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Self-Identified Natural Wine Producers in Hungary: An Exploratory Survey of Producer Characteristics and Motivations

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Abstract

Natural wines are produced with minimal or no additives, utilizing organic cultivation methods and emphasizing the high-quality and unique characteristics of terroir. In the last decade, natural wines have received considerable attention; however, the number of scientific publications analyzing their supply side is limited. This paper aims to explore the characteristics of natural wine production and the motivations of Hungarian winemakers. The analysis is based on an online survey conducted among Hungarian wine producers (n = 88), including 45 respondents who reported producing natural wine. Descriptive statistics and probit regression were applied to compare natural and conventional producers and to identify factors associated with natural wine production. Within the surveyed sample, respondents who reported producing natural wine generally operated smaller vineyards and reported lower turnover than conventional ones. The highest-rated reported motivations were personal conviction, a desire to personally consume natural wines, the intention to create an alternative to standardized, technologically produced wines, and a willingness to try something new. Natural wine producers also evaluate natural wines more positively in terms of desirability, perceived healthiness, and taste. The findings indicate that natural wine production is primarily associated with smaller-scale production, stronger ecological orientation, and value-based motivations.

Keywords: wine; viticulture; natural wines; motivation of winemakers; sustainable practices

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1. Introduction

Natural wine has attracted increasing attention from consumer, industry, and scholars in recent years, reflecting its emergence as a contested yet growing niche within sustainable and low-intervention wine production [1–3]. Natural wine is generally associated with organic or biodynamic grape production, the avoidance of most oenological additives, and minimal intervention during the winemaking process [4–6]. The definition of natural wine is contested, though it generally involves using organic or biodynamic grapes, excluding oenological additives, and minimizing intervention [6,7]. Natural wines have

been produced for decades; however, their popularity has surged in recent years [8,9]. The contemporary natural wine movement is often traced back to earlier low-intervention and anti-industrial winemaking practices, while its wider public visibility has increased substantially since the early 2000s and especially following the introduction of the 'Vin Méthode Nature' designation in France in 2020 [1,10,11].

Furthermore, market trends indicate that natural winemaking is capturing an increasing share of Millennial consumers, especially in the European Union [12]. Recent studies confirm that consumer interest in natural, organic, sustainable, and low-intervention wines is closely linked to perceptions of authenticity, environmental responsibility, health-related expectations, and willingness to pay for production attributes associated with naturalness [2,13–15]. In France, the "Vin Méthode Nature" designation was introduced as a framework for wines produced in accordance with specified natural winemaking principles [10]. However, this designation should not be interpreted as establishing a uniform statutory category of "natural wine" in France or at the EU level. Today, the consumption of natural wines has increased among discerning and responsible consumers [13,14]. In turn, scientific contributions addressing this topic are relatively scarce. Alonso González and Parga-Dans [16] and Alonso González, Parga Dans and Fuentes Fernández [10] argue that natural wine is a controversial topic in the literature due to the absence of a coherent definition and EU-level regulation. This has resulted in the accumulation of diverse norms and standards proposed by various national wine associations, contributing to national-level concepts [10,11,15]. This definitional ambiguity is not only a regulatory problem but also an analytical challenge, because producers, consumers, experts, and certifying bodies may attach different meanings to the same label of "natural wine" [1,2,17].

According to Martínez-Falcó et al. [18], the trade-off between competitive advantage and sustainability in the wine industry is essential for enhancing resilience and growth. This argument is supported by recent works showing that sustainability has become a central strategic issue in the wine sector, involving environmental performance, climate adaptation, vineyard inputs, packaging, innovation, and the economic viability of wine businesses [19–22]. The most contemporary topics driving research in this area include sustainable innovation, wine tourism, carbon footprint management, and adapting dynamic capabilities to address climate change. Chen et al. [23] examined pro-environmental behaviour and the role of gratitude. Their analysis revealed that inducing gratitude (a self-transcendent positive emotion) promotes an individual's emotional connection to nature. The research demonstrated that self-transcending positive emotions and a connection to nature increase the willingness to participate in environmental protection and make sacrifices for the environment. It is relevant for natural wine research because natural winemaking is frequently framed not only as a production technique but also as a value-based orientation towards soil, grapes, fermentation, terroir, and the wider natural environment [4,24].

Research comparing natural wines and conventional wines highlighted inherent differences in production methods and perceived quality. Ballester, Belascoin, Gonzalez-Hernandez, Parga-Dans, González and Sáenz-Navajas [7] investigated comparative sensory perceptions of red natural wines in Spain and France. They found that experts generally perceived natural wines as lower quality than conventional wines, regardless of whether they were informed of the production method or their cultural background (e.g., Spanish vs. French). Findings showed that natural wines had significantly higher volatile acidity and turbidity (cloudiness or haziness caused by suspended particles, such as yeast, proteins, or grape solids), coupled with lower total and free Sulphur dioxide (SO_2) content. However, the investigation notes that 55% of the natural wines showed no faults, indicating the technical feasibility of producing high-quality wines using natural methods. The concept

of naturalness is frequently discussed in connection with sustainability; however, natural wine production and sustainable wine production should not be treated as equivalent concepts [6,19]. Environmental sustainability in the wine sector depends on multiple dimensions, including vineyard inputs, energy and water use, waste management, greenhouse gas emissions, and certification or production standards, which may vary considerably among producers [19,21]. For example, Wei et al. [6] emphasize that sustainability extends beyond natural or organic production to encompass economic profitability, social equity, culture, and landscape.

Despite this expanding body of research, the literature on natural wine remains strongly oriented towards consumers, sensory perception, willingness to pay, certification, and definitional controversies. Previous studies have examined why consumers drink natural wine, how naturalness affects wine choice, and how consumers evaluate natural wine attributes (see, e.g., [2,13,14,25,26]). Similar consumer-oriented approaches have also been applied in Central European beverage research [27–29], including studies on traditional spirits showing that origin-linked attributes, geographical indications, ethnocentrism, and production methods can shape consumer preferences. This further indicates that beverage-related research in the region has tended to focus more on consumer preferences and product attributes than on producer characteristics and motivations. By contrast, the supply side of natural wine production has received less empirical attention, especially regarding the socio-economic characteristics of producers and the motivations that lead winemakers to adopt natural wine practices. Recent producer-oriented studies show that winemakers' attitudes, ecological awareness, farm structure, and pre-existing beliefs may play an important role in natural wine production. Still, the available evidence remains geographically limited and concentrated mainly in Western and Southern European wine contexts [3,17]. Moreover, studies on sustainable and organic wine consumption in different European and non-European contexts further confirm that consumer-side research remains much more developed than producer-side research [30–33]. This creates a clear research gap: little is known about who produces natural wine in Central and Eastern Europe, how these producers differ from conventional winemakers, and whether their motivations are primarily market-driven, value-driven, or environmentally oriented.

Based on the above, Hungary provides a relevant case for addressing this gap. It has a long-established wine culture and diverse wine regions [34–36], though the academic literature provides limited evidence on the emergence and characteristics of natural wine production in Hungary. Examining Hungarian winemakers can therefore extend the current literature beyond the dominant consumer focus and beyond the better-studied Western European cases. Thus, the paper addresses the following research question: What are the differences in producer characteristics between self-identified natural and conventional winemakers in Hungary? What motivations do self-identified natural wine producers report for engaging in natural wine production? The first question examines differences in structural characteristics. The second question focuses on the motivations, beliefs, and values reported by self-identified natural wine producers regarding their engagement in natural wine production.

The contribution of this study is therefore threefold. First, it provides empirical evidence on the supply side of natural wine production in Hungary, a context that has received limited scholarly attention. Second, it compares natural and conventional winemakers in terms of structural characteristics, including vineyard size and turnover. Third, it examines the motivations reported by self-identified natural wine producers and assesses whether vineyard size and producers' relation to nature are associated with self-reported natural wine production. In doing so, the study contributes to the literature on sustainable and low-

intervention wine production by linking producer characteristics with motivation-based explanations of adoption.

2. Methodology and Data

2.1. Survey Design and Data Collection

The research applied a quantitative, survey-based approach to explore the characteristics and motivational factors of Hungarian natural winemakers. A specific survey was designed to investigate the main attributes of wine production, with a focus on natural wines in Hungary. Data were collected via an online questionnaire primarily designed to capture the structural characteristics and motivational factors of Hungarian winemakers. The survey was distributed between June and August 2023 using a purposive sampling strategy. The survey was available from 1 June to 31 August. Contact information for winemakers was compiled from publicly available winery registers, producer associations, natural-wine networks, and professional mailing lists. The survey was distributed to all relevant natural wine producers identified in Hungary, and the authors collected sectoral contacts. More than 500 winemakers received the survey link via email, including all identified natural wine producers in Hungary. Participation in the survey was entirely voluntary, and no financial incentives were offered.

Respondents completed the survey anonymously; no personally identifiable information beyond general demographic data (age, education level, vineyard size) was collected. This approach ensured that the dataset focused exclusively on production-related attributes relevant to the research questions. Prior to completing the questionnaire, respondents were informed about the purpose of the research, the voluntary nature of their participation, and the use of aggregated data for academic analysis. Consent was implied through survey submission. Data were stored securely, accessible only to the researcher, and processed in accordance with applicable data-protection standards. The analysis does not involve sensitive personal data and presents results only in an aggregated, non-identifiable form.

2.2. Variables and Sample Characteristics

The questionnaire included open-ended numeric, binary, categorical, 5-point Likert-type, and 1–7 pictorial-scale items. Winemakers' motivations were measured on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The motivational items formed part of the broader cross-country questionnaire reported by Dubois et al. [3]. The questionnaire was developed following preliminary research, including interviews with natural wine producers conducted at local and international wine fairs. These exploratory items were included to capture a broad range of potentially relevant intrinsic and extrinsic motivations, including environmental and personal conviction, perceived product quality, personal consumption preferences, differentiation from standardized wine production, innovation, market opportunities, export orientation, and owners' or shareholders' interests. These motivation items were used descriptively and were not intended to represent a validated latent construct.

The dependent variable was based on respondents' self-reported production status and was coded as 1 if they declared producing natural wine and 0 otherwise. Thus, the study refers to these respondents as self-identified natural wine producers. Of the 88 respondents, 45 self-identified as natural wine producers, while 43 reported producing only conventional wines. The survey targeted both natural and conventional wine producers to compare structural characteristics and examine factors associated with natural wine production.

Regarding the overall composition of the sample, the ages of these winemakers range from 25 to 79 years, with an average of 50 years. The oldest winemaker was born in 1944, and the youngest in 1998. In total (88), 17% of the winemakers were female (15), while 83%

male (73). The vineyard size across the entire sample varied from 1 to 100 hectares, with an average of 13.82 hectares (Table 1). The variable capturing the relationship to nature is measured on a 1–7 scale using a picture that best describes winemakers' relationship with the natural environment, adapted from Schmuck and Schultz [37] and Chen at el. [23].

Table 1. Summary statistics of all wine producers included in the sample.

Description of Variables	Observation	Mean	Std. Dev.	Min	Max
Natural wine producers	88	0.51	0.50	0	1
Age of producers	88	50.27	13.89	25	79
Year of birth of the winemaker	88	1972	13.89	1944	1998
Relation to nature	88	5.21	1.198	1	7
Size of vineyards in hectares	88	13.82	21.26	1	100
Turnover expressed in EUR in 2022	88	14,481	38,000	0	250,000

Source: own composition based on sample data. Annual turnover was originally reported by respondents in Hungarian forints (HUF). For comparability and presentation, turnover values were converted to euros (EUR) using an exchange rate of 400 HUF/EUR.

Regarding education level (Table 2), 4.5% completed high school, and 12.5% completed vocational school. In turn, 30% obtained their bachelor's degree and 52% their master's degree.

Table 2. Level of education completed by the wine producers.

The Highest Level of Education Completed	Percent
High school	4.55
University, bachelor's degree	30.68
University, master's degree or above	52.27
Vocational school	12.50
Total	100

Source: own composition based on sample data.

2.3. Sampling and Dataset

The study applied a quantitative, survey-based research design to examine structural characteristics and motivational factors among self-identified natural wine producers in Hungary. Because no official register exists for natural wine producers, a purposive sampling strategy was used to reach relevant actors in the sector [38]. Contact information was compiled from publicly available winery registers, online data from wine shops, producer associations, natural wine networks, and professional mailing lists. More than 500 Hungarian winemakers received the survey link via email. The online questionnaire was available between 1 June and 31 August 2023. Participation was voluntary and anonymous. Respondents were informed about the purpose of the research, the use of aggregated data for academic analysis, and the absence of incentives. Submission of the questionnaire implied informed consent. No personally identifiable information beyond general demographic characteristics (age, education level, vineyard size) was collected. A total of 88 complete responses were received. Of these, 45 respondents self-identified as producing natural wine, either exclusively or alongside conventional wines. The remaining 43 respondents reported producing only conventional wines. The questionnaire consisted of five main blocks. All items were closed-ended and designed to allow quantitative analysis. The full structure is presented below (Appendix A). The questionnaire included binary, categorical, and Likert-type items to capture structural characteristics, attitudes, and motivational factors. Likert-type questions were used to

measure the degree of agreement with statements related to natural wine production, following the general logic of attitude measurement.

Descriptive statistics were first used to summarize the main characteristics of the sample and to compare natural and conventional wine producers in terms of vineyard size, turnover, attitudes, and motivational factors. To examine the factors associated with natural wine production, a probit regression model was estimated. The dependent variable was binary, identifying whether the respondent reported producing natural wine. The probit model was selected because it is suitable for modelling dichotomous outcome variables and estimating the probability of an event as a function of explanatory variables [39,40]. The explanatory variables included vineyard size and the respondent's self-reported relation to nature. Model performance was assessed using standard post-estimation diagnostics, including classification statistics and the receiver operating characteristic curve. All statistical analyses were conducted using Stata 19. The Hungarian data analyzed in this article are part of a larger cross-country survey of European wine producers reported in Dubois et al. [3]. The present study uses only the Hungarian subsample data and provides a country-specific analysis.

3. Results

As a result of the surveys, 45 answers were received from winemakers who produce natural wines (including those who produce only natural wines and those who produce both natural and non-natural wines). Among self-identified natural wine producers, most respondents reported having started natural wine production within the previous 20 years. Their vineyard size ranged from 1 to 58 hectares. In the full sample, vineyard size ranged from 1 to 100 hectares and 68% of winemakers had 10 ha or less of vineyards. In the case of natural winemakers, vineyards of 10 ha or less reached 80%. Figure 1 suggests that respondents who reported producing natural wine generally operate smaller vineyards than conventional producers.

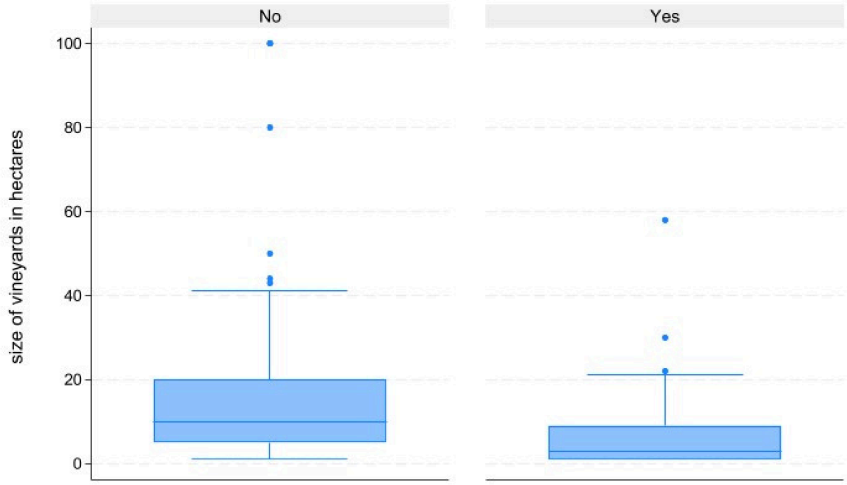

Figure 1. Differences in vineyard size between natural and conventional winemakers in Hungary. Note: Yes—Reports natural wine production, No—Does not report natural wine production. Source: own composition based on sample data.

Figure 2 illustrates the differences in turnover in 2022 between natural and conventional winemakers. Within the surveyed sample, conventional wine producers reported an average turnover of EUR 21,045, compared to EUR 8,073 for respondents who produced natural wine. This characteristic reveals the difference in economies of scale between the two producer groups.

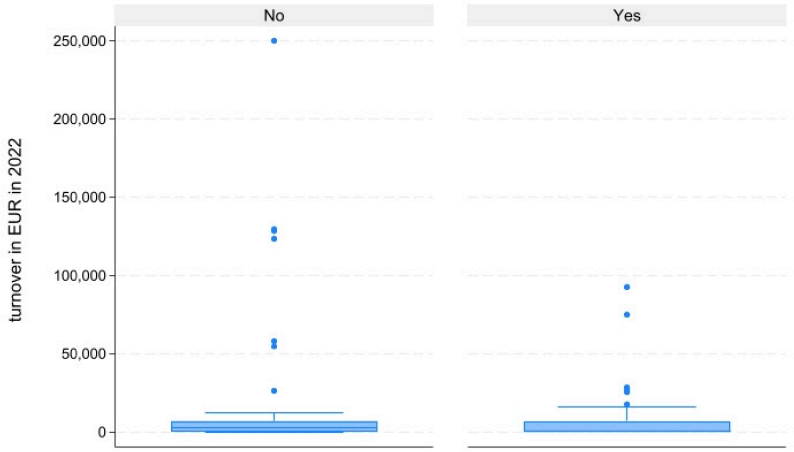

Figure 2. Differences in turnover between natural and conventional winemakers in Hungary. Note: Yes—Reports natural wine production, No—Does not report natural wine production. Source: own composition based on sample data.

Furthermore, to conduct a deeper analysis of winemakers' behaviour, additional survey questions were posed to determine the motivations behind winemakers' production of natural wine. Regarding the personal motivation behind natural wine production among winemakers (Table 3), the strongest motivations were personal conviction, the desire to drink natural wines, the intention to create an alternative to standardized and technologically produced wines, and the willingness to try something new, all of which had mean scores above 4 on the 1 to 5 point scale. Perceived higher quality of natural wine was also rated relatively positively, with a mean score of 3.58, but it was not among the four highest-ranked motivations. (In turn, improving market chances, developing the export market, or enhancing winery owners' or shareholders' interests were the lowest-rated reported motivations (these motivational factors averaged below 3 on a 1 to 5-point scale).

Table 3. Summary statistics for natural wine producers in Hungary.

Variable Description for Natural Wines	Observation	Mean	Std. Dev.	Min	Max
Personal conviction in the environment	45	4.49	1.10	1	5
Better market chances for the wines	45	2.82	1.30	1	5
Develop export markets	45	2.49	1.36	1	5
Higher quality of natural wine	45	3.58	1.34	1	5
Owner's or shareholders' interest	45	1.78	1.35	1	5
I also want to drink natural wines	45	4.11	1.47	1	5
To create an alternative to standardized and technological wines	45	4.24	1.03	1	5
To try doing something new	45	4.27	1.05	1	5
Size of vineyards in hectares	45	7.4	10.45	1	58
Turnover expressed in EUR in 2022	45	8073	18,901	0	92,750

Note: survey questions on motivations were measured on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree). Source: own composition based on sample data.

The differences in descriptive statistics in attitudes towards wine production between non-natural and natural wine producers are presented in Table 4. On a 1 to 5-point Likert scale, Hungarian natural wine producers have a higher mean score (4.20) for desirability of natural wines than non-natural producers (1.95), indicating a stronger positive attitude towards producing natural wines that are perceived as desirable. Natural wine producers also report a higher mean score for the perceived healthiness of natural wines (4.87) than non-natural producers (3.05), suggesting that natural wine producers perceive their

products as healthier. Furthermore, the sensitivity of good taste is higher among natural wine producers (4.29) compared to non-natural producers (2.65), indicating that natural wine producers believe their wines taste better than conventional wines. The mean score for encouragement by others is slightly higher for natural wine producers (2.33) than for non-natural producers (2.07), although the difference in mean scores is relatively small.

Table 4. Descriptive statistics comparing natural and non-natural winemakers in Hungary.

Variable	Non-Natural Wine Producers (n = 43)		Natural Wine Producers (n = 45)			
Description for Natural Wines	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Min**	**Max**
Desirable	1.95	1.11	4.20	1.36	1	5
Healthy	3.05	1.38	4.87	0.46	1	5
Good taste	2.65	1.23	4.29	1.08	1	5
Encouragement by others	2.07	1.08	2.33	1.48	1	5
Encouragement by friends	1.65	0.84	2.51	1.46	1	5
Have resources, time, and opportunities	2.60	1.51	4.44	0.62	1	5
Intention to produce natural wine	1.79	1.10				
Willingness to produce natural wine	1.79	1.10				

Note: Attitudes and perceptions toward natural wine were measured on a 5-point scale from 1 "strongly disagree" to 5 "strongly agree". Source: own composition based on sample data.

Natural wine producers receive more encouragement from their friends (2.51) than non-natural wine producers (1.65), suggesting a more supportive social environment for natural wine production. However, the mean scores are very low. In addition, natural wine producers reported more favourable perceived conditions in terms of resources, time, and opportunities (4.44) for producing such wines than non-natural producers (2.60), indicating a more favourable environment for pursuing natural wine production. Non-natural wine producers show a low mean score (1.79) for intention and willingness to produce natural wine, confirming their attitude towards natural wines. In summary, natural wine producers tend to exhibit a positive attitude towards natural wine production, particularly regarding desirability, health, and taste, compared to their non-natural counterparts.

A probit regression (Table 5) was estimated to examine factors associated with self-reported natural wine production among the surveyed winemakers. The analysis included vineyard size and the producer's self-reported relation to nature as explanatory variables. The estimations provide empirical support for the patterns identified in the descriptive statistics, demonstrating that structural characteristics and personal orientations differentiate Hungarian natural-wine producers from other winemakers. The results show that vineyard size is negatively associated with the likelihood of producing natural wine. This indicates that smaller vineyard size is associated with a higher probability of respondents reporting natural wine production. In contrast, the variable capturing a relation to nature shows a positive and statistically significant effect indicating that a stronger self-reported relation to nature is associated with a higher probability of reporting natural wine production. In contrast, producers' self-reported relationship to nature exhibits a significant positive association with natural-wine production. The model explains a meaningful share of variation, with a pseudo-R^2 of 0.148.

To provide interpretable effect sizes, average marginal effects (AMEs) and mean predicted probabilities (Table 6) were computed for the probit model variables to provide a probability-based interpretation of the probit model.

The average marginal effect for vineyard size is −0.007 (p = 0.025), indicating that each additional hectare of vineyard reduces the probability of producing natural wine by approximately 0.7 percentage points. This confirms that natural wine production in Hungary is concentrated among smaller producers. In contrast, the AME for relation to

nature is 0.123 (p = 0.003), revealing that a one-unit increase on the 1–7 ecological scale increases the probability of producing natural wine by 12.3 percentage points. These results indicate that vineyard size and self-reported relation to nature are statistically associated with natural wine production status in the surveyed sample.

Table 5. Probit estimates of factors associated with self-reported natural wine production among Hungarian winemakers.

Variables	Probit Natural_Wine
Size	−0.022 **
	(0.011)
Relation_to_nature	0.368 ***
	(0.142)
Constant	−1.634 **
	(0.789)
Pseudo R^2	0.148
χ^2 significance level (p value)	0.000
Observations	88

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$. Source: own composition based on sample data.

Table 6. Average marginal effects and mean predicted probabilities for the probit model.

Average Marginal Effect (Delta-Method)							
Variable	**Obs**	**dy/dx**	**Standard Error**	**z**	***p* > z**	**95% Confidence Interval**	
size	88	−0.007	0.003	−2.24	0.025	−0.014	−0.001
relation_to_nature	88	0.123	0.042	2.96	0.003	0.042	0.205
Mean predicted probability							
Variable		**Mean**	**Standard deviation**	**Min**	**Max**		
phat	88	0.512	0.217	0.004	0.822		

The mean predicted probability (0.512) indicates that, based on the probit model, an average respondent in the sample has about a 51% likelihood of being a self-identified natural wine producer. This aligns with the observed sample share, where 45 of 88 winemakers (≈51%) reported producing natural wine. It shows that the model's fitted values accurately reflect the empirical distribution of natural wine producers in the dataset.

The estimated probit model demonstrates good overall performance. The pseudo-R^2 value is appropriate for cross-sectional probit models in the social sciences, and the likelihood-ratio test is highly significant, indicating that the predictors jointly enhance model fit. The classification test indicates that the probit model accurately identifies approximately two-thirds of cases (67.05%). Sensitivity is relatively high at 77.78 percent, indicating that the model is particularly effective at detecting actual natural wine producers. In contrast, specificity is more moderate at 55.81%, reflecting greater difficulty in accurately identifying non-producers. Nevertheless, the balance of predictive values (positive predictive value of 64.81% and negative predictive value of 70.59%) suggests a consistent classification pattern. Goodness-of-fit diagnostics justify the adequacy of the model. The Pearson chi-square test fails to reject the null hypothesis of correct specification, indicating that the predicted probabilities align with the observed outcomes. Moreover, the area under the Receiver Operating Characteristic (ROC) curve (0.739) reveals acceptable discriminatory power in distinguishing between natural and conventional wine producers, although it does not achieve near-perfect separation (Figure 3).

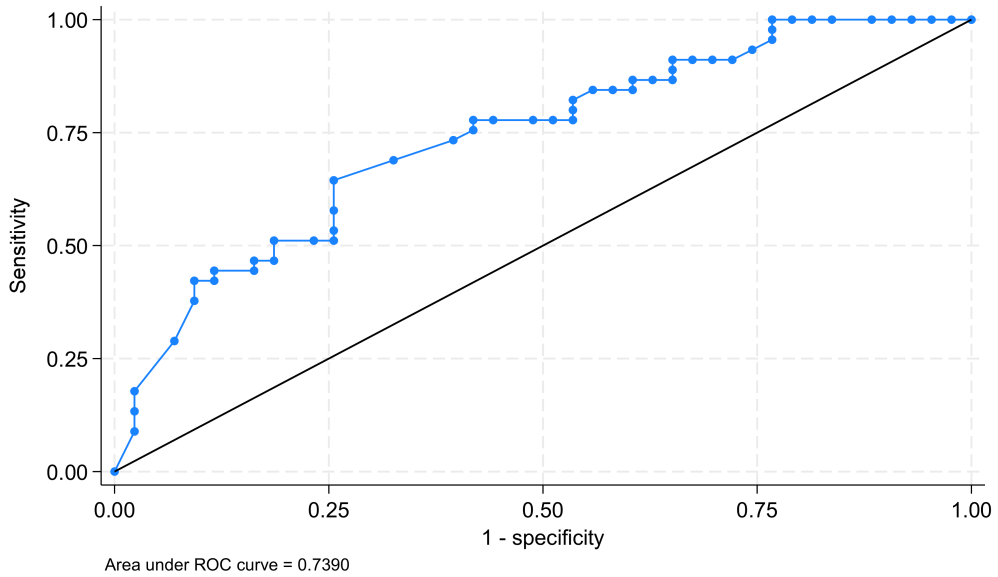

Figure 3. Graph for ROC curve area under the curve. Source: own composition based on sample data. Note: The blue line represents the performance of the predictive model. The black line is the baseline.

Figure 4 illustrates sensitivity and specificity as functions of the cutoff probability. Figures 3 and 4 indicate that the model is more effective at identifying natural wine producers compared to conventional ones. These regression results indicate that smaller vineyard size and a stronger self-reported relation to nature are associated with natural wine production status in the surveyed sample. Furthermore, these results confirm the main argument that Hungarian natural wine producers constitute a distinct group characterized by smaller operational sizes and stronger ecological orientations.

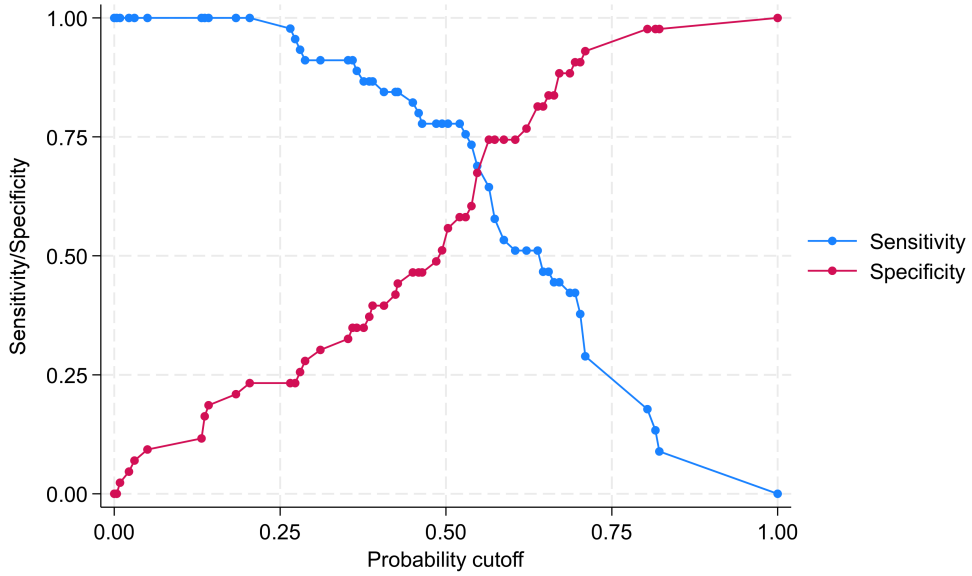

Figure 4. Graph for sensitivity and specificity against probability cutoff. Source: own composition based on sample data.

4. Discussion

4.1. Interpretation and Discussion of the Results

The results provide empirical evidence that natural wine production in Hungary is associated with a distinct producer profile. Surveyed, self-identified natural wine producers generally operate on smaller vineyards and report lower average turnover than

conventional producers, suggesting that natural winemaking is more closely associated with small-scale, artisanal, and value-driven production than with large-scale commercial wine production. This finding is consistent with producer-oriented studies [3,17] indicating that natural wine production is often embedded in personal beliefs, environmental awareness, and alternative understandings of quality rather than in purely market-oriented strategies. In the Hungarian context, the results therefore suggest that the self-identified natural wine producers in the sample show a distinct profile characterized by a smaller production scale and a stronger nature-related orientation.

The descriptive results show that the main motivations for producing natural wine are personal conviction, a desire to drink natural wines, an intention to create an alternative to standardized, technologically produced wine, and a willingness to try something new. Among natural wine producers, export development, market-related considerations, and owners' or shareholders' interests received comparatively low ratings as reported motivations. This is an important finding because much of the previous literature has examined natural wine from the demand side [2,13–15], focusing on consumer willingness to pay, label information, authenticity, and perceptions of naturalness. The present study complements this literature by showing that, on the supply side, Hungarian winemakers' motivations are also closely linked to authenticity, personal values, and an opposition to standardized wine production.

The results also indicate that natural wine producers evaluate natural wines more positively than conventional producers in terms of desirability, perceived healthiness, and taste. These findings align with consumer-side studies showing that natural wines are often associated with authenticity, environmental responsibility, and health-related expectations [13,15]. However, these results should be interpreted carefully. The survey captures producers' perceptions rather than objective sensory or health-related characteristics. This distinction is important because sensory research has shown that natural wines may also be associated with higher volatile acidity, turbidity, and greater variation in perceived quality; however, technically fault-free and high-quality natural wines can also be produced [7]. Therefore, the positive evaluations observed among Hungarian natural wine producers should be understood as part of their value system and production identity rather than as direct evidence of superior product quality.

The regression model further strengthens the interpretation that both structural and attitudinal factors matter. Vineyard size is negatively associated with the likelihood of producing natural wine, meaning that larger vineyard size decreases the probability of natural wine production. In contrast, a stronger self-reported relation to nature increases the likelihood of producing natural wine. This result is particularly relevant considering sustainability-oriented wine research [6,18,23], which argues that environmental values, ecological awareness, and a closer connection to nature can influence sustainable production choices. In this sense, natural winemaking in Hungary appears to be linked not only to production scale but also to a broader ecological orientation.

These findings suggest that Hungarian natural wine production is associated with low-intervention practices and a stronger ecological orientation among producers. However, these findings should not be interpreted as evidence that natural wine production is environmentally more sustainable than conventional production. The study contributes to the literature by extending natural wine research beyond consumer behaviour and Western European contexts, providing evidence from a Central and Eastern European wine-producing country. The results also show that natural wine producers are not simply conventional producers adopting a new market label; rather, they appear to form a distinct group whose practices are shaped by smaller production structures, stronger environmental orientation, and a critical stance toward technological standardization in winemaking.

4.2. Implications

The findings have several practical and policy implications for the Hungarian wine sector. From a managerial perspective, the results suggest that natural wine production may offer smaller wineries an opportunity to differentiate themselves in an increasingly competitive wine market. Based on the results, the market positioning of natural winemakers should be built around authenticity, transparency, terroir, and low-intervention production practices. Rather than competing primarily on scale or price, smaller wineries may benefit from communicating the values and production philosophy behind natural wines in a clear and credible way. The findings also indicate that natural wine producers perceive their wines more positively in terms of desirability, taste, and health-related attributes. However, these claims should be communicated carefully. Producers should avoid unsupported health claims and instead emphasize verifiable structural characteristics, such as organic or biodynamic grape cultivation, minimal intervention, limited use of additives, environmental responsibility, and transparency in winemaking. This is particularly important because the lack of a widely accepted definition of natural wine may create uncertainty among consumers and limit trust in the category. Clearer communication can therefore help consumers better understand how natural wines differ from conventional, organic, or other sustainable wine products.

From a policy perspective, the findings highlight the need for clearer standards and more coherent institutional support for natural wine production. The lack of a unified definition remains a challenge for both producers and consumers. Policymakers, professional organizations, and wine-sector associations could contribute by supporting transparent guidelines, voluntary certification schemes, and information campaigns that explain the principles of natural wine production. Such initiatives could strengthen consumer trust while avoiding over-regulation that might undermine the diversity and experimental character of natural winemaking. Finally, support for training, advisory services, and research and development could help small wineries manage the technical and economic risks associated with minimal-intervention production. Natural winemaking may involve greater uncertainty, including challenges with fermentation control, product stability, quality consistency, and market acceptance. Therefore, sector-level support should focus not only on market promotion and export development but also on knowledge sharing, producer networks, and technical assistance. In this way, natural wine production could contribute to the broader sustainability transition of the Hungarian wine sector while preserving its artisanal and value-driven character.

4.3. Limitations and Future Research Lines

Although this study provides rare empirical evidence on the supply side of natural wine production in Hungary, several limitations should be acknowledged. First, the sample is purposive rather than random. This approach was appropriate because there is no comprehensive official register of natural wine producers in Hungary, and the study aimed to reach the relevant producer community as effectively as possible. The relatively high share of natural wine producers in the sample reflects the targeted sampling strategy and should therefore be interpreted with caution. Second, the lack of detailed geographical information limits the possibility to analyze regional differences across Hungarian wine regions. This is important because vineyard structure, production traditions, market access, climatic conditions, and local wine cultures may differ across regions. Future research should therefore collect wine-region-level data to examine whether natural wine production is concentrated in specific territorial contexts or whether the motivations identified in this study are more generally observable across Hungary.

Third, the contested definition of natural wine remains an important limitation. Since the term "natural wine" lacks a unified, internationally accepted regulatory definition, respondents may have interpreted it differently. The dependent variable is therefore based on self-identification, meaning that the study captures producers who report producing natural wine rather than producers verified through an external certification scheme or a standardized technical definition. Future studies could address this issue by distinguishing among self-declared natural wine producers, certified organic or biodynamic producers, and producers who follow specific low-intervention practices. Fourth, the analysis relies on self-reported survey data and focuses mainly on producer characteristics, motivations, and attitudes. It does not include detailed information on production costs, profitability, price premiums, distribution channels, market competition, or objective quality and sensory characteristics. As a result, the study cannot assess whether natural wine production is more economically viable, more profitable, or objectively higher quality than conventional wine production. Future research should combine survey data with financial indicators, qualitative interviews, sensory analysis, and possibly chemical or oenological data to provide a more complete picture of the natural wine sector. Comparative research across Central and Eastern European wine-producing countries would also be valuable, as it could show whether the Hungarian case reflects a broader regional pattern or a country-specific development path.

5. Conclusions

This study examined the structural characteristics and motivations of natural wine producers in Hungary, using survey data collected from 88 Hungarian winemakers, including 45 respondents who reported producing natural wines. The results contribute to the limited empirical literature on the supply side of natural wine production, particularly in Central and Eastern Europe, where producer-level evidence remains scarce. The findings show that Hungarian natural wine producers in the sample differ from conventional winemakers in both structural and motivational terms. Natural wine producers in the sample generally operate smaller vineyards and report lower average turnover than conventional producers. This suggests that natural wine production in Hungary is mainly associated with smaller-scale and more artisanal wineries rather than large-scale commercial operations. The descriptive results also indicate that natural wine producers are primarily motivated by personal conviction, the desire to consume natural wines themselves, the intention to create alternatives to standardized, technologically produced wines, and a willingness to try something new. By contrast, market expansion, export development, and owners' or shareholders' interests appear to be less important motivational factors. These findings suggest that natural wine production in Hungary is associated with low-intervention practices and a stronger ecological orientation among producers. However, natural wine production should not be considered equivalent to environmentally sustainable production, as the present study does not measure environmental performance indicators such as carbon footprint, energy and water use, waste generation, plant protection inputs, or certification status. Rather, the results indicate that self-identified natural wine producers in the sample exhibit stronger nature-related values and environmental orientations, which may be related to sustainability-oriented production philosophies.

Natural wine production represents a distinct niche within the Hungarian wine sector. Its development appears to be shaped less by short-term market incentives and more by personal commitment, environmental values, and alternative understandings of wine quality. From a practical perspective, this suggests that smaller wineries may benefit from positioning natural wines around authenticity, transparency, terroir, and low-intervention production practices. At the same time, the findings highlight the need for clearer com-

munication and more coherent standards, as the lack of a widely accepted definition of natural wine may create uncertainty for both producers and consumers. Future development of the sector should therefore support credibility, knowledge sharing, and informed consumer understanding without over-regulating the diversity and experimental character of natural winemaking.

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Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors on request.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A. Structure of the Questionnaire

Block 1: Demographic and structural characteristics

- Age (open numeric)
- Gender (binary)
- Highest level of education completed (categorical: high school, bachelor's degree, master's degree or above, vocational school)
- Vineyard size (open numeric, expressed in hectares)
- Annual turnover (open numeric, expressed in EUR)

Block 2: Structural characteristics

- Self-identification as a natural wine producer (binary: yes/no, this variable serves as the dependent variable in the probit model).
- Years since starting natural wine production (categorical variable)

Block 3: Motivational factors for producing natural wine. Measured on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Items included:

- Personal conviction regarding environmental values
- Belief in higher quality of natural wines
- Desire to drink natural wines personally
- Intention to create alternatives to standardized or technological wines
- Interest in trying something new
- Perceived market advantages
- Export market potential
- Owners' or shareholders' interests

Block 4: Attitudes and perceptions toward natural wine. Also measured on a 5-point Likert scale:

- Perceived desirability of natural wines
- Perceived healthiness
- Perceived taste quality
- Encouragement by others
- Encouragement by friends
- Perceived availability of resources, time, and opportunities
- Intention and willingness to produce natural wine (for non-producers)

Block 5: Relation to nature

A 1–7 scale variable adapted from the literature, where respondents selected the picture that best represented their relationship with the natural environment.

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