

Exploring consumer preferences for quality labels on extra virgin olive oil: Accounting for stated versus inferred attribute non-attendance








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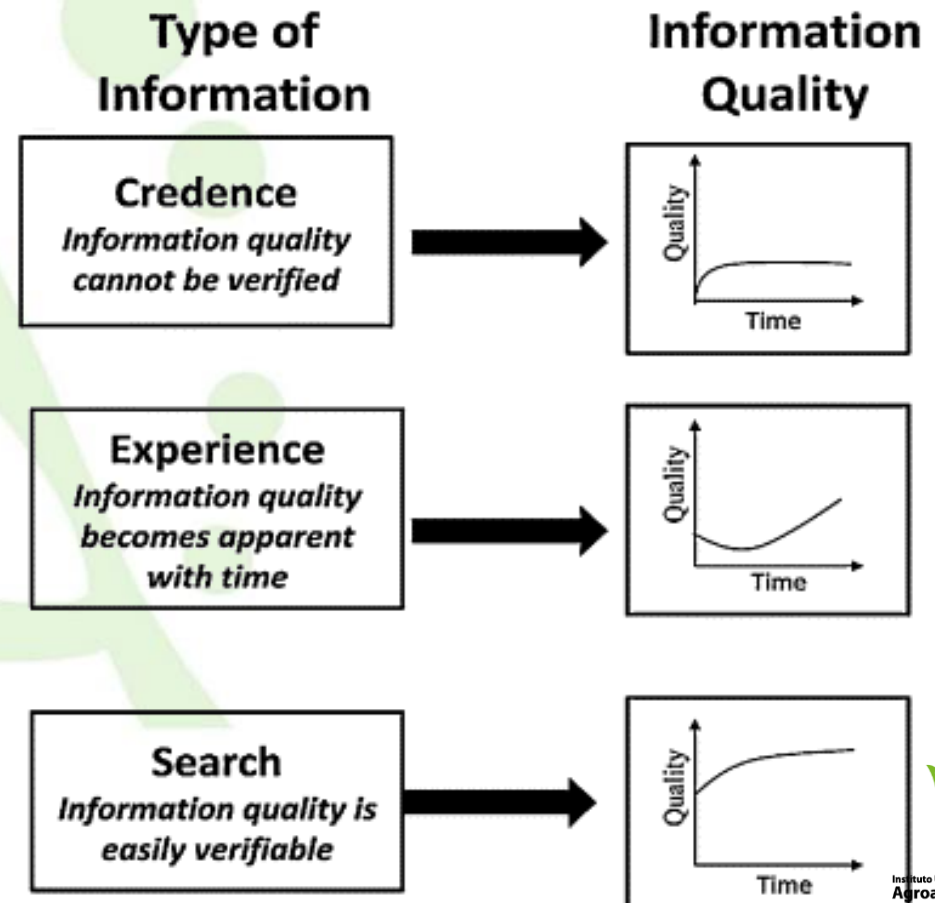
-  The EU is the leading producer of olive oil, accounting for 58.7% of global output.
-  Spain, Italy and Greece – main producer – generating 1.2 mil. tonnes – 2023/2024 campaign – about 52% of the world's total production.
-  Of this total, Spain contributed 31.8%, Italy 12% and Greece 8.1% (IOC 2023).
-  The quality grading of olive oil is regulated by EU standards (2022/2104) and the IOC. EVOO is recognized as the highest quality.
-  Remarkably, about 66% of Spanish olive oil are classified as EVOO. Hence, we focus on EVOO.

● Olive oil available on the market possess a combination of information:

● Credence (organic and PDO certifications)

● Experience (taste and texture)

● Search (colour and brand)



This study focuses on the PDO and organic EU labels, both of which are credence attributes.

- Although olive oil has been extensively explored:
- Empirically: Only few studies have investigated consumer's preferences and their WTP when multiple quality certifications (e.g., organic and PDO) are evaluated simultaneously.
- Methodologically: Only few studies using DCEs in food economics estimate ANA, and there are no studies available in the olive oil sector.



Explore consumer preferences for quality labels on EVOO: Account for stated versus inferred ANA







-  **Conducted an online DCE** in March 2021 in Aragón (the region where the EVOO with PDOs is produced).
-  **Participants** (n=402): lived in the region, were representative food buyers, older than 18 years, who consumed olive oil.

Table 1 – EVOO attributes and levels (market research).

| Attribute | Level | Variable name |
|---|------------------------------------|---------------|
| Price (€/lit) | 4€/lit - 6€/lit - 8€/lit - 10€/lit | PRICE |
| Protected Designation of Origin (PDO) | Bajo Aragón | BA_PDO |
| | Sierra del Moncayo | SdM_PDO |
| | Other Spanish PDOs | SP_PDO |
| | No PDO | Reference |
| Production method | Organic certification | ORG |
| | Non-organic certified | Reference |

 **The choice sets design: Burgess and Street (2007).**

 **Three alternatives: two designed + non-buy**

 **Main effects: 6 choice tasks (2 blocks).**

 No accounting for ANA:

 Attribute Non-Attendance (ANA)



Two main approaches to identify ANA in DCEs



Serial stated ANA

Asking respondents about the attributes they ignored in the end of the DCE.



Inferred ANA

Unrevealed preferences through analytical methods LCM



In stated preference methods it is commonly assumed that consumers consider all the attributes presented in their decision to purchase the product and evaluate them equally. However, previous studies demonstrate this is not the case (Ballco et al., 2020; Caputo et al., 2018; Van Loo et al., 2018). **This decision heuristic is referred to as ANA** in choice modelling literature.

Not accounting for ANA can bias parameter estimates and subsequent WTP calculations, thereby diminishing the reliability and validity of these estimates (Hensher et al. 2005; Scarpa et al. 2009; Campbell et al. 2011).

3 Mixed logit models – Nlogit 6

Table 2 – Information criteria comparison.

| Model | Obs. | k | AIC | AIC/N | LL | χ^2 | McFadden R2 | LR |
|-------------|------|----|------|-------|---------|----------|-------------|-------|
| MNL | 2412 | 6 | 3458 | 1.434 | -1723.3 | - | - | - |
| RPL | 2412 | 10 | 3336 | 1.383 | -1658.0 | 1982.9 | 0.37 | 130.6 |
| EC-RPL | 2412 | 11 | 3146 | 1.304 | -1562.1 | 2175.4 | 0.41 | 191.8 |
| EC-RPL-CORR | 2412 | 17 | 3014 | 1.250 | -1490.0 | 2318.9 | 0.44 | 144.2 |

1. A full attendance model – assumes participants evaluated all attributes equally.
2. A serial stated ANA model – participants selected the attributes they considered in the DCE.
3. An inferred ANA model – Unrevealed preferences (latent class model).

Table 3. Sociodemographic characteristics

| Characteristics | Definition | Sample (n=402) | Population Aragón ^a | Population Spain ^b |
|-------------------------------|-------------------------------|-----------------|--------------------------------|-------------------------------|
| Gender | Male | 49 | 49 | 49 |
| | Female | 51 | 51 | 51 |
| Age | Average \pm SD ^c | 50.2 \pm 20.4 | 44.9 | 43.6 |
| | 18-44 years | 43.5 | 38 | 35.4 |
| | 45-54 years | 15.9 | 19 | 20.4 |
| | \geq 55 years | 40.6 | 43 | 44.2 |
| Education attained | Elementary | 8 | 14.2 | 20.4 |
| | Secondary | 56.2 | 53.3 | 46.4 |
| | Higher | 35.8 | 32.5 | 33.2 |
| Personal net income per month | <1,076€ | 32.8 | n/a | n/a |
| | 1,076€-1,350€ | 18.2 | n/a | n/a |
| | >1,350€ | 49 | n/a | n/a |
| Household size | Average \pm SD ^c | 2.8 \pm 1.2 | 2.4 | 2.5 |
| Province of residence | Huesca | 17.2 | 17 | n/a |
| | Teruel | 10 | 10.3 | n/a |
| | Zaragoza | 72.8 | 72.7 | n/a |

Note: ^a IAEST (2022); ^b INE (2022); ^c SD stands for standard deviation; n/a stands for not available.

Table 4. Mixed logit (M1 and M2) and the ECLC-2^k (M3) estimates.

| | Full attendance (M1) | | "Serial stated ANA" (M2) | | | | "Inferred ANA" (M3) | |
|--|----------------------|---------|--------------------------|---------|------------|---------|---------------------|---------|
| | | | Ignored | | Considered | | Considered | |
| | Coeff. | T-ratio | Coeff. | T-ratio | Coeff. | T-ratio | Coeff. | T-ratio |
| Random parameters in the utility function | | | | | | | | |
| α | 5.62*** | 10.51 | 8.11*** | 9.23 | - | - | 4.55*** | 14.35 |
| PRICE | -0.49*** | -17.50 | -0.28*** | -4.77 | -0.70*** | 15.96 | -0.71*** | -13.63 |
| BA_PDO | 3.15*** | 13.47 | 1.40*** | 4.03 | 5.04*** | 11.19 | 5.09*** | 9.17 |
| SdM_PDO | 2.38*** | 11.51 | 1.19*** | 3.23 | 3.59*** | 9.16 | 4.02*** | 12.61 |
| SP_PDO | 1.88*** | 10.04 | 0.71** | 2.32 | 2.89*** | 9.37 | 2.80*** | 11.31 |
| ORG | 0.72*** | 6.38 | 0.28* | 1.74 | 1.71*** | 7.77 | 1.66*** | 4.21 |
| Standard deviations of parameter distribution | | | | | | | | |
| BA_PDO | 3.00*** | 10.41 | 2.05*** | 3.83 | 4.37*** | 4.88 | - | - |
| SdM_PDO | 2.05*** | 7.57 | 1.34*** | 2.62 | 3.37*** | 2.97 | - | - |
| SP_PDO | 1.78*** | 7.40 | 1.07** | 2.23 | 2.37*** | 2.63 | - | - |
| ORG | 0.74** | 2.16 | 0.46 | 1.36 | 1.45* | 1.82 | - | - |
| Sigma | 3.04*** | 6.80 | 5.00*** | 7.25 | - | - | - | - |
| N | 2,412 | | 2,412 | | 2,412 | | 2,412 | |
| LL | -1,490.40 | | -1,386.14 | | -1,496.18 | | -1,496.18 | |
| χ^2 | 2,318.90 | | 2,527.40 | | 2,307.33 | | 2,307.33 | |
| McFadden-R2 | 0.44 | | 0.48 | | 0.44 | | 0.44 | |
| Willingness-to-pay estimates (€/litre) | | | | | | | | |
| BA_PDO | 6.41*** | 12.38 | 5.00*** | 3.10 | 7.13*** | 11.08 | 7.17*** | 7.01 |
| SdM_PDO | 4.86*** | 9.92 | 4.25*** | 2.63 | 5.08*** | 8.73 | 5.67*** | 10.28 |
| SP_PDO | 3.84*** | 10.83 | 2.53** | 2.15 | 4.10*** | 9.74 | 3.95*** | 9.29 |
| ORG | 1.48*** | 6.34 | 1.01* | 1.67 | 2.42*** | 8.44 | 2.34*** | 4.05 |

Empirically

Methodologically

- Not accounting for ANA in DCEs affects the results leading to **inaccurate** consumer preferences and WTPs.

Table 4. Mixed logit (M1 and M2) and the ECLC-2^k (M3) estimates.

| | Full attendance (M1) | | "Serial stated ANA" (M2) | | | | "Inferred ANA" (M3) | |
|--|----------------------|---------|--------------------------|---------|----------------|-------------|---------------------|--------------|
| | | | Ignored | | Considered | | Considered | |
| Random parameters in the utility function | | | | | | | | |
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Empirically

Methodologically

- We cannot definitely determine whether serial stated or inferred ANA performs better – no clear superiority (Caputo et al., 2018).

Empirically:

1. Locally produced EVOO with PDO received the highest utility and WTPs.
2. Although positive, the organic certification was the least valued attribute.

Methodologically:

1. **Accounting for ANA** in choice modelling leads to **accurate preferences and WTPs**.
2. Both ANA methods have potential, but neither is definitively better.

1. Producers – highlight local origin and PDO certification – **target marketing strategies for regions close to the production area and leverage the “buy locally” trend.**
2. **Enhance the added value benefits of the organic production** – communicate health and environmental benefits **to justify the high price.**
3. **Offer organic EVOO in larger volumes** to reduce the price-per litre cost – making it more **accessible to price-sensitive consumers.**



Thank you for your attention!