Investigating the importance of product traceability in the relationship between product authenticity and consumer willingness to pay[1]

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Abstract

Research framework: *The effects of agricultural market globalization have increased the perception of inauthentic products; therefore, consumers increasingly search for real and genuine products. Product authenticity, generally defined with terms such as real, original, unique, genuine, and traditional, is becoming a frequent evaluation criterion that guides consumer decision-making. In this perspective, the traceability of the product could play a relevant role by allowing consumers to know more about the product (i.e., the whole process), which leads to greater trust in it.*

Purpose of the paper: *This study explores the importance of product traceability in the relationship between product authenticity and consumer willingness to pay (WTP) for agri-food products, specifically for organic olive oil. Traceability is seen as a crucial factor in the agri-food sector, by preventing deliberate or accidental mislabeling (i.e., adulterations, fraud, scandals).*

Methodology*: Quantitative data were collected from a convenience sample of consumers through an online survey built on the Qualtrics software platform. The survey was performed in Spain, considered the first and most important producer of organic olive oil in the world.*

Findings*: The findings provide preliminary evidence that the importance of product traceability plays a mediating role in the relationship between product authenticity and consumer willingness to pay for organic olive oil.*

Research limits: *This study adopts an exploratory approach and was developed only in the Spanish context. It would be useful to perform the analysis in other relevant olive oil producing countries, such as Italy or Greece. Additionally, the study focused on a specific type of comestible product (i.e., organic olive oil), then to corroborate the validity and generalizability of the findings further research will focus on different edible products.*

Practical implications: *Findings contribute to the literature on the authenticity construct and allow implications for the marketing of agri-food products to be drawn.*

Originality of the paper: *Through empirical evidence, this study sheds some light on the under-investigated nature of the importance of product traceability in the relationship between product authenticity and consumer willingness to pay.*

Key words: product authenticity; willingness to pay; product traceability; organic olive oil product; Spain.

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1. Introduction

Currently, the number of consumers involved in food safety (Röhr *et al.*, 2005; Grunert, 2005) and health products (Maddock *et al.*, 1999; Olsen, 2003) is continuously increasing. However, the effects of the globalization of agricultural markets imply that consumers come into contact with an endless variety of foods. Nevertheless, if, on the one hand, food market globalization provides the consumer with accessibility to non-native products, on the other hand, it has increased the perception of inauthentic products (Smiechowska and Klobukowski, 2015). Therefore, consumers begin to search for "something real from someone genuine" (Gilmore and Pine, 2007, p. 1) by demanding information and reassurances about the origin and content of food products (Carcea *et al.*, 2009). Specifically, recent trends are showing a greater sensitivity towards the origin of food products and their authenticity, observed as criteria of evaluation and decision-making that guide consumer choices (Liao and Ma, 2009). Previous research underlines that authenticity attributes have a positive and statistically significant impact on consumer interpretations, behavioral responses, and interest, such as willingness to pay (Lehman *et al.*, 2019). It has shown that consumers tend to be willing to pay more for products they consider authentic (e.g., Fuchs *et al.*, 2015; Smith *et al.*, 2016). O'Connor *et al.* (2017), found that authenticity cues increase purchase intentions and willingness to pay. By exploring a set of four distinct meanings of authenticity (i.e., moral, type, craft, and idiosyncratic), the existing literature has underlined that most consumers express a willingness to pay more for each authenticity type.

In terms of reassurances on the origin and content of food products, traceability is observed as a crucial factor for the agri-food sector (Papetti *et al.*, 2012; Costa *et al.*, 2013). Food traceability implies the control of the whole chain of food production and marketing, by allowing the food to be tracked through each step of its production back to its origin (Ampatzidis and Vougioukas, 2009). Indeed, with the objective of ensuring public health, it is a necessary tool for the prevention of deliberate or accidental mislabeling, such as food adulterations, fraud, and scandals (Charlebois and Haratifar, 2015). In this respect, very emblematic cases might be the Melamine milk powder scandal in China in 2008 (Xiu and Klein, 2010), the dioxin contamination of chicken feed in Belgium in 1999 (Bernard *et al.*, 2002), and bovine spongiform encephalopathy. To face these problems, various regulations, at national and international levels, have been defined with the objectives of providing the basis for the assurance of high-level protection of human health, and the safety and quality of food products (i.e., Charlebois *et al.*, 2014). Additionally, these incidents draw consumer attention to food safety and integrity, which increases consumer awareness of a food product, by pressure on public/private organizations to implement traceability in their food supply chain (Haleem *et al.*, 2019) in order to provide easy access to the history of the products (Olsen and Borit, 2013) and information regarding the source of raw materials, process, application, and location of products. Effectively, this increases consumer confidence (Kher *et al.*, 2010) and creates connections between

producers and consumers (Regattieri *et al.*, 2007). Concerning the case of organic olive oil products, the increasing demand for high-quality olive oil, which might be adulterated with other low-quality oil, and the safety within the food chain, has led to greater attention to the traceability of product characteristics (i.e., nutritional), production and transformation methods, to effectively improve food safety and quality and to limit the risk of adulteration and fraud (Zhang *et al.*, 2012).

Although previous scientific contributions have investigated the relationship between food product authenticity and consumer willingness to pay (WTP) (Sidali and Hemmerling, 2014; O'Connor *et al.*, 2017; Kendall *et al.*, 2019), little analysis has been conducted to examine the importance of product traceability of this above-mentioned relationship. Therefore, in order to fill this gap, the focus of this paper is to investigate the importance of product traceability in the relationship between product authenticity and consumer willingness to pay, shedding some light, through empirical evidence, on the under-investigated nature of the traceability.

To achieve this research objective, an explorative approach is adopted, and the organic olive oil product is selected because the question linked to the authenticity and traceability of this product represents a challenging task due to the complexity of deliberate fraudulent adulterations and practices (Meenu *et al.*, 2019). The study is conducted in Spain considering that this country is the first and most important producer of organic olive oil in the world[2].

This research contributes to the previous studies on food authenticity, highlighting insights into the relationships between this construct and consumer willingness to pay. Specifically, by theoretically positioning and empirically substantiating, this study underlines that traceability assumes a mediating role in the relationship between product authenticity and consumer willingness to pay for organic olive oil, and advances the existing literature focused mainly on the authenticity construct, its characteristics, and its relationships.

The paper is organized as follows. The following section reviews the existing research contributions on the authenticity construct, with particular focus on the effects of authenticity in the domain of food products and its connections with traceability and willingness to pay. Then, it is followed by a description of the research design and methodology used. Findings and discussions are presented. Finally, the theoretical and managerial implications, limitations, and future research proposals are highlighted.

2. Theoretical background

Authenticity is an important topic within marketing literature, even if it is a very elusive concept that has multiple meanings with both demand and supply connotations. The term 'authenticity' remains problematic because

[2] Spain is the biggest producer of olive oil in the European Union: from 2015/16 to 2017/18, on average, it accounted for 63% of the entire EU production (source: European Commission, 2020).

what is often seen as authentic is professed arbitrarily (Boyle, 2003). Previous studies have examined authenticity in several consumption contexts, by analyzing tourist sites (Chronis and Hampton, 2008), green products (Miniero *et al.*, 2014), beverages (Del Chiappa *et al.*, 2019) and agri-foodstuff (Chousou and Mattas, 2019). These studies have provided evidence that perceived authenticity influences consumer evaluations (e.g., Beverland and Farrelly, 2010; Sidali and Hemmerling, 2014; Fuchs *et al.*, 2015), by highlighting how consumers may use authenticity cues as risk-relieving strategies in their evaluation processes. In addition, the signals of authenticity could increase consumer awareness of the product and provide reassurance during the selection and purchase processes.

The next sections review existing research on authenticity, assuming a specific focus on the effects of authenticity in the domain of food products and its link with traceability and willingness to pay, which lead us to the definition of our research question.

2.1 Authenticity research

The quest for authenticity is a characteristic of postmodern consumption (Firat and Venkatesh, 1995). In the previous studies within the field of marketing, authenticity is defined as something original, or a realistic copy of the original (Lunardo and Guerinet, 2007). According to Boyle (2003), alternative expressions of authenticity include terms such as ethical, natural, honest, simple, sustainable, and rooted. Moreover, words such as original, genuine, unique, traditional, and real are used by modern consumers to define authenticity (Muñoz *et al.*, 2006). Beverland and Farrelly (2010) have identified a shared meaning of authenticity that is a consumer desire for genuineness, reality, and truth driven by control, connection, and virtue benefits.

From the consumer viewpoint, perceived authenticity refers to consumer beliefs or expectations about a product being genuine, real, and/or true (e.g., Grayson and Martinec, 2004; Beverland and Farrelly, 2010). Grayson (2002) has suggested that consumers interpret authenticity in several different ways, depending on what is being evaluated and under what circumstances. Grayson and Martinec (2004) have explained authenticity as iconic (e.g., when an object is an accurate reproduction of the original), indexical (e.g., when an object has a factual, spatiotemporal connection to history), and hypothetical (e.g., when an object has a hypothetic, spatiotemporal connection to history) typologies in market offerings. According to Grayson and Martinec (2004), indexical and iconic cues are predicted to influence consumer processing of apparent product significance. Moreover, Fejes and Wilson (2013) have suggested that consumers use both extrinsic and intrinsic cues to evaluate authenticity, which serve as a substantial evaluation and decision-making criterion that can guide consumer choices (Liao and Ma, 2009).

2.2 Authenticity, traceability, and willingness to pay in the domain of food products

As mentioned in the marketing literature, product authenticity has been investigated in several contexts, such as fast food (Beverland and Farrelly, 2010), green or environmentally conscious consumption (Ewing *et al.*, 2012), traditional food specialties (Sidali and Hemmerling, 2014), and handmade products (Fuchs *et al.*, 2015), stressing that perceived authenticity influences consumer evaluations and interest. Several attributes of authenticity have indeed been identified in the existing literature able to influence consumer perceptions of product authenticity. Gilmore and Pine II (2007) define natural authenticity as the people's tendency "*to perceive as authentic that which exists in its natural state in or of the earth, remaining untouched by human hands; not artificial or synthetic*" (p. 49). They refer to growers of organic foods, in forsaking pesticides and fertilizers, as commodities that belong to this kind of authenticity.

The authenticity construct is wide and involves several meanings and dimensions, for instance, the genuineness, origin, or naturalness of the product (van Giesena and de Hoogeb, 2019). Camus (2004) identifies three dimensions, which are origin, projection of the consumer to the product, and uniqueness, capable of encapsulating the concept of product authenticity concerning an agri-foodstuff. Authentic products are often considered local, regional, and/or traditional (Kadirov, 2015), real, sincere, and genuine (Beverland and Farrelly, 2010; Morhart *et al.*, 2015). For specific products, such as fruit and vegetables, the naturalness dimension of authenticity is crucial, underlying respect for the environment, healthiness, and freshness (Binninger, 2017). Uniqueness is another relevant feature of authentic products, contrary to industrial products sold in huge quantities (Groves, 2001). Additionally, foodstuff authenticity regards genuineness, related to the place of production (Sims, 2009), country of origin (Chousou and Mattas, 2019; Bertoli and Resciniti, 2013), product ethnicity (Park *et al.*, 2016), and handmade production processes (Fuchs *et al.*, 2015). According to Groves (2001) and Sims (2009) the authentic product is associated with nutritional value and assurances of high-quality. Sidali and Hemmerling (2014) investigated the object-based authenticity of traditional food, finding a positive impact of quality claims concerned with the temporal, spatial, and product-specific attributes of food specialties, on the intention to consume a food product. Food product authenticity can be communicated through certifications concerning geographical indications and organic production (Spielmann and Charters, 2013), brand name (Groves, 2001), color packaging (Marozzo *et al.*, 2020), and selling price (Fejes and Wilson, 2013).

Previous studies emphasize that food product authenticity can affect consumer willingness to pay, by finding a positive impact of authenticity claims on the intention to consume traditional food products (Sidali and Hemmerling, 2014; Mingione et at., 2020). Authenticity, increasing appeal and value, can positively influence purchase intentions and greater consumer willingness to pay for food products perceived as authentic (O'Connor *et al.*, 2017). In this respect, consumers express willingness

to pay a premium price for food products that better meet authenticity requirements (Kendall *et al.*, 2019). Consumers acknowledge the price premiums associated with the purchase of authentic food products and are willing to accept this expense to ensure the authenticity of products carrying possible health risks and to limit the problems linked to adulteration and fraud.

Regarding the food system, olive oil is one of the main foodstuffs of the Mediterranean area, with a high selling price and a great level of adulteration. So authenticity becomes an evaluation and decision-making criterion that guides specific purchasing choices for olive oil (Chousou *et al.*, 2018). Especially for organic olive oil, consumers are willing to pay an extra price premium; besides, they are aware of the alteration risk and use authenticity cues, as signals during the purchase process, for assessing food products (Yangui *et al.*, 2016). From a research study on Italian consumer preferences for extra virgin olive oil, it emerges there is a very high willingness to pay a premium price for this kind of food product (Piccolo *et al.*, 2013).

Consumer purchasing behavior of organic olive oil is affected by the fact that consumers are typically concerned about health and safety (Tsakiridou *et al.*, 2006) and are increasingly oriented to consider the adoption of traceability systems in the food supply chain (Haleem *et al.*, 2019) in order to have information transparency, to guarantee high-quality, and to limit possible food fraud (Papetti *et al.*, 2012). In particular, consumers demand verifiable evidence of traceability as an important criterion of food quality and safety, by underlining the need for a traceability system that provides information on the origin of foods, characteristics, process methods, retailing and final destination (Bertolini *et al.*, 2006; Aung and Chang, 2014). Therefore, in this perspective, traceability can potentially represent an important "*tool to assist in the assurance of food safety and quality*" (Aung and Chang, 2014, p. 172) when consumers make food-related purchasing decisions, thus preferring food products characterized by information traceability, quality assurance and certification information (Verbeke and Ward, 2006; Hou *et al.*, 2019). Evidence shows that consumers prefer and are willing to pay a premium for food with traceability information (Zhang *et al.*, 2012; Bai *et al.*, 2013) because traceability increases consumer security and confidence (Costa *et al.*, 2013) by ensuring certain processing elements and procedures.

Despite significant attention to the above-mentioned constructs, to the author's knowledge, there is a lack of empirical evidence on the role of product traceability in the relationship between product authenticity and consumer willingness to pay. Thus, understanding the importance of product traceability is proposed in the following research question:

RQ: What role (moderator or mediator) does the importance of product traceability play in the relationship between product authenticity and consumer willingness to pay?

3. Methodology: research design

Quantitative data were collected from a sample of the Spanish population with an online survey built on the Qualtrics software platform. The survey was advertised through a convenience sample of websites, blogs, social networks, and emails to reach the widest public. Convenience sampling is a kind of nonrandom sampling in which members of the target population are selected for the purpose of the study if they meet certain practical criteria, such as geographical proximity, availability at a certain time, easy accessibility, or the willingness to volunteer (Dörnyei, 2007). Therefore, considering the context of the investigation (i.e., Spanish organic olive oil consumers), Spanish websites, blogs, online forums, and pages on social networks related to the organic olive oil sector were identified, and thanks to word of mouth it was possible to reach the widest public. Although this survey method was selected for its time and cost advantages over traditional systems, it is opportune to consider that it carries some limitations such as self-selection bias (e.g., Thompson *et al.*, 2003), respondents misrepresenting their age, gender, level of education or other socio-demographic variables (e.g., Dillman, 2011), representativeness (e.g., Couper, 2011), and the possible risk of including multiple responses by the same person (e.g., Konstan *et al.*, 2005).

The Covariance-Based SEM (CB-SEM) requires a sufficient sample size and, given the asymptotic property of the maximum-likelihood (ML) estimation, a minimum sample size is necessary to generate results of sufficient accuracy (Jannoo *et al.*, 2014). According to Hair *et al.*, (2009), a minimum sample size of 100-150 is sufficient for a model with five or less constructs. Out of 292 questionnaires, even if only 191 (65.41% response rate) questionnaires were found correct and valid for the analysis, the sample of the study is much higher than 150 and, therefore, it's possible to conclude that it meets the criteria. Participants' age ranged from under 18 to over 65, with the median category falling into the 35-49year range. About 51% of the respondents were female, 86.1% of the sample had at least a bachelor's degree, and 53.9% were employed. About 67% of respondents had household monthly incomes of less than € 3.000.

The questionnaire was constructed using an adapted 7-point Likert scale, asking participants to indicate the extent to which they agree or disagree (1 = strongly disagree, 7 = strongly agree) with the proposed statements. The concept of product authenticity was captured by an eight-item scale selected from previously established scales (e.g., Beverland and Farrelly, 2010; Fuchs *et al.*, 2015; Park *et al.*, 2016). The dependent variable of the model, that is the willingness to pay for the organic olive oil (WTP), was measured using a three-item scale adopted from Ghali (2020). Finally, the concept of the importance of product traceability was captured by two semantically different items adopted from Verbeke and Ward (2006) by asking "To what extent do you pay attention to the traceability of the product when buying organic olive oil?" (ranging from 1 = very low attention, to 7 = a lot of attention); and "To what extent is the traceability of the product important to you when you buy organic olive oil?" (ranging from 1 = totally unimportant, to 7 = extremely important).

Quantitative methodology was based on a Confirmatory Factor Analysis (CFA) to test the measurement model to ensure the reliability and validity of the constructs. According to Brown (2015), CFA is an indispensable analytic tool to construct validation in social and behavioral sciences by providing evidence about the convergent and discriminant validity of theoretical constructs. Moreover, to explore the role of the importance of product traceability on the relationship between product authenticity and consumer willingness to pay, a moderation and a mediation analysis were conducted (Hayes, 2018). In social sciences, the study of the relations of moderation and mediation is significant from a conceptual and an applicative perspective (Miceli, 2013). Analyzing a conditioned relationship by one or more moderation variables allows the evaluation of the specific conditions under which a causal relationship changes in terms of intensity and/or significance. Analyzing an indirect relationship based on one or more mediation variables allows theorizing and testing the processes or mechanisms that determine a cause-effect relationship (Baron and Kenny, 1986).

4. Findings

Data were entered into IBM SPSS Statistics (version 25, SPSS Inc., Chicago, IL, USA), and data accuracy was checked throughout the process. To address the research question, a Confirmatory Factor Analysis (CFA) of the measurement model was conducted to ensure reliability and validity of the constructs. The overall measurement model with three constructs and 13 observed indicators was estimated through CFA. Estimation methods in Covariance-Based structure analysis are typically developed under an assumption of multivariate normality (e.g., Browne, 1974; Jöreskog, 1969). However, the assumption of normality is usually violated because it cannot be met in most empirical research (Hu *et al.*, 1992; Jannoo *et al.*, 2014), which is also the situation in this research. Some recent simulation studies (e.g., Goodhue *et al.*, 2012; Reinartz *et al.*, 2009) have shown that given non-normality conditions, the Covariance-Based SEM were quite robust. In particular, in the simulation study of Hu *et al.* (1992), the authors have shown that, even in the condition of assumption of multivariate normality violation, the maximum-likelihood (ML) is a robust estimation method. Then, a completely standardized solution produced by the LISREL 8 maximum-likelihood method (Jöreskog and Sörbom, 1993) was conducted by showing that the model-fit indices of the CFA resulted in a good fit: $\chi 2$ (62) = 123.617, $p < .001$; $\chi 2/df = 1.994$; GFI = .909; NFI = .961; NNFI = .975; CFI = .980; Standardized RMR = .0482; RMSEA = .0722. Moreover, all estimated factor loadings in the measurement model showed high factor loading coefficients (all loadings ≥ .60) and significant t-values (all $p < .001$ - see Table 1). Construct validity was examined by assessing convergent and discriminant validity (Fornell and Bookstein, 1982; Ping, 2004). Specifically, the standardized factor loading of all items exceeded all thresholds (all significant at $p < .001$, and the average variance extracted - AVE - was greater than the .50 cut-off) which supports the convergent validity of the measurement scales. According to Ping (2004), to ensure

discriminant validity the squared correlation coefficients between any pair of constructs should be lower than the AVE for each construct. The results have demonstrated that all of the squared correlations between pairs of constructs were lower than the AVE for each construct, therefore, all constructs were considered to be distinctively different, confirming discriminant validity.

Moreover, the three items used to measure the dependent variable (i.e., *willingness to pay*) showed a Cronbach alpha of .90, and item-to-total correlations were larger than .75 for all the items. Therefore, an average score of *willingness to pay* was created. The eight items used to measure the independent variable (i.e., *product authenticity*) showed a Cronbach alpha of .90, and item-to-total correlations were larger than .60 for all items. Therefore, an average score of *product authenticity* was created. Finally, the two items used to measure the intended mediating variable (i.e., the *importance of product traceability*) showed a Cronbach alpha of .79, and item-to-total correlations were larger than .66 for all the items. Thus, the average score of *product traceability importance* was created.

Tab. 1: Results of confirmatory factor analysis (CFA)

Construct and item	Standardized Loadings	*t*-values*	CR[a]	AVE[b]
Willingness to pay			.909	.771
I am willing to spend extra money in order to buy organic olive oil	.857	Fixed		
It is acceptable to pay a premium price to purchase organic olive oil	.806	14.009		
Compared to conventional olive oil, I am willing to pay more for organic olive oil	.963	17.630		
Product Authenticity (The organic olive oil:)			.906	.548
is a genuine product	.812	Fixed		
is an original product	.795	12.347		
is a true product (not altered)	.775	11.932		
is a typical product	.695	10.345		
is made in the traditional method	.660	9.709		
is unique of its kind	.813	12.720		
reflects its place of origin	.742	11.269		
is a typical Spanish product	.601	8.660		
Product Traceability Importance			.803	.674
To what extent do you pay attention to the traceability of the product when buying organic olive oil?	.909	Fixed		
To what extent is the traceability of the product important to you when you buy organic olive oil?	.723	6.964		

Notes: Goodness-of-fit indexes: $\chi 2$ (62) = 123.617, $p < .001$; $\chi 2/df$ = 1.994; GFI = .909; NFI = .961; NNFI = .975; CFI = .980; Standardized RMR = .0482; RMSEA = .0722. All items were measured on a seven-point Likert scale. *a*Construct reliability ≥ .70 (Numally, 1978); *b*Average Variance Extracted ≥ .50 (Fornell and Larcker, 1981).
* all $p < .001$

Source: Authors' elaboration

In line with the exploratory purpose of this study, a moderation and a mediation analysis were effectively performed (Aguinis *et al.*, 2017; Memon *et al.*, 2018; Memon *et al.*, 2019). A moderation analysis (Hayes, 2018) was conducted to test the importance of product traceability as a potential boundary condition on the relationship between product authenticity and consumer willingness to pay. The model was tested by applying bootstrapping (PROCESS macro - model 1) and the interaction was probed by testing the conditional effects at three levels of product traceability importance, one standard deviation below the mean, at the mean, and one standard deviation above the mean. As shown in Table 2, the interaction between product traceability importance and product authenticity was non-significant (β = -.035, p = .281). These results provide preliminary evidence that the importance of product traceability is not a moderator of the relationship between product authenticity and consumer willingness to pay for organic olive oil.

Tab. 2: Results of the moderation analysis

Predictor	®	*p*	*95% CI*	
PdtTrace	.195	.005	[.059	.329]
PdtAuth*	. 514	.000	[.326	.701]
PdtTrace x PdtAuth*	-.035	.281	[-.098	.029]

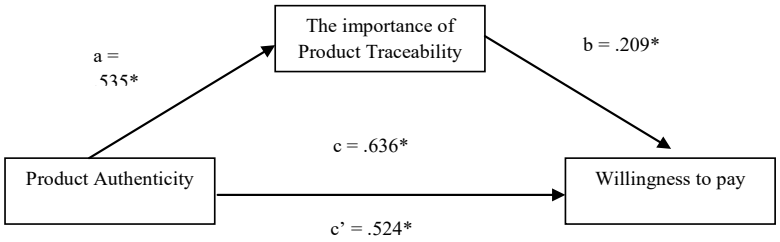
*$p \leq .05$

Source: Authors' elaboration

A mediation analysis (Hayes, 2018) was conducted to test the importance of product traceability as the underlying mechanism of the relationship between product authenticity and consumer willingness to pay (product authenticity ✇ product traceability importance ✇ willingness to pay). The model was tested by applying bootstrapping (PROCESS macro - model 4) to the test of the indirect effect to determine if it is different from zero at the conditional effect at 95 per cent confidence intervals (CI). The analysis is then run on 5000 bootstrap samples to obtain the desired statistic for every one of them, there will be 5000 computed indirect effects. These effects are then placed in ascending order to determine the lower and upper bounds of the CI (Hayes, 2018). The results of a mediation analysis revealed a significant total effect of product authenticity on WTP (c = .636; SE = .073; t = 8.706; p = .000); a significant effect of product authenticity on product traceability importance (a = .535, SE = .082; t = 6.496; p = .000); a significant effect of product traceability importance on WTP (b = .209; SE = .063; t = 3.326; p = .001); and a significant direct effect of product authenticity on WTP (c' = .524; SE = .079; t = 6.657; p = .000), when controlling for product traceability importance. The direct effect of product authenticity on WTP was found to be positive and statistically significant (Effect = .52, p < .000), also the indirect effect of product authenticity on WTP was found to be positive and statistically significant (Effect = .11, 95% C.I. [.04; .20]). Findings have shown that the indirect effect with a 95% bias-corrected bootstrap confidence interval based on

5000 resamples does not straddle zero, which allows us to conclude that the indirect effect is different from zero. This result indicates a significant indirect effect and provides preliminary evidence that the importance of product traceability partially mediates the effect of product authenticity on consumer willingness to pay. Figure 1 illustrates the results of the mediation analysis.

Fig. 1: The effect of product authenticity on willingness to pay through the importance of product traceability



Indirect effect = .11, Bootstrap 95% CI = [.04, .20], * $p < .01$

Source: Authors' elaboration

5. Discussion and conclusion

Product authenticity is becoming increasingly relevant in the agri-food context since it influences consumer evaluations, inclinations, and purchase processes (e.g., Beverland and Farrell, 2010; Sidali and Hemmerling, 2014). Product authenticity can affect consumer willingness to pay for food products that consumers perceive as authentic (O'Connor *et al.*, 2017); in particular, they are oriented to pay a premium price for food products that are coherent with authenticity requirements reducing health risks. Additionally, consumers rely on traceability in the food supply chain as an important tool in ensuring food quality and safety of the products as well as improving their confidence (Bertolini *et al.*, 2006; Aung and Chang, 2014). In this perspective, this study elucidates the role of product traceability importance on the relationship between product authenticity and consumer willingness to pay for a food product, specifically for organic olive oil. In particular, by conducting an exploratory analysis based on a quantitative methodology focused on a Confirmatory Factor Analysis (CFA) to test the measurement model to ensure the reliability and validity of the constructs, and a moderation and a mediation analysis (Hayes, 2018), the study has effectively investigated the role assumed by product traceability. The findings shed some light on the under-investigated nature of the role of the importance of product traceability in the relationship between product authenticity and consumer willingness to pay, by providing preliminary evidence that the importance of product traceability served as a mediator in the relationship between product authenticity and consumer willingness to pay for organic olive oil.

This study is the first to explore the role of the importance of product traceability in the relationship between product authenticity and consumer willingness to pay, in general, and in the organic olive oil sector, in particular. Statistically, the results indicate that food product traceability is considered a significant mediator in the relationship between product authenticity and consumer willingness to pay since product authenticity had a weak direct effect on consumer willingness to pay. These results revealed that product authenticity is significantly and positively correlated with the importance of product traceability and consumer willingness to pay. Hence, consumers who are exposed to product authenticity signals tend to be more aware of the importance of product traceability which, in turn, produces a greater willingness to pay more. Moreover, the results showed that the importance of product traceability has a significant and positive effect on consumer willingness to pay. In other words, the importance of the traceability of the product (e.g., its ability to elicit food safety) enhances the willingness to pay for organic olive oil. In fact, in the agricultural and food supply chain, the traceability system of the product is oriented to identify actors, activities, operations, and relations involved in the cultivation, production, and distribution processes in order to increase food safety since traceability can be seen as a subsystem whose presence is indispensable to the management of food quality (Peri, 2002). Therefore, product traceability is an essential tool for guaranteeing both production and product quality (Becker, 2000). In this context, the signals of product authenticity such as the origin of the product and the genuineness of the product could increase consumer awareness of the importance of product traceability, providing reassurance during the selection and purchase process. Based on this product traceability-based mechanism, consumers who are exposed to product authenticity signals tend to be more aware of the importance of product traceability and, consequently, tend to be more willing to pay a higher price for the product.

The present study provides several theoretical contributions. Firstly, it contributes to the existing literature on the authenticity of agri-food products (Groves, 2001; Camus, 2004; Verbeke and Ward, 2006; Lunardo and Guerinet, 2007; Kendall *et al.*, 2019) by investigating the relationships between product authenticity and willingness to pay for organic olive oil that consumers consider at high risk of non-compliance, fraud, and scandal (Casadei *et al.*, 2021). Secondly, the study further increases our understanding of the role assumed by the importance of product traceability, by underlining its mediation role in the relationships between product authenticity and consumer willingness to pay. In this respect, the study considers in the analysis the construct of traceability, which despite its underlined importance in the agri-food supply chain (e.g., Olsen and Borit, 2013; Papetti *et al.*, 2012; Engelseth *et al.*, 2014), has so far received limited attention.

From a managerial point of view, this study points to several implications both for firms and policymakers. Firstly, a better understanding of consumer perceptions of the authenticity of agri-food products assumes a particular relevance for product development processes, by permitting firms to effectively consider the determinants correlated to customer satisfaction,

customer loyalty, and willingness to pay more. Indeed, the aspects linked to authenticity, quality, and safety of agri-food products influence the consumer decision-making processes more and more. Secondly, by showing the findings on the importance of traceability, perceived as a new tool of safety and quality, the study underlines that firms must develop and implement well-structured traceability systems to guarantee useful transparency and meet consumer requirements. In this way, firms may benefit by providing information on the processes used for their products, the integration of production processes that involve different actors (such as suppliers), the distribution and location of products, by effectively guaranteeing the quality of materials and eliminating the possibilities of fraudulent activities along the supply chain. Certainly, the definition and adoption of internal traceability systems improve food safety, since traceability can be seen as a subsystem whose presence is fundamental to the management of food production and product quality, even if traceability in the supply chain involves several changes both in work processes and software systems. The costs associated with putting traceability systems into place are seen as quite expensive, requiring investments in hardware and software, skilled human resources, training, and certification. However, customer demand for real-time information about the products they buy will increase and will be one of the competitive advantages of agri-food industry marketing. Additionally, the benefits gained from traceability for high-risk and high-valued food far outweigh the cost of traceability (Aung and Chang, 2014). Thirdly, moving from the role of traceability as a potential risk management tool for public health purposes, it may be useful to develop efficacious activities and initiatives of education and awareness campaigns, including more effective information dissemination, in order to reduce consumer anxiety and uncertainty and to improve consumer confidence in the food industry.

Notwithstanding its contribution to the marketing literature, this study presents some limitations, mainly related to the methodology, by stimulating further research directions. Firstly, this study adopted an exploratory approach, requiring the translation of this preliminary research question into more specific hypotheses and propositions. Secondly, this research was developed only in the Spanish context. It would be useful to corroborate the investigation by expanding the geographical boundaries of the analysis to other relevant olive oil producing countries, such as Italy and Greece. Thirdly, the study doesn't analyze the type of influence that certain variables such as demographic ones or variables related to consumer motivations may have on food product authenticity. Finally, consumer ethnocentrism represents an interesting element for future directions of research. By considering the measures used for the authenticity of the product (for example, a typical Spanish product, reflects the country of origin, typical product), the effect of product authenticity on the willingness to pay could be greater for consumers with a high level of ethnocentrism than for those with a low level of ethnocentrism.

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