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Assessing the Quality and Floral Variety Market Value: A Hedonic Price Model for Honey

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Abstract: This study quantifies the market values, or implicit prices, of honey quality features (e.g., organic and origin information, package-related features) and floral varieties for supporting beekeepers in differentiating their products to escape from price competition characterizing the Italian honey market. The research employed a sample of sales data, 660 observations collected from the Italian market, and a hedonic price model, estimated via Ordinary Least Squares, to assess the implicit prices of honey characteristics. A high premium price was recorded for honey with added royal jelly and propolis, as well as for "100% Italian" honey. In contrast, moderate price premiums were recorded for Protected Designation of Origin and organic honey. Furthermore, the floral varieties used largely affected the product price: the highest premium prices were estimated for the Manuka, Kanuka, and Tawari floral varieties. Price premiums above +50% were estimated for floral varieties such as Strawberry tree, Pine, Cistus, Tree of Heaven, Sainfoin, Marruca, and Solidago. Results suggest that honey quality features and some floral varieties can effectively differentiate products, supporting beekeepers to achieve higher revenues. This study offers empirical evidence of the extent to which floral varieties and other product characteristics affect the market price of honey using a dataset of secondary data, with the aim to support producers to improve their competitive position in the market.

Keywords: honey production and consumption; hedonic price model; implicit prices; Italy

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1. Introduction

Honeybees (*Apis mellifera*), widely known for honey production, offer a pivotal service to humanity and the environment: pollination. This makes honeybees essential for global food security by ensuring crop pollination [1–3]. Their role as pollinators is coupled with their ability to generate direct and indirect jobs in agriculture through the sales of honey and other bee-derived products, positioning beekeeping as a significant contributor to the sustainable development of rural areas and overall environmental well-being [2,4,5]. Furthermore, honeybees offer many products besides honey: pollen, royal jelly, and propolis. Bee-derived products are often added to honey to meet the growing consumer preference in Western countries for "natural" products [6] with health-promoting properties, including anti-inflammatory, antitoxic, antioxidant, and antimicrobial effects [2,7].

Europe is the second largest honey producer, with approximately 285,700 tonnes after China; despite that, Europe is still not self-sufficient, as its honey production meets only about 60% of the domestic demand. Thus, Europe imports most of its honey from non-EU countries, primarily from China, Ukraine, and Mexico [8]. Those countries export their honey, typically blends of mixed floral varieties, as they have lower production costs compared with European producers, sized at approximately EUR 3.9 per kilogram. For instance, the Chinese honey production costs range from EUR 1.24 to EUR 1.30 per kilogram, largely thanks to the large-scale addition of sugar syrup that makes Chinese honey prices very low; the production costs of Ukrainian honey range from EUR 1.69 to EUR 2.35 per kilogram, while for Mexican the costs range from EUR 2.53 to EUR 3.24 per kilogram [9]. The large availability of low-priced non-European honey in Europe poses a significant threat to the competitiveness of European beekeepers, as it generates intense price competition that significantly erodes the European honey producers' profit margins [8,9]. Competition on prices places European production capacity at risk and jeopardizes the existence of over 10 million beehives across Europe, with direct negative impacts on incomes and jobs in rural areas, as well as on pollination and ecosystem biodiversity [8,9]. A further hurdle in raising European producers' margins is associated with a difference in economic scale between beekeepers and the other actors in the chain, such as retailers. The latter compete to attract consumers by offering lower prices than their competitors to gain market share. Therefore, retailers mainly focus on shrinking prices paid to beekeepers, who in turn have also access to very few or even only single buyers for their honey. Such a power imbalance in price negotiations along the chain further erodes beekeepers' profit margins [9].

To increase their profit margins, European honey producers may differentiate their products from those of non-European ones by selecting specific floral varieties and/or other quality features to achieve higher prices. To the best of our knowledge, no study has assessed the premium price associated with honey floral varieties while jointly accounting for other quality product features to support firms' differentiation strategies. Product differentiation may allow honey producers to escape from price competition and increase their profits [10,11]. In the last few years, honey producers have differentiated their products by introducing new monofloral varieties of honey and organic attributes into their products, offering options enriched with healthy enhancing features, to name a few [12].

As estimating the market value of honey features may provide valuable information for beekeepers operating in a market with low profitability, the objective of this research is to assess the premiums associated with honey attributes, focusing on floral variety and accounting for other quality features (e.g., organic and origin indications). Existing studies using secondary data such as market price, while pointing out the importance of sensory features on price, largely fail to acknowledge to what extent they are connected with floral varieties used to produce the honey and to inform producers on which floral source is preferred in the market [13–15]. Also, by using sales data, we attempt to avoid potential drawbacks, such as hypothetical bias, associated with the use of stated preference data along with the use of small samples generating findings with limited external validity [16,17].

We focus on the Italian honey market, as it contributes significantly to the development of rural areas [18]. This market generates over 100,000 jobs by producing approximately 23,000 tons of honey, with a market value of EUR 288 million in 2023. Italy is the fifth largest honey producer within the European Union, and Piedmont, Calabria, and Sicily are the three main honey-producing regions, accounting for over one-third of the national production. Also, in 2022, over 200 thousand beehives produced honey using organic methods, representing 14% of the total. In terms of honey varieties, the most common varieties in Italy are polyfloral (Millefiori), Chestnut, and Acacia, as reported in Table 1 [8–19].

Table 1. Italian regional honey production according to organic method and varieties.

Region	Number of Hives	% Organic	Wildflower	Chestnut	Acacia	Honeysuckle	Tilia	Other Varieties
Aosta Valley	4209	<2	✓	✓			✓	Rhododendron
Piedmont	179,659	20	✓	✓	✓		✓	Rhododendron
Lombardy	105,556	7	✓	✓	✓		✓	Rhododendron
Liguria	28,190	<2	✓	✓	✓			
Friuli Venezia Giulia	27,931	<2	✓	✓	✓		✓	Heather
Veneto	55,354	<2	✓	✓	✓		✓	
Trentino Alto Adige	19,951	<2	✓	✓				Fir honeydew, Apple
Emilia-Romagna	110,995	12	✓	✓	✓		✓	
Tuscany	99,541	13	✓	✓	✓	✓	✓	
Marche	61,669	4	✓					Coriander, Sunflower
Lazio	50,770	4	✓	✓	✓		✓	Eucalyptus
Umbria	19,810	<2	✓					Clover, Alfalfa
Abruzzo	40,316	3	✓			✓		
Molise	15,747	<2	✓	✓		✓		Coriander, Sunflower
Campania	70,145	4	✓		✓	✓		Citrus
Basilicata	20,789	4	✓	✓	✓	✓		Clover, Eucalyptus
Apulia	23,457	2	✓					Citrus, Coriander, Eucalyptus
Calabria	141,975	8	✓	✓	✓	✓		Citrus, Eucalyptus
Sicily	132,358	8	✓	✓		✓		Citrus, Eucalyptus
Sardinia	50,061	4	✓			✓		Citrus, Cardoon, Eucalyptus

Source: our elaboration on data provided in Naldi et al.'s (2023) [13] research.

Also, the recent Common Agricultural Policy (CAP) 2023–2027 supports this sector by offering economic incentives to Italian farmers who dedicate a share of their land to cultivating melliferous plants through eco-scheme five. Also, eco-scheme five actively encourages the expansion of flowering areas, as outlined by Giovanetti and Bortolotti (2023) [20]. This increased floral diversity provides bees with a wider variety of food sources that, beyond the direct ecological benefits, may provide an opportunity for beekeepers to differentiate their products on the market according to the floral varieties and escape from price competition. This approach not only benefits beekeepers but also contributes to biodiversity and the resilience of ecosystems.

Review of Consumers' Acceptance of and Preferences for Honey Attributes

Extensive research, largely using stated preference methods such as conjoint analysis and choice modeling along with primary data (e.g., surveys), has pointed out on one hand that intrinsic attributes like taste, aroma, and flavor, and extrinsic features like price, color, packaging, and production information (e.g., organic, origin) affect consumers' preferences for honey. Researchers consistently identify intrinsic attributes like taste, aroma, and flavor as key factors influencing honey preferences [21–24], confirming consumer preferences for honey with low and normal sweetness. Ghorbani and Khajehroshanaee (2009) [25] justified such results with the growing consumer awareness of health concerns associated with excessive sugar intake.

On the other hand, evidence on consumer preferences for honey's extrinsic attributes shows mixed results. Some researchers found that Italian and Slovenian consumers prioritize honey's price in their choices over other available features [26,27]. Other scholars found that price sensitivity depends on consumer demographic characteristics, honey shopping habits, and other honey features considered in the study design, showing the existence of a consumer group that attaches marginal importance to honey's price while relying on their choice of quality features (e.g., organic and origin labels), generally those having high education, income, and knowledge about honey features [28–31]. Also, conflicting results were found by scholars investigating consumers' preference for honey color: some scholars found that dark-colored honey has a positive effect on price and consumer preferences [25,28], while others suggest strong preferences for light-colored honey and rejection of dark honey [32,33]. Those results are likely specific for consumers sampled across studies conducted in different geographical areas. Instead, consistent results were found for honey packaging material, with consumers largely preferring honey marketed in glass packaging as it is perceived to have greater value. First, glass transparency allows consumers to directly assess the color, clarity, and honey purity by fostering trust and a sense of authenticity; second, glass does not interact with honey at a chemical level, preserving the organoleptic properties over time [14,15,21,30,34].

Furthermore, marketing literature has consistently documented consumers' preference for domestic honey, for those with Protected Designation of Origin (PDO) certification on the label, and honey produced according to organic practices. Preferences for domestically or locally produced honey are positively associated with multiple consumer values and beliefs. Domestic honey is largely preferred for its perceived higher quality and authenticity compared to non-domestic honey. Furthermore, selecting domestic honey supports local communities, making this purchase an ethical choice [35,36]. For such reasons, domestic honey or local honey purchases are associated with higher market prices [14,27,37–39] and positively with consumers' willingness to pay [35].

In addition to the honey's origin, European consumers attach great value to honey with the PDO quality certification [14,24,27,39]. The PDO label ensures higher product quality by adhering to strict production regulations. Additionally, it guarantees a distinct flavor profile due to the unique regional characteristics of the areas and the related floral variety and production methods in which the honey is produced. Thus, the PDO label attracts consumers seeking authenticity and unique sensory features [14,24,27,39]. Lastly, consumers also attach great importance to the organic production method of honey and are willing to pay price premiums. Such results are consistently found in consumer surveys based in Denmark [40], Italy [24,36,41], Germany [38], and Serbia [42]. Preferences for organic honey are largely due to a mix of pro-environmental and health-related reasons, as organic honey has higher antioxidant and bioactive compound content [43]. This concise review of empirical studies examining consumer acceptance and preferences for several attributes associated with honey shows a trend of increasing consumer interest in the multifaceted dimensions of honey quality. However, the existing body of research has predominantly focused on assessing consumer acceptance and preferences for a limited set of product attributes. Furthermore, these studies frequently rely on relatively small consumer samples sampled in specific countries; thus, the results are likely to be context-specific, applying primarily to the particular sample/country analyzed and the specific attributes incorporated into the study design. Notably, there remains a critical gap in the literature, as currently no study has systematically explored the market value associated with different floral varieties of honey.

2. Materials and Methods

2.1. Hedonic Price Model

Our analysis employed the traditional hedonic pricing model proposed by Rosen (1974) [10], which conceptualizes a product in the market as a bundle of attributes. In the market, consumers select the optimal attribute combination that maximizes their utility under the budget constraint. Conversely, producers maximize profits by setting product prices based on their included attributes [10]. In a market with unique product attribute combinations, equilibrium is achieved when buyers' marginal bids and sellers' marginal offers match. The combined envelope of demand bids and supply offers generates the hedonic price function [10]. This function expresses the price (P) of product j as a function of its attribute vector (Z):

$$P_j = f(Z_j) \quad (1)$$

Equation (1) points out that the hedonic price function, represented by $f(Z_j)$, expresses the price (P_j) of product j as a function of its attribute vector (Z_j). As stated by Ladd and Suvannunt [44], this implies that the price reflects the marginal monetary values of product j's attributes. By partially differentiating Equation (1) with respect to each attribute in Z_j, one can estimate the attribute's marginal implicit price, revealing how much consumers are willing to pay for each individual feature. Consequently, this also provides insight into the marginal cost incurred by producers for supplying each of these attributes. In the analysis, Z is divided into 3 vectors: Z^{PK}, Z^{QA}, and Z^{FV}. Z^{PK} represents a vector of product characteristics capturing packaging characteristics such as package size, material, and whether shipping fees are associated with the product. Z^{QA} is the vector of features encompassing information on whether the product is sold with added pollen, royal jelly, and propolis. Also, it captures whether the product is sold as organic, 100% Italian, or with PDO certification. Lastly, Z^{FV} is the vector of product floral varieties on the product label. In our study we employed a single-equation approach (as in studies by Panzone, 2011 [45]; Carlucci et al., 2013 [46]; Szathvary and Trestini, 2013 [47]; Bimbo et al., 2016 [48]) to investigate the impact of honey features on its price. Given that the relationship between price and attributes (Equation (1)) was left unspecified by theory, we adopted a semi-logarithmic specification for the hedonic price equation in our analysis following previous literature [45–48]:

$$lnP_j = a_0 + \sum_{p=1}^{P} \beta_p X_p^{PK} + \sum_{q=1}^{Q} \beta_q X_q^{QA} + \sum_{f=1}^{F} \beta_f X_f^{FV} + \varepsilon_j \quad (2)$$

The β_s are parameters to be estimated, capturing the implicit values associated with the different honey attributes, and ε_j is an idiosyncratic error term. Equation (2) was estimated via Ordinary Least Squares (OLS). The marginal prices of each attribute (in percentage terms) were calculated using Kennedy's [49] adjustment for the indicator variables.

2.2. Data

The study employed data collected from leading Italian food retailers such as Carrefour, Coop, and Esselunga. These retail chains sell food products and distribute groceries across Italy through physical hypermarkets and supermarkets, which also serve as delivery hubs or ship products directly to customers' homes. Over six weeks, from mid-January to the end of February 2024, two independent researchers based in Italy gathered information from the retailers' websites using the search term "honey" to identify all available honey products across the three retailers selected. The search was conducted on the same day across all three retailers' websites. The researchers then downloaded the web page outputs that were stored on a digital device to create a structured dataset. For each product on sale, its label was inspected and the price (EUR/kg) was collected. The database was populated with information on honey prices and packaging characteristics, including size, number of packages available (single pack vs. multipack), and packaging material. By examining product labels, the researchers recorded whether the honey contained added pollen, royal jelly, or propolis; whether it was produced according to organic farming practices; and whether it was 100% Italian or held a Protected Designation of Origin (PDO) certification. Also, data on floral varieties and any applicable shipping fees were collected. For Manuka honey, the dataset included the Methylglyoxal (MGO) content, a naturally occurring compound in Manuka nectar believed to contribute to its health benefits. Beyond data collection from leading Italian retailers, the researchers applied the same methodology within the same time frame to gather information on honey products sold by major online platforms, including Amazon, NaturaSì, and Naturitas, the latter two specialized in online organic food sales. Only honey products that had received at least one customer review and had been sold at least once over the past year were included in the analysis. This selection criterion was applied to minimize the inclusion of discontinued or inactive listings and to focus on products actually sold from all stores selected.

3. Results and Discussion

The final database encompasses information on 660 honey products sold across the six outlets explored and the product features collected are listed in Table 2. Table 2 shows that the average honey price per kilogram is EUR 51.35, with high variability (SD EUR 54.37), and it ranges from EUR 6.98 to EUR 291.96. Of the honey in the sample, 67% is sold with shipping fees. The majority of the honey sampled (97.12%) is packaged in glass. The most prevalent package size category falls within the 500 g–1 kg range, accounting for 46.67% of all analyzed samples. Furthermore, a share of honey is sold with added pollen (0.15%), royal jelly (1.06%), and propolis (0.3%), while a significant share of honey (31.36%) is sold with organic certification, approximately 6.67% as 100% Italian, and 3.3% with PDO certification. Honey sold in the Italian market encompasses 48 distinct types in terms of floral variety, ranging from popular choices like Acacia and Wildflower to unique offerings such as Manuka and Heather.

Table 2. Summary statistics and variable descriptions (Obs. = 660).

Variables	Variable Descriptions	Mean [a]
Price	Honey price EUR/kg min: 6.98–max: 291.96; s.d. 54.37	51.34
Shipping_Fees	1 = Honey with shipping fees	0.667
Glass_Package	1 = Glass container	0.971
Package_size < 500 g	1 = Package size less of 0.5 kg	0.356
Cont_size_500_1000 g	1 = Package size between 0.5 kg and 1 kg	0.467
Package_size > 1000 g	1 = Package size above 1 kg	0.177
Pollen	1 = Honey added with pollen	0.002
Royal Gelly	1 = Honey added with royal jelly	0.011
Propolis	1 = Honney added with propolis	0.003
Organic	1 = Honey with organic certification	0.314
100% Italian	1 = Honey sold as 100% Italian	0.067
PDO	1 = Honey with Protected Designation of Origin certification	0.033
Acacia	1 = Acacia honey	0.117
Citrus	1 = Citrus honey	0.068
Honeysuckle	1 = Honeysuckle honey	0.024
Linden	1 = Linden honey	0.036
Spruce	1 = Spruce honey	0.005
Chestnut	1 = Chestnut honey	0.074
Tree of Heaven	1 = Tree of Heaven honey	0.003
Asphodel	1 = Asphodel honey	0.005
Borage	1 = Borage honey	0.003
Cardoon	1 = Cardoon honey	0.014
Carob tree	1 = Carob tree honey	0.002
Cherry-tree	1 = Cherry-tree honey	0.006
Cistus	1 = Cistus honey	0.002
Canola	1 = Canola honey	0.002
Strawberry tree	1 = Strawberry tree honey	0.009
Coriander	1 = Coriander honey	0.009
Heather	1 = Heather honey	0.021
Eucalyptus	1 = Eucalyptus honey	0.062
Sunflowers	1 = Sunflowers honey	0.009

Table 2. *Cont.*

Variables	Variable Descriptions	Mean [a]
Wheat	1 = Wheat honey	0.002
Kanuka	1 = Kanuka honey	0.002
Lavender	1 = Lavender honey	0.020
Sainfoin	1 = Sainfoin honey	0.002
Marruca	1 = Marruca honey	0.002
Honeydew	1 = Honeydew honey	0.042
Apple tree	1 = Apple tree honey	0.003
Mint	1 = Mint honey	0.002
Wildflower	1 = Wildflower honey	0.165
Blackberry	1 = Blackberry honey	0.002
Niaouli	1 = Niaouli honey	0.002
Pine	1 = Pine honey	0.003
Oak	1 = Oak honey	0.014
Rhododendron	1 = Rhododendron honey	0.006
Rosemary	1 = Rosemary honey	0.050
Tawari	1 = Tawari honey	0.002
Dandelion	1 = Dandelion honey	0.006
Thyme	1 = Thyme honey	0.029
Clover	1 = Clover honey	0.009
Alfalfa	1 = Alfalfa honey	0.002
Solidago or Goldenrod	1 = Solidago or Goldenrod honey	0.005
Mediterranean scrub	1 = Mediterranean scrub honey	0.002
Manuka_no_info_MGO	1 = Manuka honey with no info on MGO content	0.024
MGO > 1–250	1 = Manuka honey with MGO content below or equal to 250 mg	0.044
MGO > 251–500	1 = Manuka honey with MGO content above 351 and below 500 mg	0.062
MGO > 501	1 = Manuka honey with MGO content above 501	0.033

[a] For all binary variables, the mean represents the percentage of observations showing a value of 1 and the standard deviation is omitted.

The estimated parameters of Equation (1) are reported in the second column of Table 3, along with their standard errors in parentheses, and the implicit prices in % of each product characteristic in percentage in the third column. The baseline product is a non-organic honey blend of mixed floral varieties for mass consumption, sold as polyfloral, produced outside Italy, and sold in plastic packages with a capacity of less than 0.5 kg. The estimated model shows an adjusted R2 equal to 0.8711 with a statistically significant value of the F-Statistic, indicating the joint significance of coefficient regressors. Ramsey's RESET test for missing variables (F(3, 602) = 0.98, p = 0.132) suggests no model misspecification. Additionally, the Variance Inflation Factor (VIF) test for multicollinearity yielded a value of 1.22, indicating no multicollinearity issue.

Table 3. Estimated parameters and percentages of premium price.

Variable	β (s.e.)		Percentage Premium Price [a]
Shipping_Fees	−0.032 (0.0525)		−3.26%
Glass_Package	0.471 (0.1077)	***	59.13%
Content_size_500_1000 gr	−0.399 (0.0442)	***	−32.96%
Package_size > 1000 gr	−0.613 (0.0482)	***	−45.91%
Pollen	−1.062 (0.1116)	***	−65.66%
Royal Jelly	0.366 (0.0754)	***	43.83%
Propolis	0.477 (0.1045)	***	60.26%

Table 3. *Cont.*

Variable	β (s.e.)		Percentage Premium Price [a]
Cert_Biologica	0.169 (0.0417)	***	18.29%
100% Italian	0.527 (0.0651)	***	69.08%
PDO	0.239 (0.0689)	***	26.76%
Acacia	0.287 (0.0724)	***	32.87%
Citrus	0.018 (0.0683)		1.57%
Honeysuckle	0.176 (0.0856)	**	18.88%
Linden	0.098 (0.1052)		9.75%
Spruce	0.314 (0.0979)	***	36.25%
Chestnut	0.133 (0.0727)	*	13.89%
Tree of Heaven	0.523 (0.1424)	***	67.10%
Asphodel	0.274 (0.2169)		28.56%
Borage	0.053 (0.0695)		5.25%
Cardoon	0.133 (0.1195)		13.38%
Carob tree	0.406 (0.0711)	***	49.69%
Cherry-tree	0.035 (0.2032)		1.42%
Cistus	0.529 (0.0704)	***	69.28%
Canola	0.025 (0.0711)		2.24%
Strawberry tree	0.673 (0.1291)	***	94.35%
Coriander	0.099 (0.1461)		9.22%
Heather	−0.027 (0.0933)		−3.12%
Eucalyptus	0.121 (0.0769)		12.59%
Sunflowers	−0.019 (0.1178)		−2.58%
Wheat	−0.017 (0.0711)		−1.91%
Kanuka	1.756 (0.0704)	***	477.48%
Lavender	0.043 (0.1137)		3.70%
Sainfoin	0.446 (0.0625)	***	55.04%
Marruca	0.448 (0.0617)	***	55.10%
Honeydew	0.028 (0.0919)		2.45%
Apple tree	0.255 (0.0601)	***	28.80%
Mint	0.001 (0.0794)		−0.17%
Blackberry	−0.109 (0.0561)	*	−10.50%
Niaouli	−0.641 (0.0561)	***	−47.36%
Pine	0.658 (0.2451)	***	87.41%
Oak	−0.007 (0.1111)		−1.28%
Rhododendron	0.259 (0.1402)	*	28.31%
Rosemary	−0.047 (0.0797)		−4.92%
Tawari	1.035 (0.0754)	***	180.85%
Dandelion	0.227 (0.0699)	***	25.17%
Thyme	0.049 (0.0869)		4.68%
Clover	0.013 (0.1436)		0.25%
Alfalfa	−0.373 (0.0662)	***	−31.28%
Solidago or Goldenrod	0.439 (0.2379)	*	50.78%
Mediterranean scrub	0.104 (0.0849)		10.62%
Manuka_no_info_MGO	1.592 (0.1602)	***	385.23%
Manuka_MGO > 1–250	1.262 (0.0821)	***	252.34%
Manuka_MGO > 251–500	1.694 (0.1031)	***	441.29%
Manuka_MGO > 501	2.001 (0.1066)	***	635.82%
Costant	3.008 (0.1264)	***	
Number of Observations		660	
R-square		0.871	
Specification test			
Ramsey's RESET F(3, 602)		0.982	
p-value		0.132	
Variance Inflation Factor (VIF)		1.12	

[a] Adjustment made according to Kennedy (1981) [49]. *, **, and *** are 10, 5, and 1 percent significance levels, respectively.

Findings in Table 3 show that shipping fees are not associated with higher honey price, while glass package material was associated with a premium price of +59.13%. This result points out the strong consumers' preferences for honey packaged in glass containers over other materials. Glass packaging is perceived as more hygienic, less polluting, and better at preserving taste, as well as enabling consumers to visually evaluate the honey's color and fostering a sense of trust and authenticity in the product [50,51]. However, the higher market price for glass-packaged honey products may reflect the increased cost of glass compared to other materials. Also, package size offers a discount of −32.96% for 500 g–1 kg containers, increasing to −45.91% for containers above 1 kg, compared to honey packaged in containers with a capacity of less than 500 g. A negative association between the capacity of the honey package container and its retail price was also found by Unnevehr and Gouzou [50] and Ballaco et al. [14], who explored honey price drivers in the U.S. and Spanish markets, respectively. Larger containers have a lower price per unit compared to smaller ones. In fact, price discounts are associated with larger packaging, making these products more appealing to price-sensitive consumers [14,50]. Also, honey added with pollen is associated with a discount of −65.66%, while honey added with royal jelly and propolis benefit from price premiums of 43.83% and 60.26%, respectively. On one hand, consumers might perceive pollen as a less valuable or beneficial addition compared to royal jelly and propolis, which are often associated with specific health benefits. In detail, studies found that royal jelly has immune system modulator activity, while propolis offers antioxidant and anti-inflammatory properties along with antimicrobial effects [52–54].

This lower perceived value could lead to lower demand for honey containing pollen, potentially driving down prices. On the other hand, consumers might associate pollen with lower-quality honey due to expected concerns about taste, texture, or potential allergens risks [21,52]. Instead, the premium price for honey with added royal jelly and propolis can be attributed to the health benefits of royal jelly and propolis, such as boosting immunity, reducing inflammation, and improving skin health. These health benefits lead consumers to be willing to pay more for honey containing them [53]. Additionally, royal jelly and propolis are less available than pollen, contributing to their perceived unicity, which increases their value to consumers [53], although the higher market price can also be attributed to increased production costs associated with harvesting and processing royal jelly and propolis [54].

Honey produced according organic practices is associated with a price premium of 18.29% compared to conventional honey. This finding is consistent with Ballaco et al.'s [14] research, which found a 10.7% price premium for organic honey in the Spanish market. Also, comparable results were found in studies conducted in several countries such as the U.S. [55], Denmark [40], Italy [36], Germany [15], Romania [35], and Serbia [42], recording positive willingness to pay for organic honey among consumers. Consumers are often willing to pay higher prices for organic products, including honey, for a combination of interrelated factors, spanning from environmental and ethical concerns to perceived health benefits of organic foodstuff consumption. Organic production prioritizes the well-being of animals, like bees, and the environment, attracting consumers who value both animal health and environmental sustainability [56]. Furthermore, organic certification guarantees the absence of harmful chemicals and antibiotics throughout the production process, capturing the interest of consumers concerned about chemicals exposure and potential health risks [22,56]. Also, consumers may perceive organic foods as containing more vitamins, minerals, and antioxidants as well as having a more natural and authentic flavor compared to conventional foods [22,56]. To support organic honey production, European policymakers have established a robust regulatory framework (Reg. EU 848/2018) that regulates organic honey production, including measures to improve the skills and knowledge of beekeepers in organic regimes along with their networking activities [57].

Also, findings reported in Table 3 point out that the "100% Italian" origin label has a positive and significant effect on the honey price, with a price premium of +69.08% relative to the baseline product. This result is consistent with other studies that found a positive willingness to pay among Italian consumers for domestic honey [36,37] and stronger preferences for local honey compared to those obtained from organic practices [36]. Also, our findings are in line with EU- [15,27,40,42] and US-based [21] studies pointing out that consumers highly prefer locally produced honey and are willing to pay a price premium for it.

Related to the information on honey origin, the European Union has recently revised Directive EU 1438/2024, which will be effective on 14 June 2026. This directive mandates that honey blends display origin countries in descending order along with their respective percentage shares by replacing current terms such as "blend of EU honey", "blend of non-EU honey", or "blend of EU and non-EU honey" available on the label as not adequately informing consumers [58]. The revised origin labeling rules enable consumers to make more informed purchasing decisions, thereby reducing the likelihood of honey fraud. Honey is frequently mixed with sugar, leading to fraudulent practices, especially in blends from China. The new regulation aims to reduce such occurrences and support EU honey in accordance with consumer preferences (EU Directive, 1438/2024) [58].

Also, our results indicate that honey carrying the PDO quality certification is associated with a +9.9% price premium. This result is consistent with previous research carried out in Italy and Slovenia, which pointed out a positive association between the PDO label and consumer honey preferences [27,39,59]. Despite the PDO certifications signaling high-quality production standards, results show that Italian consumers prioritize purchasing domestically originated honey (e.g., "100% Italian") and honey produced according to organic practices. However, such results could be due to the limited Italian consumer awareness of PDO labels that, unlike other food categories, record only three PDO products: Miele della Lunigiana DOP, Miele Varesino DOP, and Miele delle Dolomiti Bellunesi DOP [39]. It is important to acknowledge that organic and PDO-certified honey are likely priced higher due to their higher production costs (e.g., costly quality production schemes and control) compared with conventional honey.

Estimated parameters reported in Table 3 show that the floral varieties affect the product's price to a different extent, ranging from a premium of + 635,82% associated with Kanuka honey with the highest amount of methylglyoxal (MGO) of 500 mg/kg to a price discount of −47.4% for Alfalfa honey. Out of 41 floral varieties analyzed, 18 add value to the product, 20 record no price premium, and 3 are associated with discounts compared to the baseline alternative, such as a honey blend of non-EU origin. These findings suggest that differentiating honey according to the floral source could be a profitable strategy for producers. Manuka, Kanuka, and Tawari honeys receive the highest price premiums, ranging from +635.8% to +180.8%, compared to the baseline product, likely due to two factors. First, their production is geographically limited to Australia and New Zealand, restricting supply. Manuka and Kanuka honey rely on nectar from Leptospermum species, largely located in coastal regions of these countries, while Tawari honey is even more exclusive since it is sourced exclusively from the Tawari tree in New Zealand. The limited supply likely justifies their higher market price [60]. Second, Manuka and Kanuka honey have unique health properties that contribute to their premium price: Manuka has antibacterial properties due to the presence of MGO, while Kanuka honey contains unique antibacterial compounds, including polyphenols, offering anti-inflammatory benefits. Such peculiar health properties, substantiated by ongoing research, have spurred the global demand for these honeys, driving their prices [61,62].

Instead, Strawberry tree, Pine, Cistus, Tree of Heaven, Sainfoin, Marruca, and Solidago (Goldenrod) honey benefit from price premiums ranging from +94.35% to +50.77% compared to the mass consumption honey blend of non-EU origin. These honeys are valued in the market likely for two complementing reasons: rarity and unique flavor profiles, which appeal to niche consumer groups [19,63]. For example, Strawberry tree honey has a bitter and astringent taste, Pine honey has a menthol-like flavor, and Cistus honey has a strong citrus flavor. Tree of Heaven honey combines floral muskiness and earthy undertones, while Sainfoin honey offers notes of asphodel, almond blossom, and chamomile. Marruca honey has a strong aroma, and Solidago honey has a spicy, tangy taste with potential health benefits [64,65]. Furthermore, the production of these kinds of honey is geographically limited; for instance, Strawberry tree honey is almost exclusively produced in Sardinia, attracting consumers interested in supporting local apiculture and communities [21,65]. Carob tree, Spruce, Acacia, Apple tree, Rhododendron, Dandelion, Honeysuckle, and Chestnut honeys record intermediate price premiums, ranging from +49.69% to +13.89% compared to mass consumption honey. The lower premiums compared to the honeys discussed above are likely due to their larger availability in multiple Italian regions, resulting in a greater market supply. These honeys also have unique flavors that attract specific Italian consumer groups. Carob tree honey has a dark amber color with hints of hazelnut and balsamic notes, while Spruce honey has a distinct resinous character. Honeysuckle honey is prized for its light color and delicate floral taste, and Apple tree honey has rich floral notes with a scent of apple. Chestnut honey has a dark color and bold, malty flavor, making it a good source of antioxidants and minerals. Acacia honey is light-colored with mild sweetness and vanilla flavor, characterized by slow crystallization, making it suitable for consumers with pollen allergies. Rhododendron honey offers a strong floral and fruity flavor with potential antibacterial properties, and Dandelion honey has a unique, slightly bitter taste with antioxidant and prebiotic properties [63,64]. Conversely, honeys such as Citrus, Linden, Asphodel, Borage, Cardoon, Cherry-tree, Canola, Coriander, Heather, Eucalyptus, Sunflowers, Wheat, Lavender, Honeydew, Mint, Oak, Rosemary, Thyme, Clover, and Mediterranean scrub do not record a premium price. These results are likely because some of them have unpleasant or unfamiliar flavors; for instance, eucalyptus honey has a strong, bitter, and sometimes unappealing flavor that can limit its consumption. Similarly, Oak honey has a cork-like flavor that the average consumer may dislike. Also, compared to established favorites like mass consumption table honey, unfamiliar sources such as Mediterranean scrub could be overlooked by consumers and fail to achieve higher prices on the market [63,64]. Blackberry, Alfalfa, and Niaouli honeys receive price discounts ranging from −10.50% to −47.36% compared to mass consumption honey. On the one hand, the Blackberry flavor profile with its tart notes may restrict the appeal of the average consumer. Instead, Alfalfa honey, despite being widely available, possesses a mild flavor profile that may fail to attract many consumers who generally prefer the flavor of the most common sweet mass consumption honey. Additionally, Alfalfa honey crystallizes quickly, which can alter its texture and make it less convenient to use. This rapid crystallization may justify its lower price point compared to the wider variety of floral notes found in Wildflower honey. Lastly, Niaouli honey, typically produced in Madagascar, has a strong unique flavor of vegetal and caramel due to the bees collecting nectar from the Niaouli tree [63,64]. It is a less common honey in Europe than Wildflower honey, thus resulting in lower demand due to a lack of familiarity or knowledge with its unique flavor profile among European consumers, which is reflected in its lower price.

4. Conclusions

The current study employed sales data along with information about honey features available in the Italian market. The information collected encompasses several quality features, floral varieties, and prices to assess the market value of such features of honey.

First, results show a strong market preference for honey packaged in glass bottles rather than other packaging materials, particularly glass containers with a capacity less than 500 g. Additionally, adding royal jelly and propolis increase the value of the honey, leading to higher prices ranging from 43.83% to 60.26% compared to conventional honey, respectively. Conversely, adding pollen is associated with a price discount. Therefore, beekeepers may add value to their products by packing the honey in glass jars below 500 g rather than in plastic containers or packages of higher capacity; also, the addition of royal jelly or propolis may further increase the value of their products.

Second, honey production methods also affect the honey price. Organic honey benefits with a price premium compared to conventional honey, confirming that Italian consumers on average value animal welfare and environmental sustainability practices such as organic beekeeping [13,66]. Also, domestic honey labeled as "100% Italian" origin or with a PDO certification benefits from higher prices, reflecting consumer interest in domestic and local products. These findings point out the increasing demand for honey that goes beyond just taste, with ethical and quality issues playing a significant role in consumer choices. Thus, honey producers may adopt organic production methods as valued on the market as well as clearly indicate on the label the domestic origin of the product to differentiate their product; as well, policymakers may support producers by providing direct monetary incentives to comply with organic standards to lower the organic production costs and improve the economic sustainability of producers.

Third, several floral varieties benefit from price premiums compared to the baseline wildflower honey. Strawberry tree, Pine, Cistus, Tree of Heaven, Sainfoin, Marruca, and Goldenrod honeys all receive of high premiums in market price ranging from +94.35% to +50.77%. This high pricing is likely due to their rarity and limited market availability compared to common varieties like wildflower honey. Other floral honeys, such as Carob tree, Spruce, Acacia, Apple tree, Rhododendron, Dandelion, Honeysuckle, and Chestnut, receive lower price premiums compared to the first group. These premiums range from +49.69% to +13.89% when compared to Wildflower honey. Finally, some floral varieties, including Blackberry and Alfalfa, experience price discounts of −10.50% to −31.28% compared to Wildflower honey. Therefore, beekeepers may add value to their products by increasing the supply of honeys from floral varieties to achieve higher prices on the market while potentially reducing or eliminating production of honey from varieties associated with lower prices, such as Alfalfa honey produced in some areas of Umbria. Also, the observed price premiums for specific floral varieties may indirectly reflect the ecological value of certain habitats and their role in supporting biodiversity through beekeeping practices.

Finally, findings show the importance of label information related to the honey production method, composition, and origin for consumers. This highlights the need for researchers to develop analytical methods and tools to ensure honey origin and floral varieties can be verifiable, indirectly contributing to more sustainable production models aligned with circular economy principles. Additionally, policymakers play a crucial role in enforcing these methods, guaranteeing the truthfulness of information reported on labels and safeguarding the consumers' trust in honey label information.

Despite our findings' relevance in supporting honey producers in identifying more profitable marketing strategies, our analysis exhibits several limitations that future research may address. Firstly, our findings refer exclusively to the Italian market; thus, it would be beneficial to test these results in other countries. Secondly, our estimated results assess the average impact of honey characteristics on price, including floral varieties and production methods. Thus, the current analysis does not account for non-linearities or interactions among attributes. Future research may employ household-level purchase data, flexible modeling approaches, and techniques such as quantile regression to overcome these limitations. Thirdly, comparing premium prices and associated costs of each attribute would offer a clearer understanding of the mark-up achievable by honey producers pursuing product differentiation strategies. Fourthly, our findings do not clarify the role of consumer heterogeneity in price formation; thus, future in-depth investigation using stated preference elicitation methods could provide valuable insights into consumer preferences and willingness to pay for specific honey attributes. Lastly, future research will explore the interplay between honey market dynamics, ecosystem services, and climate resilience, providing a more integrated understanding of the environmental benefits linked to diversified and sustainable beekeeping.

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