

# Do Consumers Not Care About Biotech Foods or Do They Just Not Read the Labels?

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## Abstract

We conduct an experiment to study the discrepancy between European public opinion and consumer purchase behavior with regard to genetically modified organisms in the food supply. We find that consumers are typically unaware of the labeling indicating GMO content.

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## 1. Introduction

In all Western countries, labeling of food products is strictly regulated. Labels are required to be informative in that they must provide the consumer correct and useful descriptions of the characteristics of the products. Labeling is not allowed to be misleading, in the sense that it should not induce the consumer to make errors in their purchase decisions. Obviously, however, producers have an incentive to make the labels indicating their products' positive characteristics as prominent and those revealing the unfavorable characteristics as discreet as possible. In response, regulators have imposed strict conditions on the size, color, and positioning of information on packaging.

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The rules for disclosing that a product contains genetically modified organisms (GMO)'s constitute an example. At the present time in Europe, when a product is classified under current law as containing GMO's, it must carry in its list of ingredients the statement "produced from genetically modified ...". A note at the end of the list of ingredients, specifying the genetically modified origin, is also considered sufficient, as long as it is easily legible. The size of the letters must be at least as large as those in the list of ingredients.

The large food producers have put a few products containing GMO's on the market to gather data to estimate the impact of the labeling on their sales. The studies indicate that despite the hostility toward GMO's that is ubiquitous in survey data,<sup>1</sup> sales do not decrease when the label reveals that the product contains GMO's. Can we conclude that there is a large difference between opinions and behaviors when it comes to products containing GMO's? Does the hostility of the "citizen", become attenuated when he is placed in the role of a "consumer"?

The research reported here argues that this is not necessarily the case. We use an economic experiment to show that the absence of a reaction in demand to the current labeling of products likely is due to the fact that most customers do not notice the labeling, and thus do not realize that the product they are purchasing contains GMO's. We also find, for the product we study, that the willingness-to-pay of the average consumer declines by approximately 30% when he becomes aware that the product contains GMO's.

## **2. Methodology**

The participants in our experiment<sup>2</sup> were a demographically representative sample of consumers in the Grenoble, France area. 112 subjects took part in the experiment, each one taking

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support for this project. We would like to thank Isabelle Avelange, Yves Bertheau, Pierre Combris, Sylvie Issanchou, Steve Tucker, and Egizio Valceschini, for valuable comments and assistance.

<sup>1</sup> See for example, the Eurobarometer survey commissioned by the European Union or the survey results reported in Noussair et al (2001).

<sup>2</sup> The experiment that produced the data we report in this paper had several objectives, but the others had nothing to do with GMO's. In each session two series of sales with increasing information took place, only

part in exactly one of the 16 sessions. The sessions were conducted between June 7<sup>th</sup> and July 1<sup>st</sup>, 1999, and in each session between 5 and 9 subjects participated. The ages of the subjects ranged from 18 to 74 years, and averaged 33 years. 53.6% were female. At the time of recruitment, subjects were invited to come to the laboratory to sample food products for a government research project.<sup>3</sup> They were not aware that GMO's were to be involved.

We used Vickrey auctions to elicit willingness-to-pay information, a common technique in experimental research (see for example Hayes et al., 1995). In a Vickrey auction, each subject simultaneously submits a bid to purchase a good. No communication between subjects is allowed during the bidding process. The agent who submits the highest bid wins the auction, and pays an amount equal to the second highest bid among the bidders in the auction. The other bidders do not receive items and pay zero. Each bidder has a dominant strategy to truthfully bid an amount equal to his willingness-to-pay (Vickrey, 1961).

Despite this, however, previous studies (see Kagel, 1995) have shown that untrained subjects often submit bids that differ from their valuations, and we included a training phase, in part to make the demand-revealing property more transparent. At the beginning of a session, each subject received 150 francs (roughly US\$21) in cash. Subjects then participated in several auctions in which they bid for fictitious items, which the winners could redeem from the experimenter for cash. The ability to redeem the items from the experimenter induced a valuation for the item sold in the auction (see Smith, 1982 for a discussion of induced valuations).

After the subjects submitted their bids, the experimenter wrote all of the valuations and bids on the blackboard. He then asked the following questions to the group of subjects, who were free to engage in open discussion on the topics (the experimenter did not participate in the discussion beyond posing the initial question). a) Which bid was yours? b) Which bidder won the

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one of which is reported in this paper. In both cases, the central task was to compare the hedonic rating that subjects assigned to products with their revealed willingness to pay in the Vickrey auctions. The objective of the other part of the experiment was to observe the effect on bids of the revelation of information about product quality (place of origin, official classification of quality, brand names, etc...).

auction? c) How much did the winner pay? c) Do you regret the bids you submitted, now that you know how much the others bid? After the discussion, the winner received an amount of money equal to his induced valuation minus the price he was required to pay. The cash was physically placed on the desk in front of the subject after the auction. A series of identical auctions was conducted using the same procedure, but with new randomly chosen induced values each time. The auctions continued until at least 80% of their bids were within 5% of valuations, typically 3-5 auctions.

In the three periods of interest, the sequence of activity was as shown in table 1. Each period consisted of the revelation of some information about the products, followed by an auction for the products. Four chocolate bars were auctioned each period, including two identical bars, called S and U. The products are made by a world leader in the food industry and are widely available in grocery stores and supermarkets in Europe.

At the beginning of period 1, subjects each received a sample of each of the four products to taste, without its packaging or labeling. Then a simultaneous Vickrey auction for each of the four goods took place. At the beginning of period 2, we distributed one unit of each of the products to each subject in its original packaging (with the price removed, but with the list of ingredients available). Subjects then had three minutes to study the products. A second auction was then conducted for each of the goods. At the beginning of period 3, we magnified and projected the list of ingredients of each product, exactly as it appeared on the packaging, and invited subjects to read the list of ingredients. The list is shown in figure 1<sup>4</sup> for the products of interest S and U, translated from the original French. Subjects then bid in the final round of auctions.

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<sup>3</sup> We screened for participants who made the food purchasing decisions in the household.

<sup>4</sup> The list of ingredients on the label of product S, as it actually appeared in French, is “Pétales de maïs 36% (maïs, sucre, sel, malt), chocolat 24%, sucre, graisse végétale, émulsifiant: lécithine”. For product U the list

[Table 1 and Figure 1 About Here]

### 3. Results

Figure 2 shows the average bid over all subjects<sup>5</sup> for each of the three periods of the purchase stage. The data in the figure are calculated by taking each individual's bid in period 1 as the base equaling 100, tracking that individual's bids over time relative to his bid in period 1, and averaging across all individuals in each period. Table 2 contains the actual unnormalized average bids, the variance of prices and the percentage change in the average bid from one period to the next.

In period 2, subjects observe the products as they are seen in the supermarket. Presumably, we have created favorable conditions for the subjects to read and study the labels because they are seated and have no alternative activities for 3 minutes other than to study the label. What is not read in the laboratory will probably not be read in the supermarket. However, we observe that bids do not change in period 2 from their levels in period 1. A pooled variance t-test fails to reject that the normalized average bids are different between periods 1 and 2 ( $t = .071$  for S and  $t = .070$  for U). We also cannot reject that the bids for S and U are different from each other ( $t = 1.53$ ). We thus replicate the result obtained by the private industry econometric studies of consumer behavior, that the labeling of products as containing GMO's does not affect the willingness to pay of consumers.

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is "Pétales de maïs 38% (maïs génétiquement modifié, sucre, sel, malt), chocolat 25%, sucre, matières grasses végétales, émulsifiant: lécithine de soja"

<sup>5</sup> Among the 112 subjects in the experiment, 10 did not submit bids in the first period and 27 submitted bids of zero for at least one of the two identical products in the first period. We viewed these subjects as non-consumers of the products, or as satiated with purchasing a single unit. After eliminating these 37 from our data, we have 75 observations. Six other subjects submitted bids of zero for at least one of the two identical products in the second period. Of these six, two submitted zero bids of 0.10 francs in period 1 and zero bids for both products in period 2, and we consider them as non-consumers of the products. Two others submitted zero bids on both products in period 2 after purchasing both in period 1, and we consider them to have been satiated by their purchases in period 1. The remaining two subjects submitted zero bids for the product containing GM corn in period 2, and a positive bid for the other product, and their behavior is

However, the data change radically in period 3, in which subjects bid while able to view the list of ingredients on large overheads. The average willingness to pay for a product labeled as “containing GMO’s” decreases by 27.3% compared to the previous period. The decrease is statistically significant (a pooled variance t-test for a difference in sample means between periods 2 and 3 for product U yields  $t = 2.40$ ). In contrast, an identical product without any indication of GMO content (product S) experiences an insignificant average decrease of 3% from the previous period ( $t = .271$ ). The bids for the two products, S and U, are significantly different from each other in period 3 ( $t = 10.37$ ). Thus the impact of the labeling “contains GMO’s”, when it is actually noticed, induces a substantial decrease in willingness to pay that is specific to that product.

[Table 2 and Figure 2: About Here]

Table 3 shows the direction of individuals’ changes in bids between periods two and three. The first two columns contain the product name, and the unnormalized average bid in period 2 (in French francs). The third column, entitled Percentage Boycotting, indicates the percentage of our participants that boycotts a product by bidding 0 in period 3 after having submitted a positive bid in period 2. The last three columns display the percentages decreasing, holding constant and increasing their bids from periods 2 to 3. We classify any increase or decrease of 5% or less as “bid unchanged”.

The bids for product S indicate that there is disagreement about how to interpret the labeling information. Roughly one-third of bidders increase their bid, one-third lower it, and the

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consistent with having read the label and bidding zero in response to the presence of GMO’s. The data presented in figure 2 and tables 2 and 3 are those from the remaining 69 subjects.

remaining third do not change it. However, upon learning that product U contains GM corn, 22%<sup>6</sup> of our subjects boycott the product entirely by bidding zero, and 60% lower their bid by at least 5%.

[Table 3: About Here]

## 4. Conclusion

This paper uses experimental economic methods to present evidence that the absence of a negative effect on demand in reaction to products containing GMO's is in large measure due to the fact that customers do not notice the labeling. Consumers appear not to note labels that they are not looking for in the first place. The use of a standardized logo, such as for example the French recyclable label, might be one method of concisely transmitting information.

The paper illustrates the impact on consumer behavior of becoming aware of the fact that a food product contains GMO's. We show that the impact is considerable, leading to an average decrease of offer prices by about 30%. Most French consumers do require lower prices to buy products with GMO's. The hostility toward GMO's evident in public opinion surveys does appear, at least to some extent, in consumer behavior. However, since almost 80% of our subjects were willing to buy the product at some positive price, the market does appear to moderate opposition to GMO's.

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<sup>6</sup> This percentage increases to 24% if we include the two subjects who bid zero in period 2.

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**Table 1: Sequence of events in phase three of an experimental session**

|          |   |
|----------|---|
| Period 1 | <ul style="list-style-type: none"><li>- Blind tasting of the products U, and S, along with other products</li><li>- Hedonic recording of evaluation of the four products</li><li>- 1<sup>st</sup> auction</li></ul> |
| Period 2 | <ul style="list-style-type: none"><li>- The products are distributed to subjects with their original packaging</li><li>- 2<sup>nd</sup> auction.</li></ul>  |
| Period 3 | <ul style="list-style-type: none"><li>- Slides with the exact labels on each product are projected on a large screen. Subjects are invited to read the labels</li><li>- 3<sup>rd</sup> auction</li></ul>            |

**Table 2: Average Bid and Variance of Bids, Periods 1 – 3**

|                                     | <b>Period 1<br/>Blind</b> | <b>Period 2<br/>Original Packaging<br/>and Labeling<br/>Available</b> | <b>Period 3<br/>Labels Projected</b> |
|-------------------------------------|---------------------------|---|--------------------------------------|
| <b>Product U</b> (Contains GM Corn) | 8.04FF<br>(0.74)          | 7.80FF<br>(0.75)<br>[-3.0%]   | 5.67FF*<br>(1.13)<br>[-27.3]         |
| <b>Product S</b> (GMO-free)         | 7.90FF<br>(0.70)          | 7.58FF<br>(0.80)<br>[-4.1%]   | 7.35FF<br>(0.84)<br>[-3.1%]          |

(...): variance, [...]: increase from previous period, \*: significantly different at 5% level from previous period. n = 69.

**Table 3: Percentage Boycotting and Decreasing, Increasing, and Holding Constant Their Bids After Seeing Learning GM Corn Content**

| Product           | Average previous bid for the product | Percentage Boycotting                   | Bid decrease                             | Bid unchanged                           | Bid increase                            |
|-------------------|--------------------------------------|---|--|---|---|
| S: "GMO-free"     | (8.18FF*)                            | 1%<br>(3.50FF)<br>(-3.50FF)<br>[-100%]  | 33%<br>(8.19FF)<br>(-2.40FF)<br>[-29,3%] | 32%<br>(9.54FF)<br>(-0.01FF)<br>[-0%]   | 33%<br>(6.74FF)<br>(1.76FF)<br>[+26,1%] |
| U: "With GM Corn" | (8.41FF*)                            | 22%<br>(7.86FF)<br>(-7.86FF)<br>[-100%] | 38%<br>(8.02FF)<br>(-2.62FF)<br>[-32.7%] | 25%<br>(7.75FF)<br>(-0.14FF)<br>[-1.8%] | 16%<br>(11.11FF)<br>(3.00FF)<br>[+27%%] |

...%: share of subjects in the category rounded to the nearest 1 percent, (...): average bid for the previous auction in French Francs, (...): absolute decrease or increase in FF, [...]: average percentage increase [+] or decrease [-] (n = 69).

**Figure 1: Labels of Product S and Product U**

**Product S**

**Corn flakes 36% (corn, sugar, salt, malt), chocolate 24%, sugar, vegetable fat, emulsifier: soy lecithin**

**Product U**

**Corn flakes 38% (genetically modified corn, sugar, salt, malt), chocolate 25%, sugar, fatty vegetable matter, emulsifier: soy lecithin**

**Figure 2: Normalized Average Bids for the Two Identical Chocolate Bars in Period 1-3**

