



Exploring the mediating role of trust in food products with Protected Designation of Origin. The case of “Jamón de Teruel”

Carmina Fandos-Herrera

Universidad de Zaragoza, Facultad de Economía y Empresa (Paraiso), Dept. de Dirección de Marketing e Investigación de Mercados. Gran Vía 2. 50005 Zaragoza. Spain

Abstract

The growing concern about quality in food products has substantially increased the competitiveness of agro-food products that possess quality-system certifications compared to non-certificated products. This research focused on understanding how consumer trust is greater when agro-food products have a Protected Designation of Origin (PDO). In particular, we analyze whether the influence of consumers' perceived quality of a PDO product has a direct effect on their perceived risk or whether this relationship is mediated by consumer trust, which can help us advance in the study of consumer behavior within the agro-food marketing discipline. Our findings obtained through the comparison of two models, the proposal and another rival, suggest that the initially proposed model present a better fit and explains the relationships better than the rival model, which highlights the essential role of consumer trust in explaining consumers' perceived risk and their subsequent purchasing behavior. Consequently, managers should pay special attention to consumer trust because trust is the key mediating aspect which allows the incorporation of characteristics highly valued by consumers in food products like origin, tradition and production methods to reduce perceived risk.

Additional key words: perceived quality; perceived risk; agro-food products

Abbreviations used: AVE (Average Variance Extracted); CFA (Confirmatory Factor Analysis); CFI (Comparative fit index); EU (European Union); PDO (Protected Designation of Origin); PGI (Protected Geographical Indication); PRFIN (Financial Perceived Risk); PRFU (Functional Perceived Risk); PRPHSI (Physical Perceived Risk); PRPHSO (Physiological Perceived Risk); PRSO (Social Perceived Risk); PRTIM (Time Perceived Risk); QEXT (Extrinsic Quality); QINT (Intrinsic Quality)

Citation: Fandos-Herrera, C. (2016). Exploring the mediating role of trust in food products with Protected Designation of Origin. The case of “Jamón de Teruel”. Spanish Journal of Agricultural Research, Volume 14, Issue 1, e0102. <http://dx.doi.org/10.5424/sjar/2016141-7169>.

Supplementary material: This work has 1 supplementary table published online alongside the electronic version of the article

Received: 03 Dec 2014. **Accepted:** 15 Feb 2016

Copyright © 2016 INIA. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial (by-nc) Spain 3.0 Licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Funding: INIA, Spanish Ministry of Science and Education (project PET 2007-008-C11-11)

Competing interests: The author has declared that no competing interests exist.

Correspondence should be addressed to Carmina Fandos-Herrera: cfandos@unizar.es

Introduction

In recent years, notable changes in consumer behaviour have led to higher requirements about food products. Possible reasons for this include a more intensive search for information, higher income levels, the evolution of consumer preferences and, especially, a greater concern about food safety and health (Loureiro & Umberger, 2007). As well as the consolidation of these new human values in the consumption of agro-food products, we should also take into account the different crises or alarms about consumer health which have taken place as a consequence of different diseases in certain animal species (Loureiro & Umberger, 2007). These episodes have, on many occasions, led to

a drop in the consumption of their meat (Calvo, 2001; Yeung & Morris, 2006). The economic effects of these crises are important but the loss of consumer trust is even more significant (Calvo, 2001; Badiola, 2006). These crises have meant an increase in consumer demands for policies of greater protection and quality in food products.

Grunert (2005) defines consumer risk perception as the probability of contracting a disease as a consequence of consuming a certain food. Howard (1989) suggests that trust is a buyer's degree of certainty about his ability to correctly judge a product, and that it increases with the positive experiences resulting from trying out the product or receiving favourable information from external sources. Consumers have been able

to restore trust by buying products protected by brands of certified quality, subject to very strict controls, such as those of Protected Designation of Origin (PDO). These systems of food-quality guarantee are established by the European Union (EU) through its policy aimed at protecting and promoting food products manufactured under these labels, specifically, PDO, Protected Geographical Indication (PGI) and Traditional Guaranteed Specialities (TGS). All of them allow the exploitation of features such as natural or human factors, geographical origin and/or manufacturing methods (Bonetti, 2004), attributes increasingly valued by consumers. The number of these specialties is growing yearly (currently there are more than 700 in the EU) as are the number of companies and products protected by them, seeking to use these labels to guarantee the quality they offer. PDO brands act as business cards, the starting point being the local level while the objective is the global level, at which product differentiation is even more important to their success (García-Galán *et al.*, 2012). PDOs represent both the quality image they want to convey and the seal of identity of their origin (García-Galán *et al.*, 2014).

When evaluating aspects such as the perceived quality of a PDO agro-food product, it is necessary to highlight that the information provided by the intrinsic attributes of a product constitutes one of the main information sources for consumers about product quality, trust and aspects such as safety, health and ethical considerations (Becker, 2000; Bernués *et al.*, 2003). Similarly, if we focus on the influence of intrinsic attributes on consumer purchase perception and behavior, it should be emphasized that quality perception involves a complex process starting with the acquisition and classification of signals associated with intrinsic attributes such as appearance, color, taste or product presentation (packaging). However, due to the lack of information about the products or to the inability of the consumers to process this information (Steenkamp & Van Trijp, 1996), it is essential to stress that some of these attributes cannot be perceived properly by individuals until they consume them (*e.g.* taste and smell). Consumer trust in the consumption of food products may increase if the product possesses one of the certifications within the European quality systems (Badiola, 2006). The protocols associated with these quality systems require strict controls that allow the distinctive characteristics of the product to reach certain standards (color, taste, smell, appearance, etc.). The final objective of these controls is to provide the consumer with the necessary trust to make the decision to purchase the product.

With respect to consumers' preferences when taking purchasing decisions about food products, the literature

shows a consensus that price and origin are the most important attributes (Yanguí *et al.*, 2014). Origin is one of the most important extrinsic attributes in the evaluation stage and a fundamental aspect for product differentiation. Other attributes, such as country of origin, region of origin and local origin, production method and organic characteristics are also extremely important for consumer preferences (*e.g.* Menapace *et al.*, 2011). The consumers cannot be certain about attributes of credence (animal welfare, how farm animals are raised, production, transport and slaughter conditions) that affect their preferences (Sans & Sanjuán, 2015), even after consuming the food product. In this context, a label or certification becomes a useful tool of information and guarantee to the final consumer. In the case of cured ham, consumers paid more attention to the appearance of the product or the ageing times of dry-cured ham, although the geographical origin has the greatest effect on consumer preferences and purchasing decisions (Resano *et al.*, 2007).

Thus, it seems reasonable to think that quality perceived through the intrinsic attributes of a PDO food product will mean a significant increase in consumer trust. For consumers of "Jamón de Teruel", a higher perception of quality through the intrinsic attributes of the product (*taste, aroma, color, shape and fat* – see Table S1 [online resource]) will result in an increase in their trust towards it (Hypothesis 1).

Focusing on the influence of the extrinsic attributes of a PDO agro-food product on consumer trust, we should point out that objective quality is a signal based on certain features associated with the image of a product (*e.g. pata negra* is a visible aspect that reflects a better quality of air-cured ham), which will improve as the manufacturing of the product involves more technology and complexity. In fact, as Calvo (2001) suggests, the more processed, transformed, manufactured and standardized a product is, the more importance extrinsic attributes will have as indicators of the quality of a PDO product. Similarly, the better the image that a product has as a consolidated brand (due to a higher differentiation capacity, as in the case of a PDO), the more consumers will trust in its extrinsic attributes (Magistris *et al.*, 2014). This will allow a decrease in the perceived risk at the place of purchase and when consuming the product.

The PDO food-product labelling may provide useful information for consumers and, in consequence, may influence the amount of money that consumers will be willing to pay for products with certain certifications and attributes like a PDO (Sans & Sanjuán, 2015).

Much research has analyzed the influence of different food product attributes on consumer-perceived quality, emphasizing the importance of PDO labelling

as an extrinsic attribute in which consumers can trust (Zeithaml, 1988; Steenkamp, 1990; Grewall, 1995; Grunert *et al.*, 1996; Steenkamp & Van Trijp, 1996; Bredahl *et al.*, 1998; Bello & Calvo, 2000; Magistris *et al.*, 2014).

Thus, we may consider that the quality perceived through the extrinsic attributes of a PDO food product involves an increase in consumer trust. For consumers of “Jamón de Teruel”, a higher perception of quality through its extrinsic attributes (numbered band, star and the name of Teruel, place of origin, brand, price, nutritional information, packing and purchase place – see Table S1 [online resource]) will improve trust in its consumption (Hypothesis 2).

In recent years, consumer concern about health and systems of food quality, control and certification has increased (Verbeke & Viaene, 1999; Loureiro & Umberger, 2007). It should also be highlighted that consumers are more demanding when consuming food products and are more concerned about the need to respect animal welfare in the manufacturing of food products (Verbeke & Viaene, 1999; Sans & Sanjuán, 2015). For Calvo (2001), the facility with which consumers may foresee unfavourable consequences when making purchase decisions will increase or reduce perceived risk. In the case of PDO food products, the most influential factors on risk perception are: absence of indicators to infer food safety (Calvo, 2001), psychological variables of attitude or predisposition (Sjöberg, 2000) and trust in the agents responsible for the food chain (Siegrist & Cvetkovitz, 2000). Similarly, trust in the brand refers to a feeling or sense of safety experienced by consumers who expect the brand to satisfy their consumption expectations (Delgado & Munuera, 2001). If we consider PDO as an umbrella brand gathering all products manufactured under it, including controls and certifications imposed by its regulation board, consumers can depend on a PDO to diminish risk perception when purchasing the products offered by food companies. Therefore, it is reasonable to assume the existence of a negative and significant relation between trust and perceived risk in PDO food products. It seems logical to think that consumers who trust more in the consumption of “Jamón de Teruel”

will perceive less risk when consuming this product (Hypothesis 3).

In view of all this, this paper focuses on analyzing the influence of the perceived quality of a PDO agro-food product on consumer trust and perceived risk (see Fig. 1). The proposed model contributes to a better understanding of the relationship between perceived quality and perceived risk, mediated by trust as a key variable, within the agro-food marketing framework. We believe that a better management of the purchase intention of consumers must be achieved through the reduction of perceived risk. To do this, we must focus on achieving greater trust in a product and on the variables associated with this trust, such as the reputation of the brand or PDO.

The product studied in this paper is PDO cured ham “Jamón de Teruel”. This certification stands out above all others in Spain due to its great accumulated experience, given that: (i) it was the first PDO of air-cured ham in Spain and the third in Europe, and (ii) the production of “Jamón de Teruel” made up 46% of the total Spanish PDO cured ham market in 2008 when it reached a record with 743,738 pieces sold.

Material and methods

Data collection

In this section, we describe how the data was collected, how the measures have been validated, how we have tested the hypotheses through structural equations and, finally, how a rival model has been compared with our proposed model. Structural equations modelling (SEM) is a statistical methodology that takes a confirmatory (*i.e.*, hypothesis-testing) approach to the analysis of a structural theory bearing on some phenomena (Byrne, 2006).

In order to examine the proposed hypotheses, we conducted a data-gathering exercise involving a series of actions. Firstly a focus group was developed. This was a structured discussion by a group of people on a topic of interest (Mas, 2007). According to Rabadán & Ato (2003), the purpose of focus groups is basically exploratory and their most important aspects are: (1) obtaining hypotheses, (2) understanding consumer emotions when taking purchasing decisions, (3) perception of qualities and weaknesses of a product, (4) opinions, attitudes and preferences with respect to products, their marketing and use, selecting geographic areas to simulate pricing, distribution and promotion, and (5) to find out the terminology employed in, for instance, designing questionnaires and effective communication campaigns. A focus group of regular consumers of cured

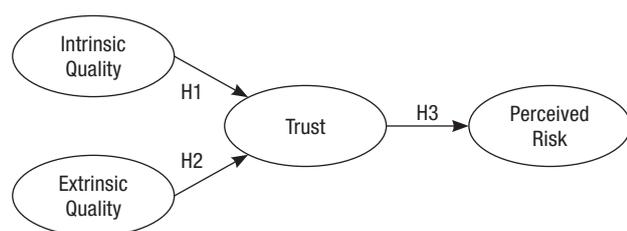


Figure 1. Conceptual model relating perceived quality, trust and perceived risk for a product with a PDO.

ham was formed, selecting ordinary consumers with a similar socio-demographic profile, most of them being “housewives” because they have more experience, knowledge and involvement in the purchase, consumption and cooking of food products in the home (e.g., Grunert, 1997; Van Den Heuvel *et al.*, 2007). The results of this exercise, together with a literature review, helped us to improve the design of the measurement scales to quantify the concepts of intrinsic and extrinsic perceived quality, trust and perceived risk.

Secondly, data were obtained by using a structured questionnaire containing closed questions. This questionnaire about PDO cured ham “Jamón de Teruel” was designed to gather information on quality perceptions (scored in terms of intrinsic and extrinsic features), consumer trust and perceived risk (in terms of functional, financial, social, physical, physiological and time dimensions). The consumer was asked about his/her level of agreement with a series of statements based on a 7-point Likert scale. The development of these scales was based on a review of the most important marketing and agro-food marketing literature, while constructs were measured through a multi-item scale to guarantee the content validity (see Table S1 [online resource]). The questionnaire sought information on purchasing frequency, the variety of cured ham the consumer usually bought and other data to provide a more detailed view of the purchasing behavior and socio-demographic characteristics of consumers. We carried out interviews in hypermarkets, supermarkets and specialized shops in the cities of Zaragoza and Teruel. After the fieldwork, a screening process was performed to select the valid cases and a total of 426 were obtained. We eliminated 15 cases due to missing information. The overall response rate was 96.5%. The main demographic characteristics of the respondents were that they were the ones who did the shopping for the family unit, they were mainly women (69%) and married (57%). In addition, most respondents (66%) had completed secondary or university education, and were between 18 and 50 years old (69%). The income distribution of the family units was relatively uniform in the four intervals considered, 61% of sample earning between €900 and €2700; 40% of the sample did not work (*i.e.*, were unemployed, students, retired or engaged in taking care of the home). Finally, the most common family size is four members (32%).

Measure validation

An in-depth review of relevant literature pertaining to marketing and agro-food marketing enabled us to propose an initial set of items to measure the latent

constructs. This review also helped guarantee the content validity of the scales. We also tested their face validity with a variation of the Zaichkowsky (1985) method, in which a panel of experts with knowledge of issues related to PDO food products qualified each item as clearly, somewhat, or not representative of the construct of interest.

The first measure validation step consisted of an exploratory analysis of reliability and dimensionality. This analysis was carried out with Cronbach’s Alpha test and yielded satisfactory levels of reliability in all cases. The results of Cronbach’s Alpha test for the different dimensions of the model were as follows: 0.92 for intrinsic attributes, 0.90 for extrinsic attributes, 0.87 for trust; and for the six sub-dimensions of perceived risk it was: 0.79 for functional; 0.77 for financial; 0.91 for social; 0.93 for physical; 0.89 for physiological and 0.91 for time. Similarly, initial analyses of unidimensionality provided satisfactory results in all cases, the variance explained being 71.1% for intrinsic attributes, 53.7% for extrinsic attributes 74% for trust and, for perceived risk: 78.3% for functional; 53.1% for financial; 83% for social; 86.2% for physical; 79.8% for physiological and 83.2% for time.

To confirm the dimensional structure of the scales, we used confirmatory factor analysis (CFA), employing the statistical software EQS5 v.6.1, and robust maximum likelihood as the estimation method because it provides greater security in samples which might not present multivariate normality (see indicators of the goodness of fit in Table 1). This process required developing various confirmatory models in line with the methodology proposed by Hair *et al.* (1998), based on the three criteria established by Jöreskog & Sörbom (1993). It resulted in the successive elimination of various indicators from the scales used in the analysis, namely: from the scale of Intrinsic Quality (QINT_5); from the scale of Extrinsic Quality (QEXT_5); from the subscale of Functional Perceived Risk (PRFU_1) and from the subscale of Financial Perceived Risk (PRFIN_1) (See Table S1 [online resource]).

In order to test for the presence of a multidimensional structure in the construct of perceived risk, a rival model strategy was developed. We compared two alternative models (Anderson & Gerbing, 1988): a first-order factorial model in which dimensions were not differentiated, and a second-order model (Steenkamp & Van Trijp, 1991) with six dimensions for perceived risk. The results showed a higher fit in the second-order model, which allowed us to confirm the multidimensionality of the variable.

Then, an internal validity analysis was conducted. This analysis is to confirm the properties of reliability, content validity and construct validity. Reliability was

Table 1. Average variance extracted (AVE) and composite reliability coefficient (CRC). Convergent and discriminatory validity.

Indicators ^[1]	Correlations	Confidence interval	χ^2 Differences	Indicators ^[1]	AVE	CRC
PRSO-PRFU	0.426*	(0.290-0.562)	161.023*	PRFU	0.88	0.79
PRPHSI-PRFU	0.427*	(0.289-0.565)	156.025*	PRFIN	0.73	0.68
PRPHSO-PRFU	0.470*	(0.338-0.602)	27.772*	PRSO	0.91	0.83
PRTIM-PRFU	0.424*	(0.290-0.558)	155.249*	PRPHSI	0.93	0.86
PRFIN-PRFU	0.530*	(0.404-0.656)	113.420*	PRPHSO	0.89	0.80
PRPHSI-PRSO	0.922*	(0.850-0.994)	265.996*	PRTIM	0.91	0.84
PRPHSO-PRSO	0.855*	(0.765-0.945)	45.271*	QINT	0.94	0.79
PRTIM-PRSO	0.656*	(0.540-0.772)	958.678*	QEXT	0.87	0.73
PRFIN-PRSO	0.375*	(0.241-0.509)	299.059*	TRUST	0.96	0.89
QINT-PRSO	-0.180*	(0.260-0.100)	352.502*			
QEXT-PRSO	-0.230*	(-1.110-0.650)	616.758*			
PRPHSO-PRPHSI	0.897*	(0.813-0.981)	547.825*			
PRTIM-PRPHSI	0.701*	(0.589-0.813)	985.240*			
TRUST-PRPHSI	-0.217*	(-0.119-0.315)	661.736*			
PRFIN-PRPHSI	0.375*	(0.239-0.511)	91.570*			
QINT-PRPHSI	-0.180*	(-0.102-0.258)	132.181*			
QEXT-PRPHSI	-0.220*	(-0.142-0.298)	79.199*			
PRTIM-PRPHSO	0.817*	(0.725-0.909)	769.883*			
TRUST-PRPHSO	-0.145*	(0.039-0.251)	579.350*			
PRFIN-PRPHSO	0.376*	(0.238-0.514)	149.416*			
QINT-PRPHSO	-0.105*	(0.011-0.199)	477.029*			
QEXT-PRPHSO	-0.137*	(0.049-0.225)	191.239*			
TRUST-PRTIM	-0.063*	(0.041-0.167)	963.117*			
PRFIN-PRTIM	0.034*	(0.106-0.174)	108.908*			
QINT-PRTIM	-0.120*	(0.012-0.228)	154.528*			
QEXT-PRTIM	-0.107*	(0.003-0.211)	156.253*			
PRFIN-TRUST	-0.267*	(0.145-0.389)	149.908*			
TRUST-PRFU	-0.251*	(-0.137-0.365)	32.978*			
QINT-TRUST	0.769*	(0.705-0.833)	896.02 *			
QINT-QEXT	0.814*	(0.740-0.888)	664.104*			
TRUST-QEXT	0.725*	(0.643-0.807)	25.331*			

[1] PRFU, Functional Perceived Risk; PRFIN, Financial Perceived Risk; PRSO, Social Perceived Risk; PRPHSI, Physical Perceived Risk; PRPHSO, Physiological Perceived Risk; PRTIM, Time Perceived Risk; QINT, Intrinsic Quality; QEXT, Extrinsic Quality. “*” coefficients are significant at a level of 0.01. d.f.=1; $p < 0.01$. Goodness of fit indicators of CFA: $\chi^2=289.76$ (163), ($p < 0.01$); RMSEA=0.089; NFI=0.94; NNFI=0.96 CFI=0.98; IFI=0.99; Normed $\chi^2=1.8168$).

satisfactorily tested using various analyses. Content validity was guaranteed by an exhaustive literature review and scale refinement by experts.

The verification of construct validity requires testing for the convergent validity and discriminant validity of all the scales. For convergent validity, the composite reliability coefficient (CRC) was analyzed, as Jöreskog (1971) suggests, along with the average variance extracted (AVE) coefficient for each of the proposed scales. In the case of the CRC, all the values obtained (Table 1) were 0.65 or greater, exceeding the benchmarks suggested as acceptable (Bagozzi & Yi, 1988; Steenkamp & Geyskens, 2006). In the case of the AVE coefficient, all the values obtained were 0.5 or greater, valid according to Fornell & Larcker (1981)

Finally, discriminatory validity could be considered as a type of construct validity. Discriminatory validity requires that indicators for different constructs should

not be highly correlated. The discriminatory validity was confirmed through two distinct criteria. Firstly, we checked that value “1” was not within the confidence interval of the correlations between the different variables. Secondly, the correlation between each pair of confirmatory model variables was fixed at 1 and a Chi-squared difference test was carried out (Bagozzi & Yi, 1988). The evaluation of all the discrimination criteria confirmed the discriminatory validity (Table 1).

Results

Having designed and validated the measurement scales, we tested the hypotheses that make up the structural model. The estimation method was Maximum Robust Verisimilitude, because it provides greater security in samples which might not present multivariate

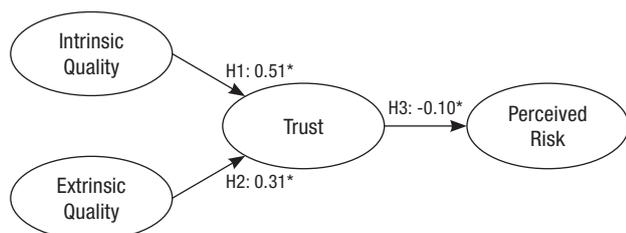


Figure 2. Initial structural model. *Significant at the 0.01 level.

normality; the same method was used for the measurement model (Fig. 2). For the multidimensional variable (perceived risk), the indicators which were used for the causal analysis were derived from the arithmetical average of the items included in each dimension. This common research practice reduced the number of parameters to be estimated and, therefore, made model adjustment and understanding easier. Nevertheless, these measurements could not have been used without the guarantee of reliability, dimensionality and validity, based on the second-order factorial models which confirmed the existence of robust multi-dimensional structures.

The goodness of fit of the model showed acceptable values [$\chi^2=310.85$ (182), $p < 0.01$; RMSEA (root mean square error of approximation)=0.062; NFI (Bentler-Bonett normed fit index)=0.92; NNFI (Bentler-Bonett non-normed fit index)=0.94 CFI (comparative fit index)=0.96; IFI (incremental fit index)=0.97; normed $\chi^2=1.7079$]. Regarding the hypotheses tested, relating intrinsic and extrinsic quality to trust and perceived risk is within the recommended limits. Furthermore, we can appreciate that the influence of both intrinsic and extrinsic perceived quality on trust are direct and significant. Consequently, the analysis showed enough evidence to support hypotheses 1 and 2. Similarly, it was noted that the negative and direct influence of trust depended on perceived risk, as shown by the parameter significance and sign. Therefore, it was not possible to reject hypothesis 3.

These results highlight the importance of consumers of certified brands trusting their attributes. Thus, it strengthens the quality of the products covered by a PDO and decreases the perception of possible risk when buying and consuming a food product. Moreover, both the intrinsic attributes of PDO cured ham “Jamón de Teruel”, like taste, aroma, aspect or fat, and the extrinsic attributes, like the brand, the name of Teruel, place of origin, price, label with nutritional and manufacturing information, packing and accessibility at the purchasing place, are trustworthy attributes that help to reduce the perceived risk.

Proposal rival model

With the aim of analyzing to what extent the influence of intrinsic and extrinsic quality attributes di-

rectly or indirectly influence perceived risk through consumer trust, we compared our proposed model with a rival one.

In the context of perceived quality, perceived risk is a concept that relates the heterogeneity or variability in perceived quality with a product category (Calvo, 2001). This level of risk tends to reduce total quality assessments and sometimes, when there is a great variety in the degree of quality, consumers do not have sufficient knowledge to evaluate the product. In these cases, the tracking process that food products are subjected to acts as a catalyst to reduce the perceived risk. Thus, we considered that consumers may exhibit a diminished perception of risk when consuming food products if they are under the strictest quality controls of a PDO (Badiola, 2006) (Hypothesis 4).

When consumers make purchase decisions, they routinely face inherent risk situations that reflect their individual uncertainty about the outcome and consequences of such purchases (Bauer, 1960; Ross, 1975). Authors such as Calvo (2001) note that the more processed, transformed, developed and standardized a product is (in the case of cured ham, this includes maximum weight standards, being cut into a V-shape, the thickness of the fat covering the lean side, a numbered band, the retaining of the hoof, and the etched mudejar star indicating “Jamón de Teruel”), the more important the extrinsic attributes will be as indicators of the quality of the product. Similarly, the better the brand image of a product, because it results in a higher capacity for differentiation, the lower the perceived risk of the consumer. Belonging to a PDO means that consumers can identify the product with the brand and, thus, reduce the effort required to acquire information, simplify product evaluation at the time of purchase, and reduce the perception of risk (Bello & Calvo, 2000). Therefore, all extrinsic signals inherent to the quality of a PDO could be instruments used by consumers to reduce their risk perceptions (Hypothesis 5).

In our model, it is important to note that trust is a key mediating variable. According to Morgan & Hunt (1994), a rival view of the mediating role of trust would be a model allowing direct paths from all precursors to the outcomes. Broadly speaking, trust and perceived quality are considered antecedents of perceived risk in the rival model (see Fig. 3).

Several researchers (e.g Bagozzi & Yi, 1988; Morgan & Hunt, 1994; Bloemer & Odekerken, 2003) highlight the interest of comparing rival models to confirm the interest of the model finally selected. The comparison of the hypothesized model with a rival one may also serve to strengthen the support we found for the meaningfulness and robustness of our proposed model (Bloemer & Odekerken, 2003).

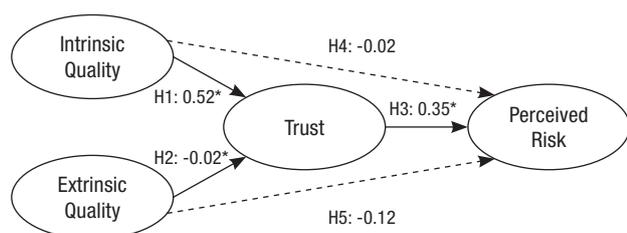


Figure 3. Rival model. *Significant at the 0.01 level.

Following Morgan & Hunt (1994)'s suggestions, we compared our model to its rival in the following terms: (i) overall fit as measured by the CFI indicator (Morgan & Hunt, 1994; Bloemer & Odekerken, 2003); (ii) parsimony as measured by the ratio of chi-square over degrees of freedom (Bloemer & Odekerken, 2003); (iii) percentage of statistically significant model paths; (iv) the ability to explain the variance of the endogenous constructs.

Rival model results

The results suggest that the proposed model fits better than the rival one: (i) the CFI of the rival model (0.72) was much lower than that of the proposed model (0.96), (ii) the rival model's ratio of chi-square over degrees of freedom was higher than that of the proposed model (4.11 vs. 1.7079), and (iii) the percentage of statistically significant paths in the proposed model was higher than that in the rival model. In addition, perceived risk was explained at a higher level in the proposed model ($R^2=0.512$) than in its rival ($R^2=0.461$). In sum, these results suggest that the initially proposed model explains all these relationships better than the rival model.

Therefore, these findings allow us to conclude that trust is a key mediating factor in the influence of perceived quality on perceived risk in this context.

Discussion

It is very important for food manufacturers to know the preferences of consumers. The system used for the formation of these preferences has become a key factor of the quality and production methods of these products. At the same time, consumer safety and health have become very important social values and are taken into account when purchasing food products. Aspects such as food safety, production characteristics, sensorial properties, convenience, availability and the quality/price ratio are progressively increasing the demand for PDO agro-food products with high added value (Van der Spiegel, 2004; Aramyan *et al.*, 2006).

This differentiation based on higher requirements shows the increasing importance of the evaluation of perceived quality broken down into its two dimensions: the extrinsic and the intrinsic attributes of PDO food products. These two factor groups (the organoleptic or physiological —detected by the senses— and those which mainly refer to the image of the product) interact with each other and determine the quality of the product perceived by the consumer (Fandos & Flavian, 2006). These factors are becoming increasingly important to achieve greater trust and to diminish consumer risk-perception in this kind of products.

Many studies have focused on analyzing the relation between the brand and trust in the food sector (Becker, 2000; Delgado & Munuera, 2001). Consumer trust in the safety of food might be dependent on the degree to which consumers trust the various actors responsible for food safety. This trust in institutions that have a responsibility for guaranteeing food safety, such as farmers, retailers, manufacturers and regulators, has been identified as a factor that enhances consumer confidence in the safety of food (De Jonge *et al.*, 2008).

With respect to perceived risk in food products, different studies have indicated that the most influential factors are: absence of indicators to infer food safety (Calvo, 2001), psychological variables of attitude or predisposition (Sjöberg, 2000) and trust in the agents responsible for the food chain (Siegrist & Cvetkovitz, 2000).

The present study has analyzed whether the influence of consumer perceived quality of a PDO product has a direct effect on perceived risk or whether this relationship is mediated by consumer trust. The results of our study confirming the mediating role of consumer trust between perceived quality and perceived risk allow us to better understand the interaction between these variables, in particular, and agro-food marketing, in general.

Consequently, these findings shown that one way to reduce perceived risk in PDO food products is to increase consumers' trust levels. These trust levels could be increased through the perceived quality of the PDO, whose certification is a signal of quality in which consumers can trust. This trust in the PDO acts as a mediating variable between the intrinsic and extrinsic quality of the product and the perceived risk.

In contrast to previous studies, this research highlights the importance of the intrinsic attributes of PDO food products and their influence on the generation of consumer trust. The results obtained emphasize the effect exerted by the PDO regulation board through its strict controls over the traceability and guarantees with which products are manufactured with respect to natural and human factors, geographical origin and/or

traditional methods. This means that consumers trust in the intrinsic attributes of these food products which are a symbol of the link to the place of origin, tradition and natural values.

Secondly, we have confirmed the importance of the extrinsic attributes and the effect exerted by these attributes on consumer trust. However, this effect has proved to be lower than that shown by the intrinsic attributes. These findings suggest that extrinsic attributes do not affect consumer trust in the most desirable way. The reason for this is that consumers cannot recognize these attributes of PDO image as trustworthy signals because, for example, the PDO logo, the etched mudejar star, the numbered band, the hoof, or even the price, are not visible in the place of purchase or the seller does not recommend “Jamón de Teruel”: all of this will affect the purchase decision.

Previous research on food products has constructed a consumer trust typology comparing consumers’ attitudes in different European countries and investigated whether it is individual attributes, such as age and gender or organized food events that have the greatest effect on consumers’ trust (Berg, 2004). Authors like Becker (2000) focused their work on the analysis of information processing by the consumer, when information on the product quality is supplied in the form of cues received while shopping or consuming and a distinction is made between extrinsic and intrinsic cues and between search-, experience-, and credence-quality attributes.

This study has found that the perceived risk cannot be reduced directly by the perceived quality of its dual perspective (intrinsic and extrinsic attributes). In fact, the comparison between the hypothesized model and a rival one confirms the mediating role of trust in the development of consumer perceived risk within the context of PDO food products. The importance of trust in a PDO product is evidence of its positive mediating role between perceived quality and perceived risk in food products with a PDO, which highlights that trust is the key aspect for consumers when selecting agro-food products. This finding corroborates how important it is for PDO producers to transmit, through their marketing strategies, that consumers can trust in these products and, thus, choose them instead of the other products in the market.

This analysis offers several insights into how consumers can reduce perceived risk in food products. Managers should make a greater effort to let consumers know that their products are manufactured under the strictest control systems in order to achieve the highest quality standards. Therefore, it is necessary to develop product labels that offer more information about the high quality of the intrinsic and extrinsic attributes of PDO prod-

ucts. As a result of this strategy, consumers could improve their knowledge and their trust in these factors.

It is also necessary to design communication campaigns emphasizing that products are manufactured under PDO strengthening the local, traditional and natural values in which the consumers may trust. These PDO food products offer very high quality in order to differentiate them from competitive products that are not protected by a PDO certification. Although the PDO is usually characterized as a product of a particular area, its impact can reach international levels if suitable business strategies and marketing are developed.

Producers must try to meet the needs of different types of consumers. In times of crisis like the present, consumer preferences are modified and price pushes quality and brand into the background, becoming the key factor in the purchasing decision. For García-Galán *et al.* (2014), the place of origin is associated with a higher quality product, so managers must educate and convince consumers to pay a premium price for this unique product because they do not know what a PDO is. Furthermore, producers must attend to consumers whose features are not affected by the crisis and are willing to pay a higher price. Yanguí *et al.* (2014) show that older consumers with a university education are less sensitive to price. The same is true of “ecological” consumers who, being concerned about their health, increasingly consume ecologically-produced Iberian ham. They are characterized by being well informed, reading labels and knowing how to identify these products that they perceive as natural and of superior quality, so they are also willing to pay a higher price.

The results of this research show the importance for an area like the province of Teruel of adding value to their agrifood products to gain competitive advantage. The PDO “Jamón de Teruel” and the PGI “Ternasco de Aragón” are the ambassadors of the largest subsector of Aragonese farming. Aragon’s PDOs are key for the present and future of the region’s agro-food sector. In the province of Teruel, which is where most Aragonese PDOs are located, we can find, in addition to ham, olive oil “Aceite del Bajo Aragón” and peaches “Melocotón de Calanda”, which have been the benchmark for many others such as paleta, cheeses, saffron and truffle “Trufa de Sarrión”, and have followed the strategy of certification as a competitive advantage. This strategy may be of interest to other rural areas similar to Teruel, whose development is based on food production or even to attracting tourists wishing to explore their gastronomy.

The strategies described above have developed taking into account the current situation of the sector, in which its regulation (seals, labelling, information concerning livestock production, slaughter and the development and marketing of products) and the significant growth of

its exports (alleviating the difficulties of the internal market) deserve our attention now. However, there is a gap between supply and demand due to the mismatch between regulatory obligation and business reality. The information required by the companies is inadequate and there is a noticeable lack of resources for its dissemination. The expansion and development of Spanish exports of products of animal origin has been achieved by overcoming problems related to animal health, which has allowed the progressive removal of trade barriers to our country. However, there is a long way to go to achieve higher rankings in the international market.

Finally, it is necessary to point out some future research lines to overcome the limitations of this paper. These should be primarily directed at identifying and quantifying, in the PDO context, the effect of other precursors of trust and their influence on perceived risk. Firstly, it would be interesting to replicate the study in other areas. Secondly, it would be very interesting to test other kinds of PDO products. Lastly, it would be interesting to analyze the influence of other drivers of trust in this model (*e.g.* consumer satisfaction with previous experience, PDO reputation or the propensity of consumers to trust).

References

- Anderson J, Gerbing D, 1988. Structural modelling in practice: a review and recommended two-step approach. *Psychol Bull* 103(3): 411-423. <http://dx.doi.org/10.1037/0033-2909.103.3.411>
- Aramyan L, Ondersteijn C, Van Kooten O, Lansink AO, 2006. Performance indicators in agri-food production chains. In: *Quantifying the agri-food supply chain; Ondersteijn CJM et al. (eds)*. pp: 47-64. Springer, Netherlands. http://dx.doi.org/10.1007/1-4020-4693-6_5
- Badiola JJ, 2006. De la EEB a la gripe aviar. *Revista Cárnica* 33, Etapa 269: 10-12.
- Bagozzi R, Yi Y, 1988. On the evaluation of structural equation models. *J Acad Mark Sci* 16(1): 74-94. <http://dx.doi.org/10.1007/BF02723327>
- Bauer RA, 1960. Consumer behavior as risk taking. *Proc 43rd Conf Am Market Assoc*, Dynamic marketing for a changing world; Hancock RS (ed). pp: 389-398.
- Becker T, 2000. Consumer perception of fresh meat quality: a framework for analysis. *Brit Food J* 102(3): 158-176. <http://dx.doi.org/10.1108/00070700010371707>
- Bello L, Calvo D, 2000. The importance of intrinsic and extrinsic cues to expected and experienced quality: an empirical application for beef. *Food Qual Prefer* 11: 229-238. [http://dx.doi.org/10.1016/S0950-3293\(99\)00059-2](http://dx.doi.org/10.1016/S0950-3293(99)00059-2)
- Berg L, 2004. Trust in food in the age of mad cow disease: A comparative study of consumers' evaluation of food safety in Belgium, Britain and Norway. *Appetite* 42(1): 21-32. [http://dx.doi.org/10.1016/S0195-6663\(03\)00112-0](http://dx.doi.org/10.1016/S0195-6663(03)00112-0)
- Bernués A, Olaizola A, Corcoran K, 2003. Extrinsic attributes of red meat as indicators of quality in Europe: an application for market segmentation. *Food Qual Prefer* 14: 265-276. [http://dx.doi.org/10.1016/S0950-3293\(02\)00085-X](http://dx.doi.org/10.1016/S0950-3293(02)00085-X)
- Bloemer J, Odekerken-Schröder G, 2003. Antecedents and consequences of affective commitment. *Australas Mark J* 11 (3): 33-43. [http://dx.doi.org/10.1016/S1441-3582\(03\)70133-5](http://dx.doi.org/10.1016/S1441-3582(03)70133-5)
- Bonetti E, 2004. The effectiveness of meta-brands in the typical product industry: mozzarella cheese. *Brit Food J* 106 (10/11): 746-766. <http://dx.doi.org/10.1108/00070700410561360>
- Bredahl L, Grunert KG, Fertin C, 1998. Relating consumer perceptions of pork quality to physical product characteristics. *Food Qual Prefer* 9(4): 273-281. [http://dx.doi.org/10.1016/S0950-3293\(98\)00007-X](http://dx.doi.org/10.1016/S0950-3293(98)00007-X)
- Byrne B, 2006. *Structural equation modeling with EQS: basic concepts, applications, and programming*. Ed. Taylor & Francis Group, New York.
- Calvo D, 2001. *Analysis of quality and perceived risk in the buying decision-making process of food products*. Doctoral thesis. University of A Coruña, Spain. [In Spanish].
- De Jonge J, Van Trijp JCM, Van Der Lans IA, Renes RJ, Frewer LJ, 2008. How trust in institutions and organizations builds general consumer confidence in the safety of food: A decomposition of effects. *Appetite* 51: 311-317. <http://dx.doi.org/10.1016/j.appet.2008.03.008>
- Delgado E, Munuera JL, 2001. Brand trust in the context of consumer loyalty. *Eur J Mark* 35 (11): 1238-1258. <http://dx.doi.org/10.1108/EUM00000000006475>
- Dholakia U, 1997. An investigation of the relationship between perceived risk and product involvement. *Adv Consum Res* 24: 159-167.
- Fandos C, Flavián C, 2006. Intrinsic and extrinsic quality attributes, loyalty and buying intention: an analysis for a PDO product. *Brit Food J* 108 (8): 646-662. <http://dx.doi.org/10.1108/00070700610682337>
- Fornell C, Larcker DF, 1981. Evaluating structural equations models with unobservable variables and measurement error. *J Mark Res* 18: 9-50. <http://dx.doi.org/10.2307/3151312>
- García-Galán MM, Del Moral-Agúndez A, Galera-Casquet C, 2012. Assessing the introduction and development of a designation of origin from the firm's perspective: The case of the Ribera del Guadiana wine PDO. *Span J Agric Res* 10 (4): 890-900. <http://dx.doi.org/10.5424/sjar/2012104-2873>
- García-Galán MM, Del Moral-Agúndez A, Galera-Casquet C, 2014. Valuation and importance of the extrinsic attributes of the product from the firms' perspective in a Spanish wine protected designation of origin. *Span J Agric Res* 12 (3): 568-579. <http://dx.doi.org/10.5424/sjar/2014123-6036>
- Grewal D, 1995. Product quality expectations: towards an understanding of their antecedents and consequences. *J Bus Psychol* 9 (3): 225-240. <http://dx.doi.org/10.1007/BF02230967>
- Grunert KG, 1997. What's in a steak? A cross cultural study on the quality perception of beef. *Food Qual Prefer* 8 (3): 157-174. [http://dx.doi.org/10.1016/S0950-3293\(96\)00038-9](http://dx.doi.org/10.1016/S0950-3293(96)00038-9)
- Grunert KG, 2005. Food quality and safety: consumer perception and demand. *Eur Rev Agric Econ* 32 (3): 369-391. <http://dx.doi.org/10.1093/euragg/jbi011>

- Grunert KG, Larsen H, Madsen TK, Baadsgaard A, 1996. Market orientation in food and agriculture. Kluwer, Boston. <http://dx.doi.org/10.1007/978-1-4613-1301-4>
- Grunert KG, Bredahl L, Brunso K, 2004. Consumer perceptions of meat quality and implications for product development in the meat sector –A Review. *Meat Sci* 66: 259-272. [http://dx.doi.org/10.1016/S0309-1740\(03\)00130-X](http://dx.doi.org/10.1016/S0309-1740(03)00130-X)
- Hair JF Jr, Anderson RE, Tatham RL, Black WC, 1998. *Multivariate data analysis*. Prentice Hall, Englewood Cliffs, NJ, USA.
- Howard, JA, 1989. *Consumer behaviour in marketing strategy*. Prentice Hall, NY.
- Jacoby J, Kaplan LB, 1972. The components of perceived risk. In: *Advances in Consumer Research*; Venkatesan M. (ed). pp: 82-393. Association for Consum Res, Chicago.
- Jöreskog KG, 1971. Statistical analysis of sets of congeneric tests. *Psychometrika* 36: 109-133. <http://dx.doi.org/10.1007/BF02291393>
- Jöreskog KG, Sörbom D, 1993. *LISREL 8: Structural equation modeling with the SIMPLIS command language*. Scientific Software Int., Chicago (ILL), USA.
- Loureiro ML, Umberger WJ, 2007. A choice experiment model for beef: What US consumer responses tell us about relative preferences for food safety, country-of-origin labelling and traceability. *Food Policy* 32(4): 496-514. <http://dx.doi.org/10.1016/j.foodpol.2006.11.006>
- Magistris T, Gracia A, Albisu LM, 2014. Wine consumers' preferences in Spain: an analysis using the best-worst scaling approach. *Span J Agric Res* 12 (3): 529-541. <http://dx.doi.org/10.5424/sjar/2014123-4499>
- Mas FJ, 2007. *Temas de investigación comercial*, 4th rev. ed. Editorial Club Universitario, Alicante, Spain.
- Menapace L, Colson G, Grebitus C, Facendola M, 2011. Consumers' preferences for geographical origin labels: evidence from the Canadian olive oil market. *Eur Rev Agr Econ* 38 (2): 193-212. <http://dx.doi.org/10.1093/erae/jbq051>
- Morgan RM, Hunt SD, 1994. The commitment-trust theory of relationship marketing. *J Mark* 5: 20-38. <http://dx.doi.org/10.2307/1252308>
- Rabadán R, Ato M, 2003. *Técnicas cualitativas para investigación de mercados*. Editorial Pirámide, Madrid.
- Resano H, Sanjuán AI, Albisu, LM, 2007. Consumers' acceptability of cured ham in Spain and the influence of information. *Food Qual Prefer* 18: 1064-1076. <http://dx.doi.org/10.1016/j.foodqual.2007.05.002>
- Ross I, 1975. Perceived risk and consumer behavior: a critical review. In: *Advances in consumer research*; Schlinger MJ (ed). pp: 1-19. Assoc Consum Res, Cincinnati.
- Sans P, Sanjuán-López AI, 2015. Beef animal welfare, attitudes and willingness to pay: A regional comparison across the Pyrenees. *Span J Agric Res* 13(3): e0105 <http://dx.doi.org/10.5424/sjar/2015133-7273>
- Sanzo MJ, Del Río AB, Iglesias V, Vázquez R, 2003a. Attitude and satisfaction in a traditional food product. *Brit Food J* 105(11): 771-790. <http://dx.doi.org/10.1108/00070700310511807>
- Sanzo MJ, Santos M, Vázquez R, Álvarez L, 2003b. The effect of market orientation on buyer-seller relationship satisfaction. *Indust Mark Manage* 32(4): 327-345. [http://dx.doi.org/10.1016/S0019-8501\(01\)00200-0](http://dx.doi.org/10.1016/S0019-8501(01)00200-0)
- Siegrist M, Cvetkovitz G, 2000. Perception of hazards: the role of social trust and knowledge. *Risk Analysis* 20 (5): 713-719. <http://dx.doi.org/10.1111/0272-4332.205064>
- Sjöberg L, 2000. Factors in risk perception. *Risk Analysis* 20 (1): 1-11. <http://dx.doi.org/10.1111/0272-4332.00001>
- Steenkamp JB, 1990. Conceptual model of the quality perception process. *J Bus Res* 21 (4): 309-333. [http://dx.doi.org/10.1016/0148-2963\(90\)90019-A](http://dx.doi.org/10.1016/0148-2963(90)90019-A)
- Steenkamp JB, Geyskens I, 2006. How country characteristics affect the perceived value of web sites. *J Mark* 70: 136-150. <http://dx.doi.org/10.1509/jmkg.70.3.136>
- Steenkamp JB, Van Trijp HC, 1991. The Use of LISREL in validating marketing constructs. *Int J Res Mark* 8: 283-299. [http://dx.doi.org/10.1016/0167-8116\(91\)90027-5](http://dx.doi.org/10.1016/0167-8116(91)90027-5)
- Steenkamp JB, Van Trijp HC, 1996. Quality guidance: A consumer-based approach to food quality improvement using partial least squares. *Eur Rev of Agric Econ* 23: 195-215. <http://dx.doi.org/10.1093/erae/23.2.195>
- Stone R, Grönhaug K, 1993. Perceived risk: Further considerations for the marketing discipline. *Eur J Mark* 27 (3): 39-50. <http://dx.doi.org/10.1108/03090569310026637>
- Van Den Heuvel T, van Trijp, HCM, van Woerkum C, Renes RJ, Gremmen B, 2007. Linking product offering to consumer needs; inclusion of credence attributes and the influences of products features. *Food Qual Prefer* 18 (2): 296-304. <http://dx.doi.org/10.1016/j.foodqual.2006.02.001>
- Van Der Spiegel M, 2004. Measuring effectiveness of food quality management. *Proefschrift Wageningen*.
- Verbeke W, Viaene J, 1999. Beliefs, attitude and behaviour towards fresh meat consumption in Belgium: empirical evidence from a consumer survey. *Food Qual Prefer* 10 (6): 437-445. [http://dx.doi.org/10.1016/S0950-3293\(99\)00031-2](http://dx.doi.org/10.1016/S0950-3293(99)00031-2)
- Yangui A, Costa-Font M, Gil JM, 2014. Revealing additional preference heterogeneity with an extended random parameter logit model: the case of extra virgin olive oil. *Span J Agric Res* 12 (3): 553-567. <http://dx.doi.org/10.5424/sjar/2014123-5501>
- Yeung RMW, Morris J, 2006. An empirical study of the impact of consumer perceived risk on purchase likelihood: a modelling approach. *Int J Consum Studies* 30 (3): 294-305. <http://dx.doi.org/10.1111/j.1470-6431.2006.00493.x>
- Zaichkowsky JL, 1985. Measuring the involvement construct. *J Consum Res* 12 (4): 341-352. <http://dx.doi.org/10.1086/208520>
- Zeithaml VA, 1988. Consumer perceptions of price, quality and value: A means-end model and synthesis of evidence. *J Mark* 52: 2-22. <http://dx.doi.org/10.2307/1251446>