

The Potential Effects of Labeling GM Foods on the Consumer Decisions - Preliminary Results of Conjoint Measurement Experiments in Germany

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1. Introduction

In May 1997, the Novel-Food-legislation of the EU was enacted in order to regulate the characterization of genetically modified organism and food (GM food). Two weeks ago the Council of Ministers agreed on the specific instructions for the application of these regulations. Consequently, specific products must be characterized and labeled in the near future. The consumer than has to decide whether he wants

- labeled genetically modified products,
- labeled products, which are not genetically modified,
- or products without one of these labels.

Our paper presents some preliminary results of an investigation on the potential effects of labeling GM food on the buying decisions. The main method used is the conjoint analysis. We conducted a series of experiments to estimate

- the effects of different labels, product informations and brands on the consumer decision and
- the relations between attitudes and behaviour.

The results of these experiments will lead to some conclusions, which may be relevant for the market introduction strategies of GM food.

2. Survey

At the beginning of the investigation eleven core-interviews have been conducted to obtain

- some basic knowledge of the consumer attitudes on GM food and
- the potential reaction to labeling and information about GM food.

The results of these core-interviews served as a basis for the development of the questionnaires for the main consumer survey.

2.1. Sample

This survey has been conducted in April 1998. The sample consisted of 200 persons, which have been selected at random from two different supermarkets of Kiel. The structure of the samples is shown in chart 1. Three age groups of the interviewed were formed. As can be seen in chart 1 the sample is distorted in favour of younger people. This imbalance may lead to survey results, which slightly overestimate the acceptance of GM food - as we will see later. With respect to gender equal numbers of males and females were interviewed.

Chart 1

Sample Structure				
Characteristics	by age (years)			
by gender	19 - 28	28 - 38	> 38	Total
female	40	27	35	102
male	44	28	26	98
Total	84	55	61	200

2.2. Test program

The test program is shown in chart 2: We divided the total sample in four subsamples A, B, C, and D - each consisting of 50 test persons. In each subsample a specific questionnaire was used. All questionnaires consist of four conjoint-analysis with different products each. Within the test program we analysed

- the effect of different labels like
„Made with genetically modified milk (tomatoes, wheat)“ and
„Without genetical engineering“
- the effect of a pre-information on the Novel-Food regulation
- the effect of the label „New“ on the package
- the effect of a well-known brand name
- the effects of two leaflet information given
by the producer company and
by an environmental conservation group.

The test program is rather complicated. Within this presentation we can not go into the detail.

Chart 2

Test Program																		
Number	1. Conjoint				2. Conjoint				3. Conjoint				4. Conjoint					
Product	Cheese				Tomatosoup				BrandCheese				Bread					
Subsample	A	C	B	D	A	C	B	D	A	C	B	D	A	C	B	D		
Pre-Information NFV		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		
Labels	Made with..		Without gen..		Made with..		Made with..		Made with..		Without gen..		Made with..		Made with...			
Information									New				Producer				Environmental Protection Group	

As can be seen in chart 3 the conjoint-design covered four products: soft cheese, tomatosoup, soft cheese with a strong brand and bread. For each product we had three attributes: label, price and brand and for each attribute two characteristics: with or without a label, two different price levels and two different brand names.

Chart 3

Conjoint Design		
Productgroup	Attributes	Characteristics
Cheese	Label Price Brand	with, without 1,80 DM, 2,20 DM Belami, Morell
Tomatosoup	Label Price Brand	with, without 2,70 DM, 3,30 DM Mayo`s, Maise
Brand Cheese	Label Price Brand	with, without 1,80 DM, 2,20 DM Bresso, Napoleon
Bread	Label Price Brand	with, without 1,62 DM, 1,98 DM Kautsch, Grimminger

Chart 4 shows some samples of the product cards we used in the conjoint analysis. We put the labels

- „Made with genetically modified milk (tomatoes, grain)“ and
- „Without genetical engineering“.

quite visible on the front of the package - together with the brand name and the price.

Chart 4

Sample A



Sample B



3. Results

3.1. The influence of different kinds of labeling

We tested the influence of the two different labels in different subsamples. We present here the results of the first conjoint-analysis as an example. The used product was soft-cheese. As shown in chart 5, the labeling “Made with genetically modified milk..” is with 55% the most important buying criteria for the consumer, followed by price (33%) and brand name (15%). The label has a rather high negative value (partworth) for the test persons. The labeling “Without genetical engineering” has a lower relative influence (44%), but the overall significance is still very high. The value for the consumer is positive.

Chart 5

Relative Importance of the Attributes (Results of the 1. Conjoint-Analysis)		
Label Attributes	SAMPLE A „Made with genetically modified milk“	SAMPLE B „Without genetical engineering“
Label	55%	44%
Price	30%	31%
Brand	15%	24%

Why is the relative influence of the label “Without...” lower than the influence of the label “Made with...”?

An explanation could be that some consumers do not see a difference between products having a label “Without...” and non-labeled ones. Most people do not expect any genetical engineered products as long as it is not mentioned on the product. This could be a reason why some people do not see a need in buying labeled and maybe even more expensive products instead of “normal” products.

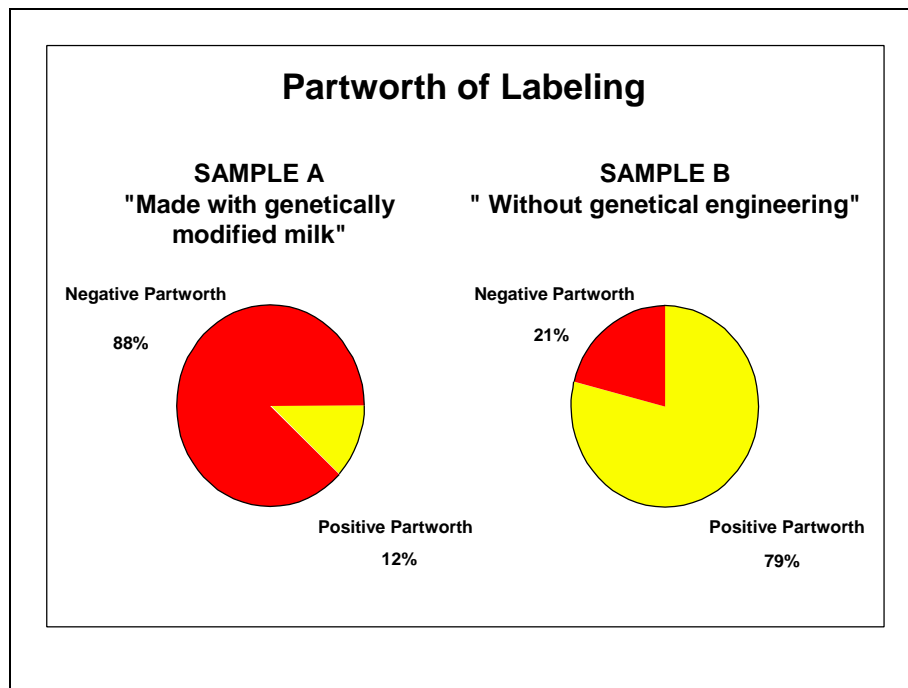
3.2. Segmentation by partworth of labeling

How big is the share of potential buyers of labeled GM food? To estimate this share we segmented the testpersons whether their partworth of labeling GM food was positive or negative. For 88% of the interviewed persons, the label “Made with genetically modified milk” had a negative effect, 12% had a positive value. This means, that only 12 % may buy a labeled GM food, if there are no other differences between the product choices. The question is: Does this result justify the market introduction of product labeling?

The label “Without genetical engeneering” had a positive influence on about 79% of the testpersons. In this case we have to raise the question: Is this a strong encouragement for using such a labeling?

The results are summarized in chart 6:

Chart 6



3.3. Influence of informations upon the results of the conjoint-analysis

As already mentioned we investigated within the test program the potential effects of different informations on the acceptance of GM food , namely the effect of

- a pre-information on the Novel-Food regulation,
- informations of producers and environmental organizations and
- the information „new product“.

The result of all these tests was: The influence of informations on the relative preferences of the test persons is rather low. Information does not change the low acceptance of GM-Food.

We had the hypothesis that the label „new product“ will lead to curiosity driven buying. However the conjoint analysis showed that this information had no effect and could not identify a “test- shopper“.

3.4. Influence of brand name upon the results of the conjoint-analysis

We also tested the effect of a strong brand on the relative preferences of the test persons. The result was: The relative importance of the brand name increased on the expense of the price however not on the expense of the labels. Conclusion: The low acceptance of the GM food will not be influenced by the strength of the brand. This results corresponds to findings in the UK (Frewer, 1998).

3.5. General attitude towards genetical engineering

To measure the general attitudes towards genetical engineering a set of seven statements was used which had to be evaluated on a four-step rating scale. The statements were taken from the so-called “Polis-study” on „Attitudes towards genetical engineering“. The study included 1.521 Germans with an age of 18 and older in Hessia. The survey was conducted in September 1997.

The results of this study served as control and comparison for our investigation. Only minor deviations between both studies were experienced. So we can state that our 200 people investigation produced reliable results.

Both studies showed - as expected -, that the opinions on gene technology are overwhelmingly critical. Only the opinion towards medical applications of gene technology was positive - with increasing tendency. Maybe because people see a reasonable benefit in using genetical engineering for medical research.

The seven statements were reduced to two attitude dimensions by factor analysis. The statements, the mean of the answers and the factor loadings are shown in chart 7.

Chart 7

Attitudes towards Genetical Engineering in Germany			
Average Scores (\bar{c}) and Results of Factor Analysis			
Scale from 1 - 4, 1 = disagree completely 4 = agree completely			
Statement	\bar{c}	Factor Loading	
		Factor 1 „Concern“	Factor 2 „Support“
Genetical engineering intervenes in areas, which mankind should not touch.	2.9	0.71	-0.22
When I hear genetical engineering, I always get a poor feeling.	2.8	0.73	-0.26
Genetical engineering manipulates nature, regardless of the consequences.	3.2	0.75	-0.13
The fears caused by genetical engineering are completely exaggerated.	2.1	-0.64	-0.12
Genetical engineering is the technology of the future.	2.6	-0.08	0.76
Utilizing genetical engineering, effective medicines against cancer and aids can be developed.	3.2	0.01	0.72
One should better increase investment in genetical engineering and decrease investment in outdated industries.	2.4	-0.31	0.53

- Factor 1 is describing the „ethical and emotional concern“ of the testpersons,
- Factor 2 the more „cognitive support“ of gene technology.

The factor “concern” is representing statements such as

- “Genetical engineering intervenes in areas, which mankind should not touch”(0,71),
- “When I hear genetical engineering, I always get a poor feeling”(0,73),
- “Genetical engineering manipulates nature, regardless of the consequences” (0,75),
- „The fears caused by genetical engineering are completely exaggerated“ (-0,64).

The factor “support” comprises statements such as

- “Genetical engineering is the technology of the future”(0,76),
- “Utilizing genetical engineering, effective medicines against cancer and aids can be developed”(0,72),
- „One should better increase investment in genetical engineering and decrease investment in outdated industries“ (0,53),

In a next step the factor scores and their distribution by age and gender have been calculated. As shown in chart 8 the ethical and emotional concern is most pronounced

- in the middle age group and
- less among the young people,

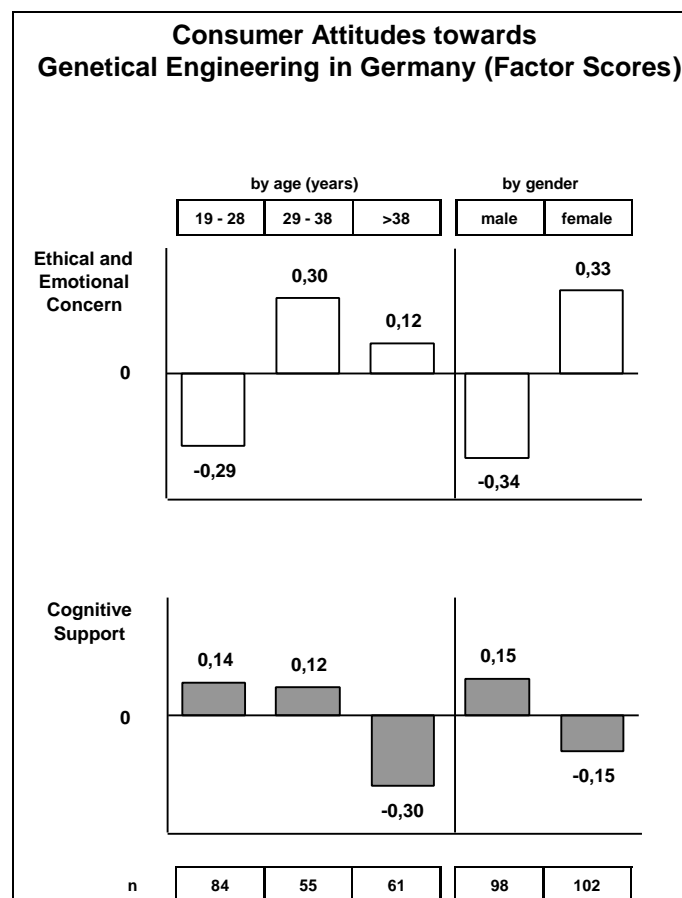
while the cognitive support is most pronounced

- in the youngest group and
- less among the older people.

This result does not correspond to the general tendency that younger people are more critical than older people. The fact, that older people are more concerned, may be an indication that neophobia is one of the reasons for the low acceptance of gene technology.

Furthermore, women reject genetical engineering more than men: a result which meets with our expectations.

Chart 8



3.6. Dependence on the general attitude towards genetical engineering

In the next step we looked at the relations between the measured attitudes towards gene technology and the results of the conjoint analysis. In order to determine this dependence the correlation coefficients between the partworth of the labeling and factor scores of the factors 1 and 2 were calculated. As can be seen in chart 9 the correlations between the general attitude towards genetical engineering and the partworth of the labeling, as determined by the conjoint-analysis, are weak. The coefficients vary between 0,15 and 0,28. Plotting the observations, we understand, why the correlation coefficients are so low.

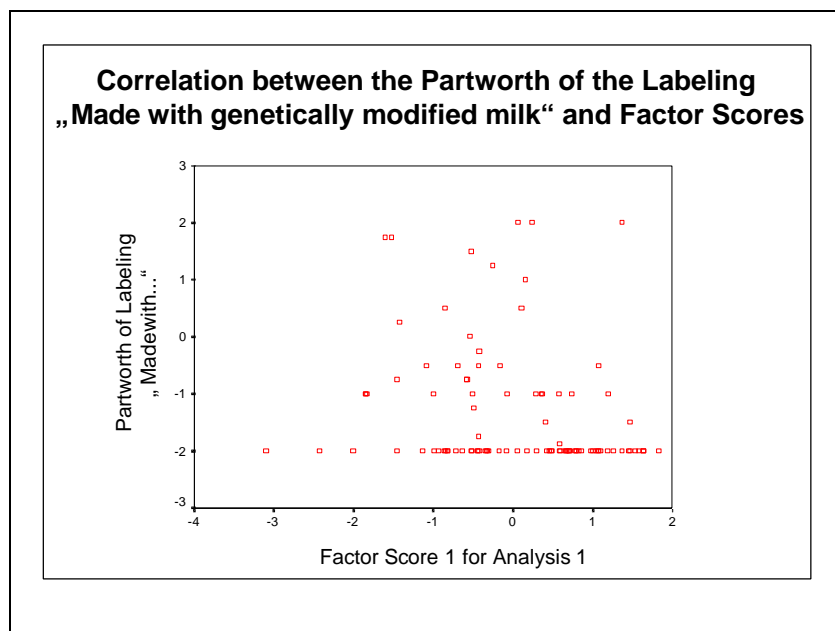
Chart 9

**Correlation of the Attitudes towards Genetical Engineering
(Factor Scores) and the Partworth of Labeling**

Correlation Coefficients

Partworth Factor Scores	SAMPLE A „Made with genetically modified milk“	SAMPLE B „Without genetical engineering“
1. Ethical and Emotional Concern	-0.22	+0.28
2. Cognitive Support	+0.15	-0.25

Chart 10



As can be seen in chart 10 many of the interviewed persons are rejecting products which are labeled „Made with genetically modified milk“. In many cases the calculated partworth of this label is getting the lowest possible score of minus 2 - regardless of the strength of the general attitude towards gene technology (factor scores). Consequently the rejection of the labeled product shows only a weak correlation with the strength of the general attitude.

4. Discussion and conclusions

4.1. Validity of results

In general it can be stated that the conjoint-analysis overestimates the influence of the labeling, because in real purchasing situations the stimuli are less recognized than under test conditions.

This overestimation is accentuated by the fact, that the EU-Council of Ministers decided recently to place the information about genetical engineered products in the ingredient list and not on the front of the package as we did in our tests. For this reason the perception of the label during the buying process will be much lower. This may lead to a „passive acceptance“ of GM food: Especially people with low involvement buying GM food without looking at the ingredient list may finally accept these products after having made own experience with these products (corresponding to the peripheral route of persuasion within the Elaboration Likelihood Model (ELM) of Petty/Cacioppo, 1986).

However there is the risk that “campaigns” of environmental organisations, such as Greenpeace can increasingly influence the consumers and cause something like a „Brent-Spar-Effect“.

On the other hand, the special publicity of GM food can cause an increase of curiosity driven purchases.

Furthermore: Consumer’s purchase decisions may also depend on the number of labeled products in the market: The higher the number of labeled products the lower will be the relative importance for the buying decision.

4.2. Conclusions for the market introduction of GM food

Before we will come to the conclusions, let us summarize the major findings:

- There are deep emotional and ethical concerns about gene technology.
- The acceptance of labeled GM food is low.
- The correlation between the attitudes towards gene technology and the acceptance of GM food is weak.
- The possibilities of influencing the acceptance of GM food by information are limited.

What are the conclusions for the market introduction of GM food?

The widespread opinion that the acceptance of GM-food is primarily an information or education problem (for instance: Hoban, 1997) has to be questioned. The possibilities to improve the acceptance by information campaigns seem to be overestimated because:

- It is difficult to change (emotional) attitudes by (cognitive) informations.
- An improved attitude is a necessary but not a sufficient condition for the acceptance, of GM food as long as no significant product advantages for the consumer exist.

For this reason changing the attitudes towards genetical engineering alone can not significantly increase the purchasing rate of GM food. Most of the consumers will accept GM food only if there are also benefits for the consumers.

For instance we can estimate on the basis of the results of the conjoint analysis that the utility disadvantage of GM food corresponds to an average price equivalent of 30-40%. This means that prices for GM food must be 30-40 % lower than the prices for competing products, to compensate their utility disadvantage for a significant proportion of the consumers. The distribution of these price equivalents shows, that some consumers will accept GM food at a lower price difference, however other consumers will not accept GM food even as a present. The utility advantage of products labeled “Made without genetical engineering” corresponds to a similar price equivalent.

What else could be done to increase the acceptance of genetical engineered products? Remembering the results of measuring the general attitudes towards gene technology, we had the most significant positive change towards genetical engineering in the field of medical applications. In this case people recognize the benefits of using the new technology. When we talk about genetical engineered food, like the ones in our sample, that had cheaper production costs for the farmer or for the food producer, it is clearly to see that there are no advantages for the consumer. To get a better acceptance of genetical engineered products it is necessary to offer products that are either cheaper or have other special significant positive functions for the consumer.

Literature

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