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Environmental Friendly Food.Choice Experiment to Assess Consumer's Attitude Toward "Climate Neutral" Milk: The Role of Information

LOMBARDI, G. V. a *, BERNI, R. b, ROCCHI, B. a

a. Department of Economics and Management, University of Florence

b. Florence Department of Statistics, Computer Science and Applications, University of Florence, Italy

Academic Work

The background

- The food accounts for 31% of the total Green House Gas (GHG) production in Europe[1].The food chain produces emission in all its stages from the farms to the households. Influencing consumer's behavior toward a more sustainable and climate neutral purchasing pattern could represent an effective option to substantially reduce global GHG emission by stimulating production systems toward cleaner productions.
- In Italy there is no food carbon foot print label. Before introducing it some question arises : have the italian consumer attitude toward climate neutral food? Could Information influences their purchaising habits?

[1] Environmental Impact of Products (EIPRO). 2006. "Analysis of the Life Cycle Environmental Impacts Related to the Total Final Consumption of the EU 25". European Commission Technical Report EUR 22284 EN

The objective of the work

- To assess consumer perception toward carbon free milk
- To verify the role of information in influencing consumer behaviour toward climate neutral food
- To evaluate interaction between new carbon free labeling and the existing environmental food labeling

The research

- The survey was carried out in a sample of 100 (only 39 are here analised) voluntarily recruited supermarket customers in rural and urban areas of Tuscany; each participant received an attendance token. The participants were asked to attend four different sessions of the focus group meeting with two administered choice experiments

METHODOLOGY

The Four sessions Focus Group

- Background questionnaire +

  Five minute video on climate change risks *(FIRST SESSION)*
- Choice experiments *(SECOND SESSION)*

BREAK

- Dicussion on consumer behaviour impact on climate change risk *(THIRD SESSION)*
- Second choice experiments with the same choice set administered in the second session *(FOURTH SESSION)*
- Choice model implementation

First session

1. During the first session participants were asked to fill a background questionnaire, composed of three main parts dealing with respondents **perceived economic condition**; respondent's **environmental sensitiveness**, **purchasing habits** (organic, food miles, conventional buyers etc..) and with respondent's **socio-demographic** issues (age, educational level, family size. etc).

1. **In this session a five minute long documentary about the climate change risks was screened**.

Second session

- The second session consisted in a **choice experiments** in which participants were administered with a number of 12 choice-sets (scenarios), each describing a series of a systematically and independently varied key attributes characteristics of each single product
  - price
  - organic labeling
  - carbon footprint labeling,
  - no eco labeling

  Each choice-set consists of two alternatives describing different milk attributes and different attribute levels. Participants were asked to select one option in each choice-set of the 12 administered.

Id=3	CO_2	Prezzo	Bio	SCELTA
A	SI riduzione CO2	0,84€	NO bio	
B	SI riduzione CO2	1,64€	SI bio	

Third session

- After a ten minute break the main section of the session followed to increase participants' exposure to information on climate change issues and on consumer behaviour impact on climate change.

  The discussions lasted between 60 and 80 min and were assisted by a moderator.
- This session had the objective to enhance consumer information about climate change issues, to improve the people's understanding about climate change risks and to share individual's views and perceptions about different food product labels and about the impact of purchasing behavior on GHG global emission.

Fourth session

- **Again Choice experiments** were administered in the last fourth session. Participants expressed their preferences on the same scenarios already administered in the second session. This session allow us to compare the choices expressed after the information session with those expressed before (in the second session) the information esposure

Multinomial discrete choice models

- The collected data were analyzed through the application of RUM models, in particular conditional logit and HEV models in order to evaluate the heteroscedasticity across alternatives (scenarios).In order to illustrate the case study, the class of Random Utility models (RUM) is defined. In general, every alternative is indicated by j (j=1,...,J), while i denotes the consumer/user (i=1,...,I); the respondent is asked to give his/her preference within each choice-set, formed several alternatives, in what follows we consider to have binary choice-sets. Thus, the following expression is characterized by a stochastic utility index Uij, which may be expressed, for each unit i as:

  $$U_{ij}=V_{ij}+e_{ij} \quad (1)$$

  whereVij is the deterministic part of utility, while eij is the random component, independent and Gumbel distributed.

Results: briefly the background questionnaire

Purchasing habits for different types of food (% of respondents)

	organic food	integrated farming	denomination of origin	local food	fair trade	ready meals
Never	8	13	10	0	3	18
Very rarely	28	15	36	0	23	38
Sometimes	46	21	38	18	41	31
Often	18	18	3	54	23	10
Almost always	0	3	13	28	5	0
I don't know	0	31	0	0	5	3
Total	100	100	100	100	100	100

- The sample shows attitude toward quality food (higher frequency of “often” purchase)
- Low attitude toward fair trade and environmental friendly food (altruistic consumption attributes)

Results: general WTP and Information

Tab 3- Conditional logit model results -1st choice-sets administering

Parameter	DF	Estimate	Std.Error	t-Value	Pr > |t|
CONST	1	1.2130	0.2613	4.64	0.0001
PRICE	1	-1.1167	0.3291	-3.39	0.0007
CO2	1	-0.7983	0.1241	-6.43	0.0001
BIO	1	-0.9921	0.1303	-7.61	0.0001

Tab 4- Conditional logit model results -2nd choice-sets administering

Parameter	DF	Estimate	Std.Error	t-Value	Pr > |t|
CONST	1	1.3953	0.2623	5.32	0.0001
PRICE	1	-0.1797	0.3179	-0.57	0.5719
CO2	1	-0.9228	0.1265	-7.29	0.0001
BIO	1	-0.7550	0.1226	-6.16	0.0001

Tab 6- HEV model results – 1st administering session

Parameter	DF	Estimate	Error	t-Value	Pr > |t|
PRICE	1	-1.0457	0.3061	-3.42	0.0006
CO2	1	-0.5304	0.1222	-4.34	0.0001
BIO	1	-0.7224	0.2205	-3.28	0.0011
PRICE*AGE	1	1.1537	0.4476	2.58	0.0099
BIO*GENDER	1	-1.0059	0.4611	-2.18	0.0291
CO2*KM0	1	0.0222	0.2540	0.03	0.9304
SCALE1	1	0.8394	0.5387	1.56	0.1192

Tab 7- HEV model results – 2nd administering session

Parameter	DF	Estimate	Std.Error	t-Value	Pr > |t|
PRICE	1	-0.4902	0.3368	-1.46	0.1456
CO2	1	-0.6277	0.0972	-6.46	0.0001
BIO	1	-0.3957	0.0883	-4.48	0.0001
PRICE*AGE	1	1.1255	0.3088	3.65	0.0003
BIO*GENDER	1	-0.3893	0.2446	-1.59	0.1114
CO2*KM0	1	-0.2952	0.2234	-1.32	0.1865
SCALE1	1	1.2374	0.6458	1.92	0.0554

Results: impact of information on consumer behaviour

- After information exposure the market share for organic decrease with -7%
- The market share for carbon free milk increased 10,3%
- The price premium for carbon neutral milk is on everage 0,55 euro and increases of 2,2% after information exposure
- The price premium for organic in the seconds choice increased slightly

Conclusion

The study shows that the role of information is crucial in determining consumer behavior changes toward climate change issues

- After information exposure the market share of carbon labelling milk increase of the 10%
  - Generally the importance of the price in the selection process is declining after the respondents' were informed on the potential impact of consumers' choices on climate change risks.
  - their attitude toward climate neutral milk have generally been increased in the second choice experiments, since the carbon footprint attribute is increasing its importance, the premium price for Carbon foot print is increasing as the number of choices
- The increased utility toward carbon free milk caused the decrease attitude toward organic milk. The interaction between the two labels develops **a competitive effect** with potential impact on market share of organic milk. Effect to be considered when introducing new labelling scheme dealing with susatinable food.

THANK YOU

The Heteroscedastic Extreme Value- HEV model

The Heteroscedastic Extreme Value model (Bhat, 1995; Hensher, 1999) belongs to the RUM class. The probability that a respondent i chooses the alternative j from a choice-set C_i is:

$$P(y_i|x_{ij}) = P_i(j) = \int_{\epsilon} \prod_{k \in C_i; k \neq j} \Lambda\{\frac{x'_{ij}\beta - x'_{ik}\beta + \epsilon_{ij}}{\theta_k}\} \frac{1}{\theta_j} \lambda(\frac{\epsilon_{ij}}{\theta_j}) d\epsilon_{ij} \quad (1)$$

with the error term distributed as follows:

$$f(\epsilon_{ij}; \theta_j) = \lambda(\frac{\epsilon_{ij}}{\theta_j}) = \exp(-\frac{\epsilon_{ij}}{\theta_j}) \exp\{-[\exp(-\frac{\epsilon_{ij}}{\theta_j})]\} \quad (2)$$

In formula (1), θ_j is the scale parameter for the j alternative and $\lambda(\cdot)$ is the probability density function of the Gumbel distribution, as in formula (2), while Λ in formula (1) is the corresponding cumulative distribution function evaluated by considering two distinct choices for the i respondent; the term $x'_{(\cdot)}\beta$ denotes the deterministic part of utility related to alternative j and alternative k, respectively. Note that the integral function is defined on the domain $[-\infty, +\infty]$ of the random component ϵ related to the unit i and the alternative j.

In this case, preferences of respondent i are evaluated by considering a scaling term θ_j for the alternative j in the choice-set C_i i.e., the heteroscedasticity of the error term.

- When considering the consumer's choice modelling, experimental designs and statistical models are closely connected and the properties of one design affect the corresponding model. When these properties do not exist in the design, this must be taken into account in the model. This is the case of an improvement in the design optimality specifically defined for a MMNL; on the other hand, when considering the respondents' heterogeneity, a specific design matrix for each respondent is planned (Sandor and Wedel, 2005), by including the heterogeneity evaluation directly in the design step instead of the model step. Within the choice experiment step, optimality criteria, above all D- optimality, ad-hoc algorithms and specified information matrices for the experimental design involved were entirely defined in 1990's. Further developments are related to the construction of optimal or near optimal designs with two-level attributes for binary choices in the presence of the first order interactions, or when optimal designs are defined with mixed-level attributes. In Bliemer et al. (2008) several algorithms are compared (in draws within the Pseudo Monte-Carlo simulation method) to select efficient Bayesian designs.

Tab. 5 - Number of choices and average price premium paid for products with carbon footprint and organic certification-1st and 2nd choice sets administering

time	CO2		BIO	
	n. of choices	av.price premium (€/l)	n. of choices	av.price premium (€/l)
t_0	272	0.55	272	0.51
t_1	300	0.57	253	0.56
% variation t_0 - t_1	10.3	2.2	-7.0	10.0