, implies that the demographic effects operate through a particular subset of n parameters which enter in the model in a relatively easy way. We chose the 'demographic translating' procedure since the procedures which apply the 'scaling' factors require a sample size which would be bigger that the one we have here. The 'modified Prais-Houthakker procedure' would not be possible for the lack of an income scale based on the demographic structure of the family. To incorporate the effect of family composition and size, we assume that the old parameter α of the model expressed in equation (3), linearly depends on the old parameters and on new variables, number of children, a, and number of adults, z, as shown in the following equation:

(8) $$\alpha_i = \alpha_i + \alpha_i^{*} a + \alpha_i^{**} z$$

The resulting demographically extended QAI demand model is then expressed, for each of the six periods, by the following formula:

(9) $$w_i^s = \alpha_i^s + \alpha_i^{*s} a + \alpha_i^{**s} z + \eta_i S + \sum_{j=1}^{n} \gamma_{ij}^s \log p_j + \beta_i^s \log \mu^R + \lambda \beta_i^s (\log \mu^R)^2$$

where $\alpha_i^*, \alpha_i^{**}$ represent the parameters that measure the impact of an increase in the number of children and adults in the same household on the demand system. *S* is a strata dummy which is set in order to incorporate for different strata differences in expenditure.

The term demographic variables here indicates the number of children, aged 13 or younger, and adults in the same household. The theoretical ratio of the distinction is that raising a child and feeding an adult in the past involved complete different costs. That distinction seems to suit particularly the Italian situation and the diet of those years. A report on the standard of living of agricultural families in some area in the South of Italy shows clearly how the difference of diet among family members. A family budget compiled in 1880 reported how the head of the household ate as much as his wife and his two children together (Cefalì,1880). The son of a peasant remembers that 'if someone gives something to eat to my father, I receive half a portion. And when my grandma makes coffee, she never offers it to me but just to the adults' (Barbagli, 1984). That was in 1903.

The demand system analysis with the inclusion of demographic variables will be computed using Italian micro data on family budgets. The entire sample is composed of approximately 8,300 family budgets scattered in the Italian peninsula over a 85 years period between 1875 and 1960.

The estimates will take into account six different sub periods and four types of households obtained by differentiating families in: i) two macro regions of provenience and ii) two sector of activities.

The empirical analysis employed in the paper regards the following seven categories of consumer expenditure (five food categories and two non food categories): cereal, meat, fats, dairy products, vegetables, clothing and housing.

With *K=7* equations, there are a total of *3(k-1)+1/2 k(k-1)=39* parameters to be estimated while the maximum number of constraints is equal to *n/k*.

The budgets shares, w_i, for the above categories have been computed using data on Italian family budgets. Data on the number of children and the number of adults in the same household (*a* and *z* in model (9)) also come from Italian family budgets. The set of prices p_i have been taken from the collection of national prices published in Istat (1958) and Barberi (1961). Within each category of goods *i*, the share of each single item *j* has been computed in the following way: $w_{ij}=p_{ij}*q_{ij}/m_i$. The average price for the category of goods *i* has been computed in the following way:

$$p_i = \sum_{j=1}^{n} w_j * p_j . \qquad (10)$$

The price index comes from ISTAT (1978) and refers to the consumer price index for working families.

The list of the prices that have been used for the categories of goods is shown in Table 1 in the Appendix.

Section 3. Data description, sub samples creation and missing values problems

Data used here come from a collection of family budgets which have been opportunely organized in a dataset in order to give them a common structure and make them to be comparable.

By family budgets we intend a survey that gathers data on one or more families regarding:

1. its demographic structure;
2. its expenditures, both for food and non food items;
3. its income.

Food and non food categories of expenditure are showed in Table 2 while demographic variables are listed in Table 3.

We will proceed here discussing about some features regarding data: creation of representative sub samples, missing data problems and quality of data.

Section 3.1. Creation and representativeness of sub samples

The time period analysed here goes from 1875 to 1960. The end year reflects the fact that Italian government and the Italian statistical office (Istat) began to collect family budgets in a systematic way and on a national level around 1963-1964 (Istat, 1968[31]). This means that a demand system analysis beginning in 1960 could use that sample rather than the kaleidoscope of family budgets considered here.

The choice of the beginning year is more practical. The idea would be to start the period of analysis back in 1861, the year of the Italian unification, in order to have one century-long view of the demand system. This is unfortunately not possible due to the lack of data in the first 15 years.

The entire time period has been divided into six sub periods and family budgets allocated into one and only one sub period forming then six distinct sub samples. Families are allocated to one of the six samples according to the year the family budget has been collected. Families whose data have been collected from 1875 up to 1889 were brought together in order to create the '1882 sample'. The mechanism is the same for the remaining five samples: 1895, 1907, 1921, 1933 and 1953. Census data is not available for those years. Italian population has been computed linearly interpolating the two closest censuses. Linear interpolation has been preferred to other techniques due to the structure of the census data.

[31] Italian family budgets have been actually collected a decade before, 1953-1954. However, this was a test survey; the sample chosen was not representative of all Italian families but of the non agricultural ones.

Each sample has been centred in the average year of the sub periods. Some sub periods overlap, which means that 4 per cent of the entire number of observations are used in two different and consecutive sub samples (514 units).

All the family budgets collected between the beginning and the end years enter into the analysis, except those which have been collected between 1941 and 1945. The reason is related to the quality of data: the occurrence of black market, which was present in almost all the country and was effective mostly in providing food, can be thought as a reasonable source of price alteration.

The number of years is approximately the same for each of the six sub periods, 15 years. The time span of each sub period has been decided to enlarge as much as possible the size of each sub sample and to try to create sub samples in which the within variance of total expenditures between units is the lowest while the between variance is maximum (Golder and Yeomans, 1973). The algorithm that has been followed is then the following:

1. create six different sub periods;
2. for each strata, the variance of total expenditure has been computed including or excluding units surveyed in border years. The comparison between all the possible scenario is summed up by the following formula:

$$(11) \qquad [\sum_{i=1}^{4}\sum_{t=1900}^{1914}\mathrm{var}(total\ \mathrm{exp}enditure)_{i,t}] < [\sum_{i=1}^{4}\sum_{t=1901}^{1915}\mathrm{var}(total\ \mathrm{exp}enditure)_{i,t}]$$

where i refers to the strata (and thus goes from 1 to 4), while t indicates the time span considered. The above formula says that the within variance of total expenditures for the observations in the period $(t;\ t+x)$ (i.e. from 1900 to 1914), computed for all the four strata is smaller than the variance computed taking into consideration the units in the time span of the same length $(t+1;t+x+1)$ (i.e. from 1901 to 1915). The variances have been computed taking into consideration all samples obtained changing the initial and final years, $((t-1;t+x-1);(\ t-2;\ t+x-2);\ (\ t+1;t+x+1);$ etc…). The time spam 1900-1914 is then chosen since the observation in this sub period present the minimum within variance. The same technique is applied to the other families in the remaining 5 sub periods.

None of the six sub samples, as they are at this stage, represents adequately Italian families living in that time. This is due to the fact that units in the samples have not been chosen according to any sample scheme, which is a fundamental prerequisite when representing a population.

The entire sample is then post-stratified (Rossi et al., 2001) in order to depict Italian families as they are reported by the Italian Census.

Post stratification consists of two different phases. The first one is common to both the sample units and the real population, and consists in partitioning the *n* units constituting each sub period (*N* individuals of the real population) into different *h* (*H)* strata. Strata correspond here to two macro geographical areas (North and Centre of Italy; Southern Italy and Italian Islands), and to the type of work of the head of the household (employed in the agricultural sector or any other sector of activity). There will be four different strata, h_1 to h_4 (H_4 to H_4) for each sub period.

The second phase attributes weights to the units; the ratio between NH_{it}/nh_{it}[32] will then represent the weight that has to be associated to each observation belonging to the strata *i* in period *t*. When the centre year of each sub period does not coincide with the census year, the Italian population has been computed through linear interpolation between the two nearest Italian Censuses[33]. Equal weights are assigned to observations belonging to the same stratum, and different weights to observations in different ones. The lower is the stratum size, the larger is the weight associated to each unit.

The total number of cells, which we refer later as strata, will then be 24, coming from two different geographical areas (North-Centre; South-Islands), two different types of sectors of activity depending on the head of household's job (agricultural job or any other), and six different time periods[34]. Table 4 in the Appendix shows the beginning and the end of each period, the number of available households for each of the 24 strata and the number of surveys from which family budgets came from.

Section 3.2. Dealing with missing values

Family budgets presented missing values in variables regarding the age of family components and non food expenditures. These two problems will be dealt in two distinct phases since different 'missing values procedures' are adopted here. The total number of persons surveyed is 48,680.

33 per cent of the persons surveyed present a missing value regarding their age. Missing values regarding the age of a family member arise for two main reasons:

1. the age was not specified in the survey of origin (17 per cent of the total number of persons surveyed), although almost all the surveys did express the relationship of each

[32] The number expressed by NH_{it} represents the total number of Italian families belonging to strata *i* in time *t*, as shown by the Italian Census, while Nh_{it} represents the total number of families in the strata *i* in time *t*.

[33] The Italian Censuses referred to were carried out in the following years: 1861, 1871, 1881, 1901, 1911, 1921, 1931, 1936, 1951. The centre years for each samples are the following: 1882, 1895, 1907, 1921, 1933 and 1953. Apart from the sample whose centre year is 1921, the centre years for the other samples do not coincide with any Italian Census. In order to compute the weights, the Italian population in 1882 has been computed by interpolating the results from the Italian Censuses in 1881 and 1901, those in 1895 using the Italian Censuses in 1881 and 1901, and so on.

[34] We will refer to the different period as Period 1, Period 2, etc…We will sometimes refer to the four strata as CN-O, CN-A, SI-O and SI-A where CN stands for Centre and North of Italy, SI for South and Islands, A refers to people working in the agricultural sector while O indicates people working in other sectors.

component with the head of the household. These information will be used in the 'filling in' process;

2. the survey of origin presents aggregated data on more than one family thus not reporting any age values for family components (16 per cent of the total number of persons).

For missing values of the type 1., a missing imputation method has been composed of two different steps:

1. we impute an age value higher than 13 (the threshold level to be considered as a child or an adult), for the components we know to be either the head of the household, his/her partner, his/her brother or sister, and the brother/ sister of the partner, his/her parents or the parents of the partner. We impute a value higher than 13 for the sons or daughters if the mother is older than 55. Persons who do not enter in the previous categories are imputed with a value smaller than 13;
2. the remaining missing values (persons for which we do not know their relationships) are imputed through the 'hotdeck' procedure and using information on age coming from variables such as the region of origin, the time period, income of the family, food and non food family expenditures.

Missing values of the ii) type are those for which we did not have any information on each family members and his/her age. We impute the average number of family components and the ages shown by the 'closest' family. The closest family is the one that belongs to the same strata, possibly the same year (otherwise the same sub period) and presents the closest value of family income and family total expenditure.

The missing value imputation does not change dramatically the percentage of children and adults in the sample. Before the imputation process, the percentage of children in the whole sample was 13; the percentage has increased to 17 after filling in all the missing values. A clear picture of the percentage of children and adults in the sample before and after the imputation process for the 6 distinct sub periods is shown in Table 5. The missing procedure has increased or decreased the percentage of children by a maximum of 5 per cent. For the purpose of the current research the exact age of each family members does not really matter. What we do care about now is the division between children and adults. That is the reason why no further controls have been made to check the distribution of the age before and after the imputing procedure.

With regard to missing values on 'non food expenditure' categories[35], the MICE procedure (Multiple Imputation by Chained Equation) has been preferred to the hotdeck method because this latter 'may perform poorly when many rows of data have at least one missing value' (Royston, 2004 and 2005), as it is the case here.

MICE consists of an iterative multivariate regression technique. The basic idea of MICE is to create a small number of copies of the data, each of which has the missing values suitably imputed. Estimates of parameters of interest are averaged across the *m* copies to give a single estimate. Missing values are assumed to be missing at random[36].

Conceptually, in order to create multiple imputed dataset for multiple variables x_1, x_2, …, x_k, with missing observations, MICE does the following:

1. ignores units for which every variable of the list $x_1, x_2, \ldots, x_k$ presents a missing value. This step eliminate families for which it is impossible to impute any values since information is not available;
2. for each variable with any missing value in the list x_1, x_2, …, x_k, MICE randomly orders that variable and replicates its observed values across the missing cases. This step initializes the iterative procedure by filling in missing data at random;
3. for each of x_1, x_2, …, x_k, MICE imputes missing values by applying a routine which imputes a single value given a set of predictor variables. Here the sample has been divided according to the 24 strata defined above. Missing values have been imputed for 'clothing' and 'housing'. The Ordinary Least Squares (OLS) regressions used to impute missing values have been run using information coming from the following set of variables: *'Total Expenditure'*, *'Total Food Expenditure'*, *'Total Family Income'*, *'Number of Family Members'* and *'Number of Working Components'*;
4. repeats the previous steps 20 times, as suggested by Van Buuren et al. (1999), and replaces the imputed values with updated values at the end of each cycle;
5. repeats the step above ten times.

MICE creates one single data set containing multiple copies of imputed data. The value for each variable is then computed with the sample mean between all the 10 different values. The patterns of some categories of non food expenditure after the imputation procedure are showed in

[35] 'Food expenditure' categories presented missing values but that issue has been solved in a previous phase.

[36] Missing values for a variable Y are considered missing at random (MAR) if the probability of missing data on Y is unrelated to the value of Y, after controlling other variables in the analysis. This means that missing values regarding the variable 'bread expenditure' can be considered MAR if the probability of missing data on 'bread expenditure' depends on the variable 'income level' but that within each category of 'income level', the probability of missing 'bread expenditure' is unrelated to the value of income.

Picture 1 to 6. The end result is a sample of 8,300 completed budgets providing information on the expenditures on different areas of food and on the total non food expenditures.

Section 3.3. Quality of data

A preliminary check of all family budgets has allowed us to disregard those budgets with negative income, negative expenditure or with data clearly implausible. For what concerns family budgets, data collected normally refer to yearly expenditure although it might happen that some family budgets refer to the expenditures faced in a representative day or month. Daily family expenditures were then multiplied by 365 while those regarding monthly expenditures were multiplied by 12.

We have no reason to believe that this procedure leads to a bias in the analysis. This conviction is supported by the facts that daily and monthly budgets, which are obviously the less precise, are more frequent in years preceding World War I and in places located in rural area. The timing and location indicate families whose expenditure profile has been pretty similar along the year. This suggests that expenditures faced in one day or in one month can be considered representative of the entire year. This is true for expenditures regarding non food items since they do not vary so much along different months. Food expenditure, on the other side, follow a fairly stable pattern with the exception of very few days, i.e. Christmas and Easter, but we do not think that the lack of information for few days will lead to a bias in the analysis. The proof of what has just been said comes from surveys regarding the Italian diet before World War I. The essence of some of these studies is reported below. In very few occasion, during Christmas day, Easter, Carnival, for a wedding and rarely for a funeral, people could finally eat more' (Felice, 1989). In the area around Treviso, in Veneto, the daily diet of peasants is composed of a big amount of *polenta* and few other foods (cheese, boiled vegetables). Peasants eat very little meat although a skinny chicken might sometimes be shared between 10 persons' (Lazzarini, 1983). 'All the Italian workers eat just vegetable, although in a different way in different Italian regions. In many areas, maize is the main food consumed; in the South, they prefer grain, fruits and legumes. The diet never changes along the year' (Celli, 1894).

A word on the composition of food expenditures is in order here. In principle, food expenditures includes purchases, home grown stock, receipts in exchange for goods and services, charity, etc. Meals given to servants have been counted only if these servants were living in that household, and were not simply daily workers.

In the context of current household budgets data, we are not able to distinguish between high quality and low quality foods. We suppose that all the households face the same quality level and

what differs is just the amount of money spent on a certain category of food, and thus the quantity of that food. This can be considered a limitation in the sense that we are not able to distinguish the consumption of white flour from that of inferior quality flour. Therefore if there have been any systematic substitutions within different grades or qualities of the same cereal, we are not able to identify them.

Data have been checked for any pattern in 'heaping' which is the habit that people have to round off values regarding income, expenditure and age. This possibility, which has been already removed for food expenditure, was not present for the remaining part of the expenditures. The heaping problem connected with the variable regarding the age of each component has not been checked because it would be irrelevant for the analysis. Here we just need to know that the distinction age between children and adults, 13, is not affected by the heaping problem. The frequency of people aged 15 does not present any statistical differences with the frequency of people aged 14 and 13. The consequences of heaping and rounding, and methods for dealing with it, are given in Battistin et al. (2003) and in Heitjan and Rubin (1990).

The comparison between the expenditure coming from the analysis of family budgets (Table 6) and some benchmark data (Barberi,1961; Rossi, Sorgato and Toniolo, 1993) lead to a couple of interesting observations (Table 7 and Table 8).

The striking feature is that family budgets estimates are positioned half way between Barberi and Rossi, Sorgato and Toniolo's estimates (indicated by the initials RST in the text below). Family budgets data exceed the amount calculated by Barberi and are below the amount offered by the other benchmark. The other features, at least the ones that are more important for the economy of this research, can be summed up as follows:

1. family budgets data for heating and fuel expenditures for the entire period exceed those of Barberi;
2. current data for clothing expenditure are below those of RST;
3. current data seem to underestimate entertainment expenditure from 1890 compared to Barberi, and entertainment and education expenses compared to RST. This last difference is partly due to the fact that family budgets data could be not so precise with regard to education expenditure.

The overall differences between current data and the two benchmark data, although high in certain periods and for some aggregates, seems to be random and strengthen the fact that data from family budgets can be considered as a good alternative to 'macro' data.

Section 4. Empirical results

The demographically extended QAI demand system was estimated in budget share form, equation (9), for each of the 6 sub periods and for the seven categories of items. The use of the quadratic model rather than the AI model is justified by the quadratic relationship between the budget shares and the logarithm of total expenditures. The significativity of λ, which is the coefficient associated to the logarithm of total expenditures squared, supports the thesis suggested by the graphic analysis.

Table 13 to 18 report the estimate of λ along with the associated standard deviation. It is clear that the evidence in favour of QAI is almost overwhelming; the parameter is proved to be significative in a very high percentage, 65 per cent, in all the sub periods and for all the consumption categories.

The coefficients in Table 13 to 18 show the effect of household size on the budget share devoted to food and non food items in six distinct period. The first item of interest from the tables is the fact that the impact of household size on food expenditure is surprisingly negative for many food items. This means that an increase in the number of children or in the number of adults reduces families' food share as an overall result. There are systematic differences in expenditure choices related to the presence of an additional child or of an additional adult which will be shown later.

The general result mirrors that of Deaton and Paxson, but the current findings deepen the 'food puzzle' to the extent that, in the past, the conditions were such that food share should have increased even more with household size, given that there were fewer substitutes for food than there are today].

The results from the estimation of the demand system incorporating demographic variables can be summed up in the following two points:

1. an increase in the number of adults within the same household leads to an increase in the share of cereal purchases. That result might be straightforward: the easiest way to feed more adults is through cereals or cereal-based food (cereal share increases in sub periods 2, 3, 4, 5 and 6). In sub periods 1, 3 and 4, the share of meat purchase increases too. The general trend suggests that an increase in the number of adults raises the share of cereal but not that of other goods until the end of World War II. After that the increase in the share of food purchase seems more general, and also applies to fats and dairy products;
2. an increase in the number of children does not cause any consistent and repeated raise in the share of food purchase. On the contrary an additional child in the household leads to

a decrease in the share of money devoted to buy meat (negative impact in sub periods 1, 2, 5 and 6), dairy food (1, 2, 4, 5 and 6) and vegetables (3, 4, 5 and 6). During sub periods 5 and 6 there is an increase in cereal and fats share, standing the fact that purchases of more expensive goods, such as meat and dairy products, decrease as well as those of vegetables. The reason of the decrease in the budget share for most of the food categories consequent to the increase in the number of children will be analysed and explained below.

Since the model estimates deepen the 'food puzzle' and do not follow the results of the Barten model, we can abandon the idea that food is a private good or we can try to explain why food in Italy does not behave like a private good. The question is how to reconcile those historical results with the economic theory on private goods.

Our explanation will be based on the distinction between the nutrition of children and adults in the same household. There are two distinct issues here. The first is the necessity to find an explanation to the empirical evidence that the allocation of goods differs according to the age of the family member. The second is whether we can find an historiographical framework that will allow us to support the empirical evidence regarding the effects of household composition on household demand patterns.

There is a large literature documenting that, at least in some areas of the world, the allocation of household resources favours some members rather than others. To be precise, much of this work (Dreze and Sen, 1989; Harriss, 1990; Dasgupta, 1993; Strauss and Thomas, 1995) is not concerned with the allocation of goods between family members but with the comparison of nutritional, educational and medical level of family members having different age and gender. Best known are the findings on excess infant mortality among girls in Asian countries, such as China, Bangladesh, Pakistan and Northern. Although the mechanism is still under debate, it is believed that female children are given less medical attention when they are sick, and it is certainly possible that they are provided with fewer attention in general. Other researchers have found a more complex pattern of consumption between persons of different gender within the same household. Thomas (1994) found out that in the United States, Brazil and Ghana there is a positive association between mother's education and her daughter's height, and between the father's education and his son's height. The relationship is very mild or completely absent between mother and son, and father and daughter.

The general result obtained with the estimation of the complete demand system model stresses the fact that food share did not increase with a rise in the household size. While an additional adult leads the food share to increase, the opposite happens with an additional child. The effect of the

household size on food share might be divided into the effect of an additional adult, a positive one, and that one of an additional child, a negative one.

The reasons of the empirical findings are not that secret for Italian historians and nutritionists. The nutritional treatment each family members received was heavily based on the sex and on the age of the person. That behaviour has to do mainly with food scarcity: the less food, the less you give to people who are unable to work and thus to produce. The other reason of that regularity is that in 'old times' the head of the household and adult men in the family had a predominant role over women and children. Nutrition within the family reflects that distinction.

Different nutrition for different family members is proved both in the Italian historical statistics and in the reports and surveys that statisticians used to make in order to study and to document poverty.

Under-nutrition of children was at the centre of a debate even back in 1920 when it became clear that children's diet was poor in proteins. Protein shortage, even when carbohydrates and fats were eaten in sufficient quantities, was the main cause of slow growth, skinny bodies and laziness at work which were distinctive aspects of poor people and peasants at that time (Loriga, 1923).

In 1888 in Italy, 49% of children affected by scarlet fever would die. Before the vaccines were in use, children had a very high probability of contracting measles and die from it. The reason was not that the pathogen was stronger in the past, but was malnutrition that caused children's body to be weaker and less ready to overcome the disease. The same happened with diseases such as tuberculosis, diarrhoea, respiratory infections and many others (McKeown, 1979).

Mortality of children aged between 0 and 5, which decreased significantly after 1950, confirms the point stressed above. Compared to a fall of 48 per cent (50 per cent) between 1881 and 1940, between 1940 and 1955 children mortality dropped by 40 per cent (35 per cent) for male (female). Mortality decrease is even more striking when looking at children aged between 5 and 15. Mortality rate for children between 5 and 10 decreased by 40 per cent in post-war years (compared to 17 per cent between 1881 and 1940) and by 33 per cent for children between 10 and 15 years old (27 between 1881 and 1940) (Istat, 1958).

When welfare and standards of living went up after World War II, the number of children born decreased by 17 per cent (Istat, 1958). Smaller families let the parents to look after their children better.

Similar findings arise from looking at height and weight. Poor children aged 17 were as tall as rich children of 14 years old. Between rich and poor children both aged 19, the height difference was 12 centimetres and the weight difference 3 kilos. Approximately 40 per cent of men were excluded from the military service for a number of physical defects, due to insufficient breast-

feeding received in the first years of their life and to the precarious level of nutrition during childhood (Nitti, 1958).

Some evidence of differences in the diet between children and adults arise looking at family budgets. Some examples are showed in the following text. In the Calabrian district of Cortale, a family budget reported that the head of the household ate as much as his wife and his two children together (Cefalì, 1880). Another report states how only adult men could sit at the table and have a proper dinner, because they worked and they were the only ones who could make money. Children used to eat standing up, sitting on the floor, in a corner, with the dish between their hands and without cutleries (Barbagli, 1984). The head of the household would also often spend in the tavern drinking wine all the money that the family had been saving from the week salary (Baleotti, 1982).

In economic and sociological literature, there are many different theories which study how resources are allocated within the household. At the two extremes there are two very simple theories which nest all the other ways of thinking about this issue. The first one looks at the household as a group of individuals who bargain with each other over resources. It makes sense to suppose that people in the family care for each other, and get pleasure from consumption of other family members (Manser and Brown, 1980; Mc Ellroy, 1990; Lundberg and Pollak, 1993). At the other extreme, the simplest theory, which has dominated in the literature until very recently, treats households as monolithic entities, endowed with preferences as if the household is an individual. This theory suggests a dictatorial model, in which the *pater familias,* most presumably the father, decides on behalf of everyone on the base of his assumptions. While the first theory seems to fit better the present situation in developed countries, the latter applies better to the world described in the current paper. The father was considered the chief of the family and had the final word over a wide set of decisions, including consumption.

Differences in nutrition were even justified by the Christian vision of relationships between food and sex: children, who were not supposed to have sexual intercourse, had to eat and drink less because food and alcohol may stimulate them in that direction (Bell, 1992). The Catholic Church in Italy suggested to Italian family how to feed their children so that they would not have any sexual stimulus. Sex before the wedding and without procreation intent was considered a sin by the Catholic Church.

Starting from the second half of the 20th century, better nutrition had a positive influence on height and on the mortality rate, as seen above. It seems that better nutrition influenced the occurrence of the menarche, from 16 to 14 years old, and the shifting of the menopause. More caloric and varied diet is seen as the main cause of the lengthening of the fertile period for women, although differences between rural and urban women were still present (Shorter, 1984).

The ‘food puzzle’ paradox might be explained following other propositions, which have been widely proposed in the literature. Some of them cannot be used as arguments in the current paper for various reasons, while others do fit into the Italian case.

Under the tight budget constraints of a larger family, the decrease in food share consequent to family enlargement might be explained by the shift from higher quality, more expensive food, to lower quality, less expensive food. The previous indication cannot be proved with the current data, which do not distinguish between high quality and poor quality food. Data on Italian family budgets, in the way they have been collected, unfortunately do not give the possibility of such studies. It is a fact, though, that families based their diet on low quality food when there was little money. If rich families were used to buy and consume high quality white bread, less endowed families used to eat black, yellow or a mixture of yellow and black bread. Distinctions between poor and rich families were often based on the colour of the bread, of wine, beans and broad beans (Nitti, 1958).

The starting point of the second explanation is the Deaton and Paxson’s assumption that a household with more members would have lower per capita food expenditures because factors other than food would increase in the food production process.

A factor that is directly related to food production is time. Household time is a function that is increasing in the size of the household; standing that fact, it is possible to substitute time for expenditure on food, leaving the consumption of food basically unchanged. Deaton and Paxson have argued that the ‘food puzzle’ might be explained incorporating time as an input into the food production function. Some problems arise for that analysis: the models that consider the time as a variable in the food production function miss other factors that would be important. The refrigeration of food, the possibility to store food for a longer time using chemical preservatives, changes in the technology used in agriculture or in food production, electrification and many other factors all play an important role in the production of food at home in the 19^{th} and 20^{th} century (Logan, 2006).

The other explanation relates to food consumption consumed at home and outside. Although meals outside were not frequent in the past, it is still possible that larger families reduced the amount of money spent on meals outside of home. If that is true, larger households would have lower food expenditures since meals consumed in a restaurant are usually more expensive than those consumed at home.

Gan and Vernon (2003) suggested that measurement errors play an important part in explaining the ‘food puzzle’, and that the basic problem lays in the way that family expenditures are

collected. We must argue that measurement errors might occur when measuring food expenditures, but systematic errors seem highly implausible. This assumption is confirmed by the fact that people purchase food more often that any other goods and it seems unlikely that only food expenditures would be measured with error while other expenses would be perfectly recorded. The other source of error could be represented by the fact that surveys on families expenditures interview a single respondent for each family, typically the head of the household, who provides detail on all the family expenditures. The respondent might not know everything about food expenditure. We do not think that this is the case, especially in Italy back in those years when eating was such an event and when the whole family used to eat together.

Another explanation, related to the previous one, is that micro data on family budgets systematically ignore expenditure on home-produced food, and home-produced food makes up a larger share of total food expenditure. This explanation does not hold here: we estimated the equations using only 'non agricultural based households' and the estimates of the effects of household size on the food share are essentially unchanged.

There are a number of other possible explanations for the 'food puzzle'. None of the following enlightens holds out the promise of resolving the puzzle, although several clearly must be taken into account for further researches:

1. the presence of direct economies of scale in food consumption: larger households may benefit from buying in stocks and thus paying a lower unit price. As a result, food expenditures might fall even when quantities are rising and quality stays even. We are not able to prove this suggestion because family budgets did not display data on quantity purchased and price paid. Our feeling is that suggestion would certainly hold now with the introduction of sales for bigger amount in department stores. We are not sure about its explanatory power back in the past;
2. economies of scale in food preparation: these almost certainly exist, although they do not help in explaining the phenomena. In addition, larger household are more willing to switch from already prepared foods, which are costly, to home prepared foods, less expensive;
3. larger household are better in eliminating waste through a more efficient system of storage. We do not think that there is so much avoidable waste in Italy at that time. Waste seems to be a more recent concept.

Furthermore, food is not the only private good that can be tested, and Horowitz has argued that food may not be the appropriate private good on theoretical grounds. It is therefore useful to

examine the coefficients associated to other household expenditure categories. Clothing is considered a private good in the literature, although the degree to which it is considered private is still a source of debate. Similarly, the demand system with demographic variables has implications for public goods like housing. This can be tested looking at housing expenditures to see if they are consistent with the implication of the Barten model.

Table 13 to 18 show estimates of the coefficients of clothing share associated to the increase in the number of adults and children. Like for food, clothing coefficients are not consistent with the prediction for the private goods. Increases in household size lead to a decrease in clothing expenditure for the entire period under consideration with the exception in the sub period 2.

Housing, on the contrary, is a public good. As such, the estimates should suggest a negative correlation between housing expenses and household size. Table 13 to 18 show how the housing expenditures do not present a clear pattern. The effect of having a larger household on housing expenses is dubious: the presence of an additional children has an opposite consequence than that of an additional adult for the first 3 sub periods. Barten consideration is verified during the fascist period (sub period 4). After World War II larger households increase housing expenditures.

Shift in the consumption patterns reveal the expected trend towards greater consumption of meat and fats for what regards food, and of clothing for non food items. For these goods the elasticity to total expenditure is constantly higher than the unity (Table 20). An increase in families income yields a new set of consumption decisions and a shift in expenditure towards more expensive calories.

Given the level of aggregation of the data, it is not surprising that there is no negative total expenditure elasticity which indicates an inferior good. By considering the total expenditure elasticity relative to unity and to the set of categories considered here, we can classify the seven categories of goods into necessities and luxuries.

Within this classification, bread and cereal-based food and vegetables represent the base of the Italian diet. The change in diet, which may be inferred from the values of elasticity, suggests a slow but regular increase in cereal consumption during all the years considered. It appears that the additional expenditure was not immediately devoted to cereals as total expenditure rose. As spending power increased, households increased the proportion of expenditure on goods which were less strictly necessary for surviving.

A change in price had also a clear effect on purchases since consumers also reacted to prices changes. In order to capture these effects, we computed the uncompensated price elasticity, i.e. the budget share response to price changes holding total expenditure fixed. Here we just focus on own-

price elasticity (Table 21). Luxuries had higher uncompensated price elasticities than necessities. As theory suggests, cereal-based food show the lowest price elasticity.

If on one side expenditures on fats and clothing rapidly increased when income improved, on the other side the same expenditures quickly decreased when these goods became more expensive.

In the context of this demand system meat has a special place since it behaves like a luxury good which has low own price elasticity. It seems that Italian families, when facing high prices for meat, try not to reduce meat purchases but rather economize on other items of expenditure. It is as if Italian people realized the importance of meat in their diet and tried to purchase meat as much as possible whatever its price.

The last results we would like to stress are the ones regarding the two dummies which define the region where the family lives and the sector of activity in which the head of the household is engaged. The striking features looking at the coefficients associated to this two variables are the following:

1. families living in the South and in the Islands experienced higher budget share for cereals and vegetables and lower for meat and fats. The coefficients associated to food items stress the repetitiveness of the diet for families living in the poorer areas of Italy;
2. the coefficients associated to the variable indicating whether the head of the household is employed in the agricultural sector suggest that those families devote an higher part of the budget share to basic needs (cereals, vegetables) and less money to luxury foods, like meat or fats, and luxury items, like the ones regarding entertainment.

The previous two findings stress the fact that differences among Italian families are likely to occur between households whose heads are employed in the two different sectors, as well as between those living in the two geographical areas described in the model. This last variables plays a very important role in explaining different patter of expenditure within distinct macro areas.

Section 5. Does the Italian experience help us to resolve the food puzzle? Conclusions

Using historical household budget data we estimated a quadratic demand system for Italy for the period from 1875 to 1960. The results enlighten us on some interesting topics. Some of them are listed below:

1. expenditure elasticities have the predicted sign. Cereals and vegetables confirm to be necessities while meat, fats and clothing prove to be luxury items;
2. price elasticity of meat has an unexpected behaviour since it is lower than other luxury and necessity items;

3. food share does not increase with family size enlargement; the effect of family enlargement on the food budget share differs for an additional child and an additional adult.

The quadratic demand system seems more appropriate for the data we are using. Evidences in that sense comes from the coefficients of the quadratic term in the estimates which are significative in 65 per cent of the cases.

We would like to add a few more things on the 'food puzzle' paradox finding. In a widely known paper, Deaton and Paxson exposed a contradiction between standard micro-theory and empirical regularity. At a constant family income, household food expenditures fell, rather than rising with household size. The theoretical expectation of a positive relationship between household size and food expenditure stems from intra-household economies of scale for public goods.

Beyond computing the size and the sign of relationship, the paper also suggests theoretical and empirical hypotheses regarding the sign of the relationship between household size and expenditure share.

Congruent with previous empirical suggestions, family food share decreases with household size until the end of World War II, although the conditions in which food share would increase with household size were stronger in the past (families were much closer to the subsistence nutritional level and food had fewer substitutes). Although the 'food puzzle' paradox is still confirmed, the estimation reveals a particular pattern. An additional adult increases the food share of cereal while an additional child does not increase any category of food in a consistent way. This result is explained by the differences between adults and children's diets. The basic reasons are linked to food scarcity and to the fact that adults needed more energy to work harder. Confirmations came from historical statistics and from family budgets reports. Differences in the diet of family members represents an original explanation to the 'food puzzle' paradox.

We would like to conclude the paper suggesting further researches in order to investigate the 'food puzzle' paradox and to shed some light, at the same time, on the different patterns of consumption within the household. The question is whether all children are treated equally or whether there are differences in the consumption according to the fact that the child is a boy or a girl. That there might be such differences is possible given the evidence on discrimination against girl in education. The same question applies to the consumption pattern between male adult and female adult.

Appendix I

Table 1
Set of prices used and their sources

Good	Source of the data
Cereals and bread	
Cereal	ISTAT
Barley	ISTAT
Rice	Barberi
Maize	ISTAT
Inferior cereals	ISTAT
Vegetables	
Broad bean	ISTAT
Bean	Barberi
Lentil	ISTAT
Potato	ISTAT-
Fresh legumes	Barberi
Tomatoes	Barberi
Orange and mandarin	ISTAT
Lemon	ISTAT
Apple	ISTAT
Cherry	ISTAT
Almond	ISTAT
Oil and fats	
Oil	Barberi
Butter	Barberi
Other oil	Barberi
Meat	
Cowpat meat	Barberi
Pork meat	Barberi
Mutton meat	ISTAT
Poulty	ISTAT
Rabbit	ISTAT
Dairy Product	
Cow buffalo milk	Barberi
Sheep milk	Barberi
Goat milk	Barberi
Eggs	Barberi
Clothing	
Winter dress for woman	ISTAT
Winter dress for man	ISTAT
Shoes for woman	ISTAT
Shoes for man	ISTAT
Housing	
Glasses	ISTAT
Plates	ISTAT
Sewing machine	ISTAT
Gas	ISTAT
Electricity	ISTAT
Rent	ISTAT

Table 2
List of variables regarding food and non food expenditures

Aggregated variables	Disaggregated variables
Food expenditure	
Cereals	• Total expenditures on cereals; • bread; • biscuits and pastries; • flour; • rice; • pasta.
Meat	• Total expenditures on meat; • veal; • beef; • poultry; • rabbit and turkey; • pork; • mutton; • horse meat; • other meats; • cured pork meats.
Oil and fats	• Total expenditures on oil and fats; • Oil of olive; • other oils; • animal fats; • other vegetables fats; • butter; • other animal fats.
Dairy products and eggs	• Total expenditures on diary products and eggs; • milk and milk products; • cheese; • eggs.
Vegetables (green vegetables, legumes and fruits)	• Total expenditures on vegetables; • potatoes; • fresh tomatoes; • tomato sauce; • preserved vegetables; • Total expenditures on legumes; • fresh bean; • broad bean; • peas; • other fresh legumes; • preserved legumes; • total expenditures on fruits; • fresh fruits; • dried fruits; • preserved fruits
Non food expenditure	
Clothing	• Total expenditure on clothing and footwear; • clothing for adult men; • clothing for children; • clothing for adult women; • footwear for adult men; • footwear for children; • footwear for adult women; • clothes repairing; • other clothes expenses.

Housing	• rent; • repair expenditure; • coal and wood; • liquid fuels; • water; • electricity; • gas and central heating; • furniture; • cutlery and kitchen utensils; • domestic appliances.

Notes: the table enumerates the variables taken into consideration in the analysis. Here we consider seven categories of expenditure which account for 80 per cent of total expenditure. Other categories of food expenditures (fish, beverages, coffee and sugar), as well as non food expenditures (health, education, transport and communication) are not considered here due to their limited importance in the context of the family budgets. The unit respondent is meant to be the head of the household and the expenditure variable regards the expenses of the entire family.

Table 3
List of the demographic variables collected in the sample

Family demographic variables	**Individual demographic variables**
• Age of the head of the household; • Gender of the head of the household; • Number of family components; • Work of the head of the household.	• Age of each component • Gender of each component • Work or activity of each component

Notes: demographic variables are here intended at two different levels: at family and at family's component level. The first one is meant to ask general information about the family and the head of the household while the second one is directed to each component. The unit respondent is then different; the head of the household in the first case, each component in the second.

Table 4
Strata, sample size and number of surveys on family budgets

Sector of activity	Number of observation and minimum cell size		Total number of observations
	North-Centre	South-Islands	
	1882 *(1854-1891)*		
Agriculture	*90(90)*	*70 (70)*	160
Other	*16 (16)*	*30 (30)*	46
Total	106	100	206
	1895 *(1887-1904)*		
Agriculture	76 *(76)*	78 *(78)*	154
Other	62 *(62)*	46 *(46)*	108
Total	138	124	262
	1907 *(1900-1914))*		
Agriculture	54 *(54)*	240 *(240)*	294
Other	52 *(52)*	0	52
Total	106	240	346
	1921 *(1913-1930)*		
Agriculture	66 *(60)*	164 *(38)*	230
Other	*249 (142)*	569 *(14)*	818
Total	315	733	1048
	1933 *(1927-1940)*		
Agriculture	302 *(296)*	341 *(215)*	643
Other	957 *(96)*	604 *(49)*	1588
Total	1259	972	2204
	1953 *(1946-1961)*		
Agriculture	475 *(130)*	0	475
Other	3682 *(2421)*	291 *(53)*	3973
Total	4157	291	4448

Notes: the table shows the sample size of each stratum and the number of surveys on family budgets from which the observations come from (between brackets). Since the number of surveys is smaller than the number of units, this means that 1 survey might display average data on more than one family. The year in bold represents the average year of the sample period, showed in the brackets. When the average year coincide with the Italian census interpolation was not needed. Some samples overlap and around 4 per cent of units are used both in one sample and in the following one. Sub samples for the stratum regarding South-Islands/Other in 1907 and South-Islands/Agriculture in 1953 have not been created due to lack of data.

Table 5
Percentage of children and adults in the sample before and after the imputation process

Period	Percentage of children and adults in the sample			
	% of children before the imputation process	*% of children after the imputation process*	*% of adults before the imputation process*	*% of adults after the imputation process*
1	14	18	86	82
2	21	29	79	71
3	20	23	80	77
4	18	23	82	77
5	25	30	75	70
6	14	16	86	84

Figure 1
Missing and non missing values:expenditure on clothing

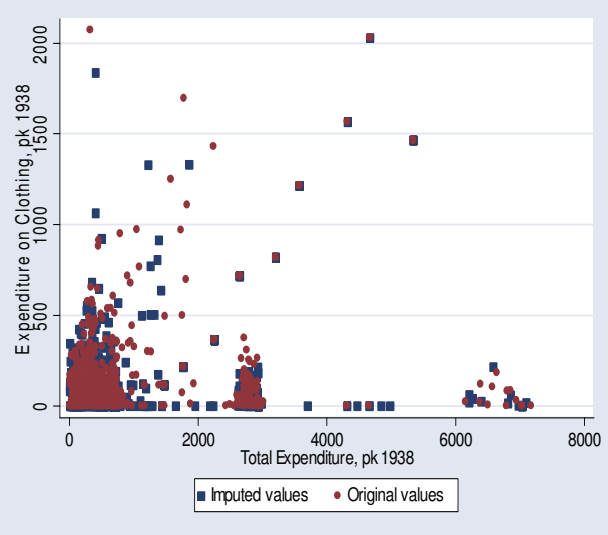
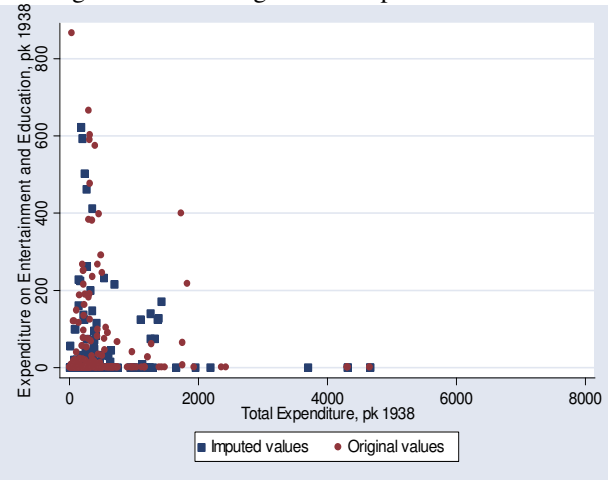


Figure 2
Missing and non missing values: expenditure on housing

Figure 3
Missing and non missing values: expenditure on entert.



Notes: Figures 1, 4 and 5 illustrate how the missing values imputation for these three expenditure aggregates respects the pattern of non missing values (the round red circles). The procedure here employed is MICE, which perform better than the hotdeck procedure in situation where the frequency of missing values is high. As a result, the variance of the total values, non missing and imputed, is slightly higher than the variance of non missing points.
The same procedure has been performed in order to impute values for food expenditure categories. This is not showed for brevity.

Table 6
Expenditure for different categories of non food items (Sources: family budgets)

Period	Expenditures categories				
	Non Food	Clothing	Heating and fuel	Transports and Communication	Entertainment
1875-1889	501	125	15	7	35
1890-1903	450	146	15	20	32
1902-1913	524	182	23	28	45
1913-1929	640	273	37	35	58
1927-1940	617	321	54	54	86
1946-1960	1175	323	143	153	104

Notes: the non food expenditure here displayed have been computed at constant prices 1938.

Table 7
Percent deviation between sample values and benchmark values (Barberi)

Period	Expenditures categories				
	Barberi- current estimates				
	Non Food	Clothing	Heating and fuel	Transports and Communication	Entertainment
1875-1889	-25	15	-33	17	-13
1890-1903	-7	8	-19	-19	17
1902-1913	-13	-7	-38	16	19
1913-1929	-21	-28	-37	26	25
1927-1940	8	-3	-15	17	14
1946-1960	-42	10	-24	-28	11

Notes: the benchmark estimates proposed in this table come from the comparison between data offered by Barberi and those coming from family budgets analysed here. The calculations have been computed taking into consideration expenditures at constant price 1938. The comparison between Barberi and current estimates relate to total non food expenditure and some expenditure aggregate composed of clothing, heating and fuel, transport and communication, and entertainment.

Table 8
Percent deviation between sample values and benchmark values (Rossi, Sorgato and Toniolo)

Period	Expenditures categories					
	Rossi-Sorgato-Toniolo					
	Non Food	Housing	Clothing	Heating	Transports and Communication	Education and Entertainment
1890-1903	23	8	24	26	15	-35
1902-1913	28	28	7	-10	17	-16
1913-1929	24	-23	10	16	11	15
1927-1940	29	18	1	-23	16	16
1946-1960	8	11	11	-34	28	12

Notes: the benchmark estimates proposed in this table come from the comparison between data offered by the paper of Rossi, Sorgato and Toniolo and those coming from family budgets analysed here. The calculations have been computed taking into consideration expenditures at constant price 1938. The comparison regard total non food expenditure and some expenditure aggregate composed of housing, clothing, heating, transport and communication, and education and entertainment.

Table 9
Demand system estimation. The dependent variable is represented by the budget share spent on cereal

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Share of cereal						
Additional adult	-0.007	0.001	0.002	0.006***	0.011***	0.006
	(0.005)	(0.002)	(0.003)	(0.002)	(0.001)	(0.004)
Additional child	-0.014**	-0.002	0.000	-0.005***	0.009***	0.032***
	(0.006)	(0.003)	(0.004)	(0.002)	(0.001)	(0.004)
South	0.106***	-0.023	-0.189***	-0.012*	0.082***	-0.038***
	(0.025)	(0.018)	(0.021)	(0.007)	(0.004)	(0.007)
Agriculture	0.002*	0.008	0.148***	0.120***	0.062***	0.031***
	(0.041)	(0.022)	(0.027)	(0.006)	(0.004)	(0.010)
Price of cereal	0.489*	-0.374**	0.496	-0.107***	0.185***	1.025***
	(0.259)	(0.189)	(0.345)	(0.023)	(0.056)	(0.069)
Price of meat	-0.069	0.073	0.109	0.070***	-0.135***	0.386***
	(0.155)	(0.188)	(0.173)	(0.025)	(0.050)	(0.045)
Price of fats	-0.429*	0.118	-0.005	-0.046***	-0.013	0.437***
	(0.223)	(0.120)	(0.172)	(0.020)	(0.044)	(0.016)
Price of dairy products	0.232	0.115	0.020	-0.058***	0.027	-0.340***
	(0.171)	(0.160)	(0.018)	(0.019)	(0.039)	(0.065)
Price of vegetables	0.015	-0.260***	0.071	-0.100***	0.054***	-0.097***
	(0.107)	(0.081)	(0.124)	(0.011)	(0.018)	(0.021)
Price of clothing	-0.115	0.136	-0.579***	0.200***	-0.174***	-0.887***
	(0.091)	(0.132)	(0.151)	(0.021)	(0.030)	(0.048)
Price of housing	0.364**	0.648**	-0.450**	0.003	0.067	-0.624***
	(0.181)	(0.295)	(0.192)	(0.013)	(0.059)	(0.034)
Total expenditure	-0.015	-0.155	-0.026	0.074	-0.433***	0.422***
	(0.011)	(0.298)	(0.192)	(0.098)	(0.069)	(0.027)
Total expenditure sq.	0.003	0.010	-0.002	-0.013	0.028***	-0.076***
	(0.002)	(0.021)	(0.014)	(0.008)	(0.006)	(0.007)
Constant	1.131*	-0.614	3.692***	-0.194	2.552***	1.430***
	(0.612)	(1.169)	(1.067)	(0.318)	(0.256)	(0.182)
No. of observations	196	262	346	1048	2204	4264
R-squared	0.163	0.26	0.358	0.317	0.268	0.332

Notes: the coefficients and the standard error (in parenthesis) of the variables used in the demand system model. *** means that the coefficient is significative at 1%, ** at 5%, * at 10%.

Table 10
Demand system estimation. The dependent variable is represented by the budget share spent on meat

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Share of meat						
Additional adult	0.009**	-0.006**	0.005***	0.006***	-0.004	-0.003
	(0.004)	(0.003)	(0.001)	(0.002)	(0.001)	(0.002)
Additional child	-0.003	-0.003	0.005***	0.013***	-0.009	-0.019
	(0.005)	(0.003)	(0.002)	(0.002)	(0.001)	(0.002)
South	-0.048***	-0.045**	0.034***	-0.018***	-0.016	-0.050
	(0.020)	(0.019)	(0.011)	(0.008)	(0.003)	(0.005)
Agriculture	-0.076**	-0.072***	-0.053***	-0.004	0.012	-0.075
	(0.033)	(0.024)	(0.014)	(0.007)	(0.003)	(0.006)
Price of cereal	-0.069	0.073	0.109	0.070***	-0.135	0.386
	(0.155)	(0.188)	(0.173)	(0.025)	(0.050)	(0.045)
Price of meat	-0.110	-1.227***	-0.066	0.308***	-0.133	-0.063
	(0.153)	(0.288)	(0.151)	(0.088)	(0.096)	(0.035)
Price of fats	0.155	0.663***	-0.114	-0.085*	0.154	-0.040
	(0.139)	(0.161)	(0.103)	(0.051)	(0.057)	(0.012)
Price of dairy products	0.245**	-0.682***	-0.001	-0.230***	0.470	-0.461
	(0.128)	(0.206)	(0.011)	(0.067)	(0.071)	(0.045)
Price of vegetables	-0.204***	-0.005	-0.164**	0.059***	-0.066	-0.112
	(0.083)	(0.098)	(0.074)	(0.024)	(0.016)	(0.014)
Price of clothing	-0.003	-0.003	0.337***	-0.036	-0.087	0.096
	(0.055)	(0.160)	(0.088)	(0.043)	(0.027)	(0.035)
Price of housing	-0.222	0.776**	0.335	-0.154***	-0.246	0.178
	(0.168)	(0.351)	(0.261)	(0.026)	(0.068)	(0.022)
Total expenditure	0.001	-0.263	0.270***	0.224*	-0.141	-0.432
	(0.009)	(0.313)	(0.096)	(0.123)	(0.052)	(0.017)
Total expenditure sq.	-0.002	0.018	-0.018***	-0.005	0.010	0.063
	(0.001)	(0.022)	(0.007)	(0.010)	(0.004)	(0.004)
Constant	0.573	1.088	-2.639***	-0.931**	0.086	1.744
	(0.462)	(1.276)	(0.668)	(0.411)	(0.213)	(0.147)
No. of observations	196	262	346	1048	2204	4264
R-squared	0.26	0.22	0.44	0.24	0.43	0.61

Notes: the coefficients and the standard error (in parenthesis) of the variables used in the demand system model. *** means that the coefficient is significative at 1%, ** at 5%, * at 10%.

Table 11
Demand system estimation. The dependent variable is represented by the budget share spent on fats

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Share of fats						
Additional adult	0.001	-0.001	-0.001	0.001	-0.002***	0.001
	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Additional child	-0.006	0.000	0.001	0.000	0.007***	0.002**
	(0.004)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
South	-0.036**	-0.026***	-0.057***	0.080***	-0.002	-0.022***
	(0.015)	(0.009)	(0.011)	(0.005)	(0.004)	(0.002)
Agriculture	0.045*	-0.074***	-0.063***	-0.007	-0.053***	0.016***
	(0.027)	(0.010)	(0.014)	(0.005)	(0.003)	(0.003)
Price of cereal	-0.429*	0.118	-0.005	-0.046**	-0.013	0.437***
	(0.223)	(0.120)	(0.172)	(0.020)	(0.044)	(0.016)
Price of meat	0.155	0.663***	-0.114	-0.085	0.154***	-0.040***
	(0.139)	(0.161)	(0.103)	(0.051)	(0.057)	(0.012)
Price of fats	0.270	-0.331*	-0.371***	-0.224***	-0.035	-0.010
	(0.302)	(0.177)	(0.140)	(0.049)	(0.062)	(0.008)
Price of dairy products	-0.296*	0.368**	0.011	0.087***	-0.294***	-0.168***
	(0.168)	(0.191)	(0.010)	(0.034)	(0.043)	(0.014)
Price of vegetables	0.118	0.141**	0.126*	0.022***	-0.005	-0.023***
	(0.090)	(0.058)	(0.071)	(0.019)	(0.018)	(0.007)
Price of clothing	0.105	-0.105	0.270***	0.267***	-0.001	-0.220***
	(0.094)	(0.106)	(0.086)	(0.034)	(0.030)	(0.018)
Price of housing	0.360	-1.222***	0.413**	-0.091***	0.345***	-0.001
	(0.239)	(0.304)	(0.211)	(0.022)	(0.061)	(0.010)
Total expenditure	-0.007	0.006	0.025	0.421***	0.223***	0.108***
	(0.007)	(0.133)	(0.098)	(0.086)	(0.056)	(0.008)
Total expenditure sq.	0.001	0.000	-0.001	-0.036***	-0.022***	-0.017***
	(0.001)	(0.009)	(0.007)	(0.007)	(0.005)	(0.002)
Constant	-1.530**	1.691***	-0.762	-1.508***	-0.150	1.148***
	(0.737)	(0.622)	(0.629)	(0.296)	(0.219)	(0.058)
No. of observations	196	262	346	1048	2204	4264
R-squared	0.20	0.48	0.29	0.27	0.21	0.22

Notes: the coefficients and the standard error (in parenthesis) of the variables used in the demand system model. *** means that the coefficient is significative at 1%, ** at 5%, * at 10%.

Table 12
Demand system estimation. The dependent variable is represented by the budget share spent on dairy food

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Share of dairy food						
Additional adult	-0.011***	-0.006***	-0.002***	-0.003	-0.005***	0.008***
	(0.004)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
Additional child	-0.007	-0.004	0.000	-0.021***	-0.001**	-0.005***
	(0.005)	(0.003)	(0.001)	(0.003)	(0.001)	(0.001)
South	0.101***	0.044***	0.035***	-0.052***	-0.018***	-0.004
	(0.019)	(0.015)	(0.006)	(0.011)	(0.003)	(0.003)
Agriculture	-0.027	0.128***	0.077***	0.094***	-0.020***	0.022***
	(0.031)	(0.019)	(0.007)	(0.009)	(0.002)	(0.004)
Price of cereal	0.232	0.115	0.020	-0.058***	0.027	-0.340***
	(0.171)	(0.160)	(0.018)	(0.019)	(0.039)	(0.065)
Price of meat	0.245**	-0.682***	-0.001	-0.230***	0.470***	-0.461***
	(0.128)	(0.206)	(0.011)	(0.067)	(0.071)	(0.045)
Price of fats	-0.296	0.368**	0.011	0.087***	-0.294***	-0.168***
	(0.168)	(0.191)	(0.010)	(0.034)	(0.043)	(0.014)
Price of dairy products	-0.293	-0.661**	-0.001	0.311***	-0.433***	1.479***
	(0.187)	(0.293)	(0.004)	(0.061)	(0.068)	(0.153)
Price of vegetables	0.006	-0.473***	-0.002	-0.066***	0.061***	0.038***
	(0.090)	(0.081)	(0.011)	(0.017)	(0.012)	(0.009)
Price of clothing	-0.020	0.293**	-0.027***	-0.003	-0.021	0.076**
	(0.073)	(0.150)	(0.009)	(0.033)	(0.021)	(0.032)
Price of housing	-0.142	0.578	-0.007	-0.027	0.172***	-0.581***
	(0.161)	(0.401)	(0.022)	(0.021)	(0.060)	(0.048)
Total expenditure	0.011	-0.822***	0.164***	0.128*	0.187***	-0.035***
	(0.007)	(0.231)	(0.051)	(0.068)	(0.040)	(0.009)
Total expenditure sq.	-0.002	0.054***	-0.011***	-0.003	-0.016***	0.005**
	(0.001)	(0.016)	(0.004)	(0.006)	(0.003)	(0.002)
Constant	0.362	1.723*	-0.545***	-0.758***	0.077	-2.071***
	(0.575)	(1.021)	(0.185)	(0.236)	(0.160)	(0.266)
No. of observations	196	262	346	1048	2204	4264
R-squared	0.14	0.45	0.31	0.25	0.21	0.23

Notes: the coefficients and the standard error (in parenthesis) of the variables used in the demand system model. *** means that the coefficient is significative at 1%, ** at 5%, * at 10%.

Table 13
Demand system estimation. The dependent variable is represented by the budget share spent on vegetables

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Share of vegetables						
Additional adult	0.002	0.000	-0.008***	0.000	-0.002***	-0.004*
	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.003)
Additional child	0.003	0.000	-0.005	-0.006***	-0.004***	-0.029***
	(0.003)	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)
South	-0.046***	0.079***	0.209***	0.043***	0.033***	0.052***
	(0.014)	(0.008)	(0.018)	(0.004)	(0.003)	(0.005)
Agriculture	0.020	0.049***	0.229***	0.068***	0.008***	-0.045***
	(0.023)	(0.010)	(0.022)	(0.003)	(0.003)	(0.006)
Price of cereal	0.015	-0.260***	0.071	-0.100***	0.054***	-0.097***
	(0.107)	(0.081)	(0.124)	(0.011)	(0.018)	(0.021)
Price of meat	-0.204***	-0.005	-0.164**	0.059***	-0.066***	-0.112***
	(0.083)	(0.098)	(0.074)	(0.024)	(0.016)	(0.014)
Price of fats	0.118	0.141**	0.126*	0.022	-0.005	-0.023***
	(0.090)	(0.058)	(0.071)	(0.019)	(0.018)	(0.007)
Price of dairy products	0.006	-0.473***	-0.002	-0.066***	0.061***	0.038***
	(0.090)	(0.081)	(0.011)	(0.017)	(0.012)	(0.009)
Price of vegetables	0.079	0.105*	0.069	-0.003	0.054***	-0.169***
	(0.082)	(0.058)	(0.100)	(0.014)	(0.011)	(0.015)
Price of clothing	0.001	-0.017	-0.095	0.022	0.003	0.344***
	(0.036)	(0.071)	(0.067)	(0.018)	(0.014)	(0.022)
Price of housing	-0.334***	0.418***	-0.152	0.074***	-0.323***	0.043***
	(0.119)	(0.107)	(0.108)	(0.011)	(0.021)	(0.010)
Total expenditure	0.016***	-0.479***	-0.392**	0.156***	-0.167***	-0.199***
	(0.007)	(0.136)	(0.163)	(0.054)	(0.055)	(0.018)
Total expenditure sq.	-0.002**	0.030***	0.028**	-0.014***	0.018***	0.033***
	(0.001)	(0.010)	(0.012)	(0.004)	(0.005)	(0.004)
Constant	0.816***	1.288**	2.032***	-0.365**	0.704***	-0.538***
	(0.310)	(0.567)	(0.706)	(0.189)	(0.182)	(0.073)
No. of observations	196	262	346	1048	2204	4264
R-squared	0.11	0.42	0.40	0.50	0.35	0.27

Notes: the coefficients and the standard error (in parenthesis) of the variables used in the demand system model. *** means that the coefficient is significative at 1%, ** at 5%, * at 10%.

Table 14
Demand system estimation. The dependent variable is represented by the budget share spent on clothing

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Share of clothing						
Additional adult	-0.004***	0.007***	0.002*	-0.002	-0.006***	0.015***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.004)
Additional child	-0.005***	0.005**	-0.001	-0.002	-0.003***	0.024***
	(0.001)	(0.003)	(0.002)	(0.002)	(0.001)	(0.004)
South	0.014***	-0.085***	0.005	0.009	-0.020***	0.007
	(0.006)	(0.014)	(0.010)	(0.006)	(0.004)	(0.007)
Agriculture	-0.001	0.070***	0.031**	0.041***	-0.038***	0.083***
	(0.010)	(0.017)	(0.013)	(0.005)	(0.004)	(0.010)
Price of cereal	-0.115	0.136	-0.579***	0.200***	-0.174***	-0.887***
	(0.091)	(0.132)	(0.151)	(0.021)	(0.030)	(0.048)
Price of meat	-0.003	-0.003	0.337***	-0.036	-0.087***	0.096***
	(0.055)	(0.160)	(0.088)	(0.043)	(0.027)	(0.035)
Price of fats	0.105	-0.105	0.270***	0.267***	-0.001	-0.220***
	(0.094)	(0.106)	(0.086)	(0.034)	(0.030)	(0.018)
Price of dairy products	-0.020	0.293**	-0.027***	-0.003	-0.021	0.076**
	(0.073)	(0.150)	(0.009)	(0.033)	(0.021)	(0.032)
Price of vegetables	0.001	-0.017	-0.095	0.022	0.003	0.344***
	(0.036)	(0.071)	(0.067)	(0.018)	(0.014)	(0.022)
Price of clothing	-0.032	0.134	-0.032	-0.420***	0.042	0.245***
	(0.060)	(0.158)	(0.106)	(0.046)	(0.028)	(0.071)
Price of housing	-0.108	-0.292	-0.184	0.145***	0.328***	0.388***
	(0.090)	(0.254)	(0.123)	(0.025)	(0.036)	(0.032)
Total expenditure	0.007***	0.905***	0.150*	-0.909***	0.316***	0.029
	(0.003)	(0.243)	(0.090)	(0.096)	(0.070)	(0.026)
Total expenditure sq.	-0.001***	-0.058***	-0.010	0.071***	-0.019***	0.025***
	(0.000)	(0.017)	(0.007)	(0.008)	(0.006)	(0.006)
Constant	0.264	-3.376***	-1.001*	3.915***	-0.802***	-0.601***
	(0.336)	(1.057)	(0.602)	(0.348)	(0.248)	(0.216)
No. of observations	196	262	346	1048	2204	4264
R-squared	0.12	0.35	0.16	0.34	0.35	0.35

Notes: the coefficients and the standard error (in parenthesis) of the variables used in the demand system model. *** means that the coefficient is significative at 1%, ** at 5%, * at 10%.

Table 15
Demand system estimation. The dependent variable is represented by the budget share spent on housing

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Share of housing						
Additional adult	-0.010**	0.003	0.000	0.001	-0.014***	0.008***
	(0.005)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)
Additional child	0.003	-0.001	-0.005	-0.007***	-0.023***	0.000
	(0.005)	(0.003)	(0.004)	(0.001)	(0.002)	(0.002)
South	0.024	0.092***	0.037*	0.075***	0.150***	-0.149***
	(0.022)	(0.018)	(0.021)	(0.006)	(0.009)	(0.004)
Agriculture	-0.112***	-0.027	-0.194***	-0.011***	-0.193***	0.001***
	(0.034)	(0.021)	(0.028)	(0.005)	(0.008)	(0.005)
Price of cereal	0.364**	0.648**	-0.450***	0.003	0.067	-0.624***
	(0.181)	(0.295)	(0.192)	(0.013)	(0.059)	(0.034)
Price of meat	-0.222	0.776**	0.335	-0.154***	-0.246***	0.178
	(0.168)	(0.351)	(0.261)	(0.026)	(0.068)	(0.022)
Price of fats	0.360	-1.222***	0.413**	-0.091***	0.345***	-0.001***
	(0.239)	(0.304)	(0.211)	(0.022)	(0.061)	(0.010)
Price of dairy products	-0.142	0.578	-0.007	-0.027	0.172***	-0.581***
	(0.161)	(0.401)	(0.022)	(0.021)	(0.060)	(0.048)
Price of vegetables	-0.334***	0.418***	-0.152	0.074***	-0.323***	0.043***
	(0.119)	(0.107)	(0.108)	(0.011)	(0.021)	(0.010)
Price of clothing	-0.108	-0.292	-0.184	0.145***	0.328***	0.388***
	(0.090)	(0.254)	(0.123)	(0.025)	(0.036)	(0.032)
Price of housing	0.285	-0.179	0.082	0.033*	-0.311***	0.625***
	(0.272)	(1.115)	(0.381)	(0.018)	(0.106)	(0.026)
Total expenditure	-0.012	0.807***	-0.191***	-0.094	0.015	0.107***
	(0.008)	(0.224)	(0.067)	(0.063)	(0.069)	(0.012)
Total expenditure sq.	0.003**	-0.053***	0.013***	0.000	0.001	-0.032***
	(0.001)	(0.016)	(0.005)	(0.005)	(0.006)	(0.003)
Constant	-0.521	-1.030	0.276	0.773***	-1.338***	0.023
	(0.414)	(1.047)	(0.402)	(0.208)	(0.274)	(0.141)
No. of observations	196	262	346	1048	2204	4264
R-squared	0.33	0.35	0.33	0.21	0.62	0.40

Notes: the coefficients and the standard error (in parenthesis) of the variables used in the demand system model. *** means that the coefficient is significative at 1%, ** at 5%, * at 10%.

Table 16
Expenditure elasticity for food and non food items in the six sub periods

Period	Expenditure elasticity						
	Cereal	**Meat**	**Fats**	**Dairy Products**	**Vegetables**	**Clothing**	**Housing**
Period 1	.83	1.04	.99	.79	.82	1.56	.69
	(.081)	*(.025)*	*(.086)*	*(.20)*	*(.07)*	*(.26)*	*(.122)*
Period 2	.75	.94	1.01	.32	.52	1.7	1.5
	(.04)	*(.13)*	*(.11)*	*(.04)*	*(.04)*	*(.08)*	*(.10)*
Period 3	.71	1.32	1.15	0.5	.89	1.54	.77
	(.02)	*(.12)*	*(.08)*	*(.18)*	*(.09)*	*(.09)*	*(.084)*
Period 4	.58	1.79	1.5	.45	.72	1.5	.38
	(.19)	*(.48)*	*(.21)*	*(.23)*	*(.23)*	*(.29)*	*(.23)*
Period 5	.49	.95	1.46	.52	.30	1.23	1.14
	(.08)	*(.17)*	*(.144)*	*(.155)*	*(.22)*	*(.14)*	*(0.15)*
Period 6	.46	.86	1.02	.46	.16	.92	.63
	(.18)	*(.58)*	*(.91)*	*(.38)*	*(.46)*	*(0.09)*	*(.5)*

Notes: the numbers represent the estimated total expenditure elasticity from the complete demand system and the standard errors, in brackets, computed via bootstrap simulation.

Table 17
Own price elasticity for food and non food items in the six sub periods

Period	Own price elasticity						
	Cereal	**Meat**	**Fats**	**Dairy Products**	**Vegetables**	**Clothing**	**Housing**
Period 1	-.003	-.6	-2.09	-.5	-.7	-.66	-.68
	(.56)	*(.14)*	*(.55)*	*(0.8)*	*(.01)*	*(.35)*	*(.21)*
Period 2	-.08	-.36	-1.03	-.41	-.62	-.37	-.29
	(.54)	*(.31)*	*(.66)*	*(.79)*	*(.62)*	*(1.12)*	*(0.2)*
Period 3	-.28	.65	-2.2	-1.2	-0.3	-1.5	-.48
	(.62)	*(1.12)*	*(.11)*	*(.83)*	*(0.13)*	(*0.22)*	*(.102)*
Period 4	-.4	-.89	-1.9	-1.80	-1.81	-1.14	-.57
	(.27)	*(.41)*	*(.45)*	*(.39)*	*(.36)*	*(.76)*	*(.37)*
Period 5	-.48	-.61	-1.3	-.7	-.35	-.45	-1.3
	(.42)	*(.21)*	*(.43)*	*(.58)*	*(.35)*	*(.55)*	*(.45)*
Period 6	-.54	-0.27	-1.5	-1.3	-1.05	-.87	-.7
	(.89)	*(.47)*	*(.80)*	*(.56)*	*(.14)*	*(.40)*	*(.67)*

Notes: the numbers represent the estimated own-price elasticity from the complete demand system and the standard errors, in brackets, computed via bootstrap simulation.

References

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