

Heterogeneity in consumer preferences for ready-to-eat pomegranate: an empirical study in Italy

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Consumer preferences for ready-to-eat pomegranate

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Abstract

Purpose – The present study aims at analysing consumer preferences for the pomegranate fruit, focussing on the effect of ready-to-eat format (i.e. packaged arils) on the purchasing choice, together with several products' attributes as the origin, the packaging typology and the price.

Design/methodology/approach – The paper presents a choice experiment (CE) among 626 Italian consumers from Veneto region through an online survey. The study estimates both a conditional logit (CL) and a latent class logit model (LCM).

Findings – By segmenting the sample based on the heterogeneous preferences of consumers, it can distinguish “eco-friendly consumers”, “time-saving lovers”, “nationalists” and “price sensitive” subjects. Interestingly, the marginal willingness to pay for ready-to-eat arils is positive for the “time-saving lovers” that are mainly young consumers. The Italian origin has always a positive effect on the choice, whereas a negative effect is found for the price. Finally, the eco-friendly package has both a negative and a positive effect.

Research limitations/implications – The sample of this study is not representative of the population and the CE has a hypothetical nature. It follows that further research will link the economic analysis to a consumer test on a more representative sample.

Practical implications – This study can be useful for the pomegranate producers and the industry because it provides original evidence that could drive their business and marketing strategies, for instance, the preference for ready-to-eat arils.

Originality/value – This study is one of the first seeking to determine the factors that affect consumers' preferences for pomegranate arils.

Keywords Pomegranate, Arils, Consumer preference, Choice experiment, Willingness to pay, Ready-to-eat, Latent class analysis

Paper type Research paper

Introduction

In recent years, the pomegranate fruit (*Punica granatum L.*) has attracted a remarkable interest from producers and consumers globally, due to its recognized health benefits (Holland and Bar-Ya'akov, 2008; Karimi *et al.*, 2017). Indeed, from a consumer perspective, the healthiness is recognized as one of the most significant market and innovation drivers in relation to the food and drink industry (Lähteenmäki *et al.*, 2010). As stated by many authors (see, for instance, Gil *et al.*, 2000; Kulkarni *et al.*, 2007; Faria and Calhau, 2011), the spreading success of the pomegranate can be largely explained by its renowned nutraceutical properties (e.g. anti-inflammatory, antimicrobial and antioxidant) and, commercially speaking, its diversified consumption patterns and the relative ease of use (e.g. as a fresh fruit or a juice or vinegar).

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It is worth noting that there are no official trade data for pomegranate; however, the most recent available statistics indicate that the class of fruits [1] in which the pomegranate is included (pomegranate being the most important product in this group, according to the experts) has increased its export volumes from 67,000 tonnes in 2013 to 95,000 tonnes in 2017 worldwide, due especially to the market development of Turkey and Peru where it is well adapted. Although global estimates are unavailable, Europe represents a net importer of pomegranates, with an estimated net volume (i.e. import minus export) close to 50,000 tonnes in 2017 and Germany as the most important buyer followed by Italy. On the contrary, developing countries such as Colombia, Peru and South Africa are the most important exporters: from here, fruits arrive in The Netherlands and then are distributed all over Europe. According to a recent paper by [Dandachi *et al.* \(2017\)](#), among the biggest producers and exporters of pomegranates worldwide, we find Iran, whereas Turkey among the Mediterranean countries and Spain in Western Europe.

Despite the growing interest in this fruit, consumer preferences for pomegranate remain barely investigated by literature. Even though the reasons behind consumer purchase of pomegranate fruit could be different, we assume that its consumption may be linked to its renowned health benefits, in line with the ongoing global drive for a healthier diet. Indeed, nowadays there is a growing consumer demand for convenient and fresh food products, with a high nutritional value and free of additives as minimally fresh processed fruits ([Caleb *et al.*, 2012](#)). As regards the pomegranate fruit, this trend is currently pushing producers to propose innovative variants of this traditional fruit as new juice blends, jellies, jams, syrups ([Calín-Sánchez *et al.*, 2011](#); [Martínez *et al.*, 2012](#); [Sidhu and Zafar, 2012](#); [Zaouay *et al.*, 2014](#); [Alcaraz-Mármol *et al.*, 2015](#); [Rios-Corripio and Guerrero-Beltrán, 2019](#)). Furthermore, according to [Ana *et al.* \(2007\)](#), the demand for ready-to-eat products has increased globally in recent years, due to a general change in the lifestyle of consumers who increasingly look for convenience products even in terms of time saving; indeed, [Tallant *et al.* \(2018\)](#) show that the availability of convenience foods is a relevant factor to encourage fruit and vegetable consumption. According to [Caleb *et al.* \(2012\)](#), the still limited pomegranate consumption is also due to consumers' perceived difficulty of extracting the arils from the fruit. To this purpose, ready-to-eat arils represent a more appealing innovative product than the whole pomegranate fruit ([Ergun and Ergun, 2009](#)), thus representing an interesting prospect for the consumer acceptance and the market development of this fruit.

To the best of our knowledge, except for the study by [McAdams *et al.* \(2013\)](#), to date there is no other study on consumers' preferences for arils and their willingness to pay (WTP) for this innovative product as for the whole pomegranate fruit, especially in Italy. Hence, the aim of this paper is to investigate consumer preferences and WTP for several pomegranate attributes including arils through a choice experiment among 626 Italian consumers.

Background

The pomegranate fruit has a long recorded history: being native of Iran, pomegranate became naturalized in many regions of the Mediterranean Basin ([Stover and Mercure, 2007](#)). Given its easy growth without special requirements, its high adaptability to harsh conditions and its tolerance of saline and heavy soils with respect to other crops, this long-lived plant may play a role in the valorization of marginal lands ([Dandachi *et al.*, 2017](#)). Its commercial appeal among consumers is mainly due to its several health and nutritional properties: among others, its antioxidant ([Guo *et al.*, 2007](#)) and antimicrobial activity ([Howell and D'Souza, 2013](#)). These properties are due to the large polyphenol content that accounts for at least 3% of the edible fruit ([Al-Maiman and Ahmad, 2002](#)). Although more than 500 known cultivars exist, only dozens are actually cultivated worldwide ([Mayuoni-Kirshenbaum *et al.*, 2013](#)) as Wonderful, Bhagwa, Rosh Hapered, Akko, and Mollar De Elche (a PDO of Alicante in Spain).

Arils, which are separated by a white astringent membrane, represent the edible part of the fruit; they can be directly consumed or transformed to produce juice, jellies, concentrates and so on. Anthocyanins are responsible for their red colour that represents one of the fundamental quality parameters in relation to consumer acceptability of the fruit (Geveke *et al.*, 2013). In addition to quality and sensory characteristics (Mena *et al.*, 2011), consumers' acceptance of healthy products such as pomegranate can be subordinated to its ease of use. Indeed, nowadays convenience represents an important food choice motive (Pula *et al.*, 2014) as the perception of naturalness (Roman *et al.*, 2017). To this purpose, ready-to-eat arils allow to preserve the natural quality of the product, as the shelling process preserves the product genuineness. Nevertheless, it is relevant to note that the edible part cannot be easily separated from the mesocarp and the exocarp (Continella *et al.*, 2018), thus representing an obstacle to the utilization of the fruit. It follows that a commercial product as ready-to-eat arils would be more appealing to consumers than the whole fruit as they considerably reduce the time needed to consume the fruit, while meeting the recent challenge for the food industry to preserve the nutraceutical properties (e.g. minimally processed arils). Accordingly, as stated by Reis *et al.* (2016), "one of the top trends in the food and beverage market is the intersection of health and convenience". Conceivably, the potential of being transformed in ready-to-eat arils that both preserve the naturalness of the product and represent a convenience product in terms of time saving could optimize consumers' utility and thus potentially increase the pomegranate consumption (Ergun and Ergun, 2009).

However, it should be noticed that a consumer segmentation is necessary in this context. Generally speaking, fresh-cut fruits are less likely to get chosen by consumers, maybe because of the higher price or the fact that many customers often believe that processed products may lose their quality and freshness. Although the WTP attached to product processing is on average negative, it appears from the literature that on specific consumption occasions and for certain consumer segments, the demand for ready-to-eat products is growing. As reported by Jaeger and Rose (2008) and by Chinnici *et al.* (2019), due to the context, consumers prefer to buy fresh-cut fruits for domestic consumption, even if they may have more time for lunch. Moreover, young people are on average more inclined to try innovative products than older consumers (Bernués *et al.*, 2012). The main reasons for consumers to buy ready-to-eat products is due to the easiness of consumption (Chinnici *et al.*, 2019), especially for those products that are difficult to peel such as pineapple or pomegranate (see, for instance, McAdams *et al.*, 2013).

To date only few studies estimated the consumers' WTP for the pomegranate product and its characteristics, regardless of the growing consumers' interest for it; moreover, the most part of the existing research is related to pomegranate fruit juices. In particular, Romano *et al.* (2016) conducted a survey on a total of 454 consumers in two supermarkets in Rio de Janeiro (Brazil), with the aim of determining consumers' WTP for a vitamin-rich pomegranate juice that preserved the antioxidants content and the aromas typical of the fresh juice. They showed that the WTP decreases when consumers' age and the level of education increase, whereas income and the past consumption are positively correlated. According to Lawless *et al.* (2013), the intention to purchase pomegranate juice blend is related to the general assessment (taste) of the product and the information reported on the label. The study estimates the WTP for nutraceutical juices (pomegranate juice blend) to maximize consumer acceptance among 100 consumers from the United States; a negative role of familiarity on consumer acceptance (i.e. product linking) emerged. On the contrary, McAdams *et al.* in 2013 highlighted that familiarity with the product and previous purchase of pomegranate fruit have a positive effect on consumers' WTP. The study, conducted on 203 consumers in Texas, aims to elicit consumers' preferences and their WTP for various pomegranate products through an experimental auction. Similarly, Lawless *et al.* (2015) estimated the WTP of 228 consumers from the United States through a non-hypothetical auction, showing that the most future-oriented consumers were more likely to purchase innovative products such as nutritional-rich juice blends with

pomegranate and were willing to pay more for a juice with guaranteed health properties (i.e. authenticity control of minimally processed product); they also demonstrated a positive role of the potential health information on WTP. According to Reis *et al.* (2016), the juice packaging and the bottle design in particular can override the influence of nutritional or processing information in shaping consumer perception and preference for those who buy a juice (i.e. an orange–pomegranate juice blend) and especially for those who spend little time for grocery shopping and who are therefore more subject to time constraints. Koppel *et al.* (2014) conducted a study in four different countries (i.e. the United States, Estonia, Thailand and Spain) with the aim of comparing consumers' acceptability for five juices (also a pomegranate juice blend): they showed that, in those countries who produce pomegranate juice, consumer acceptability was greater for the local product (based on the overall liking). Indeed, in some countries where pomegranates are locally grown such as Spain or Turkey, pomegranate juice is considered a traditional product and consumers are familiar with it. In this study we focus our attention on the analysis of consumers' preference for different attributes of pomegranate fruit, such as arils instead of the whole fruit, also estimating the WTP.

Data and method

Data were gathered in 2019 through an online survey with Italian consumers geographically stratified on the population of each administrative province of Veneto region ($N = 626$) [2]. The sample size of the analysis was determined in order to ensure reliable results: firstly, we set at 300 the minimum number of questionnaires (100 per block), then we extended the data collection in order to maximize the sample size following the indicator of population representativeness of each province, as outlined by the national population census. The research was carried out within a project focussed on analysing consumer preference for pomegranate fruit, thus the product for the experiment was selected based on this. A preliminary survey was carried out in 2018 on a sample of 32 consumers: this aimed at exploring the advantages and disadvantages of buying pomegranate arils instead of the whole fruit through some open-ended questions, while investigating the most preferred product characteristics (both the pomegranate and the arils). In a further step of the research, the final questionnaire was designed based on it: in the first section the consumption habits related to the pomegranate fruit are investigated, namely the purchasing frequency as a screening question to filter only respondents who actually buy pomegranate (otherwise they could not complete the questionnaire). Moreover, the second section contains a choice experiment (CE), while the third section contains 15 Likert scales (1 = total disagree; 7 = total agree), three for each considered construct of interest such as: people's general preference for ready-to-eat fruits and vegetables (F&V) products (*conv*); health benefits provided by F&V (*health*); F&V freshness (*fresh*); preference for shelling the pomegranate (*shell*); preference for innovative food products (*innov*). Finally, the last section collected information about socio-demographic characteristics of the sample.

As regards the CE, the choice of the attributes and their levels (Table 1) felt on the most relevant and representative of the pomegranate fruit and arils, following the evidence from our preliminary analysis. More specifically, the product typology attribute refers to the product format, presented as a pack of ready-to-eat arils (100 g) or as the whole fruit (250 g); for the arils, we used the 100 g package because this is the size that is mainly present in the market for ready-to-eat fruits (e.g. berries), deriving from the shelling of a 250 g pomegranate fruit. The origin attribute indicates whether the product comes from Italy or is imported from abroad. Regarding the packaging attribute, this refers to the type of packaging which can be eco-friendly (e.g. bioplastic) or conventional.

Theoretically, we should have included the “in bulk” level, because it best describes the purchasing condition of the whole fruit. However, we decide to omit this option because it was not reliable for pomegranate arils, which cannot be sold without packaging. Conversely, selling the whole fruits packaged is feasible, although it is a more unusual and expensive

Attributes	Levels	Code	Consumer preferences for ready-to-eat pomegranate
Product typology	(0) pomegranate fruit (250 g) (1) 100 g arils package ^a	arils	
Product origin	(0) other than Italy (1) Italy	orig_ita	
Packaging	(0) conventional (1) eco-friendly	pack_eco	
Price (€/250 g pomegranate fruit or €/100 g arils) ^a	0.39 0.79 1.49 2.99		
Note(s): ^a One package of 100 g of arils derives from one 250 g pomegranate fruit			3873

Table 1.
Description of CE attributes and levels

condition. Moreover, this form of packaging for whole pomegranates actually exists on the Italian market.

Finally, as regards the price attribute, four levels were selected based on the current market prices and estimated prices retrieved both at the supermarket and online (<https://www.miaspesa.it/search/arilli%20melagrana>).

The orthogonal design included 32 possible combinations obtained with the full-factorial design ($2^3 \times 4^1$). After that, using IBM SPSS 25.0, we reduced them to 28 combinations through the fractional factorial, keeping the orthogonality of the attributes (Hanley *et al.*, 1998). Finally, all these choice sets were then examined and those that presented pairs of implausible or dominant alternatives were removed, obtaining a total number of 21 choice sets that we divided into three blocks: each respondent had to answer to seven choice sets. In each choice set, respondents were asked to imagine buying a 250 g package of pomegranate and/or 100 g of arils; in particular, they were asked to indicate their preference among two multi-attribute alternatives (options A and B) and a “no choice” option (C) (Hensher *et al.*, 2005), where A and B differ in terms of each attribute level and the last alternative guarantees a realistic purchasing scenario (the consumer can choose not to buy the good if its characteristics do not satisfy him/her). Figure 1 displays a screenshot of a choice set. In fact, according to Lancaster (1966), the utility that consumer obtains from a product does not derive from the product itself but from its attributes.

The analytical tool used to estimate the preferences expressed in the CE is the random utility function (McFadden, 1974) which describes the utility U as the sum of an observable component V and a random error (unobservable) term ε . Among different alternatives, the consumer will choose the alternative i if the utility that he derives from it is larger than the utility from all the other alternatives different from i . It follows that the probability that the consumer n chooses the alternative i is described by the following equation:

	A	B	C
Product typology			no choice
Product origin	Italy	other than Italy	
Packaging	conventional	eco-friendly	
Price (€/250 g pomegranate fruit or €/100 g arils)	1.49	2.99	
Which alternative do you prefer?	☐	☐	☐

Figure 1.
Example of a choice set

$$P_{ni} = \text{Prob}(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj}) \forall j \neq i \quad (1)$$

The definition of the choice model to be applied to the CE depends on the assumed existence of different segments of the respondents' population. By considering the heterogeneity of preferences, we assume respondents belong to several latent classes and that their preferences are homogeneous within each segment but different across segments. The latent class model (LCM) estimates specific preferences for each segment: in particular, the utility of consumer n in segment f that chooses the alternative i can be expressed as:

$$U_{nif} = X_{ni}\beta_f + \varepsilon_{nif} \quad (2)$$

where X_{ni} is the vector of product attributes associated with the alternative i , β_f is the specific vector of preferences for the latent class f and ε_{nif} the error term. Hence, the probability of consumer n to choose the alternative i among several alternatives is given by:

$$\text{Prob}_{ni} = \sum_{f=1}^F \frac{\exp(\beta_f X_{ni})}{\sum_j \exp(\beta_f X_{nj})} \text{Prob}_{nf} \quad (3)$$

where F is the total number of latent segments, while Prob_{nf} represents the probability that consumer n belongs to the latent class f . Following [Boxall and Adamowicz \(2002\)](#), this latter can be expressed as:

$$\text{Prob}_{nf} = \frac{\exp(\theta_f Z_n)}{\sum_{f=1}^F \exp(\theta_f Z_n)} \quad (4)$$

with θ_f representing a specific parameter vector of the latent class f and Z_i including the characteristics of consumer n which can be used to explain his segment membership. We estimated β_f and θ_f via the expectation-maximization (EM) algorithm or latent class logit model ([Pacífico and Yoo, 2012](#)) in STATA 16. Hence, we conducted the LCM to identify differences in the CE across consumer classes; moreover, we estimated a conditional logit model (CL), assuming homogeneous preferences of the respondents.

Results

As shown in [Table 2](#), the sample is not representative for the Veneto (Italy) population: the investigated sample consists mainly of women (78%) and individuals of age less than 45 years (65%); the majority of the sample have an upper secondary school level of education (56%), are employed (80%) and have a family income of 2,500€ per month (49%) and three or four family members.

[Table 3](#) shows the descriptive statistics related to the variables measured through the Likert scales. As observable from the mean values, overall we notice that respondents agree with each statement, with the exception of the items for *conv* (C1, C2 and C3). The responses to the three items considered for each construct were averaged into a composite score (i.e. *health*, *conv*, *fresh*, *shell*, *innov*), whose reliability was tested through the Cronbach's α coefficient that shows values always higher than the acceptable threshold of 0.7. It is worth noting that, generally speaking, a higher value of the scale indicates that people: prefer to buy F&V with higher health benefits such as products that are rich in polyphenols and antioxidants (*health*); prefer ready-to-eat products as they are more convenient in terms of time saving (*conv*); prefer to buy fresh and unprocessed F&V (e.g. fresh products instead of technologically processed ones) as their genuineness is not compromised in this way (*fresh*); prefer to purchase the

Variable	Code		Sample population		Veneto region population ^a %
			N. obs	%	
Age (years)	age1	18–35	193	30.8	18.02
	age2	36–45	215	34.3	14.26
	age3	46–55	152	24.3	16.81
	age4	More than 55	66	10.5	36.16
Gender	sex	Female (1)	488	78.0	51.16
		Male (0)	138	22.0	48.84
Education level	edu	Secondary school (1)	85	13.6	57.70
		Upper secondary school (2)	350	55.9	28.34
Occupation	occ	University degree (3)	191	30.5	13.96
		Student (1)	44	7.0	
		Employed (2)	500	79.9	
		Retired (3)	20	3.2	
		Unemployed (4)	62	9.9	
Number of household members	<i>n_fam</i>	1–2 (1)	188	23.6	60.10
		3–4 (2)	381	60.8	34.60
		More than 4 (3)	57	9.2	5.20
Family income (€/month)	income	Less than 2,500 (1)	192	30.0	
		2,500 (2)	306	48.9	
		More than 2,500 (3)	128	20.4	

Note(s): ^aData source: Italian National Population Census 2018

Table 2.
Sample characteristics

whole pomegranate instead of ready-to-eat arils as they like shelling the fruit (*shell*); are used to try innovative products (*innov*).

Regarding the CE, in both CL and LCM, the reference product is represented by a whole pomegranate fruit (250 g) with a conventional packaging (i.e. using materials that are not recognized as sustainable), the lowest price level and not produced in Italy (i.e. imported); the pseudo R^2 for the two models is 15 and 62%, respectively.

Firstly, we estimated the CL as the baseline; as shown in Table 4, all the parameters are significant at 1% level and we appreciate that, generally speaking, respondents prefer to buy the whole fruit ($\beta_{\text{arils}} = -0.60$) instead of arils, with an Italian origin ($\beta_{\text{orig_ita}} = 1.60$), a sustainable packaging ($\beta_{\text{pack_eco}} = 0.33$) and a lower price ($\beta_{\text{price}} = -0.30$). The marginal willingness to pay (mWTP), which was estimated by dividing the coefficient of each attribute of the CE with the price coefficient, shows that respondents are willing to pay 5.3€/250 g more if the country of production is Italy, 1.1€/250 g more for having a sustainable packaging and 1.9€/250 g less for having the arils instead of the entire fruit (Table 5). The value of the WTP related to the Italian origin could seem very high. In this context, it is worth to notice that, being the WTP a monetary estimate of the consumer surplus derived by consuming a specific product, it could be possible that this value does not reflect the amount actually paid by consumers. Indeed, in many cases, these estimates exceed the real prices paid for a certain product (Poelmans and Rousseau, 2016). Besides, we selected a four-segment LCM as the more parsimonious description of the latent class structure through the Consistent Akaike Information Criterion (CAIC) index: in particular, the fourth represents the reference class and, based on it, we described the other classes and labelled them by comparing the segment membership parameters.

The first class represents the “eco-friendly” consumers (26% of the respondents), namely those who prefer buying the whole fruit ($\beta_{\text{arils}} = -1.63$) packaged with a sustainable material

Table 3.
Likert scales for
measuring consumer
preference

Scale items	Mean	S.D
Health (<i>health</i>) (Cronbach's $\alpha = 0.768$)		
H1 - When purchasing F&V, I choose products with higher health benefits	5.43	1.27
H2 - I usually eat F&V rich in polyphenols and antioxidants	5.06	1.45
H3 - When purchasing F&V, I prefer to consume products with a potential positive impact on my health status	5.88	1.22
Convenience (<i>conv</i>) (Cronbach's $\alpha = 0.658$)		
C1 - At the moment of purchase, I search for convenient (ready-to-eat) F&V	3.88	1.67
C2 - I think that ready-to-eat F&V are easy to use	3.16	1.93
C3 - For me consuming fresh-cut F&V is easier	3.72	1.90
Freshness (<i>fresh</i>) (Cronbach's $\alpha = 0.794$)		
F1 - I prefer to buy fresh F&V (e.g. the whole fruit) because I think that technological processes can compromise the organoleptic characteristics of the product	6.07	1.25
F2 - When it comes to F&V, I think that the processing can alter the freshness of the products	5.55	1.42
F3 - I think that the genuineness of the product can be compromised by the technological process, especially for F&V	5.41	1.55
Shelling (<i>shell</i>) (Cronbach's $\alpha = 0.823$)		
S1 - I prefer to purchase pomegranate instead of ready-to-eat arils because I like to shell the pomegranate	5.08	1.91
S2 - I think that by shelling the pomegranate I can live a more complete consumption experience than with ready-to-eat arils	5.08	1.89
S3 - Between the whole pomegranate and the arils, I prefer buying the whole fruit as shelling is not really boring to me	5.18	1.89
Innovation (<i>innov</i>) (Cronbach's $\alpha = 0.827$)		
N1 - Generally speaking, I love to try innovative food	4.82	1.51
N2 - Generally speaking, I'm curious to taste food products that I usually do not consume	4.99	1.56
N3 - In my opinion, it is always worth trying innovative products	5.21	1.41
Note(s): The scale measure is 1 = totally disagree; 7 = totally agree. F&V stands for fruits and vegetables		

as a bioplastic or another recycled material ($\beta_{\text{pack_eco}} = 1.42$) and produced in Italy ($\beta_{\text{orig_ita}} = 1.12$); here the price attribute is not significant.

Consumers in the second class are named “time-saving lovers” (21% of the respondents) as they are likely to buy ready-to-eat arils instead of the whole fruit ($\beta_{\text{arils}} = 1.92$). Moreover, being this product a novelty in the Italian market, customers in this segment are prone to try innovative products. For having 100 g of ready-to-eat arils instead of a 250 g pomegranate, they are willing to pay 4 € more. Moreover, consumers in this segment are likely to choose a product produced in Italy ($\beta_{\text{orig_ita}} = 1.68$), sustainably packaged ($\beta_{\text{pack_eco}} = 0.71$) and with a low price ($\beta_{\text{price}} = -0.48$).

The third class gathers the so-called “nationalists”, namely consumers that prefer the Italian origin of the product ($\beta_{\text{orig_ita}} = 4.31$) instead of a foreign origin and who are willing to pay 7.5€/250 g more for it. They also prefer buying the whole fruit instead of arils ($\beta_{\text{arils}} = -1.67$) and paying a lower price for it ($\beta_{\text{price}} = -0.58$); in this segment the attribute packaging is not significant.

Finally, the fourth class collects the “price sensitive” consumers that are those who are characterized by being highly interested in paying less for the product ($\beta_{\text{price}} = -12.99$), in addition to prefer an Italian ($\beta_{\text{orig_ita}} = 37.09$) and whole fruit ($\beta_{\text{arils}} = -29.61$) that is also conventionally packaged ($\beta_{\text{pack_eco}} = -26.86$). For having an Italian product, a sustainable packaging and arils instead of the whole fruit they are willing to pay 2.9€/250 g more and 2.1€ and 2.3€/250 g less, respectively.

Looking at the membership parameters, we notice that, compared to the fourth class, consumers in the first class prefer buying ready-to-eat products as they are more convenient

						Consumer preferences for ready-to-eat pomegranate
	Conditional logit	Class 1 Eco-friendly	Latent class model Class 2 Time-saving lovers	Class 3 Nationalists	Class 4 Price sensitive	
<i>CE attributes</i>						
Price	−0.300*** (0.025)	−0.093 (0.066)	−0.476*** (0.069)	−0.577*** (0.129)	−12.988*** (3.978)	3877
orig_ita	1.597*** (0.051)	1.124*** (0.203)	1.684*** (0.134)	4.306*** (0.381)	37.087*** (11.882)	
pack_eco	0.331*** (0.049)	1.422*** (0.148)	0.705*** (0.127)	−0.087 (0.221)	−26.855*** (8.758)	
p_type	−0.590*** (0.045)	−1.625*** (0.158)	1.922*** (0.155)	−1.669*** (0.255)	−29.609*** (8.790)	
<i>Membership parameters</i>						
Health		−0.181 (0.159)	−0.339* (0.174)	−0.106 (0.145)		
Conv		0.199* (0.108)	0.676*** (0.129)	0.292*** (0.100)		
Fresh		−0.367** (0.174)	−0.566*** (0.176)	−0.282* (0.160)		
Shell		0.093 (0.119)	−0.418*** (0.113)	−0.058 (0.098)		
Innov		0.058 (0.119)	0.024 (0.145)	−0.078 (0.106)		
Sex		−0.092 (0.341)	−0.253 (0.389)	0.122 (0.327)		
Income		0.020 (0.211)	0.006 (0.235)	−0.071 (0.192)		
Edu		−0.345 (0.232)	−0.108 (0.272)	−0.272 (0.211)		
n_fam		0.118 (0.127)	0.274* (0.146)	0.131 (0.115)		
age1		0.278 (0.423)	1.043* (0.548)	0.104 (0.423)		
age2		−0.772* (0.456)	0.213 (0.560)	−0.066 (0.403)		
age3		−0.801* (0.467)	0.176 (0.587)	−0.413 (0.425)		
age4		0.092 (0.561)	−0.208 (0.817)	0.244 (0.542)		
Cons		2.790* (1.488)	3.702** (1.613)	2.920** (1.395)		
Class probability		0.264	0.212	0.339	0.186	
N. obs	13,146			13,146		
Log-likelihood	−4,102.2698			−3,145.8908		
Mcfadden's pseudo R ²	0.148			0.624		
Note(s): * Significance at 10% level; ** Significance at 5% level; *** Significance at 1% level. Standard errors in parentheses						

Table 4. Estimation results: conditional logit and latent class model

Table 4.
Estimation results:
conditional logit and
latent class model

in terms of time saving ($\beta_{\text{conv}} = 0.20$, significant at 10% level), whereas the more they think that fresh products guarantee their genuineness better than those that are technologically processed and the less they belong to this first class ($\beta_{\text{fresh}} = -0.37$, significant at 5% level). Furthermore, people aged 36–55 years are less likely to belong to this class ($\beta_{\text{age2}} = -0.77$ and $\beta_{\text{age3}} = -0.80$, both significant at 10% level), compared to class 4. As regards the second

class, we can affirm that the time-saving lovers are more likely to be 18–35 years old ($\beta_{age1} = 1.04$, significant at 10% level) than the price sensitive consumers, and they have a large family ($\beta_{n_fam} = 0.27$, significant at 1% level). Compared to the other classes, the individuals of this segment are more likely to buy ready-to-eat products ($\beta_{conv} = 0.68$, significant at 1% level) and less likely to think that fresh products are more genuine than processed ones ($\beta_{fresh} = -0.57$, significant at 1% level) and to prefer shelling the pomegranate fruit ($\beta_{shell} = -0.42$ with significance level at 1%) as expected. What is more, when buying F&V generally they are not interested in choosing products with recognized health benefits (e.g. with high content of polyphenols and antioxidants) ($\beta_{health} = -0.34$, significant at 10% level). Compared to the fourth class, the nationalists prefer buying ready-to-eat products ($\beta_{conv} = 0.29$, significant at 1% level), whereas they do not prefer buying fresh F&V instead of processed products ($\beta_{fresh} = -0.28$, significant at 10% level). To sum up, the higher is the preference for ready-to-eat products and the more likely individuals belong to class 2, followed by class 3 and 1, respectively. Conversely, the lower is the preference for unprocessed (*fresh*) products and the more likely subjects are members of the second segment, followed by class 1 and 3, respectively.

Discussion

This study aims at investigating the effect of the ready-to-eat attribute on consumers' preferences and WTP for the pomegranate fruit, in addition to other attributes as the product origin, the price and the packaging typology. Interestingly, our results suggest that the segment that is most prone to buy ready-to-eat arils is characterized by young consumers with a preference for convenience goods. These results agree with what stated by [Larson et al. \(2006\)](#), which found a greater predisposition of young people to purchase ready-to-eat product as they usually spend less time and effort in preparing meals; moreover, young people are generally more inclined to try innovative product than older consumers ([Bernués et al., 2012](#)). Accordingly, as stressed by the literature, in recent decades more than 60% of the expenditure in F&V has been represented by pre-packaged products ([Pollard et al., 2002](#)). To this purpose, [Chinnici et al. \(2019\)](#) found that the 55% of a sample of 250 Italian consumers regularly eat fresh-cut vegetables. This increase in the ready-to-eat demand is attributable to an overall change in the lifestyle ([Lichtenstein et al., 2010](#); [Thienhirun and Chung, 2018](#)) as consumers are currently less inclined to spend time preparing food and willing to spend more money for convenience food guaranteeing their time saving ([Gatley et al., 2014](#); [Tallant et al., 2018](#)). Moreover, we found that the “time-saving lovers”, which are mainly young people, are less inclined to look for more healthy products when purchasing F&V; the inverse relation between age and health attention is in line with [Roininen et al. \(1999\)](#) and [Ragaert et al. \(2004\)](#). The results show that respondents in the first three segments generally think that the products' freshness is guaranteed for processed F&V, whereas the concern of a possible loss in freshness due to the shelling of the pomegranate fruit regards only the fourth class (“price sensitive”) that, accordingly, shows a negative WTP for ready-to-eat arils. The literature

Table 5.

Marginal willingness to pay (€/250 g pomegranate or €/100 g arils) for CE attributes

	Conditional logit	Latent class model			
		Class 1 Eco-friendly	Class 2 Time-saving lovers	Class 3 Nationalists	Class 4 Price sensitive
orig_ita	5.3	–	3.5	7.5	2.9
pack_eco	1.1	–	1.5	–	–2.1
Arils	–2.0	–	4.0	–2.9	–2.3

Note(s): Marginal WTP are shown only for significant variables from CL and LCM

reports that consumers have a divergent view with respect to the linkage between the freshness loss in convenience food and the typology of processing and/or production methods. To this purpose, by conducting a survey on 225 potential consumers of processed food, [Cardello *et al.* \(2007\)](#) found that treatments that are less invasive on the product (e.g. high-pressure processing) gain a higher consumer utility compared to others (e.g. genetic modification, irradiation, etc.), as they allow to maintain the product genuineness.

With regard to the country of origin, findings show that national pomegranates are more appreciated by all the segments, although the “nationalists” report the highest WTP for the Italian origin. This is consistent with what reported by [Moser *et al.* \(2012\)](#), who found a great importance for the local origin as well as the national one on apples. The origin, in fact, has a symbolic and affective value and can be considered as a quality signal ([Verlegh and Steenkamp, 1999](#)), so much so that consumers often use it as a discriminating attribute for their purchases ([Erdem *et al.*, 2006](#)). Nevertheless, the literature (see, for instance, [Giampietri *et al.*, 2016](#)) suggests that the origin can play a subordinate role when consumers are directly in contact with the producers. When it comes to the packaging, we found that both the “eco-friendly” and the “time-saving lovers” prefer a more ecological (e.g. biodegradable) packaging to a conventional one, as opposite to the “price sensitive” segment. Particularly, the “eco-friendly” class is mainly composed by medium-age consumers (36–55-year-old people), in line with [Laroche *et al.* \(2001\)](#). Finally, as expected, we found that price plays a fundamental role at the time of purchase: in particular, for each class except for the first, the price has a negative and significant effect, which indicates that the propensity to purchase decreases when the price increases. These results agree with what reported by [Ranasingha *et al.* \(2019\)](#), who, by conducting a CE on pomegranates and other fruits, found that price is always inversely proportional to the purchasing choice. Recently, [Darko *et al.* \(2013\)](#) and [Christensen *et al.* \(2019\)](#) reported that price can be considered a barrier to buying F&V, especially for low-income categories. This is presumably due to the fact that F&V are notoriously expensive, especially for products out of season, such as the pomegranate, which is not always available on the shelf over the year.

Conclusion

Nowadays, the society is increasingly dynamic and lives many far-reaching changes, ranging from the increase in the world population to the impacts of climate change and an increased consumer focus on healthy diets. Modern consumers are less and less inclined to spend time preparing food and the recent trends consider a significant growth in fresh F&V consumption especially out-of-home, so the demand for ready-to-eat products is globally spreading. This presents a challenge for the producers and the food industry that must consider these patterns and precisely target the consumers in terms of what, how and where they consume, in order to develop their future marketing strategies. According to the literature, the results show that, among others, the convenience attribute is a relevant factor to consider when consumers choose to buy food. Regarding the pomegranate fruit, albeit the modern appeal among consumers is due to its recognized health benefits, it is possible to gather that the healthiness can be even subordinated to its ease of use, as this fruit notoriously must be shelled. Based on our results, arils are preferred by consumers that do not motivate their choice of F&V on health benefit. This may imply that, by increasing the availability of ready-to-eat arils on the market, it could be possible to support the consumption of pomegranate also by those consumers that usually do not purchase F&V for its healthiness. As we note by the findings, the ready-to-eat attribute is mostly preferred by young people that, as highlighted in the literature, are also the most prepared to try new products such as packaged arils. This evidence provides some interesting marketing inputs for producers: indeed, they may be inspired to implement marketing strategies that are specific for young subjects, for

example, creating an appealing packaging design or promotional campaigns more appropriate to this population segment, or presenting this product as a snack proposal. Moreover, as the recent literature on fruit consumption has widely pointed to the importance of product availability as a relevant factor to promote an increased intake also among youngsters (see, for instance, Bonanno *et al.*, 2017; van den Bogerd *et al.*, 2019), producers should consider to place this ready-to-eat product especially in schools or university environments such as canteens, libraries, cafeterias or amusement arcades, to make it more accessible to potential consumers. Conversely, findings show that ready-to-eat arils are not preferred by the other three classes of consumers: taking into account the heterogeneity in their preferences and working on the marketing mix, producers may develop a product line, where each product represents a specific bundle of characteristics and one of these is particularly developed, namely the one most preferred by a specific class (for instance, the national origin for class 3, the lower price for class 4, the eco-friendly packaging for class 1). This process should be driven by a preliminary research activity involving targeted customer surveys, market analyses and also cost analysis for producers. Nevertheless, it should be considered that the ongoing trend is increasingly moving towards ready-to-eat products. This means that, with appropriate marketing strategies and a targeted promotion that highlight the attributes appreciated by consumers, the ready-to-eat arils could be purchased also by consumers who do not belong to class 2, but that shows a positive attitude towards the convenience attribute (i.e. class 1 and 3).

Furthermore, actually packaged arils are not largely present on the Italian market but, following our results, we can assume that the presence of the ready-to-eat format on the shelf may raise the accessibility to the pomegranate fruit and consequently its consumer demand. Indeed, due to its seasonality, pomegranate suffers by nature from a lack of supply during certain periods of the year. In this regard, new cultivars and new conservation techniques are currently being tested worldwide to increase the product shelf-life. It is worth noting that a barrier to the consumption of the ready-to-eat product may be linked to the general perception that food processing can somehow alter the freshness of the fruit. However, in the case of pomegranate it should be noted that a proper shelling allows to maintain the product's genuineness; moreover, the high polyphenol content of the fruit ensures a longer and more natural shelf-life of the product. Moreover, findings related to the preference for the Italian origin of the product light up to new opportunities to producers in Veneto region to increase the local production of pomegranate, perhaps implementing technologies for product transformation. In particular, it could be convenient for farms or cooperatives that already produce pomegranate juice to buy an equipment that delicately shells the pomegranate. Water pomegranate shellers already exist on the market, which allow to better preserve the quality characteristics of the arils. Moreover, the existing literature highlights that juices obtained by extracting separated arils instead of pressing the whole fruit obtain higher scores of liking by the consumers. However, each company should assess in advance whether the consumer's WTP for the ready-to-eat arils covers the investment costs required. It follows that further research on improved and more sustainable production techniques should be implemented to ensure the local supply. The research presents some limitations such as the non-representativeness of the sample and the hypothetical nature of the experiment. Further research will investigate consumers' stated preferences with a sensory panel, a consumer test and a representative region-wide survey, also testing different pomegranate cultivars.

Notes

1. The product code HS-08109075 includes, among others, pomegranates and other fruits including cherimoya, barbery figs and medlars (more information are available at: <https://www.cbi.eu/market-information/fresh-fruit-vegetables/pomegranates/europe/#>).

2. Consumers from all the seven provinces of Veneto region were surveyed: in particular, 142 self-administered questionnaires were completed in Venezia (23% of total questionnaires), 134 in Treviso (21%), 107 in Padova (17%), 101 in Verona (16%), 87 in Vicenza (14%), 33 in Rovigo (5%) and 23 in Belluno (4%). It is worth noting that in some cases the percentages are slightly overestimated or underestimated and this depends on the fact that incomplete questionnaires were eliminated. However, we guaranteed the full representativeness of the two least populated provinces (Belluno and Rovigo).

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