

# Alcohol-Free Wine Adoption in a Mediterranean Island Context: fsQCA

## Evidence from Crete

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## 33 *Abstract*

34 The steady decline in traditional wine consumption, together with the growing demand for alcohol-  
35 free alternatives, is driving significant changes across wine value chains—particularly in  
36 Mediterranean countries, where wine holds deep cultural significance. This study examines Cretan  
37 consumers' willingness to try alcohol-free wines when such willingness is shaped by current market  
38 trends. It identifies combinations of personal characteristics, health-related motivations, price  
39 sensitivity, and prior experience with alcohol-free products. Using fuzzy-set Qualitative Comparative  
40 Analysis (fsQCA), the findings identify multiple sufficient configurations that account for both high  
41 and low willingness to try alcohol-free wines, illustrating equifinality and causal asymmetry. Health  
42 emerges as a universal factor present in all configurations associated with higher willingness, while  
43 prior experience plays a central role in the configurations with the greatest coverage, suggesting that  
44 familiarity with alcohol-free products further supports consumer openness toward alcohol-free wines.  
45 The results also highlight several exploratory configurational patterns, including health-oriented  
46 consumers; younger individuals, who are more price-sensitive, and senior women for whom  
47 familiarity outweighs cost considerations. These insights offer valuable guidance for wine value chain  
48 stakeholders seeking to adapt their strategies to evolving consumption patterns amid shifting drinking  
49 habits. These findings also offer policy-relevant insights, highlighting the need for public support in  
50 technological innovation, consumer education, and context-specific diversification efforts to facilitate  
51 the willingness to try alcohol-free wines in Mediterranean markets.

52

53 **Keywords:** Alcohol-free wine; consumer behavior; fsQCA; Crete; Mediterranean island; wine  
54 economics.

## 55 **1. INTRODUCTION**

56 The European wine sector is navigating a challenging period, marked by a sustained decline in wine  
57 consumption—particularly in Mediterranean countries, where wine has historically been a deeply  
58 rooted cultural product [1,2]. At the same time, an increasing share of consumers is opting for alcohol-  
59 free beverages, driven by new social sensibilities, heightened health concerns, and movements such  
60 as the sober curious trend [3,4].

61 Within this evolving landscape, the market for alcohol-free wines has emerged as a stable response  
62 to changing consumer preferences. Growth forecasts—indicating a compound annual rate close to  
63 10% and an estimated market value of USD 5.2 billion by 2033—highlight the potential of these  
64 products to transform the sector's production and commercial structures [5,6]. These developments

65 are reshaping competitive dynamics within the sector and encouraging actors across the European  
66 wine value chain to reconsider their strategic approaches.

67 However, the willingness to try of alcohol-free wines faces cultural, sensory, and economic barriers  
68 in traditional Mediterranean contexts. Wine is deeply intertwined with the region's social and  
69 gastronomic identity, which makes it difficult for consumers to accept alternatives perceived as less  
70 authentic or of lower quality [7,8]. These constraints are particularly challenging in insular production  
71 systems, such as Crete. For Cretan wineries, predominantly small-scale operations, this trend requires  
72 adapting production processes, integrating expensive dealcoholization technologies, and redefining  
73 value propositions to remain competitive in the face of more innovative market players [9–12].

74 Despite these developments, the literature still lacks a clear understanding of how sociodemographic,  
75 motivational, and consumption-related factors combine to shape consumers' willingness to try  
76 alcohol-free wines in these traditional, insular contexts. Prior research has predominantly focused on  
77 main-effect, linear methodologies that examine variables in isolation. Consequently, there remains a  
78 significant gap in understanding the complex, asymmetric configurations of consumer traits (the  
79 specific "recipes" of motivations and characteristics) that are associated with consumer's willingness  
80 to try alcohol-free wines in a deeply rooted wine culture.

81 This study addresses these issues through a fuzzy-set Qualitative Comparative Analysis (fsQCA)  
82 applied to Cretan consumers. Thus, this work contributes to the literature in several ways. First, it  
83 provides empirical evidence from a unique Mediterranean island market that is undergoing  
84 transformation. Second, it offers a methodological contribution by analysing consumer dynamics  
85 from the perspective of equifinality and causal asymmetry. By doing so, this approach allows for the  
86 identification of multiple sufficient configurations that explain both high and low willingness to try  
87 alcohol-free wines, demonstrating how different combinations of antecedent conditions can lead to  
88 the same result, and how the pathways explaining the presence of an outcome are different (and not  
89 simply the opposite mirror image) from those that explain its absence. Ultimately, this framework  
90 offers preliminary insights for diversification strategies, communication efforts, and business model  
91 adaptation for small-scale wineries in traditional regions.

92

## 93 **2. BACKGROUND AND RESEARCH QUESTIONS**

### 94 **2.1. Mediterranean Wine Culture, Consumer Barriers, and Drivers of Alcohol-free Wines** 95 **Adoption**

96 In the Mediterranean context, wine occupies a central place in cultural identity and is closely  
97 intertwined with social and gastronomic practices. This deep-rooted tradition makes the acceptance  
98 of alcohol-free alternatives more challenging, as such products are often perceived as less authentic

or of inferior quality [13,14]. Sensory perceptions also play a significant role: simply knowing that a wine contains little or no alcohol can negatively influence its evaluation, regardless of its actual sensory attributes [7,8].

These cultural and sensory barriers are compounded by economic and structural constraints. Producing alcohol-free wines requires specific technologies that involve substantial investment, which can be particularly burdensome for small and medium-sized wineries [11,12]. Moreover, price sensitivity among Mediterranean consumers may limit their willingness to pay for these products, especially when the added value is not immediately evident.

Despite these obstacles, several factors may encourage consumer's willingness to try alcohol-free wines. Health-related motivations have gained prominence in recent years, reflecting broader societal concerns about alcohol consumption and well-being (15–20). At the same time, technological advances have improved the sensory quality of alcohol-free wines, helping to reduce initial scepticism and increase consumer's willingness to try them [21,22]. Overall, the Mediterranean context presents a complex interplay between long-standing cultural barriers and emerging opportunities driven by shifting motivations and technological innovation.

## **2.2. A Configurational Perspective on Consumer Propensity toward Alcohol-Free Wines**

The willingness to try alcohol-free wines depends on the interplay of sociodemographic, motivational, and psychosocial factors that interact to shape different configurational patterns. From a configurational perspective, these conditions do not operate in isolation; rather, they combine into patterns that help explain why some consumers show greater openness toward alcohol-free beverages, while others remain more resistant [3].

Recent market analyses indicate that alcohol-free wines are gaining traction as consumers increasingly prioritize moderation, health, and responsible drinking. This shift is reshaping wine value chains in Mediterranean regions, where traditional consumption patterns are undergoing transformation and where producers face growing pressure to diversify portfolios and adapt communication strategies to evolving expectations.

Among personal factors, education level emerges as a relevant element, as higher educational attainment is often associated with more health-oriented behaviors [16]. Place of residence also introduces differences, with urban consumers typically more exposed to new trends [14]. Health-related motivations represent another key driver, consistent with growing awareness of the risks associated with alcohol consumption [15,23]. Social norms further influence the willingness to try alcohol-free wines [22], and sensory experience plays a decisive role in shaping willingness to try these products [7,24].

133 From this perspective, these conditions combine to form different configurational patterns. This  
134 approach makes it possible to identify multiple sufficient configurations that explain both high and  
135 low propensity to consume alcohol-free wines—an especially valuable insight in culturally complex  
136 markets such as those of the Mediterranean region.

137 While previous studies have examined consumer responses to alcohol-free or no/low-alcohol wines,  
138 empirical evidence remains fragmented and focuses predominantly on isolated predictors. These  
139 studies are focused on specific geographical contexts such as Australia [25] and France [24], or  
140 targeted very narrow segments, such as university students in Italy [26]. As synthesised in literature  
141 reviews [23], consumer behavior regarding wine innovations (including alcohol-free alternatives),  
142 constitutes a core research theme, yet it is still under-researched from a holistic perspective. This  
143 study advances this literature by adopting a fuzzy-set approach that captures the interplay of multiple  
144 antecedent conditions within a Mediterranean cultural setting.

145

### 146 **2.3. Research Questions**

147 Although interest in alcohol-free beverages and changing consumption patterns (i.e. rising preference  
148 for moderation) is growing across Europe, important gaps remain regarding how different patterns of  
149 consumer responses toward these products are formed. While previous studies have explored personal,  
150 motivational, and consumption-related factors influencing the willingness to try alcohol-free  
151 beverages, these dynamics remain underexplored in Mediterranean settings, where long-standing  
152 wine traditions may shape consumer decisions differently. Moreover, few studies have adopted a  
153 configurational perspective, leaving limited evidence on how these factors combine.

154 Within this landscape, an important distinction concerns the emergence of “rational consumers”.  
155 These consumers are individuals who base their decisions on deliberate, cost-benefit evaluations of  
156 product attributes (price, functional characteristics, or health benefits) rather than on habit or  
157 emotional drivers. This decision-making pattern is particularly relevant for alcohol-free wines, yet  
158 how it interacts with other sociodemographic and psychosocial characteristics remains unexamined  
159 from a holistic perspective. Moreover, no previous studies have applied a configurational approach  
160 to analyze the trend-driven willingness to try alcohol-free wines in Greece or in other Mediterranean  
161 countries. This gap is relevant because equifinality and causal asymmetry are common features of  
162 consumer behavior in culturally complex markets. The lack of evidence on how variables such as  
163 education, health orientation, prior experience with alcohol-free products, or price sensitivity  
164 combine limits the ability of wineries and value chain actors to design effective segmentation and  
165 adaptation strategies.

166 In this context, the present study addresses the following research questions, aligned with the  
167 configurational analysis proposed:

168 **RQ1:** Which configurations of sociodemographic, motivational, and consumption-related factors  
169 explain a high trend-driven willingness to try alcohol-free wines in Greece?

170 **RQ2:** How can these configurations provide preliminary insights for adaptation strategies for  
171 producers and actors within the wine value chain responding to this trend-influenced consumer trial?

172 These questions directly correspond to the results obtained through fsQCA and provide a clear  
173 empirical and theoretical contribution by identifying complex causal patterns that explain the trend-  
174 driven willingness to try and not to try alcohol-free wines in a Mediterranean market.

175

### 176 **3. MATERIAL AND METHODS**

#### 177 **3.1. Data**

178 Greece represents a clear example of the Mediterranean wine consumption model, where viticultural  
179 tradition has historically been strong. As in other Southern European countries, per capita wine  
180 consumption has steadily declined over recent decades, reflecting broader cultural shifts such as  
181 increased concern for health, growing interest in moderation, and new ways of relating to alcohol  
182 [1,2,27]. At the same time, interest in low- and no-alcohol beverages has been rising, particularly  
183 among younger consumers and those living in urban areas, in line with healthier lifestyle trends such  
184 as the sober curious movement [3,4,28,29]. From a production standpoint, recent OIV data show that  
185 Greece is facing a challenging period, with a significant drop in wine output in 2023 [30]. This  
186 scenario combines a strong cultural identity linked to traditional wine with a growing demand for  
187 alcohol-free alternatives, making the country a particularly interesting case for examining how  
188 personal, motivational, and cultural factors shape consumers' willingness to try alcohol-free wines.

189 Data for this study were collected through an online survey conducted between 26 May 2025 and 18  
190 July 2025. After data cleaning, we obtained 71 valid observations to evaluate the item "Propensity to  
191 consume based on Trends" (PTR) which serves as our outcome variable. The sample size obtained in  
192 this study ( $N = 71$ ) is appropriate for fsQCA, a methodology particularly useful for handling medium-  
193 sized samples where the goal is to uncover multiple situational causalities rather than net effects  
194 [31,32]. Furthermore, a sample of this size enhances the robustness of the findings by reducing the  
195 likelihood of "limited diversity"—a common problem in QCA studies with small samples—thus  
196 providing an appropriate basis for identifying necessary and sufficient conditions (33–35).

197 The sample was obtained through voluntary participation in an online survey disseminated through  
198 social networks and local community channels. While this recruitment strategy implies a potential  
199 self-selection bias, it is instrumentally valuable within a configurational framework; it facilitates the  
200 inclusion on engaged respondents with distinct viewpoints, which is particularly valuable for

201 identifying the asymmetric combinations of conditions that drive consumer behaviour. To provide a  
 202 clear overview of the respondent profile, Table 1 summarizing key sociodemographic characteristics  
 203 has been added.

204 Table 1. Descriptive profile of the respondents

| Variable                                        | Category / Metric                | Frequency<br>(n)          | Percentage<br>(%) |
|-------------------------------------------------|----------------------------------|---------------------------|-------------------|
| <b>Sociodemographic characteristics</b>         |                                  |                           |                   |
| <i>Age Groups</i>                               | Young adults (18–34 years)       | 26                        | 36.62%            |
|                                                 | Middle-aged adults (35–54 years) | 33                        | 46.48%            |
|                                                 | Older adults (age over 55 years) | 12                        | 16.90%            |
| <i>Gender</i>                                   | Female (1)                       | 35                        | 49.30%            |
|                                                 | Male (0)                         | 36                        | 50.70%            |
| <i>Education Level</i>                          | Secondary School                 | 1                         | 1.41%             |
|                                                 | High school                      | 1                         | 1.41%             |
|                                                 | Vocational training              | 5                         | 7.04%             |
|                                                 | University – Undergraduate-      | 7                         | 9.89%             |
|                                                 | University – Postgraduate-       | 57                        | 80.28%            |
| <b>Consumption habits and prior experiences</b> |                                  |                           |                   |
| <i>Non-alcoholic beverages consumption</i>      | Yes (1)                          | 48                        | 67.61%            |
|                                                 | No (0)                           | 23                        | 32.39%            |
|                                                 |                                  | <b>Mean</b>               | <b>SD</b>         |
| <b>Other influences</b>                         |                                  | <i>(Likert Scale 1–5)</i> |                   |
| <i>Health Orientation</i>                       |                                  | 2.73                      | 1.04              |

205

206 For descriptive and grouping purposes, age groups were classified following common demographic  
207 criteria in Mediterranean wine-consumption studies. Young adults were defined as respondents aged  
208 18–34 (n = 26), middle-aged adults as 35–54 (n = 33), and older adults as 55 or above (n = 12). This  
209 classification is consistent with the age distribution observed in the sample.

210 The antecedent conditions included personal characteristics (age, gender, and education level),  
211 consumption habits related to alcohol-free beverages, and factors such as price sensitivity and health  
212 orientation (Table 2). Following standard recommendations for intermediate-N designs [31],  
213 selecting six antecedent conditions ( $k = 6$ ) ensures a reasonable balance; it avoids overly complex  
214 property spaces, minimizes the risk of limited diversity, and preserves configuration clarity.

215 Table 2. Descriptions of variables

| Variable                                   | Symbols     | Definition                                                                                                                                                                 |
|--------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Outcome: Propensity to try based on Trends |             |                                                                                                                                                                            |
| Propensity based on Trends                 | <i>PTR</i>  | Item “ <i>To what extent do current trends influence your willingness to try alcohol-free wines?</i> ” (1-5)<br>5 (A lot), 4 (Quite a bit), 3 (Some), 2 (Little), 1 (None) |
| Antecedent conditions                      |             |                                                                                                                                                                            |
| Sociodemographic characteristics:          |             |                                                                                                                                                                            |
| Age                                        | <i>AGE</i>  |                                                                                                                                                                            |
| Gender                                     | <i>GNDR</i> | 0 male; 1 female                                                                                                                                                           |
| Education level                            | <i>EL</i>   | Item “ <i>Education level</i> ” (1-5)<br>5 (University -Postgraduate-), 4 (University -Undergraduate-), 3 (Vocational training), 2 (High school), 1 (Secondary school)     |
| Consumer habits and prior experience       |             |                                                                                                                                                                            |

|                                                       |            |                                                                                                 |
|-------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------|
| Non-Alcoholic Consumption (experience or willingness) | <i>NAC</i> | Item “ <i>Have you tried or are you willing to try non-alcoholic wine?</i> ”<br>1 (Yes), 0 (No) |
|-------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------|

---

**Other influences**

|        |           |                                                                                                                                                                 |
|--------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Health | <i>HE</i> | Item “ <i>To what extent does health influence your willingness to try non-alcoholic wines?</i> ”<br>5 (A lot), 4 (Quite a bit), 3 (Some), 2 (Little), 1 (None) |
| Price  | <i>PR</i> | Item “ <i>To what extent does price influence your willingness to try non-alcoholic wines?</i> ”<br>5 (A lot), 4 (Quite a bit), 3 (Some), 2 (Little), 1 (None)  |

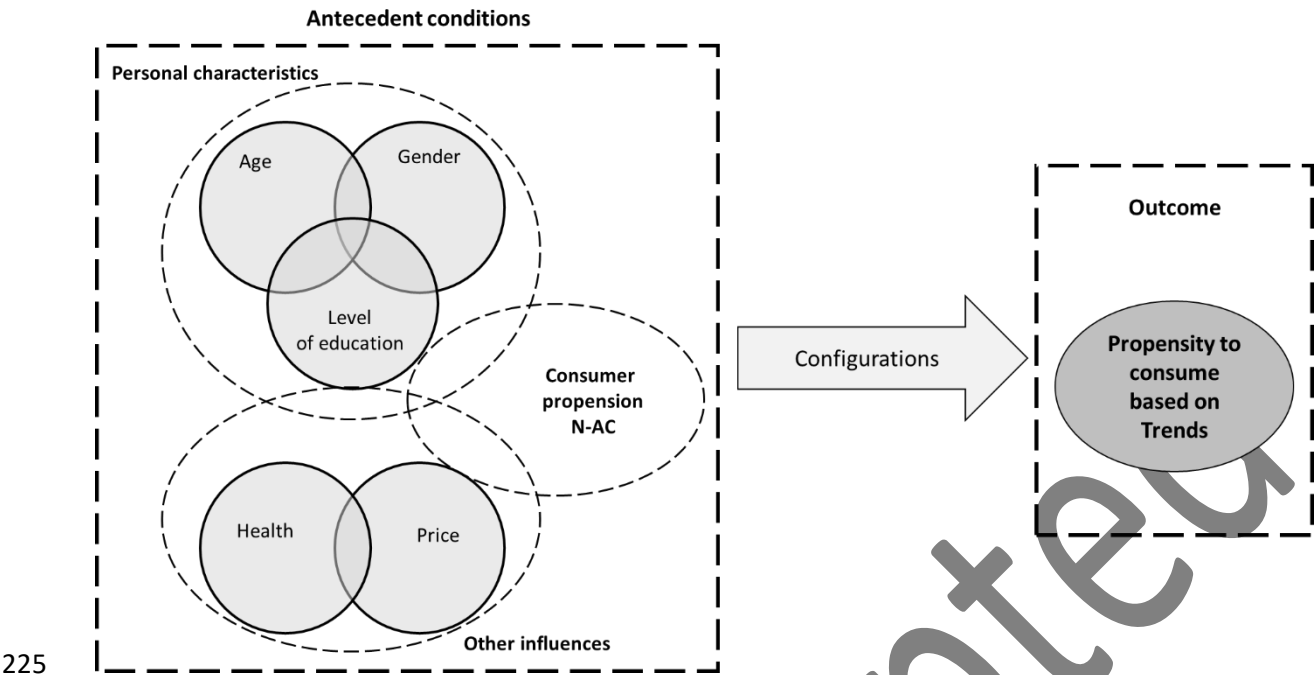
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216

217 It should be noted that NAC captures previous experience with alcohol-free beverages, whereas the  
218 outcome variable (PTR) captures trend-driven willingness to try alcohol-free wines. Although  
219 conceptually related, the constructs are not equivalent.

220 In line with the preceding discussion, the conceptual model developed for this study is presented in  
221 Figure 1. The objective is to apply a configurational approach [36] to assess how the antecedent  
222 conditions described above combine to account for a high trend-driven propensity to try alcohol-free  
223 wine.

224 Figure 1. Conceptual model



226

227 Consequently, this analysis serves as a preliminary exploration of the configurations that may lead to  
228 Propensity to try based on Trends (PTR), providing a foundation for further empirical validation.

229 In line with this methodological positioning, the identified configurations should be understood as  
230 exploratory patterns that are intrinsically linked to the specific context and sample of this study.  
231 Accordingly, they should not be interpreted as generalizable consumer typologies but rather as  
232 preliminary insights that warrant further empirical examination.

233 **3.2. Methodology**

234 To empirically identify the causal configurations of the antecedent conditions that predispose  
235 consumers to trend-driven alcohol-free wine consumption, this study employs fuzzy-set Qualitative  
236 Comparative Analysis (fsQCA) [37,38]. Unlike variance-based methods (such as regression or PLS-  
237 SEM), fsQCA assumes equifinality—that is, the existence of multiple configurations capable of  
238 producing the same outcome [39].

239 In the social sciences, most relationships are asymmetric: the same causal condition may lead to  
240 different effects depending on the presence or absence of other conditions [40]. For this reason,  
241 fsQCA enables the identification of necessary and sufficient conditions, as well as conditions that,  
242 while not sufficient on their own, form part of configurations that lead to the outcome. Accordingly,  
243 both a necessity analysis and a sufficiency analysis are conducted.

In addition, fsQCA transforms raw data into fuzzy sets (ranging from 0 to 1) through a calibration process. This process establishes three thresholds: full membership, full non-membership, and the crossover point. Following [40] we apply the direct method based on percentiles (95<sup>th</sup>–50<sup>th</sup>–5<sup>th</sup>). For each continuous and Likert-scale variable, the calibration anchors corresponding to full membership, crossover, and full non-membership were derived from the 95<sup>th</sup>, 50<sup>th</sup>, and 5<sup>th</sup> percentiles, respectively (Table 3). This percentile-based approach is appropriate given the absence of objective external benchmarks for the constructs analyzed, thereby anchoring the qualitative thresholds within the sample's specific distribution. Binary variables were treated as crisp sets, with 0 indicating full non-membership and 1 indicating full membership. In accordance with [36], a constant of 0.001 was added to all calibrated variables with values less than 1 to avoid cases with an exact fuzzy-set membership score of 0.5 [31].

Table 3. Calibration anchors for the direct calibration of fuzzy sets

|                                        | Full membership<br>(95 <sup>th</sup> percentile) | Crossover<br>(50 <sup>th</sup> percentile) | Full non-<br>membership<br>(5 <sup>th</sup> percentile) |
|----------------------------------------|--------------------------------------------------|--------------------------------------------|---------------------------------------------------------|
| Age                                    | 64.5                                             | 34.0                                       | 22.5                                                    |
| Education Level                        | 5.0                                              | 5.0                                        | 3.0                                                     |
| Non-alcoholic beverages<br>consumption | 5.0                                              | 2.0                                        | 1.0                                                     |
| Price                                  | 4.0                                              | 2.0                                        | 1.0                                                     |
| Health                                 | 5.0                                              | 2.0                                        | 2.0                                                     |
| Propensity based on Trends             | 3.5                                              | 2.0                                        | 1.0                                                     |

Following the calibration process, the truth table analysis was conducted to assess the logical sufficiency of the antecedent combinations. The criteria for filtering the truth table (frequency, consistency, and PRI thresholds) are detailed at the beginning of the Analysis of Sufficiency section to contextualize the minimization process.

Once the data are calibrated, a truth table is constructed, displaying all possible combinations of causal conditions along with their consistency index (41). This index is calculated as:

$$Consistency(X_i \leq Y_i) = \frac{\sum(min(X_i, Y_i))}{\sum X_i}$$

where  $X_i$  represents the membership score in a given combination of conditions and  $Y_i$  the membership score in the outcome.

266 In general, values above 0.8 indicate sufficient conditions; in this study, we set the threshold at 0.85.  
 267 The truth table also reports the number of cases explained by each configuration (frequency). For  
 268 small- to medium-sized samples, a minimum of two cases is recommended [31,36]. Configurations  
 269 that do not meet the consistency and frequency thresholds are excluded from the analysis.

270 Based on the truth table, three types of solutions are obtained: complex, intermediate, and  
 271 parsimonious. The intermediate solution is selected due to its stronger explanatory power and is  
 272 combined with the parsimonious solution to distinguish core conditions (present in both) from  
 273 peripheral conditions (present only in the intermediate solution).

274 In addition to consistency, coverage is calculated to assess the empirical relevance of each  
 275 configuration [31,39]. Coverage is computed as:

$$276 \quad \text{Coverage } (X_i \leq Y_i) = \frac{\sum(\min(X_i, Y_i))}{\sum Y_i}$$

277 Configurations with consistency above 0.74 and coverage between 0.25 and 0.65 can be considered  
 278 informative or valid [31,39].

279 The methodological procedures were carried out using the open-source software fsQCA 4.0  
 280 developed by [42].

## 281 4. RESULTS

### 282 4.1. Contrarian case analysis

283 Before proceeding with the necessity and sufficiency analyses, it is advisable to conduct a contrarian  
 284 case analysis. This approach helps identify asymmetric associations, which contrast with those  
 285 typically represented by regression models. Performing this analysis reinforces the need for a  
 286 configurational perspective; however, in the case of our study, it is not possible to identify main  
 287 effects, as the literature reports contradictory effects between the antecedent conditions and the  
 288 outcome variable.

### 289 4.2. Analysis of Necessary Conditions

290 Before conducting the sufficiency analysis, we first examined whether any antecedent condition could  
 291 be considered necessary for the presence of the outcome and/or for its absence (Table 4).

292 Table 4. Necessary conditions analysis

| PTR         |          | ~PTR        |          |
|-------------|----------|-------------|----------|
| Consistency | Coverage | Consistency | Coverage |

|              |        |        |        |        |
|--------------|--------|--------|--------|--------|
| <i>Age</i>   | 0.6256 | 0.5730 | 0.6574 | 0.7260 |
| <i>~Age</i>  | 0.7008 | 0.6291 | 0.6134 | 0.6640 |
| <i>Gndr</i>  | 0.5588 | 0.5139 | 0.4384 | 0.4861 |
| <i>~Gndr</i> | 0.4412 | 0.3945 | 0.5616 | 0.6055 |
| <i>EL</i>    | 0.6894 | 0.7365 | 0.6512 | 0.8389 |
| <i>~EL</i>   | 0.8492 | 0.6687 | 0.7954 | 0.7554 |
| <i>NAC</i>   | 0.8405 | 0.5636 | 0.5397 | 0.4364 |
| <i>~NAC</i>  | 0.1595 | 0.2232 | 0.4603 | 0.7768 |
| <i>HE</i>    | 0.8266 | 0.5969 | 0.8474 | 0.7380 |
| <i>~HE</i>   | 0.6372 | 0.7759 | 0.5372 | 0.7888 |
| <i>PR</i>    | 0.7823 | 0.7475 | 0.5063 | 0.5834 |
| <i>~PR</i>   | 0.5640 | 0.4865 | 0.7809 | 0.8122 |

293 *Abbreviations: PTR, Propensity based on Trends; AGE age; GNDR gender; EL, education level;*  
294 *NAC, non-alcoholic consumption (experience or willingness); HE, health; PR, price.*

295

296 The analysis of the six causal conditions and their negations shows that none of them exceeds the  
297 reference consistency threshold of 0.90 [31]. Therefore, none of the variables can be considered  
298 necessary. The closest condition is low education level (*~EL*, consistency = .8492), which indicates  
299 that it is frequent but not necessary. Likewise, no condition stands out sufficiently to be classified as  
300 quasi-necessary under the 0.90 threshold [43].

### 301 4.3. Analysis of Sufficient Conditions

302 For this analysis, a frequency threshold of two cases was established, which is appropriate for the  
303 sample size and ensures that more than 80% of observations are retained [41]. Although consistency  
304 thresholds may be lower in fuzzy-set analyses, we set the minimum consistency level at 0.85 [36,40].  
305 In addition, to reduce inconsistency and avoid simultaneous subset relations between configurations  
306 and the outcome, we applied the Proportional Reduction in Inconsistency (PRI) measure, requiring  
307 PRI scores to exceed 0.6 and adjusting for noticeable “jumps” in this value [44]. Consequently,  
308 configurations meeting these frequency, consistency, and PRI thresholds were retained for logical  
309 minimization, while those falling below these empirical cut-offs were excluded as logical remainders.

310 Table 5 presents the results using the notion proposed by [36]. Black circles (●) indicate the presence  
311 of a condition, circles with an x (⊗) indicate its absence, and blank spaces denote conditions that are  
312 irrelevant in that configuration. Large circles represent core conditions, while small circles represent  
313 peripheral ones. As recommended, we report the coverage and consistency values for each

314 configuration as well as for the overall solution. As shown, the global solution exhibits satisfactory  
 315 consistency (0.8980) and coverage (0.6432).

316 Table 5. fsQCA findings High PTR

| PTR = f(age, gender, education level, NAC, health, price) |       |       |       |       |
|-----------------------------------------------------------|-------|-------|-------|-------|
|                                                           | C1    | C2    | C3    | C4    |
| <i>AGE</i>                                                |       |       | ⊗     | •     |
| <i>GNDR</i>                                               |       | •     | ⊗     | •     |
| <i>EL</i>                                                 | •     |       | •     | •     |
| <i>NAC</i>                                                | •     | •     |       | •     |
| <i>HE</i>                                                 | •     | •     | •     | •     |
| <i>PR</i>                                                 | •     | •     | •     |       |
| Raw coverage                                              | .4653 | .3362 | .2078 | .2459 |
| Unique coverage                                           | .0572 | .0728 | .0631 | .0420 |
| Consistency                                               | .9432 | .8511 | .9487 | .9461 |
| <i>Overall solution:</i>                                  |       |       |       |       |
| <i>Coverage</i>                                           | .6432 |       |       |       |
| <i>Consistency</i>                                        | .8980 |       |       |       |

317 *Abbreviations: PTR, Propensity based on Trends; AGE age; GNDR gender; EL, education level;*  
 318 *NAC, non-alcoholic consumption (experience or willingness); HE, health; PR, price.*

319 On the other hand, complexity theory (the foundation of the methodological approach applied here)  
 320 holds that the configurations explaining the presence of an outcome (in our case, high PTR) are  
 321 generally different from those explaining its absence or negation [36]. For this reason, it is considered  
 322 good practice to analyze both separately [44].

323 The results for the negation of the outcome are presented in Table 6. As can be observed, the  
 324 configurations obtained are not simply the opposite of those explaining high PTR. These findings are  
 325 consistent with the principle of causal asymmetry.

326 Table 5. fsQCA findings High ~PTR

| ~PTR = f(age, gender, education level, NAC, health, price) |    |    |    |
|------------------------------------------------------------|----|----|----|
|                                                            | C1 | C2 | C3 |
| <i>AGE</i>                                                 | ⊗  | •  | •  |
| <i>GNDR</i>                                                | ⊗  |    | ⊗  |
| <i>EL</i>                                                  |    | •  | •  |

|                          |       |       |       |
|--------------------------|-------|-------|-------|
| <i>NAC</i>               | ⊗     | ⊗     | ⊗     |
| <i>HE</i>                | •     | •     | •     |
| <i>PR</i>                | ⊗     | ⊗     |       |
| Raw coverage             | .1672 | .1970 | .1692 |
| Unique coverage          | .0627 | .0379 | .0100 |
| Consistency              | .9453 | .9873 | .9849 |
| <i>Overall solution:</i> |       |       |       |
| <i>Coverage</i>          | .2697 |       |       |
| <i>Consistency</i>       | .9646 |       |       |

327 *Abbreviations: PTR, Propensity based on Trends; AGE age; GNDR gender; EL, education level;*  
328 *NAC, non-alcoholic consumption (experience or willingness); HE, health; PR, price.*

329

330 An examination of the previous tables also shows that the same antecedent condition can be  
331 associated with both high and low levels of propensity to consume based on trends (PTR) through  
332 different configurations, which is consistent with the principle of asymmetry.

333

#### 334 4.4. Robustness test

335 As a final step, we assess the robustness of the configurational model. In fsQCA, several strategies  
336 can be used for validation, such as modifying the calibration anchors, adjusting the frequency  
337 threshold, or changing the consistency cutoff [44]. The objective is to evaluate whether slight  
338 variations in these parameters lead to similar conclusions regarding necessity and sufficiency [43].

339 In this regard, two sensitivity analyses were conducted to assess the stability of the configurational  
340 solution. First, the model's sensitivity was tested by increasing the frequency threshold from 2 to 3  
341 cases. The resulting configurations for high PRT are detailed in Table 7. The resulting configurations  
342 were largely comparable to those obtained in the main analysis, suggesting that the solution is stable  
343 under this alternative specification. Second, the consistency threshold was raised from 0.85 to 0.90.  
344 This stricter parameter yielded highly stable and consistent results: configurations C1, C3, and C4  
345 remained completely identical to the initial model. Meanwhile, configuration C2 experienced a minor  
346 adjustment, shifting from GNDR\*NAC\*HE\*PR to ~AGE\*GNDR\*NAC\*HE\*PR, thereby adding  
347 low age as an additional condition. This high stability across different frequency and consistency  
348 thresholds confirms that the main findings are robust and independent of specific threshold selections.  
349 Overall, these sensitivity analyses indicate that the main configurational patterns remain stable across  
350 alternative frequency and consistency thresholds.

351 Table 7. Robustness test (fsQCA findings High PTR)

|                          | C1    | C2    | C3    |
|--------------------------|-------|-------|-------|
| <i>AGE</i>               |       | ⊗     | •     |
| <i>GNDR</i>              |       | •     | •     |
| <i>EL</i>                | •     |       | •     |
| <i>NAC</i>               | •     | •     | •     |
| <i>HE</i>                | •     | •     | •     |
| <i>PR</i>                | •     | •     |       |
| Raw coverage             | .4653 | .2465 | .2459 |
| Unique coverage          | .2019 | .0590 | .0420 |
| Consistency              | .9432 | .9917 | .9461 |
| <i>Overall solution:</i> |       |       |       |
| <i>Coverage</i>          | .5664 |       |       |
| <i>Consistency</i>       | .9529 |       |       |

352 *Abbreviations: PTR, Propensity based on Trends; AGE age; GNDR gender; EL, education level;*  
353 *NAC, non-alcoholic consumption (experience or willingness); HE, health; PR, price.*

354

355 **5. DISCUSSION**

356 **5.1. Discussion of Configurations**

357 The findings from the sufficiency analysis suggest that a high propensity to try alcohol-free wines  
358 (PTR) is not a one-dimensional phenomenon but rather the result of complex configurations of  
359 demographic, socioeconomic, and attitudinal factors.

360 Given the exploratory nature of the study and the size of the sample, these configurations should not  
361 be interpreted as definitive consumer segments but rather as preliminary patterns within this specific  
362 context.

363 Among the variables examined, health orientation (HE) appears as a present condition in all  
364 configurations (C1–C4), which represent the sufficient combinations of conditions identified through  
365 fsQCA. This result aligns with studies highlighting the growing role of health motivations in reducing  
366 alcohol consumption and in the search for more moderate alternatives [15–20,23]. However, the  
367 presence of health orientation in configurations associated with both high and low PTR indicates that  
368 its effect is configurational rather than universal, depending on its interaction with other antecedent  
369 conditions. Rather than acting independently, health orientation combines with other factors,  
370 particularly education level, initial predisposition, and price sensitivity.

371 Health becomes relevant among consumers with higher education levels (EL, present in C1, C3, and  
372 C4). This suggests that understanding the benefits of alcohol-free wine requires an informed  
373 consumer who recognizes the added value of the product, has greater critical capacity, and is more  
374 oriented toward healthy behaviors—consistent with evidence linking education to moderation and  
375 well-being [16]. In three configurations (C1, C2, and C4), health must combine with prior disposition  
376 or experience with alcohol-free wine (NAC). Although NAC captures previous experience with  
377 alcohol-free beverages, whereas PTR refers specifically to trend-driven willingness to try alcohol-  
378 free wines, the two constructs are conceptually related. Accordingly, the presence of NAC in these  
379 configurations should be interpreted as one component of a broader configurational pattern rather  
380 than as a fully independent antecedent. Within this context, the findings suggest that health-based  
381 campaigns may be more effective when consumers have already overcome the initial barrier of trying  
382 the product. Finally, price sensitivity (PR)—present in C1, C2, and C3—indicates that health  
383 arguments are insufficient unless accompanied by a price proposition perceived as acceptable. This  
384 is consistent with literature identifying price sensitivity as a relevant barrier to the willingness to try  
385 alcohol-free wines, particularly in markets where the added value is not yet fully internalized [11,12].

386 The analysis of the configurations reveals several distinct patterns associated with high PTR. The first  
387 configuration (C1), which has the greatest empirical weight, is characterized by health orientation  
388 together with education level and price sensitivity. In this configuration, neither gender nor age  
389 determines the outcome, indicating that the key characteristics are not tied to personal demographics.  
390 The second configuration (C2) is characterized by female gender, prior experience with alcohol-free  
391 beverages—reinforcing the role of health habits—and price sensitive.

392 Taken together, configurations C1 and C2 suggest an archetype of rational consumer who, regardless  
393 of age, is motivated by healthy lifestyle habits (NAC and HE) and price sensitivity. Across these two  
394 configurations, a configurational substitution pattern emerges between education and gender,  
395 whereby either higher educational attainment or female gender forms part of the sufficient  
396 combination of conditions associated with high PTR.

397 Configuration C3 is characterized by the combination of young age, higher education, male gender,  
398 and price sensitivity, regardless of prior experience. In contrast, while young consumers (C3) and  
399 rational consumers (C1, C2) incorporate price into their decision-making, senior educated women  
400 (C4) evaluate accumulated benefits: the consumption of healthier beverages is a consolidated lifestyle  
401 choice (supported by prior experience), where gratification and health fully justify the investment,  
402 making price an irrelevant factor.

## 403 5.2. Theoretical Contributions

404 This study suggests that the trend-driven willingness to try alcohol-free wines in a Mediterranean  
405 context does not depend on isolated factors but on specific combinations of health orientation,  
406 education, prior experience, and price sensitivity. By applying fsQCA in Greece, the study illustrates  
407 the principles of equifinality and causal asymmetry in the willingness to try alcohol-free beverages—  
408 phenomena that the literature had suggested but had not yet examined empirically. Furthermore, the  
409 findings suggest that the cultural and sensory barriers described in previous studies may become less  
410 influential when combined with higher education or prior experience.

### 411 **5.3. Practical Implications**

412 These implications should be interpreted cautiously, as they derive from an exploratory and context-  
413 specific analysis rather than from generalizable consumer segments. The configurational patterns  
414 identified in this study provide preliminary insights that may help inform marketing and  
415 communication strategies. For example, configurations characterized by health orientation, education,  
416 and price sensitivity suggest that clear communication of health benefits and perceived value may be  
417 particularly relevant. Configurations involving younger consumers indicate that price considerations  
418 may play a more prominent role, whereas configurations including older women with prior  
419 experience suggest that continuity with healthy lifestyle choice may be an important consideration.  
420 These findings also suggest that encouraging initial product trial may help reduce cultural and sensory  
421 barriers identified in previous research. Finally, the results also reinforce the importance of  
422 communicating the added value of alcohol-free wine, as within the present sample consumers  
423 (Mediterranean consumers) appeared more willing to accept higher prices when they clearly perceive  
424 this value.

### 425 **5.4. Potential Implications for Wine Value Chain**

426 Given the exploratory nature of this study, the following considerations should be regarded as  
427 preliminary insights rather than broad strategic recommendations. The configurational patterns  
428 identified suggest several potential implications for stakeholders in the wine value chain:

- 429 • **Consumer orientation:** The identified configurations suggest that health orientation, price  
430 sensibility, and prior experience may be useful considerations when designing marketing  
431 initiatives, alongside traditional demographic characteristics.
- 432 • **Product innovation:** The relevance of prior experience across several configurations  
433 suggests that sensory of alcohol-free wines through advances in dealcoholization technologies  
434 may contribute to increasing consumer acceptance.
- 435 • **Marketing communication:** The findings indicate that communication strategies may  
436 benefit from emphasizing different product attributes depending on the combination of

conditions observed, while taking into account the cultural context Mediterranean cultural consumption.

- **Portfolio diversification:** The results suggest that alcohol-free wines should be integrated as a complement to traditional wine, expanding consumption occasions and reducing dependence on the conventional market.

Taken together, the configurational patterns identified in this study provide preliminary insights into how wineries and other stakeholders might approach the development and marketing of alcohol-free beverages within contexts similar to the one examined.

### 5.5. Potential Implications for Producers and Policymakers

Within the limitations of the present study, the findings suggest several practical considerations for producers, distributors, and policymakers.

For producers, the configurational patterns identified suggest that investment in dealcoholization technologies, improvements in sensory quality, and communication strategies that clearly convey the value of alcohol-free wines may support consumers acceptance. The findings indicate that encouraging initial product trial could help reduce some of the cultural and sensory barriers discussed in previous research.

For distributors, the results suggest that increasing the visibility and availability of alcohol-free wines in channels frequented by health-oriented consumers and younger adults may contribute to greater consumer exposure and trial.

For policymakers, the findings provide preliminary support for initiatives aimed at encouraging technological innovation, sector diversification, and promoting campaigns on moderate consumption and alcohol-free alternatives. However, these implications should be interpreted with caution and would benefit from further validation using broader and more representative samples

## 6. CONCLUSIONS

This study examines the trend-driven willingness to try alcohol-free wines among Cretan consumers in a Mediterranean context where traditional wine consumption has been declining for decades and interest in healthier alternatives is increasing. Using a configurational approach through fsQCA, the results suggest that this willingness does not depend on a single factor but on specific combinations of personal characteristics, motivations, and prior experience.

Regarding RQ1, the results identify several configurations that explain a high trend-driven willingness to try alcohol-free wines. Health orientation emerges as a central element across all

469 configurations, combining with factors such as education level, prior experience with alcohol-free  
470 products, and price sensitivity. These configurations represent distinct patterns observed within the  
471 study sample rather than generalizable consumer profiles, including combinations characterized by  
472 health orientation, price-sensitive among younger adults, and prior experience among senior women.

473 Regarding RQ2, the configurations identified provide preliminary insights for actors in the wine value  
474 chain. Within the context of the present study, the findings suggest that health-based messages may  
475 be more effective among consumers with prior experience, that younger consumers appear to respond  
476 more strongly to price considerations, and that certain older segments value familiarity with the  
477 product over cost. These findings may help inform communication strategies, consumer education  
478 initiatives, and appropriate pricing strategies to facilitate the trend-driven willingness to try alcohol-  
479 free wines.

480 The study has several limitations. To begin with, the sample size and focus are limited to a single  
481 Mediterranean island, so the results should be approached with caution. Furthermore, consistent with  
482 the exploratory nature of fsQCA, the identified configurations should be interpreted as context-  
483 specific patterns rather than generalizable consumer typologies. Additionally, the NAC variable  
484 combines previous experience with willingness to try alcohol-free wine, which may partially overlap  
485 conceptually with the outcome. This limitation is acknowledged and should be addressed in future  
486 studies through refined operationalizations. Future research could extend the analysis to other  
487 countries, incorporate sensory variables, or examine how these patterns evolve as the market  
488 continues to grow.

489

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