ASSESSING CONSUMER PREFERENCES FOR LABELING INFORMATION OF DRY-CURED SERRANO HAM ON A VIRTUAL SUPERMARKET IN SPAIN

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Abstract

Encouraging healthy and personalized nutrition has become one of the EU strategic lines and, since 2015, the third sustainable developed objective promoted by the United Nations aims to ensure healthy lives and promote well-being for all ages. One approach to address this objective is to provide information to consumers through the labeling of food products. However, it has been scientifically proven that some food products provide an approximation of their nutrient content on the food packages, which might mislead consumers. Hence, this study examines consumers' acceptance of precise nutrient labeling (nutritional facts and nutritional claims related to fat and salt content) on dry-cured ham (Jamón Serrano) in a virtual supermarket. The study was conducted in Zaragoza (Spain) on 161 consumers. In a virtual supermarket that mimics a real-life environment, participants were presented with a choice set of six alternatives and a no-buy option and were asked to choose their most preferred ham. The results indicate that Spanish consumers preferred dry-cured ham with a conventional nutrition label while the low salt content nutrition claim did not affect preferences.

Keywords: consumers, virtual supermarket, precise nutrition labels, dry-cured ham, Spain.

1. Introduction

Healthy eating concerns in the 21st century represent one of the most debated issues in politics, science, and economic forums due to the negative impacts on public health, society, and the economy of a country. In recent decades, food consumption patterns have significantly changed due to socio-economic and socio-cultural structural alternations away from healthy diets (e.g., Mediterranean diet). The consequences of these changes in food consumption have favored several types of non-communicable diseases, which have negatively affected the European Union (EU) countries and led to an estimated 86% of the deaths and 77% of the disease burden in the last decade (WHO/Europe, 2018). In this context, the EU introduced three regulations related to food labeling policy (Regulation No. 1924/2006, 1169/2011, and 432/2012) and the new strategy "Farm to Fork", which aim in harmonizing future voluntary nutritional labeling on the front of package of food products and establish nutritional profiles by 2022.

Scientific evidence indicates that our diet has an important effect on our health and that food products with nutritional claims have marginally better nutritional profiles than those without these claims (Kaur et al., 2016). However, the intake of some food components (e.g. salt, fat, protein, sugar) can affect each person differently depending on genetic predispositions, age, diseases, etc. Consumers increasingly demand healthier foods and try to follow a more balanced diet. This fact highlights the need to design specific and personalized diets according to these needs and specify the nutrients of a food product to consumers in easy-to-understand and transparent labeling systems. The food industry sees nutritional claims as a good opportunity to differentiate their products and increase competitiveness with the incorporation of these claims on the products' packaging. These claims must be truthful and precise. However, although most of them are precise when calculating the compositional average of a batch, some might be largely inaccurate for an individual product, especially when there is high compositional variability within a batch. This is the case of products where the composition of a nutrient differs due to raw material variations (i.e. fat contents in meat/fish) or processing conditions (i.e. salt content in dry-cured ham, salmon, or desalted codfish). For this reason, sometimes, the nutritional composition indicated on the label does not correspond to the actual composition of the product, with a marginal error that exceeds the limits established by the EU.

For this reason, personalized nutrition to improve the well-being and health of consumers has become one of the strategic lines of the EU. Likewise, consumers also demand information regarding the quality of foods and the truthfulness of the information on the label. To respond to these concerns, it is necessary to investigate new alternatives to provide truthful and voluntary nutritional information to consumers. This is

the case of precise nutritional labeling. The precise nutritional labeling represents a voluntary alternative to provide information about the foods' precise quantity of nutrients using previous physio-chemical analysis carried out from certified laboratories. Hence, the certified laboratory adds a new column in the conventional nutritional table where the truthful amount of nutrients are indicated (Figure 1).

The objective of the study was to analyze Spanish consumers' preference for different labeling information (nutritional facts and nutritional claims related to fat and salt content) on dry-cured ham in a virtual supermarket. Laboratory decision-making experiments have become a standard part of economists' toolkit for conducting consumer behavior experiments, but conducting experiments in a virtual world can reach a larger and broader subject population with modest logistical costs. In this context, virtual environments are computer-generated models in which participants can experience and interact in real-time, and they allow the development of reliable models and more efficient and rigorous research in the field of consumer behavior (Siegrist et al., 2019). In addition, research suggests that virtual reality (VR) can be a useful tool for conducting consumer behavior experiments, especially in the context of food preferences and consumption (Siegrist et al., 2019).

2. Materials and methods

The research methods used to answer the main objective was a virtual supermarket and a survey with consumers' characteristics. The study was conducted during March-September 2020 (before and after the first covid lockdown in Spain). Participants were randomly recruited using a stratified with proportional allocation procedure for gender, age, and level of education. We conducted the experiment in a medium-sized Spanish city (Zaragoza). The target population of our study included primary food buyers who consume dry-cured ham, and were at least 18 years old.

2.1. Virtual Supermarket

Ham is selected because it is a typical food of Spanish culture, and it is consumed by the majority of Spanish households. We selected 4 attributes of dry-cured ham (Table 1): a) 3 levels of prices: 0.68€,1.03€, 1,42€, b), the presence/absence of certifications of dry-cured ham (SERRANO) c) the presence/absence of low salt nutritional claims and d) the presence/absence of precise nutritional labeling from a certified laboratory.

Table 1. *Attributes and levels used in the virtual supermarket*

Attribute	Description
Precise Labeling	Conventional nutritional table facts
	Precise nutritional labelling
Nutritional claim	None
	Low salt content
Quality certification	None
	Presence of serrano quality certification
Price (€)/100 gr.	0.68, 1.05, 1.48

The prices for ham used in the virtual supermarket (VS) were consistent with the prices found in the real market (supermarket and hypermarkets in Zaragoza). A fractional orthogonal factorial design was run and six alternatives of dry-cured ham packages were used for the experiment (Figure 1).

Figure 1. *A package of ham with precise nutrition information.*
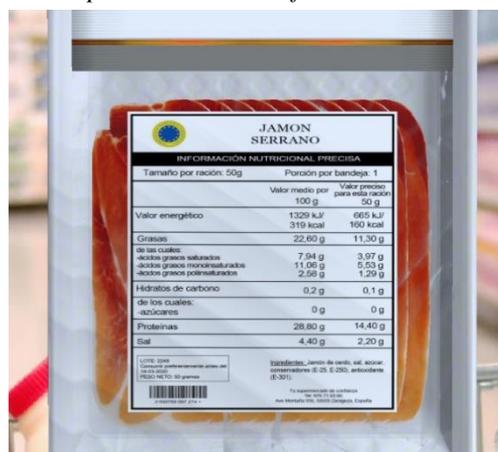
Participants received an oral explanation of the nature of the task and the most adequate way to use the equipment (Oculus and joystick). The virtual environment simulates a supermarket as in real-life, where the consumer can move freely around 6 shelves of different products (one of them contained the ham alternatives). Consumers were asked to choose one of the alternatives presented and add it to their shopping cart. The movement and the choice of the item in the virtual supermarket were assured by the use of the joystick. After the virtual shopping task, participants filled a questionnaire regarding the consumption and purchase frequency of ham, the importance attached to different attributes, and their demographic characteristics.

2. Results

The participants consisted of 50% women and 50% men. The average age was 41 years. About 30% of the sample had medium-high income level, some had >3500€/month (30%), and university educational level (30%). The estimated probit model in the study (Table 2) is based on Lancaster's theory where consumers maximize utility (Lancaster, 1966). Hence, consumer preferences depend on the product attributes and it is assumed that utility (U_n) is split into two components: one observed by the researcher and another unobserved (ε_{nj}), which is randomly distributed.

$$(HAM)_n= NO\text{-}BUY + \beta_1 H\_PRICE_n + \beta_2 M\_PRICE_n + \beta_3 NUTRI\_PRECI_n + + \beta_4\ SERRANO_n + \beta_5\ LW\_SALT_n + \varepsilon njt \tag{1}$$

Table 2. *Results from a probit model*

Choice	Coefficient	t	p>|t|
NO-BUY	-1.04	-7.43	0.000
H_PRICE	-0.605	-4.32	0.000
M_PRICE	-0.351	-3.04	0.000
NU_PRECI	0.303	2.59	0.010
SERRANO	0.406	3.47	0.000
LW_ SALT	-0.06	-0.54	0.588

As expected, the PRICE attributes were negative, which means that Spanish consumers utility decrease when price increases. The NO-BUY option is also negative, which indicates that consumers prefer to buy one of dry-cured ham better than the no-buy option. The positive coefficient associated with the variable NU_PRECI in Eq. (1) indicates that the higher the presence of precise nutritional information, the more likely consumers will buy the dry-cured ham. The positive coefficient associated with the SERRANO variable indicates that the higher presence of Serrano dry-cured ham, the more likely consumers will purchase it. However, the estimated coefficient for a nutritional claim such as low salt content (LW_SALT) is not statistically significant. This means that the importance that consumers attach to the nutritional claims when shopping does not determine the choice of dry-cured ham package.

4. Conclusion

The paper aimed to analyze the purchasing decision to buy a dry-cured ham with different voluntary nutritional information (nutritional claim and precise nutritional labeling) and quality certifications (Serrano ham) at different prices. The results indicate that the presence of the precise labeling information is positively valued while the low salt content nutritional claim does not affect consumer's decisions. These results indicate that the precise nutritional labeling provides enough information, which silences the effects of the nutritional claim on ham packages. Although this result might be promising, more research is needed to investigate heterogeneity among consumers and in particular, segment them based on personalized diets that consider the exact amount of nutrients in the food product. Future studies are encouraged to use the current findings to formulate hypotheses and test these findings in other food product categories.

References

Kaur, A., S. Hieke, and M. Rayner, Do health and nutrition claims meet consumers' health needs? Agro Food Industry Hi-Tech, 2016. 27(3): p. 22-24.

Lancaster, K.J., 1966. A new approach to consumer's theory. J. Polit. Ec. 74(2), 132–157.

Siegrist, M., Ung, C.-Y., Zank, M., Marinello, M., Kunz, A., Hartmann, C. and Menozzi, M. 'Consumers' food selection behaviors in three-dimensional (3D) virtual reality, Special Issue on "Virtual Reality and Food: Applications in Sensory and Consumer Science", Vol. 117, (2019) pp. 50–59.