The role of time preference, information and health-orientation on *consumer food-related behavior*: Some empirical analyses

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Ph.D. thesis in
Technological Innovation for Agricultural, Food and Environmental Sciences
Main domain 'Agricultural Economics'

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To my family and my husband, with all my love.

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Abstract

In the last two decades the prevalence of diet-related chronic diseases due to overeating has increased dramatically in many developed and developing countries and forecasts of obesity trends suggest that in 2030 almost 51% of the population will be obese. These data clearly remark the need to find effective ways to tackle the problem. In this context, the thesis aims at studying consumers' food-related behaviors with a specific focus on the role of time preferences and health-orientation. The work is organized as a collection of four independent studies analyzing different aspects of food behaviors, choices, and preferences. The main objective is to investigate the mechanisms through which time preferences and orientation to health are involved in individuals' decisions related to food consumption. The thesis also contributes to the literature attempting to propose novel approaches to measure time preferences and health-orientation.

The main results indicate that different time preferences are associated with different food preferences and evaluation of product attributes, thus highlighting the need to account for such factor in the economic study of obesity. Similarly, health-orientation affects food-related behaviors. In particular it seems to be positively associated with the use of nutritional information and to be able to affect preferences for different label formats.

Everything in excess is opposed to nature.
-Hippocrates-

chapter 1

Introduction

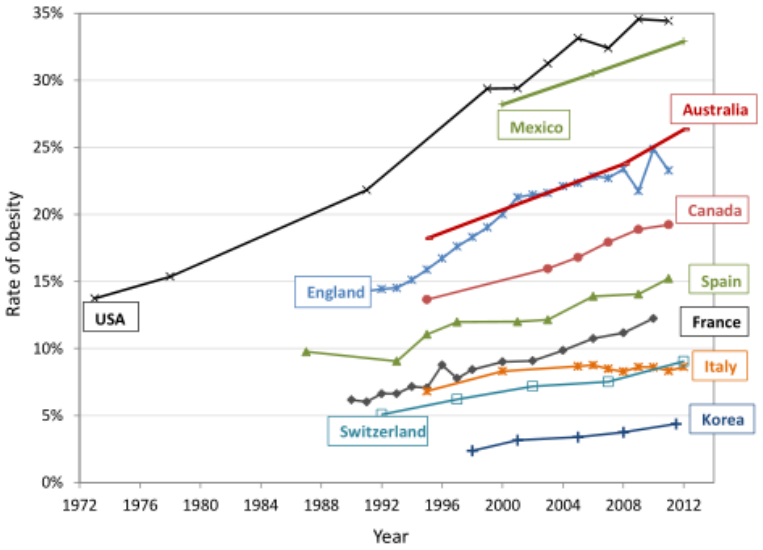
1.1 Scenario description

In the last two decades the prevalence of diet-related chronic diseases due to overeating has increased dramatically in many developed and developing countries. Overweight and obesity already reached epidemic proportions and in a recent report the World Health Organization (WHO, 2015) stated that 'Most of the world's population lives in countries where overweight and obesity kill more people than underweight'. These data, together with forecasts of obesity trends suggesting that in 2030 almost 51% of the population will be obese (Finkelstein et al., 2012), remark a urgent need to find effective ways to tackle the problem.

The prevalence of obesity has spread after 2008 faster than before and this is likely related to the financial crisis that struck many OECD countries (OECD, 2014). This situation is clearly highlighted in Figure 1, illustrating how obesity rates have increased worldwide, particularly in the US and EU. Excess weight[1] is a major public health concern as it constitutes one of the main risk factors for different noncommunicable diseases, such as some

[1] Excess weight (defined by the WHO as 'abnormal or excessive fat accumulation that may impair health') is commonly measured through the Body Mass Index (BMI) calculated as weight in kilograms divided by height in meters squared (kg/m^2). An individual is considered overweight when his/her BMI exceeds 25 and obese when BMI is higher than 30.

Figure 1. Age- and gender-adjusted rates of obesity and overweight



Source: OECD Obesity update 2014

types of cancer, diabetes, musculoskeletal disorders, cardiovascular disease, etc.

However, the problem is not only medical. Besides compromising one's health condition, overweight and obesity represent a remarkable economic issue. They cause negative externalities due to both direct and indirect costs. The former are mainly represented by medical care expenses, many of which are ultimately covered also by non-obese individuals (Cawley, 2015). This happens in countries where the sanitary system is public like Italy, as well as in countries where the health care system is private, due to the rise in health insurance premia. Indirect costs, instead, are represented by the worsening of labor market outcomes (Cawley, 2015). These external costs are estimated to range from 1% to 3% of the total healthcare expenditures in many countries and negatively impact on social welfare. The situation is even worst in the US, where obesity-related costs can reach 10% (OECD, 2014).

Given the worldwide relevance of the problem, research on the economics of obesity started gaining increasing attention and, in the last 20 years, studies on this topic augmented dramatically (Cawley, 2015). A key objective of this research is the identification of the main factors involved in consumers' food choices and the understanding of the mechanisms through which such factors can influence consumers' behavior.

For instance, there is a robust literature that explored the role of individuals' socio-demographic and economic characteristics such as age, gender, education, income, and ethnicity. Other studies examined the impact of the mass production of food and the consequent reduction in prices, the time cost of food preparation, the role of information etc. (see Cutler et al., 2003; Rosin, 2008; & Cawley, 2015 for an extensive review).

Quite recently, economists started adopting a more multidisciplinary approach incorporating insights from consumer psychology and related disciplines into solutions to tackle excess weight.

Past research provided evidence that overweight and obesity are determined by a multiplicity of interconnected factors that are sometimes very difficult to disentangle. As mentioned before, for example, many studies focused on effect of socio-demographic and economic variables finding robust and almost univocal evidence regarding their relationship with food-related behaviors and choices. However, it is very unlikely to think that the effect of such variables is independent from the influence of other individual characteristics such as personality traits, moods, attitudes and beliefs.

Thus, acknowledging the importance to incorporate insights from other disciplines into the economic study of obesity, the present thesis focuses on the analysis of the effects of time preferences and health-orientation on food-related behaviors.

Time preference refers to the individual preference for present or future utility. In other words, it represents the extent to which an individual is willing to trade immediate gratification for future benefits (Frederick et al., 2002). Individuals with high time preference typically favor present utility. They show a tendency to give more value to immediate needs and to ignore the possible consequences of present actions on future events. On the contrary, individuals with low time preference tend to privilege future utility. They are more concerned about future events and give more importance to the long-term benefits that can possibly derive from present behaviors (Smith et al., 2005).

Health-orientation, the second core variable examined in this thesis, is defined as the individual motivation to engage in healthy attitudes, beliefs and behaviours (Dutta et al., 2008; Moorman and Matulich, 1993). It can be seen as the extent to which individuals are concerned about health-related issues and gives a measure of their willingness to take responsibility for their health (Dutta et al., 2008; Moorman and Matulich, 1993). Accordingly, it is expected that more health-oriented individuals will be more willing to engage in health-enhancing behaviors, including healthy eating.

Although the effects of time preferences and health-orientation have been previously investigated in a number of studies, there is still scant literature concerning their specific influence on food-related behaviors. Time preferences, for example, have been largely investigated both by economists and psychologists especially on their effects on intertemporal decisions, that is, all choices involving a tradeoff between present or future rewards (Frederick et al., 2002). Results of these studies generally suggest that individuals with low time preference tend to be less likely to smoke, more likely to exercise (Adams & Nettle, 2009), less likely to drink alcohol (Takanori & Goto, 2009), and more willing to undergo medical

examinations (Bradford, 2010). The literature concerning health-orientation is less extensive, but provides evidence that it can significantly influence the extent to which individuals engage in healthy activities (Visschers et al., 2013).

However, up to now, only a few studies have specifically examined how time preferences and orientation to health can affect food-related behaviors.

1.2 Aims and structure of the thesis

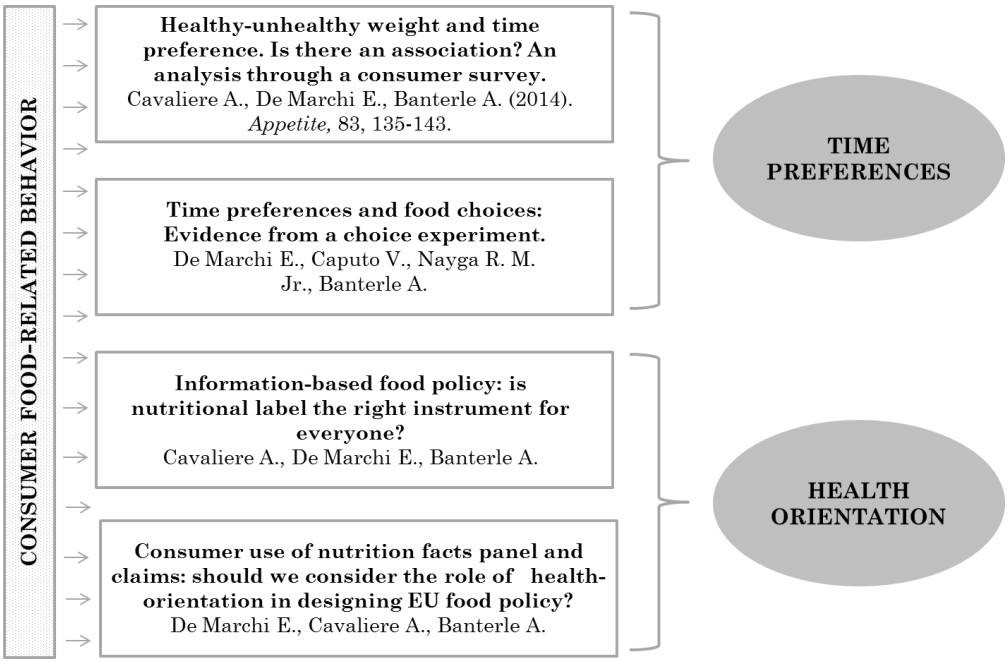
The present thesis work is structured as a step by step analysis of the effects of time preferences and health-orientation on individuals' food behaviors. The main objective is to explore how these two core variables are involved in consumers' decisions regarding food consumption and how they can explain differences in food preferences and, consequently in health outcomes. Moreover, the thesis contributes to the literature concerning these topics attempting to propose novel approaches to measure time preferences and health-orientation. Indeed, the main criticism when studying time preferences and health-orientation is that they cannot be directly measured and proxies are needed.

Standard procedures to estimate time preferences in economic studies are commonly represented by the use of multiple price lists or other monetary tasks. However, the use of such measures in the context of food behaviors might constitute a source of bias. This is because time preferences are affected by domain independence, which means that time preferences in the health and money domains might be not correlated (Lawless et al., 2013). In other words, time can vary significantly according to the specific domain in which the individual is called to make intertemporal decisions (Chapman, 2003). Differently, health-orientation is very context-specific as

it only refers to the health domain, but up to now, no standard procedures have been proposed to estimate it.

As illustrated in Figure 2, the thesis is organized into four different studies, each one developing different aspects of the analysis. In particular, the first two studies are focused on time preferences. The first analyzes the relationship between individual time preference and BMI, while the second goes more in detail into food choices and product evaluations. The last two papers, instead are centered on the role of health-orientation on a specific food-related behaviors, that is, the use of nutritional information.

Figure 2. Thesis structure



Study 1 represents the first step in the analysis of the time preferences. This paper aims at investigating which could be the role of time preferences in explaining an individual healthy or unhealthy weight condition (i.e., normal weight vs overweight and obesity). Individual BMI is considered as the outcome of dietary choices and time preferences are

measured using a broad-proxy, which is directly related to food choices in order to avoid possible biases due to time preferences domain independence.

Study 2 is designed to investigate more in depth the specific link between time preferences and food choices. This paper aims at analyzing if different time preferences are actually associated with different choice behaviors and with a different evaluation of some product attributes. The analysis is conducted by means of a choice experiment that allowed to observe consumer behaviors in a decision making context. In this second case time preferences are measured through a validated psychometric scale. Such measures are not commonly employed in choice experiment analysis, thus, if we find robust results this can be itself useful information for future research.

In **study 3**, instead, the core variable is represented by health-orientation. This paper explores how individual orientation to health is associated with the frequency of use of nutritional information. Health-orientation is measured by means of an index based on health-related behaviors.

Finally, **study 4** is intended to further explore the topic treated in paper 3. In detail, in addition to investigating how health-orientation is associated with the use of nutritional labels (frequency), the analysis considers other information sources, that is, nutrition and health claims. The aim is to understand if individuals with different orientation to health also have different preferences with regard to labels.

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chapter 2

Healthy - unhealthy weight and time preference: is there an association? An analysis through a consumer survey.

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Abstract

Individual time preference has been recognized as key driver in explaining consumers' probability to have a healthy weight or to incur excess weight problems. The term time preference refers to the rate at which a person is disposed to trade a current satisfaction for a future benefit. This characteristic may affect the extent to which individuals invest in health and may influence diet choices. The purpose of this paper is to analyse which could be the role of time preference (measured in terms of diet-related behaviours) in explaining consumers' healthy or unhealthy body weight. The analysis also considers other drivers predicted to influence BMI, specifically information searching, health-related activities and socio-demographic conditions. The survey was based on face-to-face interviews on a sample of 240 consumers living in Milan. In order to test the hypothesis, we performed a set of seven ORM regressions, all having consumers' BMI as the dependent variable. Each ORM contains a different block of explanatory variables, while time preference is always included among the regressors. The results suggest that the healthy weight condition is associated with a high orientation to the future, with a high interest in nutrition claims, a low attention to health-related claims, and a

high level of education. On the opposite, the probability to be overweight or obese increases when consumers are less future-concerned and is associated with a low searching for nutrition claims and to a high interest in health claims.

Keywords: time preference, BMI, consumer, OLS regression model.

2.1 Introduction

Consumer attitude to health has a key role in driving food choices and shaping dietary patterns (Wansink *et al.*, 2004). This individuals' attitude may be reflected in a set of health-oriented choices including the research of a balanced diet, the preference for healthy food products (such as fruit and vegetable), and the reduced consumption of junk food and big portions. A high attention to health also leads consumers to be more oriented to maintain a healthy weight, decreasing the risk of problems related to excess body weight. Nonetheless, the dramatic increase in overweight and obesity rates clearly shows that unhealthy food consumptions and over-nutrition are currently widespread. Indeed, according to OECD data since 1980 overweight and obesity rates are doubled and even tripled in many OECD countries. Nowadays, the most troubling data come from the United States where more than 36% of adults are obese, but the numbers of this disease are growing rapidly also in many European countries. With regard to the EU situation, OECD data reveals that the highest obesity rates (more than 20%) are registered in United Kingdom, Hungary, Luxemburg and Czech Republic. Moreover, OECD predicts that these numbers are expected to grow and in 2020 around two out of three people will have a BMI value higher than 25 (OECD, 2012).

Given the worldwide relevance of the problem, economists in the last decade tried to understand the main causes of obesity analysing factors

such as the food technological improvements, the industrialisation and the resulting mass production of food, the price reduction of energy-dense food, the increased availability of junk food, and also the gradual shift toward a more and more sedentary lifestyle (Cutler *et al*., 2003). Besides these factors, which have been amply investigated in the economic literature, consumers' time preference has been recently recognized as key driver in explaining weight gain or, on the opposite, consumers' maintenance of a healthy weight condition.

The term time preference refers to the rate at which an individual is disposed to trade a current satisfaction for a future benefit (Becker and Mulligan, 1997; Bishai, 2001; Komlos *et al*., 2004; Smith *et al.,* 2005). People with high time preference show a tendency to privilege short-term rewards discounting long-term benefits; on the contrary, those having a low time preference are more likely to renounce the present gratification to get health improvements in the future. This characteristic seems to be able to affect consumers' food choices and the extent at which people invest in health.

Michael Grossman in his work on the demand for health (1972) introduced the concept of time preference in relation to health issues. He saw health as an economic good, describing it as a capital stock that everyone inherits at birth, and that depreciates with aging. In his study he concluded that this depreciation can be offset by some investments, both direct investments like medical care, and indirect investments, which can be grouped in the so called 'health behaviours' (Grossman, 1972). They are defined as 'behaviour patterns, actions and habits that relate to health maintenance, to health restoration and to health improvement' (Gochman, 1997). An individual state of health is therefore the result of his health investments. According to Grossman's theory, time preference assumes a key role, because people

with high time preference will invest in health to a less extent relative to those with low time preference.

Investments in health include healthy food habits, which are strictly related to a decreased probability of consumers to incur overweight and obesity problems. As like as other health behaviours, food choices represent intertemporal decisions in which consumers always have to decide whether to get a current utility or a delayed utility (Bishai, 2001). That is, consumers prefer healthy food instead of unhealthy ones, only if the value of the improvements in future wellbeing exceeds the current pleasure deriving from consumption. The consideration attributed to future outcomes might depend on the individual time preference: consumers with high time preference are generally characterized by low self-control and tend to consider present utility more than future benefits; low time preference is, instead, associated with high self-control levels (Smith *et al.*, 2005). These individuals are more patient and tend to value future gains more than present gratifications (Zhang and Rashad, 2008). Thus, time preference can be also seen as measure of consumers' impatience (Chapman *et al.,* 2001; Frederick *et al.,* 2002).

Several studies have investigated the relationship between time preference and health outcomes, but only a few have explored the specific relation of time preference with consumers' BMI (Komlos *et al.,* 2004; Smith *et al.*, 2005; Ikeda *et al*., 2010; Papoutsi *et al.*, 2012). Hence, the purpose of this paper is to further examine this relationship. In order to better understand which could be the role of time preference in explaining a healthy weight or an unhealthy weight condition (overweight and obesity), we decided not to use the time preference proxies commonly employed in previous works (such as choice tasks or pricing tasks). For the first time to our best knowledge, this paper attempts to focus on consumer time preference for food, using a broad-proxy, which is directly related to food choices. The

hypothesis tested here is that consumers that are more future-oriented in their diet choices tend to attribute more importance to health, and consequently are more likely to have a healthy weight. On the contrary, those who attribute more value to the present utility are expected to be more likely to become overweight or obese. Given the multiple factors that can affect consumer body weight, the analysis also considers other drivers predicted to influence BMI.

The empirical analysis has been conducted through a consumer survey using face-to-face interviews in the city of Milan (Italy). We decided to interview consumers in Milan, as we aimed at analysing a consumer sample of a big European metropolis. Moreover, Italy provides an interesting case to study the determinants of healthy weight, as the prevalence of adult obesity is quite low (around 10% - Istat, 2011) and seems to have only slightly increased in the last years (Micciolo *et al.*, 2010). This relatively low rate may be due to the lack of certain unhealthy food consumption patterns, such as the big-size portions or the fast-food consumption habit, and to the widespread presence of the Mediterranean diet, which is recognized to be effective in preventing from excess weight gain and other diet-related diseases (Schröder, 2007). Nonetheless, Di Giuseppe *et al.* (2008) showed that this kind of diet is becoming more and more unpopular in Italy, above all among the youngest. Indeed, childhood overweight and obesity rates are among the highest in Europe (more than 35% of children between 7 and 11 years old can be considered overweight or obese), and represent a major public concern due to the increased probability of these children to become obese adults.

The present work is organized as follows: in the second section we illustrate our conceptual framework and describe in detail how the considered variables could affect consumers' body weight; in the third section, we explain the methodological approach consisting in a set of 7 Ordinal

Regression Models followed by the marginal effect computation; in the fourth section we analyse the results; finally, in the last section, we provide the discussion and the conclusions.

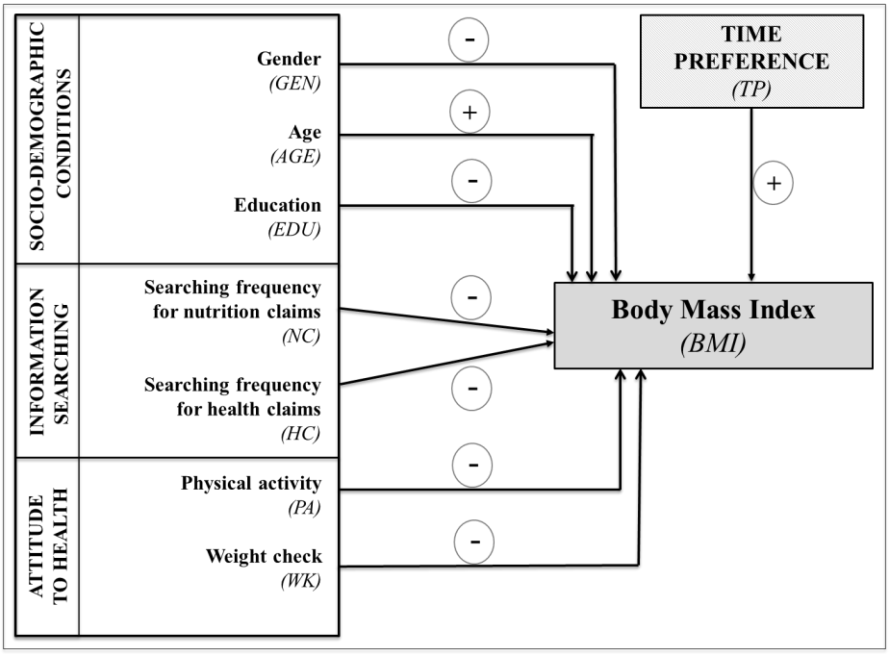
2.2 Conceptual Framework of the study

It is well known that the relation between food consumption choices and consumers' body weight problems is influenced by a lot of interacting factors (Dìaz-Mèndez and Gòmez-Benito, 2010). Among these, there are for example some genetic and biological factors, cultural norms (e.g., attachment to traditions), religious principles (e.g., taboo-food), environmental factors (e.g., the technological improvements), and psychological aspects (Miljkovic *et al*., 2008; Rosin, 2008; KÖster, 2009; Pérez-Cueto *et al.,* 2010; Pouliou and Elliot, 2010). Also the individual attitude to health can affect one's probability to maintain a healthy weight or, on the contrary, to incur overweight and obesity. Moreover, the economic and sociological literature concerning diet-related problems brings to the fore the primary role of the social, economic and demographic conditions of consumers in influencing body weight (Moreira and Padrão, 2006; Huffman and Rizov, 2007; Costa-Font and Gil, 2008; Baum and Ruhm, 2009). In line with these findings and according to Grossman's theoretical model, we designed our conceptual framework focusing, on the one hand, on the variables that can be related to consumer health attitude and, on the other hand, on the socio-demographic conditions. In detail, we analysed consumers' attitude to health considering time preference, that constitute the main focus of this paper, together with food-related information searching (consumers' searching for nutrition and health claims) and health-related activities (physical activity and weight-check). With regard to the socio-demographics we took into account gender, age,

education, the household size, and the working condition in order to analyse the role of the individuals' socio-demographic background.

The next subsections explain in more details how consumers' time preference and the other drivers included in the analysis can affect body weight, by providing the concerning literature review.

Figure 1. Factors influencing consumers' body weight based on literature review evidence.



Note: For 'gender' female is 0 and male is 1.

2.2.1 Time preference

Time preference is recognized in the economic literature to have an effect on individuals' health-related behaviours, such as smoking and having a healthy diet (Chapman and Elstein, 1995; Robb *et al.*, 2008; Adams and Nettle, 2009; Lawless *et al.*, 2013). Particularly, consumers characterized by high time preference tend to heavily depreciate the value of future

health benefits and this attitude can significantly influence their food choices. Indeed, food choices always imply a cost and benefit analysis, since consumers have to decide between an immediate gratification deriving from consumption or a delayed health improvement (Drichoutis *et al.*, 2006). For those individuals with a high time preference the cost of the renounce (e.g. give up eating big size portions or avoid to buy tasty energy-dense food) exceeds the value attached to the future health benefits (Mazzocchi *et al.*, 2009). On the contrary, those having a low time preference attribute more value to the future events (better health status), than to the current utility (pleasure deriving from food consumption). Thus, as showed by Robb *et al.* (2008), consumers' BMI may be seen as the result of their preferences for present or future utility.

The main difficulty in studying time preference is that it is not directly measurable and some proxies are needed to estimate it. In previous studies time preference was estimated mainly using choice tasks (Strathman *et al.*, 1994) and consumers' financial planning (Komlos *et al.*, 2004; Smith *et al.*, 2005). Choice tasks consist of a set of different statements to which consumers have to give a score in accordance to their agreement to the statement content. They are designed to understand how much consumers care about future or present utility. These methods include money-choice tasks that are represented by a set of questions in which consumers are asked to choose between a variable amount of money today and a different amount of money delayed over time (Fuchs, 1982; Chapman *et al.*, 2001). On the other hand, time preference proxies based on consumers' financial planning generally involve individuals' savings and debts. Blaylock *et al.* (1999) suggested that the general decrease in consumer savings that occurred in the last decades may partly explain the simultaneous growth in body weight values. Komlos *et al.* (2004) used the same kind of proxy to test if BMI can be related to the individual level of impatience and their results

give support to this hypothesis. Indeed, using American consumers' savings rate and debt ratio as proxies for time preference, they concluded that people who heavily discount future events are generally more obese. Consumers' impatience leads to behaviours aimed at getting an immediate gratification from food consumption, ignoring the negative consequences of unhealthy diets. In this context, the sensory dimension of food prevails on the nutritional aspect. Another evidence about the existence of a relationship between BMI and time preference comes from Smith *et al.* (2005). They used consumer saving and dissaving information as proxies for time preference, and related these data to consumers' BMI. Their results showed that time preference is positively related to body-weight levels for black and Hispanic men and for black women. These findings are in line with that of Borghans and Golsteyn (2006), who used a set of different questions concerning individuals' financial situation as proxies to measure consumers' discount rate in the Dutch population. They found evidence of a relationship between time discounting and BMI. The hypothesis that time preference affects individual body mass index has been strengthen also by Ikeda *et al.* (2010), who estimated consumers' attitude to time discounting behaviours and concluded that body weight is linked to time preference levels. All these previous studies examining the specific relation between time preference and BMI go in the same direction. Nonetheless, these works do not take into account that consumer body weight is strictly related to the health domain and that time preference for health-issues may be very different from time preference for money. This aspect is well-explained in Lawless *et al.* (2013), who illustrated that time preference is subject to domain independence, so that correlations between health domains and money domains are low. This could be due to the fact that the negative effects of an unhealthy diet on the health status are not immediate. This delay over time may reduce consumers' risk-perception

and lead them to heavily depreciate future health outcomes (Fuchs, 1982; Blaylock *et al*., 1999; Frederick *et al*., 2002).

2.2.2 Information searching

One of the main tools through which consumers can obtain information about food attributes and properties is represented by food labels, which have been shown to be able to lead consumers to more health-oriented consumptions (Drichoutis *et al*., 2006; Drichoutis *et al*., 2009a; NØrgaard and BrunsØ, 2009). In this context, a particular way to convey food information to consumers is represented by nutrition and health claims. They consist of very short and concise messages placed on the front side of the food packaging (Banterle *et al*., 2012). More in detail, nutrition claims are referred to the reduced or extra amount of some micro- and macro-nutrients (such as sugar, fat, salt, or minerals), while health claims refer to specific beneficial effects on health resulting from the consumption of certain food products (e.g., "Reduces cholesterol"). There is a large body of literature that shows that such claims may potentially exert a positive effect on consumers' choices. Indeed, Wansink *et al.* (2004) suggested that the conciseness of nutrition and health claims could facilitate consumers in the comprehension of food-related information, leading to healthy consumptions. In addition, Van Trijp and Van Der Lans (2007) showed that, as they refer to specific properties and attributes of food, they may help consumers to make better-informed food choices. Also Nocella and Kennedy (2012), in their study concerning consumers' understanding of health claims, concluded that claims are potentially effective in leading individuals to more health-oriented consumptions. Given this evidence, consumers' active searching for nutrition and health claims could stand for a high attitude to health and a high interest in food issues.

2.2.3 Health-related activities

Consumers' attitude to health can have an important role in maintaining a healthy weight condition. Those who highly care about their health status are generally more engaged in healthy activities and one of these is represented by physical activity, whose positive effect on health has been amply demonstrated. Indeed, physical exercise is related to a decreased probability to fall into cardiovascular events (strokes, hypertension, coronary heart diseases), and even in some types of cancer (colon and breast cancer in particular) (Fuchs, 2001), but above all physical exercise is associated with a decreased risk to be overweight or obese (Lakdawalla and Philipson, 2002). BMI increases when a prolonged situation of positive energy balance occurs, so that, the calorie intake exceeds the calorie expenditure. Hence, regular exercise can be effective in increasing the energy expenditure, reducing consumers' probability to gain weight.
People's attitude to health could be also reflected in regular weight-check. This behaviour is generally more common in people who attribute high attention to health issues and are more willing to maintain a normal weight.

2.2.4 Socio-demographic conditions

Although food choices, preferences, and tastes may seem very individualistic, they are clearly affected by a social gradient. As demonstrated by Burdieu (1984), disadvantaged social classes and less educated individuals are more oriented to a 'taste of necessity' (in which food is a good to satisfy basic needs). Higher educated people are, instead, more oriented to a 'taste of luxury' (in which food is not only nutrition but also pleasure). In this context, consumers with a taste of necessity,

probably due to their lack of knowledge concerning the link between diet and health, are expected to make unhealthy food choices and, consequently, to be less likely to have a healthy weight. This is in line with the findings of Nocella and Kennedy (2012), arguing that more educated individuals are more informed about the relation between food choices and health. Miljkovic *et al.* (2008) suggested that highly educated consumers are able to make better food choices. This may be due to the fact that more educated individuals generally have a higher inclination to healthy behaviours (Cutler and Lleras-Muney, 2010). This attitude leads to healthy food consumptions (Huffman and Rizov, 2007) and also to an increased searching for food-related information. NØrgaard and BrunsØ (2009) found that highly educated individuals look for nutritional information more frequently than others. Another contribution is provided by Moreira and Padrão (2006), that concluded that education can decrease consumers' probability to suffer from obesity mainly in relation to their ability to understand the negative consequences of unhealthy diets.

As well as education, also consumers' gender and age have been demonstrated to be strongly related to BMI. Some studies analysing how the socio-demographic background affects the weight condition highlighted the existence of a relation between weight and gender, showing that men seem to have a higher tendency to gain weight than women (Cawley, 2004; Banterle and Cavaliere, 2009).

Also age was found relevant to explain individual body weight. Particularly, the economic literature shows a positive relation between BMI and age. Baum and Ruhm (2009) made an in-depth analysis of the relationship between body weight, socio-economic status and age, and found that BMI grows on the average by 0.12 per year of age. Their results are consistent with those of Huffman and Rizov (2007) and Miljkovic *et al.* (2008) that also argued that consumer tendency to gain weight increases

with ageing. These findings could be due to the fact that older people generally reduce their physical activity and their energy expenditure favouring weight gains (Maennig *et al*., 2008). Moreover, getting older might lead consumers to attribute less importance to the long-term consequences on health, since future may be perceived as a short term event. Also consumers' working condition and household size are important to evaluate the role of the socio-economic background. In fact, working consumers seem to have higher BMI than unemployed: Huffman and Rizov (2007) found that employed men weight 1.5% more than unemployed, even if this is not confirmed for women. With regard to the household size, Drichoutis *et al*. (2009b) found evidence that it positively affects BMI.

2.3 Methods

2.3.1 Data collection and variables description

Data were collected through a consumer face-to-face survey. Although face-to-face surveys are known to be costly by comparison with telephone or on-line ones, we believe that this represents the more suitable approach when studying consumers. Indeed, face-to-face interviews are based on personal interaction and this is very helpful to avoid questions misinterpretations. Moreover, Szolnoki & Dieter (2013) in their study on the comparison between different surveying methods did not find social desirability bias effects with regard to face-to-face interviews. The survey was conducted in the city of Milan (in Lombardy, a northern Italy region) in 2011 outside the city grocery stores. The survey was based on an *ad hoc* questionnaire, which was pre-tested with a pilot survey on a small sample of 40 consumers in order to avoid potential bias. This preliminary phase also allowed to ascertain the questions' goodness.

The stores' selection was made using a systematic sampling starting from the address list of the city's commercial activities with regard to the supermarkets (grocery store with a commercial area between 400 and 2500 m^2) and hypermarkets (grocery stores having a commercial area > 2500 m^2). Basing on the different dimensions of these stores, we selected 6 hypermarkets and 12 supermarkets. Furthermore, to cover all the geographical areas of the city, including central areas and the suburbs, the selection was made with respect to the ZIP code.

It was decided to recruit 20 consumers for each hypermarket, and 10 for each supermarket in order to obtain 120 consumers for each store category. Only people younger than 18 year old were excluded from the survey. The final sample consisted of 240 consumers, with a refusal rate of 26%. Consumers were randomly approached outside the stores before or after their grocery shopping, and the interview was about 10 minutes long. Moreover, the interviews were carried out in order to cover different time bands (early morning, lunch time and evening).

The questionnaire was formulated following the conceptual framework and all the answers consisted in multiple-choice items with rating or dichotomous scales.

The anthropometric measures constitute the first focus of the analysis. Consumers were asked about their height and weight in order to calculate their BMI (estimated as the weight in kilograms divided by height in meters squared). Both these measures were based on individual statements, but face-to-face interviews allowed us to point out false responses. Indeed, in order to avoid potential biases due to consumers' weight underestimations and to improve the accuracy of these measures, the interviewer had a graphic representation of BMI both for men and women and had to sign each consumer in a BMI category, according to his personal judgement.

To estimate consumer time preference (TP) this work attempted to create a broad-proxy specifically related to food consumption. In detail, consumers were asked to characterize their diets as generally health- or taste-oriented to understand if they were concerned in future wellbeing or they were mainly present oriented. Particularly, this broad-proxy measures time preference in terms of future/present orientation: when dietary habits are oriented to health and consumers care about future health consequences, the time preference assumes value 0; on the contrary, when consumers reveal to make diet choices mainly based on taste, the time preference variable assumes value 1.

We also included some questions on consumer information searching, specifically taking into account consumers' searching for nutrition and health claims (NC and HC). We asked consumers how often (from never=1, to always=5) they search for products with nutrition and health-related claims, assuming that a high interest in such information may be related to more health-concerned people and to a higher likelihood of having a healthy weight. As the 5 values assumed by these two variables cannot be considered a scale, we turned NC and HC into binary variables following two different approaches. In detail, in the first case the new NC and HC variables assume the form: 'Consumers search for nutrition/health claims=1'; 'Consumers never search for nutritional/health claims=0'. Then, given the relevant role of food information in affecting food-related behaviours, we followed a second approach to obtain a more detailed analysis. Particularly, NC and HC variables were categorized generating a single dummy for each of the 5 scores that the original variables could assume, respectively obtaining 5 dummies for the variable NC, and 5 dummies for the variable HC (the first dummy removed for estimation purpose). Moreover, we considered some questions on consumers' health-related activities. The interviewed were asked about their habit to practice

physical activity regularly (PA), as this behaviour is generally linked to people who highly care about health issues. For the same reason, we also included consumers' habit to check body weight (WK).

Finally, in order to analyse the socio-demographic background of our sample, we considered education (EDU), gender (GEN), age (AGE), household size (HS), and working condition (WORK). All these variables are shown in the economic and sociological literature to play a relevant role in affecting consumers' probability to preserve a healthy weight or to incur overweight and obesity. Table 1, reports all the variables described above with the concerning means, standard deviations and frequencies.

2.3.2 Econometric approach

The econometric approach was designed to empirically test our main hypothesis that time preference, thus consumer future/present orientation, is associated with BMI levels. The data were analysed through a set of 7 Ordinal Regression Models (ORM), all having consumer BMI as the dependent variable. According to the WHO classification, the BMI categorical variable can assume 4 different values: value 1 corresponds to underweight consumers (with BMI levels <18.5 - only 5.4% of the considered sample, namely 13 consumers), value 2 to normal-weight consumers (with BMI levels from 18.5 to 24.9 corresponding to a healthy weight), value 3 groups overweight individuals (with BMI levels from 25 to 29.9), and value 4 identifies obese persons (with BMI level > 30). Following the conceptual framework, each ORM was performed with a different block of explanatory variables predicted to affect body weight (consumers' searching for nutrition and health claims, health-related activities and socio-demographic variables), always including our broad-proxy for time preference among the regressors.

Table 1. Variable descriptions

Variable name	Scale	Description	Obs	Mean	SD
Dependent variable					
Body Mass Index (BMI)	scale (1-4)	Body Mass Index (Kg/m^2) from underweight=1 to obese=4	240	2.43	0.74
Independent variables					
Time preference (TP)	dummy (0-1)	Respondents choose their dietary patterns paying attention to health=0, or taste=1	240	0.41	0.49
Nutrition claims (NC)	scale (1-5)	Searching frequency for nutrition claims from never=1 to always=5	240	3.18	1.63
Health claims (HC)	scale (1-5)	Searching frequency for health claims from never=1 to always=5	240	3.20	1.70
Physical activity (PA)	dummy (0-1)	Respondent practices sport once a week 1, otherwise 0	240	0.71	0.45
Weight check (WK)	scale (1-5)	Respondent checks their weight from never = 1 to every day=5	240	3.25	1.26
Gender (GEN)	dummy (0-1)	1 female, 0 male	240	0.54	0.50
Age (AGE)	scale (1-6)	The interviewee's age group (18-24; 25-34; 35-44; 45-54; 55-64; >64)	240	3.81	1.64
Education (EDU)	scale (1-5)	Education level (primary school, secondary school, higher education, degree, post degree)	240	3.12	0.88
Household size (HS)	scale (1-5)	Number of the family members (1, 2, 3, 4, more than 4)	240	2.37	1.08
Working condition (WORK)	dummy (0-1)	1 employed, 0 unemployed	240	0.53	1.08

This analysis allowed to verify if the relationship between time preference and BMI is strong, and if the robustness of this relation may be affected by the other variables employed in the models. To avoid multicollinearity problems among the explanatory variables, the Variance Inflation Factor (VIF) was calculated after each equation. In our analysis we did not find multicollinearity, and the VIFs were always far below the problematic value of 10. Moreover, aiming at obtaining a more detailed profile for each consumers' group in relation to their BMI value, we computed the marginal effect estimation of Model 6 (including all the variables considered in the analysis). The marginal effect computation was made separately for each value assumed by the dependent variable.

2.3.3 Characteristics of the sample

Table 2 compares the key demographics of the 240 respondents respectively with that of the 2011 census for the Italian and the Lombardy population, provided by the Italian Central Institute of Statistics (Istat). This comparison is helpful to verify if the socio-demographic characteristics of

our sample are in line with that of the regional and national population. With regard to the gender distribution, table 2 shows that the female category is slightly higher than that of male in our survey and also in the Istat census. This phenomenon is more marked in our sample, probably because of the fact that the consumers recruited for the survey were the major grocery shoppers of the households and in this category, at least in Italy, women are usually predominant.

Concerning the age, we observe in our sample a little over-representation for the classes 25-34 and 55-64, and a small underrepresentation for the >65 class relative to the 2011 Lombardy and Italy census. Even though there is a little gap between the percentages of these age-classes, the surveyed sample and the regional and national population seem to be in line.

Table 2. Demographic characteristics by gender and age

	Gender (%)		Age (%)					
	Male	Female	18-24	25-34	35-44	45-54	55-64	>65
2011 Italy census	47.91	52.09	8.32	13.22	18.22	18.07	15.65	26.53
2011 Lombardy census	48.02	51.98	7.25	12.39	18.89	18.44	15.89	27.15
Surveyed sample	45.42	54.58	9.58	16.67	17.92	15.00	20.42	20.42

Comparing the surveyed BMI distribution with the BMI rates provided by the '2011 Population and housing census of Istat' concerning the Italian and Lombardy population (table 3), we note only small differences between these data. Indeed, the main differences are observed among the overweight consumers, which in our sample are underrepresented by only 2.9% relative to the regional percentage.

Table 3. Comparison between consumers' BMI distribution at national, regional and survey level

	%			
	Underweight	Normalweight	Overweight	Obese
2011 Italy census	3.00	51.20	35.80	10.00
2011 Lombardy census	4.20	54.00	32.90	8.90
Surveyed sample	5.42	55.00	30.00	9.58

2.4 ORM and marginal effect results

The ORM results in table 4 illustrate that our basic model shows a positive and significant relationship between time preference and BMI (0.675). This result seems to confirm our hypothesis that consumers' future orientation is linked to a healthy weight, instead, consumers who favour the present utility are more likely to show excess weight. In other words, when consumers generally consider future consequences on health in their dietary habits, BMI levels are low.

In order to stress the consistency of our hypothesis we perform Model 2 with TP, NC and HC as regressors. The analysis reveals a negative association between consumers' searching for nutrition claims and BMI (-0.902) and a positive association of health claims with body weight (0.878). These opposite results suggest that normal-weight consumers and overweight or obese ones are differently interested in food-related claims. Indeed, the former shows a high attention to nutrition claims, whereas the latter are more concerned in health claims. Moreover, even in this case, the role of time preference in influencing consumer BMI seems to be not affected by the other explanatory variables included in the model: the ORM results reveal a positive and significant relationship between TP and BMI (0.686). Due to the primary role that information can have in affecting body

weight outcomes, we estimated Model 3 entering the categorized form of both NC and HC variables to obtain a higher level of detail.

Table 4. ORM results

	Model 1 lnBMI	**Model 2** lnBMI	**Model 3** lnBMI	**Model 4** lnBMI	**Model 5** lnBMI
Time Preference	0.044*	0.038*	0.048*	0.047*	0.041*
	(0.021)	*(0.019)*	*(0.021)*	*(0.021)*	*(0.019)*
Gender		-0.110***			-0.110***
		(0.019)			*(0.019)*
Age		0.017**			0.015*
		(0.006)			*(0.006)*
Education		-0.025*			-0.024*
		(0.011)			*(0.011)*
Nutrition claims			-0.023*		-0.016*
			(0.009)		*(0.009)*
Health claims			0.029**		0.016*
			(0.009)		*(0.008)*
Physical activity				-0.012	-0.017
				(0.023)	*(0.021)*
Weight check				-0.014*	-0.016*
				(0.008)	*(0.007)*
cons	3.177***	3.250***	3.159***	3.230***	3.320***
	(0.013)	*(0.051)*	*(0.024)*	*(0.034)*	*(0.064)*
N. obs	240	240	240	240	240
F	4.54	14.16	4.96	2.57	8.58
R^2	0.02	0.19	0.06	0.03	0.23
Breusch-Pagan test (chi2)	1.41	0.29	0.25	2.37	0.82

standard error in parentheses

* p<0.05, ** p<0.01, *** p<0.001

With regard to both nutrition- and health-related claims, Model 3 supports the results of the previous equation. Indeed, consumer searching for NC decreases when BMI is higher, while people who search for HC are more

likely to have excess weight problems. The positive and significant relationship of TP with BMI is confirmed (0.753). Model 4 includes the variables linked to consumers' health-related activities and suggests that, as expected, consumers with a healthy weight condition are more used to check their body weight (-0.647). Moreover, also in this equation time preference is positively related to BMI (0.683).

To further test the strength of the relationship between TP and individual body mass index, we specified Model 5 adding the socio-demographic variables, which are predicted to have a primary role in explaining differences in BMI values. According to the economic literature, we found that consumer education is negatively associated with BMI (-0.315), meaning that more educated individuals have a decreased probability to become overweight or obese. Moreover, the highest BMI levels are observed among men (-1.160) and body weight increases with ageing (0.254). The importance of socio demographic characteristics in affecting body weight is remarked by the fact that socio-demographic variables contribute the most to the total explained variance. Consumer household size and working condition, instead, are not statistically significant. In Model 5 also, the relationship between TP and BMI is positive and significant (0.717).

Finally Model 6 and 7 were estimated with all the explanatory variables included in the previous Models. They differ only with regard to NC and HC variables that were respectively entered in model 6 in their binary form, and in Model 7 in their categorized form. In both cases, we observe that the coefficients' significance and sign are very similar to those found in the previous equations and this makes our previous results more robust. This is of particular importance when considering the relationship between BMI and TP, since also in these last two models time preference is shown to have a key role in affecting consumer body weight. Results suggest that the effect of TP on consumers' BMI is not influenced by other variables.

Indeed, the TP coefficients magnitude in Models 6 and 7 (0.734 and 0.748) are essentially unvaried in comparison to those found in the basic model, and in models 2, 3, 4 and 5. Nonetheless, despite the significance level of TP is high (considering the low sample size of 240 individuals), the amount of total variance explained by this variable is weak and further investigations are needed to support these results.

With regard to the marginal effect computation of Model 6 (table 5), the most relevant result concerns the opposite pattern of signs, which can be observed when shifting from normal-weight to overweight and obese categories. Indeed, the healthy weight condition is associated with consumers' high orientation to the future, high interest for nutrition claims, and low attention to health-related claims. Moreover, concerning the socio-demographic conditions it is possible to note that the probability of being normal-weight is higher among better educated individuals, women and young adults.

On the opposite, the predicted probability to gain weight increases (by 12.2% for overweight and by 4.4% for obese) when consumers are less future-concerned. The probability to be overweight or obese is associated with a little attention to nutrition claims and a high interest in health-related claims. Furthermore, excess weight increases when consumers have low education and is more common in older men.

The marginal effect results support the overall findings on the crucial role of the socio-demographic conditions in affecting an individual's probability to gain weight. Indeed, the probability to be overweight or obese is higher for the disadvantaged social classes (individuals with a low level of education, and older people). Regarding consumers' searching for nutrition and health claims the opposite results need to be further investigated, due to the relevance of this matter and to the potential role that food-related may have in leading consumers towards healthy consumptions. Moreover,

these findings confirm that consumer time preference in relation to diet choices can have a primary role in affecting food behaviours, and that being more future-oriented may lead to important health improvements, due to a reduced probability to incur overweight and obesity.

Table 5. Marginal effect computation of Model 6

	MARGINAL EFFECT of Model 5			
	Underweight	Normal-weight	Overweight	Obese
Time Preference	-0.032**	-0.149**	0.133**	0.049**
	(0.014)	*(0.051)*	*(0.046)*	*(0.018)*
Nutrition claims	0.008*	0.042*	-0.036*	-0.013*
	(0.004)	*(0.024)*	*(0.021)*	*(0.007)*
Health claims	-0.008*	-0.044*	0.038*	0.014*
	(0.004)	*(0.023)*	*(0.020)*	*(0.007)*
Physical activity	0.012	0.074	-0.062	-0.025
	(0.009)	*(0.059)*	*(0.047)*	*(0.020)*
Wheight check	0.004	0.024	-0.021	-0.008
	(0.004)	*(0.021)*	*(0.018)*	*(0.007)*
Gender	0.044**	0.231***	-0.193***	-0.082***
	(0.014)	*(0.054)*	*(0.045)*	*(0.023)*
Age	-0.008**	-0.045*	0.039**	0.014**
	(0.004)	*(0.019)*	*(0.017)*	*(0.006)*
Education	-0.010*	0.055*	-0.048*	-0.018*
	(0.006)	*(0.032)*	*(0.028)*	*(0.010)*
Household size	0.001	0.008	-0.007	-0.002
	(0.004)	*(0.024)*	*(0.021)*	*(0.008)*
Working condition	-0.002	-0.012	0.010	-0.004
	(0.011)	*(0.059)*	*(0.051)*	*(0.019)*
N. obs	240	240	240	240

standard error in parentheses
* p<0.05, ** p<0.01, *** p<0.001

2.5 Discussion and conclusions

The main hypothesis tested in this work is that food-related time

preference, thus consumer future/present orientation, is associated with BMI levels. The survey was based on face-to-face interviews conducted in Milan (Italy) on a sample of 240 consumers. In order to test the hypothesis, we performed a set of 7 ORM, all having consumers' BMI as the dependent variable. Each ORM contained a different block of explanatory variables predicted to affect body weight, while our broad-proxy for time preference was always included among the regressors.

The results show that the relationship between time preference and BMI is positive and significant in every model. Thus, even if we have a small sample size and we cannot derive global conclusions, our initial hypothesis on the role of time preference (measured in terms of diet-related behaviours) in affecting an individual's probability to gain weight should be accepted. Particularly, our analysis shows that when consumers are more future-oriented, thus are more prone to take into account healthy aspects in their dietary choices, they are more likely to have healthy BMI levels, although we estimated time preference with a broad-proxy that certainly needs supplementary investigations. The analysis of the reasons that may lead consumers to favour present utility or to value future outcomes is beyond the objective of this paper. Nonetheless, on the basis of the broad-proxy used to measure TP, we can suppose that consumers' attitude to discount the long-term consequences of unhealthy eating may be due to both an individual preference for the hedonic dimension of food consumption, and to a lack of awareness about the negative consequences of unhealthy dietary habits.

Another important finding of the study is related to nutrition and health claims. Indeed, consumers' searching for nutrition claims is negatively related to BMI, while searching for health claims is positively associated with consumers' body weight. Therefore, overweight and obese consumers seem to be not concerned in the nutritional attributes of food, whereas

products with health-related claims appear to be able to catch their attention. A possible explanation may be linked the low self-perceived health status of these consumers. Even if this feeling is not enough strong to definitively shift their eating habits toward healthier diets, it may lead them to deceive their self that food with health claims may, in some way, improve their health condition. This is in line with the results of Lähteenmäki (2013), who argued that consumers perceive foods with such claims as being able to exert specific physiological functions, or to induce beneficial health outcomes. On the other hand, the type of information conveyed through nutrition claims is not explicitly linked to potential health improvements, being only focused on food nutritional properties and probably, making less evident the link between food consumption and health.

With regard to consumers' socio-demographic background the analysis reveals that men are more exposed to obesity than women, that obesity rates go up with age, and that more educated consumers are less likely to gain weight. These results go in the direction of the main findings of the economic and sociological literature concerning obesity, demonstrating that disadvantaged social classes, such as elderly and less educated, are more prone to gain weight (Miljkovic *et al.,* 2008). Of particular importance is the role of a good level of education in preventing consumers from excess-weight problems. Indeed, such consumers are predicted to be able to choose more health-oriented diets, due to their better food-knowledge and awareness about the link between diet and health.

The main policy implication of our study is referred to time preference. Given that a high orientation to the present utility leads people to favour the hedonic dimension of food consumption and to attribute a scarce importance to future events, a possible way to increase healthy eating is to make consumers more aware about the consequences of their unhealthy

dietary habits. Indeed, a higher consciousness about the increased and worrisome diseases-risks of obesity may persuade individuals to attribute more value to their future health. A concrete measure to improve consumers' awareness is represented by education campaigns. These campaigns should be focused not only on nutritional aspects, but should also convey key messages concerning the long-term risks that unhealthy eating can cause. Indeed, the combination of nutritional information together with specific recommendations to prevent negative health events may be effective in promoting healthy food consumptions. Due to the fact that overweight and obese individuals represent disadvantaged social classes, future policies should take into account the specific needs of these consumers. Tailored information campaigns based on synthetic and easy to read information could be effective for consumers with a low education level and for older people, for which information contents could be more difficult to understand.

The results concerning nutrition and health claims suggest that labels are not always effective in catching consumer attention. In the last years both in the EU and the US the legislation concerning food labelling led to a high level of transparency in the markets, providing consumers with more information and reducing the information asymmetry. Nonetheless, the way in which this information is conveyed to consumers is not always effective in leading them to healthier choices. Hence, more research is needed in this field to better understand which could be the best way to communicate the labelled information to consumers.

Furthermore, another policy implication of this study, regards the crucial role of the education level in promoting more conscious food choices and healthier diets. Therefore, the measures aimed at increasing population schooling can contribute to enhance the public health. Moreover, in order to increase individuals' food knowledge, it could be of primary importance to

introduce specific education programs in the schools. This policy intervention could be very effective, but the main limitation is that it is addressed only to young people, and may only indirectly involve their families. The positive effects of such policy, in terms of healthier food consumptions, will result only in the long run.

The main weakness and strength of this study are both linked to our time preference broad-proxy. Indeed, our proxy may be considered too simplistic to really catch individuals' time preference and consumer responses concerning their diet choices may suffer from social desirability bias. At the same time, the main added value of this measurement is that it directly refers to food time preference, trying to consider that consumer time preference for health-related issues may be different from monetary time preference. Hence, future research should attempt to collect data on a bigger sample in order to further test the goodness of our time preference proxy and stress the robustness of our results. Moreover, the study should be replicated in other European countries, where the obesity rates are different.

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chapter 3

Time Preferences and Food Choices: Evidence from a Choice Experiment

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Abstract

Time preferences have been recognized by numerous studies as an important driver of a number of healthy and environmentally-friendly behaviors. In this study, we first examined if healthy and environmentally-friendly food labels (e.g., USDA organic, carbon trust, health claim, and calories) are relevant in driving food choices. Second, using the Consideration of Future Consequences (CFC) scale we analyzed if individuals with different time preferences have different choice behavior and valuations in relation to these labels. Results indicate that consumers value both healthy and environmentally-friendly attributes displayed on labels. Results also suggest that time preferences can significantly influence consumers'

valuation for the USDA organic label and the calorie amount attributes.

Keywords: time preferences, consumer behavior, health claims, environmentally-friendly labels, choice experiment

3.1 Introduction[1]

Food consumption trends have changed rapidly in the last decade due to consumers' increased interest in what they eat. For example, consumers are becoming more aware that their food choices can potentially affect their health (Chrysochou, 2010; Sirò, Ka´polna, E., Ka´polna B., & Lugasi, 2008; Verbeke, 2005) and are showing growing interest in the health-related attributes of food. Besides this increased attention on the health dimension of food consumption, some non-health related attributes also seem to play a role in affecting food choices. For instance, a number of studies have shown that consumers are becoming more sensitive to environmental concerns and sustainability issues, and are more aware about the effects that their diets may have on the environment in the long run (Vermeier & Verbeke, 2006). This increased food consciousness is reflected by the growing demand for food products with specific nutritional- and health-related properties (e.g., foods with nutrition and health claims), organic food, and other environmentally friendly

[1] Abbreviations used in this paper: BMI = Body Mass Index, CE= choice experiment, MPL= Multiple Price List, CFC= Consideration of Future Consequences, CFC-I= Consideration of Future Consequences-Immediate subscale, CFC-F= Consideration of Future Consequences-Future subscale, MNL= Multinomial Logit Model, PCA=Principal Component Analysis, RPL= Random Parameter Logit, RPL + EC= Random Parameter Logit with error component.

products such as food with carbon labeling (Aschemann-Witzel, Maroscheck, & Hamm, 2013; Banterle & Cavaliere, 2014; Goetzke, Nitzko, & Spiller, 2014; Lee & Yun, 2015; Sirò et al., 2008; Zhao & Zhong, 2015).

These emerging trends can be viewed as remarkable changes in consumers' food consumption habits. On the one hand, healthier food choices might contribute to tackling the problem of food-related chronic diseases (i.e., obesity, hypertension, diabetes, etc.) that still represent a major public health concern in the US (Courtemanche, Heutel, & McAlvanah, 2014; Roberto, Pomeranz & Fischer, 2014). On the other hand, the increased demand for environmentally friendly foods is related to more interest in sustainable use of resources and consequently, future wellbeing (Reisch et al., 2013). However, the extent to which consumers value and respond to environmentally friendly food products through value-consistent behavior still remains a questionable point (Haws, Winterich & Walker Naylor, 2014).

In reality, various factors can discourage consumers from choosing food with healthy and sustainable characteristics. For instance, the higher price of these products is often perceived as a limiting factor in the purchase of these products (Bhattacharya & Sen, 2004; Marian, Chrysochou, Krystallis, & Thogersen, 2014; Verhoef, 2005). Another important limiting factor is peoples' tendency to pursue immediate gratification, which leads them to underestimate the value of future benefits that can be derived from the consumption of such products.

In this paper, we focused specifically on this latter aspect and explore the possible role of time preferences in affecting food choices. Time

preference refers to an individual preference for present or future utility (Frederick, Loewenstein, & O'Donoghue, 2002). Individuals with high time preferences show a tendency to give more value to their immediate needs and ignore the possible consequences of present actions on future events. On the other hand, those having low time preferences are more future-oriented and give more importance to the long-term benefits that one can possibly derive from present behaviors (Smith, Bogin, & Bishai, 2005). This topic has been studied extensively by economists and psychologists, especially on its effects on intertemporal decisions. Additionally, much of the previous research on time preferences demonstrated that it is able to affect a number of human behaviors, including health and environment-related ones (Adams & Nettle, 2009; Blaylock, Smallwood, Kassel, Variyam, & Aldrich, 1999; Franzen & Vogl, 2013; Frederick et al., 2002; Joireman, Lasane, Bennett, Richards,& Solaimani, 2001; Takanori & Goto, 2009).

Scant literature, however, exists on the effect of time preferences on food choice behavior. The aim of this paper is twofold. First, we analyze if healthy and environmentally friendly attributes are relevant in driving food choices; second, we investigate if people with different time preferences will have different choice behavior using a choice experiment (CE) approach. The CE allows us to specifically analyze consumers' behavior in a decision-making context. To the best of our knowledge, this is the first study that examines the role of time preferences in consumers' valuation for environmentally friendly and healthy attributes. Understanding whether time preferences could have a role in shifting consumers' preferences towards more healthy and sustainable food consumption is an

important issue to be addressed since it can help in the development of appropriate food policies aimed at promoting healthier and more sustainable food choices. Moreover, time preferences are not typically included in CE studies. While a few recent CE studies have explored the effects of some psychological traits on consumers' preferences (Grebitus, et al., 2015; Grebitus, et al., 2013), none have specifically considered time preferences. If we find that there is heterogeneity in choice behavior and preferences based on time preferences, then this in itself is an important finding since it would imply that future CE studies should also elicit time preferences and check if there is choice/ preference heterogeneity based on these measures. CE is now one of the most popular methods being used for valuation of food products/attributes.

This paper is organized as follows: the next section contains an overview on time preferences and their role in affecting intertemporal decisions. In the following sections, we describe the experimental procedures used for the time-preference estimation and CE. We then explain the data collection, describe the sample characteristics, discuss the empirical analysis of the data, and, finally, present the results and the conclusions of our study.

3.2 Time Preferences: Background and Research Hypothesis

Human behaviors can differ significantly among individuals according to their time preferences, that is, how they discount future events (Adams, 2012; Bishai, 2001; Blaylock et al., 1999). Time-discounting behavior generally refers to any motive that leads individuals to care less about future outcomes. As such, it is of great

importance to intertemporal decisions; namely all choices in which individuals have to decide whether to favor a present utility or delayed benefit (Frederick et al., 2002). Individuals with high time preferences heavily discount future events and typically show a tendency to value present gratification more than future rewards. From a utility-maximization point of view, present orientation may lead to inefficient decisions. Indeed, present-biased individuals are more likely to make decisions that will cause a disutility over time and, therefore, are more likely to regret these choices in the future. On the other hand, individuals characterized by low time preferences value future events to a greater extent, and tend to consider the long-term consequences of their present actions. Hence, they are more willing to forgo immediate needs to give priority to future utility (Frederick et al., 2002).

There is a robust literature that examined the effects of time preferences on intertemporal decisions. Moreover, numerous studies have attempted to explain how time preferences influences health-related behaviors. Their results generally suggest that individuals with low time preferences tend to be less likely to smoke (Adams & Nettle, 2009; Harrison, Lau, & Rutstrom, 2010; Robb, Huston, & Finke, 2008; Scharff & Viscusi, 2011; Takanori & Goto, 2009), more likely to exercise (Adams & Nettle, 2009; Ouellette, Hessling, Gibbons, Reis-Bergan, & Gerrard, 2005; Wardle & Steptoe, 2003), less likely to drink alcohol (Bishai, 2001; Takanori & Goto, 2009), and more willing to undergo medical examinations (Bradford, 2010; Chapman, Brewer, Coups, Brownlee, & Leventhal, 2001). Much of the previous research on time preferences also focused on the link between time preference and BMI (Body Mass Index). Evidence

showed that high future-discounting is generally associated with higher BMI levels (Adams & White, 2009; Borghans & Golsteyn, 2006; Ikeda, Kang, & Ohtake, 2010; Komlos, Smith, & Bogin, 2004; Smith et al., 2005).

Time preference has also been analyzed in the context of environmentally friendly behaviors, although the literature in this field is less extensive. The general evidence is that higher time preferences are related to lower environmental concern (Carmi & Arnon, 2014; Franzen & Vogl, 2013; Grebitus, Lusk, & Nayga, 2013; McCollough, 2010). Franzen and Vogl (2013) and Carmi and Arnon (2014) found that individual discount rates influence environmental concern and provide evidence that low time preferences are associated with increased pro-environmental attitudes. Joreiman et al., (2001) reported the same result and showed that higher future orientation was positively related to stronger engagement in pro-environmental activism. Ebreo & Vining (2001) and McCollough (2010) have also found that more future oriented individuals are more likely to engage in recycling behaviors and less likely to waste.

There are only a few studies that have examined the relationship between time preferences and food choices (e.g., Cavaliere, De Marchi, & Banterle, 2014; Piko & Brassai, 2009; Houston & Finke, 2003). For example, Houston and Finke (2003) examined the effects of time preferences on diet choices and found that individuals showing high future discount rates have a lower diet quality (measured using the Healthy Eating Index), and are less likely to use nutritional labels. No other known study, however, has investigated how time preferences could affect consumers' valuation for healthy and environmentally friendly attributes in food.

In this study, we hypothesize that (i) individuals would value both healthy and environmentally friendly attributes when choosing food products and that (ii) the extent to which individuals would give importance to such attributes is associated with their time preferences.

In particular, individuals with high time preferences (present orientation) are expected not to consider the long-term potential benefits that can be derived from both healthy and environmentally friendly food attributes. As a result, they are then expected to attach a lower value to both healthy and environmentally friendly attributes. On the other hand, since future-oriented individuals (low time preference) are supposed to be more sensitive about the long-term consequences of their food choices, they are expected to attach more importance to such attributes. Thus, the value that individuals attach to such food attributes might depend on how concerned they are about the future. This is because both healthy and environmentally friendly quality features might be perceived as tools to achieve future personal and/or social benefits. For instance, healthy foods might contribute to the maximization of personal utility by improving health, which would then lead to health benefits in the long run. On the other hand, environment-related attributes are more strongly linked to a social dimension (Aprile, Caputo & Nayga 2012); individuals that are interested in such attributes are generally driven by a social concern and give higher importance to the social utility that can be derived from sustainable consumption (Haws et al., 2014; Grebitus et al., 2013).

3.3 Experimental Procedures and Data

To assess if time preferences are associated with food-related decision-making, we used the Consideration of Future Consequences 14-item scale (CFC), and implemented a CE on yogurt consumption. The following subsections explain in detail how we estimated time preference and set-up the CE study. The last subsection discusses the survey procedure and data collection.

3.3.1 Time Preference Elicitation

Previous literature on intertemporal choices used a variety of different methods to elicit time preferences (for an extensive review, see Frederick et al., 2002). Among these methods, Multiple Price Lists (MPLs) and psychometric scales represent two of the most commonly used measures of time preference.

MPLs consist of multiple-choice tasks in which individuals are asked to choose between smaller amounts of money to be received closer to the present time, or larger amounts to be claimed further in the future. These methods have been the norm in experimental studies analyzing intertemporal decisions and the effect of time preferences on a variety of individuals' behaviors (e.g. smoking, drinking, gambling, etc.) and health outcomes (e.g., obesity) (Andreoni & Sprenger, 2012; Borghans & Golsteyn, 2006: Chapman, 1996; Courtemanche et al., 2014; Ikeda et al., 2010; Takanori & Goto, 2009; Van der Pool, 2011).

The psychometric scales, on the other hand, are generally based on different statements aimed at measuring some of the psychological

traits of individuals. One of the most popular of these scales is the Consideration of Future Consequences (CFC) scale which has been used in several studies analyzing individual time preference and health-related behaviors (Adams & Nettle, 2009; Adams & White, 2009; Borghans & Golsteyn, 2006; Piko & Brassai, 2009; Strathman, Gleicher, Boninger, & Edwards, 1994) (Table 1).

Table 1. Consideration of Future Consequences (CFC) 14-Item Scale.

	CFC 14-item scale	*Sub-scale**
1	I consider how things might be in the future, and try to influence those things with my day-to-day behavior.	F
2	Often I engage in a particular behavior in order to achieve outcomes that may not result for many years.	F
3	I only act to satisfy immediate concerns, figuring the future will take care of itself.	I
4	My behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions.	I
5	My convenience is a big factor in the decisions I make or the actions I take.	I
6	I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes.	F
7	I think it is important to take warnings about negative outcomes seriously, even if the negative outcome will not occur for many years.	F
8	I think it is more important to perform a behavior with important distant consequences than a behavior with less important immediate consequences.	F
9	I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis-level.	I
10	I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time.	I
11	I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date.	I
12	Since my day-to-day work has specific outcomes, it is more important to me than behavior that has distant outcomes.	I
13	When I make a decision, I think about how it might affect me in the future.	F
14	My behavior is generally influenced by future consequences.	F

Source: Joreiman et al. (2012)

*Subscale: F = CFC-Future subscale item, I = CFC-Immediate subscale item; CFC 14-item scale instructions: For each of the statements shown, please indicate whether or not the statement is characteristic of you. If the statement is extremely uncharacteristic of you (not at all like you) please write a "1" in the space provided to the right of the statement. If the statement is extremely characteristic of you (very much like you), please write a "7" in the space provided. Of course, use the numbers in the middle if you fall between the extremes.

This scale is meant to capture consumers' present or future orientations. In other words, the CFC detects the extent to which individuals value the future outcomes of present actions, and the

extent to which they are affected by these possible outcomes (Strathman et al., 1994). Strathman et al. (1994) first proposed a CFC construct made of 12 items to measure individual consideration of future consequences, and demonstrated the validity of this scale. Several years later, Joireman, Shaffer, Balliet, and Strathman (2012) proposed an improved version of the scale, known as the CFC 14-item scale.

The new construct contains seven statements that typically characterize present-concerned individuals and constitute the CFC-Immediate (CFC-I) subscale; the other seven items, are mainly characteristics of those who highly value the possible effects of present actions on future events; these statements constitute the CFC-Future (CFC-F) subscale. In the original construct, the CFC-F subscale only contained five items; the additional two statements were added in the CFC 14-item scale to improve the reliability of the subscale itself (Joireman et al., 2012).

This is the first study implementing the CFC scale in CEs. We decided to use the CFC 14-item scale to elicit time preference for a number of reasons. First, the CFC construct is very easy for the respondents to understand and, therefore, is suitable to be used in our study given that we conducted an online survey of a random sample of yogurt consumers.

Second, the use of the CFC does not require providing individuals with incentives in order to obtain reliable results. Indeed, when using time-preference elicitation methods (such as the above mentioned MPL), money incentives are typically used to motivate people to truly reveal their preferences. The use of monetary incentives, however, has been criticized by a number of authors. For instance, O'Donoghue

and Rabin (2015) highlighted that if monetary incentives are not relevant then they might not be effective and respondents might not behave in accordance with a utility maximization strategy. Moreover, providing relevant monetary incentive to participants can be relatively expensive and so it might not be suitable for use with relatively large sample sizes. Additionally, some studies have argued that real money experiments present considerable tactical problems related to payment reliability issues (e.g., Thaler, 1981; Andreone & Sprenger, 2012). For example, Sprenger (2015) argued that the inconsistent findings in past studies could be due to payment uncertainty and transaction cost issues. Payoffs received in the present, for instance, may be viewed as certain while payoffs received in the future may be viewed as uncertain and involving higher transaction costs. The use of CFC has another main advantage, namely that it is not affected by domain dependence. Indeed, time preferences have been demonstrated to be domain-dependent; meaning that time preferences for money and health might not be similar (Cairns, 1994; Chapman, 2003; Chapman & Elstein, 1995; Lawless, Drichoutis, & Nayga, 2013). In other words, discount rates across health and money domains have been found to be not strongly correlated (Chapman & Elstein, 1995). Specifically, discount rates in the health domain have been found to be higher than those in the monetary domain (Chapman et al., 2001; Chapman & Elstein, 1995; Lazaro Barberan, & Encarnacion, 2001). For example, Chapman et al. (2001) found that individual discount rates for a monetary-based scenario were consistently lower than those observed for a health-related scenario. This might be due to the fact that future health-related outcomes are subject to uncertainty, which might lead

individuals to highly depreciate them. Thus, using monetary-based tasks (i.e., MPLs) to analyze the effect of time preferences might not be the best approach for our study given that our focus is on food choices. Finally, the validity of the CFC scale for measuring time preferences has already been established in a number of previous studies investigating both healthy and pro-environmental behaviors (Adams & Nettle, 2009; Adams & White, 2009; Carmi & Arnon, 2014; Joreiman, Van Lange & Van Vugt, 2004; Joireman et al., 2001; Joireman et al., 2012; Lindsay & Strathman, 1997; Piko & Brassai, 2009; Strathman et al., 1994).

3.3.2 Choice Experiment

In CEs, respondents are generally asked to choose one product among a set of product profiles, within a number of choice sets that differ in terms of their attribute level. In implementing a CE study, different steps should be followed, including defining the product of interest, identifying the attributes and attribute levels, and generating an experimental design.

In this study, we conducted an online CE survey of a sample of consumers in the US (to be discussed in more detail in the next section) using a pack of yogurt as the product of interest (a four-count packed yogurt product). Yogurt is largely consumed among both men and women, and is a common component of everyday diets (Miklavec, Pravst, Grunert, Klopcic, & Pohar, 2015; Wang, Livingston, Fox, Meigs, & Jacques, 2013). The fact that individuals are familiar with this product makes yogurt a suitable food item to be used in a CE study. This simplifies the evaluation of the different attributes and

facilitates individuals in making choices that are in accordance with their personal preferences. Moreover, yogurt can easily be associated with different healthy and environmentally friendly food attributes. Here, we describe it by a set of quality attributes including price, calories per serving, health claim, organic label, and carbon trust label. For each of these attributes, different levels were selected. For instance, four levels were selected for the price attribute to mirror the market prices of yogurt in the US ($1.89, $2.59, $3.29, and $3.99). The second attribute is the number of calories per serving. To define the different calorie levels, we started from the observed highest and lowest calorie content for an average serving (70 grams) of low-fat yogurt. Within these values, we then chose three calorie levels, from 80 to 140 calories per serving. Calories represent an important attribute of food products about which many individuals care. For example, according to the International Food Information Council Foundation (2006), two-thirds of Americans say they look at the calorie content on the Nutrition Facts Panel. The health claim is related to a disease-risk reduction. Due to its nutritional values, and in line with the FDA guidelines for health claims, a low-fat yogurt could be associated with the claim that diets low in saturated fat and cholesterol may reduce the risk of heart disease. Products with such claims seem to be appealing to individuals who already show a particular interest in nutritional issues and healthy eating (Dean, Lampila, Shepherd, Arvola, Saba, Vassallo, Claupein, Winkelmann, & Lähteenmäki, 2012; Urala & Lähteenmäki, 2007), and are supposed to be generally future-oriented.

The last two attributes are environment-related; we took into consideration the USDA-organic and carbon trust labels. It should

also be mentioned that there are various reasons why certain individuals would show a positive attitude toward organic food. Specifically, organic consumption is related to a number of environmental and social concerns such as sustainable food production, support of local economies, animal welfare, etc. (Hughner, McDonagh, Clifford, Shultz, & Stanton, 2007; Loureiro, McCluskey, & Mittelhammer, 2001; Van Loo, Caputo, Nayga, & Verbeke, 2014). Above all, these might be of great importance for future-oriented individuals. Other organic consumption behaviors might be driven by health-related motives (Hjelmar, 2011). For example, organic products are often considered safer due to the absence of common chemicals used in conventional food production (Van Loo, Caputo, Nayga, Meullenet, Crandall, & Ricke, 2010). Hence, organic food could be perceived as carrying both environment and health benefits. Finally, the carbon trust label identifies environmentally friendly foods, whose production process minimizes the environmental impact. The issue of 'food miles' and carbon emissions is becoming of interest to food, environmental, and agricultural communities (Teisl, 2011; Caputo et al. 2013a; Caputo et al. 2013b). Accordingly, some studies have explored consumers' preferences for these quality attributes. Grebitus, Steiner and Veeman (2013) for example, found that consumers' utility decreases with an increase in food miles and Grebitus et al. (2015) found a similar result in their analysis on food labelled with environmental footprint. Caputo, Nayga, and Scarpa (2013a) in their CE study aimed at evaluating the labeling preferences for food transport's carbon footprint, found that Americans value information on carbon dioxide emissions more than they do the equivalent information

about the length of time and mileage that the food traveled (i.e., food miles). Individuals' interest in both organic- and carbon-labeled food may be linked to socially conscious consumption that could be of interest to individuals with low time preferences. Table 2 shows an overview of the attributes and attribute levels used in this application.

Table 2. Product Attributes and Levels for the Choice Experiment.

Product: Yogurt (1 pack, 4-counts)		
Attributes	Description	Levels
Price	Price for a 4-count pack	$1.89
		$2.59
		$3.29
		$3.99
Calories	Calories per portion (70g on average)	80
		110
		140
Organic	USDA organic logo	Present
		Absent

The CE consisted of a set of choice questions (choice tasks), each comprising two experimentally designed yogurt alternatives and a no-purchase option. An example of a choice task is reported in Table 3. The allocation of the attribute levels was designed using a sequential experimental design with a Bayesian information structure, geared to the minimization of the expected D_b-error (Sándor & Wedel, 2001; Scarpa, Campbell, & Hutchinson, 2007).

Table 3. Example of a Choice-Set

Attributes	Alternative A	Alternative B	Alternative C
Calories	110	80	
Organic	No logo	USDA organic logo	
Carbon Trust	Carbon Trust logo	No Carbon Trust logo	
Health Claim	None	Diets low in saturated fat and cholesterol may reduce the risk of heart disease	I would not buy either alternative A or B
Price	$1.89	$2.59	$0.00
I prefer	□	□	□

Accordingly, it was performed in three stages. In the first stage, an orthogonal fractional factorial design was generated. It consisted of 36 choice tasks, which were then randomly divided into three different blocks of 12 choice sets each. This design was then used to carry out a pilot survey (second stage) that was used to obtain the Bayesian priors for the main design (third stage). The Bayesian priors used to generate the final design were obtained through the estimation of an MNL.

Finally, due to the hypothetical nature of our CE, the online survey also included a cheap talk script (see Methodological Details Appendix) before the CE task. This method was introduced by Cummings and Taylor (1999), and consists of a script that explains the potential issue of hypothetical bias to the respondents, before the start of the experiment. Past studies have found that making participants aware of the existence of hypothetical bias, and telling them why it occurs, could be effective in its reduction (Lusk, 2003; Murphy, Stevens, & Weatherhead, 2005; Silva, Nayga, Campbell, & Park, 2007). The objective of the cheap talk is to lead respondents to

reveal their real preferences. Thus, this script invites participants to answer questions by placing themselves in real buying situations, so that they do not overestimate their willingness to pay for the product and make choices that would reflect their actions, if they were in a real purchase setting (Murphy et al., 2005).

3.3.4 Survey

We created an online survey that was sent to a random sample of US consumers in 2015. The data collection was carried out by Qualtrics, an industry-leading provider of online survey software. They were invited to participate in the survey via email, and informed about the questionnaire length and type. The average time necessary to complete the survey was about 14 minutes. To guarantee the quality of the data, a time cutoff was fixed at one-third the median time, to exclude all of the respondents that did not take enough, or took too much, time to complete the survey. Moreover, respondents were excluded *a priori* if they did not buy yogurt products in the month preceding the survey, and if they were younger than 18 years old. This age threshold was used as a screener in order to exclude the younger population that, generally, is not yet in charge of grocery shopping. To monitor the quality of the final data and be able to exclude respondents that were only clicking through the questions, we also included an attention filter and reverse-wording questions at different points in the survey. The attention filter is a trick question, which uses a large block of text and asks respondents to answer in a certain way. The reverse-wording questions change the direction of the scale by asking the same question two times, in a positive (or

negative) voice. In addition to the questions related to the CE and time-preference measurement scale, the survey also included socio-demographic characteristics, and other health- and environment-related questions.

3.4 Empirical Analysis

To determine how time preferences are associated with food choice behavior, the data were analyzed following two different steps.

In the first step, the CFC 14 items were analyzed using a principal component analysis (PCA), which is a variable-reduction technique that maximizes the amount of variance accounted for in the observed variables, by a smaller group of variables called *components*. The number of components to be retained is generally determined as the number of eigenvalues higher than one. Previous studies (Adams, 2012; Joireman, Balliet, Sprott, Spangenberg, & Schultz, 2008; Joireman et al., 2012) showed that performing a PCA on the CFC 14-item scale leads to the identification of two factors (CFC-I and CFC-F). The two-factor PCA has a number of advantages compared to the common one-dimensional approach initially used by Strathman et al. (1994). For instance, the one-factor analysis considers the sum of the scores related to future items and reverse-coded immediate items. This implies that CFC-I and CFC-F are perfect opposites. However, if one completely agrees with a CFC-I item, he/she would not necessarily disagree with the converse CFC-F item. As such, the adoption of a two-factor PCA allows us to separately analyze the CFC-I and CFC-F components, which then facilitates the interpretation of the results. In addition, these two subscales allow

us to specifically understand if a behavior is determined by an individual's high consideration of future consequences (low time preference), or if an action is mainly due to the consideration of immediate consequences (high time preference) (Adams, 2012; Joireman et al., 2008; Joireman et al., 2012). When performing a PCA, researchers should predetermine which factor rotation should be used. Two methods are generally used: oblique or orthogonal. Orthogonal rotation methods assume that the factors are uncorrelated, while oblique rotation methods assume correlation. In the exploratory phase, an oblimin rotation approach was first applied because the CFC-F and CFC-I factors are generally assumed to be (negatively) correlated (e.g., Joireman et al., 2008). The results of this exploratory phase revealed that the two factors are negatively, but not strongly, correlated (0.26). As such, an orthogonal rotation method was successively applied for a more intuitive interpretation of the results. In the second step, the identified time-preference factors (CFC-I and CFC-F) were included in the analysis of the CE data. As mentioned previously, in our survey, respondents made choices among a set of choice questions (choice tasks), each comprising two experimentally designed yogurt alternatives (buying options) and a no-purchase option (status quo). Assuming that our CE data can be analyzed in a random utility framework, the utility of individual n of choosing alternative j in choice situation t can be described as:

$$U_{njt} = \beta' X_{nit} + \varepsilon_{njt}$$

where x_{njt} is a vector of observed variables relating to alternative j

and individual n; ß is a vector of structural taste parameters, which characterize choices; and ε_{njt} is the random and unobserved part of the utility. Depending on the assumption underlying the structure of consumer preferences, different choice models can be used.

In this study, we estimated a random parameter logit with an error component (RPL+EC) model with panel structure, as proposed by Scarpa, Ferrini, and Willis (2005), and Scarpa, Campbell, and Hutchinson (2007). We used this model because it allows us to jointly account for (1) random taste variations, (2) correlation across taste parameters, and (3) correlation across utilities of the two buying options. Indeed, the literature suggests that all of these issues should be considered when modeling food-choice behavior. Specifically, as the standard RPL model, the RPL+EC accounts for random taste variation, by allowing the coefficients of the different attributes to vary randomly across individuals and deviate from the population mean, and, for correlation across taste parameters, by estimating the elements of the Cholesky matrix. Moreover, unlike the RPL, the RPL+EC accounts for correlation structure across utilities, by capturing the extra variance of the utility shared by the two buying options, which is different from the no-purchase option (status quo) (for computational details, see: Scarpa et al., 2005; Scarpa et al., 2007; Train, 2003). Previous studies on food choices (Caputo et al., 2013b; Scarpa, Thiene, & Marangon, 2008; Scarpa, Zanoli, Bruschi, & Naspetti, 2013; Van Loo et al., 2014; Van Wezemael, Caputo, Nayga, Chryssochoidis, & Verbeke, 2014) found that the RPL+EC model outperforms other model specifications such as the RPL model. Given the main hypotheses of this study, two RPL-EC models were specified. Model 1 is the basic specification, accounting for the main

effects only. The utility that respondent n gets from choosing one of the product alternatives j, within each choice task, can be expressed as follows:

$$U_{nj\ t} = \beta_0 * NoBuy_{nj} + \beta_1 * PRICE_{nj} + \beta_2 * CAL_{nj} + \beta_3 * HC_{nj} + \beta_4 * ORG_{nj} + \beta_5 * CT_{nj} + \eta_{it} + \varepsilon_{njt} \quad (1)$$

where n = 1, ..., n is the number the respondents, t is the number of choice occasions, j is option A, B, or C (where A and B represent the two buying alternatives and C refers to the no-buy alternative); NoBuy is an alternative-specific dummy variable taking the value equal to 1 for the no-buy alternative, and 0 for all other alternatives in the choice set. β_0 is therefore an alternative-specific constant representing the no-buy option. $PRICE_{njt}$ is a continuous variable referring to the price of a package (4-count) of yogurt. CAL_{nj} is a continuous variable indicating the amount of calories per servings (e.g. 80, 110, and 140). The rest of the variables refer to the other experimental design attributes, namely claim (HC), USDA organic (ORG), and carbon trust (CT) labels; these entered the model as effect coded variables. Effect coding has been preferred to dummy coding since it makes the coefficients of the attributes not correlated with the constants and avoids confounding effects (Bech and Gyrd-Hansen, 2005); ε_{ijt} is the unobserved random error term and η_{it} is the error component.

Model 2 determines how consumer choice behavior varies with time preferences. Accordingly, this model adds the interaction terms between each non-monetary attribute (e.g., calories, USDA organic label, health claim, and carbon trust label) and respondents' observed

CFC-factor scores from the PCA, namely the CFC-I and CFC-F, to Model 1.

We used interaction terms since discrete choice models are defined on utility differences across attribute values. Thus, including an individual's time preference as a variable in the model would produce no effects, since it is constant across choice alternatives (Grebitus et al., 2013). We estimated the interaction terms between the CFC-factor scores and all non-monetary attributes (e.g., 80 calories per serving, 110 calories per serving, USDA organic label, carbon trust label, and health claim).

In Model 2, the utility function can be expressed as follows:

$$U_{njt} = \beta_0 * NoBuy_{nj} + \beta_1 * PRICE_{nj} + \beta_2 * CAL_{nj} + \beta_3 * HC_{nj} + \beta_4 * ORG_{nj} + \beta_5 * CT_{nj} + \eta_{it} + \varepsilon_{njt}$$
$$+ \gamma^{CFC\text{-}I\_CAL}\, 1(CFC\text{-}I) * CAL_{nj} + \gamma^{CFC\text{-}F\_CAL}\, 1(CFC\text{-}F) * CAL_{nj} + \gamma^{CFC\text{-}I\_HC}\, 1(CFC\text{-}I) * HC_{nj} + \gamma^{CFC\text{-}F\_HC}\, 1(CFC\text{-}F) * HC_{nj} + \gamma CFC^{\text{-}I\_ORG}\, 1(CFC\text{-}I) * ORG_{nj} + \gamma^{CFC\text{-}F\_ORG}\, 1(CFC\text{-}F) * ORG_{nj} + \gamma CFC^{\text{-}I\_CT}\, 1(CFC\text{-}I) * CT_{nj} + \gamma^{CFC\text{-}F\_CT}\, 1(CFC\text{-}F) * CT_{nj} + \eta_{it} + \varepsilon_{njt} \quad (2)$$

where $\gamma^{CFC\text{-}I\_CAL}$, $\gamma^{CFC\text{-}I\_HC}$, $\gamma^{CFC\text{-}I\_ORG}$, and $\gamma^{CFC\text{-}I\_CT}$ are the coefficients of the interaction terms between the non-monetary attributes and the individual CFC-I observed factor. Similarly, $\gamma^{CFC\text{-}F\_CAL}$, $\gamma^{CFC\text{-}F\_ORG}$, $\gamma^{CFC\text{-}F\_HC}$, and $\gamma^{CFC\text{-}F\_CT}$ represent the coefficients of the interactions with the CFC-F factor. The other variables in the utility function are specified as in Model 1.

3.5. Results

3.5.1 Sample Characteristics

The final sample consisted of 173 respondents. Table 4 reports the socio-demographic and economic characteristics of the sample.
The most represented age categories are those between 50 and 69 years old, with a lower percentage of respondents aged between 30 and 39 years old. The number of female respondents is almost double that of men. This result, in fact, reflects a real buying context in which women are mostly in charge of the grocery shopping. The majority of respondents are non-Hispanic White/Caucasian. The income distribution is heterogeneous, and only a small percentage of respondents (4.6%) have very low annual income, while the percentage of individuals ranking in the highest income level is considerably higher (10.4%). The level of education is quite high, with 23.1% of the respondents having a 4-year college degree. Finally, almost 65% of the respondents have one child younger than 18 in the household.

3.5.2 Results of Principal Component Analysis

To test the suitability of the data for the PCA, we considered three measures commonly used in the literature. Particularly, we examined: (1) the Kaiser-Meyer-Olkin measure, which was acceptably high (0.832) (Field, 2009; Joireman et al., 2012); (2) the determinant of the correlation matrix (0.002), which rules out multicollinearity; and (3) the Bartlett's test of sphericity (χ^2= 91, p<

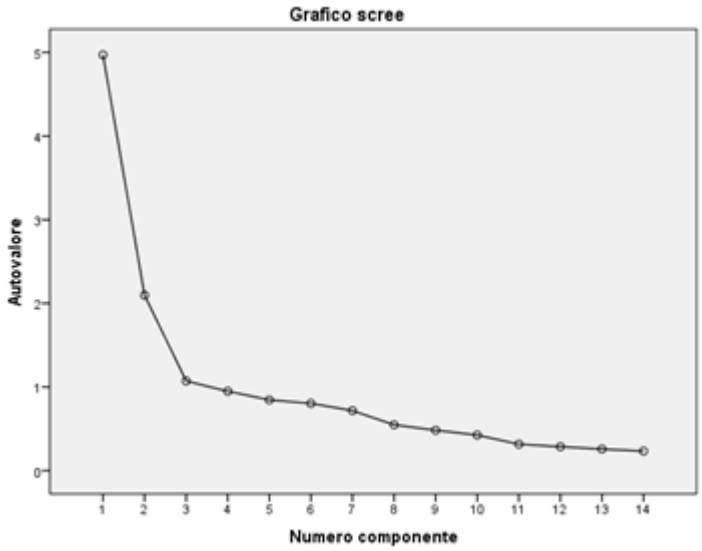
Table 4. Socio-Demographic and Economic Characteristics of the Sample

Socio-demographic and economic characteristics		*% of total (n =173)*
Age	18-29 years	6.5
	30-39 years	19.2
	40-49 years	20.4
	50-59 years	24.1
	60-69 years	24.4
	>70 years	6
Gender	Male	32.9
	Female	67.1
Race	White/Caucasian	90.8
	African American	3.5
	Asian	4.6
	Native American	0.6
	Pacific Islander	0.6
Ethnicity	Hispanic	4.6
	Not Hispanic	95.4
Annual Household Income	<$15,000	4.6
	$15,000-$24,999	12.7
	$25,000-$34,999	12.7
	$35,000-$49,999	15
	$50,000-$74,999	22
	$75,000-$99,999	15
	$100,000-$149,999	5.8
	$150,000-$199,999	1.7
	≥$200,000	10.4
Education	Less than High School	1.7
	High School/GED	16.2
	Some College	21.4
	2-Year College Degree	17.9
	4-Year College Degree	23.1
	Master Degree	16.2
	Doctoral Degree	2.3
	Professional Degree	1.2
Children Younger than 18 in the Household	1	64.7
	2	13.9
	3	12.7
	4	6.4
	5	1.2
	>6	1.2

0.000), which suggests that the correlations are acceptably large for the PCA (Joireman et al., 2012).

As in Joireman et al. (2012), in an exploratory analysis, we found that three eigenvalues exceeded one suggesting the possibility of the existence of three factors. However, the scree plot (Figure 1) clearly indicates the presence of only two factors.

Figure 1. Scree Plot from PCA



Following Joireman et al. (2012), we also based our PCA on two factors, which explained 50.4% of the variance. The rotated factor loadings of the rotated component matrix are displayed in Table 5.

As can be noted, all items loaded on their expected factors. Specifically, the CFC-I subscale items had the largest loadings on the CFC-I factor, while the CFC-F subscale items had the largest loadings on the CFC-F factor. Moreover, according to the results of Cronbach's statistics, the seven items of the CFC-I and CFC-F

subscales are highly reliable (Cronbach's alpha = 0.85 and 0.80, respectively), strengthening the reliability of our PCA.

Table 5. Rotated Component Matrix

Items		CFC-I factor	CFC-F factor
CFC 3	(I)	0.784	-0.239
CFC 4	(I)	0.747	-0.15
CFC 5	(I)	0.419	0.09
CFC 9	(I)	0.64	-0.389
CFC 10	(I)	0.809	-0.2
CFC 11	(I)	0.824	-0.278
CFC 12	(I)	0.617	0.053
CFC 1	(F)	-0.109	0.766
CFC 2	(F)	-0.089	0.691
CFC 6	(F)	-0.056	0.591
CFC 7	(F)	-0.269	0.669
CFC 8	(F)	0.043	0.46
CFC 13	(F)	-0.179	0.696
CFC 14	(F)	-0.14	0.729

3.5.3 Results of Choice Experiment

As previously discussed, the CE data were analyzed using two RPL+EC models: Models 1 and 2. All specifications allowed for correlation across random taste, using a full Cholesky matrix and correlation across utilities (results are available upon request). Specifically, Model 1 allowed us to verify if the presence of the main health and environmental attributes affected yogurt selection (main effects), and if individuals exhibited heterogeneous preferences. Model 2 allowed the exploration of the interactions between each non-monetary product attribute, with the two CFC factors (CFC-I and CFC-F) observed for each individual. The specification of Model 2

provides insight into the general preferences for the different attributes that characterize the yogurt products considered in the CE (main effects). Moreover, it also allows us to analyze how these preferences vary according to individual present or future orientation (interaction effects).

All of the model estimations were based on 2,076 observations (173 respondents performing 12 choice tasks each), with three options per choice task, for a total of 6,228 alternatives evaluated. All coefficients, except for that of price, are allowed to be random, following a normal distribution. Results are displayed in Table 6.

In Model 1, the price coefficient is, as expected, negative and significant, indicating that an increase in yogurt price decreases its utility to individuals. The No-Buy constant (β_0) is also negative and significant, suggesting that one of the two buying alternatives was preferred over the opt-out option (No-Buy). When looking at the coefficient estimates of the yogurt attributes (main effects), it can be noted that they are all significant and positive. This evidence confirms our first hypothesis that both healthy and environmentally friendly attributes affect yogurt selection. Specifically, the negative and significant coefficients of CAL (CAL= -0.013) generally suggest that low calorie amounts increase individuals' utility when selecting yogurt compared to higher calories amounts. Individuals may perceive low calories as a proxy of healthier products. This might be because calorie-labeling has often been used as a tool to help consumers make healthier food choices. As for the USDA organic label, our finding reflects previous evidence concerning consumers' evaluation of the organic label. For instance, Van Loo, Caputo, Nayga, Meullenet, & Ricke (2011) found that Americans have a

Table 6. Results of RPL-EC Models 1 and 2.

Main Effects		Model 1	Model 2
CAL	Mean	-0.013***	-0.192***
		(0.003) [1]	*-0.003*
	St. Dev.	0.031***	0.040***
		-0.002	*-0.003*
HC	Mean	0.121**	0.223***
		-0.054	*-0.052*
	St. Dev.	0.527***	0.475***
		-0.058	*-0.054*
ORG	Mean	0.178***	0.535***
		-0.068	*-0.066*
	St. Dev.	1.068***	0.856***
		-0.075	*-0.067*
CT	Mean	0.120*	0.194***
		-0.061	*-0.056*
	St. Dev.	0.445***	0.384***
		-0.073	*-0.074*
Price		-2.319***	-2.361***
No Buy		-14.283***	-12.781***
Interaction Effects			
CAL*CFC- I	Mean		0.161***
			-0.002
CAL*CFC- F	Mean		-0.007***
			-0.002
HC*CFC- I	Mean		-0.109**
			-0.05
HC*CFC- F	Mean		0.028
			-0.057
ORG*CFC- I	Mean		-0.173***
			-0.063
ORG*CFC- F	Mean		0.163***
			-0.06
CT*CFC- I	Mean		0.021
			-0.05
CT*CFC- F	Mean		0.036
			-0.057
Models fit			
BIC/N[2]		1.511	1.514
AIC/N[3]		1.473	1.47

[1] Standard errors in parentheses

[2] BIC: Bayesian information criterion

[3] AIC: Akaike information criterion

Note: *, **, and *** indicate the coefficients statistically significant at the 10%, 5%, and 1% level, respectively.

higher willingness to pay for organic chicken breast, especially when labeled as USDA organic. This positive attitude toward organic products is also observed in Europe. For example, Van Loo et al. (2014) and Aprile, Caputo, & Nayga (2012) found that consumers positively value the European Union organic label. The fact that our results indicate that the USDA organic label is the attribute that is most responsible for increasing consumers' utility might be due to its link with both the environment and health sphere. As such, this attribute might capture the interest of both environment- and health-concerned individuals. The positive and significant coefficient related to the health claim (HC) shows that individuals value health claims when choosing among different kinds of yogurts. Nonetheless, the effect of HC is relatively small, which might be due to the fact that yogurt is perceived as a healthy product (Miklavec et al., 2015). Finally, consistent with other studies analyzing carbon footprint labels on other food-product selections (Van Loo et al., 2014), the coefficient of the carbon trust label is positive and significant, meaning that this label also affects yogurt selection, although the statistical significance of the coefficient is lower.

The significant standard deviations also indicate variation across taste parameters, implying the heterogeneity of individuals' preferences across both healthy and environmental attributes. As the random coefficients are specified to be correlated, this evidence is also confirmed by the significance of the diagonal values of the Cholesky matrix (Hensher et al., 2005) (Cholesky matrix of Model 1 available upon request). In fact, as can be noted, all diagonal elements are statistically significant in this matrix. In addition, the off-diagonal elements of the Cholesky matrix highlight the presence

of some significant cross-correlations across attributes, indicating correlation across taste parameters. Finally, the presence of extra variance shared by the two buying alternatives is confirmed by the significance of η_{nj}. This evidence is in line with the results of previous studies, using the RPL-EC model to analyze food-choice behavior (Caputo et al., 2013b; Gracia et al., 2011; Scarpa et al., 2008; Scarpa et al., 2013; Van Loo et al., 2014; Van Wezemael et al., 2014).

Turning to Model 2, we can observe that the main effects results are consistent with those found in Model 1. Specifically, the price and no-buy coefficients are negative and significant. Individuals' utility increases for yogurt with lower amount of calories per serving, having the USDA label, health claim, and carbon footprint label. Standard deviations of all attributes are significant as the diagonal values of the Cholesky matrix (Cholesky matrix of Model 2 available upon request), except for the carbon trust label (CT). Moreover, the error component is also significant.

Looking at the interaction effects between the CFC-I and CFC-F factors and yogurt attributes, our results suggest that time preferences affect the choices of yogurt products associated with USDA organic label, health claims, and characterized by low calorie amounts. Specifically, the interaction term between CFC-I (high time preference) and ORG is negative and significant ($\gamma^{CFC\text{-}I\_ORG} = -0.163$), indicating that when individuals are highly present-oriented, they do not give importance to the presence of the organic label. In contrast, when ORG interacts with CFC-F (low time preference), the (significant) coefficient becomes positive ($\gamma^{CFC\text{-}F\_ORG} = 0.163$), indicating that future-oriented individuals are more prone to consider the future benefits that can possibly be derived from organic

food consumption. This higher interest in the organic attribute might be attributable to both environmental and health-related concerns. Indeed, due to their future orientation, these individuals may be more concerned about sustainability issues, thus favoring organic consumption to enhance environmental protection. At the same time, their preference for organic food could be determined by the fact that these food products are often perceived as healthier, possibly due to the absence of common chemicals used in the production process (Magnusson, Arvola, Koivisto Hursti, Aberg, & Sjoden 2003).

As for HC, the interaction with CFC-I is significant and negative (-0.109) suggesting that the presence of this health-related attribute does not positively contribute to consumers' utility. Less future oriented consumers might be more interested in taste or other food characteristics that are able to give them immediate gratification.

With regard to calories, we observe that only the interaction term between CAL and CFC-I is significant ($\gamma^{CFC\text{-}\_CAL} = 0.161$). In this case, the coefficient sign is negative, meaning that respondents with high time preferences are not particularly concerned about low-caloric intake. Indeed, as discussed previously, calorie-labeling can serve as a tool to help individuals make healthier diet choices. Thus, this attribute does not catch the preferences of individuals with high time preferences because they are less interested in future health consequences linked to high calories intake.

The significance of some of the interaction terms between time preferences and certain yogurt attributes, suggests that accounting for time preferences when analyzing food choices better explains the heterogeneity around the mean of some random parameters and individuals' decision-making.

3.6 Conclusions

Several studies have highlighted that consumers are increasingly interested in healthy attributes of food products and show growing consciousness about the relevance of environment-related issues linked to food choices. Nonetheless, to date, there is scant literature examining the role of both healthy and environmentally-friendly attributes in consumers' food choices.

Time preferences has been recognized by numerous studies as an important driver of a number of healthy and environmentally-friendly behaviors (Adams and Nettle, 2009; Takanori and Goto, 2009; Harrison *et al.*, 2010; McCollough, 2010; Scharff and Viscusi, 2011; Franzel and Vogl; 2013; Gretibus *et al.*, 2015), but there is still lack of empirical studies concerning the role of time preferences in predicting food choice behavior related to healthy and environmentally friendly attributes.

In this study we analyzed first, if healthy and environmentally-friendly attributes are relevant in driving food choices, at least in our yogurt case, and, second, if individuals with different time preferences have different choice behavior and valuations in relation to our specific CE context. We would like to reiterate that our goal was not to determine if time preferences causes choice behavior to change. Rather, we were only interested to know if people with different time preferences have different choice behavior and valuations in relation to our specific CE context, given all the possible confounding factors that could come into play when attempting to conduct a "causal" analysis on the effect of time preferences (see for example discussions about this issue by O'Donoghue & Rabin, 2015).

We specifically focused on healthy and environment-related attributes to better understand if time preferences are associated with more healthful and sustainable food choices. In this study, we hypothesized that individuals with high time preference (present orientation) would attach less importance to both healthy and environmentally-friendly attributes while making their food choices. On the other hand, we expected individuals with low time preferences (future orientation) to make more healthful and sustainable food choices.

The results showed that both the healthy and environmentally-friendly attributes in our CE study influenced food choice. Indeed, in model 1 all the coefficients for the yogurt attributes are significant and positive. In particular, calories play an important role in driving consumer choices, showing that individuals look at the low energy content as a signal of healthier food. This result seems to indicate that consumers care about the calorie labels when making food choices. The USDA organic label also seems to notably affect consumers' choices. This can be due both to the fact that the organic label reinforces the health profile of yogurt, and to the fact that consumers are interested in the environmentally-friendly production process. The health claim and the carbon trust label have a relatively less relevant effect on consumer choices, even though their coefficients are significant and positive.

With regard to time preferences and how they are related to different choice behavior, significant effects were found with regard to the presence of the USDA organic label, health claims, and the calorie amount. In particular, as expected, the higher the time preferences, the lower the value attached to the organic USDA label, health

claims and the calorie amount. On the other hand, choices of products with low calorie amounts and the USDA organic label are significantly better explained by respondents with low time preferences. These results suggest that such attributes are relevant especially for "future-oriented" people.

This study contributes to the literature by providing novel evidence from attribute-based CE that time preferences could play a role in influencing food choices, especially for foods with health and environmentally related food attributes. This finding suggests that people with different time preferences could also have different food preferences. As discussed above, a limitation of our study is that we cannot definitively determine if time preferences can *cause* changes in food choice behavior, given the host of possible confounding variables that could potentially affect both time preferences and food choice behavior (e.g., habits, projection bias, anticipatory utility). Nevertheless, we have shown, at least in our CE study, that people with low vs high time preferences can have different food choices. To some extent, while this may not be surprising or earth-shaking, it is still useful information not only for food marketing purposes but also for public policies geared toward making people purchase and consume, among others, healthier and more environmentally friendly food products. Research on time preferences and health outcomes has conventionally had applications in shaping public policy by uncovering motivations behind seemingly irrational health behaviors (Lawless, Drichoutis & Nayga 2013). Given that experimental findings are generally context dependent, future research should test the robustness of our findings in other contexts including other types of food and food attributes, other time preference measures, and

other countries. Since it is conceivable that individuals may not value their health and money in the same way, then it would be interesting as well to check the relationship between time preferences in the health domain and food choice behavior.

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chapter 4

Information based food policy: is nutritional label the right instrument for everyone?

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Abstract

In this paper we focus on the relationship between consumers' health-orientation and the use of nutritional food label. The use of this label is affected by several factors such as socio-demographic and economic variables, but less is known about the role of consumers' orientation to health, namely the individual motivation to engage in healthy attitudes, beliefs, and behaviors. To better understand this relationship is crucial for the development of future policy interventions aimed at fostering food-related information. We collected the data with face-to-face interviews on a sample of 540 Italian consumers. The main result of our analysis highlights that those consumer categories that show low orientation to health (specifically smokers, who do not exercise regularly and have unhealthy body weight) do not really care about nutritional labels. In other words, labels as a tool to promote healthier food choices seem to have only a limited effect on those consumers that mostly would need to pursue healthier lifestyle habits. Alternative policy intervention should be carried out in order to reach this consumer category.

Keywords: health-orientation, consumer health, consumer behavior, food label, food policy, food economics

4.1 Introduction

Diet-related chronic diseases, such as overweight and obesity, reached epidemic proportions in many developed and developing countries and constitute a public issue not only from a medical point of view, but also in economic terms. Indeed, unhealthy lifestyle choices are a source of negative externality due to the sizable sanitary costs and to the reduced productivity of obese individuals [1]. Thus, the costs associated with obesity-related diseases denote a major reason to take action [2-6]. To challenge these problems and to help policy makers to find proper ways to promote healthier food consumption, many economists studied the main factors behind consumers' food choices. A number of these studies found that food information has a crucial role. The general evidence is that food-related information might be considered a precondition of healthier diet choices, as it can potentially increase consumers' awareness concerning nutritional issues, thus having an indirect positive effect on health [7].

In light of these findings, many countries carried out several policy interventions aimed at providing consumers with more, and more detailed information. Such interventions included, dietary guidelines, nutritional information on menus, public campaigns to increase awareness concerning fruit and vegetable consumption (e.g., '5 a day'), education campaigns in the schools, and advertising control.

Many governments also regulated food labelling system recognizing that such information tool may have a key role. Indeed, food labels represent one of the most direct tool to convey information about food

products to consumers [8]. In 1994 the nutrition fact became mandatory in the United States with the enactment of the Nutrition Labeling and Education Act (NLEA) and, more recently, also the EU revised the labeling system. The EU Regulation No. 1169/2011 on the provision of food information to consumers aims at improving the overall efficiency of labels and makes the nutritional fact mandatory, with application obligatory from December 2016.

The potential positive effect of food labels in empowering individuals to make healthier choices was already recognized in the economic literature [9-14]. However, its effectiveness was widely debated. Indeed, the use of labels might strictly depend on consumers' ability to recognize the benefits deriving from such information source and, consequently, to their will to care about its contents. As shown in the literature this might depend on several factors. Some of them such as, for example, education, income and other socio-demographic variables were already extensively investigated [13, 15, 16]. On the other hand, fewer studies have analyzed the role of consumers' orientation to health on nutritional label use. Health-orientation can be defined as the individual motivation to engage in healthy attitudes, beliefs, and behaviors [17]. Orientation to health can be seen as a measure of the importance that individuals attach to their own health, and it represents an essential factor to understand their willingness to be responsible for their health [18]. In other words, the higher the individuals' concern about health-related issues, the greater their willingness to engage in health 'investments', including diet-related ones. As such, could health-orientation be a key element also in the use of nutritional food labels? To analyze the relationship between health orientation and the use of nutritional labeling can help to

understand which consumer segments really care about this information source. Indeed, food labeling could be an effective health policy instrument to promote healthier food choices only if it is used by a large part of the population and, especially, by those consumers showing unhealthy-attitudes. Thus, to better understand which could be the role of health-orientation on consumers' nutritional label use seems to be crucial for the development of future policy interventions aimed at fostering food-related information.

In this paper, we tried to answer this question analyzing the relationship between a number of direct investments in health (namely those behaviors that can directly contribute to maintain a good health status), and nutritional label use. The latter is assumed in this paper to be an indirect investment in health. Indeed, many studies showed that the use of labels can increase consumers' awareness concerning nutritional issues. This could, in turn, lead to more healthful diet choices, thus having an indirect positive effect on health in the long-run [9-13].

This paper is structured as follows: the next section describes the economic framework followed in this study and based on Grossman's approach on the demand for health; the third section explains the details of the data collection and the methodology applied; the fourth section provides the results and discussions; finally, the paper ends with the section dedicated to the conclusions and limitations.

4.2 Economic framework

Following Grossman's model [19], the health condition can be considered a source of utility for the individuals. In fact, being in a

good state of health increases the productivity of working time and allows the enjoyment of a number of activities different from work [19, 20]. Consider, for example, that individuals derive utility from working time (W), non-working time (F), health (H), and from the consumption of a bundle of other goods (G) different from health. The utility function can be written as:

$$U = U(W, F, H, G) \qquad (1)$$

The health component in *(1)* is seen as an endowment that individuals have by birth and that is subject to depreciation over time. Such depreciation can be offset through a number of activities that can contribute to maintain or restore a good health condition, namely health investments [19, 21]. Therefore, in this model health is not only demanded as consumption good to maximize the utility function, but also produced by individuals. In fact, in some ways they are able to affect their own health level to the extent at which they engage in health-enhancing activities. The health function can be then expressed as:

$$H = H(I_H, \Omega) \qquad (2)$$

where I_H represents the investments in health and Ω represents a number of exogenous factors. For the sake of simplicity, we assume Ω to include all the factors that able to affect the health status and which are independent from the individuals' willingness to invest in health (e.g., nature, genetics). According to Grossman's model, I_H can be divided in two components: direct investments (I_d), which exert a

direct effect on health, and indirect investments (I_i). The latter include those behaviors that impact one's lifestyle without directly affecting the health status.
Thereby, the health function can be expanded as:

$$H = H(I_d, I_i, \Omega) \quad (3)$$

Within the economic framework established here, in this paper we consider smoking behavior (S), physical activity (PA), and the maintenance of a healthy weight (W) as direct investments:

$$I_d = S + PA + W \quad (4)$$

On the other hand, the I_i component is represented by nutritional label use (L). Indeed, as mentioned in the introduction, the use of labels can be seen as an indirect investment in health as food-related information might affect diet choices without having a direct impact on the health condition. Thus:

$$I_i = L \quad (5)$$

In line with the aim of the paper to understand if health-orientation is related to the use of food labels, we will further focus on L and on its relationship with the direct investments in health described in *(4)*.

$$L = L(I_d, \Gamma) \quad (6)$$

in which Γ is a bundle of other factors. Among these, we included nutritional knowledge, a proxy variable for time constrain, and socio-demographic and economic variables. Indeed, the economic literature highlighted that these are some of the key factors that must be taken into consideration while studying label use. Thus we express L as:

$$L = L\,(I_d, KN, T, S) \qquad (7)$$

where *KN* is nutritional knowledge, *T* represents the average time spent to choose a new food product, and *S* refers to socio-demographic and economic variables.

The nutritional knowledge component included in the label function *(7)* may represent a source of endogeneity in the equation [13, 22, 23]. To account for the endogeneity issue we define the *KN* function as:

$$KN = KN\,(X, E_i) \qquad (8)$$

where *X* is a vector of observable individual characteristics and E_i represents the unobservable characteristics of nutritional knowledge. Precisely, basing on the main evidence in the economic literature, we include in the vector *X* the socio-demographic and economic conditions [23, 24], the time spent choosing a new food product, and some sources of food-related information different from labels (i.e., information from TV, internet, and doctors/nutrition experts) [22]. Hence, following the approach used by Nayga [15], in the empirical model we treat KN as an endogenous variable (as explained in section 3).

4.3 Methods

4.3.1 Data collection

The data for our analysis were collected through face-to-face interviews on a sample of Italian consumers in charge of their grocery shopping. The survey was carried out in Milan, in northern Italy. Consumers were randomly approached outside the grocery stores, totally 40, including hypermarkets and supermarkets. More in detail, we applied a systematic sampling starting from the address list of all the grocery stores in the city with respect to the postal code, and selected 26 supermarket and 14 hypermarkets. Twenty interviews were collected in each supermarket and ten in each hypermarket, with respect to the different store's dimension. The geographical distribution of the grocery stores covered both the central areas and the suburbs of the city. Moreover, to have a better representation of the socio-economic characteristics of the surveyed population, the interviews were collected in different time bands (early morning, lunch time, and evening). We excluded *a-priori* only consumers younger than 18 year old because, generally, they are not yet in charge of the grocery shopping for the family. We also dropped from the sample those consumers who did not fully complete the questionnaire.

The final dataset consisted of 540 observations. With this sample size, considering the dimension of Milan's population, the relative error is estimated at 3.95% [25].

4.3.2 Models specification and variables description

To analyze our data we performed a set of 3 equations: model (*a)* (Ordinary Least Squares regression), and models (*b)* and (*c)* (Ordinal Logistic regressions).
Due to the endogeneity issue discussed in the economic framework and following eq. *(8)*, model *(a)* was performed as:

$$KN = KN\ (GEN, AGE, EDU, INC, HS, I_{TV}, I_{INTERNET}, I_{DOCTORS}, T) \qquad (a)$$

in which the dependent variable KN is a factor based on a set of questions about protein, fat, and carbohydrate content of different food products (Table 1). The regressors included socio-demographic and economic conditions (gender, age, education level, household income, and household size) some variables that represented the main sources of information (different from label), that consumers use to get information about food products (namely ITV, IINTERNET and IDOCTORS), and the time spent choosing a new food product (T).
The predicted value of nutritional knowledge ($\widehat{KN}$) estimated with model *(a)* was then included as a regressor in models *(b)* and *(c)*, both having label use as dependent variable:

$$L = L\ (HO, GEN, AGE, INC, H, \widehat{KN}, T) \qquad (b)$$

$$L = L\ (GEN, AGE, INC, HS, \widehat{KN}, T) \qquad (c)$$

The label use variable (L) in both equations is categorical and is constructed to reflect how frequently consumers make use of food

Table 1. Definition of variables, means, standard deviations and frequencies

Variable name	Description	Obs	Freq	Mean	SD
Dependent variable					
Label use	Scale, respondents use nutritional labels from never = 1, to always = 5	540		3.27	1.38
Independent variables					
HEALTH-ORIENTATION					
Physical activity	Dummy, respondents practice sport less than once a week = 0; at least once a week = 1	540	303		
Smoking behavior	Dummy, smokers = 0; non-smokers = 1	540	382		
Weight	Dummy, respondents' BMI > 25 =0; BMI < 25 =1	540	346		
GENDER	Dummy, female = 1, male = 0	540	293		
AGE $_{18\text{-}24}$ [a]	Dummy, respondents' age group 18-24 = 1; otherwise = 0	540	64		
AGE $_{25\text{-}34}$	Dummy, respondents' age group 25-34 = 1; otherwise = 0	540	104		
AGE $_{35\text{-}44}$	Dummy, respondents' age group 35-44 = 1; otherwise = 0	540	85		
AGE $_{45\text{-}54}$	Dummy, respondents' age group 45-54 = 1; otherwise = 0	540	87		
AGE $_{55\text{-}64}$	Dummy, respondents' age group 55-64 = 1; otherwise = 0	540	92		
AGE $_{>65}$	Dummy, respondents' age group >65 = 1; otherwise = 0	540	108		
EDUCATION $_{\text{Primary school}}$ [a]	Dummy, respondents' level of education primary school = 1; otherwise = 0	540	32		
EDUCATION $_{\text{Secondary school}}$	Dummy, respondents' level of education secondary school = 1; otherwise = 1	540	99		
EDUCATION $_{\text{Higher education}}$	Dummy, respondents' level of education higher education = 1; otherwise = 2	540	233		
EDUCATION $_{\text{Degree}}$	Dummy, respondents' level of education degree = 1; otherwise = 3	540	160		
EDUCATION $_{\text{Post degree}}$	Dummy, respondents' level of education post degree = 1; otherwise = 4	540	16		
HOUSEHOLD INCOME $_{<800€}$ [a]	Dummy, household income < 800€ = 1; otherwise = 0	540	33		
HOUSEHOLD INCOME $_{800\text{-}1500€}$	Dummy, household income 800-1500€ = 1; otherwise = 0	540	139		
HOUSEHOLD INCOME $_{1500\text{-}3000€}$	Dummy, household income 1500-3000€ = 1; otherwise = 0	540	222		
HOUSEHOLD INCOME $_{3000\text{-}5000€}$	Dummy, household income 3000-5000€ = 1; otherwise = 0	540	97		
HOUSEHOLD INCOME $_{>5000€}$	Dummy, household income > 5000€ = 1; otherwise = 0	540	49		
HOUSEHOLD SIZE $_{\text{1 members}}$ [a]	Dummy, household size 1 component = 1; otherwise = 0	540	124		
HOUSEHOLD SIZE $_{\text{2 members}}$	Dummy, household size 2 components = 1; otherwise = 0	540	168		
HOUSEHOLD SIZE $_{\text{3 members}}$	Dummy, household size 3 components = 1; otherwise = 0	540	107		
HOUSEHOLD SIZE $_{\text{4 members}}$	Dummy, household size 4 components = 1; otherwise = 0	540	108		
HOUSEHOLD SIZE $_{\text{more than 4 members}}$	Dummy, household size greater than 4 components = 1; otherwise = 0	540	33		
INFORMATION SOURCE $_{\text{Tv}}$	Scale, respondents use TV as a source of information on food properties from never= 1 to always = 5	540		2.25	1.24
INFORMATION SOURCE $_{\text{Internet}}$	Scale, respondents use internet as source of information on food properties from never= 1 to always = 5	540		2.09	1.39
INFORMATION SOURCE $_{\text{Doctors}}$	Scale, respondents rely on doctors and/or nutrition experts as source of information on food properties from never= 1 to always = 5	540		3.28	1.54
NUTRITIONAL KNOWLEDGE					
Knowledge $_{\text{carbohydrates}}$	Dummy, level of knowledge on carbohydrates (knowledgeable = 1, not knowledgeable= 0)	540	425		
Knowledge $_{\text{fat}}$	Dummy, level of knowledge on fat (knowledgeable = 1, not knowledgeable= 0)	540	326		
Knowledge $_{\text{protein}}$	Dummy, level of knowledge on protein (knowledgeable = 1, not knowledgeable= 0)	540	424		
TIME SPENT CHOOSING A NEW FOOD PRODUCT	Dummy, more than one minute = 1; less than 1 minute = 0	540	409		

[a] Removed for estimation purpose.

labels. As in Variyam [26] and in Loureiro *et al.* [27], label use can assume five values: from 1 corresponding to 'never use', to 5 corresponding to 'always use'. Such specification of the dependent variable allows for modelling the intensity of use: responses can vary by frequency and thereby give a better description of the distribution of uses across the population.

As for model (*b)*, consumers' health-orientation (HO) was estimated through a number of healthy behaviors that can indeed be considered as direct investments in health. The basic assumption is that consumers are more willing to engage in health investments when they are more health-oriented. Accordingly, we created a standardized index taking into account the maintenance of a healthy weight (W), smoking behavior (S), and physical activity (PA). W was measured through a self-reported measure of Body Mass Index (BMI - calculated as weight in kg divided by height in meters squared). Following the WHO classification, we considered as healthy weight BMI values below 25. S and PA were also dummy variables. These three variables were then coded so that high scores were associated with high health-orientation, namely consumers having BMI below 25, nonsmokers and practicing physical activity regularly. Similarly, low scores were associated with low health-orientation.

As for model *(c)*, it differs from model (*b)* because HO was not included among the regressors. This final model estimation allowed verifying if the relationship between label use and individual's health-orientation is significant independently of the other variables included in the equation. As a last step in the analysis we also computed the marginal effect estimation of model (*b)*.

4.4 Results and discussion

The results of our analysis (Table 2) show that the relationship between consumers' health-orientation and label use is positive and significant, meaning that more health-oriented individuals (nonsmokers who exercise regularly and have a healthy body weight)

Table 2. Model estimations

	NUTRITIONAL KNOWLEDGE		LABEL USE (Whith HO)		LABEL USE (Whithout HO)	
	Coef.	*SE*	Coef.	*SE*	Coef.	*SE*
HEALTH-ORIENTATION			0.076	*0.047* *		
GENDER	0.180	*0.085* **	0.119	*0.171*	0.159	*0.169*
AGE $_{25\text{-}34}$	-0.113	*0.161*	0.346	*0.298*	0.351	*0.298*
AGE $_{35\text{-}44}$	-0.191	*0.163*	0.661	*0.315* *	0.675	*0.316* *
AGE $_{45\text{-}54}$	-0.074	*0.162*	0.954	*0.309* ***	0.938	*0.309* ***
AGE $_{55\text{-}64}$	0.045	*0.169*	0.146	*0.311*	0.071	*0.308*
AGE $_{>65}$	0.050	*0.180*	0.354	*0.314*	0.297	*0.313*
EDUCATION $_{\text{Secondary school}}$	0.482	*0.214* **				
EDUCATION $_{\text{Higher education}}$	0.692	*0.218* ***				
EDUCATION $_{\text{Degree}}$	1.037	*0.237* ***				
EDUCATION $_{\text{Post degree}}$	1.254	*0.329* ***				
HOUSEHOLD INCOME $_{800\text{-}1500€}$	-0.178	*0.200*	0.095	*0.353*	0.097	*0.352*
HOUSEHOLD INCOME $_{1500\text{-}3000€}$	-0.176	*0.201*	0.518	*0.351*	0.551	*0.350*
HOUSEHOLD INCOME $_{3000\text{-}5000€}$	-0.045	*0.228*	0.424	*0.406*	0.483	*0.404*
HOUSEHOLD INCOME $_{>5000€}$	-0.210	*0.247*	0.939	*0.444* *	1.010	*0.441* *
HOUSEHOLD SIZE $_{2\text{ members}}$	0.145	*0.122*	-0.097	*0.229*	-0.100	*0.229*
HOUSEHOLD SIZE $_{3\text{ members}}$	-0.030	*0.137*	0.236	*0.264*	0.211	*0.263*
HOUSEHOLD SIZE $_{4\text{ members}}$	0.195	*0.142*	-0.032	*0.277*	-0.019	*0.276*
HOUSEHOLD SIZE $_{\text{more than 4 members}}$	0.259	*0.199*	-0.839	*0.378* *	-0.830	*0.378* *
INFORMATION SOURCE $_{\text{Tv}}$	-0.010	*0.037*				
INFORMATION SOURCE $_{\text{Internet}}$	-0.063	*0.033* **				
INFORMATION SOURCE $_{\text{Doctors}}$	0.131	*0.030* ***				
NUTRITIONAL KNOWLEDGE			0.908	*0.294* ***	0.925	*0.294* ***
TIME SPENT CHOOSING A NEW FOOD PRODUCT	0.195	*0.100* *	0.500	*0.199* *	0.477	*0.199* *
α_1	-1.154	*0.305* ***	-0.443	*0.451*	-0.422	*0.450*
α_2			0.218	*0.450*	0.230	*0.450*
α_3			1.223	*0.454*	1.231	*0.454*
α_4			2.563	*0.462*	2.566	*0.462*
R-squared	0.128		0.038		0.038	
N	540		540		540	

Significance: *** p < 0.01; ** p < 0.05; * p < 0.10
Note: the variable education has not been included in models 2 and 3 because of multicollinearity problems.

are more likely to make use of the nutritional information reported on labels. This suggests that food labels are mostly used by those individuals that already engage in health-enhancing behaviors. Being more concerned about health, they might be more interested in food-related issues and better perceive the benefits deriving from such information source [28]. These consumers might consider food labels

as a useful tool to make healthier food choices and therefore improve their health in the long-run.

With regard to the socio-demographic and economic characteristics, people aged between 35 and 54 years old are more likely to use labels compared to other categories. This might be due to the fact that at this age the probability to have little children is higher, thus leading people to be more careful about the food they purchase. Also, people with higher income are more likely to make use of food label. This result is in line with previous research, which found that high income consumers rely on labelled information more than low income individuals, and generally attribute more value to such information [29]. Moreover, label use decreases as the household size becomes bigger, probably due to the fact that these households may suffer from higher time constraint.

As for nutritional knowledge, it is positively related to label use, meaning that when consumers are more knowledgeable about nutritional properties, they are more willing to use labelled information. This result is in accordance with those studies that highlighted how nutritional knowledge could be important in facilitating consumers to understand the information on labels [9].

Finally, the results highlight that the more is the time spent for choosing a new food product, the more consumers are likely to use food labels. This suggests that when consumers do not experience high time constraint, they are more willing to get information through labels and to select products in line with their preferences.

The last regression, estimated excluding health-orientation from the explanatory variables, shows overall the same results. The signs and statistical significance of all the regressors remain unchanged across

models (*b)* and (*c).* The coefficient magnitudes of statistically significant variables are also unchanged, suggesting that the relationship of health-orientation with label use is independent of the other individual characteristics included in the analysis.

Moreover, the marginal effect computation (Table 3) indicates that the effect of low health-orientation is more evident for those consumers that use labelled information most frequently. Indeed, results highlight a different pattern of signs between consumers who use label with a low-medium frequency (never, rarely, and sometimes) and those who, instead, usually use it (often, always).

Table 3. Marginal Effect for label use equation

	Label use									
	Never		Rarely		Sometime		Often		Always	
	Coef.	*SE*	Coef.	*SE*	Coef.	*SE*	Coef.	*SE*	Coef.	*SE*
HEALTH-ORIENTATION	-0.010	*0.006* *	-0.005	*0.003*	-0.004	*0.003*	0.007	*0.004*	0.013	*0.008* *
GENDER	-0.016	*0.023*	-0.007	*0.011*	-0.006	*0.009*	0.010	*0.015*	0.020	*0.028*
AGE $_{25\text{-}34}$	-0.043	*0.035*	-0.021	*0.018*	-0.022	*0.021*	0.026	*0.019*	0.060	*0.055*
AGE $_{35\text{-}44}$	-0.076	*0.031* *	-0.040	*0.018* *	-0.046	*0.026* *	0.039	*0.012* **	0.123	*0.065* *
AGE $_{45\text{-}54}$	-0.103	*0.027* ***	-0.055	*0.017* ***	-0.070	*0.028* **	0.044	*0.011* ***	0.185	*0.068* **
AGE $_{55\text{-}64}$	-0.019	*0.039*	-0.009	*0.019*	-0.008	*0.019*	0.012	*0.024*	0.025	*0.054*
AGE $_{>65}$	-0.044	*0.036*	-0.022	*0.019*	-0.022	*0.022*	0.026	*0.020*	0.062	*0.058*
HOUSEHOLD INCOME $_{800\text{-}1500€}$	-0.013	*0.046*	-0.006	*0.022*	-0.005	*0.020*	0.008	*0.029*	0.016	*0.060*
HOUSEHOLD INCOME $_{1500\text{-}3000€}$	-0.068	*0.045*	-0.032	*0.022*	-0.029	*0.021*	0.041	*0.026*	0.087	*0.061*
HOUSEHOLD INCOME $_{3000\text{-}5000€}$	-0.052	*0.045*	-0.026	*0.024*	-0.027	*0.030*	0.030	*0.022*	0.075	*0.077*
HOUSEHOLD INCOME $_{>5000€}$	-0.097	*0.034* ***	-0.054	*0.023* **	-0.073	*0.040* *	0.036	*0.013* **	0.187	*0.102* *
HOUSEHOLD SIZE $_{2\ members}$	0.013	*0.032*	0.006	*0.014*	0.005	*0.012*	-0.008	*0.020*	-0.016	*0.037*
HOUSEHOLD SIZE $_{3\ members}$	-0.030	*0.032*	-0.015	*0.016*	-0.014	*0.017*	0.018	*0.019*	0.040	*0.047*
HOUSEHOLD SIZE $_{4\ members}$	0.004	*0.038*	0.002	*0.017*	0.002	*0.014*	-0.003	*0.024*	-0.005	*0.045*
HOUSEHOLD SIZE $_{more\ than\ 4\ members}$	0.142	*0.077* *	0.046	*0.017* **	0.012	*0.013*	-0.091	*0.045* *	-0.110	*0.038* **
NUTRITIONAL KNOWLEDGE	-0.122	*0.040* ***	-0.056	*0.020* **	-0.049	*0.018* **	0.078	*0.027* **	0.149	*0.049* **
TIME SPENT CHOOSING A NEW FOOD PRODUCT	-0.073	*0.032* *	-0.030	*0.012* **	-0.020	*0.007* **	0.048	*0.021* *	0.076	*0.028* **

Significance: *** p < 0.01; ** p < 0.05; * p < 0.10

4.5 Conclusions and limitations

This study analyzed the relationship between consumers' health-orientation and their use of nutritional labels as a tool to obtain information about food. The main result of our analysis underlines

that consumers are more prone to use such information tool when they are more health-oriented. This study represents only a preliminary analysis of this topic but, despite the existence of limitations, it offers new cue for reflection for the policy debate. Indeed, it is well known that nutritional labelling has a fundamental role in reducing the information asymmetry, increasing market transparency, and supporting more conscious food choices. However our result highlights a critical issue.

This study stresses the idea that nutritional labels are mainly used by those consumers that already engage in a number of other health-enhancing activities. This suggests that those consumer categories that show low orientation to health (namely smokers, who do not exercise regularly, and have unhealthy body weight) do not really care about nutritional labelling. In other words, labels as a tool to promote healthier food choices seem to have only a limited effect on those consumers that mostly would need to pursue healthier lifestyle habits.

Since labels seem not to be able to reach all consumers, but only those interested in health-related issues, other measures should be considered in order to make information more accessible also to this population segment. Certainly, information based food policy are fundamental to give consumers proper notions about nutrition and food products. In fact, previous research showed that providing consumers with proper information plays an important role in varying their preferences [30]. However, the key point is to understand which kind of information to convey and through which tool. Some information campaigns in the past were aimed at providing consumers with the basics of nutrition and the good

practices to maintain a healthy weight (e.g., '5 a day'). Little information is given about the relationship between diet and the risks for health, and consumers might not be aware enough about the consequences that unhealthy dietary choices exert on health. We argue that this could be one of the main reasons why consumers underestimate the importance of their food choices. In the short-run, policy interventions should be focused on informing about the specific diseases that might be caused by unhealthy diets.

Moreover, our results also suggested that low levels of nutritional knowledge seem to discourage individuals in the use of labels. In light of this result, in the long-run the development of educational programs in the school can be a measure to increase individuals' knowledge concerning nutritional aspects, and promote healthier food choices.

The main limitation of our study is that the analysis is based on self-reported data and, therefore, the results might be affected by social desirability bias. Another limitation is related to our measure of health-orientation, which is only based on three health-related behaviors. Moreover, one of these is a measure derived from body mass index and for some authors this might be a possible source of endogeneity, with respect to the dependent variable. However this issue is still debated in the literature. Further investigations on this topic might consider other variables that could be able to give a better understanding of consumers' orientation to health.

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chapter 5

Consumer use of nutrition facts panel and claims: should we consider the role of health-orientation in designing EU food policy?

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Abstract

The epidemic proportions of diet related diseases highlight the urgency to find effective ways to tackle the problem. Food labelling might play a key role in increasing consumers' food-related consciousness, and improving the healthiness of their food choices. However consumers' use of food labels is affected by a number of variables. In this paper we try to further explore the role of health-orientation on consumers' use of different labelled information, making an important distinction between mandatory and voluntary information (namely, nutrition facts panel vs claims). Data were collected in Italy through vis-à-vis interviews on a sample of Italian consumers and were analysed performing a set of OLS regressions. The main results overall suggest that highly health-oriented consumers are more likely to refer to nutrition facts panel to obtain information about food products, whereas low orientation to health is associated with greater interest in nutrition and health claims. The analysis underlines that nutrition facts panel is only used by a specific segment of the population

made of consumers highly motivated to engage in healthy activities. Policy interventions should not be only focused on improving labelling design or contents, but should also aim at making consumers more oriented to health. This might result in a higher motivation to engage in healthy behaviours, including the use of nutrition facts panel.

Keywords: health-orientation, food label use**,** claims, nutrition facts panel**,** food policy

5.1 Introduction

Unhealthy eating behaviours are well recognized as the main cause of several health problems and represent a major public concern. In fact, overweight, obesity and obesity-related diseases are constantly increasing worldwide and, currently, according to the World Health Organization 'Most of the world's population lives in countries where overweight and obesity kill more people than underweight' (WHO, 2015). The epidemic proportions of this phenomenon clearly highlight the urgency to find effective ways to tackle the problem. Over the last 10 years, many economists investigated the main factors guiding consumers' food choices and found that the use of food labels can play a crucial role in leading towards healthier food consumption (Banterle and Cavaliere, 2014; Barreiro-Hurlè et al., 2010; Drichoutis et al., 2005; Mazzocchi et al., 2009; Varyam, 2008). Particularly, these studies found evidence that nutritional label usage may increase consumers' food-related consciousness, thereby improving the healthiness of their food choices (Barreiro-Hurlè et al., 2010; Drichoutis et al., 2005; Varyam, 2008).

Nutritional labels, which represent an effective way to reduce information asymmetry and increase market transparency, also represent an important and easy-to-access tool for consumers to collect information on food

products. Labelled information allows consumers to know the main properties of foods, to compare among different product alternatives, and potentially to choose the healthier option.

A great body of literature examined how different variables can affect nutritional label usage. Several studies, for example, analysed the role of socio-demographic and economic characteristics such as age, gender, income, and education (Cavaliere et al., 2015; Cavaliere et al., 2014; Drichoutis et al., 2006; Drichoutis et al., 2008; Grunert et al., 2010; Nayga, 2000). Other research focused on nutritional and health knowledge (Barreiro-Hurlè et al., 2010; Drichoutis et al., 2008; Grunert et al., 2010; Hess et al., 2012; Kim et al., 2001), time constraint (Drichoutis et al., 2006), and label design (Becker et al., 2015; Bialkova and van Trijp, 2010; Visschers et al., 2010).

Instead, relatively little is known about how motivational factors can influence the use of nutritional labelling and how such factors may be involved in consumers' use of different labelled information. In this paper we try to bridge this gap analysing whether individual orientation to health may be associated with the use of food labels, specifically distinguishing between nutrition facts panel and claims.

Health-orientation is defined as the individual motivation to engage in healthy attitudes, beliefs and behaviours (Dutta et al., 2008; Moorman and Matulich, 1993). It can be seen as the extent to which individuals are concerned about health-related issues and gives a measure of their willingness to take responsibility for their health (Dutta et al., 2008; Moorman and Matulich, 1993). The relationship between label usage and health-orientation has been previously analysed using different health-orientation proxies, such as induced health-motivation (Visschers et al., 2010), health- and nutrition-related beliefs (Blitstein and Evans, 2006; Hess et al., 2012), health consciousness (Visschers et al., 2013), and health-

involvement (Pieniak et al., 2010). Together, the results of these studies provided evidence that high orientation to health is positively associated with the use of nutritional labelling. However, only a few of these studies explored the relationship between health-orientation and label use making a distinction between mandatory and voluntary information, namely nutrition facts panel and claims.

In fact, the EU recently revised the labelling system making nutrition facts panel mandatory for all pre-packaged foods through the enactment of the EU Regulation N. 1169/2011. Instead, nutrition and health claims (respectively regulated by the EU Regulation N. 1924/2006 and EU Regulation N. 432/2012) still remain voluntary indications. Mandatory and voluntary information differ substantially in many respects (e.g., positioning on the food product, length, complexity, etc.) and mixed results were found concerning their impact on consumers' healthy food choices. Indeed, a number of evidence show that nutrition facts panel usage is associated with lower intake of fat and sugar and with higher intake of Vitamin C, iron, and fiber (Guthrie et al., 1995; Post et al., 2010; Varyam, 2008). On the other hand, the results concerning consumers' use of claims are diverse. Some literature suggested that claims may facilitate consumers to make well-informed food choices (Verbeke, 2005), whereas other studies suggested that such information (very concise and only focused on one nutrient content or health benefit) might be misinterpreted (Nocella and Kennedy, 2012; Svedberg, 2002). The presence of a health claims in particular seem to lead consumers to attach inappropriate health benefits to the product itself (Roe et al., 1999).

In this paper we explored the relationship between health-orientation and nutritional label usage (distinguishing between facts and claims) creating an index of health-orientation based on the three main components mentioned in its definition (i.e., healthy attitudes, beliefs and behaviours).

This paper contributes to the literature extending the knowledge concerning how motivational factors are involved in consumers' use of food labels. Moreover, understanding differences in the use of mandatory and voluntary labelled information can be of primary importance to redesign policy measures related to the food sector and public health.
This paper is structured as follows: section two describes the empirical analysis applied and the construction of the health-orientation index; section three analyses the results of the model estimates; finally, section four provides the discussion and concluding remarks of our study and illustrates the main policy implications.

5.2 Methods

5.2.1 Data collection and variable descriptions

Data for the analysis were collected in Milan (Italy) through vis-à-vis interviews on a sample of consumers in charge of their household grocery shopping. A geographically stratified systematic sampling was used for the selection of the retailers. Specifically, starting from the postal code, we listed all the super- and hypermarket of Milan area. The first store was selected by means of a randomly extracted number between 1 and the sampling fraction. The remaining stores were chosen adding to this number the sampling fraction. The different size of the selected retailers was used as criterion to establish the number of consumers to be recruited in each store: 10 consumers were interviewed in each supermarket (totally 14) and 20 in each hypermarket (totally 8). Consumers were randomly approached outside the grocery stores covering different time bands in order to reach different shoppers categories. We totally collected 300 interviews. Taking into account that Milan population exceeds 1.3 million people, this sample

size allows us to incur a relative error of about 6% (Mazzocchi, 2008). Data were gathered using a questionnaire previously validated on a small sample of 40 consumers.

According to the purpose of the paper, the first part of the analysis was meant to investigate consumers' use of different food label formats, namely the nutrition facts panel (mandatory) and nutrition and health claims (voluntary).

As for the nutrition facts panel (NFP), we asked consumers how frequently they use it. Answer to this question ranged from 'Never' to 'Always' (from 0 to 10) on a graphic continuous scale (respondents were asked to make a sign on a bar).

As for nutrition claims (NC), consumers were asked to state their interest in different claims, namely those referring to fat, energy, sugar, light, and salt, permitted by the Reg. n. 1924/2006. Answers to such questions ranged from 'Not at all interested' to 'Very interested' (0 to 10) on a graphic continuous scale (Table 1). Similarly, consumers were asked about their interest in the presence of health claims (HC) on food products.

We referred to 'use' in the question about nutrition label since NFP, being generally placed on the back side of the packaging, requires consumers to make an active process of information searching. On the other hand, claims represent very short and concise messages displayed on the front of the food pack. This implies that consumers might be exposed to such information even though they do not actively look for it, thus the use of claims might be involuntary and the term 'interest' is more appropriate.

The second part of the survey aimed at measuring consumers' orientation to health and a detailed description of the variables used to construct the health-orientation index is provided in the next paragraph.

Another section included the questions necessary to estimate consumers' level of knowledge concerning nutritional aspects. Previous studies showed

Table 1. Variable descriptions

Variable name	Description	Obs	SD	Freq	Min	Max
DEPENDENT VARIABLES						
Nutrition facts panel use	Frequency of use of nutrition facts panel (never=0, always=10)	300	2.6		0	10
Interest in nutrition claims						
Energy	Level of interest in energy-related claims (Not at all interested=0, Very interested=10)	300	3.24		0	10
Fats	Level of interest in fat-related claims (Not at all interested=0, Very interested=10)	300	3.18		0	10
Sugar	Level of interest in sugar-related claims (Not at all interested=0, Very interested=10)	300	3.28		0	10
Sodium	Level of interest in sodium-related claims (Not at all interested=0, Very interested=10)	300	3.15		0	10
Light	Level of interest in the claim 'light' (Not at all interested=0, Very interested=10)	300	2.86		0	10
Interest in health claims	Level of interest in health claims (Not at all interested=0, Very interested=10)	300	2.88		0	10
INDEPENDENT VARIABLES						
Health-orientation index						
Healthy attitude	Which is the most important factor that you consider when choosing a food product? Health=1, otherwise=0	300	0.41	66	0	1
Beliefs about junk food	Do you limit junk food consumption? Yes because I believe that excessive intake might be unhealthy =1, otherwise =0	300	0.5	168	0	1
Beliefs about F&V	Do you eat fruit and vegetable? Yes because I believe that this is beneficial for my health=1, otherwise=0	300	0.46	207	0	1
Fruit consumption	Consumption frequency: more than once a day=1, otherwise=0	300	0.5	143	0	1
Vegetable consumption	Consumption frequency: more than once a day=1, otherwise=0	300	0.5	135	0	1
Physical activity	Respondents practice physical activity regularly=1, otherwise=0	300	0.5	144	0	1
Smoking behaviour	Respondents do not smoke=1, otherwise=0	300	0.5	157	0	1
Nutritional Knowledge						
F&V	Respondents' Knowledge about F&V recommended consumption frequency (knowledgeable=1, not knowledgeable=0)	300	0.49	113	0	1
Fat	Respondents' Knowledge about the type of fat that must be reduced among monounsaturated, polyunsaturated and sa	300	0.46	206	0	1
Energy content	Respondents' Knowledge about energy content of fats, proteins, and carbohydrates (knowledgeable=1, not knowledgea	300	0.47	200	0	1
Carbohydrate source	Respondents' Knowledge about carbohydrate content of among pasta, fish and eggs (knowledgeable=1, not knowledgea	300	0.35	256	0	1
Protein content	Respondents' Knowledge about protein content of different dairy products (knowledgeable=1, not knowledgeable=0)	300	0.43	227	0	1
Diet self-perceived healthiness	Self-perceived healthiness of the diet (very unhealthy=0, very healthy=10)	300	1.81		0	10
BMI	Respondents' Body Mass Index (kg/m^2)	300	3.46		16	33
Gender	1 female, 0 male	300	0.5	162	0	1
Age	Respondents' age	300	18.18		19	91
Education level	Respondents' education level (secondary school, higher education, degree and post degree)	300	0.75		1	3
Household income	Respondents' household Income (<800€, 800-1500€, 1500-3000€, 3000-5000€, >5000€)	300	1.06		0	4

that high levels of nutritional knowledge are able to encourage consumers in using labels (Hess et al., 2012; Kim et al., 2001; Petrovici and Ritson, 2006), thus suggesting that this is a key variable to consider when studying label use. In line with the different measures of knowledge previously applied in the literature (Barreiro-Hurlé et al., 2008 and 2010; Drichoutis et al., 2005), we estimated it through 5 items. Two items aimed at assessing consumers' knowledge concerning nutritional recommendations, respectively regarding fruit and vegetable consumption, and the type of fats that must be reduced. The other three items regarded specific knowledge on energy, carbohydrate, and protein content of several food products.

Moreover, some studies found a positive link between healthy diets and the use of food labels (Coulson, 2000; Graham and Laska, 2012; Guthrie et al., 1995; Kristal et al., 2001; Ollberding et al., 2010). In line with these results we decided to include one question assessing consumers' self-perceived healthiness of the diet. We chose a self-reported measure of healthiness because we were interested in estimating how consumers actually perceive their diet, instead of having an evidence-based information. Answers to such question ranged from 'Unhealthy' to 'Very healthy' (0 to 10) on a graphic continuous scale.

The final section was about socio-economic and demographic variables and included gender, age, education level (secondary school, high school, and university degree) and income (<800€, 800-1500€, 1500-3000€, 3000-5000€, >5000€).

5.2.2 Construction of the health-orientation index

Several studies analysed how different health-related aspects and attitudes can affect food behaviours. Geeroms et al. (2008), for instance, used multiple health-related questions included in their survey to estimate individual health-related motive orientation and its effect on ready meals

consumption. Visschers et al. (2013) in their study on food consumption behaviour investigated the role of individual health consciousness, measuring it through a modified version of the health-consciousness scale previously developed by Schifferstein and Oude Ophius (1998). Pieniak et al. (2010), instead, in their study on fish consumption measured health-involvement through a 4-items scale based on the Zaichkowsky involvement scale (1985). However, as already mentioned in the introduction, only a few studies have specifically explored the role of health-related aspects on food label use. Blitstein and Evans (2006) designed a study to evaluate the individual characteristics associated with NFP usage and found that consumers' health-seeking orientation is positively associated with the use of nutritional labelling. Visschers et al. (2010) used an eye-tracking experiment to analyse how health-motivation affects visual attention to nutritional information and Hess et al. (2011) used multiple questions to assess how health-related aspects predict consumers' use of food labels. However, until now, there is no standard procedure to estimate consumers' orientation to health.

In this paper we made an attempt to develop a health-orientation index (HOI) starting from the definition of health-orientation reported in the introduction and using some questions that are specifically related to food consumption behaviour (Dutta et al., 2008; Moorman and Matulich, 1993). In detail, the HOI was constructed by means of 7 questions aimed at capturing three different elements, namely individuals' health-related attitudes, beliefs, and behaviours, respectively corresponding to the three components mentioned in the definition of health-orientation.

Health-related attitudes can be explained as the way an individual views health, or tends to behave towards it. To capture this aspect we asked consumers which is the most important factor among health, taste, and price when they choose a food product.

Healthy beliefs can be described as health-related ideas that individuals accept as true. They were elicited by means of two questions. The first one assessed if respondents limit their consumption of junk food[1] (snacks, sugary beverages, and fried food) because they believe that excessive consumption of such foods might be unhealthy; similarly, the second question assessed if respondents eat fruit and vegetable believing that this is beneficial for their health. Junk foods were chosen for the former question due to the fact that they are generally considered less healthy than other foods. On the contrary, fruit and vegetable consumption is acknowledged to be associated with positive effects on health (Anderson, 1999; Liu, 2003; Radnitz et al., 2015).

Healthy behaviours represent a manner of behaving that is clearly oriented to health. In this case we used four questions: two of them were specifically related to healthy food behaviours (fruit consumption and vegetable consumption following nutritional recommendations - more than once a day). The other two questions were about smoking behaviour and physical activity.

5.2.3 Data analysis

To analyse the relationship between consumers' health-orientation and the use of different label formats, we performed a set of three equations differing only with regard to the dependent variables used: *i)* use of nutrition facts panel; *ii)* interest in nutrition claims; *iii)* interest in health claims. The equations were specified as follows:

$$NFP = \beta_0 + \beta_1 HOI + \beta_2 KNOW + \beta_3 DIET + \beta_4 GEN + \beta_5 AGE + \beta_6 EDU + \beta_7 INC + \varepsilon_1 \quad (1)$$

[1] There is no clear definition on what junk food is exactly, but studies consistently refer to food items that are high in fat, sugar and salt (HFSS) such as soft drinks, confectionaries, crisps/savory snacks, fast food, pre-sugared breakfast cereals, and pre-prepared convenience foods (Capacci, 2012).

$$NC = \beta_0 + \beta_1 HOI + \beta_2 KNOW + \beta_3 DIET + \beta_4 GEN + \beta_5 AGE + \beta_6 EDU + \beta_7 INC + \varepsilon_2 \quad (2)$$

$$HC = \beta_0 + \beta_1 HOI + \beta_2 KNOW + \beta_3 DIET + \beta_4 GEN + \beta_5 AGE + \beta_6 EDU + \beta_7 INC + \varepsilon_3 \quad (3)$$

where NFP in eq. 1 is consumers' stated frequency of use of nutrition facts panel. NC is the dependent variable referred to consumers' interest in nutrition claims. Such variable is the result of a factor analysis performed using the five questions on nutrition claims mentioned in the previous section. Such analysis allowed simplifying the final interpretation of the results. The factor loadings are reported in table 2.

Table 2. Factor loadings

Interest in Nutrition Claims (NC)		
Fats	0.916	
Energy	0.93	
Sugar	0.922	
Sodium	0.808	
Light	0.807	
Total Variance explained	77.14%	
Kaiser-Meyer-Olkin	0.822	
Bartlett Test	1414.02	***
Cronbach α	0.925	

Finally, the dependent variable of the eq. 3 is related to consumers' level of interest in health claims (HC). As for the regressors, HOI constitutes our measure of health-orientation. Four of the seven questions used to create the index were binary, the other three were in a multiple choice format always including 'Health' among the response options together with other alternatives. In this latter case, the questions were transformed into dummy variables following this criterion: when health was chosen as the answer, the dummy assumed value 1, otherwise value 0. A health-orientation score was then assigned to each respondent based on the

summation of the single scores obtained for such question. The index values ranged from '0' meaning 'Not at all health-oriented' to 7, 'Very health-oriented'. The index was then normalized[2]. As for the nutritional knowledge (KNOW) we constructed a normalized index using the summation of the scores obtained by each respondent in the related five questions. Correct answers to such questions were assigned value 1, otherwise value 0. This way, the KNOW index assumed value 5 when the respondent gave correct answer to all questions. With regard to the other regressors in the equations, DIET is self-perceived healthiness of the diet; GEN (gender), AGE, EDU (education level) and INC (income) represent the set of socio-demographic and economic variables in the models. To verify the absence of multi-collinearity among the independent variables included we computed the variance inflation factor (VIF) test.

5.3 Results

5.3.1 Sample characteristics

Sample characteristics are illustrated in table 3. With regard to gender, women were slightly more represented (54%) compared to men and the average age was around 47 years old, with a majority of consumers (39.7%) aged between 41 and 65 years old. The education level of the sample population was distributed as follows: 30.7% had bachelor or master degree, 43.7% had high school diploma, while 25.7% had a lower levels of education. 39.3% of the sample stated to have a household monthly income between 1500-3000€.

[2]The normalization is based on the following formula: $x_i = \frac{x_i - x_{min}}{x_{max} - x_{min}}$

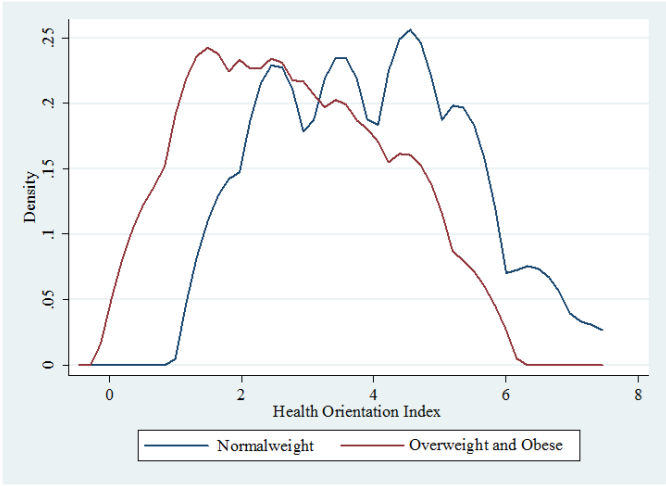
Table 3. Sample characteristics

	% of total *(n=300)*
Gender	
Male	46
Female	54
Age	
18-25	17.33
26-40	24.67
41-65	39.67
>65	18.33
Education level	
Secondary school	25.67
High school	43.67
Bachelor or Master degree	30.67
BMI	
Normal weight	55.33
Overweight and obese	44.67
Household income	
<800€	6.67
800-1500€	26.33
1500-3000€	39.33
3000-5000€	17.33
>5000€	10.33

To better characterize our sample, we also considered consumers' body mass index (BMI). Indeed, a number of previous studies showed that BMI may affect food behaviours, including food label usage (Blitstein and Evans, 2006; Liu et al., 2015). However, we decided not to include it as a regressor in our models due to multicollinearity problems with the variables included in the HOI and with nutritional knowledge. Moreover, someone might argue that BMI could represent a source of endogeneity with the three dependent variables of our equations.

However, given the health-orientation definition and the variables used in this paper to construct the HOI index, it is reasonable to expect the existence of a link between consumers' orientation to health and their BMI. Indeed, comparing respectively the distribution of the HOI in the sub-sample of normal weight consumers and the sub-sample of overweight and obese consumers, it is possible to notice a remarkable difference (Figure 1). The distribution of the HOI in the normal weight category is much more shifted towards right relative to the distribution of the HOI in consumers with higher BMI.

Figure 1. Distribution of the health-orientation index across BMI



In other words, overweight and obese consumers have lower probability to have high HOI scores, meaning that they have lower orientation to health.

5.3.2 OLS Results

The results of our analysis are displayed in table 4. Looking at the results of the first equation having NFP as dependent variable, we observe a positive and significant relationship with HOI (0.575). On the contrary, when moving to the results concerning consumers' interest in nutrition and health claims, the relationship with HOI becomes negative (-0.170 and -0.700 respectively). This change in the pattern of signs indicates that consumers with higher orientation to health are more prone to use NFP compared to those scoring lower on the HOI.

Table 4. OLS results

	NFP	NC	HC
Health-orientation Index	0.575 ***	-0.17 ***	-0.7 ***
	-0.144	*-0.049*	*-0.158*
Nutritional knowledge	0.304 *	-0.087 **	-0.282 *
	-0.145	*-0.05*	*-0.158*
Diet self-perceived healthiness	0.08	0.113 ***	0.25 **
	-0.081	*-0.027*	*-0.088*
Gender - Female	0.267	0.687 ***	0.761 **
	-0.289	*-0.100*	*-0.317*
Age	0.007	0.008 **	0.037 ***
	-0.009	*-0.004*	*-0.012*
Education level	0.45 *	0.06	0.329
	-0.247	*-0.085*	*-0.271*
Household income	0.297 *	-0.05	-0.233
	-0.148	*-0.051*	*-0.162*
N	300	300	300
R2	0.14	0.225	0.15
F	6.77 ***	14.08 ***	7.86 ***
VIF	1.01	1.01	1.01

Significance: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

These latter consumers, instead, seem to be more likely to refer to NC and HC when choosing food products.

Concerning consumers' nutrition knowledge, the coefficient estimates show that higher levels of KNOW are associated with higher frequency of use of the NFP (0.304). When moving to consumers' interest in NC and HC, instead, the relationship with nutritional knowledge becomes negative (-0.087, -0.282 respectively). This suggests that consumers with higher knowledge are more likely to use more complex information sources,

namely the NFP, whilst less knowledgeable consumers might feel more confident in using the concise and easier information of claims. Results of equation 2 and 3 highlight that consumers who are more likely to use NC and HC perceive their diets to be on average very healthy. The variable estimating the self-perceived healthiness of the diet is not significant in the first equation, having NFP as dependent variable.

As for the socio demographics, the model estimates are in line with previous findings in the economic literature. In detail, elderly consumers and women are more likely to use claims compared to other population categories. Education is significant in the first equation and is positively related to the use of NFP. This result stresses the idea that the NFP is a complex information and that consumers may face difficulties in using it. Moreover, this strengthens the relationship found between nutritional knowledge and nutrition facts panel usage.

Finally, with regard to income, results indicate a positive relationship with the use of NFP. Although the income variable is not significant in equations having NC and HC as dependent variables, it is possible to notice a shift in the coefficient sign.

5.4 Discussion and concluding remarks

This study represents an attempt to further explore which is the role of health-orientation in affecting consumers' food behaviours. In particular, we investigated whether health-orientation plays a role in consumers' use of labels, making a distinction between mandatory and voluntary nutritional information.

As expected, the main results of our analysis overall suggest that health-orientation can be a key driver in consumers' use of labelled information.

Moreover, different levels of health-orientation seem to be related to the use of different label formats.

In detail, results indicate that more health-oriented consumers, namely those that already engage in healthy attitudes, beliefs, and behaviours, are more likely to make use of the nutrition facts panel. On the other hand, lower health-orientation is related to a greater interest in nutrition and health claims of food products. These findings together suggest that health might be a motivator of consumers' choice of the nutrition facts panel as a main source of information on food. Health-oriented consumers can recognize in the NFP a more exhaustive information source with respect to claims. Such source could empower them in making healthier choices.

Another important evidence emerging from our results regards the role of nutritional knowledge: when consumers are more knowledgeable about nutritional issues, they are more likely to use nutrition facts panel. On the contrary, the interest in claims increases when nutritional knowledge is low. This might be explained by the different degree of complexity of these two labels formats. Indeed, the concise and brief messages of claims might seem much easier to understand compared to the complex format of nutrition facts.

Consumers who use nutrition facts panel also have high education and income. Claims, instead, are of main interest for elderly and women. Moreover, claims users stated to have very healthy dietary habits. This seems to indicate that claims are perceived as guarantee of the healthiness of food products and that such idea of healthiness is then easily and generally extended to the diet itself.

The results of our analysis offer some cues for reflection. Food labelling is well acknowledged as an effective intervention to solve the market failure due to information asymmetry and to increase market transparency. However, its effectiveness as a public health policy seems to suffer from

some criticisms. The fact that NFP became mandatory through the EU Regulation N. 1169/2011 has represented a key step to improve information accessibility. Actually, our analysis underlines that this tool is only used by a specific segment of the population made of consumers highly motivated to engage in healthy activities. On the other hand, there is still part of the population which does not access such information tool. This category is represented by less health-oriented consumers and those with low levels of nutritional knowledge. They could suffer from lack of proper capabilities to understand the NFP contents. Thus, the effectiveness of mandatory labelling to promote healthier food choices is limited and this is the main criticism of such policy.

Claims are mainly considered by a weaker part of the population. In this direction, the market regulation in EU is fundamental to avoid opportunistic behaviours. Nonetheless, one of the main criticisms related to claims is that information is limited. Indeed, claims are by definition very concise front-of-pack messages focused on one nutrient only and the use of such indications should constitute only the first step in consumers' process of information searching.

In light of these considerations, we might argue that policy interventions should not be only focused on improving labelling design or contents, but should also aim at making consumers more oriented to health and more knowledgeable about nutritional characteristics of food products. To succeed in increasing consumers' nutritional knowledge and their motivation to behave healthily might have significant implications also on their decision to increase their use of NFP. For this purpose, food policies should be specifically targeted to reach the segment of the population represented by less health-concerned and by less knowledgeable individuals.

In this context, information campaigns aimed at making consumers more aware about the health risks related to unhealthy food consumption might lead them to become more health concerned. This might result in a higher motivation to engage in healthy behaviours. On the other hand, acting on education with specific nutritional program in the school would be an effective policy to significantly increase individuals' knowledge concerning nutritional aspects, although it requires long time.

The main limitation of our study is that the analysis is based on self-reported data and, therefore, the results might be affected by social desirability bias. Further investigations on this topic might consider a greater number and variety of variables that could be able to give a better understanding of consumers' orientation to health.

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If we could give every individual the right amount of nourishment and exercise, not too little and not too much, we would have found the safest way to health.

-Hyppocrates-

chapter 6

Conclusions and future research

This thesis work is organized as a collection of four independent studies connected through the common objective of analyzing consumers' food-related behaviors focusing on two core variables, namely time preferences and health-orientation. The rationale is to provide novel insights on these topics, that can be helpful to better explain overweight and obesity and find effective ways to contrast their constant growth.

The main results of *Study 1,* exploring the effects of time preferences on individual BMI, indicate that high time preferences are positively associated with body mass index levels, meaning that when consumers show a strong preference for present utility (i.e., they have a high time preference) they are more likely to have BMI values above the normal weight cutoff. Thus, as expected, this study confirms that different time preferences can explain a healthy or unhealthy weight condition and ultimately suggest the existence of a direct relationship between time preferences and food choices.

In order to further explore the findings obtained in the first study, *Study 2* investigates more in depth how time preferences are involved in food choices and influence attribute evaluation. The choice experiment analysis conducted on a yogurt product, reveals that *(i)* different time preferences are associated with different choice behaviors and that *(ii)* time preferences actually affect the way consumers evaluate product attributes. In

particular, the model estimations indicate that when consumers have high time preferences and favor present utility, they tend to give less importance to health- and environment-related attributes. Indeed, such individuals seem to attach only a low value to the calorie amount of food and to the presence of health claims and of the organic label.

Concluding, the results of studies 1 and 2, suggest that time preferences play a primary role in food choices, consequently having an impact on health outcomes. Indeed, high orientation to present utility leads people to favor the hedonic dimension of food consumption and to value nutritional properties to a less extent. Accordingly, the value of healthy eating and future wellbeing is highly depreciated. Although it is not easy to think about policies that can be able to change individual time preferences, it is reasonable to imagine that if consumers would be more aware about the increased disease-risk associated with unhealthy eating and obesity, they would pursue more healthful food choices. In this sense, information campaigns would be a valuable tool to fill this lack of knowledge. However, such campaigns should be not only focused on mere nutritional aspects, but should also convey precise messages concerning the long-term risks that can derive from unhealthy eating. Moreover, the fact that individuals with different time preferences also have different food preferences is a useful information for food marketing purposes. Such evidence might be used to design targeted interventions geared toward making people purchase and consume, besides healthier foods, also more environmentally friendly products, thus promoting a sustainable use of resources.

Studies 3 and 4 explore how health-orientation can affect a specific food-related behaviors, that is the use of nutritional labelling. Study 3 represents a first exploratory analysis of this topic and examines if health-orientation can affect the frequency to which individuals make use of nutritional information on food products. The following analysis (study 4)

makes a step forward, considering the distinction between different types of information. In detail, in addition to analyzing differences in the frequency of use of nutritional labels, this paper explores if health-orientation also affects consumer preferences for different label formats, namely nutrition facts panel (mandatory) and claims (voluntary). The main findings of these two latter papers provide evidence that the more consumers are concerned about health-related issues, the more they are likely to use nutrition facts panel. Less health-oriented individuals, instead, seem to be more interested in health and nutrition claims.

Together these results suggest that orientation to health can be an important motivator for individuals to use nutritional information. Indeed, mandatory labelling seems to be mostly used by those individuals that are highly interested in health issues. On the opposite, when health-orientation is low individuals show greater interest in claims. This might be due to the different cost of information. Indeed, information cost is much higher for nutrition facts panel due to the amount of information reported and to their degree of complexity. Therefore, when orientation to health is low, individual motivation to bear the cost of information of nutrition facts might not be strong enough to lead consumers to really use it. Thereby, in this case nutrition and claims might be preferred. This ultimately means that consumers that mostly would benefit from the information on nutrition facts panel (namely those that are not concerned about health issues), in fact, do not use it, reducing their probability to make more healthful food choices.

As already suggested with regard to time preferences, policy interventions aimed at increasing consumers' consciousness about the health-risks associated with unhealthy eating could persuade them to engage in healthy behaviors (including reading labels). However, the effectiveness of mandatory information as public health policy needs to be further

discussed. Even though labelling is well acknowledged to be able to increase market transparency and reduce information asymmetry, its potential positive effects are only limited to a specific segment of the population.

Overall, the results of the four studies conducted in this three year period, corroborate the utility to incorporate insights from other disciplines into the economic study of obesity. This can significantly help researchers to explain the main mechanisms behind food choices, thereby providing useful hints to formulate new food policies aimed at containing the growth in obesity rates. However, additional research should be conducted in order to strengthen the results obtained. First of all, the measurements of time preferences and health-orientation used in these analyses should be further tested to ascertain their robustness and predictive power. With regard to time preferences, in particular, such measures should be compared with standard methods. This would also allow to better investigate differences in time preference estimates in the food choice domain.

Moreover, it would be valuable to simultaneously study time preferences and health-orientation. Indeed, although these factors differ by definition, they are actually interconnected. The former determine one's preference for present or future rewards, whereas the latter can be described as the motivational factor that makes people behave in a certain way with regard to health. Thereby, it can be expected that if one has a general preference for future utility (in the health domain), he/she will be more motivated to behave healthily. Such analysis would significantly contribute to extend the knowledge concerning how time preferences and health-orientation are related to (and eventually dependent on) each other.

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Picture in facebook:

http://www.beliefnet.com/Wellness/Health/Weight-Loss/7-Effective-Activities-to-Keep-You-on-Your-Diet-Plan.aspx?p=3

“One cannot think well, love well, sleep well, if one has not dined well.”

Virginia Woolf, (1929). A Room of One's Own.