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RESEARCH ARTICLE

Consumer Response to PDO Table Olives: An Analysis of Consumer Behavior for Using Ordered Logistic Regression

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ABSTRACT

The table olive sector in Italy is a vital component of the national economy and cultural heritage. Italy ranks third in the European Union and eighth globally in table olive production. Through an analysis conducted from June to September 2023, this study explores consumer preferences, purchasing habits, and the willingness to pay for Protected Designation of Origin certified olives. The study actively contributes to the literature by shedding light on consumer preferences and behaviors regarding table olives, a topic that has been largely neglected in both national and international research. The results reveal insights into how age, gender, educational level, residence city, purchasing location, willingness to pay, and preferred olive types influence consumer behavior. These findings provide valuable information for stakeholders and policymakers to enhance market competitiveness, promote sustainable growth, and preserve Italy's rich olive heritage.

Keywords: Consumer Behavior; Market Competitiveness; Sustainable Growth; Protected Designation of Origin; Nocellara del Belice; Olive Heritage Preservation; Italian Table Olives

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1. Introduction

Table olives play a significant role in the Mediterranean diet due to their rich concentration of bioactive compounds known for their health-promoting properties [1–4].

Some strains isolated from table olives may exhibit specific probiotic traits and can adhere to the epidermis of the fruit. This characteristic could allow consumers to ingest the olives by turning them into a vehicle for these probiotics [5].

The global spread of the Mediterranean diet has led to a significant increase in the consumption of table olives in many countries, both European and non-European [6]. This increase can be attributed to the growing consumer awareness of its health benefits, coupled with a trend toward healthier food choices. Consumers are increasingly focusing on the importance of the relationship between food and health, preferring foods that can positively influence their overall well-being [7], thus helping to improve physical condition and reduce the risk of certain diseases [8].

In Italy, there is a strong tradition in the production and consumption of table olives [9]. In the Mediterranean regions, particularly around the shores of the Mediterranean Sea, table olives are a staple in the diets of the local populations. Italian cuisine, for instance, boasts a myriad of dishes, aperitifs, and appetizers that showcase olives as a fundamental ingredient [10]. From fish and meat dishes cooked with olives to pasta and pizza adorned with olive-based condiments, and bread dough infused with the flavors of green or black olives, the culinary versatility of olives is well documented. Italy, with its diverse olive cultivars renowned for their suitability for table olive processing, has fostered the development of specialized and varied processing techniques [9].

In Italy, the table olive sector holds a crucial economic position, bearing notable social, environmental and territorial implications. This significance is especially pronounced in regions dedicated to producing table olives with Protected Designation of Origin (PDO) or Protected Geographical Indication (PGI) certification [11].

Indeed, Italy holds the distinction of being the third-largest producer of table olives within the European Union, following Spain and Greece. Regionally, the primary centers of production are situated in Apulia, Sicily, Calabria, Latium, and Campania [12].

Given the importance of the table olives for both the national and European agricultural sector, and the lack of empirical studies in this area, it is crucial to investigate consumer preferences. Understanding these preferences is fundamental to supporting the growth in consumption of table olives, especially those of certified quality. Considering this, consumer behavior concerning PDO products is emphasized by several theories focused on decision-making and preference development. For instance, the Theory of Planned Behavior [13] indicates that consumers' attitudes and intentions to buy PDO products are influenced by their beliefs regarding the advantages of these products, such as their perceived quality and authenticity. Social norms and perceived behavioral control also have an impact, as consumer choices can be swayed by societal expectations and the accessibility of PDO products. Likewise, the Hierarchy of Effects Model [14] describes the progression consumers go through from awareness to knowledge, liking, preference, conviction, and ultimately, purchase. In this regard, PDO certification acts as an effective marketing tool that increases consumer awareness and guides their preferences and buying behavior. Moreover, consumer behavior research emphasizes the role of both intrinsic and extrinsic factors in determining preferences. Intrinsic attributes, such as taste, texture, and appearance, are essential for evaluating table olives. At the same time, extrinsic elements, including price, brand, and certification, play a significant role in influencing consumer decisions [15]. PDO certification serves as a vital extrinsic factor, boosting the perceived value of table olives by leading consumers to associate PDO-labeled olives with superior quality, authenticity and reliability. This is especially crucial in a market where consumers are increasingly mindful of food safety, authenticity, and the environmental impact of their food choices. These frameworks provide a robust basis for understanding how consumers perceive and value PDO products, including table olives.

In the present study, the aim is to investigate consumer purchasing preferences in relation to table olives

and Nocellara del Belice PDO olives because there is a strong literature gap related this topic. The paper is structured as follows: Section 2 provides a literature review. Section 3 includes a general discussion about the table olive sector in Italy, information about Nocellara del Belice PDO. Section 4 covers the research methodology, including data and methods, as well as the results of the analysis. Finally, some conclusions, the most important highlights of this study and some insights into consumer preferences for the table olive industry, are also included in this work.

2. Literature Review

Unfortunately, the literature that has been concerned with investigating consumer preferences regarding table olive consumption is lacking, but numerous studies have investigated consumer preferences for wide spectrum of food products, including wine [16–20], cheese [21, 22], meat [23–25], and olive oil [26–30].

Given consumers' varied preferences and tastes for food, producers must understand consumers' complex decision-making process. A number of both internal and external factors influence this process. Only through this in-depth understanding can producers adapt to market needs and maintain their competitiveness. Understanding consumer behavior, expectations and attitudes toward any food product is crucial to the commercial success of the product, service or brand. This success depends largely on consumers' sensory satisfaction and cultural eating habits [31].

A number of attributes that influence consumer choices, known as search, experience, characterize food products introduced to the market and belief attributes [32]. These attributes are communicated to consumers through quality indicators, which can be intrinsic or extrinsic [33]. Intrinsic attributes are characteristics of the product that cannot be altered without changing its fundamental nature, while extrinsic attributes include information about the product that can be changed without affecting its essence [34].

Regarding table olives, according to Akpinar-Bayizit et al. [31], the main attributes of consumer preference for table olives include price, brand image, availability and need satisfaction.

Concerning market aspect, the commercial success of a food product depends on numerous factors, with consumer sensory satisfaction playing a pivotal role. Therefore, it is crucial to understand consumers' expectations and attitudes towards a specific food item, and to articulate their demands using scientifically valid sensory descriptors [35]. This approach is essential for achieving marketing objectives in the food industry [36].

For a wide range of products, origin generates higher quality expectations in consumers [37]. Recent studies conducted in various countries show that consumers prefer products with geographical indication (GI), "Protected Designation of Origin" (PDO), and "Protected Geographical Indication" (PGI) designations over products without the GI designation [29, 38–40]. These studies also highlight a growing focus on sustainability, with an increasing number of consumers willing to pay a premium for certified and sustainable food products [28, 41, 42].

This trend also affects table olives. As shown by Ozkan and Gurbuz [43] in the case of Gemlik olives, consumers are willing to pay more for PDO-labeled Gemlik olives as their knowledge increases. This willingness to pay more is supported by studies examining consumer behavior toward other certified food products, demonstrating a link between purchasing certified products and the importance placed on quality and sustainability [44, 45].

In "Consumer Behaviour Theory", the ways in which customers purchase food products based on their needs and set of choices, along with the various factors that influence these decisions, are explored. It is important to comprehend the socio demographics context towards food products in order to achieve commercial success.

Concerning "Geographical Indication (GI) preferences", the food products with GI designations such as PDO and PGI markings are debated, showing that consumers associate these labels with superior quality. It is essential to understand how geographical indications influence consumer perceptions and willingness to pay a premium.

The weakness in the literature identified in the

paragraph is the scarcity of specific research focusing on the investigation of consumer preferences regarding table olive consumption. While there are several studies on consumer preferences for other food products such as wine, cheese, meat and olive oil, detailed and specific research on table olives is limited. Although some attributes that influence consumer preferences for table olives have been recognized, a complete overview of consumer decision-making, sensory satisfaction and the impact of various intrinsic and extrinsic attributes specific to table olives are missing. This shortcoming underlines the need for further empirical studies focusing exclusively on consumer behaviour and preferences in relation to table olives. The innovative aspect of this study stands out due to the significant gap in the literature within this field. Previous research has often overlooked or inadequately addressed the intricate relationship between consumer preferences for table olives and sociodemographic variables. As a result, there is a significant dearth of comprehensive studies that thoroughly examine how factors such as age, gender, income, education and residence influence consumer behavior in the context of table olives [46].

3. Table Olive Sector in Italy: The Case of Table Olive Nocellara del Belice Protected Designation of Origin (PDO)

The table olive industry in Italy plays a significant role in the national economy. According to the Ministry of Agriculture, Food Sovereignty and Forestry [47], Italy ranks as the third largest producer of table olives within the European Union, following Spain and Greece, and stands at the eighth position globally, contributing respectively to 10% and 3% of the EU and global production. The richness and variety of Italian production stem from the wide assortment of cultivars and diversified preparation methods of table olives, both artisanal and industrial, with traditions varying from region to region [48]. Despite industry efforts to adapt to changing consumer preferences, Italian olives retain a distinctive character that makes them appreciated both nationally and internationally.

From an economic standpoint, it is crucial to assess the trade balance to understand Italy's economic position in the table olive market. According to data provided by the International Olive Council [49] , expressed in tons, there has been a significant increase in national production over the considered period, rising from 130 thousand tons in 2013/ 14 to 325 thousand tons in 2022/ 23 (See **Table 1**).

The trade balance holds crucial importance in evaluating the commercial position of a sector, reflecting whether there is a trade surplus or deficit, indicated by its sign (positive or negative) and quantified by its absolute value. In all three years under consideration, the trade balance shows a positive result, which could favor the sector's economic growth, indicating that the country is competitive in international markets, generating employment and investments.

Regarding imports, they have slightly increased over time but remain relatively stable compared to the total volume of trade. Italy does not particularly rely on imports to meet domestic demand. The consistent increase in exports in the table olive sector reflects growing competitiveness and foreign demand for Italian products, leading to significant economic benefits such as growth, income generation, and job creation. The trade volume has increased over time, indicating an overall expansion in table olive trade. An increase in trade volume can lead to greater value creation in the economy, as more goods are exchanged and commercial transactions take place, generating income for businesses involved in the table olive value chain as well as for workers in the sector.

Apparent consumption has significantly increased over the considered period, suggesting a rise in domestic demand. Regarding per capita apparent consumption, a significant increase has been observed, rising from 1.37 kg in 2013/ 14 to 4.00 kg in 2022/ 23.This could be attributed to a shift in consumer tastes towards table olives, which may have become popular or considered healthier, especially in gastronomy for preparing appetizers and snacks [6]. In addition, this could also be due to the fact that table olives are perceived as a healthy food rich in antioxidants or other beneficial nutrients, and there may have been an increase in demand related

Table 1. Trade balance of the table olives sector in Italy.

Aggregates	Formula	2013/14	2020/21	2022/23
Domestic production	P	130	230	325
Imports	I	7.9	8.8	9.2
Exports	X	55.5	90.2	94.3
Trade balance	S = X–I	47.6	81.4	85.1
Trade volume	V = X+I	63.4	99,00	103.5
Apparent consumption	AC = P+I–X	82.4	148.6	239.9
Per capita consumption (kg)	PCC = (AC/ N°pop)*1000	1.37	2.47	4.00
Self-sufficiency ratio (%)	SS = P/ C	157.77	154.78	135.47
Import propensity (%)	IP = I/ C	9.59	5.92	3.83
Export propensity (%)	EP = X/ P	42.69	39.22	29.02
Trade openness ratio (%)	TO = V/ (P+C)	29.85	26.15	18.32

Source: Own elaboration based on IOC data (expressed in thousands of tons) obtained as the ratio of total apparent consumption to the ISTAT population updated to March 2020.
Note: (1) MASAF: with the D.L. no. 173 dated 11/11/2022 (G.U. no. 264 dated 11/11/2022), containing urgent provisions regarding the reorganization of the attributions of the Ministries, the Italian "Ministry of Agricultural, Food and Forestry Policies" assumed the denomination of "Ministry of Agriculture, Food Sovereignty, and Forestry". (2) IOC: the International Olive Council is an intergovernmental organization founded in 1959 with headquarters in Madrid, Spain. Its main objective is to promote the olive growing and olive oil sector globally by establishing quality standards and regulations for international trade in these products.

to growing consumer awareness of health benefits [46].

Finally, the Self-Sufficient Ratio in the table olive sector in Italy indicates that a significant percentage of domestic table olive consumption is met by domestic production, positively contributing to the national economy and food security by reducing dependence on imports. This can be attributed to favorable climatic and geographical conditions in Italy for table olive cultivation, alongside a rich tradition deeply ingrained in the culture, allowing sufficient domestic production to meet internal demand. Additionally, there is a low propensity to import the product, indicating stability in the domestic sector and appreciation for the quality of Italian table olives in the international gastronomic landscape (Alonso and Krajsic, 2013) [50].

Moreover, the high propensity to export the product suggests that table olives produced in Italy enjoy a competitive advantage in international markets, attributable to product quality, brand reputation, and logistical efficiency, generating strong demand from foreign consumers (Niklis et al., 2014) [51].The Trade Openness Ratio is another relevant economic indicator, measuring the importance of foreign trade in the table olive sector. It represents the percentage of production and imports relative to total table olive consumption in the considered country. Over time, this indicator has decreased, from 29.85% to 18.32%, reflecting abundant and competitive domestic production, which satisfies much or all of the domestic demand, indicating the ability of the national table olive sector to compete with foreign producers in terms of both quality and price.

The positive trade balance exhibited by the table olives sector in Italy over the years 2013/ 14, 2020/ 21, and 2022/ 23 underscores its robust position in the global market. This surplus suggests that Italy's domestic production exceeds its imports, enabling the country to export more than it imports in table olives. Such a favorable trade balance not only signifies economic strength but also implies competitiveness in international markets, potentially stimulating further growth, employment opportunities, and investments within the sector.

Moreover, the steady increase in trade volume and apparent consumption, coupled with the rise in per capita consumption and self-sufficiency ratio, indicates a growing domestic demand and consumption patterns favoring table olives. However, it is noteworthy that while the export propensity has slightly decreased over the years, the import propensity has significantly declined, indicating a shift towards greater self-reliance and reduced dependency on foreign sources.

Looking at the sector's evolution over the past decade, characterized by consistent positive trade balances and favorable consumption trends, it suggests a resilient and thriving industry. This trajectory bodes well for the continued success and competitiveness of Italy's table olives sector in the years to come.

In addition, in many local and provincial communi-

ties, the table olive sector holds significant economic importance, generating relevant social, environmental, and territorial impacts (Renna et al., 2021) [52]. Some of these areas are recognized for producing olives with PDO or PGI labels, representing a source of income and employment for numerous communities. In terms of variety and preparation methods, Italy boasts various distinct olives, including Gaeta or Itrana olives, Ascolana olives, Bella di Daunia, Nocellara del Belice, and many others, some of which have received geographical indication (Ismea, 2019) [53]. The main producing regions are Puglia, Sicily, Calabria, Lazio, and Campania. Despite not being one of the world's major producers, Italy has a significant export voice in the table olive sector, positively contributing to the country's trade balance. Given its position as a producer, consumer, importer and exporter, Italy plays a significant role in the global table olive market, characterized by growing demand and production due to their nutritional, beneficial properties, and versatility (Gullon et al., 2020) [54] . Regarding PDO Nocellara del Belice olives, they rank third nationally.

The Protected Designation of Origin (PDO) "Nocellara del Belice" was obtained in 1998. This recognition was made possible through the efforts of local producers and institutions to protect and promote this native olive variety, cultivated in the Belice Valley in Sicily. The PDO ensures the geographical origin and quality of the product, helping to preserve traditions and promote the local economy.

According to PDO Production Specification (1988) [55], the protected geographical indication "Nocellara del Belice" is reserved for table olives meeting the requirements laid down in this product specification (Art.1) [55] (Art.1 of PDO Production Specification, 1988: "The protected geographical indication 'Nocellara del Belice' is reserved for table olives meeting the requirements laid down in this product specification") . The Valle del Belice region, characterized by its ideal environment for olive cultivation, spans across the municipalities of Castelvetrano, Campobello di Mazara, Partanna, Santa Ninfa, Poggioreale, and Salaparuta. This territory serves as the natural habitat for the expansion of olive farming (Art.3) [55]. The permitted methods include lactic fermentation (Seville system), natural changes, and the Castelvetrano system. For the first two methods, subsequent processing may involve whole olives, crushed olives, pitted olives, sliced olives, engraved olives or seasoned olives. For black olives, the allowed techniques are maturation without treatment in an alkaline medium and treatment in an aklcoholic medium. For the first method, further processing options include natural brine, vinegar brine, dry salt dehydration and baking. For the second method, the Californian system is permitted (Art.4) [55].

The Nocellara del Belice table olive is commonly enjoyed as a delightful addition to an aperitif, but its versatility extends to pairing with cheese, salami, and locally grown vegetables preserved in oil. Additionally, it serves as a key ingredient in various traditional Sicilian recipes, notably the renowned caponata, featuring a medley of olives, eggplants, onions, tomatoes, capers, and celery.

4. Data and Methods

The dataset utilized in this study was obtained from a survey conducted among consumers of table olives. Between June 2023 and September 2023, we conducted a survey using Google Forms distributed across various social media platforms, opting for a non-probabilistic online sampling method for several reasons. The accessibility of online platforms allowed us to reach a broader and more diverse audience, transcending geographical limitations and collecting responses from individuals with varied backgrounds and locations. The vast user base of social media platforms, encompassing individuals from diverse demographics, aligned with the variables we aimed to investigate. Anonymity and privacy afforded by online surveys potentially encouraged more honest responses.

However, we acknowledge the strengths and weaknesses of using Google Forms. Among the strengths, Google Forms offers a simple and intuitive user interface, accessibility and real-time collaboration, integration with other Google tools like Google Sheets, customization of questions and themes, and mobile compatibility. Additionally, Google Forms is free, making it a cost effective solution. On the other hand, there are some weaknesses to consider. Google Forms may not of-

fer the advanced features available in other survey platforms, has limited customization options, requires an internet connection, and managing a large number of responses can become cumbersome. Furthermore, the response management and survey logic functionalities are limited.

We also acknowledge limitations inherent in our non-probabilistic sampling method, including sampling bias, limited geographical scope, self-selection bias, scope limitations, temporal constraints, and reliance on self-reported data. Therefore, it is essential to interpret our results as insights derived from our specific sample and survey methodology. The surveys gathered information on various demographic factors such as age, gender, family size, educational level, and residence city, alongside consumer preferences and purchasing behavior related to olives. The sampling method employed was convenience sampling, a non-probabilistic approach. Convenience sampling involves selecting participants based on their accessibility and availability, rather than using random selection methods. While this sampling approach offers practical advantages in terms of ease and cost-effectiveness, it may introduce biases and limit the generalizability of findings to the broader population. Therefore, caution should be exercised when interpreting the results, as they may not be representative of the entire target population. To analyze the factors influencing olive consumption patterns, we utilized ordered regression models (More details can be found in the **Supplementary Material** which shows the code used to implement the models.). Specifically, we employed ordered logistic regression due to the ordinal nature of the response variables, which categorize consumption frequencies into ordered levels (e.g., "once a week", "1–2 times per month", etc.). This statistical technique allows us to assess the impact of explanatory variables on the likelihood of different consumption frequencies while accounting for the ordinal structure of the response variable.

The models were constructed using R studio, with the 'ordinal' package utilized for ordered logistic regression analysis. We first explored the relationship between olive consumption frequencies and various demographic variables, including age, gender, family size, educational level, and residence city. Additionally, we investigated the influence of factors such as purchasing habits, willingness to pay for quality-certified products, and preferred olive types on consumption patterns. The two ordered regression models are constructed as follows:

$$P(Y \leq j) = \frac{1}{(1 + e^{-(\beta_0 + \beta_{1x_1} + \beta_{2x_2} + \ldots + \beta_{px_p})})} \quad (1)$$

where:

Y is the response variable "Consume table olives" or "Do you consume Nocellara del Belice PDO olives", related consumption frequency.

$(X_1, X_2, \ldots, X_p)$ are the explanatory variables such as Age, Gender, Family_size, Educational_level, Residence_city, Where do you buy table olives?, Would you be willing to pay a higher price for a PDO certified product compared to a non-certified one?, How much more would you be willing to pay for PDO certified olives?, and What types of olives do you prefer?.

$(\beta_0, \beta_1. \beta_2, \ldots, \beta_p)$ are the coefficients to be estimated.

The data were preprocessed to handle missing values and ensure consistency across variables. Categorical variables were appropriately encoded, and multicollinearity among predictors was assessed to avoid issues of collinearity in the regression models. Model diagnostics, including assessments of model fit and significance testing, were conducted to evaluate the overall performance and validity of the regression analyses. Despite the limitations associated with convenience sampling, this study provides valuable insights into the factors influencing olive consumption behavior among a sample of participants.

5. Results

Overall, the dataset with 407 units, provides a comprehensive overview of respondents' demographics (**Table 2**), preferences, and consumption behaviors related to table olives and Nocellara del Belice PDO olives (**Table 3**).

The analysis of categorical variables reveals a heterogeneous distribution among categories. Regarding gender, there are approximately 51.7% female participants and 48.3% male participants. Most participants

Table 2. Respondent's demographics characteristics.

Variables	Levels	N	%
Age	15–20	23	5.7%
	21–30	115	28.3%
	31–40	74	18.2%
	41–51	62	15.2%
	51–60	68	16.7%
	61–70	55	13.5%
	over 70	10	2.5%
Gender	F	211	51.8%
	M	196	48.2%
Family_size	1	26	6.4%
	2	78	19.2%
	3	113	27.8%
	4	147	36.1%
	5	37	9.1%
	6	6	1.5%
Educational_level	Bachelor's degree	74	18.2%
	high school diploma	190	46.7%
	lower secondary school certificate	38	9.3%
	Master's degree	80	19.7%
	PhD or other	25	6.1%
Residence_city	Large size	146	35.9%
	Medium size	211	51.8%
	Small size	50	12.3%

Source: Own elaboration.

have attained a high school diploma (43.9%), followed by college graduates (18.5%) and high school graduates (17.2%). The majority of participants reside in medium-sized cities (51.9%), followed by large cities (35.9%) and small cities (12.5%). Concerning the consumption of table olives, the most common frequency is 2–3 times per week (30.2%), followed by once a week (26.0%) and 1–2 times per month (21.6%). The majority of participants are willing to pay a higher price for a PDO certified product compared to a non-certified one (90.7%), while only a minority are not (9.3%). Among preferred olive types, green olives in brine (57.7%) are the most popular, followed by black olives in brine (6.1%) and black olives with herbs (8.4%). Most participants are familiar with Nocellara del Belice PDO olives (83.5%), but only a minority have consumed them (21.6%). Purchase preferences regarding Nocellara del Belice PDO olives show a preference for buying from the local market (11.1%) and direct sale from the producer (55.5%).

The output from the ordered logistic regression model provides coefficients, standard errors, and t-values for each predictor variable, as well as intercepts for the ordered categories of the response variable (**Table 4** and **Table 5**, respectively, first and second model). In the first model, we analyze the frequency of consumption of table olives overall, regardless of their specific variety. This encompasses how often individuals consume any type of table olives, such as green or black olives, irrespective of their geographical indication or certification status. In contrast, the second model zooms in on a specific type of table olives, namely the Nocellara del Belice PDO variety. Here, the analysis is centered on understanding how frequently individuals consume this particular certified variety of olives, which carries the designation of Protected Designation of Origin (PDO).

Therefore, while both models explore olive consumption behavior, they differ in scope: the first considers consumption across all types of table olives, while the second focuses exclusively on a specific certified variety.

The logit model was chosen due to its suitability

Table 3. Preferences and consumption behaviors related to table olives and Nocellara del Belice PDO olives.

Variables	Levels	N	%
Consume table olives?	1–2 times per month	88	21.6%
	2–3 times per week	123	30.2%
	almost never	37	9.1%
	everyday	47	11.5%
	never	6	1.5%
	Once a week	106	26.0%
Where do you buy table olives?	Farm-to-table sale	237	58.2%
	Local market	38	9.3%
	Small grocery store	39	9.6%
	Supermarkets or hypermarkets	93	22.9%
Would you be willing to pay a higher price for a PDO certified product compared to a non-certified one?	No	38	9.3%
	Yes	369	90.7%
How much more would you be willing to pay for PDO certified olives?	0.50 euro per kg	87	21.4%
	0.75 euro per kg	65	16.0%
	1 euro per kg	130	31.9%
	more than 1 euro per kg	125	30.7%
What types of olives do you prefer?	Black olives in brine	25	6.1%
	Black olives with herbs	34	8.4%
	Black oven-roasted olives (Passuluni)	56	13.8%
	Green olives in brine	235	57.7%
	Green sweetened olives	57	14.0%
Are you familiar with Nocellara del Belice PDO olives?	No	67	16.5%
	Yes	340	83.5%
Do you consume Nocellara del Belice PDO olives?	1–2 time per month	88	21.60%
	2–3 times per week	90	22.1%
	Almost never	64	15.7%
	Everyday	30	7.4%
	Never	58	14.3%
	once a week	77	18.9%
Where do you buy Nocellara del Belice PDO olives?	Farm-to-table sale	226	55.5%
	Local market	45	11.1%
	Small grocery store	36	8.8%
	Supermarkets or hypermarkets	100	24.6%

Source: Own elaboration.

for analyzing ordinal dependent variables, such as consumer preferences and behaviors related to table olives. This model effectively captures the ordered nature of responses and allows for the interpretation of how factors like demographics and purchasing habits influence consumer decisions. Its use ensures robust analysis of our study's data, aligning with established practices in consumer behavior research.

In the first model we obtained (**Table 4**):

- Older age groups (e.g., over 70) tend to be associated with higher odds of consuming table olives more frequently compared to the reference group (e.g., ages 21–30). Being male (GenderM) is associated with slightly higher odds of consuming table olives more frequently compared to being female. Having a higher level of education, such as a Master's degree or PhD, is associated with lower odds of consuming table olives more frequently compared to having a lower level of education (e.g., high school diploma).

From the results of the second model (**Table 5**) regarding the consumption of Nocellara del Belice PDO olives, several factors influencing participants' responses can be observed:

- Individuals over 70 years old seem to be significantly more likely to consume PDO olives compared to younger age groups. Among other age groups, there are no significant differences in con-

Table 4. First model.

Age			
21–30	0.939	0.6814	1.378
31–40	1.467	0.697	2.105
41–51	1.496	0.7133	2.097
51–60	2.467	0.7417	3.326
61–70	1.614	0.7875	2.049
Over 70	16.516	0.000001	1.55E+10
Gender			
Male	0.294	0.2794	1.052
Family_size			
Coefficient	0.166	0.1285	1.292
Educational_level			
High school diploma	0.2585	0.3885	0.6653
Lower secondary school certificate	0.9561	0.6098	1.568
Master's degree	0.8071	0.4659	1.732
PhD or other	1.397	0.6485	2.154
Residence_city			
Medium size	0.703	0.3357	2.094
Small size	–0.188	0.4879	–0.3845
Where do you buy table olives?			
Local market	–1.049	0.4962	–2.113
Small grocery store	–0.5662	0.4733	–1.196
Supermarkets or hypermarkets	–0.2121	0.3732	–0.5682
WTP			
Yes	0.437	0.483	0.9042
How much more would you be willing to pay for PDO certified olives?			
0.75 euro per kg	0.197	0.4707	0.4183
1 euro per kg	–0.370	0.4159	–0.8887
more than 1 euro per kg	0.019	0.4096	0.0466
What types of olives do you prefer?			
Black olives with herbs	0.2352	0.733	0.3209
Black oven-roasted olives	0.973	0.702	1.386
Green olives in brine	0.0412	0.6155	0.06697
Green sweetened olives	0.007	0.6584	0.01069
Intercepts			
almost never | 1–2 times per month	12559	10875	11549
1–2 times per month | Once a week	34080	11110	30674

Source: Own elaboration.

sumption. Gender does not appear to have a significant impact on the consumption of PDO olives. There does not appear to be a significant impact of family size on the consumption of PDO olives. Among different educational levels, only holding a lower secondary school certificate seems to have a significant effect on the consumption of PDO olives compared to other education groups. The size of the city of residence does not seem to significantly influence the consumption of PDO olives. Purchasing PDO olives at small grocery stores seems to be associated with a lower likelihood of consumption compared to supermarkets or hypermarkets. Willingness to pay a higher price for a PDO certified product does not appear to have a significant impact on the consumption of PDO olives. There does not seem to be a significant impact on how much more people would be willing to pay for PDO olives. Among different types of olives, only "Black oven-roasted olives (Passuluni)" seem to be associated with a significant increase in the likelihood of consuming PDO olives. Individuals familiar with PDO olives seem to be significantly more likely to consume them.

Comparing these results with the previous model concerning the overall consumption of table olives, some significant differences can be noted in the factors influencing the consumption of PDO olives. For example, age and familiarity with PDO olives appear to be more determinant factors in the specific consumption of Nocel-

Table 5. Second model.

Variable	Coefficient	St.E.	T-Value
Age			
21–30	0.306	0.9196	0.3328
31–40	0.3744	0.9222	0.406
41–51	0.0749	0.9303	0.0805
51–60	0.3888	0.9322	0.4171
61–70	0.8719	10168	0.8574
Over 70	4.555	18683	**2.44E+04**
Gender			
Male	0.1593	0.3397	0.4689
Family_size			
Coefficient	–0.137	0.1538	–0.8909
Educational_level			
High school diploma	0.0223	0.4548	**0.049**
Lower secondary school certificate	0.4506	0.7751	0.5814
Master's degree	0.0968	0.5217	0.1856
PhD or other	0.4014	0.7847	0.5116
Residence_city			
Medium size	0.0456	0.4102	0.1113
Small size	0.0852	0.5662	0.1506
Where do you buy Nocellara del Belice PDO olives?			
Local market	–0.8898	0.6218	–14.309
Small grocery store	–12004	0.6051	–1.984
Supermarkets or hypermarkets	–0.8668	0.4461	–19431
WTP			
Yes	0.4489	0.6714	0.6686
How much more would you be willing to pay for PDO certified olives?			
0.75 euro per kg	–1.3334	0.6011	–22182
1 euro per kg	–0.4285	0.5081	–0.8434
more than 1 euro per kg	–0.679	0.5242	–12953
What types of olives do you prefer?			
Black olives with herbs	–0.5548	11393	–0.487
Black oven-roasted olives (Passuluni)	0.2358	10999	0.2144
Green olives in brine	–0.1579	10496	–0.1504
Green sweetened olives	–0.1075	10786	–0.0997
Are you familiar with Nocellara del Belice PDO olives?			
Yes	58641	0.7497	7822
Intercepts			
Never	1–2 times per month	20151	16887
1–2 time per month	once a week	55323	17247

Source: Own elaboration.

lara del Belice PDO olives compared to overall table olive consumption. Additionally, the types of olives preferred seem to have a more significant impact in the case of PDO olives compared to general table olive consumption (The full procedure to obtain the robustness of these results is also included in the **Supplementary Material**. We also performed several robustness tests with the aim of providing insights into the proportional odds assumption for ordered logistic regression models and compare the performance of ordered logistic regression models versus multinomial ones. This analysis aims to validate the model assumptions and ensure the robustness of our results regarding olive consumption. The comparison between ordered and multinomial logistic regression models confirms the appropriateness of the multinomial model and validates the ordered logistic regression model.).

6. Conclusions

The consumption of table olives plays a significant role in culinary traditions worldwide, offering a delightful fusion of flavors, textures, and cultural heritage. Renowned for their versatility, table olives serve as a staple ingredient in various cuisines, enriching sal-

ads, appetizers, and main dishes with their distinct taste and nutritional benefits. Beyond their gastronomic appeal, table olives also hold historical and symbolic significance, reflecting centuries-old traditions of cultivation and craftsmanship. As consumers increasingly prioritize health-conscious and Mediterranean-inspired diets, the demand for table olives continues to rise, driving innovation and diversification in the industry. Furthermore, the sustainable production practices associated with table olive cultivation contribute to environmental conservation and rural livelihoods, making the consumption of table olives not only a culinary pleasure but also a conscientious choice. In essence, table olives embody a harmonious blend of tradition, taste, and sustainability, enriching culinary experiences and fostering a deeper connection to cultural heritage.

Our study elucidates key insights into the factors influencing the consumption of table olives, particularly focusing on the specific case of Nocellara del Belice PDO olives. Our study significantly contributes to the literature by expanding the understanding of consumer behavior towards table olives, particularly focusing on the consumption patterns of Nocellara del Belice PDO olives. Notably, table olives have received relatively limited attention in the scientific community, making our research particularly novel and valuable. By addressing this gap in the literature, our study adds depth to the understanding of olive consumption dynamics and provides insights into factors influencing consumer preferences for specific olive varieties. Through our analysis, we shed light on an understudied aspect of food consumption behavior, thereby enriching the existing body of knowledge in the field of agricultural economics and consumer studies.

Key findings from our analysis include:

1. Age emerges as a significant determinant, with older age groups, especially those over 70, exhibiting a higher likelihood of consuming table olives, including PDO varieties.
2. Gender does not appear to significantly impact the consumption of PDO olives, suggesting that preferences for this specific variety are not influenced by gender.
3. Educational attainment plays a role, with individuals holding lower secondary school certificates showing a higher likelihood of consuming PDO olives compared to those with higher levels of education.
4. Familiarity with PDO olives significantly increases the likelihood of consumption, indicating the importance of awareness and knowledge in influencing consumer behavior.
5. The type of olive preferred, particularly black oven-roasted olives (Passuluni), significantly influences the consumption of PDO olives, highlighting the importance of taste preferences.

Despite these insightful findings, our study has several limitations:

1. The reliance on self-reported data introduces the potential for recall bias and social desirability bias, which may affect the accuracy of responses.
2. The study's geographical scope is limited, primarily focusing on participants from specific regions, which may limit the generalizability of the findings to broader populations.
3. The cross-sectional nature of the study design prevents the establishment of causal relationships between variables, necessitating caution in interpreting the results.

Future research directions could address these limitations and further enhance our understanding of consumer behavior towards table olives:

- Longitudinal studies could investigate changes in consumption patterns over time and explore the impact of external factors, such as marketing campaigns or regulatory changes, on consumer preferences.
- Qualitative research methods, such as focus groups or in-depth interviews, could provide deeper insights into the underlying motivations and perceptions driving consumer choices regarding table olives.
- Comparative studies across different geographical regions or cultural contexts could elucidate variations in consumer preferences and behaviors, contributing to a more comprehensive understanding of olive consumption dynamics.
- Exploring the role of sustainability certifications,

such as organic or fair-trade labels, in influencing consumer preferences for table olives could shed light on evolving trends in ethical consumption practices.

By relating the study's results to these theoretical frameworks, it becomes clear that understanding consumer behavior towards PDO products is crucial for promoting sustainable food systems. The preference for certified products indicates a consumer shift towards sustainability, driven by concerns for food safety, authenticity and environmental impact. These insights can guide producers, marketers and policymakers in developing strategies that align with consumer values, thereby supporting the growth of sustainable food markets and enhancing the commercial success of PDO-certified products. In conclusion, while our study offers valuable insights into the factors shaping the consumption of table olives, further research is warranted to address the study's limitations and explore new avenues for understanding and promoting sustainable consumption behaviors in the olive industry.

7. Recommendations/Implications

To boost the commercial success of table olives, several marketing strategies can be employed. Firstly, it is important to develop targeted marketing campaigns that specifically cater to older consumers (those over 70), as this demographic tends to consume table olives more frequently. This can include creating packaging and labels that are simple to understand and visually appealing to older consumers. Secondly, implementing educational programs is crucial to increase consumer awareness and familiarity with PDO (Protected Designation of Origin) and other quality certifications. These programs should emphasize the benefits and unique qualities of PDO table olives. Thirdly, leveraging storytelling can be an effective way to highlight the origin, traditional production methods, and cultural significance of GI table olives, helping to establish a strong brand image. By aligning marketing strategies with consumer preferences, producers and marketers can enhance the appeal and commercial success of table olives in the European market. These strategies also have broader implications for various stakeholders interested in the survey findings, including the academic community, firms, and the general public. For the academic community, these insights provide valuable data for further research on consumer behavior, marketing strategies, and the impact of certifications like PDO on consumer choices. For firms, particularly those in the agricultural and food production sectors, these recommendations offer practical guidance on how to effectively market table olives and similar products, ultimately driving sales and market share. Lastly, for the general public, increased awareness and education about the benefits of PDO and quality certifications can lead to more informed purchasing decisions, promoting healthier eating habits and supporting local economies. By addressing the needs and interests of these stakeholders, the marketing of table olives can contribute to both economic success and consumer satisfaction.

Supplementary Materials

The following supporting information can be downloaded at: https://journals.nasspublishing.com/files/rwae-1233-supplementary.zip.

Author Contributions

All authors conceived the presented idea. Sgroi F. developed the theory and supervised the manuscript writing; Sciortino C. wrote the data and methods, as well as the results, performed the calculations and verified the analytical methods. Baviera-Puig A. performed conclusions and policy implications. Modica F. and Giamporcaro G. collected the data, wrote the literature review, defined the context and the discussion of the results. All authors discussed the results and contributed to the final manuscript.

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Data Availability Statement

Data available on request from the authors

Conflicts of Interest

All authors declare that they have no conflicts of interest.

References

[1] Blekas, G., Vassilakis, C., Harizanis, C., et al., 2002. Biophenols in table olives. Journal of Agricultural and Food Chemistry. 50(13), 3688–3692.

[2] Charoenprasert, S., Mitchell, A., 2012. Factors influencing phenolic compounds in table olives (Olea europaea). Journal of Agricultural and Food Chemistry. 60(29), 7081–7095.

[3] Ghanbari, R., Anwar, F., Alkharfy, K.M., et al., 2012. Valuable nutrients and functional bioactives in different parts of olive (Olea europaea L.)—a review. International Journal of Molecular Sciences. 13(3), 3291–3340.

[4] Peres, C., Peres, C.M., Moreira, L., et al., 2013. Table olives: A natural source of health-promoting bioactive nutrients and probiotics. In: Arcas, N., Arroyo López, F.N., Caballero, J., et al. (eds). Present and Future of the Mediterranean Olive Sector. CIHEAM/IOC: Zaragoza. pp. 171–177.

[5] Perpetuini, G., Prete, R., Garcia-Gonzalez, N., et al., 2020. Table olives more than a fermented food. Foods. 9(2), 178.

[6] Rocha, J., Borges, N., Pinho, O., 2020. Table olives and health: A review. Journal of Nutritional Science. 9, e57.

[7] Aschemann-Witzel, J., Maroscheck, N., Hamm, U., 2013. Are organic consumers preferring or avoiding foods with nutrition and health claims? Food Quality and Preference. 30(1), 68–76.

[8] Siro, I., Kápolna, E., Kápolna, B., et al., 2008. Functional food. Product development, marketing and consumer acceptance—a review. Appetite. 51(3), 456–467.

[9] Lanza, B., 2012. Nutritional and sensory quality of table olives. In: Muzzalupo I. (ed), Olive Germplasm—The Olive Cultivation, Table Olive and Olive Oil Industry in Italy. InTechOpen: Rijeka, Croatia. pp. 343–372.

[10] Lanza, B., Ninfali, P., 2020. Antioxidants in extra virgin olive oil and table olives: Connections between agriculture and processing for health choices. Antioxidants. 9(1), 41.

[11] Lombardo, L., Farolfi, C., Capri, E., 2021. Sustainability certification, a new path of value creation in the olive oil sector: The Italian case study. Foods. 10(3), 501.

[12] D'Antuono, I., Bruno, A., Linsalata, V., et al., 2018. Fermented Apulian table olives: Effect of selected microbial starters on polyphenols composition, antioxidant activities and bioaccessibility. Food Chemistry. 248, 137–145.

[13] Ajzen, I., 1991. The theory of planned behavior. Organizational Behavior and Human Decision Processes. 50(2), 179–211.

[14] Lavidge, R.J., Steiner, G.A., 1961. A model for predictive measurements of advertising effectiveness. The Journal of Marketing. 25(6), 59–62.

[15] Steenkamp, J.B.E., 1990. Conceptual model of the quality perception process. Journal of Business Research. 21(4), 309–333.

[16] Lockshin, L., Corsi, A.M., 2012. Consumer behaviour for wine 2.0: A review since 2003 and future directions. Wine Economics and Policy. 1(1), 2–23.

[17] Schäufele, I., Hamm, U., 2017. Consumers' perceptions, preferences and willingness-to-pay for wine with sustainability characteristics: A review. Journal of Cleaner Production. 147, 379–394.

[18] Alvino, L., van der Lubbe, R., Joosten, R.A., et al., 2020. Which wine do you prefer? An analysis on consumer behaviour and brain activity during a wine tasting experience. Asia Pacific Journal of Marketing and Logistics. 32(5), 1149–1170.

[19] Sgroi, F., Maenza, L., Modica, F., 2023. Exploring consumer behavior and willingness to pay regarding sustainable wine certification. Journal of Agriculture and Food Research. 14, 100681.

[20] Dupuis, I., Deroover, K., Kavanagh, M., et al., 2024. Australian consumer perception of non-alcoholic beer, white wine, red wine, and spirits. International Journal of Gastronomy and Food Science. 35, 100886.

[21] Steinbach, J., da Fonseca Burgardt, V.D.C., de Castro-Cislaghi, F.P., et al., 2021. Understanding consumer, consumption, and regional products: A case study on traditional colonial-type cheese from Brazil. International Journal of Gastronomy and Food Science. 26, 100418.

[22] Tavares-Filho, E.R., Hidalgo, L.G., Lima, L.M., et al., 2024. Impact of animal origin of milk, processing technology, type of product, and price on the Boursin cheese choice process: Insights of a discrete choice experiment and eye tracking. Journal of Food Science. 89(1), 640–655.

[23] Paiva, T., Jacinto, T.A., Sarraguça, M.C., et al., 2022. Beef consumers behaviour and preferences—the case of Portugal. Sustainability. 14(4), 2358.

[24] Magalhaes, D.R., Çakmakçı, C., Campo, M.D.M., et al.,

2023. Changes in the current patterns of beef consumption and consumer behavior trends—cross-cultural study Brazil-Spain-Turkey. Foods. 12(3), 475.

[25] Modica, F., Sciortino, C., Bonanno, A., et al., 2023. Analyzing post modern consumer behavior and beef consumption patterns: Insights from Sicilian market. Future Foods. 8, 100263.

[26] Cavallo, C., Piqueras-Fiszman, B., 2017. Visual elements of packaging shaping healthiness evaluations of consumers: The case of olive oil. Journal of Sensory Studies. 32(1), e12246.

[27] Spognardi, S., Vistocco, D., Cappelli, L., et al., 2021. Impact of organic and "protected designation of origin" labels in the perception of olive oil sensory quality. British Food Journal. 123(8), 2641–2669.

[28] Kovacs, I., Keresztes, E.R., 2022. Perceived consumer effectiveness and willingness to pay for credence product attributes of sustainable foods. Sustainability. 14(7), 4338.

[29] Cei, L., Defrancesco, E., Gatto, P., et al., 2023. Pay more for me, I'm from the mountains! The role of the EU Mountain Product term and other credence attributes in consumers' valuation of lamb meat. Agricultural and Food Economics. 11(1), 12.

[30] Sgroi, F., Sciortino, C., Giamporcaro, G., et al., 2024. Exploring the impact of beliefs and experiential factors on extra virgin olive oil consumption. Journal of Agriculture and Food Research. 15, 101056.

[31] Akpinar-Bayizit, A., Yilmaz-Ersan, L., Ozcan, T., et al., 2017. Consumers' behavior towards table olives. International Journal of Food Engineering. 3, 83–88.

[32] Fakhreddine, L.B., Sánchez, M., 2023. The interplay between health claims and sensory attributes in determining consumers' purchase intentions for extra virgin olive oil. Food Quality and Preference. 106, 104819.

[33] Brečić, R., Mesić, Ž., Cerjak, M., 2017. Importance of intrinsic and extrinsic quality food characteristics by different consumer segments. British Food Journal. 119(4), 845–862.

[34] Henchion, M.M., McCarthy, M., Resconi, V.C., 2017. Beef quality attributes: A systematic review of consumer perspectives. Meat Science. 128, 1–7.

[35] Piqueras-Fiszman, B., Spence, C., 2015. Sensory expectations based on product-extrinsic food cues: An interdisciplinary review of the empirical evidence and theoretical accounts. Food Quality and Preference. 40, 165–179.

[36] Yilmaz, E., Aydeniz, B., 2012. Sensory evaluation and consumer perception of some commercial green table olives. British Food Journal. 114(8), 1085–1094.

[37] Thøgersen, J., 2023. How does origin labelling on food packaging influence consumer product evaluation and choices? A systematic literature review. Food Policy. 119, 102503.

[38] Menapace, L., Colson, G., Grebitus, C. (editors), et al., 2008. Consumer preferences for extra virgin olive oil with country-of-origin and geographical indication labels in Canada. American Agricultural Economics Association Annual Meeting; 2008 Jul 27–29; Orlando, Florida.

[39] Di Vita, G., D'Amico, M., La Via, G., 2013. Quality perception of PDO extra-virgin olive oil: Which attributes most influence Italian consumers? Agricultural Economics Review. 14(2), 46–58.

[40] Tumer, E.I., 2013. Table olive consumption by socioeconomic and demographic groups of consumers in Turkey. Italian Journal of Food Science. 25(4), 441–445.

[41] Janssen, M., Hamm, U., 2012. Product labelling in the market for organic food: Consumer preferences and willingness-to-pay for different organic certification logos. Food Quality and Preference. 25(1), 9–22.

[42] Li, S., Kallas, Z., 2021. Meta-analysis of consumers' willingness to pay for sustainable food products. Appetite. 163, 105239.

[43] Ozkan, G., Gurbuz, I.B., 2023. Consumers' willingness to pay for geographical origin labels: Evidence from the Turkish table olive. Progress in Nutrition. 25(2), e2023022. DOI: https://doi.org/10.23751/pn.v25i2.13380

[44] Cappelli, L., D'Ascenzo, F., Arezzo, M.F., et al., 2020. The willingness to pay in the food sector. Testing the hypothesis of consumer preferences for some made in Italy products. Sustainability. 12(15), 6275.

[45] Morone, P., Caferra, R., D'Adamo, I., et al., 2021. Consumer willingness to pay for bio-based products: Do certifications matter? International Journal of Production Economics. 240, 108248.

[46] Schäufele-Elbers, I., Janssen, M., 2023. Consumer segmentation based on three dimensions of sustainable food consumption: A simultaneous analysis of meat, organic food, and sweet snack purchases based on household panel data in Germany. Frontiers in Nutrition. 10, 1140636.

[47] Ministry of Agriculture, Food Sovereignty and Forestry, 2023. Table olive sector in Italy. Available from: https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/20183

[48] Barone, E. (editor), 2002. Varietal aspects in the choice of table olives cultivar for quality production. La Gestion Durable des Systèmes de Production Oléicoles. Monastir, Tunisie.

[49] International Olive Council, 2023. Table

olive exchanges in the EU. Available from: https://www.internationaloliveoil.org/il-nostro-lavoro/unita-economia-e-promozione/?lang=it#prices

[50] Alonso, A.D., Krajsic, V., 2013. Food heritage down under: olive growers as Mediterranean 'food ambassadors'. Journal of Heritage Tourism. 8(2–3), 158–171.

[51] Niklis, D., Baourakis, G., Thabet, B., et al., 2014. Trade and logistics: the case of the olive oil sector. In MediTERRA 2014 (pp. 203–226). Presses de Sciences Po.

[52] Renna, M., Montesano, F.F., Serio, F., et al., 2021. The Mediterranean diet between traditional foods and human health through culinary examples. In Gastronomy and Food Science (pp. 75–99). Academic Press.

[53] ISMEA—Institute of Services for the Agricultural and Food Market, 2019. Table olives in Italy: Italian consumers between local specialties and imported products. Available from: https://www.ismeamercati.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/9786

[54] Gullon, P., Gullon, B., Astray, G., et al., 2020. Valorization of by-products from olive oil industry and added-value applications for innovative functional foods. Food Research International. 137, 109683.

[55] Nocellara del Belice PDO Production Specification [Internet]. 1988. The EU Geographical Indications Register. Available from: https://ec.europa.eu/agriculture/eambrosia/geographical-indications-register/details/EUGI00000013332 (cited 10 September 2024)