Can Innovations in Traditional Pork Products Help thriving EU Untapped Pig Breeds? A Non-Hypothetical Discrete Choice Experiment with hedonic evaluation

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Abstract

The EU is supporting measures that stimulate enhanced value-added products in order to conserve local and threatened livestock breeds. Several Traditional Pork Products (TPP) and Innovative Traditional Pork Products (ITPP) with health innovations from four untapped pig breeds in Spain (*Porc Negre Mallorquí*), Croatia (*Turopolje*), Italy (*Cinta Senese*) and Slovenia (*Krškopolje*) were analysed. Consumers' "Non-hypothetical" willingness to pay (WTP) and hedonic evaluation were investigated. An integrated experimental approach using two Non-Hypothetical Discrete Choice Experiment (NH-DCE) was carried out before and after a hedonic evaluation test. Results showed that the health innovative products (ITPP) received similar and even lower WTP than the "control" products (TPP) from the untapped pig breeds. The TPP outperformed products enriched with healthy ingredients or with reduced undesirable compounds. The potential demand for traditional and "unaltered" product from the rustic pig breeds could contribute to their conservation. A market niche exists, where consumers appreciate these high-quality products and where no "add-ons" are required to enhance their uptake.

Key words: Untapped pig breeds, Innovative Traditional Pork products, Non-hypothetical Discrete Choice Experiment, Health perceptions, Hedonic evaluation.

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1. Introduction

Conservation and enhancement of agro-biodiversity remains one of the top policy challenges addressed by the Common Agricultural Policy (CAP). Different measures have been taken to halt biodiversity loss, to preserve farm genetic resources and to protect the natural capital inherent to the European citizens' health and economy (EC, 2017a). In 2001, the EU adopted the Biodiversity Action Plan for Agriculture (EC, 2017b) which integrated the environmental requirements into market policy. One of the main priorities of this plan is the promotion of actions to conserve local or threatened livestock breeds.

The preservation of the untapped animal breeds plays a relevant role in protecting the genetic value related to specific traits that are nearly disappeared from highly selected breeds. It may also contribute to maintain the cultural landscape associated to the animal habitats and their production systems (Tieskens *et al*., 2017). It furthermore, helps to sustain the cultural and ethnological characteristics of the European rural communities associated to farming and agricultural activities.

The EU is supporting measures that stimulate enhanced traditional products with a special quality cues (Balogh *et al*., 2016). The promotion of the Traditional Food Products (TFP) falls within this approach due to their positive image associated to better quality, positive sensory merits and their strong associations with a particular origin and locality (Guerrero *et al*., 2009; Almli *et al*., 2011, Verbeke *et al*., 2016). There is an increasing interest to analyse consumers' purchase intention and WTP towards the TFP and to understand what these products means to consumers and which values bring to societies (Vanhonacker *et al*., 2010, Balogh *et al*; 2016; Verbeke *et al*., 2016). This research fits within these proposed measures that aim to protect the local, autochthonous and untapped pig breeds by creating added-value products that meet consumers' preferences and market demand.

The perceived quality traits of the TFP can be improved by several food innovations (Kühne *et al*., 2010) leading to what we call Innovative Traditional Food products (ITFP). In particular, food innovations that may provide consumers with tangible benefits and perceived consequences for human health are relevant (Magnusson, *et al*. 2003). However, tradition and innovation may appear to be incompatible concepts and even contradictory according to consumers' perceptions (Guerrero *et al*., 2009). Therefore, it is relevant to verify how health innovations and traditional food products may affect consumers' preferences and how they contribute to the maintaining of threatened animal breeds.

Health concerns are becoming a determinant factor for food consumption and purchase decision (Siró, *et al*., 2008). A relevant part of food innovations is based on producing healthy alternative products by reducing undesirable components (less salt, less saturated fat, less added sugar, without chemical conserving agent...) or by adding healthy substitute ingredients (polyunsaturated fatty acid such as omega-3, natural antioxidant, Stevia leaves, vitamins...). At market level, health claims are increasingly playing an important role as determinant factor for the purchase decision of food (Nayga, 2008; Viana *et al*., 2014). Several studies showed that health claim label reduces the perception of risk exposure to certain diseases (Kozup *et al*., 2003; Choi & Springston, 2014; Kallas *et al*., 2014). In consequence, the proliferation of these products has led the European authorities responsible for food policy to continuously regulate the use of these new claims (Regulation 432/2012).

The food sector is constantly trying new formulations, innovative ingredients and technologies in food processing. Thus, the market availability of these new and novel products is constantly growing. Their demand has been increasing with respect to what consumers traditionally purchased, making worth the effort to understand consumers' response towards these kind of innovative products, in particular those obtained from autochthonous (local) animal breeds as a policy conservation tool. In this context, it is relevant to update our knowledge regarding the consumers' preference (i.e., their willingness to pay, WTP) and acceptance (i.e. hedonic evaluation) towards these added-value products linked to untapped pig breeds since this may constitute a valuable way to enhance their conservation status.

In this context, the main objective of this study was to analyse the consumers' non-hypothetical WTP and hedonic evaluation towards new products obtained from four untapped and local pig breeds in Spain (*Porc Negre Mallorquí*), Croatia (*Turopolje*), Italy (*Cinta Senese*) and Slovenia (*Krškopolje*) in order to asses to what extent promoting either Traditional (TPP) or Innovative (ITPP) added-value pork products may contribute to preserving threatened pig breeds in four EU case studies. For this purpose, we followed a methodological approach that combines the consumers' preference elicitation with the hedonic evaluation. First, the consumers' expected WTP were analysed by a Non-Hypothetical Discrete Choice Experiment (NH-DCE). Afterwards, a hedonic evaluation test in different information environment was carried out. In the last step, the same NH-DCE was repeated allowing to estimate consumers' actual WTP and to understand how the informed sensory experience affected consumers' preferences. In this stage, consumers were allowed to simultaneously review their first choice to control for random change. For the econometric modelling, preferences were estimated by means of the universal logit model (McFadden *et al*., 1977) using a 'reduced form' indirect utility function of a Random Parameters Logit (RPL).

2. Material and methods

Our methodological approach relied on the expectancy-disconfirmation model (Oliver, 1980) and in part on the Total Food Quality Model (Grunert *et al.*, 1996). In an experimental economic environment, we looked for simulating consumers' behaviour in a grocery store when facing a new product for the first time. In this stage, many of the product attributes cannot be experienced before or during the purchase action. Thus, consumers' built expectations (expected WTP) on the basis of the information provided by the product label and on consumers' past experience with other products (cognitive state before consumption). However, after consuming and tasting the food product, other cognitive state appears (actual WTP). The actual hedonic evaluation may have an impact on what consumers expected from the product. A negative disconfirmation occurs when the actual liking experience worsens expectations, leading to consumer dissatisfaction and vice versa. When the expected preferences match the experienced one, the former are confirmed and consumers' satisfaction is reached.

2.1. The experiment performance

Data was collected from open-ended questionnaires completed in a controlled environment from a sample of at least 120 consumers in each country. The individuals selected were consumers over 18 years' old who purchase food and beverages and had purchased and consumed the selected products at least once in the last month. A quota sampling procedure was used in terms of gender and age. The experiment was conducted in Barcelona (Spain), Bologna (Italy), Ljubljana, Maribor and Koper-Capodistria (Slovenia) and Zagreb (Croatia) from February to October 2017. To engage consumers, they were economically compensated for their participation (approximately with twenty Euros value in a voucher/gift by respondent). Each experiment session lasted approximately 1.5 hour. Table 1 represents a summary of the sample description across countries. The experiment was carried out according to the following main steps:

i. An initial questionnaire regarding pork consumption, purchasing behaviour and opinions towards the traditional pork products was administered. Perceptions regarding the healthiness of the pork products proposed in each case study were also retrieved. The demographic and socioeconomic variables were collected.
ii. A second step that focused on analysing the expected preference by asking participants to select their preferred product from different choice sets at competing price levels built within a NH-DCE labelled design. Before starting the choice exercise, consumers were unexpectedly rewarded by an extra amount of money and informed that a binding choice set will be drawn and they should exchange money for products based on their decision.

iii. A hedonic evaluation test was carried out for the products. The hedonic evaluation was carried out with information but without tasting (expected liking) and with both tasting and information (actual liking). After the hedonic test, consumers were asked to carefully review their actual liking scores and to check for the characteristics of each specific product they tasted.

iv. In the fourth step, consumers turned to answer the same NH-DCE, but this time taking into account their hedonic evaluation.

v. At the end of the experiment, a non-hypothetical purchase scenario was created to exchange products and money in order to reduce the hypothetical bias and to enforce incentive compatibility. When the "no-purchase option" was selected, no real exchange was realized.

2.1.1. The untapped pig breeds used in each case study

The Majorcan Black Pig (*Porc Negre Mallorquí*) is a native, rustic and autochthonous breed from Mallorca (Balearic Islands in Spain) that is managed in extensive and semi-extensive system (between 10 and 25 pigs/ha). This breed is catalogued in list of breeds with danger of extinction since 1997 by the Spanish Ministry of Agriculture, Food and Environmental Affairs (Gonzalez *et al*., 2013). it is well adapted to the Mediterranean climatic conditions and it is tightly related to the local economy and cultural heritage of the region. The last data available showed that the breed population include 1000 sows and 90 boras in 60 farms (Gonzalez *et al*., 2013). Currently, there are two available products from the breed: The *Sobrassada de Mallorca de Porc Negre* with a Protected Geographical Indication (PGI) which is a spreadable dry cured sausage and piglets slaughtered at 8 Kg. The development of new products from the breed is fundamental to contribute to its economic sustainability.

Slovenia has only one preserved indigenous local pig breed, the Krškopolje pig (*Krškopoljski prašič*). The origin and name of this pig comes from the area where it was mostly populated and preserved (around the town of Krško with the local area named Krško polje). Krškopolje pig has a black coat colour with a white belt across shoulders and forelegs. In the nineties the *in situ* gene bank for Krškopolje pig was established with nucleus of only 30 sows and 3 boars. Presently there are 130 registered farms of Krškopolje pigs with about 300 breeding sows and 60 boars, however, the breeders have on average only 2 to 3 sows and pigs are reared in very different conditions; usually farmers combine indoor and outdoor rearing. Feeding is varied, and farmers use various crops and pasture, but also feed mixtures. The increased interest for the breed can be ascribed to the promotion and support for the organic farming along with the subsidies for the use of Krškopolje pig (Kastelic & Čandek-Potokar, 2013).

The Turopolje pig breed (*turopoljska svinja*) is one of the oldest pig breeds in Europe. It is a medium-sized, primitive-type and fatty pig breed. Its original habitat, the Turopolje valley, between the Sava and Kupa rivers near Zagreb in the Republic of Croatia did not change for centuries. Even though, this pig had important economic factor in the past, it is nearly extinct in the second half of the 20th century and currently, despite the state support, it is still endangered. Based on official data (HPA, 2018), there were only 14 breeders of Turopolje pig with total of 17 boars and 124 sows under production control in 2017. Pigs are maintained mainly in outdoor system, often in forest with a possibility of free movement (Luković *et al*., 2017). Turopolje pig is poorly exploited local pig breed whose conservation is mainly maintained thanks to a state support to farmers without any marketing strategy (Cerjak *et al*., 2017).

Cinta Senese is a native Tuscan pig breed. After being nearly extinct in the '80s, it underwent an intense recovery program that, nowadays, has led to about 5000 animals reared in 140 farms. Currently there are 131 boars and 809 sows are currently registered as reproducers. *Cinta Senese* is a medium size pig and tends to an excessive overall carcass fatness. Its name "*Cinta*" derived from the characteristics white band that surrounds the trunk at shoulder level and includes the forelimbs, while the remaining coat is black. *Cinta Senese* is traditionally reared in free-range system and fattened in woods with acorns and chestnut (Pugliese *et al*., 2013). The combination of its intrinsic meat characteristics, the feeding strategies and its ancient link with the territory has gained the breed a Protected Designation of Origin (PDO) on fresh meat in 2012 which ensure that the products are produced, processed and prepared in a given geographical area, using recognized know-how (Pugliese & Sirtori, 2012).

2.1.2. The new added-value products and the introduced health innovations

We used several pork products obtained from the above mentioned four untapped pig breeds. The selected products fit within the measures that aim to protect the local and untapped pig breeds by creating added-value products that meet consumers' preferences and market demand. As can be seen in Table 2, different products were identified according to their relevance in each market in terms of consumption and the limited resources to produce the pork products at small scale in enough quantities to be purchased by consumers during the created non-hypothetical purchasing scenarios. The products were patty (Spain), salami (Italy and Slovenia) and dry-cured ham (Croatia). These products were produced using the meat from the untapped breeds as Traditional Pork Products (TPP). For each identified TPP and case study, we included different innovations targeting healthiness improvement by adding

a positive component or reducing a negative one. Several Innovative Traditional Pork Products (ITPP) were identified.

The ITPP in Spain was obtained by enriching the patties with Porcini (*Boletus edulis*) as a natural source of dietary fibre (*Beta Glucans,* ITPP1) and Blueberries (*Vaccinium corymbosum,* ITPP2) as a natural source of antioxidants (Szajdek, & Borowska, 2008; Tsai *et al*., 2007; Sari *et al*., 2017). In Croatia the ITPP dry-cured ham was produced with reduced salting time and with less smoking (Martuscelli *et al*., 2009; Hersleth *et al*., 2011) which were recently identified as the best accepted health-related innovations in TPP by Croatian consumers (Karolyi & Cerjak, 2015). In Italy, the ITPP for salami was produced with natural antioxidant agent. The natural antioxidants employed consisted of grape seed extract, tocopherol and hydroxytyrosol extracted by defatted olive pomace (Shah *et al*., 2014) and they were obtained from by-products of important Tuscan agricultural productions. Moreover, among the investigated plant extracts, they have shown an interesting potential both for antioxidant activity and microbial inhibition. In Slovenia the ITPP salami was produced without nitrites having important role in typical color formation (stable cured color), characteristic cured aroma, microbiological safety and oxidative stability (Sebranek & Bacus, 2007). However, consumer concerns about health risks associated with consumption of products containing nitrite and nitroso-derivatives (Cassens, 1997) have encouraged meat processors to look for reduced use of nitrites. The main criteria used in the election of each innovation within each case study were: a) the relevance of the innovation in tackling with the most relevant consumers' health concerns. The proposed innovations may contribute to diseases prevention related to salt and nitrites additives consumption. b) The capacity to include the innovations and produce the ITPP at small scale for the experiment performance, c) The ability to afford the production cost due to budget constraints and d) The availability of meat raw material taking into account the limited available number of the untapped breeds according to each case study.

The TPPs and the ITPPs produced from the untapped pig breeds were compared with two additional products obtained from commercial pig breeds. The first product was with "conventional quality" (CONV) that met the standards and the minimum requirements of the production process with relatively "normal" or low prices. The second product was with "premium quality" (PREM) that goes beyond the minimum standard and quality requirement with relatively higher prices. Both the CONV and the PREM products were produced in each case study, using different meat quality standards, to ensure homogeneity in the production qualities when compared to the TPP and the ITPP.

2.1.3. Hedonic evaluation of the Traditional and Innovative products

The overall acceptability of the products j (TPP, ITPP, CONV and PREM) was assessed using the 9-points hedonic scale that ranges from "I extremely dislike" to "I extremely like" (Peryam and Girardot, 1952). Consumers n received a sheet that contains the description of the j products (the breed type and the innovation description) similar to the description in choice sets used in the NH-DCE and were asked to carefully read the information and to state their "expected liking" scores $(L_{nj}^{Expected\_Liking})$. Later, consumers were given the same products j to be evaluated simultaneously with the information sheet that allowed them to identify the products they taste. In this case, consumers were asked to state their "actual liking" scores $(L_{nj}^{Actual\_Liking})$. Taking into account the objective of this study, the impact of the hedonic evaluation on the consumers' non-hypothetical WTP towards the proposed innovations from the untapped pig breeds will be analysed.

The products valuation was conducted in individual booths according to ISO 8589 (2007) in several consecutive sessions and days with approximately 15 consumers per session. Consumers were instructed to eat unsalted toasted bread and drank mineral water between samples (Realini *et al*., 2014). Each product sample was assigned with three digit random numbers and presented to consumers in random order according to a randomized complete-block design in which products were presented to consumer separately. For the salami products (Italy and Slovenia) each consumer received one slice of 4 mm thick for salami following the protocol in Marino *et al*. (2015). For the dry-cured ham product (Croatia) the samples were presented to consumers with a 0.6 mm thick half-slice of ham following Hersleth *et al*. (2015). For the salami and the dry-cured ham, samples were served at room-temperature and sliced immediately before tasting in a room located away from the sample preparation area. For the patty products (Spain) we followed the protocol presented in Martínez *et al*. (2012). Samples were grilled at 165 °C to an internal temperature of 70–75 °C and cut into quarters and kept at 25 °C until tasting. The whole test lasted no more than five days with three or four different panel's sessions per day depending on each laboratory capacity in each case study.

2.1.4. The Non-Hypothetical Discrete choice experiment

Following the description of the experiment performance section, a NH-DCE was applied to analyse consumer preference. The DCE aims to identify the consumers' trade-offs in their choice decision. In this study the TPP, ITPP, CONV and PREM products j at different price levels were presented to participants n in an array of choice sets. Respondents were asked

to select the product they would purchase for sure in a real market situation, thereby revealing their preference for certain characteristics of the products.

- *Design of the choice sets*

In the standard application of the DCE, the first step is to identify the main attributes and level that describe different products. However, Lusk and Schroeder (2004) proposed a holistic design in which the same products were repeated in all scenarios (i.e. choice sets) by only varying the prices of the products across choice sets. Alfnes *et al*. (2006) also used a similar approach but by varying both the prices and the products across choice sets. In this context, each choice set contained the TPP, the ITPP, the CONV and the PREM products that appeared at different price combinations. The NONE option was also included to be consistent with the demand theory and to make the choice task more realistic as this is an available option when shopping. We used an optimal D-efficient experimental design to create labelled alternatives using the Ngene software (ChoiceMetrics, 2016). Accordingly, eight choice sets were needed for estimating Random Parameters Logit models by ensuring price-level balance across the products. Four price levels were identified for the different products in each case study. Price levels and product size and format within choice sets and case study are shown in Table 3.

We adopted for a non-hypothetical approach in order to avoid the hypothetical bias related to stated preferences studies, in particular, in relation to small sample sizes. Our aim is to reduce the difference between what a respondent indicates he would purchase in a survey and what he would actually do in real market. According to Loomis (2014), hypothetical bias in surveys reflects the old saying that “there is a difference between saying and doing”. Several *ex-ante* and *ex-post* approaches are available to reduce the hypothetical bias in surveys (Loomis, 2014). One of the *ex-ante* ways is to let the survey to be consequential to respondent. That is, in our research we created a non-hypothetical purchase scenario at the end of the survey. Individuals who agreed to participate were asked to purchase their selected product and to mandatory pay its posted price. To reduce protest answers, before the choice tasks participants were unexpectedly rewarded by an amount of money that covered the highest price level of products presented in the choice sets plus an additional margin ranging from 10% to 30% of the highest price depending on the product and the budget constraints.

For the description of the TPPs, the product label contained a common text in all case studies: “obtained from an autochthonous and untapped pig breed reared in an extensive (or semi-extensive) production system”. In the case of the health innovations introduced with the ITPP, we provided consumers with a simple and short description about the innovations as appeared in Table 2. An additional description was introduced in the Spanish case study in the

porcini mushroom innovation: “enriched with a natural source of dietary fibber that may contribute to improved natural defence system”. In the case of the blueberries the text read as follows: “Enriched with a natural source of antioxidant that contribute to prevent cardiovascular diseases”. An Example of the different choice sets (in local languages) can be seen in Figure 1. The experiments were approved by an ethical committee and have been conducted according to the principles expressed in the Declaration of Helsinki with a specific care on protecting personal information according to the European regulations. Before conducting the experiment, the participants signed a consent form and received an explanation of the experiment which was read to them aloud and projected using power point before starting in each case study.

Finally, before asking consumers the DCE questions, consumers' beliefs regarding the healthiness of the proposed products were elicited in order to better understand the role of perceptions in defining consumers' preference (Lusk *et al*., 2013). Beliefs were elicited using the consumers' subjective probabilities with the direct numerical method (Lusk *et al*., 2013). Accordingly, consumers were asked for each product the following: “If you were to purchase the product what is the likelihood that this product would be healthy? For example: a 0% chance would mean there is no chance the product would actually be healthy; whereas, a 100% chance would mean that the product would be healthy for certain. There is a __% chance the product will be healthy.

- *The Willingness to Pay estimation*

The DCE relies on Lancaster's Theory of Value (Lancaster, 1966) and on the Random Utility Theory (RUT) of Thurstone (1927). Subjects (n) choose among alternatives (j) according to a utility function (U_{jn}) with two main components: a systematic observable (V_{jn}) and a random error term non-observable (ε_{jn}) as follows:

$$U_{jn} = V_{jn} + \varepsilon_{jn} \quad (1)$$

Assuming linear and additive function, the utility can be expressed as:

$$V_{jn} = \beta_j + \alpha_j P_{jn} \quad (2)$$

Where j are the TPP, ITPP1, ITPP2, CONV, and PREM products presented previously in Table 1. P_{jn} is the price of alternative j for consumer n, β_j are the coefficients of the Alternative Specific constant (ASC) for each product relative to the NONE option, α_j are the coefficients representing the effect of the jth product price on utility for the jth product.

To predict the subjects' preferences for a product, the probability that an individual *n* chooses the product *i* rather than the product j (for any i and j within choice sets, T) can be obtained by the multinomial logit (MNL) model developed by McFadden (1974) as follows:

$$\text{Prob}\{j \text{ is chosen}\} = \frac{e^{\mu V_{jn}}}{\sum_{k=1}^{J} e^{\mu V_{jn}}} \qquad \forall k \in T \qquad (3)$$

Where μ is a scale parameter that is inversely related to the variance of the error term.

However, the MNL assumes homogeneity in preferences and imposes a very strict structure on cross-price elasticities avoiding the possibility to analyze substitutability between products (Hensher *et al*., 2005). Within this approach, the universal or the "mother" logit model (McFadden *et al*., 1977) assumes that the utility of a product is specified as a function of the attributes of the other products. In our research, the utility is a function of an Alternative Specific Constant (ASC) and the prices of all other products. For example, the utility of the TPP is a function of the ASC_{TPP} and the prices of TPP, ITPP, CONV and PREM products. In this case, the utility for product j is specified as follows:

$$V_{jn} = \beta_j + \sum_{j=1}^{J} \alpha_j P_{jn} \qquad (4)$$

Where j=TPP, ITPP1, ITPP2, CONV, PREM, P_{kn} is the jth product's price for consumer n, and α_j represents the effect of the jth product's price on the utility for the jth product. To estimate the universal model, the equation (4) is placed into equation (3). However, this model still incorporates the violation of the Independence from Irrelevant Alternatives (IIA) assumption inherent to the MNL model. The Mixed or heterogeneous logit models (MIXL) known also as Random Parameter Logit models (RPL) are one of the most used alternative to relax the IIA restriction. The RPL model extends the MNL by allowing for unobserved heterogeneity through random coefficients on attributes (Ben-Akiva *et al*., 1997). According to this model, the coefficient vector for person n is $\beta_j = \overline{\beta} + \sigma \lambda_n$, where $\overline{\beta}$ is the estimated mean and σ is the standard deviation of the marginal distribution of β and λ_n is a random term assumed normally distributed with mean zero and unit standard deviation. The term $\sigma \lambda_n$ is the vector of person *n* specific deviations from the mean value of the β s. The η_n is described by an underlying continuous distribution for the attributes defined by the researcher. In most applications the multivariate normal distribution is the most used, MVN (0, Σ). In our case, we assumed the ASC independently normally distributed in the population following Lusk and Schroeder (2004). The price coefficients were considered fixed to ensure the estimated WTP are normally distributed. The WTP of a product j versus the baseline product NONE (i.e.

none of them) is calculated as the ratio of the ASC to the price coefficient (Lusk and Schroeder, 2004) as follows:

$$WTP_{\text{Product j Vs. No-option}} = -\left(\frac{\beta_{\text{Product j}}}{\alpha_{\text{price j}}}\right) \quad (5)$$

The WTP of the proposed health innovations can be obtained by calculating the marginal WTP of any product j versus any other product by subtracting both WTP values (Lusk and Schroeder, 2004).

The Krinsky and Robb parametric bootstrapping method was applied to calculate the confidence intervals of the WTPs with 1,000 random repetitions (Krinsky and Robb, 1986). Finally, coefficients obtained from the estimated RPL models (NLOGIT 6 with 1,000 random draws) before and after the hedonic evaluation cannot be directly compared because of the specific scale parameters that belong to each data sets (Swait and Louviere, 1993). Thus, only the WTPs were compared since the scale parameter is cancelled out. To test the significance of the WTPs differences before and after the hedonic evaluation we used the 1,000 marginal WTP estimates obtained according to the Krinsky and Robb procedure and we performed the combinatorial test suggested by Poe *et al*. (2005).

3. Results and discussions

3.1. The expected and actual Liking of the untapped pig breeds products

We first report the results of the expected ($L_{nj}^{Expected\_Liking}$) and the actual liking ($L_{nj}^{Actual\_Liking}$) scores. The main results and the mean comparisons between products and treatments are shown in Table 4. Focusing on the expected liking, non-significant results were found in Spain between the ITPP2 (6.08) and the TPP (6.28), being similar to the expectation for the CONV product (6.62). However, it is relevant to highlight that the ITPP1 received significantly the lowest liking expectation (5.74) and the PREM product the highest one (7.05). In Croatia the innovations ITTP1 and ITPP2 received similar liking expectation to the PREM product (6.48, 6.66 and 6.31 respectively), while the TPP received the highest liking expectation (6.97) and the CONV the lowest one (5.09). In Italy, the ITPP and the TPP received similar expected scores (7.46 and 7.44 respectively). Finally, only in Slovenia the ITPP received the highest expected liking (7.38) followed by the TPP (6.89), the PREM (6.17) and the CONV (4.53). In general term, when health innovations were introduced, consumers did not expect any taste improvement when compared to the control product (TPP). Healthy product and related innovations tend to be less tasty and thus it may have played a relevant role in constructing consumer liking expectation for the ITPP (Hieke & Grunert, 2018).

For the actual liking scores, results showed that in Spain the ITPP1 and ITPP2 significantly received lower score (5.45 and 5.71 respectively) compared to the TPP (7.07) confirming an informed taste reluctance to the proposed health innovation. Similarly, in Croatia the ITPP1 and the ITPP2 received lower actual liking scores (6.55 and 6.53 respectively) compared to the TPP (6.88). In Italy and Slovenia, the actual liking score of the innovations ITPP1 (6.77 and 5.92 respectively) was similar to the TPP (6.92 and 5.95, respectively) confirming non–additional taste improvement from the innovations. Results confirmed that the proposed ITPPs were not able to add a differentiating perceived quality and thus they did not provide a clear added-experience value in comparison to the TPPs.

Differences between the expected and the actual liking scores for each product were estimated (Table 4). Results in Spain showed that the actual liking was similar to the expected liking for the CONV, ITPP1 and ITPP2 showing a complete assimilation of what consumers expected from these products. However, the actual liking score was higher than the expected one for the TPP showing an incomplete assimilation with an improved liking scores when consumers tasted the products with information. The Spanish consumers exhibited a better expected liking from the PREM and a worse one from the TPP. In Croatia, consumers taste experience with information matched what they expected from the untapped pig breed products (TPP, ITPP1 and ITPP2). However, the actual liking for the CONV improved what consumer expected from this product while it worsened what consumers expected from the PREM product. Consumers expect more from the PREM product and less from the CONV one. In Italy, the liking expectations of all products from the untapped pig breed were higher than what consumers experienced. Consumer expected more from the products and the innovation proposed from the untapped pig breed. However, the actual liking was higher for the PREM and CONV products. In the same line, in Slovenia the expected liking was higher for all products. It was negatively disconfirmed for the TPP, ITPP1 and the PREM and was positively disconfirmed for the CONV.

Compared to the expected liking, the actual liking for the salami innovations (ITPP1) and the basic products (TPP) in Italy and Slovenia decreased significantly. However, for all the proposed innovations (ITPP1 and ITPP2) in Spain (patty) and Croatia (dry-cured ham) the expected and actual liking were equal, confirming what consumers expected. Only the information for the pure product (TPP) from the untapped pig breed in Spain played a relevant role in improving consumers' expectation. It is worth mentioning that three of the four PREM products failed as well to meet consumers' taste expectations and three of the four CONV products outperformed what consumers expected. It is clear that the information and taste experience played a role in determining consumers' final acceptance as it is widely demonstrated that expectations may vary from actual liking (Bredahl *et al*., 1998, Napolitano

et al., 2010). In fact, the eating experience plays an important role in defining the final consumer acceptance (Grunert, 2005; Kallas *et al*. 2014).

Results showed that different information conditions provided by the ITPP played a heterogeneous role when influencing consumer acceptance. Consumers in Slovenia and Italy exhibited higher expectation towards the untapped breeds and innovation proposed, indicating a positive influence of the local breed and health information on their purchasing intention. These results corroborate with studies where the inclusion of health information on food label influenced consumers' acceptance (Iaccarino *et al*. 2006; Schouteten *et al*., 2015) and preference (Kallas *et al*., 2012; Lange *et al*., 2002). However, the inclusion of dietary fiber in the patty product in Spain received the lowest expectation. Consumers did not perceive a clear added health value of such innovation. These results are similar to the findings of Laureat *et al*. (2016) who found that the inclusion of fiber information had a non-significant impact on consumers' acceptance.

3.2. Consumers WTP for the proposed innovations from the untapped pig breeds

We started by estimating a reduced RPL model by case study. Results (Table 5) showed that at 99% confidence level, we can reject the null hypothesis that all coefficients are jointly equal to zero with a Log-Likelihood ratio test highly significant. The goodness of fit was assessed through a highly acceptable McFadden's pseudo-R^2. The model estimates showed that all coefficients were statistically significant in all countries and treatments. The ASCs represent the utility of the latent attributes different from price that are not included into the utility function, which represent the marginal utility of the product in a holistic way.

The utilities associated with the products from the untapped pig breeds were positive and highly significant in all countries before and after the hedonic evaluation. Before the hedonic evaluation, high heterogeneity was found comparing the marginal utility of the health innovative products with the other products in the same treatment. The innovations in Spain received relatively low marginal utility (4.00 for ITPP1 a product enriched with natural source of dietary fibber and 4.64 for ITPP2 with added source of natural antioxidant) compared to the TPP (4.77) and PREM (4.95). Compared to the other products, the ITPP2 (less smoking time) in Croatia clearly exhibited low preference (5.30). However, the ITPP1 (less salting time) was more preferred (12.67). Innovations introduced by the ITPP1 (with natural conserving agent) in Italy and without nitrites in Slovenia were more preferred compared to the other products (8.95 and 11.50 respectively). After the hedonic evaluation, the actual preference models were estimated. Compared to the other products in the same treatment and country, the TPPs in Spain and Italy were the most preferred products (6.40 and 14.34 respectively). In Croatia, the ITPP2 (less smoking time) remained the most preferred alternative (13.89). In Slovenia the PREM product showed the highest relative marginal utility level (12.23).

To better understand the preferences, in a further step we estimated and compared the WTP for the different products. Comparisons were done across products in each treatment and between treatments. Results are shown in Table 6. Before the hedonic evaluation the TPPs and the ITPPs received the highest expected WTPs compared to the other products (PREM and CONV) in all countries with the exception of Spain. These results shed light on the positive evaluation of the breeds and the high expected preference that consumers have for their products compared to the commercial one. The proposed products would receive an acceptable market penetration as a starting point that may contribute maintaining the threatened pig breeds. However, results showed that the proposed health innovations did not have a relevant added-value. Non-significant differences were found between the expected WTPs for the TPP and the ITPP in all countries. Innovations would be only relevant if the additional production cost is marginal or if innovations clearly have a positive social impact in decreasing disease related to salt consumption such as the hypertension (Campbell *et al*., 2011), preventing cardiovascular disease related to the consumption of natural antioxidant or reducing health risks related to nitrites (Knekt, *et al*., 1999) or potentially unhealthy substances from the smoke (Andrés *et al*., 2007).

After the hedonic evaluation treatment, the actual WTP showed that in Spain the TPP remained the most preferred product followed by all the other products in which the preference for the innovative products was similar to the CONV and PREM. In Croatia, relatively similar outcome was obtained, the TPP was the most preferred product followed by the PREM and the ITPP1. The ITPP2 received non-significant WTP similar to the CONV alternative. In Italy, the TPP and the ITPP1 were the most preferred product followed by the PREM and the CONV. In Slovenia the TPP was the most valued product in similar preference position to the PREM followed by the ITPP2 and the CONV.

Taking into account the identified significant difference between the expected and actual WTPs, The WTP of the pure products from the untapped pig breed (i.e. the TPP) in all countries gave an encouraging outcome as a policy measure to contribute maintaining the untapped local pig breeds. The innovations “enriched with dietary fiber”, “without nitrites”, “with low salting time”, “with low smoking time” showed lower WTP than the control product (TPP), while the innovations “with natural conserving agent” do not bring a clear added value, in economic term, as it showed similar WTP compared to the control product (TPP).

These results showed that consumers have a higher preference for the traditional, natural and unaltered products such as those chosen from the pure untapped local pig breeds. These results agree with the findings of Verbeke *et al*., (2016) who showed in a large-scale study that European consumers support the development of new meat products guaranteeing the eating quality but without an excessive manipulation. Moving away from a ‘natural’ (i.e. unaltered) meat product tended to be negatively perceived by consumers. In the same context,

Siegrist & Sütterlin (2017) demonstrated that mentioning possible health effects using additives in food product decreased the perceived naturalness.

To better understand the similar and even lower WTP values of the innovative products (ITPP) compared to the control one (TPP), the consumer's beliefs regarding the healthiness of the products may shed light on these outcomes. Results (Table 7) showed that four of the six health innovations introduced were perceived by consumers as similar to the control product in term of healthiness. Only the innovation "salami without nitrites in Slovenia" and "patty with natural antioxidant in Spain" received statistically higher healthiness perceptions. However, the latter innovation in the patty product was similar to that obtained by PREM, not showing again any clear added health value. In this context, the only innovation that was clearly differentiated by its added health value was "salami without nitrites in Slovenia". These results may explain in part the consumer WTP towards innovation. These results are in accordance to what literature showed on the relevance of consumers' health perceptions in defining their preferences (Lusk *et al*., 2013, Malone & Lusk 2017 and Lusk, 2018).

The NH-DCE using a labelled choice set design is a straightforward alternative to elicit individuals' preference for a product in a holistic way (Lusk and Schroeder, 2014). However, this approach cannot identify preferences for specific attributes not embodied in the choice sets and thus it may ignore other choice motivations (Kamphuis *et al*., 2015). The use of a non-hypothetical approach in which consumers are presented with a set of products that they can taste and then purchase is not necessarily the best method to minimize hypothetical bias (Loomis, 2014; Meenakshi *et al*., 2012; Kamphuis *et al*., 2015). Further research is needed to compare the NH-DCE and taste experience with hypothetical choice designs, testing for external validity (Lusk and Schroeder, 2014). Finally, while other modelling alternatives are available to obtain willingness to pay estimates (Kallas and Gil, 2012), the RPL (known also as mixed logit model) is still the most flexible and preferred modelling option in choice experiment studies (Hess and Train, 2017).

The comparability of innovation preferences across countries is limited due to the particular characteristics and the specific quality traits of each local untapped pig breed. The presence of several interfering factors in the product preparation and the inclusion of heterogeneous health innovations makes it difficult to derive an overall conclusion regarding the health innovations. Furthermore, the different socioeconomic features of the samples across countries represents an additional limitation. Nevertheless, our results indicate that preferences clearly depend on the innovation proposed and the product types. It would be worthy classifying the innovations regarding their novelty, i.e. whether they consist in a reduction or an addition of additives and whether they are introduced in fresh or processed products.

4. Conclusions

We analysed the consumers non-hypothetical WTP for Traditional (TPP) and Innovative (ITPP) Pork Products obtained from untapped pig breeds in Spain, Croatia, Italy and Slovenia. Compared to conventional (CONV) and premium (PREM) marketed products, results showed high-expected preference in all countries, showing higher expected WTP compared to the majority of the alternative products. However, comparing the informed overall acceptability between the health innovative products and the pure ones, results showed lower average values for the innovation in Spain and Croatia and similar average values in Italy and Slovenia. Consumers did not perceive a clear added quality value from the proposed health innovations in the four local pig breeds.

After the informed hedonic evaluation, the WTP for the innovations decreased in all countries with the exception of Italy. The WTP decreased for both innovations in Spain (enriched with dietary fibber and natural oxidant), for both innovations in Croatia (less salt and less smoke) and for the innovation in Slovenia (without nitrites). These results were tightly related to the relatively low average values of the informed overall acceptance compared to the competing products. Furthermore, our research showed that the TPPs and the ITPP were equally perceived as healthy products for the majority of the proposed innovations. Thus, the health added-value of the suggested innovations was marginal. Policy that promotes products from the analysed untapped local pig breeds should focus, in general term, on the “original” and “pure” version of the product without any addition of healthy ingredients or reduction of the undesirable compounds. This may allow consumers to judge the product with a special focus on its origin and therefore highlight the untapped pig breed systems.

The European Common Agricultural Policy (CAP) as the main policy driver of agriculture at the EU level is progressively decoupling its subsidies from production, aiming for agriculture and livestock productions that contribute to the conservation and enhancement of rural landscapes. The extensive production systems that characterize these traditional and rustic breeds are fully aligned with this trend, since they are essential in the conservation and enhancement of high natural value farming systems. Despite subsidies to support traditional breeds have been part of the CAP subsidies for a long time, policies aimed to improve the status of these breeds should look for the economic viability of traditional breed farms. Our results show that a market niche exists, where consumers appreciate these high-quality products and where no “add-ons” are required to enhance their uptake by the consumers. Innovations introduced in the way information is conveyed to the consumers on high-quality of the products and its positive externalities may contribute to a higher extent to increase consumer acceptance.

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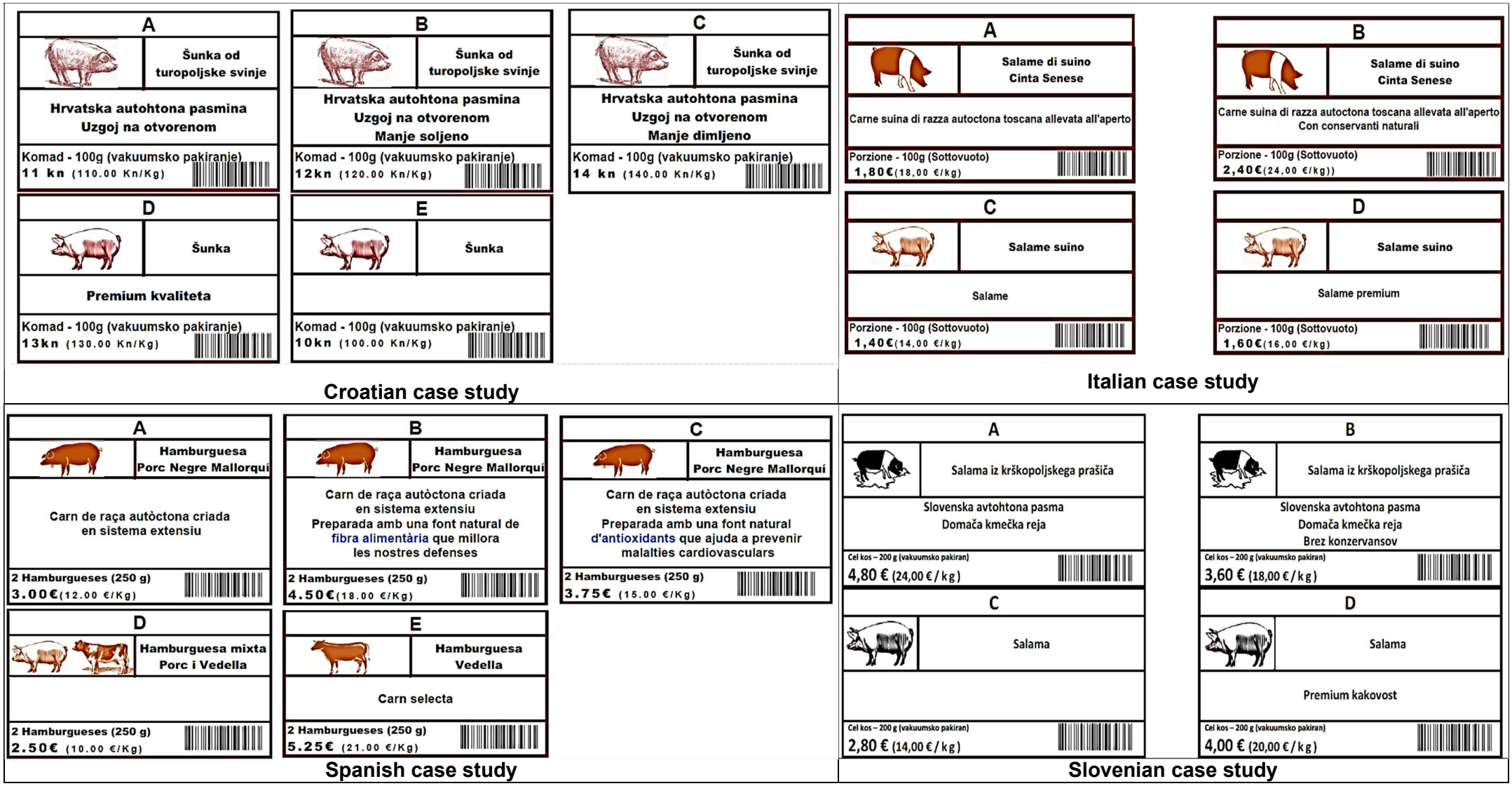

Figure 1: choice set example by case study

Table 1: Summary of the socio-economic and demographic variables across countries

	Country Sample size	Spain 121	Italy 121	Slovenia 131	Croatia 121
Gender	**Female**	48.76%	60.33%	56.49%	49.59%
	Male	51.24%	39.67%	43.51%	50.41%
Age (years)	**18-29**	12.40%	38.66%	19.85%	17.36%
	30-39	21.49%	26.05%	22.90%	23.97%
	40-49	26.45%	16.81%	22.14%	28.10%
	50-59	22.31%	10.92%	20.61%	14.88%
	>60	17.36%	7.56%	14.50%	15.70%
Family members	**Average**	2.92	3.23	2.79	3.65
% with children below 12 years	**Yes**	19.83	18.18	16.79	39.50
Household perception of the monthly net income compared to the average	**Far below average**	18.18%	0.83%	3.05%	3.31%
	Below average	26.45%	14.88%	14.50%	9.92%
	Average	32.23%	62.81%	61.07%	49.59%
	Above average	18.18%	16.53%	17.56%	32.23%
	Far above average	2.48%	0.83%	2.29%	4.13%
	I don't know	2.48%	4.13%	1.53%	0.83%
Household perception of the monthly food expenditure compared to the average	**Far below average**	5.00%	11.57%	6.11%	3.31%
	Below average	21.67%	35.54%	21.37%	19.01%
	On average	26.67%	30.58%	41.22%	39.67%
	Above average	38.33%	16.53%	26.72%	28.10%
	Far above average	5.83%	1.65%	3.05%	8.26%
	I don't know	2.50%	4.13%	1.53%	1.65%
% who lived in rural area	**Yes**	30.58%	42.02%	57.25%	52.50%

Table 2: The traditional and innovative pork products in each case study

Country	Pig breed	Product	Commercial product with conventional quality (CONV)	Commercial product with premium quality (PREM)	Traditional Pork Products (TPP)	Innovative Traditional Pork Products (ITPP1)	Innovative Traditional Pork Products (ITPP2)
Spain	***Negre Mallorquí (NM)***	**Patty**	**Patty Conventional**	**Patty Premium**	**Patty (NM)**	**Patty (NM) & dietary fibber**	**Patty (NM) & Natural antioxidant**
Italy	***Cinta Senese (CS)***	**Salami**	**Salami Conventional**	**Salami Premium**	**Salami (CS)**	**Salami (CS) & Natural conserving agent**	**-**
Slovenia	***Krškopolje (KRS)***	**Salami**	**Salami conventional**	**Salami Premium**	**Salami (KRS)**	**Salami (KRS) without nitrites**	**-**
Croatia	***Turopolje (TRP)***	**Dry-cured ham**	**Dry-cured ham conventional**	**Dry-cured ham Premium**	**Dry-cured ham (TRP)**	**Dry-cured ham (TRP) less salting time**	**Dry-cured ham (TRP) less smoking time**

Table 3: Price vectors of the products by countries

Price levels	**Spain**	**Italy**	**Slovenia**	**Croatia**
products	Patties 250 g Tray of 2 patties	Salami 100 g Vacuum sliced	Salami 200 g Vacuum one piece	Dry-cured ham 100 g Vacuum sliced
TPP	3.00€, 3.75€ 4.50€, 5.25€	1.80€, 2.00€ 2.20€, 2.40€	3.60€, 4.00€ 4.40€, 4.80€	11.00Kn, 12.00Kn 13.00Kn, 14.00Kn
ITPP1	3.00€, 3.75€ 4.50€, 5.25€	1.80€, 2.00€ 2.20€, 2.40€	3.60€, 4.00€ 4.40€, 4.80€	11.00Kn, 12.00Kn 13.00Kn, 14.00Kn
ITPP2	3.00€, 3.75€ 4.50€, 5.25€	-	-	11.00Kn, 12.00Kn 13.00Kn, 14.00Kn
CONV	2.00€, 2.50€ 3.00€, 3.50€	1.20€, 1.40€ 1.60€, 1.80€	2.40€, 2.80€ 3.20€, 3.60€	8.00Kn, 9.00Kn 10.00Kn, 11.00Kn
PREM	3.00€, 3.75€ 4.50€, 5.25€	1.60€, 1.80€ 2.00€, 2.20€	3.20€, 3.60€ 4.00€, 4.40€	10.00Kn, 11.00Kn 12.00Kn, 13.00Kn

Table 4: Actual and expected liking of the products

		Spain		Croatia		Italy		Slovenia	
		Mean	**St.d.**	**Mean**	**St.d.**	**Mean**	**St.d.**	**Mean**	**St.d.**
TPP	**Expected liking**	**6.28**^{b,y}	(1.59)	**6.97**^{a,x}	(1.79)	**7.44**^{a,x}	(1.08)	**6.89**^{a,y}	(1.38)
	Actual liking	**7.07**^{a,k}	(1.13)	**6.88**^{a,k}	(1.62)	**6.92**^{b,k}	(1.68)	**5.95**^{b,k}	(1.97)
ITPP1	**Expected liking**	**5.74**^{a,z}	(1.65)	**6.48**^{a,y}	(1.91)	**7.46**^{a,x}	(1.16)	**7.38**^{a,x}	(1.37)
	Actual liking	**5.45**^{a,m}	(2.19)	**6.55**^{a,l}	(1.77)	**6.77**^{b,k}	(2.06)	**5.92**^{b,k}	(2.11)
ITPP2	**Expected liking**	**6.08**^{a,y}	(1.74)	**6.66**^{a,y}	(1.81)				
	Actual liking	**5.71**^{a,m}	(2.26)	**6.53**^{a,l}	(1.71)				
PREM	**Expected liking**	**7.05**^{a,x}	(1.50)	**6.31**^{a,y}	(1.57)	**5.96**^{b,y}	(1.37)	**6.17**^{a,z}	(1.45)
	Actual liking	**6.41**^{b,l}	(1.39)	**5.84**^{b,m}	(1.93)	**6.29**^{a,l}	(1.57)	**5.66**^{b,k}	(2.20)
CONV	**Expected liking**	**6.62**^{a,y}	(1.56)	**5.09**^{b,z}	(1.76)	**5.29**^{b,z}	(1.59)	**4.53**^{b,w}	(1.84)
	Actual liking	**6.44**^{a,l}	(1.70)	**6.00**^{a,m}	(1.80)	**6.02**^{a,l}	(1.66)	**5.81**^{a,k}	(2.12)

^{a,b} refer to the differences between expected and actual liking for each product
^{x,y,z,w} refer to the differences across products for the expected liking scores.
^{k,l,m,n} refer to the differences across products for the actual liking scores.

Table 5: RPL estimates results before and after the hedonic evaluation test

	Spain		*Croatia*		*Italy*		*Slovenia*	
	Expected	Actual	Expected	Actual	Expected	Actual	Expected	Actual
Random Alternative Specific Constant β_s								
ASC-TPP β_1	4.77***	6.40***	11.86***	9.72***	5.84***	14.34***	4.96***	11.42***
ASC-ITPP1 β_2	4.00***	3.25***	12.67***	13.89***	8.95***	7.78***	11.50***	11.33***
ASC-ITPP2 β_3	4.64***	2.06***	5.30**	-0.76				
ASC-PREM β_5	4.95***	2.63***	4.85***	3.01	4.02***	10.06***	5.30***	12.23***
ASC-CONV β_4	3.06***	3.29***	1.23	1.89	-1.72***	2.78***	0.92	4.22***
Non-random price α_s								
Price-TPP α_1	-1.36***	-1.77***	-0.78***	-0.62***	-2.19***	-6.73***	-1.13***	-3.13***
Price -ITPP1 α_2	-1.27***	-1.25***	-0.88***	-1.11***	-3.74***	-3.49***	-2.34***	-3.73***
Price -ITPP2 α_3	-1.28***	-1.19***	-0.36***	-0.64***				
Price -PREM α_4	-1.38***	-1.01***	-0.61***	-0.56***	-2.88***	-8.11***	-2.06***	-3.32***
Price -CONV α_5	-1.12***	-1.22***	-0.50***	-0.43***	-2.33***	-3.58***	-1.46***	-2.42***
S.D. of random estimates								
S.D. ASC-TPP η_1	3.31***	5.13***	2.94***	7.29***	2.29***	4.57***	2.40***	6.13***
S.D. ASC-ITPP1 η_2	2.43***	3.48***	4.43***	6.85***	2.71***	5.16***	2.77***	7.33***
S.D. ASC-ITPP2 η_3	2.87***	5.68***	4.06***	17.1***				
S.D. ASC-PREM η_4	3.52***	3.95***	3.45***	6.51***	2.88***	8.52***	3.26**	6.41***
S.D. ASC-CONV η_5	2.74***	5.19***	3.92***	4.67***	4.38***	4.67***	2.34***	3.90***
Log-LL (θ)	-1,157	-952	-874.1	-689.3	-957.6	-752.19	-988.76	-804.05
Pseudo R^2	0.33	0.45	0.50	0.60	0.38	0.52	0.41	0.52

Table 6: Willingness to Pay of the products before and after the hedonic evaluation test

		Spain		*Croatia*		*Italy*		*Slovenia*	
		Expected	**Actual**	**Expected**	**Actual**	**Expected**	**Actual**	**Expected**	**Actual**
TPP	$-\beta_1/\alpha_1$	**3.48^{***a} (2.9-4.1)**	**3.60^{***a} (2.8-4.3)**	**15.17^{***a} (13.-16.6)**	**15.58^{***a} (13.-17.9)**	**2.66^{***a} (2.2-3.0)**	**2.13^{***a} (1.9-2.2)**	**4.35^{***a} (3.8-4.8)**	**3.63^{***a} (3.2-4.1)**
	Poe Test	**WTPs are equal**		**WTPs are equal**		**WTPs are different**		**WTPs are different**	
ITPP1	$-\beta_2/\alpha_2$	**3.13^{***a} (2.5-3.7)**	**2.59^{***b} (1.6-3.5)**	**14.38^{***a} (13.-15.7)**	**12.44^{***b} (11.-13.5)**	**2.39^{***a} (2.2-2.5)**	**2.22^{***a} (1.8-2.5)**	**4.90^{***a} (4.6-5.2)**	**3.03^{***b} (2.5-3.6)**
	Poe Test	**WTPs are different**		**WTPs are different**		**WTPs are equal**		**WTPs are different**	
ITPP2	$-\beta_3/\alpha_3$	**3.60^{***a} (3.0-4.1)**	**1.73^{**b} (0.4-3.1)**	**14.45^{***a} (-5.2–9.2)**	**-1.18^{d} (-11.–9.1)**				
	Poe Test	**WTPs are different**		**WTPs are different**					
PREM	$-\beta_4/\alpha_4$	**3.57^{***a} (2.9-4.1)**	**2.69^{***b} (1.3-4.1)**	**9.67^{***b} (7.3-11.9)**	**6.95^{***c} (1.8–12.1)**	**1.39^{***b} (1.0-1.7)**	**1.24^{***b} (0.8-1.5)**	**2.56^{***b} (1.9-3.2)**	**3.67^{***a} (3.2-4.1)**
	Poe Test	**WTPs are different**		**WTPs are equal**		**WTPs are equal**		**WTPs are equal**	
CONV	$-\beta_5/\alpha_5$	**2.72^{***b} (2.0-3.4)**	**2.60^{***b} (1.6-3.6)**	**2.00^{c} (-5.2–9.2)**	**3.36^{d} (-1.6 - 8.4)**	**-0.73^{c} (-2.6-1.2)**	**0.77^{***b} (0.2-1.2)**	**0.63^{c} (-1.1-2.4)**	**1.74^{***c} (1.1–2.3)**
	Poe Test	**WTPs are equal**		**WTPs are equal**		**WTPs are different**		**WTPs are different**	

a, b, c, refers to the difference between the products within each treatment (i.e. by column)

Table 7: Consumers' healthiness perceptions of the products

consumers' beliefs regarding the healthiness	Spain		Croatia		Italy		Slovenia	
	Mean	**St.d.**	**Mean**	**St.d.**	**Mean**	**St.d.**	**Mean**	**St.d.**
TPP	71.20^{h}	(23.81)	79.95^{g}	(17.31)	61.60^{g}	(24.91)	68.08^{h}	(24.55)
ITPP1	73.05^{g,h}	(23.03)	81.49^{g}	(17.82)	61.18^{g}	(25.25)	75.85^{g}	(22.00)
ITPP2	74.79^{g}	(21.82)	78.45^{g}	(19.90)				
PREM	73.74^{g}	(24.09)	59.40^{h}	(25.23)	40.73^{h}	(23.31)	55.52^{i}	(26.73)
CONV	64.50^{i}	(25.37)	45.55^{i}	(26.12)	37.42^{i}	(23.85)	33.40^{j}	(23.03)

^{g,h,I} refer to the differences using the Wilcoxon signed ranks test between health perceptions across products in each case study.