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Paper prepared for presentation at the 113th EAAE Seminar "A resilient European food industry and food chain in a challenging world", Chania, Crete, Greece, date as in: September 3 - 6, 2009

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The influence of country of origin on German consumer preferences for peaches: a latent class choice model[§]

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Abstract. Germany is an important world level market for fresh fruit. Spain and Italy are the main suppliers of fresh fruit on the German market while the main imported products are apple, grapes, peaches and oranges. The aim of this paper is to assess the role country of origin plays in the preferences of German consumers for peaches. Since German legislation requires fresh fruit sold on the market to clearly display the product's country of origin, German consumers usually make their choice with this information to hand. How important is such information, and what is the trade-off between country of origin and price or organic production system? We attempted to investigate such concerns through a choice experiment approach conducted by means of a questionnaire-based survey administered to a representative sample of 300 German households. In the experiment, respondents were asked to choose their favorite peach among four alternatives. Each peach was described as imported from four specific countries (Italy, Spain, Turkey and France) and available at a specific price; some of the peaches were certified Organic or PDO. The stated choices are analyzed using a latent class choice model to derive estimates of preferences for peaches. Results indicate the presence of three distinct consumer segments in the German peach market. The largest segment (48%) showed a strong preference for Italian peaches as well as for organic and PDO certification. For this segment, price was not an important attribute. The second segment (41%) showed a strong preference for Spanish produce and organic certification. Price was important in this case. The third segment (11%) had a negative preference for Italian and Spanish peaches, with price being the main attribute.

Keywords*:* Germany peach market, consumer preferences, latent class choice models

1. Introduction

The intense food market internationalisation process is giving rise to new competitive scenarios. The growing market shares of new countries as well as consumer and retail issues impose different marketing policies for agri-food products. In particular, greater consumer concern with environmental and health issues is modifying the structure of demand for fresh products. In the past, the country of origin was an aspect related to intrinsic product attributes like taste. Nowadays, markets are moving towards new product attributes, namely environment and food safety, and product origin is becoming an important

[§] Research financed by the MiPAF (Italian Ministry for Agricultural and Forestry Policy). QUAGRI Project.

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component of this new aspect. The aim of this paper is to assess the role that country of origin plays in the preferences of German consumers for peaches and suggest new, more successful marketing strategies.

Of the credence attributes, certification of origin is acquiring a new role, partly thanks to the growing importance of traceability as a mandatory element of modern production processes. As a result, there has been greater recourse to various forms of certification of the product and the production process. The growing use of both voluntary and mandatory labeling is in line with what is described by economic theory according to which, in efficient markets for credence goods or attributes, credible signals are required (Hobbs, 2003). The "signals" (Shapiro, 1983; Stiglitz, 1989) are information stimuli that allow consumers to judge products prior to consumption (Steenkamp, 1990). When a signal is perceived, association of the consumer with the attribute which needs to be stressed is automatically evoked. The combination of opinion on quality and consumer desires constitutes the basis for judgments and preferences (Sheth et al., 1991; Huffman and Houston, 1993). In particular, marketing agri-food products by using the name of their region of origin (e.g. Parma ham) is a strategy that exploits the evocative capacity of this name-signal (Aaker, 1991). Indeed, by using an indication of origin it is possible to exploit associations of consumers with a region and attribute to the product a perceived image and quality (Kapferer, 1992).
Below we present results based on a two-step analysis conducted in Germany focusing on peaches. The first step in the analysis was centered on focus groups run in representative cities. This phase shed some light on German consumer preferences and opinions on fruit and vegetables. It also provided useful suggestions for developing the questionnaire and for choice set design, integral parts of the multi-attribute choice survey which made up the second step of the study. This was administered to a representative sample of German consumers. A consumer preference analysis was then performed estimating a latent choice model on the choice data collected in this survey. Product attributes surveyed were country of origin (Italy, Turkey, France and Spain), protected geographic indication and organic production. Our results show the important role played by country of origin as a fundamental characteristic underlying quality perception of the product.

The results indicate the presence of three distinct consumer segments in the German peach market. The largest segment (48%) showed a strong preference for Italian peaches as well as for organic and PDO certification. For this segment price was not an important attribute. The second segment (41%) showed a strong preference for Spanish products and organic certification. Price was important in this case. The third segment (11%) had a negative preference for Italian and Spanish peaches, and price was the most important attribute

2. The survey

A representative sample of 300 German peach consumers was selected and interviewed in Germany in order to outline choice behavior towards, and opinion of, peaches and their country of origin. The sample was randomly selected in five German cities: Berlin, Stuttgart, Munich, Cologne and Hamburg (60 in each city). Face-to-face interviews were conducted in halls and in public venues in city centers. Individuals were selected among those who stated they were in charge of grocery shopping and consumers of peaches. The interview was based on a questionnaire structured into four sections. The first section focused on purchase and consumption models for peaches.

According to the survey German peach consumers can be generally defined as frequent consumers of this fruit (Tab. 1). Indeed, more than half the sample state they buy peaches at least once a week. Taste, appearance and degree of maturity are the highest ranked attributes. However, none of the attributes listed performed with a rank significantly below 4 (the lowest was packaging with 3.9 - Figure 1).

Table 1. Distribution of how often interviewees stated they bought peaches during the peach season

Alternatives	Percentage
3-4 times per week	4.00
1-2 times per week	31.00
1-3 times per month	49.00
less than once per month	16.00
Tot	*100.00*

The importance of some real and immaterial product attributes was investigated in a seven-item Likert scale, going from 1 for "not important at all" to 7, "very important". The attributes considered were organic certification, geographic indication, packaging, taste, transport from farm to shelf, price and growth level.

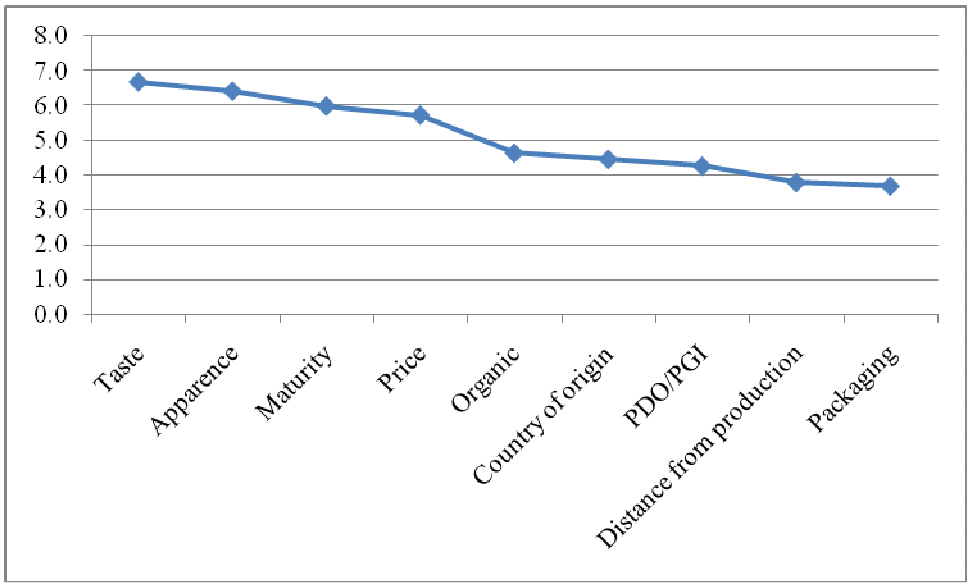

Figure 1. Sample average Likert scores of peach attributes

Spain holds the best reputation for producing high quality peaches, very closely followed by Italy. France was indicated as the worst producer for this product (Tab. 2).

Table 2. Sample average Likert score (1= the worst – 4= the best)

Alternatives	Average Likert score
Spain	2.9
Italy	2.8
Turkey	2.2
France	2.1

The second section was devoted to the choice experiment. Important insights emerging from four focus groups (2 in Berlin and 2 in Frankfurt) were instrumental in designing the experiment. Three peach attributes were considered: country of origin (France, Spain, Italy, Turkey), European certification of geographic indication (PDO/PGI), organic certification and the price in Euro/kg (1, 1.5, 2, 2.5, 3). An orthogonal design on these attributes and levels produced profiles, then shifted four times. Every consumer was interviewed on two sets, with five profiles each.
The hypothetical scenario for the choice experiment was presented as follows: "*Imagine you are in the shop where you normally buy fruit and vegetables: the following one-kilogram packages of peaches are available. Would you buy any of them? Which one in particular?*". This approach, cognitively simple to manage, highlighted the most preferred profile for each set. Data from consumer responses were analyzed with a latent class choice model as reported in the next section.
The third section is designed to gather information concerning psychographic variables by using Likert scales of 1-7. In particular, consumer lifestyles are investigated, as well as several behavioral aspects and the perception and values associated to the purchase of peaches and product attributes. Of the above, particular attention is laid on analyzing the effect of origin on the purchase process. Finally, the last section of the questionnaire investigated socio-economic characteristics.

4. Latent class choice model

Traditional clustering approaches utilize unsupervised classification algorithms that group cases together that are "near" each other according to some ad hoc definition of "distance". In the last decade interest has shifted towards model-based approaches which use estimated membership probabilities to classify cases into the appropriate cluster (Scarpa and Thiene, 2007). The most popular model-based approach is known as mixture-model clustering, where each latent class represents a hidden cluster (McLachlan and NelderR, 1989). Within the marketing research field, this method is sometimes referred to as "latent discriminant analysis" (Dillon and Mulani, 1999).
A latent class model allows the analyst to identify groups of people with different preferences, as reflected by their self-reported attitudes. Basically, we expected to identify segments of people according to the choice made by consumers. There are consumers who are very concerned with price or organic certification or country of origin, as well as others who are not particularly bothered by this issue. Each of these groups has other characteristics which tend to vary among groups but not much within the group (Cicia et al., 2009). People with a high probability of being placed in the same group are homogeneous with respect to their attitude scores. As a result, they are expected to have similar underlying preferences.
The assumption of latent class models is that a person belongs to a specific group, but that class membership is unknown or latent. As a consequence, people belonging to different classes will have different preferences and will therefore respond in different ways to attitudinal questions. The interesting thing is that the number of classes is estimated by the model without setting any restriction, hence allowing for a wider range of preference heterogeneity. This means that the researcher does not have to assume a single distribution for the parameters or a specific functional form.
The latent class logit model estimates simultaneously the probability of a consumer choosing an alternative in the context of a choice set and the same consumer belonging to a specific segment with taste homogeneity. If each individual consumer interviewed is subject to a sequence of choice sets equal

to Tn, where in our case n = 2, then the joint probability of the individual n making the sequence of choices Tn is:

$$P_{in} = \sum_{s-1}^{S} P_{in|s} P_{ns} = \sum_{s-1}^{S} \left(\frac{e^{\alpha\gamma_s Z_n}}{\sum_{k=1}^{S} e^{\alpha\gamma_s Z_n}} \right) \prod_{t-1}^{t=T_n} \left(\frac{e^{\mu_s \beta_s X_{in}}}{\sum_{j \in C_n} e^{\mu_s \beta_s X_{jn}}} \right) \tag{1}$$

where Zn is a vector that contains information on the psychometric and socio-economic variables for individual n, with coefficients equal to γs, α is the parameter scale error which is assumed Gumbel distributed, S is the number of segments s comprising the sample, X_{in} is the vector of individual characteristics and attributes of the products and μs is the scale parameter. Although the scale parameter μ_s may vary between segments, it is usually considered equal to 1 in order to identify the other parameters.
If $\gamma_s = 0$, $\beta_s = \beta$ and $\mu_s = \mu$, ∀s, then eqn. (1) is none other than McFadden's classic multinomial logit (1974) in which taste homogeneity is assumed in the population. Hence the latter consists of a single segment (Scarpa and Thiene, 2005).

5. The results

The results obtained by applying the latent model show the existence of three distinct segments of peach consumers. The number of segments was chosen by both taking account of information criteria[1] and ensuring that the various clusters obtained had a width and identifiability which is indispensable in the operative effects of marketing.
As may be seen in table 3, the first segment is characterized both by a clear preference for the Italian product, for certifying source and organic production, and by a lack of price-sensitivity. Indeed, the positive sign of the relative coefficient could indicate that the consumers belonging to this cluster use price as a quality indicator. According to estimates made, this first segment holds 48% of consumers. By contrast, the other two segments differ from the first in the presence of a clear, growing sensitivity to price. In both cases, the coefficient, in line with economic theory, has a negative sign. Moreover, cluster 2 seems to prefer the Spanish product, cluster 3 Turkish peaches in particular. The preference for certification remains constant in the three groups, albeit to different degrees.
As regards the two behavioral variables detected in the third section of the questionnaire and included in the model (*focusing on food country of origin* and *bought Italian peaches*), these help to characterize the segments more clearly. Indeed, cluster 1 shows positive coefficients for both variables, the opposite of cluster 3, while cluster 2 shows a positive effect of the variable *focusing on food country of origin* and a

[1] Some authors have used as a guide to choosing the number of groups a variety of information criteria C = -2lnL + J k, where lnL is the log likelihood of the model at convergence, J is the number of parameters estimated in the model and k is a constant that may assume different values according to the criterion used. If k=2, we obtain Akaike's Information Criterion (AIC); if k=3, we obtain Akaike's Information Criterion 3 (AIC3); if k=ln(N) we obtain the Bayesian Information Criterion. Lastly, if k= 2+2(J+1)(J+2)/(N-J-2) the corrected AIC (CAIC) (Hurvich and Tsai, 1989) is obtained, which tends to increase the penalty for the numbers of extra parameters estimated.

negative coefficient for the use of Italian peaches. In terms of cluster size, estimates of the probabilities of cluster membership indicated that 41% of the population belongs to segment 2, only 11% to segment 3.

Table 3 – Latent class model estimate (3-class cluster model)

Variables	Class1	p-value	Class2	p-value	Class3	p-value
Spain	-3.3973	0.0004	1.7677	0.0004	-0.9116	0.0004
Turkey	-1.3694	0.0003	-0.2782	0.0001	5.9801	0.0000
France	-0.1505	0.0000	-0.0784	0.0000	4.0008	0.0006
Organic	1.5692	0.0000	1.7407	0.0003	3.9041	0.0000
PDO/PGI	0.4859	0.0002	0.5277	0.0000	2.0001	0.0004
Price	0.397	0.0000	-0.5296	0.0000	-3.0145	0.0000
Focusing on food country of origin	1.492	0.0085	0.542	0.0005	-0.2928	0.0085
Bought Italian peaches	3.948	0.00097	-0.1416	0.00007	-0.4269	0.00097
Class n.	144		123		33	
(cluster membership probabilities)	48%		41%		11%	

Log-likelihood (LL) = -1089.33
BIC= 2314.159; AIC = 2226.67;
AIC3=2250.7; CAIC= 2338.16 #

By contrast, table 4 reports the relative importance attached by consumers to the various attributes in making product choice. Given the signs of the coefficients of the various attributes, it appears even more evident that the first segment is looking first and foremost for a product whose country of origin is clear, which is organic and whose price provides the assurance of high quality. The second segment, by contrast, seeks a healthy product (organic) but at a moderate price. By contrast, segment 3 uses price as the main driver of purchase.

Table 4. Relative importance of different attributes (%)

Variables	Class1	Class2	Class3
Spain	41.5	30	3.5
Turkey	16.7	5	23
France	1.8	1	15.5
Organic	19	28	15
PDO/PGI	6	9	7.8
Price	15	27	35
Tot. Importance	*100*	*100*	*100*

6. Conclusion

Competitive markets are the contexts where product development and promotion strategies are best implemented. The agri-food sector has a diversified and continuously evolving framework. For some product types, such as fruit and vegetables, product differentiation on worldwide markets has been left to generic and immaterial attributes often related to country of origin.

The results obtained in our survey appear to indicate in the peach market the existence of three distinct consumer segments, differentiated by two elements. The first is the importance which knowledge of the product's country of origin has on choice; the second is related to the role of the *price* attribute in the purchase process. Also on the basis of the relative importance estimated for the different attributes in the various clusters, it would seem that the first segment consists of consumers attentive to food origin who associate Italian peaches with high quality. This perception is borne out by the fact that, on comparing the relative importance attributed to organic and PDO/PGI in the various segments, the latter are either comparable or, in some cases, greater in segments 2 and 3 which are more price-sensitive. In other words, for segment 1 which represents about 50% of consumers, Italian provenance is the most credible guarantee of quality.

If we bracket segments 1 and 2 together, our results indicate that about 90% of consumers use product origin as a major attribute in the choice process. This evidence suggests the advisability of a strategy to develop fresh fruit and vegetables based on origin, so much more so in light of the traceability provisions established by national and international law. However, at the same time it must be borne in mind that such interventions, especially on modern, evolved markets, might be to satisfy the emerging needs of post-modern society (Fabris, 2005) that are related to higher food safety requirements, and with a low environmental impact of both production and distribution.

In this context, using a product's origin as further information to give consumers so that they attach a higher degree of credence to the product only makes sense if this ensures a production and distribution process with greater environmental and social sustainability.

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