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Determinants of food demand and the experienced taste effect of healthy labels – An experiment on potato chips and bread☆

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ABSTRACT

This paper examines the importance of taste and health in food demand, as well as the effect on consumers' experienced taste of the non-intrinsic value of healthy labels. Our analysis is based on taste experiments and Vickrey second price auctions on potato chips and bread. Our findings imply a large positive effect on demand, as measured by willingness to pay, for potato chips from higher taste scores. The estimated effect from taste on bread demand is smaller, but may be sizeable for subgroups of consumers. Our evidence suggests that demand for chips and bread may be positively affected by the healthy label, but the effect is not statistically significant when one control for taste. Finally, we find that consumers' experienced taste of a food is unaffected by the food carrying a healthy label.

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1. Introduction

The prevalence of diet related illnesses, such as cardiovascular disease, diabetes, several types of cancer, as well as the conditions of overweight and obesity, has become one of the most important public health issues throughout the Western world and many transition economies. Public and private institutions are therefore making efforts to promote healthy eating, e.g., via information campaigns, food labeling and tax reforms.

When aiming to promote healthy eating, it is important to help consumers identify healthy products, e.g. via food labels. Further, consumers typically state taste to be the most, or amongst the most, important determinants of food choice (Lennernas et al., 1997; Glanz et al., 1998), suggesting that it is important to ensure that healthy products are tasty. Promoting a tasty supply of healthy food may be difficult, though, since taste is enhanced by ingredients that are perceived as unhealthy (i.e. often over consumed) – fat, sweeteners and salt (Drewnowski, 1997a, 1997b). To our knowledge, there are no studies quantitatively examining the importance of both taste and health to food demand.

An additional potential obstacle to developing a tasty healthy food supply is the possibility that consumers expect unhealthy food (i.e. food high in fat, sweeteners and salt) to taste better: for instance, Raghunathan, Walker Naylor and Hoyer (2006) show that consumers' experienced taste pleasantness of food is higher for food *portrayed* as unhealthy, compared to the exact same food when it is not portrayed as unhealthy. There are, however, no previous studies analyzing the impact on food demand of the non-intrinsic value of healthy labels commonly used by food producers (i.e. labels indicating that food is healthier than its alternatives).[1] If people experience lower taste for food that carries healthy labels, labeling food as particularly healthy may have unintended negative effects on food demand, i.e. it may even discourage people from buying the healthy food.[2]

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[1] This differs from Raghunathan, Walker Naylor and Hoyer (2006) who analyzed if consumers' experienced taste was affected by the food being portrayed as *unhealthier* than its substitutes. Our study is also related to two recent studies by Norton, Fryer and Parkinson (2013) and Wan-chen et al. (2013), although our study differs in important dimensions from theirs. Norton, Fryer and Parkinson examine the impact on product "liking" (i.e. a measure likely to be composed by both consumer perceptions of health and taste) from labelling a chocolate as lower in fat. Wan-chen et al. analyze the impact on taste perception, and perceived healthiness of an organic label, and found that consumers often perceive organic products as healthier, but not necessarily tastier. Both Norton, Fryer and Parkinson and Wan-chen et al. also collect measures of WTP for the products. However, in both studies, the price measure is stated (i.e. not revealed), and product characteristics, such as health and taste, as determinants of the price are not examined.

[2] Utility from a product is generally assumed to only depend on the product's intrinsic characteristics and preferences of the consumer: taste should only depend on the

The purpose of this paper is twofold: first, to quantitatively examine the revealed impact on willingness-to-pay (WTP) for food of a healthy label and taste. Second, we examine if the non-intrinsic value of the healthy label affects consumers' experienced taste from food.

Our analysis is based on experiments entailing potato chips and bread. Subjects' demand, as measured by WTP, for potato chips and bread is extracted via experimental Vickrey second price auctions (Vickrey, 1961; Shogren et al., 2001), and the impact of healthy labels on subjects' experienced taste from food is extracted via taste experiments, where the healthier alternative appears twice; once labeled and once without the label. Our results imply that food demand is strongly determined by peoples' taste experience of food. We further explore the idea that the importance of taste may differ over consumer groups, and our evidence suggests that taste is especially important in determining demand for normal weight subjects. For bread, taste also seems more important to subjects who classify their overall food intake as unhealthy/less healthy and have a higher level of education. We do not find a statistically significant impact of nutrition (represented by healthy labels) on food demand, for any consumer group. Our results also imply that consumer's experienced taste from food is unaffected by the non-intrinsic value provided by a healthy label.

The paper is structured as follows. Section 2 describes the data and experimental design, Section 3 provides the results and Section 4 provides a final discussion of the findings.

2. Data and experimental design

A market research company recruited 63 subjects from the Stockholm area, of different ages, education, income and gender. Subjects were offered a general gift card SEK 100 to participate in the taste experiment and Vickrey second price auction. The study was estimated to take between 15 and 20 min of subjects' time.

The subjects were asked a number of background questions (see the survey questions in Appendix B). For instance, subjects were asked to classify their food intake as "not healthy", "less healthy", "healthy" or "very healthy", and their weight (underweight, normal- or overweight). We created a dummy variable for subjects that classified their food intake as not healthy or less healthy (not healthy or less healthy = 1; healthy or very healthy = 0) and a dummy variable for subjects that assessed themselves as underweight or normal weight (under- or normal weight = 1; overweight = 0).[3] We also created a dummy variable for low income earners (low income earner = 1; higher income group = 0). The average taxable labor income in Sweden 2010 was EUR 25,183/year (SEK 241,000/year[4]) for those 20–64 years of age. We define those with an income of EUR 25,183/year or less as low-income earners. For a detailed summary of subject characteristics, see Table 1 below.

Table 1
Subject characteristics.

Characteristic	Percent of subjects	No of obs
Female	48.4	62
Perceived healthiness of diet		
Unhealthy	1.6	61
Less healthy	24.6	61
Healthy	67.2	61
Very healthy	6.6	61
Perceived body weight		
Underweight	4.9	61
Normal weight	63.9	61
Overweight	31.1	61
Income		
Annual income < average	34.9	60
Highest level of education		
High school	21.7	60
College/university	56.7	60
Other post high school education	21.6	60
Age	41 years (both average and median)	59

Table 2
Subject characteristics in the empirical analysis.

Variable	Mean	Min	Max	No of obs
Female[a]	0.484	0	1	62
Unhealthy diet[a]	0.254	0	1	63
Normal (or under) weight[a]	0.689	0	1	61
Over weight[a]	0.311	0	1	61
Low income[a]	0.349	0	1	63
College/university[a]	0.567	0	1	60
Age	41.339	22	60	59

[a] This variable is a binary variable, i.e. the mean value of the variable is equal to the fraction of subjects for which the variable takes the value 1. For instance, for the variable "Female", this fraction is 0.484. Since the "Female" variable takes the value 1 if a subject is female; zero otherwise, this means that 48.4% of subjects in the empirical analysis are female.

In our empirical analysis, we use the variables in Table 1 as a basis. Due to our limited number of observations, we merge some of the variables for perceived healthiness of diet and body weight to keep the number of explanatory variables reasonable, see above and Table 2.

The taste experiments for potato chips and bread were designed as follows. Subjects were brought into a room in groups of 15–20 subjects at the time. The subjects were asked to rate the taste of five different potato chips alternatives on a scale from 1 ("very poor") to 5 ("very good"). The chips alternatives were presented on several tables in the room, in equal white cups, labeled A, B, C, D and E, where alternative B was labeled "low fat, 7.5%". Each participant was assigned a seat at one of the tables and the order of the cups (A–E) on the tables across the room was varied. The chips alternatives they were asked to rate were all of the flavor sour cream and onion. Unknown to the subjects, alternative B and D were actually the same potato chips alternative (i.e. the low fat alternative), but it was only labeled as low fat when it appeared as alternative B.

For bread, the taste experiment was designed correspondingly, except here subjects had four alternatives they were asked to rate and alternative B was labeled with a healthy label – the Nordic Keyhole. The Nordic Keyhole is a label certified to particularly healthy food alternatives by the Swedish National Food Administration (SLV), and is widely recognized by the general public. The criteria for certification vary over food products, and for bread to be certified with the Keyhole, it needs to contain moderate amounts of sugar, salt and fat, while being high in fiber. Unknown to subjects, alternative B and D were

ingredients in a food product and the individual characteristics and preferences of the person eating the food. However, other studies show that non-intrinsic attributes of a good (price, brand, etc.) can affect reported or experienced taste (e.g. Plassman et al., 2008; Robinson et al., 2007; Lee, Frederick and Ariely, 2006; Allison, 1964). For instance, Plassman et al. (2008) find that consumers' experienced taste pleasantness of wine increases with the stated price of the wine, regardless of the actual quality or market price of the wine. Their results were confirmed both by stated pleasantness and measuring brain activities by a functional MRI.

[3] Note that we below refer to the subjects for which this dummy variable takes the value 1 as "normal weight", since only three of our subjects perceived themselves to be underweight. Note that the variables on body weight and healthy eating are subjects' perceptions of themselves and their behavior, i.e. they may deviate from their actual eating habits and body weight. Studies show, for instance, that women often overestimate their actual bodyweight, whereas men often underestimate their bodyweight (Brug et al., 2006; Kamel and McNeill, 2000). Behavior is, however, likely to be guided by perceptions, rather than actual eating habits and body weights.

[4] On 26th of December 2014, the exchange rate EUR/SEK = 9.57.