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## RESEARCH IN ECONOMICS AND RURAL SOCIOLOGY

### EXPERIMENTAL ELICITATION OF CONSUMERS' PREFERENCES

*On highly segmented markets where information plays a significant part, the estimation of willingness-to-pay for products showing specific characteristics remains a major problem. Experimental economics methods provide incentives to people to reveal their willingness-to-pay in an environment where the supply of information is controlled. Applied to different types of goods (food containing GMOs, wine, Champagne...) whose characteristics are gradually disclosed, these methods help understand the contribution of each item to the global value assigned to the tested products. They help assess the impact on choice behaviours of information related to the sanitary, nutritional or commercial characteristics of food.*

Food consumption trends in developed economies focus the attention of researchers and market specialists on two main issues: on the one hand, differentiation in products and behaviours, and on the other hand, food impact on health.

On mature, thus highly segmented, markets, differentiation in products and labelling of characteristics are crucial factors in the competition between producers. As to consumers, food choices require the treatment of increasing information in order to establish which products fit their preferences better and the constraints they face.

Simultaneously, changes in food consumption, which result from both the pressure of supply and consumers' choices, come hand in hand with increasing nutritional pathologies which are of concern to public health specialists.

In this context, tools are needed to help analyse the effects of information on consumers' choices, whether this information is directly related to products (sanitary, sensory characteristics, ingredients, nutritional claims, brand, origin, label...) or is general (nutritional facts, relation between health and food, food advice...). Heterogeneity in consumer reactions to information must be characterized in order to gain a better understanding of the reasons for failure or success of marketing strategies and public prevention policies.

Micro-economic analysis is a well-adapted conceptual framework for this task. When analysing choices, economists assume that consumers use the information they have in order to maximize an indicator of utility. More precisely, theory assesses that an individual who makes a choice is able to organize the different options offered to her in order to keep the one that will give her the

greatest satisfaction (the one that maximizes her utility function). This ability to compare different alternatives assumes that consumers are competent to value the products among which they have to choose. The understanding of this valuation process is essential for the analysis of decision mechanisms.

In the valuation process, the whole product value is generally regarded as the aggregation of the values of different characteristics: sensory, sanitary, nutritional, symbolic, convenience and so on...The value of a product may be studied either globally or as the sum of the values of its characteristics. In both cases, it is necessary to know how value can be measured. The value of product characteristics may be quantified, *a posteriori*, applying statistical methods to market data. Hedonic regression and discrete choice modelling are well adapted to this purpose. They provide statistical estimates of the value of product attributes, but it is also important to understand how each individual estimates a global value for a product from the values of its different characteristics. By monitoring the information given to people placed in controlled conditions, experimental methods help deal with this issue.

Besides the mechanism of valuation (measured by the willingness-to-pay for a characteristic or by the reservation price for a product), these methods provide indications on the statistical distribution of individual values and on the way they vary according to consumer characteristics and to the information people have on products characteristics.

#### Context and methods

The basic conceptual framework, where consumers maximize their expected utility using clear information on the characteristics of a given set of products, has the advantage of being simple but it does not disclose all the

mechanisms which help understand how each element contributing to the final level of utility is estimated and combined with others.

Among the issues raised by this valuation process, some are important in analysing food choice. In particular, some unanswered questions remain on how people account for:

- remembered, expected, and experienced pleasure with food,
- instant pleasure and future consequences on health,
- risks regarding the effects of products,
- uncertainty on product characteristics,
- new information on a product or its properties.

Most of these issues could be approached with marketing research methods: focus groups, conjoint analysis, surveys and test markets. The test market technique is certainly the most efficient for controlled experiments on consumer behaviour. It is also by far the most expensive one. Other methods are more common but their hypothetical nature may induce biased estimations of preferences, purchase intentions or willingness-to-pay. This distortion comes from a lack of incentives, the decisions taken by people being of no consequence to their well-being.

Systematic use of incentives attached to the choices made during the experiment is the main characteristic of experimental methods used by economists. Another interesting feature of these methods is the systematic measure in monetary terms of the value of product attributes. This allows work on the issue of value additivity.

The experimental approach is generally used in experiments where the stakes are in monetary terms. Participants know that their final reward will be an amount of money and that this amount will depend on the decisions they will make through the experiment. These methods are more widely used, nowadays. They have been adapted to new issues. Economists working on food

#### **Price of Champagne: do consumers pay for taste or brand?**

Experimental works at the INRA began with collaborations between economists and sensory scientists. Methods commonly used in sensory experiments, such as hedonic rating techniques, are declarative. Nothing prevents participants from answering at random or trying to conform to an implicit social norm. Moreover, aggregating the results obtained on different characteristics and, in particular, on sensory and commercial characteristics is difficult.

After showing that experimental economics techniques and sensory assessment methods could be combined, our research turned to the impact of information on willingness-to-pay.

A work on Champagne in partnership with Mumm-Perrier-Jouët (Lange, Martin, Chabanet, Combris and Issanchou, 2002) was conducted in various successive phases on a total of 243 randomly selected subjects from the urban area of Dijon (177 persons took part in assessment protocols of willingness-to-pay with purchase and 66 in an assessment protocol of hedonic rating without purchase).

demand have set up new protocols adapted to choice on real goods. Up to now, their attention has mainly been focused on the elicitation of willingness-to-pay for products showing specific characteristics, with a special interest for attributes linked to food safety. The enclosed frame explains the two most currently used elicitation mechanisms.

For instance, Hayes, Shogren, Shin and Kliebenstein (1995), conducted one of the first experiments of that type by estimating the willingness-to-pay to obtain a higher level of microbiological safety in food. The experiment took place at lunch time and the participants who had been served a hamburger from a local store took part in an auction to get the possibility to exchange it for a hamburger that had been specifically treated in order not to present any bacterial risk (intestinal infection for example). For participants, the incentive to reveal their willingness-to-pay for better controlled products came from the obligation to eat the hamburgers at the end of the experiment and from the effective payment of the price offered by the participant who won the auction for a safer hamburger.

The application of the experimental methods in economics has increased these past years. The INRA contributed to it by financing multidisciplinary projects and partnerships helping start a research program in this field. Besides one project on choice coherence to test the generalized axiom of revealed preferences (Février and Visser, 2004), all the issues addressed in this program are related to the effects of information on the acceptability of products and willingness-to-pay. Experiments were focused on wine (Lecocq, Magnac, Pichery and Visser, 2005), Champagne (Combris, Lange and Issanchou, 2006), food containing GMOs (Noussair, Robin and Ruffieux, 2004), and sanitary quality certification (Rozan, Stenger and Willinger, 2004). The results on Champagne and GMOs are presented here as examples.

Participants had to estimate five dry non-vintage Champagnes, successively, in three different situations: (i) blind-tasting, (ii) bottle examination, (iii) bottle examination and tasting. After each assessment participants wrote down a maximum purchase price for each Champagne. One of the fifteen cases (5 bottles x 3 conditions) was drawn randomly and either a Vickrey auction or a BDM procedure (see frame) determined the subjects who had to buy and pay for the bottle at the end of the session. In the hedonic rating protocols, participants simply gave a subjective score at the end of every assessment.

Whatever the method, one can see that participants are not able to differentiate between bottom-priced and upmarket brand Champagnes on the basis of a blind-tasting (market prices of the tested champagnes range from 11 Euros to 22 Euros). The reservation price increases significantly for upmarket brand Champagnes when the bottle is closely looked at but decreases when the tasting is accompanied by the examination of the bottle. The comparison between Vickrey auction and hedonic rating shows a higher discriminating power of the auction. Furthermore, individual data distributions analysis suggests that

participants may give a high mark without necessarily being actual buyers.

Results clearly show that brands have a higher impact than sensory characteristics on the willingness-to-pay for Champagne. They help understand the producers' marketing strategies based on a constant and high sensorial quality, yet little differentiated, accompanied by a large investment in brand promotion. This work also helped characterize the properties of incentive methods for preference elicitation and compare them with a declarative method, the "hedonic rating". This method, which must not be mistaken with the estimation of hedonic price functions based on the observation of market prices, is completely declarative. It supplies good estimates of average reactions to information, but contrary to incentive methods (Vickrey auction and BDM procedure) it does not help predict effective participant purchasing behaviours.

### **Do consumers really refuse to buy food containing GMOs?**

The introduction of genetically modified organisms in human and animal food gave rise to a passionate debate in Europe. French and European public opinion remains predominantly hostile: our inquiries show that 89% of French people are opposed to GMO content in their food and 79% think that GMOs should be purely and simply forbidden.

A recent European regulation gave a framework for GMO traceability and labelling. This regulation assures consumers they will get information so that they can choose with full knowledge of the facts. In concrete terms, the European Union decided to impose the wording "contains GMOs" on transgenic products. To avoid that label, products must not contain over 0.9% GMO traces in an accidental or technically inevitable way.

Are these measures likely to lead consumers to accept GMOs? Research conducted at the INRA (Noussair, Robin, Ruffieux, 2004) allowed the observation of consumer behaviours while GMO products were withdrawn from sale.

This research provides answers to the following questions: beyond expressed opinions, how many consumers definitely refuse to buy food products containing GMOs? For those who accept these products, what is the impact of GMO traces on their propensity to pay? What is the acceptable threshold of incidental contamination for consumers? What is the appropriate labelling? The participants in the experiment are a representative sample of French consumers.

The results are the following. In general we observe that consumers value the lack of GMOs in their food products. 34.9% of consumers who buy a conventional product no longer buy it when they happen to know that this product contains GMOs. 42.2% lower their willingness to pay, compared to the conventional product (this willingness to pay leads to a 26.5 average drop in offers). Lastly, 23% of consumers do not modify their willingness to pay or increase it when they happen to know that a product contains GMOs. Was it reasonable to maintain a threshold near 1% and choose the wording "products containing

GMOs" instead of allowing an explicit sign "without GMOs" for products that do not contain any? A product simply presented as "guaranteed without GMOs" is not refused by anybody. With a threshold of 0.1% incidental contamination, the level of refusal goes up to 4.4%. With a 1% threshold the product is refused by 10.7% of consumers. There is a real niche of consumers for products guaranteed without GMOs. Compared to conventional non-labelled products, 33.8% of consumers increase their willingness to pay (28.3% on average) for a product guaranteed without GMOs at a threshold of 0.1% contamination.

All these results which are, let us remember, linked to effective consumer behaviours observed in laboratory, strongly contrast with results from opinion surveys. In fact, according to our study, opinions appear to be much more hostile to GMOs than behaviours do.

### **Limits and perspectives of the experimental elicitation of preferences**

Research carried out until now shows that participants in experiments are quite capable of distinguishing and valuing very subtle differences between product characteristics. The elicited preferences and willingness-to-pay are, nonetheless, conditional to alternatives offered during the experiment, which are necessarily limited.

This limitation is of no consequence when it is a matter of observing and understanding mechanisms; it becomes an issue when the objective is to measure values. For example, willingness-to-pay for a product during an experiment will probably change if other options are offered or if the context changes. Therefore, experimental results with food products which are of little unit value, or very frequently purchased, bring up legitimate questions.

In the first place, we may wonder whether variations in willingness-to-pay observed after an information shock will be transitory or permanent. Even in the case of repetitive auctions, the laboratory elicited values are not necessarily the equilibrium values resulting from the long-term preferences of participants. Observed values may have an important transitory component linked to curiosity, novelty attraction or the wish to give the "right" answer, components which may disappear if consumption becomes usual.

In the second place, incentives introduced by scientists may become inoperative with products of little unit value. In this case, assessment errors will have almost no consequences on the participants' well-being.

Lastly, and this may be the most important limit, experiments focus participants' attention on specific information or the special characteristics of tested products. In an environment where a lot of signals compete to catch consumers' attention, some characteristics may simply not be perceived at all (Shrogren, Fox, Hayes, Roosen, 1999; Noussair, Robin, Ruffieux, 2002).

These different issues (observation of equilibrium values, measurements of willingness-to-pay for products of little unit value, and focus bias) raise the more general question of the external validity of experimental results. The

research program will now consist in devising methods and protocols allowing experimental observations over

longer periods and in environments where information is not filtered and structured *a priori*.

**Pierre Combris**, INRA – SAE2/CORELA Ivry  
**Bernard Ruffieux**, INRA – SAE2/UMR GAEL Grenoble  
[pierre.combris@ivry.inra.fr](mailto:pierre.combris@ivry.inra.fr), [bernard.ruffieux@ensgi.inpg.fr](mailto:bernard.ruffieux@ensgi.inpg.fr)

**For further information:**

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### **Frame: Preference elicitation mechanisms**

A recurring issue in experimental economics concerns the mechanisms that induce participants to reveal their private preferences. Two of the most popular methods are second-price auction (Vickrey auction) and BDM procedure (after its authors' initials Becker, DeGroot and Marshak).

In the Vickrey auction, each participant submits a written bid for an item to the experimenter. The highest bidder wins the auction and pays a price equal to the second-highest bid. The dominant strategy consists then for each participant in submitting a bid equivalent to their willingness-to-pay.

In the BDM procedure, participants are invited to reveal their highest purchase price for a product. Next, the product selling price is drawn randomly from a pre-specified price distribution. All the participants who stated a purchase price higher or equivalent to the selling price buy and pay the selling price. Thus, they benefit from the difference between both prices. Here again, the dominant strategy consists in stating the real reservation price since this information will not have any effect on the real selling price.

In theory, both methods are equivalent but frequently result in different valuations (Noussair, Robin and Ruffieux, 2004; Rozan, Stenger and Willinger, 2004). If the question of knowing which method reveals preferences better stays open, specificities between both methods are quite clear: the Vickrey auction is more efficient in the sense that estimation errors are most costly for participants, but on the other hand its training phase is longer and it may result in a competitive effect leading participants to over-bid. The BDM auction procedure is simple to understand and may chiefly be used at an individual level, which suppresses group effects and allows its use in field experiments.