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Keywords
Red meat, processed meat, health, environmental impact, generations, Mediterranean Diet

JEL Codes
I12, I15, Q18, Q56, Q57

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Patterns of Red and Processed Meat Consumption across Generations: A Shift from the Traditional Mediterranean Diet

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Abstract

Social changes, widespread dissemination of Western-type culture, and the globalization of food production and consumption have reduced adherence to the traditional Mediterranean diet (MD) in the Southern European countries where the MD originated. This study explores whether changes in the technology, culture and social welfare that have characterized Italy for decades may have influenced red and processed meat consumption across generations. Such consumption has been associated with a higher risk for cardiovascular disease and colorectal cancer and with negative environmental impacts. To obtain a broad picture of red and processed meat consumption and adherence to the MD across generations, we constructed a Mediterranean composite score that summarizes the frequency of these foods' consumption. For the purpose of our study, we constructed a pseudo-panel derived from repeated cross-sections of the annual household survey, "Aspects of Daily Life," that was part of the Multipurpose Survey carried out by the Italian National Statistical Office (ISTAT) from 1997 to 2012. We adopted an APC (Age, Period, Cohort) approach that involves age, period, and cohort effects. Our findings reveal that the oldest generations undertook a major shift from the traditional MD.

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Introduction

Food-consumption habits are undergoing profound changes. The last century has shown a conspicuous increase in meat consumption, thanks also to economic growth, developments in meat production technology and intensified urbanization. However, meat production and consumption are also subject to criticism for environmental and health-related reasons. The production of meat has become a major concern because of the impact of livestock on global warming and environmental degradation (Koneswaran and Nierenberg, 2008; Nijdam et al., 2012; Katare et al., 2020), as according to the Food and Agriculture Organization (FAO), in 2013 livestock farming accounts for a significant proportion (14.5% in 2013) of anthropogenic greenhouse gas emissions. High consumption of meat, especially red met, has also been associated with a risk of diet-related non-communicable diseases ("chronic disease" hereafter). Meat is a good source of energy and some essential nutrients, including protein and micronutrients like iron, zinc and vitamin B12, but its consumption is a risk factor for cardiovascular disease because of its saturated fat and cholesterol content. In the 2007, the World Cancer Research Fund and the American Institute of Cancer Research (WCRF/AICR) published a report based on a systematic review of previous research and concluded that high intake of red and processed meat convincingly increases the risk of colorectal cancer.[1] In October 2015 the World Health Organization International Agency for Research on Cancer (IARC) announced that consumption of processed meat is "carcinogenic to humans" (Group I) and that consumption of red meat is "probably carcinogenic to humans" (Group 2A).

The IARC's warning and the ecological concerns about excessive meat production and consumption have raised awareness especially in Western countries and among the youngest generations. In August 2018, the Swedish vegan climate activist Greta Thunberg conducted a strike from school every Friday outside Sweden's parliament to raise awareness about climate change. Her actions sparked a large youth movement, leading to a series of school strikes across the world against the lack of action on the climate crisis. In the food context, reducing the environmental impacts of food consumption requires a shift to the "plant-based" diets that require less land, energy, and other resources than meat-based diets do.

One of the best-studied examples of a diet that emphasizes plants and is consistent with environmental sustainability is the Mediterranean diet (MD) (i.e., the traditional dietary pattern of people living in the Mediterranean basin). Adherence to the MD has been associated historically with longevity, lower prevalence of chronic diseases, and a significant reduction in mortality from

[1] The term "processed meat" refers to meat that has been transformed through salting, curing, fermentation, smoking, or other processes to enhance flavor or improve preservation.

cardiovascular disease and cancer (Keys et al., 1986; Sofi et al., 2014; Schwingshackl et al., 2015; Sofi et al., 2018).

However, the widespread dissemination of Western-type culture and the globalization of food production and consumption have reduced adherence to the MD in the Southern European countries where it originated (da Silva et al., 2009). This decline has two main aspects: increased consumption of refined grains, saturated fats, sugars, and red and processed meat and decreased consumption of complex carbohydrates like cereals and legumes (Bottalico et al., 2016). Social changes, too, appear to have contributed to the shift in dietary habits in Southern European societies: Changing household structures (with more single households), women's participation in the labor force, longer working hours, and consumer prosperity may also have opened the door to such ready-to-eat and convenience food as processed meat (Buckley, Cowan, and McCarth, 2007; Sheely, 2008). Thus, the influence of Western-type culture and social changes may have seriously threatened the transmission of the MD heritage to the youngest generations, despite their increasing sensitivity to environmental and health-related issues.

This study explores whether the changes in the technology, culture and social welfare that have characterized Italy for decades may have influenced red and processed meat consumption across generations. The Italian context is similar in many ways to those of other countries in Southern Europe, but Italy underwent a dramatic change in the second half of the last century, passing from an agro-familial society to an industrialized society. This change produced a significant shift in food habits, increasing animal product consumption, particularly meat (Fidanza, 1980). Among Sothern European countries, Italy ranks medium-high in terms of red meat and processed meat consumption (Kanerva, 2013). Differences in the dietary transition in Italy are also related to geography in terms of areas that have relied on agricultural production but also on differences in the degree to which Western-type culture has penetrated (Farchi et al., 2017). These peculiarities make Italy a particularly interesting case study.

To obtain a broad picture of red meat (beef and veal) and processed meat (e.g. sausage, ham, salami) consumption, we constructed a composite score that summarizes the frequency of consumption across cohorts, taking into account compliance with the Mediterranean pyramid recommendations (Goulet et al. 2003; Trichopoulou et al., 2005; Panagiotakos et al., 2006; Benedetti et al., 2016). We employed a pseudo-panel derived from repeated cross-sections of the annual household survey, "Aspects of Daily Life," that was part of the Multipurpose Survey carried out by the Italian National Statistical Office (ISTAT) from 1997 to 2012. We adopted an Age-Period-Cohort (APC) approach that involves age, period, and cohort effects. We followed the experiences of four

cohorts: the Silent Generation (born 1926-1945), the Baby Boomer 1 Generation (1946-1955), the Baby Boomer 2 Generation (1956-1965), and Generation X (1966-1980).

The results revealed that the Silent and Baby Boomer 1 generations shifted from the traditional MD in terms of red meat consumption and that the Baby Boomer 2 generation shifted in terms of processed meat consumption. Our findings also confirm that the youngest generations are the most adherent to the MD, thanks to their higher sensitivity to the environmental and health-related impacts of meat production.

The empirical results lead to the need for reflection concerning the oldest generations. Older age is typically associated with worse health, more use of the healthcare system and increased healthcare costs, so the older generations' high consumption of red and processed meat during early adulthood may present a significant and increasing challenge for today's National Health Service as these generations develop chronic health conditions, including cardiovascular disease and cancer.

The remainder of the paper is organized as follows. Section 2 describes the consumption of red and processed meat across generations. Section 3 describes the data and the empirical model, while the results are presented and discussed in Section 4. Concluding remarks are made in Section 5. The sensitivity analysis is available in the Appendix.

2. Generational Changes in Food Consumption

An individual's eating regime encompasses more than just food; it is a social marker that, through its symbolic value, constructs social identities (Shepherd, 2001). Food choice is a complex system influenced by multiple factors related to consumer preferences and to the consumption context: culture, economic conditions, and environmental and health concerns (Kaya, 2016; Stasi et al., 2018). Among the motivations that influence food choices, the consumption context plays a major role and may explain the differences in food preferences across generations (Rozin, 2007; Lee et al., 2020).

Here, we review the diffusion of red and processed meat in Italy across generations. ISTAT identified the generations as the Silent Generation (born 1926-1945), the Baby Boomer 1 Generation (1946-1955), the Baby Boomer 2 Generation (1956-1965), and Generation X (1966-1980).[2]

We contextualized the consumption of red and processed meat according to the economic conditions and the cultural factors that characterized Italy in the decades since 1950. We identified the median age at which women of each birth cohort left their parental homes in the transition into

[2] ISTAT defines a "generation" as an identifiable group that shares birth years and significant historical events. This paper may vary from other papers in the birth year that begins or ends a generation based on the source to which the researchers refer.

early adulthood. (See Table 1A in the Appendix.) We focused on women because of their traditional role in preparing meals and food management (Eurostat, 2020). We considered leaving one's parents' home as a central event in the transition into adulthood (Billari et al., 2001), as it can disrupt parents' diet and dietary behaviors and give the younger generation more autonomy in preparing meals and decision-making related to food (Verplanken and Roy, 2016). We concentrate on early adulthood since behaviors established during this period, such as dietary intake and eating behaviors, tend to persist into later adulthood and to influence the risk of chronic disease in later life (Miller et al., 2013).

The Silent Generation entered early adulthood between the end of 1940s and the end of 1960s, a period during which Italy enjoyed intense economic growth. All of the macroeconomic variables—national GDP, GDP per capita, exports/imports, investments, and so on–grew to unprecedented levels and, in parallel, household spending leapt forward in terms of both the quantity and quality of food consumption. The increase in food consumption was significant (albeit much lower than that of other European counties), a remarkable transformation from the past, as a richer and more varied diet became accessible to classes that had not previously had access to it (D'Apice, 1981).

The conspicuous decline in the 1950s in the consumption of maize, rye and barley, lard and suet, legumes, and dried fruit, together with the conspicuous increase in the availability of fresh vegetables, fresh fruit, milk, and beef transformed Italy into a "sated" country that began to suffer from the negative health consequences of such a rich and abundant diet, including cardiovascular, endocrine and metabolic diseases (Montanari, 1992).

Between 1950 and 1970, food consumption per household more than doubled as the richness of people's diets increased: the consumption of grains flattened out as meat consumption (especially beef) increased (Figure 1).

[Figure 1 about here]

The result was a European diet that combined a high level of animal proteins a MD of pasta, fruit and vegetables, of which Italy was among the main European producers, a combination that was, in many respects, unique in Europe. Calorie intake increased from an average of around 2,350 calories per person in the early 1950s to 3,000 calories in the late 1960s and 3,200 in the following decade (De Bernardi, 2015). Italy ranked medium-high in terms of beef consumption among the countries of Europe (Figure 2).

In the 1970s Italy experienced a fundamental change in the daily consumption of the animal proteins that had been scarce in the past. With approximately 61 kg of meat consumption per capita per year at the end of the 1970s, Italy jumped to thirteenth place in consumer countries' rankings, a

significant leap forward compared to twenty years earlier, when it was at the bottom of the scale. This leap is even more significant when we look only at the ranking for beef consumption, as Italy rose to fifth in the world (De Bernardi, 2015). It was in this period that the Baby Boomer 1 generation began to enter early adulthood.

[Figure 2 about here]

In the 1980s, the picture changed again. Much of the Baby Boomer 2 generation reached young adulthood in this period, which was characterized by improved economic wellbeing and faster technological innovation compared to the past. This was also the period of a progressive reduction in the consumption of wheat, wine, and sugar, stabilization in the consumption of red meat, and a further increase in that of fruits and vegetables. The consumption of red meat, especially beef, after a phase of strong expansion in the first twenty years after World War II, slowed down at the end of the 1970s, and lost additional ground in the following decade and later. However, increasing prosperity, technological changes, participation of women in the labor force (especially in the North of Italy) contributed to an increase in consumption of convenience foods like processed meat as time-saving meals.

In the new millennium, when much of Generation X entered adulthood, the consumption of poultry and pork increased significantly and overtook that of beef. The spread of the Bovine spongiform encephalopathy (BSE) epidemic certainly affected the consumption of beef. BSE, nicknamed "mad cow disease," frightened consumers and redirecting them to alternative, cheaper meat while drastically cutting down beef consumption. Between the old and the new millennium, beef lost its appeal as a symbol of nutritional well-being and family wealth and became synonymous with an unbalanced, unhealthful and environmentally unsustainable diet, especially for the youngest generation. In the same period, the consumption of processed meat also decreased with a reassessment of dietary models linked to the MD.

3. Empirical Analysis

3.1 Data and Estimation Strategy

We adopt an APC approach, which involves age, period, and cohort effects (O'Brien, 2000), for our analyses using a pseudo-panel derived from repeated cross-sections of the annual household survey, "Aspects of Daily Life," which is part of the Multipurpose Survey system carried out by the

ISTAT. The analysis uses fifteen years of repeated cross-sections from 1997 to 2012, excluding 2004, when the survey was not fielded.[3] In constructing the pseudo-panel, we divided each year's observations into cohorts (individuals who share some common characteristics) and used these cohorts to estimate a fixed-effects model from repeated cross-sections (Deaton, 1985; 1997). The main assumption behind the construction of a cohort is that it consists of respondents who share a set of characteristics that do not change (e.g., birth year, gender) or that remain broadly constant over time (e.g., region of residence), have similar food consumption habits, and can be treated as a single observation (Verbeek, 2008).

In choosing the width of the cohort, we aggregated birth cohorts based on the ISTAT definition of generations (Section 2) to assess the differences in red and processed meat consumption ("generation effects"). We followed the experiences of four birth cohorts: those born 1926-45 (the Silent Generation), 1946-55 (the Baby Boomer 1 Generation), 1956-65 (the Baby Boomer 2 Generation), and 1966-80 (Generation X).

Then we considered the trade-off between the need to have as much informative data as possible and the need to have a sufficiently large number of observations per cell to reduce the potential for error in estimating the cohorts' means. A large number of observations in each cell helps to ensure that the necessary asymptotic theory is applicable to the pseudo-panel approach.[4]

Our choice of cohorts included a pseudo-panel that was constructed on two genders, four birth cohorts, and two educational levels (those who left school at the compulsory age and those who undertook additional voluntary schooling (cf. Banks et al., 1998) in nineteen regions over fifteen years.[5] The cut-off we used for the respondents' educational level may seem crude and to involve significant loss of information, but this construction allows us to assume that education is a time-invariant characteristic since all of the participants included in the sample were old enough to have been able to complete at least the compulsory education.[6] We did not consider tertiary education as a cut-off in splitting the sample since the percentage of respondents with tertiary education in the oldest

[3] We assessed the surveys for their comparability and consistency. Given the repeated nature of the Multipurpose Survey, its years have similar survey designs, scopes, coverages, sampling units, reporting methods, modes, and weighting methods. The questionnaire's wording for most variables of interest are also similar across the surveys. Where there are differences with respect to some variables, effort was made to align their definitions and/or categories as closely as possible across the surveys prior to pooling the data.

[4] The problem of the number of individuals in a cell can be ignored and cohort data can be treated as genuine panel data if the number of individuals in each cell is above 100 (Verbeek, 2008).

[5] Italy is politically divided into 20 regions. ISTAT collapsed data from the Aosta Valley and Piedmont into a unique regional unit, so our analysis deals with 19 regions.

[6] The Italian Constitution of 1948 states that primary education is compulsory for at least 8 years, until the individual is 14 years old, independent of the degree achieved. In 1997 the "Berlinguer reform" extended the minimum age for leaving school from age 14 to age 16, so education is currently compulsory for 10 years (up to 16 years of age). It includes the first cycle of education (5 years of primary school, followed by 3 years of lower secondary school) and the first two years of the second cycle of education (upper secondary education).

generations, particularly the Silent Generation, was too low, especially among women (3.2%). Even though younger generations have seen an increase in their level of education, Italy's tertiary education attainment rate remains one of the lowest in the EU (Checchi, 2000).

Dividing the education variable into these two phases allows us to study how the consumption of red and processed meat evolves between the two educational groups using larger cohort sizes, thus achieving more robust results. The literature has often interpreted food choices in relation to consumers' socio-economic characteristics: Higher education levels in particular have been associated with lower consumption saturated fats, sugars, and red and processed meat, while lower education levels have been associated with high-fat food and energy intake. It is likely that a high level of education stimulates information-acquisition behaviors, involvement with healthful foods, and a preference for natural and light foods, improving health and increasing health-oriented behaviors (Casini et al., 2015).

Finally, we averaged all of the variables over the year among individuals of the same gender and within birth cohorts, educational levels and regions to find a time series for each cohort (Deaton, 1985). The resulting average number of individuals per cell is 128 for the entire sample (Italy), 143 for the Northern regions, and 121 for the Southern regions. (See Table 2A in the Appendix.) Cells with 30 or fewer individuals were excluded from the analysis to ensure robust estimates of the subgroups' mean statistics.

Although microeconomic heterogeneity is clearly reduced in pseudo-panels, this approach presents two primary advantages over those of a genuine panel: First, the approach does not suffer from the non-random attrition that occurs with conventional panel data because a new sample is drawn each survey year (Deaton, 1997). Second, the wide availability of cross-sectional data allows us to build a pseudo-panel that covers substantially longer periods than those that can be covered by real panels.

3.2 APC models and "the identification problem"

From a methodological point of view, age–period–cohort models suffer from an identifiability problem because of the relationship between the variables: Year of birth plus age equal calendar year (cohort + age = period). Hence, unrestricted age, cohort, and period effects cannot all be separately identified (van Kippersluis et al., 2009). The literature makes several attempts to find a solution to this problem, one of the most common of which is to constrain certain parameters in a model so they are equal. (See Bell and Jones (2013) for details.) Each age and birth cohort group is included in a regression model as a dummy variable, but two age groups and cohort groups are combined into a single group (e.g., Propper et al., 2001). This approach solves the problem of perfect collinearity, but

as Glenn (2005, p. 12) pointed out, "When this is done, the linear dependence is broken in the statistical model only and not in the real world [so] the obtained estimates of effects are not meaningful."

We addressed the identification problem by employing Deaton's (1985) solution, which decomposes temporal change into birth-cohort dummies and a continuous age profile, while period effects are regarded as exogenous shocks that sum to zero in the long run. In keeping with on Bell and Jones (2013) and Veday (2014), we assumed that changes in red and processed meat consumption over time is the result of birth cohorts' differing attitudes toward red and processed meat, rather than period effects, and allocated temporal trends to variations in age or cohort. (See also Veday (2014).) We estimated a separate regression equation for consumption of red meat and processed meat. Hence, our models for the estimations are given as follows:

$$\textit{Red Meat Consumption Adherence to MD}_{ct} = \alpha\, \textit{Age}_{ct} + \beta\, \textit{Gender} + \textit{Generations} + \delta\, \textit{Education} + \\ + \gamma\, \textit{Regions} + \varepsilon_{ct}$$

$$\textit{Processed Meat Consumption Adherence to MD}_{ct} = \alpha\, \textit{Age}_{ct} + \beta\, \textit{Gender} + \textit{Generations} + \\ + \delta\, \textit{Education} + \gamma\, \textit{Regions} + \varepsilon_{ct}$$

Concerning the dependent variables (*red meat consumption adherence to MD* and *processed meat consumption adherence to MD*), we followed Benedetti et al. (2015) in constructing an index (a composite score) based on the Mediterranean pyramid recommendations to evaluate the Italians' adherence to the MD with reference to red meat and processed meat. The Multiscopo Survey includes a section that is devoted to the exploration of individuals' food-consumption habits, where the respondents report the frequency of their intake of red and processed meat in terms of times per day and week. We assigned a score ranging from 0 to 4 to each respondent's frequency of consumption based on the degree of adherence to the MD (Table 1). The final score was then calculated by summing the points for red meat and processed meat, with the score ranging between 0 (lowest adherence) and 4 (highest adherence).

[Table 1 about here]

Then, using cohort data, we transformed the dependent variable into the mean value of the score in the cohort c, for gender g, with level of education e, in region r, and in period t. Age was

included as a continuous variable, and gender, birth cohorts, education, and regions were included as dummy variables.[7]

We estimated all models using the weighted least squares (WLS) approach, as the cohorts differ in size, and when the number of observations per cell varies substantially, the disturbance term may be heteroskedastic, leading to biased standard errors. By using the WLS estimation and weighting each cell with the square root of the number of observations in each cell, we corrected for heteroskedasticity (e.g., Dargay, 2007; Duval-Hernandez and Orraca-Romano, 2009; Warunsiri and McNown, 2010; Guillerm, 2017).

To test the robustness of our results, we also re-ran the model by assuming that period effects on the two dependent variables derived from a business cycle effect that operates through economic conditions (Ruhm, 2005). The results of our sensitivity analysis are shown in the Appendix (Table 3A)

4. Results

Table 2 and Table 3 show the distributional characteristics of the demographic variables (age, birth cohort, region of residence), the educational level, and the average score for adherence to MD in terms of red and processed meat consumption across demographics and education.

[Table 2 about here]

[Table 3 about here]

Table 4 shows the results from the red and processed meat consumption-specific regression models.

[Table 4 about here]

Gender and age are confirmed to be significant demographic characteristics related to higher adherence to MD and lower consumption of red and processed meat. Women tend to follow the MD's recommended quantities for red meat and processed meat more than men do. Our results are in accordance with the previous literature, as women have more healthful food habits, while men succumb to the flavor aspects of foods and stand out for their high consumption of meat. Such

[7] This is the standard decomposition Deaton (1985; 1997) proposed.

differences in preferences and values influence the consumption of red and processed meat and the adherence (or lack thereof) to the Mediterranean pyramid recommendations (Prättälä et al., 2007). Increasing age also leads to a higher degree of adherence to MD, as older people usually eat less and focus more on their health and nutrition than younger people do because of a higher awareness and perception of risks related to their health status. A higher level of education, too, appears to have a positive influence on adherence to the MD, as more educated consumers tend to follow nutritional recommendations for a healthful diet more than less educated consumers do and to know more about the relationship between a diet rich in saturated fat and cholesterol and chronic disease (Nocella and Kennedy, 2012).

Our results show differences in the diffusion of red and processed meat consumption across birth cohorts, confirming that individuals' consumption habits are likely to be shaped not only by sociodemographic characteristics but also by the culture of the era in which they enter early adulthood (Lee et al., 2020).

According to our findings, the Silent Generation and the Baby Boomer 1 Generation engaged in a major shift from the traditional MD, particularly in terms of red meat consumption. Italy become more affluent after World War II, even though problems of undernutrition persisted, especially in the less developed areas of Southern Italy. Beef become more easily accessible and represented a symbol of well-being and richness, while the older generations considered the traditional MD, which was rich in plant foods like cereals, legumes, fruits and vegetables, a symbol of deprivation, rather than a healthful life choice.

According to our results, the Baby Boomer 2 Generation adheres more closely to the MD recommendations in terms of red meat consumption, but not in terms of processed meat consumption. This generation entered early adulthood at a time of prosperity and modernization that influenced their food habits. Beef started to loss its appeal as a symbol of wealth and status, and its consumption begin to decline. The period was also characterized by social change that also affected the oldest part of the Baby Boomer 1 Generation): women entering the workforce at increasing rates and changes in household structures, with more single-person households that led individuals to consume more convenience food, such as ready-to-eat meals and processed meat products.

Finally, Generation X shows a lower frequency in the consumption of red and processed meat. Generation X entered early adulthood in an era characterized by an overall decline in the consumption of red and processed meat in favor of more sustainable and healthful foods. In 2001, the first domestic BSE case in Italy was also detected, leaving creating a shadow on the safety of beef. These concerns lead to a significant drop in beef consumption in that period an increased lack of confidence in the wisdom of consuming beef products.

4.1 Dietary Transition and Geographic Differences

Italy is characterized by complex regional dietary patterns with significant geographic differences in culinary traditions, as well as in culture and economic development, that have affected attitudes toward certain foods (Brunello and Labartino, 2014).

The country's northern regions, for instance, exhibit greater intake of beef than other regions because of the influence of agricultural production, including livestock, but also because of penetration of Western-type culture: The cultural safeguard of traditions tends to be much stronger in the country's southern regions, especially among the older generations (Farchi et al., 2017).

To determine the presence of a North-South gradient in the adherence to the MD diet pyramid's recommendations and in the evolution in red and processed meat consumption across generations, we re-ran the model on two subsamples using geographic dummies for the North and South of Italy. The results are shown in Tables 5 and 6.

[Table 5 about here]

[Table 6 about here]

Our findings support the presence of a North-South gradient in the consumption of red meat, as expected, with residents of the North consuming red meat more frequently than those of the South. Our results also revealed standardization in the evolution of red meat consumption across generations in the country's two geographical areas. As for the full sample, the oldest generations (the Silent and Baby Boomer 1 Generations) in the two macro-areas present similar dietary lifestyles that are characterized by greater frequency of red meat consumption and lower scores on the MD pyramid recommendations. The younger generations, again, seem to be more oriented to lower consumption of red meat than the older generations are.

The analysis of our results on the evolution of processed meat consumption across the two macro-areas and across generations, however, indicates a more complex pattern with differences that reflect the dissimilar "food culture" and economic conditions that have characterized the Italian regions in the last several decades. The northern regions again consume processed meat more often than the southern ones, and it is the Baby Boomer 1 Generation that has the lowest degree of compliance with the MD diet. In the diffusion process of processed meat, the southern regions appear to lag one generation behind the northern regions, as those in the South who present the lowest adherence to the MD, ceteris paribus, are the Baby Boomer 2 Generation and Generation X.

Arguably, the economic and social dualism between the more economically developed northern regions and the less developed southern regions may have interacted with the diffusion of convenience food more than with the diffusion of red meat (Lopez, 1994). Both Baby Boomer generations enjoyed the postwar economic development, which might have influenced their food choices. Women began to be a steady presence in Italy's work force, and the time they had to spend in preparing food declined, creating a progressive entry of processed foods on Italian market that conquered a broader segment of consumers in the northern regions. While in the North the two Baby Boomer generations started to became "convenience seekers," with increasing preferences for foods that require less time to be prepared, the less developed South remained tied to traditional cuisine and meal preparation, which was still considered an important activity.

The "traditional" pattern that was a peculiar characteristic of the oldest generations of the South was abandoned later by the younger generations in favor of a rise preferences for processed products like processed meat. While Generation X in Northern Italy was more oriented toward sustainable and healthful foods, the same generation in the South became the new "convenience seeker," with food habits farther from those recommended by the MD pyramid (Casini et al., 2013).

Conclusions and Policy Implications

The choice of foods as part of a diet implies a complex mechanism of interactions between social and cultural processes, values and traditions. Our results revealed that increases in disposable income, changes in women's role in society, and urbanization and globalization have had significant effects on the Mediterranean lifestyle. Some of the more important of these social changes came to Italy in the second half of the last century, when the Silent and Baby Boomer Generations entered early adulthood, profoundly affecting their adherence to the MD and leading to progressive abandonment of traditional food habits in favor of consumption of animal protein, particularly of red and processed meat.

According to our results, the Silent and Baby Boomer 1 Generations are characterized by a major shift from the traditional MD in terms of red meat consumption, which these generations saw as a symbol of prosperity, while the Baby Boomer 2 Generation, especially in northern Italy, had a tendency to consume more convenience food, such as processed meat, in response to their need for meals that could be prepared quickly.

The health, social and environmental concerns that are associated with red and processed meat consumption are part of an ongoing global debate and have led younger generations to adopt more healthful and environmentally sustainable eating patterns. However, despite the increasing shift away

from the consumption of red meat products among the youngest generations, our findings echo previous findings regarding older age's association with poor health, as the evolution in the oldest generations diet toward more animal products has increased their risk of developing chronic health conditions in later life, placing an increasing burden on the National Health Service (Bonnet et al., 2020).

According to our findings, a country's eating regime is deeply rooted in its history and dietary patterns are shaped by consumers' culture, context, and socioeconomic status. Therefore, altering individuals' consumption decisions is often challenging. Informational campaigns should consider that, among the oldest generations, health-related reasons for consuming less red and processed meat may be perceived as more convincing than environmental reasons are likely to be (Hartmann et al., 2017).

Arguably, more stringent regulation is needed to reduce red and processed meat consumption. These meats could be treated like other carcinogens and foods that raise public health concerns. For instance, informational campaigns could be combined with pricing instruments like "sin" taxes—designed according to the Pigouvian principle—that incorporate the health and environmental costs of meat consumption into the price paid by the consumers, forcing them to take the outcomes of their consumption habits into account when they choose what foods to consume (Edjabou and Smed, 2013; Katare et al., 2020).

The combination of such policies should be effective in encouraging consumers to return to a plant-based diet like the MD, whose principles could be an important step toward a more sustainable future (Sabaté et al., 2014).

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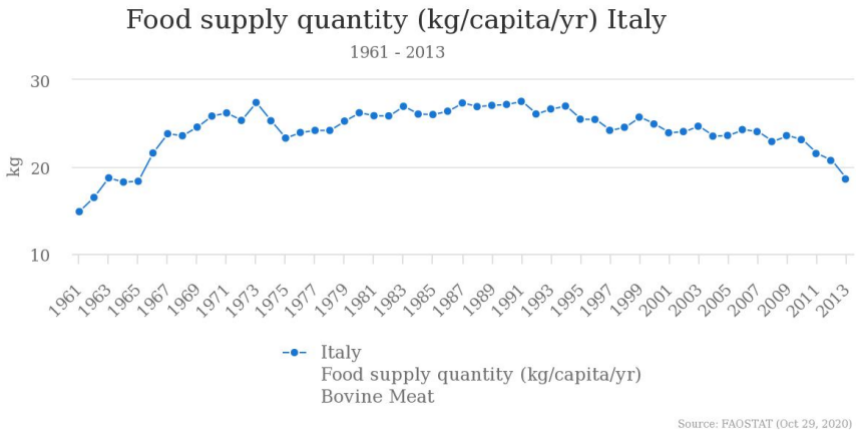
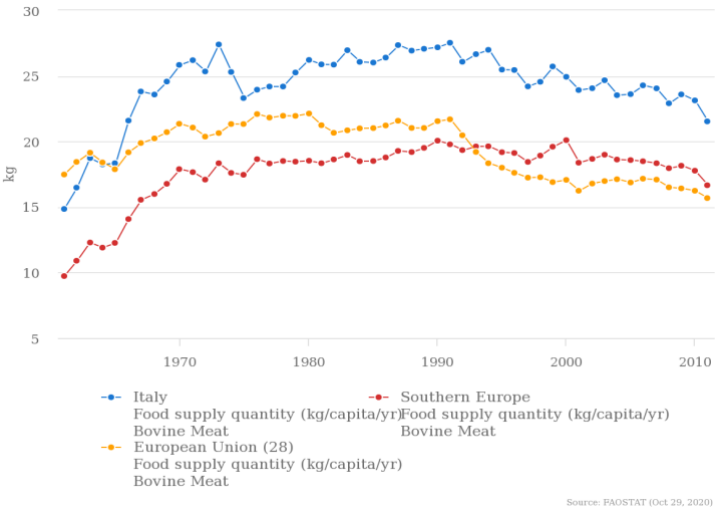
Figures and Tables

Figure 1: Per capita Consumption Trends Bovine Meat since 1961 – Italy



Source: FAO – meat supply data (potentially available for human consumption).

Figure 2: Per capita Consumption Trends Bovine Meat since 1961 – Italy, Southern Europe, Europe Union



Source: FAO – meat supply data (potentially available for human consumption).

Table1: Scores for Meat Group

Meat Group	More than once per day	Once a day	A few times per week	Less than once a week	Never
Red Meat	0	0	2	4	3
Processed meat	0	0	1	4	3

Table 2: Red meat: mean values of the score by generations, age, education, regions and gender (18 years and over): 1997-2012

	Mean value of the score by Generation				Population distribution (%)			
	Silent Generation	Baby Boomer 1	Baby Boomer 2	Generation X	Silent Generation	Baby Boomer 1	Baby Boomer 2	Generation X
Age								
18-34			2.2772	2.2210			5.20	67.22
35-49		2.2532	2.2889	2.2862		27.23	79.19	32.77
50-64	2.3108	2.3160	2.3674		35.68	71.18	15.59	
65+	2.4090	2.4679			64.32	1.58		
Educational level								
Low	2.3695	2.2681	2.2454	2.1960	83.33	61.23	48.51	37.05
High	2.4141	2.3593	2.3543	2.2747	16.67	38.77	51.49	62.95
Regions								
North	2.3940	2.3337	2.3560	2.2794	44.33	42.37	42.07	41.27
Centre	2.2741	2.1993	2.1990	2.1372	19.60	18.60	18.18	17.63
South	2.4201	2.3250	2.2882	2.2597	36.05	39.02	39.74	41.09
Sex								
Female	2.4294	2.3402	2.3550	2.3440	53.22	50.88	50.92	50.54
Male	2.3162	2.2666	2.2485	2.1477	46.77	49.11	49.07	49.45

Table 3: Processed meat: mean values of the score by generations, age, education, regions and gender (18 years and over): 1997-2012.

	Mean value of the score by Generation				Population distribution (%)			
	Silent Generation	Baby Boomer 1	Baby Boomer 2	Generation X	Silent Generation	Baby Boomer 1	Baby Boomer 2	Generation X
Age								
18-34			1.7823	1.6494			5.20	67.22
35-49		1.7672	1.7529	1.7504		27.23	79.19	32.77
50-64	1.9678	1.8977	1.8733		35.68	71.18	15.59	
65+	2.1774	2.0154			64.32	1.58		
Educational level								
Low	2.0976	1.8037	1.6832	1.5946	83.33	61.23	48.51	37.05
High	2.1683	1.9694	1.8599	1.7421	16.67	38.77	51.49	62.95
Regions								
North	1.9360	1.7914	1.7487	1.6619	44.33	42.37	42.07	41.27

Centre	2.1793	1.9319	1.8543	1.8053	19.60	18.60	18.18	17.63
South	2.3380	1.9389	1.7653	1.6556	36.05	39.02	39.74	41.09
Sex								
Female	2.2258	1.9978	1.9162	1.8859	53.22	50.88	50.92	50.54
Male	1.9738	1.7357	1.6328	1.4902	46.77	49.11	49.07	49.45

Table 4: Adherence to MD for red meat and processed meat by generation

	Red meat		*Processed meat*	
	Coef.	Std.err.	Coef.	Std.err.
Age	0.0799***	0.0006	0.0117***	0.0005
Generation (ref. Baby Boom 1)				
Silent Generation	-0.0208**	0.0122	0.1253***	0.0115
Baby Boom 2	0.0646***	0.0111	0.0067	0.0104
Generation X	0.0964***	0.0159	0.0432**	0.0150
Male	-0.1272***	0.0058	-0.3133***	0.0054
Educational level	0.0937***	0.0063	0.1655***	0.0060
Constant	1.889***	0.0351	1.081***	0.0336
Regional Fixed Effects	YES		YES	
Observations	4398		4398	
Adj R-squared	0.5930		0.7162	

Note: *** indicates p < .001, ** indicates p < .01 and * indicates p < .05.

Table 5: Adherence to MD for red meat by generation: North-South Gradient

	Noth Regions		*South Regions*	
	Coef.	Std. Err.	Coef.	Std. Err.
Age	0.0083***	0.0006	0.0068***	0.0006
Generation (ref. Baby Boom 1)				
Silent Generation	-0.0298*	0.0122	0.008	0.0121
Baby Boom 2	0.0921***	0.0111	0.0217*	0.0106
Generation X	0.0948***	0.0159	0.0795***	0.0154
Male	-0.1801***	0.0058	-0.0875***	0.0057
Educational level	0.1404***	0.0063	0.0318***	0.0063
Constant	1.8736***	0.0351	1.9527***	0.0339
Regional Fixed Effects	YES		YES	
Observations	1666		1803	
Adj R-squared	0.7149		0.4201	

Note: *** indicates p < .001, ** indicates p < .01 and * indicates p < .05.

Table 6: Adherence to MD for processed meat by generation: North-South Gradient

	North Regions		*South Regions*	
	Coef.	Std. err.	Coef.	Std. err.
Age	0.0108***	0.0008	0.0114***	0.0008
Generation (ref. Baby Boom 1)				
Silent Generation	0.0420*	0.0166	0.2532***	0.0166
Baby Boom 2	0.0491**	0.0151	-0.0613***	0.0146
Generation X	0.0726**	0.0216	-0.0367	0.0212
Male	-0.3233***	0.0079	-0.3116***	0.0078
Educational level	0.1992***	0.0086	0.1166***	0.0086
Constant	1.117***	0.0477	1.518***	0.0464
Regional Fixed Effects	YES		YES	
Observations	1666		1803	
Adj R-squared	0.7307		0.7960	

Note: *** indicates p < .001, ** indicates p < .01 and * indicates p < .05.

Appendix

Table 1A: Medium age at which women left their parental household

Generations	*Medium Age*	*Period*
Silent	23	Between the ’50 and the end of ’60
Baby Boomer 1	23	Between the ’70 and the’80
Baby Boomer 2	24	Between the ’80 and the’90
Generation X	25	Between the ’90 and the beginning of 2000

Source: ISTAT, 2014.

Table 2A: Size Distribution of cells (1997-2012)

Sample	*Mean*	*Min*	*Max*
Italy	128	31	768
Northern Regions	143	31	768
Southern Regions	121	31	728

Sensitivity Analysis

In order to test the robustness of our results, we also re-run the model by assuming that period effects on the red and processed meat consumption could derive from a business cycle effect operating through economic conditions. Indeed, Clark et al. (2010) show that changes in aggregate economic conditions affect subjective well-being, which may also influence the propensity towards red and processed meat consumption (Ruhm, 2005).

We include in the regression model the GDP growth rate. Even though the inclusion of period effects, which derive from business cycle fluctuations, lowered the precision of the estimates of the age and cohort effects, the patterns of the age and cohort profiles remain similar.

Table 3A: Adherence to MD for red meat and processed meat by generation and GDP growth rate

	Red meat		*Processed meat*	
	Coef.	Std. Err.	Coef.	Std. Err.
Age	0.0061***	0.0005	.0112***	0.0007
Generation (ref. Baby Boom 1)				
Silent Generation	0 .0081	0.0099	0.1335***	0.0144
Baby Boom 2	0.0522***	0.0087	0.0098	0.0126
Generation X	0.0647***	0.0131	0.0384*	0.0190
Male	-0.1286***	0.0044	-0.3126	0.0064
Educational level	0.0972***	0 .0048	0.1638***	0.007
GDP growth rate	-0.0063	0.0039	-0.0001	0.0056

Constant	1.9732	0.0297	1.1011***	0.0431
Regional Fixed Effects	YES		YES	
Observations	3242		3242	
Adj R-squared	0.5863		0.7142	

Note: *** indicates p < .001, ** indicates p < .01 and * indicates p < .05.

Figure 1.A : Red meat consumption by generation: mean scores of MD adherence. (The maps were constructed by taking for each generation the average scores over the period 1997–2012)

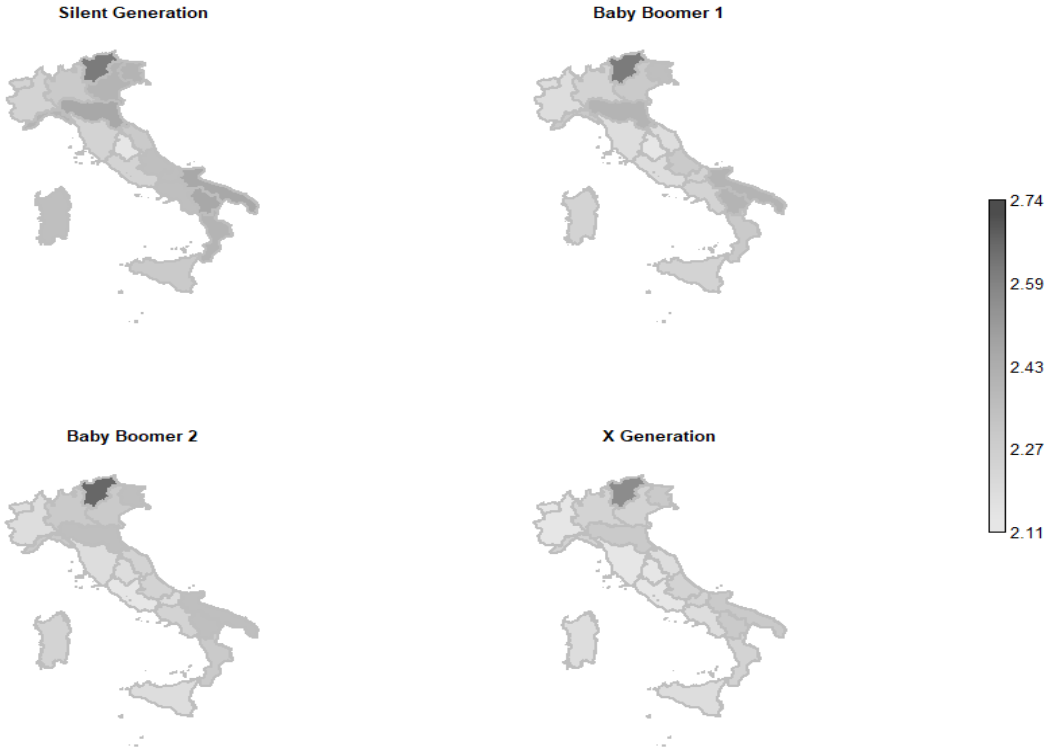


Figure 2.A: Processed meat consumption by generation: mean scores of MD adherence. (The maps were constructed by taking for each generation the average scores over the period 1997–2012.)