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Agricultural and Food Economics (2025) 13:4
https://doi.org/10.1186/s40100-025-00347-9

Agricultural and Food Economics

RESEARCH Open Access

Exploring consumer preferences and policy implications in local food systems: Does taste or labeling matter in honey?

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Abstract

This study analyses the influence of geographical origin and taste on honey consumer behavior. First, we explore the influence of geographical origin on consumers' hedonic evaluation of honey. We then assess the influence of geographical origin and taste on their willingness to pay (WTP) for honey. We conducted a field experiment at a real supermarket. The participants were exposed to two treatments (*blind* and *informed treatment*). The findings showed that knowledge about the geographical origin of honey influences consumers' hedonic evaluations and that the WTP for honey is more strongly influenced by geographical origin than by taste.

Keywords: Field experiment, Honey, Hedonic liking, Geographical origin, Willingness-to-pay

Introduction

Local food systems have garnered considerable attention in recent years because of their perceived benefits for farmers, consumers, and communities (Augére-Granier 2016; Deller et al. 2017; European Commission 2020; Prišenk et al. 2020). However, doubts regarding their long-term viability have emerged, prompting a revaluation of their economic sustainability (James 2016; Deller et al. 2017; Enthoven and Broeck 2021). Three significant gaps have been identified in the literature, suggesting that such systems are not economically sustainable.

The principal gap concerns studies in the consumer behavior literature, predominantly indicating an increased willingness to pay (WTP) for locally sourced products. This trend is mainly because the participants in most studies tend to be better educated and have higher incomes, increasing their WTP a premium for local foods. However, this preference is not representative of the general population, particularly those with lower incomes (Deller et al. 2017; Enthoven and Broeck 2021). The second gap is associated mainly with the structure of food supply chain (James 2016; Deller et al. 2017). Local food systems are commonly linked with short supply chains, a concept acknowledged in food policies in Europe and North America. However, several local food products sold in the long supply chain are not covered by these policies (Enthoven and Broeck 2021). In

some cases, these products are sold via a mandatory generic label (i.e., an indication of the place of production) and do not use voluntary quality labels designed to protect special food products from a particular geographical origin (i.e., protected designation of origin (PDO), geographical indication (GI), or protected geographical indication (PGI)) (Augére-Granier 2016; Enthoven and Broeck 2021).

Finally, most studies have been conducted in laboratory settings and do not provide any context (e.g., a short supply chain such as a farmer's market or a conventional supply chain such as a supermarket) to consumers in their experiments, reducing the possibility of estimating WTP for local food products that are more closely aligned with real-world scenarios (Blumenschein et al. 2008). Only a few studies have been carried out in field settings, particularly on conventional supply chains (Costanigro et al. 2011; Cosmina et al. 2016; Bazzani et al. 2017). These studies have revealed that consumers not only demonstrate a WTP a price premium for local food products but also that a specific segment of consumers exhibits a greater WTP for this characteristic than other extrinsic attributes, such as organic labeling (Cosmina et al. 2016; Costanigro et al. 2011).

Given the scarce literature that addresses both types of attributes in real settings, this paper aims to fill these gaps by contributing to the literature on local food systems from the consumer perspective. In particular, this study investigates the influence of extrinsic (i.e., origin label) and intrinsic attributes (i.e., taste) on the WTP for local food products such as honey. To achieve this objective, we conduct a nonhypothetical choice experiment to elicit preferences for jars of honey among shoppers in a supermarket.

Our findings contribute to the literature in several significant ways. First, we investigate actual consumer purchasing behavior for honey through a nonhypothetical experiment at the point of purchase, employing an incentive-compatible mechanism to control the hedonic evaluation of honey taste and origin labels. Second, from an empirical perspective, our study provides practical insights into whether a combination of attributes, including credence and experiential attributes, jointly influences purchasing decisions. Finally, the results have policy implications, offering valuable information to policymakers and local food producers to address the lack of knowledge about the long-term viability of local food systems by determining honey consumers' WTP in the context of a conventional supply chain. Additionally, we examine the influence of origin labels on the hedonic valuation of honey and their effects on consumers' WTP for jars of honey with various local origin labels.

The rest of this article is structured as follows. In the next subsection, we provide a brief overview of the theoretical framework used in our study. Section "Theoretical framework" explains the data collection process and the experimental and data analysis procedures. Section "Methods" presents the results, and Sect. "Results" discusses these results and concludes the paper.

Theoretical framework

Food choices are doubtlessly complex, as consumers consider a set of credence and experience attributes to assess the quality of a food product and establish their preferences (Blanc et al. 2021). Extensive studies on local food products demonstrate that consumers consider local origin labels as indicators of high-quality food products (Feldmann and Hamm 2015; Printezis et al. 2019; Jia 2021). Moreover, researchers have also

assessed consumers' WTP for other factors, such as organoleptic characteristics. Empirical evidence indicates that the origin label and taste of food products play important roles in consumers' preferences (Żak 2017; Giudice et al. 2018; Blanc et al. 2021). However, only a few studies have incorporated both factors as attributes into their choice design (Dobbs et al. 2016; Cosmina et al. 2016; Fan et al. 2019; Kallas et al. 2021; He et al. 2021)) or included a tasting task in their experimental design (Bazzani et al. 2017; Fan et al. 2019; Kallas et al. 2021; He et al. 2021; Schott et al. 2022).

Among the studies that have examined both origin labeling and taste attributes (Bernard and Liu 2017; Kallas et al. 2019, 2021; He et al. 2021; Schott et al. 2022)), only two have investigated whether the origin of a product influences taste perception (Bernard and Liu 2017; Schott et al. 2022). The findings suggest that, in certain cases, consumers' hedonic evaluations of a product may be influenced by their knowledge of its geographical origin. In other words, consumers' hedonic evaluations seem to change when they realize that the tasted food product is local or from different geographical origins. However, given that the term "local" is open to various interpretations (Enthoven and Broeck 2021), further research is needed to determine whether consumer preferences differ according to the definition of local.

In our study, we examine the link between extrinsic (i.e., origin label) and intrinsic attributes (i.e., taste) and their influence on consumers' preferences via expectancy–disconfirmation theory[1] (Oliver 1980). This theory suggests that the expectations created by the origin label serve as a reference that consumers can confirm or disconfirm only after experiencing the food product through organoleptic attributes such as taste, thereby shaping their preferences (Oliver 1980; Gutjar et al. 2014; He et al. 2021). Therefore, if consumers have a more positive experience after consuming the food product than they initially expected, their preferences may improve, particularly for food products with varying interpretations of local origin (i.e., from a country, from a province, and so on). This study simultaneously assesses the impact of origin labels and the hedonic evaluation of organoleptic characteristics, such as taste, on consumer purchases of jars of honey with five different origin labels—two types of blends of foreign honey and three different categories of local origin (national, regional, and territorial)—in a real supermarket setting.

To guide our research, we formulate the first research question:

RQ1: Does the origin label influence consumers' hedonic evaluations of the taste of food products?

Previous studies have also consistently demonstrated that food products bearing a local origin label—whether through a mandatory indication of the place of production or a voluntary label such as PDO, GI, PGI, etc.—command a higher price premium than products produced abroad (Fan et al. 2019; Blanc et al. 2021; Kallas et al. 2021; Schott et al. 2022). In the case of honey, these studies reveal that, depending on the country of the consumers, consumers are willing to pay between €2.49/kg and €14.34/kg more for

[1] This theory, developed by Richard Oliver in the early 1980s, explains that before purchasing any product, especially food products, consumers create an expectation based on the product's credence/extrinsic attributes (visual appearance, color, origin, etc.). However, after experiencing its intrinsic attributes (taste, texture, etc.), consumers confirm or disconfirm their expectation, thereby increasing or decreasing their satisfaction or dissatisfaction with the product.

local than nonlocal honey (Wu et al. 2015; Cosmina et al. 2016; Cela et al. 2019; Bissinger and Herrmann 2021; Ballco et al. 2022).

Moreover, the limited existing research examining the impact of consumers' taste evaluations on the WTP for local food products indicates that a higher taste evaluation leads to a greater WTP (Fan et al. 2019; Kallas et al. 2021; Schott et al. 2022). However, this influence is not universally manifested in all food products (Kallas et al. 2019; He et al. 2021).

Therefore, employing a design similar to that proposed in Kallas et al.'s study (2019) and based on expectancy–disconfirmation theory (Oliver 1980), we estimate the WTP for natural honey with different labeled origins. This involves conducting a control and informed treatment, including a nonhypothetical choice task and a hedonic evaluation in each treatment. Consequently, we formulate the second research question for this study:

RQ2**:** Do origin labels and consumers' hedonic evaluations of taste influence the WTP for food products, particularly those that are locally sourced?

In this study, we chose multifloral honey as a case study because of its particular vulnerability to food fraud and because it represents one of the most-notified product categories for food fraud to AAC-FF (European Commission 2021). Despite the adoption of a directive on the geographical origin of honey by European authorities to safeguard consumers from potential food fraud, the current mandatory label of origin is deemed insufficient.

The primary criticism of European Directive 2001/110/EC concerns the lack of consumer knowledge regarding the specific origin of honey. Although the European Directive mandates that the country of origin must be labeled when fully obtained in a single country, the requirements are more lenient in the case of blends. For blends, labeling only necessitates the use of generic phrases such as "blend of EU honeys," "blend of non-EU honeys," or "blend of EU and non-EU honeys" (European Commission 2014), p. L10/48). At the time this study was conducted (early 2020), several countries, including Spain,[2] were discussing the necessity of introducing stricter regulations to address the gaps in the Directive (BOE 2020; EBCD 2021). The beekeeping sector argued that more transparent and specific labeling could help consumers make more informed choices and could have a positive effect on the sector's competitiveness (EBCD 2021). In this context, they proposed that labeling should indicate the particular region, territory, or topography where the honey is produced if it is entirely from a single country, and in the case of blends, the labeling should specify the countries and percentages from which the honey was sourced. Therefore, to assess whether consumers value more specific labeling, the present study focused on evaluating preferences for five different origin labels: two blended honeys ("blend of EU and non-EU honeys", "blend of EU honeys") to assess differences in preferences between local vs. nonlocal honeys and three different local honeys ("from Spain", "from Aragón", and "from Teruel") to study whether consumers

[2] In May 2020 (after we conducted our study), Spain approved a new directive that addressed all the demands of the beekeeping sector, except for the requirement to specify the percentage of honey from different countries in the case of blended honeys.

differentiated among various localities and whether the implementation of the new Spanish Directive [Real Decreto 523/2020 (BOE 2020)] would be effective.

Methods

Data collection

This study was conducted between November 2019 and January 2020 at a supermarket in Zaragoza, Spain. This city was selected because it is located in one of the geographical regions included in the study (Aragón) and near the other geographical region included in the study (Teruel). The sociodemographic characteristics of the population of Zaragoza are representative of the population of Spain (Baba et al. 2017). Additionally, the selected supermarket offers a wide variety of locally produced food products.

A total of 131 consumers of honey participated in the study. This sample size was determined according to the minimum size required for a sensory acceptability study (Hough et al. 2006)) and infinite populations (95.5% confidence level, sample error of $\pm 5\%$, and proportions $p = q = 0.5$). Participants were recruited by an external company that selected participants over the age of 18 and stratified them by sex, age, and educational level. This study followed the guidelines of the Declaration of Helsinki and the Ethics Committee of our institution.

Experimental design

To examine how origin labeling and hedonic evaluation of taste affect consumer preferences for local honey, our experiment was designed on the basis of the expectancy–disconfirmation model (Oliver 1980). This model compares consumers' cognitive states before and after an event, specifically, a tasting task and an explanation of European Directive 2001/110/EC. Initially, consumers base their decisions solely on the extrinsic attribute of honey, but after the event, they incorporate both extrinsic and intrinsic attributes into their decision-making process.

In line with the methodology outlined by Kallas et al. (2019), our experiment employs a within-subjects design with two treatments: a control treatment, referred to as the *blind treatment*, and an *informed treatment* (see Fig. 1). In the *blind treatment*, consumers expressed their WTP for five jars of honey (150 g) with different origin labels solely on the basis of information typically available in real-life purchases, such as geographical origin, price, and visual inspection, without knowing how the honey tasted. A no-purchase option was available. Following the choice task, the participants tasted and rated five honey samples, each labeled with a three-digit number, and a 9-point Likert scale was used to indicate their preference level.

After the tasting task in the blind treatment, a research assistant explained the European Directive 2001/110/EC to the participants to clarify the meaning of each of the five origin labels. Specifically, we reported that two of the original labels refer to blends of honey, as defined by the European Directive: 'blend of EU honeys' and 'blend of EU and non-EU honeys.' However, instead of a single local origin label, as stipulated by the Directive for honey sourced from one country—in this case, Spain—the participants evaluated three progressively more specific local labels: 'from Spain,' 'from Aragon,' and 'from Teruel.'

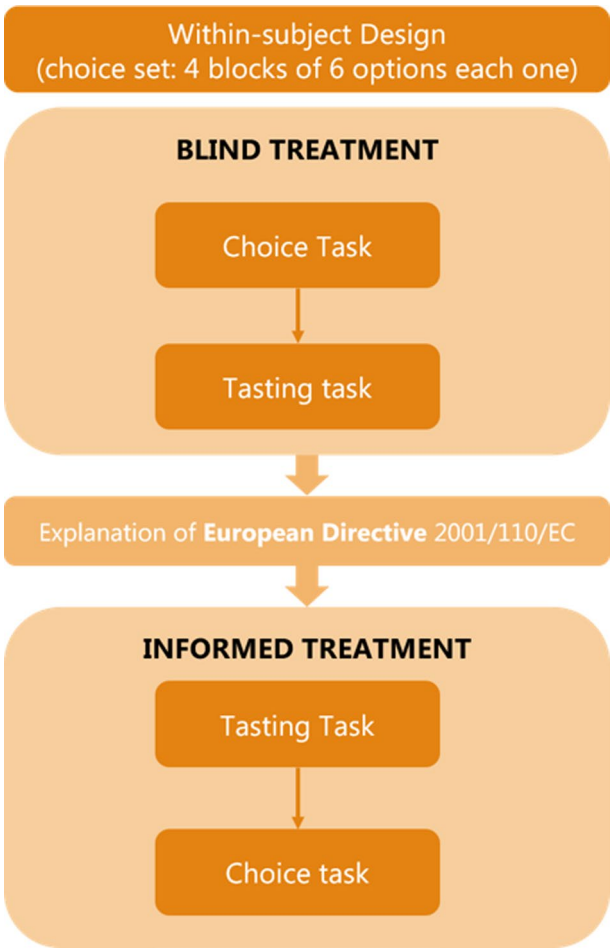
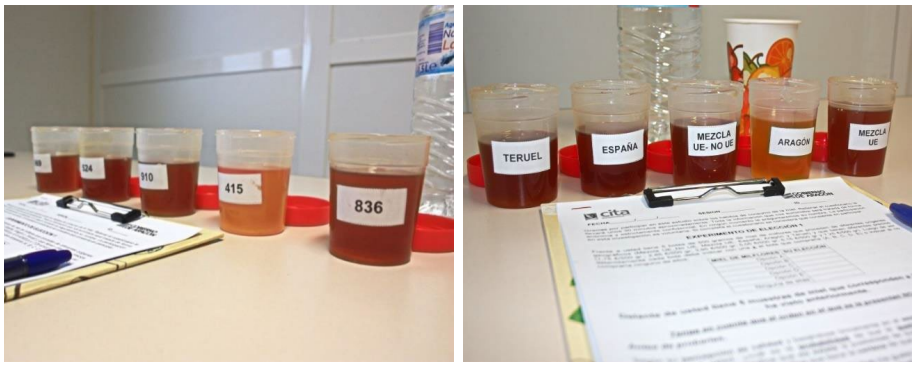


Fig. 1 The implemented treatments

After the explanation, the participants took part in the *informed treatment*. In this treatment, they tasted and rated five honey samples, each labeled with its geographical origin, using a 9-point Likert scale for hedonic evaluation. A choice task was subsequently conducted in which participants were given the option to purchase one of five jars of honey (150 g). Thus, the participants indicated their WTP for honey after considering the same information as in the blind treatment but with the added explanation of European Directive 2001/110/EC and knowledge of the honey's taste. As in the first choice task, a no-purchase option was available.

Hedonic evaluation

The consumers' hedonic evaluation of natural honey was analyzed by asking the participants about their expected liking for and hedonic evaluation of the taste of honeys at two different moments. The probability of expected liking is a measure used to capture individual differences in purchase behavior. This measure was applied before each of the tasting tasks, and the participants had to anticipate whether they would like the honey. For this purpose, this study used a direct numerical elicitation method, which ranged



A
Honey samples for blind tasting on *blind treatment*

B
Honey samples for informed tasting on *informed treatment*

Fig. 2 Honey samples used in the tasting tasks

from 0%, meaning 'there is no chance they would like the honey', to 100%, meaning 'they are sure they would like the honey'.

Following expectancy–disconfirmation theory, consumers made their purchase decisions according to the evaluation of the quality of extrinsic attributes they can evaluate in the supermarket (e.g., the brand, geographical origin, visual aspects, price, etc.). However, after testing a product, consumers were able to assess its intrinsic characteristics (e.g., flavor, smell) and confirm or disconfirm their expectations (Oliver 1980). When the experience was better than expected, the consumers experienced positive disconfirmation, indicating they were satisfied with their purchase decision. Moreover, the consumers experienced negative disconfirmation when the experience was worse than expected, meaning they were unsatisfied with their purchase decision. To determine whether consumers' expectations were confirmed, we asked them, in each tasting task, how much they liked the honey, using a 9-point hedonic scale ranging from 1 ('I extremely dislike this') to 9 ('I extremely like this'). Moreover, in the *blind treatment* tasting task, the honey samples were identified with three-digit numbers, without any additional information. This means that the consumers had to make their hedonic evaluation on the basis of the appearance and taste of the honey sample without knowing its geographical origin. In the *informed treatment* tasting task and after hearing the explanation of the European Directive 2001/110/EC, the research assistant revealed the geographical origin of the five honey samples and then made a second hedonic evaluation (see Fig. 2).

The choice set

In our experiment, the choice sets were designed following (Hudson et al. 2012) and an ad hoc database that contains data about the honey offered on the Spanish market. As a result, five multifloral honey alternatives were presented in glass jars of 500 g each. The selected geographical origins were as follows: (1) 'blend of EU and non-EU honey' (NEU), (2) 'blend of EU honey' (EU), (3) 'from Spain' (SP), (4) 'from Aragon' (ARA), and (5) 'from Teruel' (TE).

The market prices of the products differ according to their geographical origins. Among the blends, EU and non-EU honey had the lowest prices (from €1.75 to €5.05,

Table 1 Prices in the four blocks of the choice task

	NEU-EU	EU	SP	ARA	TE
Block 1 (n = 36)	€1.75	€**3.95**	€5.05	€6.15	€7.25
Block 2 (n = 30)	€2.85	€7.25	€**3.95**	€5.05	€6.15
Block 3 (n = 35)	€**3.95**	€6.15	€7.25	€**3.95**	€5.05
Block 4 (n = 31)	€5.05	€5.05	€6.15	€7.25€	€**3.95**

The price in bold (€3.95) represents the lowest price in the honey market at the time this study was conducted

increased by €1.10 at each price level); therefore, this geographical origin represents the benchmark. Other prices were higher than the benchmark prices, ranging from €3.95 to €7.25 and increasing by €1.10 at each price level. To make the results robust, characteristics such as size, floral origin, type of packaging, and geographical origin were fixed, whereas prices, which varied by up to four times among the five geographical origins, were not. In the first block of Table 1, the cost of €3.95 corresponds to the blend of EU honey, whereas in the second block, this same price corresponds to honey from Spain. The sample was evenly distributed over the four blocks to ensure that all participants had the same opportunity to evaluate all prices.

Implementation of the experiment

The participants were called to the supermarket in groups of five. The supermarket was accessible to all participants. The researchers began by explaining the experiment's aim and the tasks involved. After this, they asked the participants to sign an informed consent form, and the participants were given €15 as payment for their participation, which they could use to buy their preferred jar of honey, although they could also choose not to buy any jars of honey. At the end of the session, the participants had to pay for the jars of honey if they chose to purchase them.

Blind treatment

Before starting the choice task, the participants were asked to report their most important sociodemographic characteristics in a short questionnaire. The research assistant then gave them another questionnaire to record their choice/taste test responses. The research assistant placed the five jars of honey on a shelf. The participants were informed that all the products were available in the Spanish market and that their task would be to evaluate the geographical origin and price of each product. For this reason, other information (e.g., the brand name, nutritional label, etc.) was removed, as it is beyond the scope of this study. Given this information, the participants had to choose one of the jars of honey, bearing in mind that they could pay for their chosen jar at the end of the session.

When the participants finished their first-choice task, they were conducted to a counter near the shelf. This counter had samples of the corresponding five jars of honey. The research assistant prepared an individual tasting package that included water, bread, plastic stick mixers, paper napkins, and plastic containers of 150 ml each with the corresponding five types of honey. Each container was coded with a random three-digit number. Then, considering only the color and texture of each sample, the participants

indicated the expected probability that they would like the honey (Kallas et al. 2019). To test each honey sample, the participants proceeded as follows. When the research assistant opened each plastic container, each participant took a small amount of honey with a disposable plastic stick mixer and put it on their tongue to spread it all over the inside of their mouth. After tasting each honey sample, the participants completed their hedonic evaluation. The participants completed the hedonic evaluation of the corresponding honey sample via a 9-point hedonic scale. Before tasting the following sample, the participants were required to sip water, rinse their mouths, and even eat bread to ensure that their palates were cleansed. The research assistant checked that the participants had used the hedonic scale to rate the sample they had tasted.

Explanation of European Directive 2001/110/EC

At the end of the tasting task, the research assistant explained European Directive 2001/110/EC (European Commission 2014, p. L10/48). The assistant clarified that the Directive mandates that honey sourced from different countries is considered a blend and must be labeled 'blend of non-EU honeys,' 'blend of EU honeys,' or 'blend of EU and non-EU honeys.' However, our study focused on evaluating only the last two labels. Additionally, when honey is harvested in a single country, the Directive requires it to be labeled with the specific country of origin. Instead of adhering strictly to the Directive, our study considered three more specific local labels—'from Spain,' 'from Aragon,' and 'from Teruel'—to better understand participants' preferences for different local labels.

Informed treatment

After the explanation, the research assistant placed another five plastic containers labeled with each honey sample's geographical origin, and the second tasting task was conducted. The second tasting followed the same procedure as the first, using the same measures (i.e., numerical probability and hedonic scale). At the end of the second tasting task (informed tasting), the second-choice task (informed choice) was carried out, and the research assistant asked the consumers to choose one of the five jars of honey. The consumers were reminded that they had to consider taste, geographical origin, the European Directive 2001/110/EC, and the price when choosing one of the jars of honey.

To make the selection as realistic as possible, the research assistant put two pieces of paper labeled with the numbers one and two, corresponding to the first and second choice tasks, respectively, into a bag and asked the consumers to choose one. The participants had to buy the honey chosen in the choice task of the blind treatment if the piece of paper labeled 'one' was chosen, and if the piece of paper labeled 'two' was chosen, then the participant had to buy the honey chosen in the choice task of the informed treatment. If the participant chose not to purchase the honey, the research assistant gave them €15. However, if they decided to buy honey, the research assistant gave them the real product (including the brand name) and €15, and the participants then had to pay the corresponding price at the supermarket checkout.

Econometric framework

A crossed-effects model is appropriate for experiments in which repeated observations are obtained from the same sample (Quené and Bergh 2008). The crossed-effects model generalizes the linear regression model containing fixed and random effects. This model is less restricted than linear regression because it relaxes the assumptions of heteroscedasticity and sphericity, allows unbalanced datasets, etc.

Equation (1) represents a typical two-way crossed-effects model with three random terms:

$$Y_{ij} = \beta_0 + \beta_1 X_{ij} + u_i + v_j + \varepsilon_{ij}. \quad (1)$$

The dependent variable Y_{ij} represents all the prices considered in the two-choice tasks. The independent variable X_{ij} measures a fixed effect, meaning that the coefficients β_0 and β_1 are assumed to be fixed throughout the population. In this model, there are three random errors: one for each participant (v_j), another for each treatment (u_i), and the deviation of each observation from the estimated value (ε_{ij}).

Equation 2 represents the estimated model:

$$Price_{ij} = \beta_0 + \beta_1 NEU_{ij} + \beta_2 EU_{ij} + \beta_3 SP_{ij} + \beta_4 ARA_{ij} + \beta_5 TE_{ij} + u_i + v_j + \varepsilon_{ij}, \quad (2)$$

where i=1, 2 represents each treatment, j=1, …, 131 honey consumers, the random error associated with participants $u_i \sim (N, \sigma_u^2)$, treatments $v_j \sim (N, \sigma_u^2)$, and the residual error $\varepsilon_{ij} \sim (N, \sigma_u^2)$ are normally distributed. All random effects were independent, and the consumer effects (v_j) were crossed with the tasting effects for each choice task (u_i). The β_0 coefficient represents the no-purchase option, and the coefficients $\beta_1 NEU_{ij}$, $\beta_2 EU_{ij}$, $\beta_3 SP_{ij}$, $\beta_4 ARA_{ij}$, and $\beta_5 TE_{ij}$ represent the explanatory variables for each geographical origin or origin label.

A third model was estimated to test the influence of the treatment as a fixed effect. Hence, Eq. 3 represents the estimated model:

$$\begin{aligned} Price_{ij} &= \beta_0 + \beta_1 NEU_{ij} + \beta_2 EU_{ij} + \beta_3 SP_{ij} + \beta_4 ARA_{ij} \\ &+ \beta_5 TE_{ij} + \beta_6 treat_{ij} + \beta_7 plNEU_{ij} + \beta_8 plEU_{ij} + \beta_9 plSP_{ij} \\ &+ \beta_{10} plARA_{ij} + \beta_{11} plTE_{ij} + \beta_{12} tNEU_{ij} + \beta_{13} tEU_{ij} \\ &+ \beta_{14} tSP_{ij} + \beta_{15} tARA_{ij} + \beta_{16} tTE_{ij} + v_{ij} + \varepsilon_{ij} (3) \end{aligned} \quad (3)$$

where i=1, 2 (tasting), j=1, …, 131 honey consumers, $v_{ij} \sim (N, \sigma_u^2)$, and $\varepsilon_{ij} \sim (N, \sigma_u^2)$. The random effects were independent and represented the deviation of each observation from the estimated value. Moreover, we introduce the variable $\beta_6 treat_{ij}$ to capture the fixed effect of the informed treatment on purchase behavior. On the other hand, Eq. 3 includes ten variables that capture the effects of the expected liking and the hedonic evaluation on purchase behavior. These variables assess the fixed effect of tasting on the WTP for honey. The first five variables ($\beta_7 plNEU_{ij}$, $\beta_8 plEU_{ij}$, $\beta_9 plSP_{ij}$, $\beta_{10} plARA_{ij}$, $\beta_{11} plTE_{ij}$) represent the expected liking probability for a given honey sample for both tasting tasks (*blind* vs. *informed treatments*). Consequently, a positive and significant variable means that an increase in the expected liking score would increase the WTP for a particular honey. The other five variables ($\beta_{12} tNEU_{ij}$, $\beta_{13} tEU_{ij}$, $\beta_{14} tSP_{ij}$, $\beta_{15} tARA_{ij}$, $\beta_{16} tTE_{ij}$) are related to the hedonic evaluation for both tasting tasks *(blind* vs. *informed treatments)*.

Table 2 Sociodemographic characteristics of the sample (%)

	Sample	Population[a,b]
Sex		
Male	50.4	50
Female	49.6	50
Age	43.9	
From 18 to 35 years old	34.4	35
From 35 to 54 years old	32.8	31
More than 54 years old	32.8	34
Education level		
Elementary	17.6	18
High School	51.9	50
University	30.5	32
Income level (per month)		
Less than €1500	59.5	
Between €1501 and €2500	26.1	
Between €2501 and €3500	14.4	

[a] Instituto Nacional de Estadísticas (INE 2017, 2020))

[b] Education at a glance: Organisation for Economic Co-operation and Development [OECD] indicators (2014)

In this case, a positive and statistically significant variable indicates that an increase in the hedonic evaluation would increase the WTP for a specific honey.

Finally, the collected data were input into a Microsoft Excel spreadsheet and then imported into the statistical software Stata 16. The cross-effects model was then estimated by using the *xtmixed* module to calculate the mean WTP for each geographical origin.

Results

In this section, we present the sample characteristics and the results, which we use to answer the two research questions. First, we explore whether consumers' knowledge of geographical origin influences their hedonic evaluation of natural honey. The nonparametric Wilcoxon signed-rank test for paired data was used to determine if a significant difference existed between the hedonic evaluations made by the consumers before and after the tasting task. We then present the estimation of two-way crossed-effects models to examine whether the origin label and taste influence the WTP for natural honey.

Sample characteristics

The sociodemographic characteristics of the sample were not significantly different from those of the Spanish population. Table 2 shows that 50% of the participants were female, and the average age was 44 years. The group aged between 18 and 35 years was slightly larger (34.4%) than each of the two older age groups. Half of the consumers had a high school degree, and 60% had an income of less than €1500 per month.

Hedonic evaluation

Before the participants tasted the honey samples, they were instructed to estimate the probability of liking the honey on a scale ranging from 0% (indicating no likelihood of liking) to 100% (reflecting the absolute certainty of liking).

Table 3 Mean and standard deviation (SD) of expected liking in the blind and informed treatment

Origin label	Blind treatment Mean ± SD	Informed treatment Mean ± SD	*t* test	*p* value
Blend UE-noUE (NEU)	58.57 ± 24.49	40.49 ± 29.08	5.28	< 0.01
Blend EU (UE)	57.63 ± 24.61	48.45 ± 24.84	3.02	< 0.01
From Spain (SP)	58.41 ± 27.69	72.05 ± 87.08	− 1.77	< 0.1
From Aragon (ARA)	50.77 ± 32.89	70.69 ± 27.71	− 5.32	< 0.01
From Teruel (TE)	59.82 ± 26.11	72.76 ± 26.69	− 4.22	< 0.01

Table 4 Means and standard deviations (SDs) of consumers' hedonic evaluations in the tasting task of the blind and informed treatments

Origin label	Blind treatment Mean ± SD	Informed treatment Mean ± SD	Wilcoxon signed-rank z test	P-value
Blend UE-noUE (NEU)	6.32 ± 1.85	5.46 ± 1.87	− 4.360	0.0000
Blend EU (UE)	6.35 ± 1.76	5.95 ± 1.57	− 2.885	0.0039
From Spain (SP)	6.48 ± 1.78	6.45 ± 1.76	− 0.252	0.8007
From Aragon (ARA)	6.08 ± 2.17	6.31 ± 2.17	1.153	0.2488
From Teruel (TE)	5.86 ± 2.13	6.29 ± 2.19	2.264	0.0236

Table 3 presents the means and standard deviations of the expected liking in both the blind and informed treatments. In the blind treatment, where participants were unaware of the geographic origin of the honey, they estimated similar probabilities of liking for each sample, except for the honey from Aragon, which a presented lower expected liking than the other samples. However, upon revealing the products' geographic origin, the expected liking decreased for honey blends of UE–non-UE and UE countries. Conversely, compared with the blends, the expected liking increased for honey produced in Spain, the province of Aragon or Teruel. These differences in expected liking between the *blind* and *informed treatment* were statistically significant at the 1% level in all the cases except for honey from Spain, where the difference was statistically significant at the 10% level.

An analysis of the consumers' hedonic evaluation of natural honey was performed by asking the participants to rank the tasted honey sample using a 9-point hedonic scale.

Table 4 shows the hedonic valuation after the tasting task in both the *blind* and the *informed treatment* for each sample. Most participants positively evaluated honey in both treatments. In the tasting task of the *blind treatment*, the highest mean value corresponded to honey from Spain (SP: 6.48), followed by blends of honey from EU countries (EU: 6.35) and blends of honey from non-European and European countries (NEU: 6.32). Surprisingly, the least preferred honeys were from Aragon (ARA: 6.08) and Teruel (TE: 5.86). In contrast, in the tasting task of the *informed treatment*, the highest mean value corresponded to honey from Spain (SP: 6.45), followed by honey from Aragon (ARA: 6.31) and Teruel (TE: 6.29). Moreover, participants reported lower scores on the hedonic scale for honey harvested outside Spain (blends of EU honeys and blends of EU and non-EU honeys).

A Wilcoxon signed-rank test for repeated measurements (indicated for ordinal data) was used to determine if being aware of the geographic origin of the honey influenced the consumers' hedonic valuation. This test revealed significant differences between the hedonic evaluations of the tasting task in the *blind* and *informed treatments* for all geographical origins (except Aragon and Spain) (see Table 4). In the blind treatment, their evaluations of honey harvested in non-European and European countries ($z = 4.360$, $p < 0.001$) and honey harvested in European countries ($z = 2.885$, $p < 0.01$) became more negative. However, in the informed treatment, when consumers received information from the European Directive 2001/110/EC, their evaluations of honey from Teruel ($z = -2.264$, $p < 0.05$) became more positive. In contrast, regarding significant differences, the hedonic evaluations of honey from Spain and Aragon did not change.

These results suggest that information regarding geographic origin significantly influences the hedonic evaluation of honey, albeit with varying effects contingent upon the proximity of the honey's origin to consumers' homes. In line with the expectancy–disconfirmation model, consumers exhibited decreased satisfaction levels for honey sourced from European and non-European countries, indicating a negative disconfirmation in their anticipated liking and subsequent hedonic evaluations. Conversely, consumers demonstrated increased satisfaction levels, positively confirming their expected liking for locally sourced honey with distinct origin labels (e.g., from Spain, Aragon, and Teruel), alongside elevated hedonic evaluations for honey specifically harvested in Teruel. Notably, consumers maintained their satisfaction with other local honey variants originating from Aragon and Spain, reinforcing their consistent hedonic evaluations of honey from these regions.

Influence of taste on purchase behavior for honey with geographical origin labels

To analyze the effects of origin labeling and taste on purchase decision-making, a multivariate repeated-measures analysis of variance (RM-ANOVA) was performed. If the heteroscedasticity assumption of the RM-ANOVA is violated, then the treatment that includes tasting tasks (taste) or individual differences (i.e., variance) may be responsible. If this is the case, a more flexible model is more appropriate (e.g., a two-way crossed-effects model).

The RM-ANOVA of the condition factor that measures within-subjects differences (i.e., taste and individual differences) showed the results for taste, $F(1,131) = 1.34$ and $p = 0.25$, with an effect size of $\eta^2 = 0.01$, and for individual differences, $F(131,132) = 4.05$ and $p = 0.00$, with an effect size of $\eta^2 = 0.80$. This result means that differences in consumer preferences between the two choice tasks (*blind* vs. *informed treatment*) are due to individual differences and not taste. Moreover, the presence of heterogeneous preferences indicated that estimating a mixed-effects model is more appropriate. The equivalent mixed-effects model for an RM-ANOVA is a two-way crossed-effects model.

Table 5 shows three different two-way crossed-effects models. Model 1 [i.e., Eq. (1) without the term $\beta_1 X_{ij}$] represents an empty model, which is equivalent to an RM-ANOVA. The likelihood ratio (LR) test confirmed that a cross-effects model was more appropriate than linear regression because it allows heterogeneity in choices ($\chi^2(2) = 59.56$, $p = 0.00$). The fixed effect of the model showed a single variable (constant)

Table 5 Two-way crossed-effects model

	Model 1		Model 2		Model 3	
	Coefficients	**Std. error**	**Coefficients**	**Std. error**	**Coefficients**	**Std. error**
Blend EU-Non-EU			3.26***	0.25	3.29***	0.25
Blend EU			4.65***	0.38	4.59***	0.37
From Spain (SP)			5.01***	0.23	4.95***	0.24
From Aragon (ARA)			5.39***	0.22	5.23***	0.22
From Teruel (TE)			5.11***	0.23	5.00***	0.23
Treat					−0.10	0.13
plNEU					0.00	0.00
plEU					0.00	0.00
plSP					0.00	0.00
plARA					0.00	0.00
plTE					0.01***	0.00
tNEU					− 0.03	0.04
tEU					− 0.06	0.04
tSP					0.03	0.04
tARA					0.06	0.04
tTE					0.04	0.03
Constant	4.06***	0.18	− 0.02	0.20	− 0.45	0.44
Random effects						
Taste (u_i)	0.01	0.03	0.01	0.03	–	–
Individual differences (v_j)	2.97	0.50	0.50	0.12	0.48	0.12
Residual (ε_{ij})	1.95	0.24	0.66	0.09	0.61	0.08

***, **, and *Indicate statistical significance at the 1%, 5%, and 10% levels, respectively

that represented the mean price of both choice tasks, and the coefficient of this constant (4.06) was significant. The random effects showed that the effect of taste, the effect of individual differences, and the joint effect (both taste and individual differences) explained the variance of the model. The estimated random effects confirmed the results of the RM-ANOVA. The effect of individual differences is significant (2.97), but the effect of taste is not significant (0.005).

Model 2 (i.e., Eq. 2) converged on a restricted log-likelihood of −383.37 and showed that the null hypothesis was rejected, indicating that all fixed coefficients were jointly different from zero at a 95% confidence level ($Wald\ Chi^2(5) = 751,\ p < 0.01$). In other words, this model indicated that some individual differences may explain differences in the WTP for honey from different geographical origins. On the other hand, similar to Model 1, the LR test of Model 2 indicates that a crossed-effects model was more appropriate than a linear regression because it allowed heterogeneity in the choices ($\chi^2(2) = 22.17,\ p < 0.01$). All the fixed coefficients were individually significant, indicating that geographical origin influences consumers' purchase decisions. The parameters show the mean WTP for each geographical origin. Consistent with the purchased product results, the consumers were willing to pay more for honey from Aragon (€5.39/500 g), Teruel (€5.11/500 g), and Spain (€5.01/500 g) than for honey produced far from domestic markets (i.e., blends of EU and non-EU honey and blends of EU honey). The constant was not significant, indicating that consumers preferred buying one of the jars of honey over not purchasing any of the jars. The random effects parameters indicated that at a

95% confidence level, the effect of taste was close to zero, meaning the two slopes of the choice tasks were equal and there was no significant difference between the WTP in the choice tasks of the *blind* and *informed treatments*. Moreover, the individual and residual random effects were different from zero, meaning that consumers' choices were heterogeneous across both choice tasks.

In Models 1 and 2 the random-effects parameter of taste was close to zero; thus, the influence of this experience attribute (taste) did not differ across individuals, and a third model was estimated. In this model, the effect of the tasting task in both the *blind* and the *informed treatment* was included in the fixed part of the model. Ten dummy variables measured the interaction between the choice preferences (i.e., the WTP for each geographical origin label) and the probability of expected liking and hedonic evaluation, respectively. As a result, the parameters of these dummy variables indicate the differences in the WTP for those individuals with differences in the tasting task (*blind* vs. *informed treatment*) in terms of the probability of expected liking and hedonic evaluation. For example, the plNEU variable indicated differences in the WTP for blends of honey from EU and non-EU countries for consumers who presented differences (*blind* vs. *informed treatment*) in the probability of expected liking compared with the rest of the consumers.

Model 3 (i.e., Eq. 3) presented a better-restricted log-likelihood (log likelihood [Logl] = −407.88) than Model 2, indicating that Model 3 fits the data better. Moreover, the joint significance test showed that the null hypothesis is rejected; therefore, all fixed coefficients are jointly different from zero at a 95% confidence level (*Wald* $Chi^2(16) = 833.71$, $p = 0.00$). This confirmed that including the effect of the tasting task as a fixed effect is more appropriate than using the random effects model. Finally, the LR test reaffirmed that using a cross-effects model to capture consumer heterogeneity is more effective than using a linear regression model ($\chi^2(1) = 21.79$, $p < 0.01$).

The fixed effect of Model 3 presents the same trend as that of Model 2. Honey from Aragon was the most valued (€5.23/500 g), followed by honey from Teruel (€5.00/500 g) and honey from Spain (€4.95/500 g). Furthermore, only one variable related to the probability of expected liking had individual significance. In particular, the variable plTE was positive and statistically significant, meaning an increase of one percentage point in the probability of expected liking for honey from Teruel increases its WTP by €0.01. On the other hand, the variables related to the hedonic evaluation were negative for blends of EU and non-EU honey (tNEU) and blends of EU honey (tEU), but they were not statistically significant. Moreover, the variables tSP, tARA, and tTE were positive but not statistically significant. These results corroborate the results of Models 1 and 2; the hedonic evaluation of taste did not influence the WTP for honey. Finally, as in Model 2, the constant parameter was significant, meaning consumers preferred buying one of the honey alternatives to not buying any.

The random-effects part shows, at a 95% confidence level, that although the individual and residual effects are lower than those of Models 1 and 2, their statistical significance means that the differences in consumers' choices (blind vs. informed treatment) are explained by individual characteristics.

At the aggregate level, consistent with expectancy–disconfirmation theory, the absence of statistical variance between the willingness-to-pay (WTP) observed in both

the blind and informed treatment suggests a validation of consumers' initial expectations. Notably, only the provision of information regarding the geographical origin of honey was found to significantly influence consumers' WTP. However, at the individual level, substantial variations in the probability of expected liking resulted in increased WTP solely for honey sourced from Teruel. This outcome indicates a positive disconfirmation of consumers' expectations subsequent to receiving details about the geographical origin of the honey, which is particularly evident in the case of honey from Teruel. Moreover, the lack of statistical significance in hedonic evaluation implies confirmation of consumers' expectations concerning the purchased honey.

Discussion

Local food systems seem to hold out the promise of a transitional path to more sustainable agrifood systems. However, the empirical evidence is far from aligned with this expectation. Researchers point to the need for more studies that contextualize consumers' choices in real-life settings and consider preferences not often assessed in the local food literature, such as consumers' preferences for labeled local food sold in the conventional supply chain as well as the influence not only of a credence attribute (origin label) but also an experience attribute (taste) on consumers' behavior.

Consequently, our study jointly assesses the influence of geographical origin and taste on consumers' purchase decisions regarding honey by using an incentive-compatible mechanism. First, we analyzed whether geographical origin influenced consumers' hedonic evaluation of natural honey. Second, we investigated whether geographical origin and taste influence consumers' WTP for this food product. To do this, a non-hypothetical choice experiment was conducted in a real supermarket. On the basis of the expectancy–disconfirmation model and the procedure of (Kallas et al. 2019), we designed a within-subject experiment in which the full sample performed *blind* and *informed treatments*.

The results suggest that consumers' hedonic evaluation of honey is influenced by knowledge of its geographical origin. Specifically, consumers tended to rate honey harvested from more distant countries less favorably, as evidenced by decreased expected liking for blends from the EU and blends of non-EU countries within the EU. In contrast, locally produced honey, particularly from Teruel, received improved hedonic evaluations. These findings align with prior research by Kallas et al. (2021), which highlighted that consumers consistently rated the sensory attributes of local honey, including taste, most positively.

Importantly, however, conflicting results exist in the literature. For example, Kos Skubic et al. (2018) reported no statistically significant differences in hedonic evaluations between geographically labeled and conventionally labeled honey. Thus, addressing our initial research question, the origin label appears to influence consumers' hedonic evaluation by enhancing their experience with locally labeled honey while diminishing their experience with blends from non-EU countries within the EU and UE countries.

Furthermore, our findings indicate that only the origin label, rather than consumers' hedonic evaluation of taste, addresses our second research question. The two-way cross-effects model revealed that taste influenced WTP for certain honeys but only at the individual level. In other words, these factors' effects on WTP were observed only at the

individual level and for the probability of expected liking (in blind vs. informed treatments). Specifically, an increase of one percentage point in the probability of expected liking for honey from Teruel led to a €0.01 increase in WTP. This observation aligns with the findings of Batt and Liu (2012), who demonstrated that, for Australian consumers, knowledge of local honey production had a greater effect on purchase decisions than taste alone. Conversely, Kallas et al. (2021) reported that sensory experiences (e.g., taste, color) could either increase or decrease Argentinian consumers' WTP for local versus nonlocal honey.

Moreover, our results indicate a significantly greater WTP for local honey than for blends sourced from both EU and non-EU countries. Specifically, we found evidence that Spanish consumers are willing to pay 54% more for local honey and 65% more for regional honey than for blends originating from EU and non-EU countries. This finding underscores the considerable value consumers place on local honey over foreign alternatives, highlighting the important role of origin labels as a key factor influencing honey purchase decisions (Wu et al. 2015; Cosmina et al. 2016; Vapa-Tankosić et al. 2020; Bissinger and Herrmann 2021; Kallas et al. 2021).

This trend is consistent with findings from various studies conducted worldwide. For instance, Bissinger and Herrmann (2021) discovered that German consumers would be willing to pay between 37 and 65% more for German honey than for EU–non-EU blends. Similarly, Cosmina et al. (2016) estimated that Italian consumers would pay up to €4.97 per jar of honey from the Friuli Venezia Giulia region. Kallas et al. (2021) reported that Argentinian consumers pay between 1.74 and 45% more for local honey than nonlocal varieties. Similarly, (2020) reported that the WTP for honey is 10% to 20% greater for locally harvested honey in Serbia. Additionally, Wu et al. (2015) reported that American consumers were willing to pay a 9% premium for honey from the US and an 18% premium for honey sourced from a defined region in the northeastern US.

Conclusions

Taken together, our results have important implications for the local food system. First, following James (2016) and Quené and Bergh (2008), our study supports the idea that policy-makers should consider extending the types of local food distribution channels in their policy toolbox (i.e., from short supply chains to conventional supply chains) to ensure the long-term viability of small producers by increasing their markets. In the case of honey, given that most local honey is marketed in a short supply chain and that our results show that consumers are willing to pay a higher price for Aragon and Teruel honey sold in a real supermarket, it is reasonable to state that local honey has the potential to increase its market share in the long food supply chain.

Second, it can be assumed that our results reflect the actual purchase behavior of honey consumers in the context of the conventional distribution channel. This is because we use an incentive-compatible mechanism that reduces the hypothetical bias of the estimated WTP. Furthermore, our results show that taste, as an intrinsic characteristic, is not part of consumers' notion of the high quality of a food product with a generic local label; therefore, this characteristic does not influence consumers' WTP. However, our results also show that a segment of customers seems to be positively influenced by their

taste preferences, making it reasonable to consider this intrinsic characteristic in marketing strategies.

Third, a good marketing strategy would be to indicate the place/region where honey was harvested. This would help distinguish local from foreign honey. This strategy can be used in any type of communication campaign, including social media campaigns (Sparacino et al. 2023), to build the reputation of honeys that do not have a quality label such as the PDO; furthermore, the use of this strategy is not limited to honey labels.

There are several limitations in this study that could be addressed in further research. First, we did not analyze honey consumers' purchase behavior from other geographical areas with a higher-quality reputation (e.g., Alcarria honey). Further research can assess whether consumers are willing to pay for this credibility attribute, which can be demonstrated through mandatory origin labeling or a quality certificate such as the PDO. Moreover, given that hedonic price studies have shown that the implicit price paid by consumers is greater for monofloral honeys (Bissinger and Herrmann 2021; Ballco et al. 2022) and that this study analyzed consumer behavior for multifloral honeys, future research could investigate consumers' purchase behavior for monofloral honeys.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s40100-025-00347-9.

Additional file1.

Acknowledgements
We thanks Petjon Ballco for help with the tasting experiment and research assistance.

Author contributions
B.L.-G. and T.d.-M. conceived the experimental design, B.L.-G development of methods, data extraction, data analysis. B.L.-G and T.d.M: interpreted the results, and drafted the work or substantively revised it. T.d.-M substantively revised it. B.L.-G. and T.d.-M. have approved the submitted version (and any substantially modified version that involves the author's contribution to the study) AND have agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature. T.d.-M funding adquisition.

Funding
This work was supported by Gobierno de Aragón—Fondo de Inversiones de Teruel (FITE) and Gobierno de España under grant project [FITE-2018-FITEMIEL. Recuperar la miel para recuperar el territorio]. IP: Tiziana de-Magistris. And also was under the grant project PCI2022-132917 "Development of a blockchain-based ecosystem that allows an improved positioning of small producers of honey on local and international markets (TECHONEY). PRIMA, SECTION 2 (2021–2025)", supported by MCIN/AEI/10.13039/501100011033 and by European Union "NextGenerationEU"/PRTR. IP: Tiziana de-Magistris.

Availability of data and materials
The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Competing interests
The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Received: 13 April 2024 Revised: 29 November 2024 Accepted: 15 January 2025
Published online: 25 January 2025

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