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The Impact of Country-of-Origin Information on Consumer Perception of Environment-Friendly Characteristics

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ABSTRACT

The intense process of internationalization of the food market is giving rise to new competitive scenarios. Growing market shares on the part of new export countries, along with other consumer and retail issues, impose different marketing policies for agri-food products. In particular, greater consumer awareness of environmental and health issues is changing the structure of demand for fresh products. In the past, the country of origin and a good quality/price ratio were the main strategic strengths for gaining and maintaining international market shares. Nowadays, market shares are gained by moving towards new product attributes, namely environmental friendliness and food safety. This paper draws attention to new, more successful marketing strategies. The case study is the German cherry tomato market. Our analysis of German consumer preferences on stated choice data produces interesting insights. Product attributes related to the environment are found to be relevant to forming consumer preferences. As these are termed "faith" attributes, we speculate that German consumers refer to product origin country as a proxy of its environmental aspects. Two separate competitive segments emerge, one with a higher level of environmental quality, namely Germany and Italy, and the other comprising Turkey, Spain, France and Holland.

Keywords: competitiveness strategies, German cherry tomato market, environmentally friendly, fresh vegetables, Mixed Nested Logit

1 Introduction

The process of intense internationalization of the food market is giving rise to new competitive scenarios, mainly concerning quality products. The growing concern of consumers for environmental friendliness and health issues is slowly changing the structure of demand for several goods, including those belonging to the fresh fruit and vegetable market. Up to a few years ago, country of origin and a good quality/price ratio were the main strategic strengths for gaining and maintaining quotas in international markets. At present, the major role played by new retailers is steering the market towards new product attributes, thereby affecting market share distributions across the largest conventional export countries.

In the present study these issues are tackled by analyzing German consumer preferences for different cherry tomato attributes. Tomato production in Germany is relatively low, and imports high, almost all of which are from producer countries within the EU (Benelux, Spain and Italy are the largest suppliers). Consumer concern about agro-chemical residues is strong in Germany, and particularly relevant to products consumed fresh, including tomatoes. Consumers not only demand high quality products, but are also concerned with how products are grown from the environmental aspect (Mann, 2003; USAID, 2006).

Country-of-origin is a well known proxy for credence attributes such as food safety (Cicia and Colantuoni, 2010). The aim of this paper is to investigate whether country-of-origin cues can also influence the perception of environmentally friendly intangible characteristics in food products.

We present the results of an analysis conducted in Germany and focused on survey data. A multi-attribute choice survey was administered to a representative sample of German consumers. Consumer preference analysis was then performed by estimating random utility models on the choice data collected. Cherry tomato attributes surveyed were: 1. Country-of-origin (Italy, Germany, Holland, Turkey, France and Spain); 2. Protected Geographic Indication (PGI); 3. Organic certification; 4. Biodegradable plastic packaging; 5. Price. The results indicate the existence of a relationship for German consumers between country-of-origin and the environmental characteristics of the cherry tomato.

2 The Survey

A representative sample of 360 German cherry tomato consumers was recruited by a market research company (*Istituto Piepoli*). Individuals were selected among those who stated they were in charge of grocery shopping and were consumers of cherry tomatoes. According to data presented in table 1, the interviewees can be generally defined as frequent consumers of cherry tomatoes since more than 60% of the sample stated that they bought this product at least once a week. Moreover, according to consumer responses the identification of cherry tomato country of origin is not perceived to be a problem.

Table 1.
Cherry tomato buying frequency

Buying frequency	Sample percentage	Buying frequency	Sample percentage
More than once a week	9.3	At least once a month	28.7
At least once a week	53.7	Less than once a month	8.3

n. = 360

The interview was based on a questionnaire structured in three sections. The first section focused on purchasing and consumption models for cherry tomato consumers. 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*". Table 2 shows the sample average Likert score for these attributes. Surprisingly, the attributes considered most desirable (over 5) are hedonistic: taste, appearance, ripeness, ready-to-eat and price. By contrast, attributes related to area of origin and the environment were awarded a lower score, albeit always over 4.

Table 2.
Likert score (1-7) for different cherry tomato attributes

Attributes	Sample average Likert score	Attributes	Sample average Likert score
Taste	6.7	Country of origin	5,0
Appearance	6.3	Organic certification	4.8
Ripeness	5.8	PGI certification	4.3
Price	5.5	Biodegradable packaging	4.2
Ready to eat	5.2	Food miles	4.1

n. = 360

Consumers were also asked to rank cherry tomatoes in terms of quality by the country of origin. Table 3 shows Germany holds the best reputation for producing high quality cherry tomatoes, followed by Italy and Spain. The other three countries follow at a considerable distance.

Table 3.
Cherry tomatoes ranked in quality terms by country of origin

Best country of origin	Sample percentage	Worst country of origin	Sample percentage
Germany	32.2	Holland	46.5
Italy	23.7	Turkey	20.4
Spain	19.6	France	13.4
Turkey	9.3	Germany	8.9
France	8.5	Spain	6.2
Holland	6.7	Italy	4.6

n. = 360

Conversely, 46.5% of the sample ranks Holland as the worst producer for this product. By contrast, a very small share of the sample (4.6%) considers Italy the worst producer of cherry tomatoes.

The second section of the questionnaire consisted in a choice experiment. After five focus groups held in different German towns to design the experiment, five attributes of cherry tomatoes were considered: 1. Country-of-origin (Italy, Germany, Holland, Turkey, France and Spain); 2. Protected Geographical Indication (PGI)[*]; 3. Organic certification; 4. Biodegradable plastic packaging; 5. Price (1, 1.5, 2, 2.5, 3 Euro/500 gram package).

In order to make a design generation, standard procedures for labelled experiments were used (Louviere *et al*., 2000). To ensure identification of all the effects concerned, an orthogonal fraction of the whole factorial was used as the basic design and produced 45 profiles. These profiles were then cycled six times to produce the other elements of the choice set, and blocked in choice sets. Employing cycling gives designs that are more robust to mis-specification than minimization of the *D*-p error when the analyst has no clear prior information on the value of b (Ferrini and Scarpa, 2005). Each consumer was interviewed on a sequence of three choice sets, choosing their preferred alternative from a set of six profiles each time.

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 500 gram packages of cherry tomatoes are available. Would you buy any of them? Which one in particular?*"

This approach has the advantage of being cognitively undemanding for the respondent (De Shazo and Fermo, 2002). Data from consumer responses were analyzed, accounting for substitutability across different export countries by means of a mixed logit with an error structure design to capture correlation in a similar way to a nested logit, as reported in the next section. Finally, the last section of the questionnaire investigated the respondent's socio-economic characteristics.

3 Random Utility Model with additional error components

Consumer preference estimation is achieved by means of a random utility model specified on quality attributes as described in packaging labels. We draw from the extensive literature on flexible discrete choice models without closed-form solutions and use a mixed logit model that combines error components (Brownstone and Train, 1999) as well as random taste parameters over respondents (Train, 1998). As shown by McFadden and Train (2000), mixed logit models have the ability to represent any preference structure and hence we undertook an extensive model specification search to identify the best performing model under a wide range of criteria that included statistical fit to the data, plausibility of substitution patterns across countries of origin, and implications for the marginal rate of substitutions and parsimony. The latter is an important criterion as these models can soon become over-parameterized and require complex specification decisions[†].

Put succinctly, in order to jointly address taste variation and flexible substitution patterns these mixed logit models are specified with indirect utility including error components in addition to random taste intensities and the conventional Gumbel error. The assumption remains that the chosen cherry tomato is the one maximizing utility in the choice set. Hence the probability of selection is linked to the probability of this tomato providing the highest utility across those available.

While conditional on the Gumbel error the selection probability of a type of cherry tomato is logit, the unconditional probability of the panel of the six observed choices made by each respondent requires integration over all the possible values of the additional zero-mean normal errors denoted by

$\varepsilon_n \sim N(0, \sigma^2)$ and normal random taste intensities $\beta_n \sim N(\mu_\beta, \sigma_\beta^2)$. After all, one respondent can either like or dislike the Spanish origin with some kind of high density region, so a unimodal distribution spanning the entire line is appropriate. While the use of mixing taste intensity distributions is quite straightforward (i.e. one assumes a distribution of taste in the population and estimates its parameters),

[*] Within the EU, there are several areas that grow tomatoes with Protected Geographical Indication (PGI): Pachino (Italy), Reichenau Island (Germany), La Cañada-Nijar (Spain). San Marzano (Italy) and Vesuvio (Italy) grow tomatoes with Protected Denomination of Origin (PDO).

[†] See Train (2003) for a general exposition on mixed logit modeling, Herriges and Phaneuf (2002) for details on the use of error component mixed logit models to describe and select from competing specification in terms of substitution patterns, Scarpa et al. (2005) for performance under mis-specification, Scarpa et al. (2007) for comparison between panel and non-panel error structures in the context of variable error variance with socio-economic interactions, and Ferrini and Scarpa (2005) for issues of their robustness to commonly employed experimental designs for WTP estimation in choice experiment with opt-out or status-quo.

the induction of substitution is less frequently used, but perhaps just as important to the realism of the model. Testing of substitution patterns is induced by testing for the existence of specific correlation structures which can be obtained by selective inclusion of common error terms across alternatives. For example, in our specification search not only did we investigate the randomness of all attributes across respondents, but also all the possible combinations of substitution patterns across countries of origin. The best performing model was derived by using a single error component associated with both German or Italian origin through the indicator function 1(˙), as well as with one attribute showing cross individual variation: the taste parameter for Spanish origin. Hence the unconditional probability of the sequence is:

$$\Pr\left\langle i_{t=1}, i_{t=2}, i_{T=3}\right\rangle = \int_{\varepsilon_n \in \mathrm{i}} \prod_{t=1}^{T=3} \frac{e^{\boldsymbol{\beta}_n \mathbf{x}_{it} + 1_{it}(\varepsilon_n)}}{\sum_{j=1}^{J=6} e^{\boldsymbol{\beta}_n \mathbf{x}_{jt} + 1_{jt}(\varepsilon_n)}} f(\varepsilon_n \mid \boldsymbol{\Omega}) g(\boldsymbol{\beta}_n \mid \boldsymbol{\Sigma}) d\varepsilon_n d\boldsymbol{\beta}_n,$$

where $f(\dot{})$ defines the assumed distribution for the additional errors and $\boldsymbol{\Omega}$ is a set of parameters determining the behaviour of this distribution. Such probability does not have a closed form and hence simulation methods need to be employed for its computation during the estimation of the parameters from the observed choices. Techniques to achieve this are well illustrated by Train (2003) and need not be repeated here.

As reported in section 2, five characteristics of cherry tomato were used to estimate the choice probability for German consumers:

1. Country of origin (French, Spain, Turkey, Holland), dummy coded using—after an extensive specification search—Germany or Italy as baseline;

2. Biodegradable plastic packaging (YES=1, NO=0);

3. PGI (YES=1, NO=0);

4. Organic (YES=1, NO=0);

5. Price (in Euros).

Many interaction terms were also used in the specification search as proposed amongst others by Brambor *et al*. (2006), but these were found to be either not statistically significant, or to complicate interpretation of the results. Table 4 reports the estimates of the model we finally chose to present.

4 Results of the model

The results in table 4 show that the coefficient for PRICE is negative and statistically significant: *ceteris paribus*, a price increase reduces the choice probability. The ORGANIC attribute has a positive sign, showing that it increases the probability of tomatoes being chosen by German consumers. This is consistent with what was found by other authors (Halawany *et al.,* 2007) and discussed in the previous part of this paper. This attribute guarantees, on average, a premium price of 0.72 Euro per 500 grams of product.

Table 4.
Results of the Random Utility Model with additional error component

Variable	*Coefficient*	*β/st.dev.*	*p_values*
France	-0.281	-2.83	0.0017
Turkey	-0.101	-1075,000	0.2825
Holland	-0.227	-2.32	0.0201
Organic	0.249	3818,000	0.0001
Price	-0.343	-7471,000	0.0000
	Additional error component		
Italy_Germany_Organic (β)		*fixed*	
Italy_Germany_Organic (σ)	0.191	1.319	0.1872
	Random parameter (Normal distribution)		
Spain (β)	-0.107	-0.927	0.354
Spain (σ)	0.428	1.719	0.0856

n. = 360
Loglik = 1840

PGI certification and BIODEGRADABLE PLASTIC PACKAGING do not appear to have a statistically significant influence on choice probability. Quite interesting is the role played in consumer choice by COUNTRY-OF-ORIGIN: the results of the econometric model suggest that with the exception of Turkey, countries of origin have a statistically significant influence on choice probability, with an intensity that varies depending on the country. For example, origin from France, Spain and Holland have a negative influence using domestic production as reference. Nonetheless, our specification testing shows that Spain is the only country towards which German consumers showed substantial degree of taste heterogeneity. In fact, the null that this attribute is randomly distributed could not be rejected. Estimates of mean and standard deviation for the distribution of this attribute imply that about 40% of consumers show a positive attitude toward Spanish cherry tomato.

Preference for the Italian and German product is confirmed in the econometric model with error components by the presence of a correlated preference structure (common error term in the utilities) that places Italy and Germany together, separately from all the other countries: the common error component for German or Italian origin from organic production was the only one consistently showing significance in the specification search with a significant estimate for the standard deviation. This represents the spread of the additional error component associated with Italian and German origin if the chosen tomatoes came from an organic production technique.

This error component is additional to the Gumbel error and provides the model with a correlation structure similar to a nested model (Herriges and Phaneuf, 2002).

This result suggests that cherry tomatoes from Germany and Italy are perceived by German consumers as superior to those from other countries. Moreover, these two countries are positively associated with an important environmentally friendly characteristic (organic). The utility structure is consistent with the interpretation that consumers have an opinion about tomatoes with Italian and German origins, which differs from the rest of the origins investigated here. Not only do consumers put them into a different category from those of all the other investigated countries, but it seems they perceive them as environmentally friendly products.

In conclusion, the interpretation of the nest is consistent with our understanding of motivations underlying German consumer preference for local and Italian cherry tomato, namely the perception of "ecological and area" aspects and greater attention to the environment which they associate to production and producers from these countries.

5 Final remarks

In this study we investigated whether country of origin can influence the perception of environmentally friendly intangible characteristics in food products by analysing the preferences of German consumers for different cherry tomato attributes.

The first result obtained concerns a new and unexpected definition of competing country groups within the cherry tomato segment in the German market. That is, it was possible to define, through a RUM model with flexible substitution patterns, the existence of two well-defined groups of countries: Germany and Italy on the one hand, and Turkey, Holland, France and Spain, on the other. Consumers deem the two groups as producing two different quality levels of cherry tomatoes. More specifically, a higher quality standard is associated to the first group of countries.

Another significant result was the characterization of an attribute involved in forming the quality concept in consumer perception: ecological attributes such as organic. This attribute contributes to give the product under analysis a higher ecological ranking when related to country-of-origin.

As ecological attributes are defined as credence attributes, German consumers seem to refer to product country-of-origin as a proxy for its "environmental value content". As a consequence, they seem to perceive two different competitive segments: the first, with a higher level of "environmental" quality, includes tomatoes from Germany and Italy, while the second block of countries, ranked less highly under this criterion, comprises Turkey, Spain, France and Holland.

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