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An Economic-Psychological Model of Sustainable Food Consumption

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AN ECONOMIC-PSYCHOLOGICAL MODEL OF SUSTAINABLE FOOD CONSUMPTION

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ABSTRACT

This paper proposes a novel economic-psychological model of individual food consumption and food waste that recognizes individuals as social and moral beings who are boundedly rational and have limited capacity for self-control. The model identifies five components of individuals' utility that correspond to five modes of being or selves: the hedonic agent, the social agent, the moral agent, the health-conscious agent and the habits-driven agent. In the model, individuals maximize this composite utility given their budget and effort constraints. We apply the model to analyze policies that can support the adoption of sustainable food consumption practices.

Keywords: bounded rationality; bounded self-control; habits; identity; social and moral norms; sustainable food consumption.
JEL Classification codes: D03 - Behavioral Economics, Underlying Principles; D11 - Consumer Economics: Theory; D12 - Economic Sociology; Economic Anthropology; Social and Economic Stratification.
Psychological classification codes (PsychINFO): 3920 - Consumer Attitudes & Behavior

1 INTRODUCTION

Food production and consumption have significant environmental impacts (see e.g. Foster et al. 2006, Steinfeld et al 2006, Tukker & Jansen 2006, 169) most of which have the nature of negative externalities.

Behavioral changes in terms of which foods we choose to eat and how much we eat (see e.g. Baroni et al. 2007, Carlsson-Kanyama (1998), Carlsson-Kanyama et al. (2003), Carlsson-Kanyama & Gonzales, 2009, Duchin 2005) as well as how much we throw away as food waste (see e.g. Engstrom & Carlsson-Kanyama 2004. Sibrián et al. 2006, Stuart 2009) can significantly contribute to reduce these impacts.

Therefore an important question for environmental economists is how to effectively promote these behavioral changes. Economists' attention when looking for instruments to induce dietary changes tends to concentrate on economic incentives, in the specific case, on food prices.

In the recent years, behavioral economists and psychologists, recognizing that eating behavior is significantly affected by bounded self-control, bounded rationality, social norms and habits have been exploring how manipulations of the food and eating environment can contribute to steer food consumption in a healthier direction (Just & Payne 2009, Just & Wansink 2009, Just et al. 2008, Thaler & Sunstein 2008, Wansink 2004). Analogous manipulations of the food and eating environment could also help to steer food consumption in an environmentally friendlier direction.

Economists have also increasingly focused on how identity considerations, self-image and social norms affect individual choices (see e.g. Akerlof & Kranton 2000, 2002, Brekke et al. 2003).

In this paper, we integrate these research contributions into an economic-psychological model of individual food consumption and food waste that recognizes individuals as boundedly rational, social and moral beings with limited capacity for self-control and subject to habitual behaviors.

Unlike traditional models of consumer choice, our model identifies five components in the individuals' utility function, which correspond to different modes of being, namely the hedonic, the social, the moral, the health-conscious, and the habits-driven self.

Food consumption yields individuals different types of utility or payoffs: hedonic utility as in Loewenstein (1996), utility from moral self-image as in Brekke et al. (2003), utility from social identity as in Akerlof & Kranton (2000, 2002), and utility from the evaluation of the future health consequences of one's diet. Moreover, deviating from habitual behavior is a source of disutility for the consumer. As in the traditional neoclassical model of consumer choice, consumption is affected by food prices and by the effort required to choose, obtain, prepare and consume the food. The individual maximizes his or her total utility under these constraints.

As hedonic agents, individuals maximize the sensory pleasure obtained by food. They have bounded self-control, so that in addition to tastes, their food consumption is also affected by visceral factors as in Loewenstein (1996).

As social agents, individuals define their identity partly through how well their food consumption adheres to that of their salient reference group. They obtain payoffs from the sense of belongingness to the group and suffer a disutility whenever their choices deviate from those of their reference group. Following Akerlof and Kranton (2000, 2002), we assume that individuals' identity payoff increases in the social status of their reference group and decreases in the extent to which one's food consumption departs from that of their reference group. The more conformist the individual is the greater is the disutility from deviating from the group behavior. Individuals may have multiple reference groups of which some are more salient than others at the moment of choice. We discuss which factors determine the salience of reference groups.

As moral agents, individuals may suffer a disutility from dissonance if their realized food consumption does not conform to their ideal of what is a morally appropriate food consumption vector. Adapting Brekke et al. (2003) the payoff from moral self-image decreases in the extent to which individuals deviate from their moral ideal. The extent of this disutility varies across individuals: Individuals who feel more strongly either the cognitive dissonance (Festinger 1957) from not conforming to their ideal or the negative emotions due to the discrepancy between their actual self and ideal self (Higgings 1987) will tend to experience a stronger disutility. Following Loewenstein (1996, 275), we also assume that an intensification of relevant visceral factors narrows the individuals' focus on themselves thus undermining altruism and potentially increasing the deviations from the morally ideal diet.

As health conscious agents, individuals consider the possible future negative consequences of today's consumption on their future health. Individuals differ in their taste for health, that is, in the importance they give to their health. In addition, depending on their genetic make-up and previous health conditions, they also differ in how damaging an unhealthy diet can be to them. Finally, individuals differ in their rate of time preference. The more intense are visceral factors, the higher is the rate of time preference, that is, the less weight the individuals give to the future.

As habits-driven agents, they suffer a disutility from initial deviations from habitual behavior. This disutility however peters out as the new behavior is repeated and becomes habitual.

In the model, individuals maximize this composite utility given their budget and effort constraints. Cognitive biases and bounded rationality affect this process of maximization.

We apply the model to the design of policies aimed at encouraging more sustainable food consumption practices. In addition to traditional instruments such as taxes, subsidies, information campaigns and moral suasion, we look at other instruments such as the manipulation of the food and eating environment. By food environment we mean the way food is packaged, labeled, placed, or made in any other way salient (Just & Payne 2009, S51). With the term eating environment we indicate the effort related to getting the food, the social interactions present during food choice and consumption, and non-food related environmental factors such as lighting, music and other sounds, and the presence of other distractions (Wansink 2004, 456).

2 THE ECONOMIC-PSYCHOLOGICAL MODEL OF FOOD CONSUMPTION

Let us assume that individuals derive hedonic utility from food consumption. They have bounded self-control, so that in addition to tastes, their food consumption is affected by visceral factors as in Loewenstein (1996). Besides the hedonic utility, food consumption yields utility, which arises from the payoffs from moral self-image as in Brekke et al. (2003), from social identity as in Akerlof & Kranton (2002), from today's evaluation of the future health consequences of one's diet, and from the costs of deviating from their food habits. As in the traditional neoclassical model of consumer choice, consumption is affected by food prices and by the effort required to choose, obtain, prepare and consume the food. Individuals maximize their total utility under these constraints.

Let the utility U from food consumption of individual j at a given time t be

$$U = p[u(X_t, A)] + s[I_G - (X_t - X_G)^2] + m(A)[I_{ideal} - (X_t - X_{ideal}(K))^2] + h * \delta(A)[I_H - c(X_t - X_H(K))^2] - z(X_t - X_{t-1})^2 \quad [1]$$

The first term in square brackets depicts the hedonic utility $u(X_t, A)$ from food consumption. The second term describes the social utility from food consumption given by the payoffs from social identity $I_G - (X_t - X_G)^2$ and the third the utility from self-image $I_{ideal} - (X_t - X_{ideal}(K))^2$, where parameter K portrays the individual knowledge about the health, social environmental and animal welfare impacts of food consumption. The fourth term in square brackets measures the health benefits I_H from eating a healthy diet X_H and the loss in utility $c(X_t - X_H(K))^2$ from deviating from it, weighted by the discount factor δ. The last term in the equation indicates the cost from deviating from habitual food consumption, approximated by the consumption realized at time *t-1*. Parameters *p, s, m(A), h,* and *z* measure the weight given by the individual to these different components of utility. Next, we describe the utility function in more detail.

2.1 The hedonic agent

Individuals get hedonic utility from food consumption $u(X_t, A) = u(x_1, \dots, x_n\ , \alpha_1, \dots, \alpha_n\ )$ where $X_t = (x_1, \dots, x_n\ )$ is their food consumption vector time t where x_i is the amount of food item i consumed. $A = (\alpha_1, \dots, \alpha_n)$ is the level of visceral factors operating at time t.

By visceral factors we mean moods, emotions, physical pain, cravings and drive states such as hunger, thirst, and sexual desire (Loewenstein 1996, 272). The functional form $u(X_t, A) = u(x_1, \dots, x_{n,}\ \alpha_1, \dots, \alpha_n\ )$ implies that visceral factors have direct hedonic consequences, that is, if we become hungrier or more fatigued, this affects our hedonic utility even when our food consumption is held constant (Loewenstein 1996, 273). For instance being hungry increases the utility of eating a slice of cake. Moreover as visceral factors intensify individuals' focus on the form of consumption that is related to the visceral factor's increases, while their interest for other forms of consumption decreases.

In summary, $u(X_t) = u(x_1, x_2, \dots, x_n)$ tells us if the individual prefers broccoli to chocolate cake or pasta to pizza; in other words, it describes the individual tastes in a visceral factor neutral environment, whereas $u(X_t, A) = u(x_1, \dots, x_{n,}\ \alpha_1, \dots, \alpha_n\ )$ tells us the value of eating pizza at time t given the level of the relevant visceral factor α_i at that time.

2.2 The social agent

In the utility function, as social agents, individuals define their identity partly through how well their food consumption adheres to that of their salient reference group. They obtain payoffs from the sense of belongingness to the group and suffer a disutility whenever their choices deviate from that of their reference group. This is captured by the payoff from social identity $I_G - (X_t - X_G)^2$. Following Akerlof and Kranton (2000, 2002), we assume that individuals' identity payoff depends on the social status I_G of belonging to the group G and on the degree to which individual consumption X_t departs from the social norm X_G of the group G. The group social norm is expressed as a specific food consumption vector X_G. The greater is the distance between the individual consumption vector and the social norm of the group X_G, the greater is the disutility $(X_t - X_G)^2$ due to "*losses in identity*" that cause anxiety, a feeling to the individual of not fitting in (Akerlof & Kranton 2000, 719).

The social category G is conceptualized as a positive reference group, i.e. a group that is "*psychologically significant for one's attitudes and behavior*" (Turner 1991, 5) and that the individual wishes to be associated with.

Parameter *s* (*s* = social) is non-negative and could be taken as a measure of conformism, being relatively small for those individuals who do not particularly care whether their behavior *X* fits that of their reference group X_G nor about the status that being member of a group gives them. Some characteristics of the reference group may affect the size of parameter *s* such as "*pronounced in-group homogeneity, acceptance and small group size*", which increase the strength of the identification with the group (Witchard 2008, 138)

Our model simplifies the concept of social identity by assuming that only one reference group affects individual food consumption. In reality, individuals usually hold different social identities and identify with different groups. Moreover, these social identities may not be perfectly aligned with each other or even be in conflict. In this paper we do not discuss the selection of the most relevant identity; we simply assume that the reference group depends on the context where the behavior takes place (Louis et al. 2007, 60) and that only one reference group *G* at a time is salient when individuals make their food consumption decisions.

2.3 The moral agent

As moral agents, individuals may suffer a disutility from dissonance if their realized food consumption does not conform to their ideal of what is a morally appropriate food consumption vector $X_{ideal} = (x_{1,ideal}, \dots, x_{n,ideal})$. The individual for instance might set his/her ideal diet X_{ideal} so as to have a low environmental impact or to avoid suffering to animals.[1] Adapting Brekke et al. (2003) we model the payoff from self-image as $I_{ideal} - (X_t - X_{ideal}(K))^2$, where I_{ideal} is the payoff to self-image from following one's moral code and $(X_t - X_{ideal}(K))^2$ is the disutility from deviations from the code. K is a vector of domain-specific knowledge where each element k_j, with $j = 1, 2, \dots, N$ portrays the individual knowledge about the health, social environmental, and animal welfare and other impacts of food consumption. Each of these domains contributes to different degrees to determine the individual ideal vector $X_{ideal}(K)$.

In this paper, we do not analyze the formation of the ideal vector, although we assume that knowledge about the impacts of food consumption affects this ideal to some degree. We also assume, in line with self-discrepancy theory (Higgings 1987, Higgins et al. 1986), that the discrepancy between a person's perception of his or her *actual self* (here defined in terms of personal food consumption) as opposed to one's *ideal self* (here the ideal consumption vector) is a cause of negative emotions that decrease utility. Parameter *m(A)* (*m* = moral) is assumed to be non-negative, to vary across individuals, and to depend on the intensity of visceral factors A.

Individuals who feel more strongly either the cognitive dissonance (Festinger 1957) from not conforming to their ideal X_{ideal} or the discrepancy between their actual self and ideal self (Higgings 1987, Higgins et al. 1986) will tend to have a large *m*.

2.4 The health-concerned agent

Element $h * \delta(A)[I_R - c(X_t - X_H(K))^2]$ represents the present value of the benefits I_H from eating a healthy diet X_H net of the loss in utility $c(X_t - X_H(K))^2$ from deviating from such a diet. This loss in utility is due to the expected future health damage from an unhealthy diet. The awareness of this loss at time t depends on the knowledge about the consequences of one's diet, which is part of the individual's food-related knowledge K. We assume that there are three periods in the lifetime of the individual and that the health consequences of today's diet become manifest only in the third period while habits are formed in the first period. Period t is the second period during which choice takes place. Not all consumers care equally about their health, insomuch as it relates to food consumption, a fact captured by the non-negative parameter *h* (*h* = health), which varies across individuals. Also, the individual rate of time preference *r* in the discount factor $\delta(A) = \frac{1}{1+r(A)}$ differs, with some people giving a greater weight to the future, that is, having a relatively low *r* while others give little weight and thus have a high *r*.

Following Loewenstein (1996, 275), the discount factor is assumed to depend on the intensity of the relevant visceral factors $A = (\alpha_1, \dots, \alpha_n)$ is, that is, $\delta(A)$. An intensification of visceral factors produces in the individuals a collapse of their time perspective toward the present thus decreasing $\delta(A)$. Parameter *c* is assumed to be strictly positive since deviations from a healthy diet $(X_t - X_H(K))^2$ are assumed to always have a negative impact on health. This impact however, differs between individuals depending, for instance, on their individual genetic make-up and their current state of health leading to different values of *c*.

2.5 The habits-driven agent

When choosing their vector of food consumption X_t in period t, consumers are affected by the eating habits they have developed before period t. Habits here are seen as a propensity or disposition to behave in a particular way in a certain class of situations (Hodgson 2010, 4). In the specific context of this paper, they are a disposition to adopt the food consumption behavior realized in the past, that is, in period $t - 1$. Deviating from habitual behavior is difficult, and this creates a disutility, $z(X_t - X_{t-1})^2$, which is greater

[1] Although in our model we focus on the individual moral ideal, we could easily extend the model to the case where the ideal emerged from non-ethics-related motives - even pathological ones - such as the ideal food consumption of individuals suffering from anorexia nervosa. For an application of Akerlof's and Kranton's (2000) identity model to pathological eating behaviour see Costa-Font and Jofre-Bonet (2010).

the greater the change in habit. Habits may be stickier and harder to change for some individuals, a fact captured by parameter z.

2.6 The constraints to individual utility maximization

Individuals' choice of food consumption is constrained by their available income, time, mental and physical energy. Thus in the model, individuals maximize their utility subject to an income and an effort constraint. We next describe each constraint. The income constraint is given by

$$p_1x_1 + p_2x_2 + \ ... + p_nx_n \leq M, \qquad [2]$$

where p_i is the price of food item i, x_i is its quantity and M is the income allocated to food consumption in a given period. The effort constraint takes the form

$$e_1x_1 + e_2x_2 + \ ... + e_nx_n \leq E, \qquad [3]$$

where E is the total effort expendable in period t for food consumption and e_i indicates effort, that is, the time, physical and mental energy required to choose, obtain, prepare and consume one unit of food item i.

3 EXTENDING AND APPLYING THE MODEL

In this section we discuss which policies could help to nudge food consumption towards greater environmental sustainability. Here we take advantage of the model developed in the previous section. In particular, the comprehensive identification of the five modes of being which constitute the building blocks of the utility function allows us to structure the literature in a novel way and with a broad perspective.

Drawing from the model and the literature, we identify several avenues through which a benevolent libertarian regulator could help decrease the environmental impact of food consumption. Some of these are well known such as the provision of information, the use of environmental taxes and subsidies, as well as the redesign of the current agricultural policy. Others like manipulations of the food and eating environment are, to the best of our knowledge, new to the sustainable food discussion even though they have figured prominently in the recent discussion on how to nudge individuals towards healthier eating habits and fight obesity (section 3.1). We then examine, as an illustrative example, the case of individuals who want to shift towards a vegetarian diet for either moral or health reasons, but suffer from bounded self-control and cognitive biases and are subject to habits and social pressures that can make the adoption of such a diet difficult (section 3.2).

3.1 Policies to encourage sustainable food consumption: Adding the food environment to the model

In our model, identity, self-image, social norms, bounded self-control and bounded rationality act as crucial contributors to the utility from food consumption and together with the income and effort constraints determine consumers' food consumption choices. The model suggests that since food choice and intake is affected by a multiplicity of factors, there is also a multiplicity of potential instruments to steer food consumption towards greater sustainability. We examine these instruments in this section.

Let us go back to equation 1, which defines the utility from food consumption

$U = p[u(X_t, A)] + s\left[I_G - (X_t - X_G)^2\right] + m(A)[I_{ideal} - \left(X_t - X_{ideal}(K)\right)^2\Big] + h * \delta(A)\left[I_H - c\left(X_t - X_H(K)\right)^2\right] - z(X_t - X_{t-1})^2$ and to the income and effort constraints $p_1x_1 + p_2x_2 + \ ... + p_nx_n \leq M$ and $e_1x_1 + e_2x_2 + \ ... + e_nx_n \leq E$.

Policies to help shifting food consumption towards greater sustainability tend to focus on the provision of information K, for instance through various labeling schemes such as eco-labeling and carbon footprint labeling. Certainly information can be crucial, especially when the consumer is faced with credence goods such as organically grown or animal-welfare friendly food. Reliable provision of information creates the conditions for market in these goods to develop. (See e.g. Costa et al. 2009.)

The provision of information has also been and still is very important in transmitting the main message found in the scientific literature that a sustainable diet should include a much lower amount of dairy products and meat, especially beef and pork, compared to the average diet in most developed countries (see e.g. Carlsson-Kanyama & Gonzales 2009, Garnett 2011). Such information can help shape individual food consumption ideals $X_{ideal}(K)$. However, the provision of information is of limited help in changing food consumption patterns if the other elements that affect food consumption, as illustrated in our model, are not taken into account in policy design.

One such element is the budget constraint. Internalizing the negative externalities from food production into the price of food items is possibly the policy with the greatest potential impact but also the one most difficult to implement for political reasons. Such internalization would require fundamental changes in agricultural policies with a focus on the redesign of existing subsidy schemes coupled with taxation of greenhouse gases including methane, a key pollutant associated especially to beef and milk production. We do not discuss further these policies.

Looking at income, it is well known that as income increases so does consumption of meat and dairy products; in other words, meat and dairy products are normal goods. Several authors express worry that income increases will lead to higher levels of consumption of meat in developing countries such as India and China, thus significantly increasing the environmental impact of food consumption worldwide. However, there appears to be a failure to fully appreciate how much food consumption is driven by social norms and other cultural factors. (York & Gossard 2004.) Social norms and identity considerations are strictly related to meat consumption (see e.g. Potts & White 2008, Roy 2002). Thus sustainable food policies should also target these norms.

In our model, food consumption is affected by visceral factors. They affect the ability of individuals to exercise self-control. The economic-psychological literature on food consumption and health offers some important insights into how the food and eating environment can either mitigate or enhance the impact of bounded self-control, bounded rationality and food-related social norms. Much in the same way as appropriate manipulations of the food environment can help nudge consumers towards healthier diets, they can nudge consumers to adopt more sustainable dietary practices. In fact, this literature has important implications for sustainable food policies for three main reasons. First, the key health-motivated dietary changes towards which individuals are being nudged for health reasons, such as reducing the amount of meat and dairy consumption and increasing the consumption of vegetables and fruits, are consistent with dietary changes towards greater sustainability. Second, health policies not only aim at changing the mix of food consumed by individuals but also their overall quantity in an effort to fight obesity. Such overall reduction in food consumption would also benefit the environment (Michaelowa & Dransfeld 2008). Third, a better understanding of the role of bounded self-control and bounded rationality on food-related behavior could help find ways to reduce food waste levels in households as well as in cafeterias.

Given the limited impact of the provision of information and the formidable obstacles towards a reform of agricultural policy or the introduction of environmental taxes, the use of manipulations of the food and eating environment should be taken into serious consideration. In fact, they would be easier to implement and in most cases would not restrict freedom of choice.

By food environment we mean the way food is served, packaged, labeled, placed, or made in any other way salient (Just & Payne 2009, S51). With the term eating environment we indicate the effort related to getting the food, the social interactions present during food choice and intake, and non-food related environmental factors such as lighting, the presence of music and other distractions (Wansink 2004, 456).

Let $D = (d_i, d_2, \dots, d_n)$ be a vector that portrays the features of the food environment associated respectively with the choice and intake of food items *1, 2,..., n* at time *t*. These features could be for example the degree of salience of item *i* in the food environment, the people item *i* is consumed with, the proximity of item *i*, the container it is served in, etc.

From the psychological literature, we know that the food and eating environment:

1) provides cues such as size of bowls, plate, serving utensils, etc. that affect food intake $X_t(D)$. Individuals in fact are imperfectly able to monitor their intake due to cognitive biases and rely on such external cues. (See e.g. Wansink, Ittersum & Pantier 2006.)
2) affects the perception of the social norms related to food volume intake $X_G(D)$ through cues such as portion and packaging sizes (see e.g. Wansink, Just and Payne 2009, Wansink & van Ittersum 2005, Wansink & Kim 2005, Wansink & Cheney 2005, Wansink, Painter, & North 2005, Wansink 2004), the

degree of variety and organization of assortments (Kahn & Wansink 2004), and the behavior of eating companions (see e.g. Herman et al. 2003, Salvy et al. 2007, Sorensen et al. 2007).

3) can augment the intensity of visceral factors $A(D)$ through increased exposure to tempting stimuli by making some foods more salient (see e.g. Wansink, Painter and Lee 2006, Chandon and Wansink 2002) or by increasing distractions (Paquet et al. 2005).

   This in turn i) affects the level of hedonic utility $u(X(D), A(D))$; ii) causes "*a good-specific collapsing of one's time perspective towards the present*" thus decreasing the discount factor $\delta(A(D)) = \frac{1}{1+r(A(D))}$ (Loewenstein 1995); iii) can affect the weight given to moral norms $m(A(D))$ by narrowing the individuals' focus on themselves thus undermining altruism (Loewenstein 1995) or iv) simply deplete the individual's strength to resist temptation (ego depletion) (Baumeister 2002, Baumeister et al. 2008).

4) affects the effort, that is the time, mental and physical resources needed to obtain and consume a unit of a given food, that is, $E = (e_1(d_1, \dots), \dots, e_n(d_n, \dots))$, for instance by the use of default options or a relocation of food items in cafeterias.

When these effects are incorporated into the utility maximization problem, the utility function becomes:

$$U = p[u(X_t(D), A(D))] + s[I_G - (X_t(D) - X_G(D))^2] + m(A)[I_{ideal} - (X_t(D) - X_{ideal}(K))^2] + h * \delta(A(D))[I_H - c(X_t(D) - X_H(K))^2] - z(X_t(D) - X_{t-1})^2$$

and the effort constraint

$$e_1(d_1)x_1 + e_2(d_2)x_2 + \dots + e_n(d_n)x_n \leq E.$$

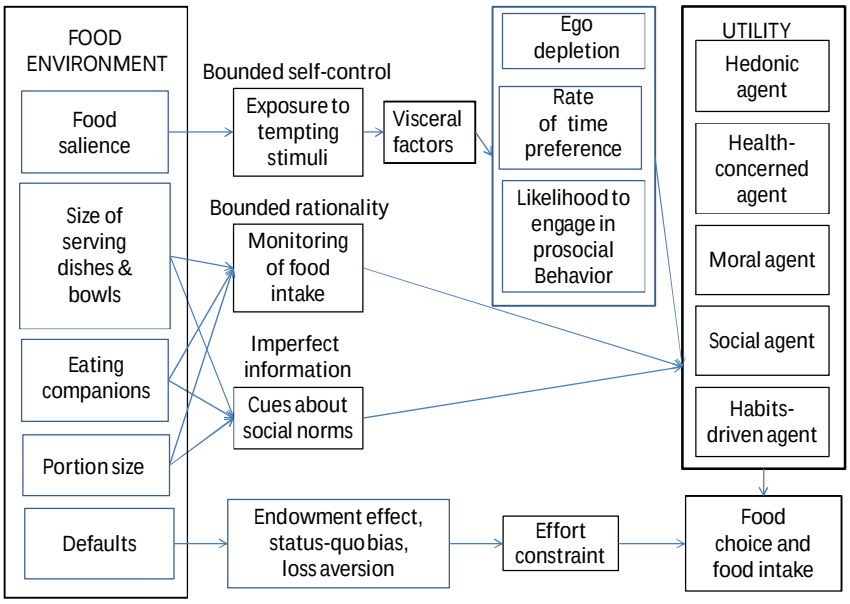

Figure 1 The impact of the food environment on food consumption

Figure 1 illustrates how the food environment affects the five elements of the individual utility: hedonic, health-oriented, moral, social, and habits-driven. In summary, manipulations of the food and eating environment can play an important role in affecting eating behavior especially in the case of food consumed away from home such as during school lunches (Just & Wansink 2009, Just et al. 2008). Awareness of the impact of the food and eating environment can also help individuals to better stick to their ideal diet by suggesting ways to redesign their own environment.

3.2 Applying the model to the adoption of a vegetarian diet

In this section we apply the model to examine the incentives and obstacles to the adoption of a plant-based, "vegetarian" diet given that scientific literature suggests this diet to be more sustainable due to the great environmental impact from the production of beef and pork (see e.g. Carlsson-Kanyama 2009, Garnett 2011, Xue & Landis 2010). Here the word vegetarian is used in a loose meaning in line with a major result in the literature that individuals who identify themselves as vegetarian may sometimes eat meat (Gossard & York 2003).

It is generally concluded that individuals adopt a vegetarian diet mostly for health or animal-welfare related reasons (see e.g. Fox & Ward 2008, 2008b). In other words becoming vegetarian is strictly linked to the health-concerned and the moral agent modes of being rather than to the hedonic, social or habit-driven agent modes. Lack of social support and the effort needed to eat well as vegetarians appear to be an important determinant for resuming a non-vegetarian diet (Barr & Chapman 2002, 358). This suggests that group norms X_G and the effort constraint play a key role in this type of dietary change. For an aspiring health- or ethical-vegetarian shifting to a vegetarian diet is likely to reduce either the adverse health effects of a diet too rich in animal fats $\delta(A)h\left[c\left(X_t - (X_t - X_H(K)\quad\right)^2\right]$ or the disutility from deviations from one's moral ideal $(X_t - X_{ideal}(K))^2$. Nevertheless such dietary change entails a disutility from deviating from old habits $z(X_t - X_{t-1})^2$ as well as a possible disutility $(X_t - X_G)^2$ if the new diet clashes against the social norms of the individual's reference group. For instance, in developed countries meat, especially red-meat consumption tends to be seen a masculine (Kubberød et al. 2002, Sobal 2005). Reducing or eliminating meat intake may cause a disutility to men when their salient reference group is other men.

Visceral factors can make it difficult for the consumers to stick to this ideal, if they like meat and the food environment makes meat salient. Also the mental and time effort required to learn how to cook balanced and appealing vegetarian food is likely to increase.

4 Conclusions

This paper presented a novel model of food consumption that recognizes the roles of identity, moral and social norms, habits, bounded self-control and bounded rationality as crucial contributors to the utility from food consumption. These contributing factors, together with the income and effort constraints, determine consumers' food consumption choices. The model suggests that since food choice and intake are affected by a multiplicity of factors, there is also a multiplicity of potential instruments to steer food consumption towards greater sustainability. Notwithstanding this fact, research on sustainable food consumption policies has tended to focus only on a subset of these instruments such as the provision of information, subsidies and taxes.

On the other hand, there has been little attention on the use of manipulations of the food environment as policy instruments. This is surprising since there is a very abundant economic-psychological literature on this topic within the debate on policies to fight obesity and nudge consumers towards healthier diets.

This paper by modeling the complexity of food choice pointed out at novel possibilities for policy interventions and attempted to cross-fertilize the literature on sustainable food consumption with the contribution from the psychological literature on food and health.

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