A choice experiment to analyse preferences for different profiles of chicken and honey

Cristina Mora - University of Parma
Split, 3rd February 2010
Overview

• In response to consumers’ increasing concerns about food safety, both supply chain actors and public authorities have developed, in the last decade, labelling schemes to provide markets with more information.

• Although some level of traceability is necessary to provide consumers with valuable information (such as country-of-origin, production process, etc.), it is not clear so far if traceability per se is important to consumers (TRACE EU Project).
• The objective of this paper is to analyse consumers’ perception of food traceability with respect to two food products: chicken and honey.

• CE methodology allows to weight the relative importance of any given attribute for consumers, providing an estimation of their marginal willingness to pay (WTP).

• More specifically, it aims to provide more insights for both policy makers and supply chain actors into Italian consumer’s perception and preferences for different attributes connected to traceability.

• **Methodology:** Choice Based Conjoint Experiment (CBC)
Introduction to CBC Choice Based Conjoint Experiment

• Conjoint is not new but methods start to evolve rapidly in the late 1950s and early 1960s.

• CBC, or Choice-Based Conjoint, has become the preferred method, due to its ability to truly gauge price elasticity, and it’s easy to comprehend trade-off task.

• Full product combinations (FULL PROFILE) are pitted against each other in “choice sets” (reduced with fractional factorial designs). Respondents choose among the products depicted, or (as an option) can choose none of the products.
• A respondent typically receives anywhere from 10 to 20 choice sets, depending on the number of factors and levels in the design.
• Its modeling capabilities (interactions, special effects, etc.) are seen as an improvement from prior methods.
• Due to relative pricing, elasticity models are more accurate.
• Like Adaptive CA, allows for more factors and levels than traditional method.
• Group utilities may be calculated
Conjoint Study Process

Stage 1 —Designing the conjoint study:
Step 1.1: Select attributes relevant to the product,
Step 1.2: Select levels for each attribute, and
Step 1.3: Develop the product bundles to be evaluated.

Stage 2 —Obtaining data from a sample of respondents:
Step 2.1: Design a data-collection procedure, and
Step 2.2: Select a computation method for obtaining part-worth functions.

Stage 3 —Empirical results
Stage 1

How do I know what attributes and levels to use?
**Step 1.1. Select attributes (preliminary qualitative phase)**

- Literature Review
- Focus group and
- Means and Chains analysis
- Secondary data

The researcher can choose the attributes that are believed to have the largest impact on the respondents.

- **Quality**
  - Information (production process, raw material origin, etc.)

- **Food safety**
  - Recall, withdrawal of the product

Market research (on shop)

Focus Group (10 pers.) to assess the attributes and the levels to be tested and to elicit new attributes of interest
Step 1.2. Select levels of attributes

- Choose attribute levels similar to the existing products
- As few levels as possible to simplify respondents task
- Roughly the same number of level for each attribute
- Attributes that are demand-relevant, policy-relevant and measurable should be used.

Each attribute is given a number of levels, for example high, medium and low.
<table>
<thead>
<tr>
<th>Attributes</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>a) – 35%</td>
</tr>
<tr>
<td></td>
<td>b) – 20%</td>
</tr>
<tr>
<td></td>
<td>c) – 10%</td>
</tr>
<tr>
<td></td>
<td>d) Average price</td>
</tr>
<tr>
<td></td>
<td>e) + 20%</td>
</tr>
<tr>
<td>Country of Origin</td>
<td>a) Nessuno</td>
</tr>
<tr>
<td></td>
<td>b) Product of Italy</td>
</tr>
<tr>
<td></td>
<td>c) Imported product</td>
</tr>
<tr>
<td>Region of Origin</td>
<td>a) No</td>
</tr>
<tr>
<td></td>
<td>b) Si</td>
</tr>
<tr>
<td>Brand</td>
<td>a) No brand</td>
</tr>
<tr>
<td></td>
<td>b) retailer</td>
</tr>
<tr>
<td></td>
<td>c) Big national scale firm</td>
</tr>
<tr>
<td></td>
<td>d) Local scale firm</td>
</tr>
<tr>
<td>Production Process Info</td>
<td>a) No</td>
</tr>
<tr>
<td></td>
<td>b) Yes</td>
</tr>
<tr>
<td>Seal “Traceable product”</td>
<td>a) No</td>
</tr>
<tr>
<td></td>
<td>b) Yes</td>
</tr>
<tr>
<td>Way of communication of info</td>
<td>a) None</td>
</tr>
<tr>
<td></td>
<td>b) IT based (ID code ID, web site)</td>
</tr>
<tr>
<td></td>
<td>c) Written</td>
</tr>
<tr>
<td>Certification by whom</td>
<td>a) None</td>
</tr>
<tr>
<td></td>
<td>b) Supply chain</td>
</tr>
<tr>
<td></td>
<td>c) Third party</td>
</tr>
<tr>
<td></td>
<td>d) Public body</td>
</tr>
</tbody>
</table>
Step 1.3. Use orthogonal design to develop product bundles

- Presentation and measurements scale: in the full profile approach, all 8 attributes are presented to each respondent for evaluation.
- To reduce the numbers of profiles for evaluation, fractional factorial orthogonal design was developed by means of SPSS (58 product profiles—subdivided in 32 choice set for chicken and honey— from the full design with 5760 profile.)
Stage 2

Obtaining Data from respondents
Step 2.1 Design a data-collection procedure

- The research use full-profile approach in which all attributes are presented to each respondent for evaluation in a personal interview.
- Visual stimuli: in the study we choose to present the product by providing a picture along with product labels containing the different attributes and levels.
Example of choice set; each respondent received 8 card and approach the stimuli as if they were intending to buy the product being presented.
Example of choice set; each respondent received 8 card and approach the stimuli as if they were intending to buy the product being presented.
• Eligible persons: 160 respondents, >18 years in charge of shopping in his/her household or shares it with others in his/her household.
• Recruitment should take primarily place on the basis of gender (male/female) and age groups (younger/older).
• Stratification criteria include geographical area, city size and age groups representative of the general population and geographical spread of Italy.
## Sample description

<table>
<thead>
<tr>
<th>Gender</th>
<th>Chicken</th>
<th>Honey</th>
<th>Total</th>
<th>Frequency of purchases</th>
<th>Chicken</th>
<th>Honey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>25,0</td>
<td>23,8</td>
<td>24,4</td>
<td>Every day or almost every day</td>
<td>3,8</td>
<td>0,0</td>
</tr>
<tr>
<td>Female</td>
<td>75,0</td>
<td>76,3</td>
<td>75,6</td>
<td>Several times a week, but not every day</td>
<td>16,3</td>
<td>0,0</td>
</tr>
<tr>
<td>Age distribution</td>
<td></td>
<td></td>
<td></td>
<td>Once a week</td>
<td>27,5</td>
<td>0,0</td>
</tr>
<tr>
<td>18-24</td>
<td>37,5</td>
<td>17,5</td>
<td>27,5</td>
<td>Several times a month</td>
<td>36,3</td>
<td>2,5</td>
</tr>
<tr>
<td>25-40</td>
<td>15,0</td>
<td>17,5</td>
<td>16,3</td>
<td>Once a month</td>
<td>15,0</td>
<td>13,8</td>
</tr>
<tr>
<td>41-50</td>
<td>26,3</td>
<td>26,3</td>
<td>26,3</td>
<td>Every two months;</td>
<td>1,3</td>
<td>12,5</td>
</tr>
<tr>
<td>51-60</td>
<td>7,5</td>
<td>18,8</td>
<td>13,1</td>
<td>Every three/four months</td>
<td>0,0</td>
<td>16,3</td>
</tr>
<tr>
<td>&gt;60</td>
<td>13,8</td>
<td>20,0</td>
<td>16,9</td>
<td>Twice per year</td>
<td>0,0</td>
<td>25,0</td>
</tr>
<tr>
<td>Education Distribution</td>
<td></td>
<td></td>
<td></td>
<td>Once per year</td>
<td>0,0</td>
<td>30,0</td>
</tr>
<tr>
<td>Primary</td>
<td>6,3</td>
<td>12,5</td>
<td>9,4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>31,3</td>
<td>40,0</td>
<td>35,6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post – Secondary</td>
<td>31,3</td>
<td>18,8</td>
<td>25,0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tertiary or higher</td>
<td>31,3</td>
<td>28,8</td>
<td>30,0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Members living in the household</td>
<td>2,7</td>
<td>2,4</td>
<td>2,6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FOCUS**

**FOOD CONSUMER SCIENCE IN THE BALKANS**

**SEVENTH FRAMEWORK PROGRAMME**
Step 2.2: Select a computation method for obtaining part-worth functions

- For each attribute the part-worth’s of the respondent is estimated, this means that the researcher estimates a value that explains how important the respondent finds each attribute and these values are called **part-worth’s or utilities**.
- Results can be analysed as additive functions of the attributes.
• In choice-based experiment the estimation method is probabilistic, such as LOGIT and PROBIT: the dependent variable is categorical.

• Several discrete choice models have been developed from different statistical assumptions.
  - In the study we use Multinomial Logit Model and a latent class (LC) model were applied to estimate the parameters associated to each product’s attribute.
  - The LC model, in particular, fitted better the data providing more detailed results able to capture heterogeneity of preferences across the considered products.
  - to estimate this model we use the Maximum Likelihood Approach.
  - The statistical analysis has been conducted thanks to NLOGIT v.4.0, developed by Prof. William Greene.
Stage 3

EMPIRICAL RESULTS
Results

• The LC model, in particular, fitted better the data providing more detailed results able to capture heterogeneity of preferences across the considered products.

• Beta coefficients refer to parameters that weight exogenous variables in determining the consumers’ utility.

• A negative Beta coefficient means that increments on that attribute decrease the associated utility level provided by the choice (dislike), whereas a positive value means that the presence of the considered attribute increase the utility (like), zero means “neutral” effect on respondents.
<table>
<thead>
<tr>
<th></th>
<th>Chicken</th>
<th>Honey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>-1,076 (0,280)</td>
<td>-0,482 (0,077)</td>
</tr>
<tr>
<td>Product of Italy</td>
<td>2,773 (0,776)</td>
<td>2,056 (0,204)</td>
</tr>
<tr>
<td>Region</td>
<td>0,993 (0,526)</td>
<td>0,480 (0,113)</td>
</tr>
<tr>
<td>Brand Retailer</td>
<td>4,228 (1,539)</td>
<td>-1,007 (0,266)</td>
</tr>
<tr>
<td>Major firm Brand</td>
<td>2,503 (0,983)</td>
<td>-0,246 (0,271)</td>
</tr>
<tr>
<td>Local firm Brand</td>
<td>6,089 (2,081)</td>
<td>-2,147 (0,356)</td>
</tr>
<tr>
<td>Production Process Info</td>
<td>3,051 (0,942)</td>
<td>0,485 (0,207)</td>
</tr>
<tr>
<td>Seal “Traceable”</td>
<td>2,541 (0,697)</td>
<td>-0,184 (0,135)</td>
</tr>
<tr>
<td>IT Information</td>
<td>0,082 (1,080)</td>
<td>0,815 (0,237)</td>
</tr>
<tr>
<td>Written Information</td>
<td>-1,733 (1,311)</td>
<td>0,754 (0,230)</td>
</tr>
<tr>
<td>Chain certification</td>
<td>5,467 (1,767)</td>
<td>-0,036 (0,289)</td>
</tr>
<tr>
<td>Third part certification</td>
<td>1,732 (1,203)</td>
<td>0,072 (0,258)</td>
</tr>
<tr>
<td>Public institution certification</td>
<td>4,072 (1,748)</td>
<td>0,935 (0,257)</td>
</tr>
</tbody>
</table>
CHOICE EXPERIMENT RESULTS FOR TRACEABLE CHICKEN
• The price is statistically significant. This shows that when the price increases, the utility of the chicken, even with traceable aspects, decreases.

• The known region of origin of the chicken is st. important. However, the low coefficients show that is not one of the most important aspects of a chicken.

• The production/process information is statistically important.

• The seal “Traceable” appears to be important, with low coefficients though, compared to other attributes of the chicken.
• From the three different brands which were used in the experiment, the local firm brand appears to be in a leading position, since it is significant in improving the utility. This aspect is one of the most important for the final choice of the consumers; also, retailer brand is in an important position.

• “Information technology based” information isn’t statistically significant.

• Italian products are mostly preferred. Their coefficients are high but not so important than expected.

• Certification by producers/supply chain and the European Union increases the utility of the product statistically significantly.
CHOICE EXPERIMENT RESULTS FOR TRACCEABLE HONEY
• The price is statistically significant. This was also the case in the experiment with the chicken. This shows that when the price increases, the utility of the honey, even with traceable aspects, decreases.
• Italian products are mostly preferred. The coefficient is very high, compared to other attributes’ coefficients, making this aspect one of the most important for the final choice of the consumers.
• The known region of origin of the honey is important. The coefficients are low, showing that it is not one of the most important aspects of a honey, there are a bit higher than in the results for the chicken though.
• The production/process information is not very important.
• The seal appears isn’t s.s.
• From the three different brands which were used in the experiment, all the brand represent a dislike.
• “Information technology based” information is equally preferred to written information in general.
• Only the certification by Public Institution increases the utility of the product statistically significantly.
Identifying the willingness to pay

• Once the parameters have been estimated, the **marginal rates of substitution** can be calculated giving an estimation of the rate at which respondents are willing to **trade-off one** attribute for another.

• Where the attribute being traded is the monetary attribute, this rate estimates the implicit price, or marginal **willingness to pay** (WTP), of the attribute (with respect to the status quo).
Design market simulations

- The “ideal” product

8.8 /Kg

2.8 /Kg
Validation

• Do the signs of the utilities follow expectations?
• If monetary values are measured in the conjoint analysis, a comparison with some sort of external monetary value of the same object is a logic validation.
• In the absence of monetary values the internal consistency and validity may be tested from an assumption about which alternative is best. If a respondent chooses a certain alternative in a specific choice set, and if an even better alternative is presented in one of the following choice sets, then this better alternative should be chosen.
Conclusions

- One of the findings in this study is that traceability perception is a product specific issue: Italian consumers have more preferences for traceability attributes in the case of chicken than for honey.
- This is probably due to a different level of perceived risk and to the higher market penetration of chicken.
- Therefore, on the one hand, we suggest supply chain operators to develop traceability-based valorisation strategies per product.
- On the other hand, the introduction of vertical public regulations on food traceability, i.e. defined per product category, should be preferred by public authority.
Insights for researcher …..

• To be able to evaluate the preference structure of the respondents individually, as well as members of different groups-consumers, and to validate the study, the survey must include a supplementary questions:
  – Socio-economic information
  – Attitude towards food consumption, food habits, product use or knowledge
  – Actual conjoint topic
• Group estimation needs a wider sample: at least ….
Weaknesses of conjoint analysis

• There is no guarantee that the attributes and levels mirror the true preferences of the respondents, it may be
• The results tend not to be completely repeatable.
• Internal problem of the method: pre-test seem to be invaluable ... poor design .. Selection of participants ... self-selection bias ....
References

Thank you for your attention!

http://www.trace.eu.org