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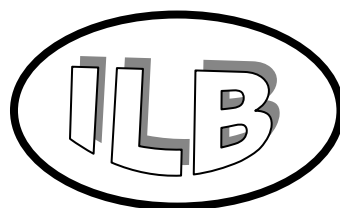
# **System Dynamics and Innovation in Food Networks 2010**

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## Naturalness and Consumer Choices: The Case of Microfiltered Milk

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### **Abstract**

Food is a very sensitive area and the most intimate form of consumption. Consumer choice is known to be strongly affected by emotional factors usually not taken into account in economic analysis. At the same time it is clear that such emotional factors can affect consumer behaviour and market reactions above all when there are scandals and concerns.

One of the emotional aspects that seems to dominate consumer behaviour in the food sector is so-called magical thinking which leans on two different pillars: the contagion principle and the similarity principle. The contagion principle affects the concept of naturalness which, according to cognitive psychologists, is a key factor in determining consumer preferences. The main element stemming from this psychological approach is the generalised superiority which characterises those foods which are perceived as natural by consumers. It has also been observed that the specific kind of processing as well as the adding or subtracting of unnatural elements can modify the perception of naturalness and the degree of acceptability for food products.

A survey which bore all such considerations in mind was conducted on a sample of 180 people interviewed shortly after their shopping trip to super- and hyper-markets in the province of Naples. A questionnaire was submitted to sample in winter 2009. The questionnaire collected information about the perception of naturalness and its role in determining consumer preferences for different food products and different kinds of processing. A specific section of the questionnaire covered a case study and gathered information about the willingness to buy a specific food product: pasteurized and microfiltered fresh cow's milk. This product has the same nutritional qualities and the same taste as fresh pasteurized cow's milk, but has a longer shelf-life due to specific technology.

On the basis of the results and by using a binary model, consumer willingness to purchase the specific milk was estimated. The findings permit an analysis of the role that both different types of product processing or manipulation and the various forms of innovation can play in determining levels of trust and modifying the discrepancy between objective and perceived quality.

**Keywords:** *food technology, consumer perception, contagion principle*

### **1 Introduction**

In the last 20 years the agri-food sector has undergone a profound restructuring process and change whose most evident signs are progressive widening and diversification of product supply, the establishment of new technologies, the pervasiveness of Large Distribution Groups and, lastly, the increase in the distance between the production phase and final consumers. The changes within the agri-food sector are part of a wider development process in modern Western societies which has permitted, especially in the sociological field, a clear break to be postulated between the modern and the so-called postmodern (Giddens, 1994). One of the signs of this break would be the rapid decline in the categories customarily used to describe society and consumers: the customary income-price binomial appears to have been replaced by concepts of language and communication (Fabris, 2003).

To be specific, income no longer appears to be a basic element for consumption, since in modern developed societies consumption takes place without a direct connection with needs, and *status symbols* are no longer sought, but rather *style symbols* (Fabris, 2003; Luhmann, 1996). It is no accident that several authors share the idea that the stratified society, divided into classes and differentiated by behaviour and lifestyles, no longer reflects reality. The pyramidal structure appears to have been replaced by an onion-type structure, with narrow top of privileged consumers and a small, very low-income base. In the middle is an enormous middle class whose objective is that of differentiating itself by seeking its own lifestyle. The decline of the income-price binomial and society's pyramid structure has entailed the loss of centrality of production within the economic system. Attention has shifted towards consumption and importance is assigned to action applied by *consumption significance and supply significance*<sup>1</sup>. In this sense postmodern societies are faced with the paradox of being the least materialistic in history. Indeed, the dematerialization of products and the rise of their symbolic and communicative value have transformed products into means of communication and have shifted competition onto the plane of messages. Hence the success of a product is now closely linked to what it communicates.

By adopting this interpretation to explain consumption dynamics, economic analysis has to tackle the problem of seeking new variables to apply alongside those traditionally used (Beardsworth, Keil, 1997; Verneau, 2007). This need appears especially important for food products which have a high symbolic valency and for which the concepts of *consumption significance and supply significance* appear particularly useful.

In light of the situation described above, this paper is a preliminary attempt to import into the economic paradigm some new interpretations developed by anthropology and by modern cognitive psychology, with a view to explaining consumer food choice behaviour. The main concepts that will be developed and used are those of *the contagion principle, magical thinking* and the so-called *natural superiority of the natural* (Rozin, Royzman, 2001). These concepts will be used to verify, on a sample of consumers, whether or not the naturalness of foods is one of the factors that steer consumption choices. Referring to a specific case study of microfiltered milk, using a binary choice model, we will seek to verify whether the perception of food naturalness affects the probability of entering the specific market of microfiltered milk.

## 2 The principle of *magical thinking* and the concept of naturalness

Among the theories stemming from anthropology and explicitly dealing with the food-quality binomial, underlining the symbolic and archetypal values of food itself, a key role is occupied by so-called *magical thinking*. Claude Fischler observed that diet is the most intimate form of consumption and that in the relation with food there is a behavioural paradox which generates anxiety. It has simultaneous connotations of demand for novelty (neophilia) and great caution, at times aversion, concerning the new, the unknown (neophobia): eating means incorporating, taking food inside oneself, within the confines of one's own body (Fischler, 1990).

The explanation offered is that mental functioning, especially in the case of diet, is deeply affected by a mechanism known to anthropologists as *magical thinking*. This type of mental functioning is defined as primitive, intuitive and archetypal. The first anthropologists to

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1. This is only a rough translation of Fabris' expression : "domande di significato e offerte di significato" which means the different significances and values sent out by consumers and firms by means of goods production and consumption.

describe this mental process were Frazer and Mauss who analyzed *magical thinking* with reference to two distinct principles: the *contagion principle* and that of similarity (Frazer, 1934; Mauss, 1950; Malinowski, 1948).

The contagion principle may be summarised with the slogan *once in contact, always in contact*: contact with an object considered impure will convey impurity to the person, who cannot be liberated without recourse to some purification ritual. By contrast, the similarity principle is based on the idea that representation of the object is the same as the object itself. When it comes to diet, the two principles of contagion and similarity on which the idea of *magical thinking* is based converge in the belief “we are what we eat” (Fischler, 1990; Fischler, 2007).

The contagion principle is revisited, and assumes a fundamental role in the thought of the psychologist Paul Rozin. It is often considered as the key to interpret many inquiries, especially those focusing on the preference for the *natural* (Rozin, 2005). The basic idea of this principle is that when two products are touching, the “essence” passes between them and leaves a permanent trace (“*Once in contact, always in contact*”). The contagion concept perhaps offers the most singular example of *propensity for the negative*, according to which the negative elements are stronger than their positive counterparts and, given two inverse events, negative and positive, of the same magnitude, the negative event is more powerful than its positive counterpart. The contagion principle and that of propensity for the negative explain why contact with substances/processes perceived as impure may reduce the desirability of food products.

*Natural* is an attribute which generally seems to improve the perception of each item to which it is applied. It may be understood as a manifestation of what Kellert and Wilson describe as “biophilia”, an innate desire to concentrate attention upon forms of life and on all that recalls it, and in some cases to be affiliated emotively (Kellert, Wilson, 1995). The preference for the *natural* seems particularly important in the case of diet and usually *natural* foods are considered more desirable than *non-natural*, “artificial” or “transformed” foods.

According to the literature, in many cultures including the dominant cultures in the West such as the USA, France, the UK, Italy and Germany, the adjective *natural* associated to food is considered extremely positive and is often treated in contrast to genetic engineering applied to food products. In confirmation, in the USA and Europe the term *natural* is frequently used in the labelling of fresh or processed food products. In a recent survey conducted on a sample of US consumers it emerged that 96% of the interviewees agreed with the statement that “*natural* is a positive attribute”, and 57% were willing to pay twice as much for natural food (Rozin, 2006).

Further confirmation of the positivity assigned by individuals to the term *natural* comes from a recent survey by Mintel, according to which *natural, healthy and pure* were the most commonly used terms in new food and drink product claims worldwide in 2008, while the use of such terms accompanying new product launches such as *more vitamins and minerals* or *less fat and fewer calories* had fallen sharply, appearing on only 5% of new products in 2008, representing a fall of 20% over the previous year (Mintel, 2009). The changes are not only indicated by advertising techniques but also by market trends. In the UK one of the most important consumption trends is the growing demand for local, natural and fresh products, and similar observations have been made in other European countries such as France, Switzerland, Ireland and the Netherlands (Zelman, 2008).

The degree of naturalness possessed by a product is affected, in the perception of consumers, by several factors that may be classified as follows:

- the type of food;
- the addition/removal of natural or unnatural substances;
- the type of processing undergone by the product;
- the use of genetic engineering.

Studies conducted on the concept of naturalness seem to assign greater agreement to food of plant origin compared to that from animals, especially red meat. In this respect, both the scientific literature and daily accounts show that certain foods are more capable of generating concern: for example, animal products are typically perceived as more hazardous (Ferrières, 2004; Fischler, 1990). At the same time, meat is the most desired foodstuff worldwide: no documented society is completely vegetarian and in all cultures most of the prohibitions and all of the most stringent individual aversions concern meat (Ferrières, 2004; Fischler, 1990).

The types of food product processing that entail even infinitesimal addition or removal of natural or unnatural substances are usually associated to a loss of naturalness. This is greater when addition or removal concerns ingredients believed to be non-natural such as additives or preservatives. The production process that a food product undergoes appears to play a decisive role on the perception of naturalness, and in many respects the process seems to prevail over the same product content. In other words, the history of a product prevails in determining its naturalness against the nature of the content itself. In particular, chemical rather than physical changes compromise the judgement of naturalness.

Finally, insertion of a gene from another species, to produce genetically modified products, results in the most marked decline of naturalness. By contrast, hybridisation and crossing among different species and races, activities that ultimately lead to changes in the genotype and phenotype, are considered less damaging to the reduction of naturalness (Cembalo et al., 2003; Sjöberg, 2000a; Rozin, 2005).

### **3 Empirical analysis**

#### *3.1 Field survey*

The aim of this work was to insert into the economic analysis of consumer behaviour the variables highlighted by the modern social sciences and assess to what extent they affect processes of food product choice. For this purpose we carried out a field survey focusing on the theme of naturalness and specifically analysed microfiltered milk. The case in question thus involves the problem of removing elements from a specific product through a physical process. The process in question allows an end-product to be obtained with a longer shelf life. The survey was carried out in January 2009 and was effected by administering a questionnaire to a sample of 180 consumers with household shopping responsibility, recruited randomly on every day of the week and at different times. The survey participants were interviewed by the pay-out desks in two hypermarkets in the province of Naples.

The questionnaire consisted of five parts. The initial question was designed just to select families which were habitual milk consumers. The first part of the questionnaire was introductory, aiming to record the importance attributed by the interviewee to problems of a general nature, all linked to the theme of food safety. Section two, preceded by the operative definition of naturalness, aimed to assess to what extent the opinion on the degree of naturalness, defined on a Likert scale from 0 to 8, was linked to a series of factors which in the literature are held to be important in choosing foods (Sjöberg, 2000b; Eiser et al., 2002; Cembalo et al., 2003): first of all, this concerned processing/manipulation such as addition/removal of natural and non-natural ingredients, physical and chemical processing, the use of biotechnology (GMOs) and irradiation; secondly, with reference to the type of food and processing, inter-

viewees were asked to express their opinions on a set of 25 plant, dairy and meat products, with different degrees of processing and obtained with the use of various production technologies, such as those which permit out-of-season production of fruit and vegetables. Continuing to use the Likert scale, the interviewees were asked to make a comparison between nine pairs of products which undergo addition/removal of substances. Section two concluded with evaluation of the perception of possible risks and benefits linked both to natural foods and to those processed (Rozin, 2005; Brunel, Pichon, 2004).

Part three of the questionnaire was devoted more specifically to the problem of consumer choices. First of all, the interviewees were presented with alternative products. The importance which they attributed to some specific attributes, given the same price and sensory characteristics (flavour, consistency), was highlighted. Overall, six alternatives were analysed: organic apples vs. zero-residue conventional apples, conventional sweet corn vs. GM sweet corn, fresh cheese vs. fresh cheese with a low cholesterol content, conventional onions vs irradiated onions, cooking salt vs. cooking salt enriched with iodine, orange juice vs. orange juice with added vitamin C. The purchase scenario was then hypothesised for microfiltered, describing the characteristics and technological process adopted to produce it and stressing that microfiltration:

- is a physical process that leads to almost total removal of somatic cells, equivalent to 99.8-99.9% of the total bacterial load, 99.95% of the load of *Bacillus cereus*;
- has no adverse effects upon nutritional or sensory quality or on the physical and chemical properties of milk;
- allows milk to be obtained with a shelf-life of two weeks, considerably longer than that of the traditional type of fresh pasteurised milk (5-6 days).

At the end of the scenario, the interviewees were asked whether they were interested in consuming the product, thereby taking part in the market.

Section four of the questionnaire contained a series of control questions to evaluate the reasons that had driven the interviewees to enter this potential market or otherwise, and to characterize with precision the fears linked to the use of microfiltered milk. The fifth and last section was designed to evaluate the socio-demographic characteristics of the interviewee and his/her family.

### 3.2 Survey results: explorative analysis

The data gathered in the survey confirm what was already highlighted in other studies regarding the relations between perception of naturalness on the part of consumers and factors concerning product type and the processing/manipulation involved. On analysing the distribution of the responses on the scale from 0 (not at all natural) to 8 (completely natural) with reference to different types of manipulation (tab. 1) it emerges that:

the addition of ingredients *per se* does not affect the opinion of naturalness, but the degree of naturalness perceived by consumers is linked to the type of ingredient added. Indeed, almost 91% of the interviewees award a score between 6 and 8 to products to which a mix of natural ingredients has been added. As regards food with an added mix of non-natural ingredients, the distribution of responses was very different: only 5% of consumers gave a score of naturalness between 6 and 8;

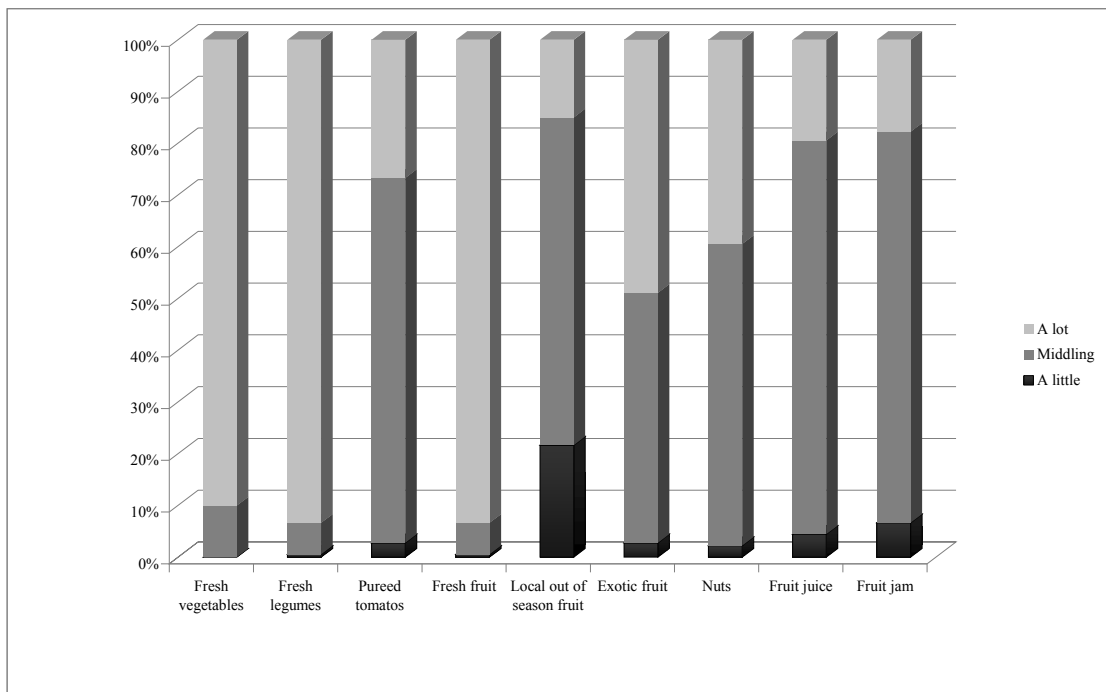
consumers believe that physical treatment affects naturalness less than chemical. Nevertheless, they consider that physical treatment, such as irradiation, substantially reduces the degree of naturalness. Perception of naturalness of irradiated food is similar to that for food that contains GMOs;

opinions on conventional agriculture are very varied. One-third of the interviewed sample gave food from conventional agriculture a naturalness score of less than 6.

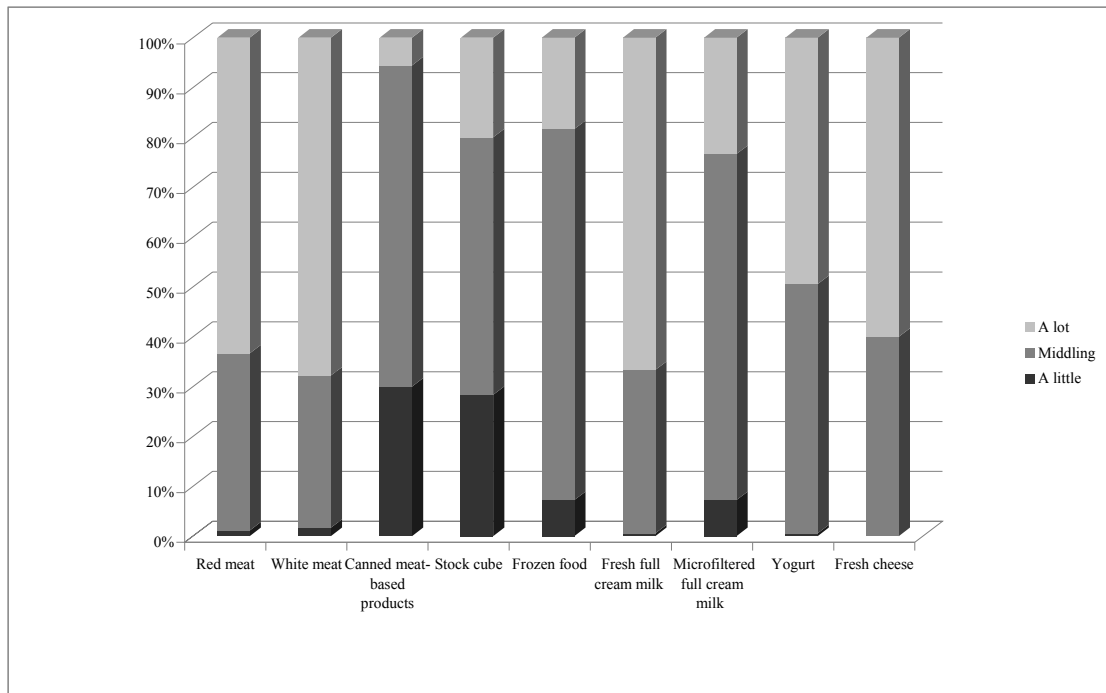
**Table 1.** Degree of naturalness of foods undergoing various types of processing/manipulation: percentage distribution of responses for the attributed score

Score	Addition of a mix of natural ingredients	Physical processing	Chemical processing	Addition of non-natural ingredients	Insertion of a gene from another species	Treatment with irradiation	Conventional agriculture
0	1.7	1.1	13.3	10.0	20.0	16.7	1.7
1	0.6	0.6	8.9	3.3	13.9	20.6	0.0
2	1.7	3.3	23.9	11.1	25.0	25.0	0.6
3	1.1	9.4	26.1	24.4	17.2	20.0	2.8
4	2.2	22.8	14.4	31.1	13.3	9.4	3.9
5	2.2	35.6	6.1	15.0	5.6	3.9	23.3
6	6.7	12.2	3.9	3.3	2.8	1.7	26.7
7	14.4	10.6	1.1	1.1	2.2	0.6	21.7
8	69.4	4.4	2.2	0.6	0.0	2.2	19.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Perception of naturalness is highly differentiated in relation to the type of food and especially in relation to the degree of product processing. In general, processing appreciably affects the judgments (fig. 1). This holds especially when referring to meat, while the differences between fresh and processed products are less substantial when talking of dairy products, especially fresh milk and cheese.







(\*) A little: from 0 to 2; Middling: from 3 to 5; A lot: from 6 to 8.

**Figure 1.** In your opinion, how natural are these foods?(\*)

However, within the various food categories there are very complex opinions for single products. In particular, in the category of fresh vegetables, the processes that enable out-of-season production somehow make “naturalness” more remote, just as exotic products are perceived as less natural. The loss of naturalness is thus not only associated with distancing from the natural course of the seasons, but also with distancing from local production.

To ascertain to what extent the addition/removal of substances reduces the degree of naturalness perceived in relation to various food products, we compared the score that each interviewee awarded the two types of the same food (simple or with the addition/removal of a substance) using the paired-samples T test. The test results (table 2) show that, except for water with or without mineral salts, in the various comparisons made the mean difference among the values attributed to the two variables considered on each occasion is statistically different from zero. The largest differences concern ham, in which the addition of polyphosphates appreciably reduces the level of naturalness perceived, and non-alcoholic drinks, in which the degree of naturalness drops on addition of CO<sub>2</sub> or caffeine. The loss of naturalness is also perceived when addition/removal leads to an improvement in terms of health, as in the case of vitamin C for orange juice or the reduction in the cholesterol content in fresh cheeses.

**Table 2.** Effect of the addition/elimination of substances on the opinion of naturalness. Results of the paired-samples T test.

Comparison	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
stock cube - stock cube with lower salt content	0.278	0.992	0.074	0.132	0.424	3.757	179	0.000
water with mineral salts - water without mineral salts	0.056	1.056	0.079	-0.1	0.211	0.706	179	0.481
yogurt with added cream - light yogurt	-0.394	1.69	0.126	-0.643	-0.146	-3.132	179	0.002
fresh cheese - fresh cheese with low cholesterol content	1.028	1.462	0.109	0.813	1.243	9.428	179	0.000
orange juice - orange juice with added vitamin C	1.189	1.332	0.099	0.993	1.385	11.975	179	0.000
ham added with polyphosphates - ham without polyphosphates	-2.444	1.828	0.136	-2.713	-2.176	-17.936	179	0.000
non-alcoholic drinks with added CO2 - non-alcoholic drinks without CO2	-1.706	1.808	0.135	-1.972	-1.44	-12.653	179	0.000
non-alcoholic drinks with added caffeine - non-alcoholic drinks without caffeine	-1.567	1.718	0.128	-1.819	-1.314	-12.236	179	0.000
mayonnaise - light mayonnaise	0.294	1.289	0.096	0.105	0.484	3.065	179	0.003

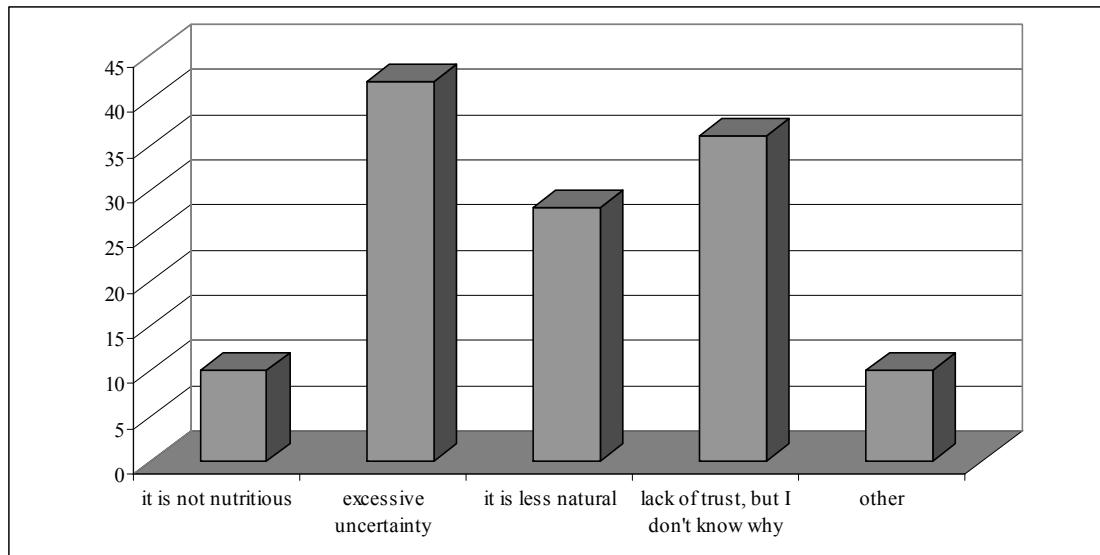
To show in greater detail to what extent the opinion on naturalness affects consumer purchase behaviour, the interviewees were asked to choose among pairs of foodstuffs which, at the same price and with the same sensory characteristics, were differentiated by the type of production process with which they are made or by some added/removed element. The results obtained are reported in table 3 and, compared with other aspects investigated above, lead one to make two reflections:

the concept of naturalness is not necessarily correlated more closely with health criteria. Indeed, health-conscious principles seem to outrank the concept of naturalness. This is particularly evident when referring to cheeses and to orange juice. Faced with a purchase choice, two-thirds of the interviewees prefer cheeses with a low cholesterol content and orange juice with added vitamin C. Yet these are products associated with a lower level of naturalness; purchase choice is largely steered by a concern for food safety and the risks connected with some treatments. This is the case of maize, with 95% of the interviewees choosing conventional maize over genetically modified maize, and onions, with over 94% of the sample stating they were in favour of the conventional product as opposed to irradiated onions. GMOs and irradiation, together with the presence of microorganisms, are the factors regarding which consumers express the highest levels of concern.

**Table 3.** Number of responses in choosing between alternative foods

Product	Frequency	Percent
organic apple	140	77.78
zero-residues apples	8	4.44
no preference	32	17.78
conventional onions	170	94.44
irradiated onions	1	0.56
no preference	9	5
fresh cheese	43	23.89
fresh cheese with low cholesterol content	120	66.67
no preference	17	9.44
conventional sweet corn	171	95
GM sweet corn	1	0.56
no preference	8	4.44
cooking salt	43	23.89
cooking salt enriched with iodine	93	51.67
no preference	44	24.44
orange juice	30	16.67
orange juice with added vitamin C	118	65.56
no preference	32	17.78

The cautious attitude towards the manipulation of food products clearly emerges when we move on to analyse more specifically consumer behaviour in relation to purchasing microfiltered milk. As many as 70% of the interviewees stated they were not willing to buy this product (although 13% of these stated they had bought it in the past). The motivations behind this choice were firstly the excessive uncertainty linked to this type of milk, and secondly the lack of trust, yet without there being a rational explanation underlying this attitude (fig. 2). However, the problem of less naturalness of microfiltered milk is posed by little more than one-fifth of those who would not buy the product.



**Figure 2.** Why are you unwilling to buy microfiltered milk?

On analysing the socio-demographic characteristics of the sample, significant differences emerge in the choice of purchasing microfiltered with respect to:

- age of the purchaser: more than 48% of the interviewees under 30 stated they were willing to purchase microfiltered milk. This figure decreases to 22% for consumers between 30 and 50 years of age, and further to 10% for those over 50;
- the presence of children under 12: 43.5% of families without children under 12 would buy microfiltered milk, compared with 18% of those who have children;
- degree of education: 42% of graduates, 33% of those with high-school diplomas and 9% of those with a lower qualification stated their willingness to purchase microfiltered milk.

By contrast, no link was highlighted between attitude to purchasing this product and the gender of the interviewee, his/her occupation or income level.

### 3.3 Survey results: the econometric model

Since we wanted to evaluate to what extent the variables showing a link with the perception of naturalness affect the decision to enter the microfiltered milk market, we estimated an econometric model that analyses the choice of the individual to take part in the specific market. The statistical model adopted in this work starts from the hypothesis that the population of interviewees at the two shopping malls consisted of two sub-populations, one of which was interested in the purchase of microfiltered milk and the other unwilling to enter this product market.

The dependent or response variable is represented by the event that the consumer is interested in the purchase and consumption of the proposed product. This variable is measured against a set of explanatory or independent variables, extracted from the data emerging from the questionnaire.

In formal terms, the binary models may be expressed as follows:

$$(1) \quad y = \text{Prob}(Y_i = 1) = F(\beta' X_i) \text{ con } i = 1, 2, \dots, n$$

where:

- $Y_i$  is a sequence of independent binary random variables that are equal to 1 when the interviewee is willing to buy the product, 0 otherwise;
- $X_i$  is a vector of the explanatory variables;
- $\beta'$  is a vector of parameters to be estimated;
- $F$  is a known function.

This function usually belongs to a parametric family such as normal, logistic, log-normal and normal logistic. In the case in question it is assumed that  $F$  is distributed as a logistic, and a log-linear Logit analytical procedure is thus used (Kennedy, 1992; Piccolo, 1998).

Given the groups of variables found in this survey, the general theoretical model to which reference is made may be formalised as follows:

$$(2) \ y = \text{Prob} (Y_i = 1) = F (\beta'_{SE} SE_i + \beta'_{NAT} NAT_i + \beta'_{risk} RISK_i)$$

in which:

- $i = 1, 2, \dots, n$  is the index of the interviewees;
- $SE_i$  indicates the group of variables relative to the respondent's socio-economic characteristics, such as education level, income, age, occupation and so forth;
- $NAT_i$  indicates the group of variables regarding the perception of naturalness in relation to food products presented in the questionnaire with low, medium and severe levels of manipulation/processing;
- $RISK_i$  indicates the group of variables that detects the interviewee's perception of risks associated with using manipulated/processed food products.

Descriptive analysis showed that the decision to join the market is connected to the above three groups of factors. The way in which the variables belonging to the three groups operate would depend upon all the socio-economic characteristics that define the profile of the interviewees. For example, we observed that it is chiefly the degree of education which is dependently linked to the variables aiming to represent possible interviewee behaviour. By contrast, *income* and *occupation* variables showed no dependence with purchase behaviour.

In constructing the empirical model we started from a very broad set of independent variables, from which all the regressors unable to significantly explain the behaviour of the dependent variable were progressively excluded. The empirical model which, in terms of significance<sup>1</sup> of coefficients, best estimates willingness to join the microfiltered milk market is as follows:

$$(3) \quad y = \text{Prob} (Y_i = 1) = F (\beta'_{EDU} EDU_i + \beta'_{D1} D1_i + \beta'_{D4} D4_i + \beta'_{AGE} AGE_i)$$

where:

$Y = 1$  if the interviewee is willing to enter the microfiltered milk market, 0 otherwise;

**EDU** = degree of education (1 primary school certificate, 2 middle school certificate, 3 high school diploma, 4 degree);

**D1**= index of naturalness loss. This index was calculated by difference between the average scores awarded to the three products with the lowest degree of processing/manipulation (fresh local fruit, seasonal greens and vegetables, fresh full cream milk) and the average of

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1. Significance is always guaranteed at least at the 95% level.

scores awarded to three products with a higher degree of processing/manipulation (canned meat-based products, frozen ready-to-eat dishes, frozen products). As the interviewees had to express their judgements by adopting a Likert scale anchored to the two extremes (0 and 8), a continuous variable is obtained whose potential field of variation is (-8, 8). The loss of naturalness index measures the intensity of the decline in naturalness perceived in foods between foods with a low degree of processing/manipulation and those with a high degree. Values close to zero show a scant loss of naturalness perceived and values close to 8 underline a sharp decrease in naturalness associated with processed/manipulated products. Finally, possible negative values would indicate inconsistent behaviour on the part of the interviewees who, in this case, would associate products subject to manipulation/processing with an idea of greater naturalness compared with others.

**AGE** = age of the interviewee.

**D4** = risks associated to the use of food products subject to manipulation/processing. This is a dichotomous variable that assumes the value of 1 if the interviewee feels that there is some risk associated with consumption of processed/manipulated products and 0 otherwise.

Overall, the model shows a good explanatory capacity. Indeed, the *prediction and evaluation index* which measures the relation between Y values correctly determined and total Y values observed is 74.43. This means that in 74% of cases the calculated values of Y were the same value, 1 or 0, as the Y observed. the results are listed in table 5.

**Table 4.** Main results of the logit model

Variable	Coeff. $\beta$	Z-Stat	P-Value	Odds Ratio
C	0.8181	0.6803	0.4963	--
Education degree	0.2546	2.0563	0.0399	1.2899
Loss of naturalness	-0.4435	-3.4371	0.0006	0.6417
Age	-0.0563	2.8813	0.0040	0.9452
Risk associated to consumption of manipulated foods	-0.8570	-2.4428	0.0143	0.4244
Total observations	180			
Observations with y= 0	124			
Observations with y= 1	56			
Prediction evaluation (cutoff = 0.5)	74.43			

Source: our survey data

In light of the results obtained, as illustrated above, it may be concluded that the willingness to enter the market of proposed microfiltered milk depends:

- positively on the level of education: in other words, the higher the interviewee's education level the more he/she is willing to take part in the market;
- inversely on the index of loss of naturalness: the higher the index, which captures the intensity in the decline of the perception of naturalness, the lower is the probability of entering the market;
- inversely on the risks associated to the use of processed food products: the higher the risks perceived, the less willing the interviewee will be to purchase the product;
- inversely on age: it is especially the younger consumer categories who show interest in this product.

The two socio-economic variables, age and level of education, show that the propensity to try innovative products in the food sector rises with the average level of knowledge and is higher in the case of a younger public probably still little affected by the set of *a priori* credences which tend to become settled over the years.

The variable that measures the decline of the perception of naturalness, comparing food with low/high degrees of manipulation/processing, is evidence that the concept of naturalness may be considered one of the factors that influences the decision to enter the market of innovative food products. The odds ratio suggests that the declining rate of probability of taking part in the microfiltered milk market for unit increases in the naturalness index is higher than 35%. However, as emerged during the descriptive analysis, the concept of naturalness is not necessarily correlated more closely with health criteria. Indeed, health-conscious principles seem to outrank the concept of naturalness. Rather, purchase choice would appear at least partly guided by the concern for food safety and for the possible risks involved. In this context, the presence among the regressors of the perception of the potential risks involved in using food products with a higher degree of manipulation/processing (Eiser et al., 2002; Hansen et al., 2003, Gaskell et al., 2007) appears consistent with our results. In this respect, however, the use of the variable for potential benefits offered by the same products did not appear statistically significant. This observation appears to be indirect confirmation of the already cited *power of the negative* according to which, given two inverse negative and positive events of the same magnitude, the negative event is more potent than its positive counterpart (Rozin, Royzman, 2001).

#### 4 Conclusions

Our study is a preliminary attempt to import into the economic paradigm several new interpretations developed in anthropology and modern cognitive psychology with a view to explaining consumer behaviour in food choices. The main concepts used were those of the *contagion principle* and the so-called *natural superiority of the natural*.

Using data collected from a questionnaire administered to a reasoned sample of 180 individuals with purchase responsibility, we sought to ascertain whether or not food naturalness is one of the factors guiding consumer choice. In this respect we developed a specific case concerning microfiltered milk: by using a binary choice model we ascertained whether perception of food naturalness affects the probability of entering this specific market.

The approach used and the results obtained allow us to confirm findings from previous studies and offer some interesting cues for discussion. First of all, the survey showed that the concept of naturalness applied in the food sector appears complex and is influenced by various factors such as addition/removal of ingredients and process type, but also by respect for the natural course of the seasons and distance from the production area. In this respect, it is worth recalling that the interviewees associated a high degree of naturalness to in-season fruit from Italy and a low degree of naturalness both to imported exotic fruit and to out-of-season fruit from Italy and/or abroad. In particular, as regards the relation between the opinion on naturalness and purchase behaviour there emerged a sort of outranking of health principles over the concept of naturalness. Indeed, purchase choice appears largely guided by concern for food safety and the risks connected with certain treatments. This applies to GM products and those undergoing irradiation, which represent factors about which consumers express the highest levels of concern.

A cautious attitude to food product manipulation also emerged in relation to buying microfiltered milk among 70% of the sample who stated they were unwilling to purchase this product. Use of the econometric model confirmed that the concept of naturalness and the

contagion principle combine to explain purchase behaviour in the case of microfiltered milk: we observed that the more intensely the loss of naturalness from food processing/manipulation is perceived, the lower is the probability of entering the microfiltered milk market. The presence among regressors of age and education level, on the one hand, point to the importance of *a priori* credences which are progressively stratified in individuals and, on the other, to the capacity to elaborate critically and objectively the available information. Our research thus confirmed the importance of communication and information techniques targeting consumers through claims contained on labels or advertising campaigns, especially when launching innovative new products with considerable use of modern technologies.

Finally, there is a clear need for in-depth investigation into the concept of naturalness and the way in which, even unconsciously, the concept affects consumer attitudes and choices. The idea of naturalness, precisely because of its multidimensional nature and the complex relations linking it to the contagion principle and the opinions expressed by the consumer, should also be developed by recourse to more flexible qualitative tools, such as means-ends analysis, laddering techniques and the use of focus groups.

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