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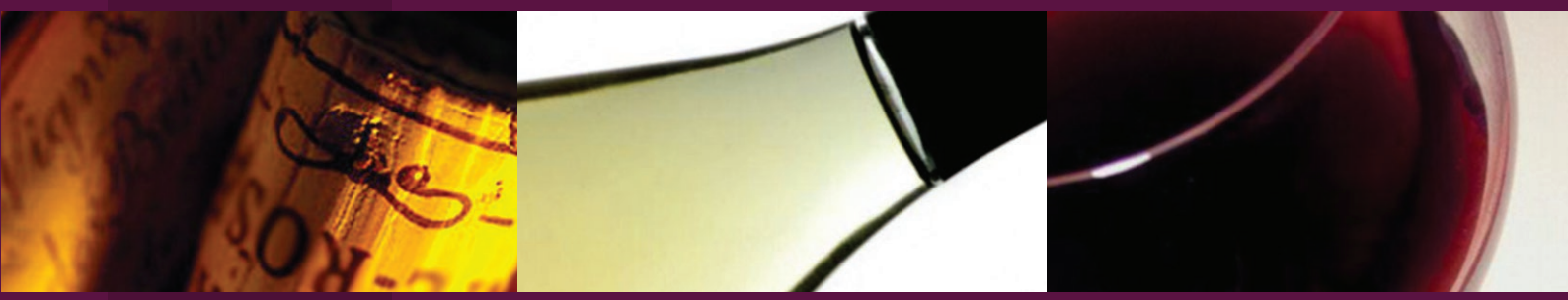

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Contacts:
Scientific Manager:
Veronica Alampi Sottini
email: wepjournal@fup.unifi.it
Department of Agriculture, Food, Environment and Forestry (DAGRI) – University of Florence
P.le delle Cascine, 18 – 50144 Florence (I)

Editor in-Chief
Nicola Marinelli
email: nicola.marinelli@unifi.it
Department of Agriculture, Food, Environment and Forestry (DAGRI) – University of Florence
P.le delle Cascine, 18 – 50144 Florence (I)

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Analysing Economic Performance of German Wine Estates Across Three Decades - What can we Learn for the Future?

Anthony William Bennett*, Simone Mueller Loose

Department of Wine & Beverage Business, Hochschule Geisenheim University, Von-Lade-Straße 1, D-65366 Geisenheim, Germany
Email: AnthonyWilliam.Bennett@hs-gm.de; Simone.Loose@hs-gm.de
*Corresponding author.

Abstract. In recent decades, the German wine market has undergone significant structural changes due to intensifying competition and shifting consumption patterns. Increased imports and declining exports have pressured German wine estates to adapt for survival. The study explores these long-term trends and structural changes in German wine estates, focusing on those marketing bottled wine. It aims to understand how these businesses have adapted to economic pressures in a highly competitive market from 1993 to 2020, using business panel data and regression analysis for 16 key performance indicators (KPIs). At first (until the financial crisis of 2008) estates benefitted from mechanisation and economies of scale, leading to a significant reduction in labour hours per hectare and moderate increases in wine prices, improving labour productivity and profitability. However, yields declined due to a shift towards lower-yield grape varieties in response to market demand. From 2009 onward, rising labour and material costs as well as stagnating yields started eroding profitability gains, leading to an overall stagnation of long-term profitability. When observing differences in developments between size groups, large wine estates experienced a considerably sharper increase in costs per ha than small to medium sized wine estates, from 2009 onward. Nonetheless, this could be counterbalanced by large wine estates also generating significantly higher productivity increases in the same time period, resulting in a significant increase in profitability for large wine estates from 2009 onward, while small to medium sized wine estates stagnated.

Keywords: key-performance-indicators, business structure, long-term trends, economic crisis, economies of scale.

1. INTRODUCTION

Over the past decades, international wine markets have changed fundamentally and increased internationalisation [1,2]. In a global context, Germany is a medium-sized wine producer and major wine importer [2]. Saturated domestic wine consumption, declining exports, and increasing imports from a highly competitive global bulk wine market have resulted in intense price competition for German wine producers [3,4].

To ensure sustainable long-term survival, various types of wine producers have been driven to adapt. Much like the agricultural sector as a whole, the wine industry has undergone structural change and increased concentration, with wine prices experiencing only marginal growth [5]. This long-term process of consolidation has also been observed in both the German and international agricultural sectors [6,7]. The current economic crisis and significant cost pressures present major challenges for businesses within the wine sector [8].

It is of great interest to understand how wine estates have responded and adapted to competitive market conditions in the past. Gaining insight into existing long-term trends and survival strategies from the past will be invaluable for addressing the present and future challenging conditions [9]. In this context, this paper examines developmental processes using a unique data set of long-term business data from German wine estates, spanning nearly three decades, from 1993 to 2020. The key findings derived from analysing structural changes can provide a deeper understanding of how wine estates have adjusted over time, while also offering potential recommendations for policymakers and wine estates to achieve future economic success.

1.1. The Position of Wine Estates within the German Wine Sector

The German wine market is highly competitive. Wine consumption remained relatively stable until around 2012, after which it began to decline, with a brief but strong recovery during the COVID-19 pandemic [10]. Within this market, German wine holds a significant, yet recently diminishing, market share, decreasing to 44% in 2022 in terms of purchase volume [5,11]. The declining reach of German wine is evident, with the percentage of German households purchasing domestic wine falling from 46.3% in 2004 to 35.9% in 2023. [10].

Globally, Germany ranks among the largest wine importers, with a significant share of these imports comprising bulk wine priced around €0.80 per litre, which is bottled domestically by large, efficient co-packers [2]. After peaking at 3.0 million hectolitres in the 1980s, German wine exports have steadily declined, hitting a historic low of under 1.0 million hectolitres in 2020, with only modest recovery following the post-COVID period and the removal of US wine tariffs. The combination of strong import competition, falling exports, and a gradually declining domestic consumption creates a highly competitive market environment with intense price pressure [12].

Wine estates account for around 27% of the total volume of German wine sold domestically [4]. The approximately 7,000 estates typically operate fully integrated supply chains, growing grapes, producing, bottling, and marketing their own wine. Recently, some estates have begun purchasing bulk wine or grapes to market under their own brand, competing with bottlers and cooperatives for retail space. Predominantly family-owned SMEs, wine estates focus heavily on direct-to-consumer sales, with cellar-door sales playing a key role in regional wine tourism [4,13]. Unlike bottlers or cooperatives, wine estates manage the entire supply chain, making them the least specialised, as family members often develop expertise across multiple areas of production and business management. The fragmented nature of wine production, price competition from imports, and the dominance of large food retailers create a highly competitive market, where most producers, including estates, are price-takers, with only a few differentiating through strong branding.

1.2. Research objective

Wine estates, confronted with this highly competitive environment, have been compelled to adapt their business strategies in various ways in order to ensure survival. This study seeks to analyse and explore the economic and structural changes that German wine estates have undergone, with the aim of sustaining their operations in the long term. Expectations regarding the development of business indicators are drawn from agricultural economics and existing research on the economic evolution of wine businesses.

The long-term development of a total of 16 business factors and key performance indicators (KPIs) are empirically analysed for a sample of wine estates participating in the Geisenheim Business Analysis, based on their balance sheets and income statements over a period of 28 years. In line with research in agricultural economics, the development of these KPIs is examined for potential structural breaks and shifts in trajectory, particularly around the 2008 financial crisis. Additionally, developmental variations of different size groups (small, medium and large) were analysed separately, to gain a deeper understanding if wine estates of different sizes developed homogeneously, or if some size groups were able to develop and adapt to market changes more successfully than others.

2. EXPECTATIONS FOR ECONOMIC DEVELOPMENT OF WINE ESTATES

2.1. Overall framework of economic performance

This study builds on the economic sustainability framework developed by Bennett & Loose [14], with minor modifications (Figure 1). The framework organises economic input factors and Key Performance Indicators (KPIs) into three tiers. These key figures from controlling can, by definition, be derived from one another and categorized into three tiers. The key figures in Tier 2 are ratios of the key figures from Tier 1. Similarly, KPIs in tier 3 further aggregate KPIs from tiers 1 and 2.

Tier 1 includes traditional agricultural economics input factors such as land, labour (including workforce composition), and capital. It covers the raw output generated by these factors, represented as wine yield per hectare, and its external market valuation, represented as turnover per hectare. This paper builds on previous research by also examining investments, fixed asset structures, and workforce composition within wine estates.

Tier 2 aggregates KPIs from Tier 1, focusing on cost, efficiency, and productivity. Cost per litre considers total costs, including family wages, relative to production volume, while cost per hectare measures costs in relation to estate size. Labour productivity is defined as turnover per worker, and area productivity as turnover per hectare. Although previous studies have examined area and labour productivity, long-term cost trends in the wine estate sector, as analysed here, remain underexplored.

Tier 3 represents the highest level of aggregation. Profit per litre reflects the surplus after accounting for price and cost per unit, while the operational result measures the surplus per hectare. The operational result per hectare includes an imputed family wage, which ensures a fair remuneration for family members working within the wine estate, making it a key indicator of economic sustainability in this framework [14]. Return on equity and sales are calculated from profit relative to total equity and turnover. While profitability has been studied in agricultural and wine economics, long-term trends in profit per litre remain largely unexplored.

The following subsections outline expectations for the long-term development of these KPIs, based on existing literature in agricultural and wine economics. For areas where research is limited, statistical data and relevant considerations are used to establish expectations.

2.2. Tier one

2.2.1. Business size

In recent decades, the agricultural sector has seen significant consolidation across numerous countries [6,9,15,16]. Increased globalisation has heightened competition in international agriculture, leading to substantial restructuring [9]. In the US, average farm size

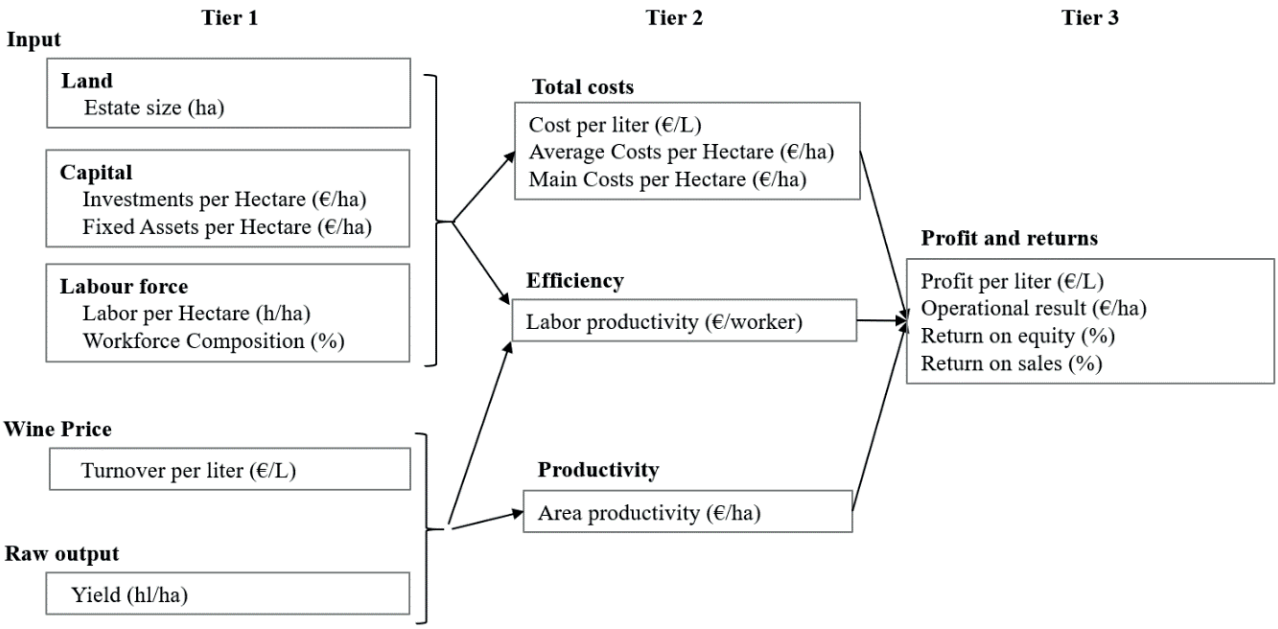

Figure 1. Conceptual basis for Key-Performance-Indicators (based on and expanded upon from [14]).

expanded dramatically from the 1940s to the 1980s, with the number of large farms more than doubling between 1987 and 2017 [6]. In Germany, the number of agricultural businesses halved between 1995 and 2020, while average business size grew by 62% [17]. These changes are often attributed to efficiency gains through economies of scale [18,19].

In the wine sector, studies indicate that larger businesses tend to be more efficient, with size-related performance benefits attributed to the greater viability of mechanisation, such as the use of grape harvesters [20–22]. Research on consolidation in the wine industry has primarily focused on cooperatives, large companies, and distributors, especially in countries like Italy and Spain [20,23–25]. However, there is limited research on the concentration of family-run wine estates that primarily market their own bottled wine. The trend of consolidation and increasing business size in agriculture is anticipated to continue in the wine sector, likely leading to a gradual increase in the average size of wine estates.

2.2.2. Labour per Hectare and Workforce Composition

Annual Work Units

The agricultural industry has seen several labour-related changes in recent years. Rising opportunity costs for farm labour, due to higher wages in non-farm sectors, have driven the development of labour-saving technologies [6,26]. Larger farm sizes make it more viable to adopt these technologies by investing in large machinery, resulting in efficiency gains [21,27]. In Germany, despite increasing farm sizes, the Annual Work Units (AWU) per farm halved from 1990 to 2020 [28]. Although no data on AWU trends for wine estates in Germany is currently available, a reduction in labour per hectare required is anticipated, based on developments of the broader agricultural sector.

Workforce Structure

In agriculture, workforce structures have shifted despite rising business sizes. From 1995 to 2020, the number of family workers per business remained stable, while growth was managed through a significant rise in both permanent and temporary employees [28]. Similar trends are expected in the wine sector, which also relies heavily on family and temporary workers. However, since wine estates manage the entire supply chain, growth leads to more specialised labour needs, including management and administrative roles, making an increase in permanent employees likely [14].

2.2.3. Investments per ha and Fixed Assets

The adoption of labour-saving technologies, increased mechanisation (as discussed in sections 2.2.1 and 2.2.2), and the potential expansion of productive capacity through business growth require capital investment, leading to an anticipated rise in average investments per hectare over time [6,29]. These investments are expected to result in increased technological assets, machinery, and vehicle fleets necessary for the supply-chain processes in viticulture and wine production. In contrast, expansion in sales and marketing typically does not require costly machinery but is reflected in increased salaries as part of variable costs.

2.2.4. Turnover per litre

The demand for German wine has been visibly declining, reflected in a shrinking market share, reduced domestic consumption, and falling exports [11,12]. Combined with price competition from imports, this forces German producers to compete for the remaining demand, creating a highly competitive market with significant price pressure [12]. Given this weakening bargaining power, producers are unlikely to achieve substantial increases in real prices over the observed period.

2.2.5. Yield

In recent decades, agricultural businesses have seen increased productivity due to improvements in plant material and fertilisation, leading to higher yields across the sector [30–32]. However, the conditions for wine and grape production differ significantly. The wine sector is highly diverse, with products varying by grape varieties, appellations, and price segments. Additionally, it is heavily regulated, with strict yield limits per hectare to ensure quality and comply with regional regulations.

In Germany, there has been a shift towards market preferences by replacing high-yield grape varieties from the 1970s with more traditional, lower-yield varieties, such as Riesling, Pinot Gris, and Pinot Noir [33]. Data on average wine must yields indicate a long-term decline in volume [34]. As a result, no significant increase in long-term yield development is expected in the wine sector, unlike the trends seen in broader agriculture.

2.3. Tier 2

2.3.1. Development of costs

The cost of agricultural input products in Germany has steadily risen over recent decades [35]. Data show that average material costs per hectare for German wineries increased by 27% between the 2006/07 and 2021/22 agricultural years [36,37]. Labour costs, driven largely by the introduction of minimum wages in 2015, rose even more sharply, increasing by 106% over the same period [36,37]. After high inflation rates following German reunification, interest rates were initially high in the early 1990s but steadily declined to low levels by the mid-1990s, with central banks imposing negative rates after the financial crisis, keeping financing costs very low until around 2021[38].

This variation in cost growth over time indicates a shift in the composition of main costs, with labour and material costs rising, while financing costs decreased. The sharp rise in labour costs post-minimum wage introduction suggests a temporary acceleration in overall cost increases.

2.3.2. Area Productivity and Labour Productivity

The adoption of labour-saving technologies and specialisation, as outlined in section 2.2.2, along with improvements in planting material and fertilisation, as discussed in section 2.2.5, have contributed to notable productivity gains in the agricultural sector globally [26,29,32]. In particular, increases in land productivity (output per hectare) and labour productivity (output per annual work unit, AWU) have been observed. In Germany, area productivity (measured in €/ha) has risen by 72% over two decades, from 2001/02 to 2021/22 [37].

However, the wine sector is less likely to benefit to the same extent from improvements in planting material and fertilisation. Instead, the primary drivers of productivity gains in this industry are increased mechanisation and the adoption of labour-saving technologies. Wine estates must reach a certain scale to fully benefit from mechanisation, such as grape harvesting or woodcutting machinery [21]. As a result, the efficiency of larger wine businesses, due to reduced labour requirements per unit of output, outperforms smaller ones [20,27].

An additional benefit of increasing average business sizes is the effect of specialisation, particularly relevant for wine estates operating across all stages of the supply chain. In smaller operations, a family of two typically manages viticulture, winemaking, administration, marketing, and sales, which limits specialisation and creates time conflicts. For example, sales and marketing often receive less attention during busy periods such as plant protection or harvest seasons. The division of labour, with tasks allocated to specialised roles, has been shown to increase economic efficiency and labour productivity [39–41].

In summary, the productivity gains seen in the agricultural sector, combined with anticipated improvements from technological advancements and specialisation due to larger business sizes, suggest rising area and labour productivity over time.

2.4. Tier 3

Return on Sales and Return on Equity

Return on sales (ROS) and return on equity (ROE) for German agricultural businesses have fluctuated significantly over the past two decades, averaging 2.7% and 1.3% respectively from 2001/02 to 2021/22 [37]. This aligns with stable ROS and ROE values observed in agricultural businesses across several European countries between 2009 and 2015, though some were negatively impacted by the global financial crisis until around 2010 [42].

Official statistics for German wine estates, including those producing high shares of bulk wine, suggest a stronger performance than agriculture overall. Wine estates nearly doubled their average ROS from 5.97% in 2006/07 to 11.5% in 2021/22, while average ROE rose from 2.86% to 7% over the same period [43]. Given these trends, an increase in both ROS and ROE is anticipated for wine estates in this data set, specifically focusing on bottled wine.

Operational result and profit per litre

The average operational result of German wine estates increased by 12.9% from 2006/07 to 2021/22, though this does not account for an imputed family wage for estate owners [43]. Over the same period, average profit per hectare grew by 20.3% [43]. Long-term trends in profit per litre for German wine estates remain unexplored.

Given the expected decrease in yield (section 2.2.5), only approximate conclusions can be drawn about its impact on profit per hectare. However, a slight increase in profit per litre may still result from efficiency gains from larger estate sizes. The average operational result per hectare is expected to continue increasing in line with historical trends.

2.5. Potential changes of path within the assessed time period

Major economic events can create structural breaks or shifts in developmental paths for various sectors. The

literature has identified the 2008 financial crisis, triggered by the sub-prime mortgage collapse, as such an event with significant implications for the agricultural sector [44,45]. Several studies confirm the long-lasting impacts of the financial crisis on both economies and societies, including persistent effects on economic systems and growth capacity [46], slower recovery in regional areas [47], and long-term shifts in political sentiment [48].

The pronounced impact of the global financial crisis has been consistently highlighted in agricultural economics. When examining agricultural developments over periods that include the 2008 financial crisis, structural breaks and functional changes in the sector were evident post-2008 [45,49–52]. As this study spans both the pre- and post-crisis period, it will consider potential changes in developmental trajectories by dividing the analysis into two phases: before and after 2008.

3. METHODOLOGY

Data was sourced from the Geisenheim Business Analysis [14,53]. It comprises internal business data from participating wine estates. Due to the voluntary nature of participation, a potential self-selection bias in the sample could limit its representativeness for German wine estates in general. The sample includes only wine estates where bottled wine constitutes at least 80% of total revenue. Wine estates primarily selling bulk wine or grapes were excluded, as they cover only the initial stages of the supply chain and have a fundamentally different cost structure.

The initial sample size was 106 wine estates in 1993, shortly after the project's inception. A gradual expansion saw the sample grow to 182 estates by 1999. However, a change in project leadership in 1999 caused a drop to 112 wine estates in 2000. From that point, the sample size gradually increased over the next decade, reaching 311 wine estates in 2010. Since then, the sample size has stabilised at around 300 wine estates per year. A slight reduction in the most recent year analysed (2020) occurred due to delays in data preparation and provision by tax consultants. A detailed distribution of the sample sizes for each year can be found in Table 4 (see Appendix A, Table 4).

The Geisenheim Business Analysis is a panel study of wine estates, with participation varying over time. On average, wine estates remain in the sample for seven years, though some have participated throughout the entire observation period. This exploratory analysis, spanning 28 years, does not account for panel or individual business effects; instead, each estate is treated as a separate observation for each year.

In 2017, all historical data was transferred into a unified data management system. This process involved correcting obvious data entry errors, standardising the data to a single currency (the Euro, replacing the Deutsche Mark as of 01.01.2002), and adjusting the data to net values excluding VAT. Extreme outliers (defined as values more than 2.5 standard deviations from the mean) were removed using RStudio.

For 16 Key Performance Indicators (KPIs), yearly averages across all businesses were calculated over the 28-year period from 1993 to 2020. These were graphed in Excel, and linear trend lines were fitted. A visual inspection of the graphs and trend lines guided the decision to divide the linear regressions into two phases. Graphs that showed clear changes in trend around 2008/09 (coinciding with the global financial crisis) were split into two phases: 1993–2008 (Phase 1) and 2009–2020 (Phase 2). Regression coefficients were calculated for both the overall period and/or the two separate phases. For KPIs influenced by earlier tiers of the economic framework, these were also divided into two phases to ensure consistency. Dividing the KPIs into phases allowed the trend lines to better align with the observed data, as well as a more accurate and nuanced understanding of its implications. Since this is an exploratory analysis, with the focus being on investigating the long-term developments of said KPIs, significance tests between the two phases were not conducted, as such tests would exceed the scope of this paper [44,45,50–52,54].

To evaluate whether size groups developed homogeneously, wine estates were divided into terciles based on vineyard area, representing small, medium-sized, and large estates. Since the average wine estate expands over time, the relative business size of these three groups is not static but increases accordingly (see Appendix B, Figure 18).

Regression analysis was performed using IBM® SPSS® (Statistical Package for Social Sciences). Adjustments for inflation were calculated using data from the German Federal Office of Statistics, with 1993 as the base year. Although the residuals were not perfectly normal, the increased sample size (above n=100) was sufficient for the Central Limit Theorem to apply. This ensures that the sampling distribution of the regression coefficients is approximately normal, allowing for valid interpretation of standard confidence intervals and hypothesis tests [55,56].

Additionally, since the assumption of homoscedasticity was not fully met, residual plots were inspected, and extreme outliers were removed to reduce the influence of individual data points on model fit and variance,

indicating that the impact on the model was limited. The overall pattern of results remained stable, suggesting that the core findings are robust to minor violations of this assumption [57].

To investigate potential differences in development across business sizes, regressions were performed separately for each tertile, with confidence intervals of the regression coefficients analysed to identify statistically significant variations. Due to space constraints, these differences are presented in tables in the appendix only if significant differences were observed between at least two tertile groups.

4. RESULTS

The following section presents the results of the linear regression for each tier, accompanied by graphical visualisations of the long-term development of the KPIs over the 28-year period. The graphs display the starting value in 1993, the end value in 2020, and the linear trend across the full period, or two separate slopes for the distinct phases (1993–2008 and 2009–2020).

4.1. Tier 1

4.1.1. Business Size

The average size of wine estates exhibited consistent and highly significant growth over the 28-year period, more than doubling from 7.5 hectares in 1993 to 16.6 hectares in 2020 (Figure 2, Table 1). As shown by the slope in Table 1, wine estates expanded by an average of 0.3 hectares per year. The three size groups exhibited significantly different growth trajectories. While large wine estates expanded by 0.62 hectares per year, small estates grew by only 0.09 hectares annually (Appendix C, Table 5).

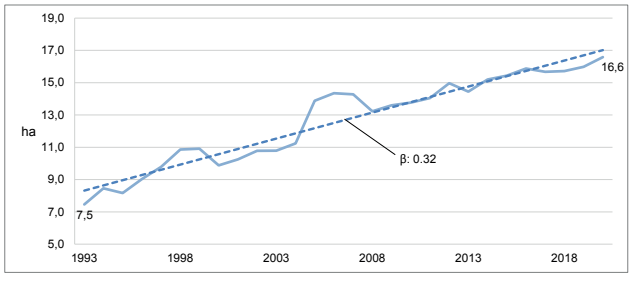

Figure 2. Average business size in hectares 1993-2020. β indicates the regression coefficient found in Table 1.

4.1.2. Investments per Hectare and Fixed Assets per Hectare

Major investments in buildings, machinery, or cellar equipment are infrequent for wine estates, as buildings can last over 30 years and tractors for more than 10 years. Consequently, it is not surprising that average investments per hectare fluctuate significantly over time (Figure 3). The nominal average increase in investments of €21 per hectare was non-significant (Table 1), indicating that they remained relatively constant over time. However, when adjusted for inflation, real investments per hectare show a significant downward trend, with a reduction of €30 per hectare per year on average (Table 1). Generally nominal investment increased with business size, but due to high variance this difference was not statistically significant.

Figure 4 shows the long-term development of major asset categories of wine estates, viticultural area, buildings, technological assets and machines as well as vehicles. The average value of land used for viticulture per hectare fluctuates significantly (Figure 3). Values were higher before 2008, followed by a sharp decline after 2010, with minimal change through to 2020. Analysing both periods separately shows a significant reduction of €334.10 per hectare during 1993 to 2008, while no significant linear trend is observed from 2009 to 2020 (Table 1). The decrease around 2010 may be linked to the reassessment of land value as loan collateral following the financial crisis, when banks increased collateral requirements to mitigate risk. Another possible explanation is a decline in the marginal productivity of land, which is likely associated with a decrease in land value.

The nominal value of viticultural land shows a consistent decline over the entire time span for small wine estates, whereas no such trend is evident for large estates. For medium-sized estates, land values decrease significantly in the first period but recover in the second. This pattern may indicate that larger businesses successfully preserved the marginal productivity of their land (Appendix C, Table 6).

The average value of agricultural buildings per hectare increased significantly from 1993 to 2020 (Table 1). A notable peak between 2001 and 2004 can be attributed to both changes in the sample and a surge in the construction of vinotheques, which tapered off with the financial crisis. After recovering from the crisis, building investments appeared to rise again from 2011 onwards. Over the entire period, building asset values increased due to both a rise in value per hectare and an expansion in hectare size.

Technological assets and machinery values showed modest growth during the observation period (Figure

Table 1. Tier 1 regression analysis results.

Variable	Total timespan (1993 - 2020)				Phase 1 (1993 - 2008)				Phase 2 (2009 - 2020)			
	Coefficients			Corrected R^2	Coefficients			Corrected R^2	Coefficients			Corrected R^2
	Coefficient	T-value	p-value		Coefficient	T-value	p-value		Coefficient	T-value	p-value	
Business Size (ha)	0.32	18.17	<0.001	0.92	-	-	-	-	-	-	-	-
Investments per ha (€/ha)												
nominal	20.63	1.50	0.145	0.04	-	-	-	-	-	-	-	-
real	-29,75	-2,62	<0.05	0,18	-	-	-	-	-	-	-	-
Fixed Assets per ha (€/ha, nominal)												
Viticultural area	-321.43	-6.84	<0.001	0.63	-334.07	-2.17	<0.05	0.21	-125.50	-1.70	0.118	0.14
Buildings for agricultural use	102.56	2.38	<0.05	0.15	-	-	-	-	-	-	-	-
Technological assets and machines	36.31	2.97	<0.01	0.22	-	-	-	-	-	-	-	-
Vehicle fleet	-9.62	-3.07	<0.01	0.24	-	-	-	-	-	-	-	-
Labour per hectare (h/ha)	-14.59	-9.18	<0.001	0.76	-25.51	-7.27	<0.001	0.79	-0.77	-0.41	0.687	-0.07
Workforce composition												
% Family workers	-0.61	-14.00	<0.001	0.88	-	-	-	-	-	-	-	-
% Full-time employees	0.85	34.58	<0.001	0.98	-	-	-	-	-	-	-	-
% Temporary employees	-0.20	-5.34	<0.001	0.51	-	-	-	-	-	-	-	-
Turnover per Litre (€/L)												
nominal	0.06	7.06	<0.001	0.65	0.05	2.14	0.054	0.22	0.12	5.43	<0.001	0.70
real	0.00	-0.14	0.887	-0.04	0.00	-0.18	0.862	-0.08	0.04	2.73	<0.05	0.35
Yield (hl/ha)	-0.63	-2.62	<0.05	0.18	-1.21	-1.91	0.078	0.16	-0.13	-0.17	0.867	-0.09

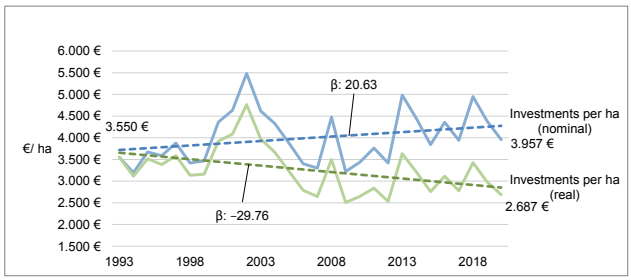

Figure 3. Long-term development of nominal investments per hectare (as € per hectare), and investments per hectare adjusted for inflation.

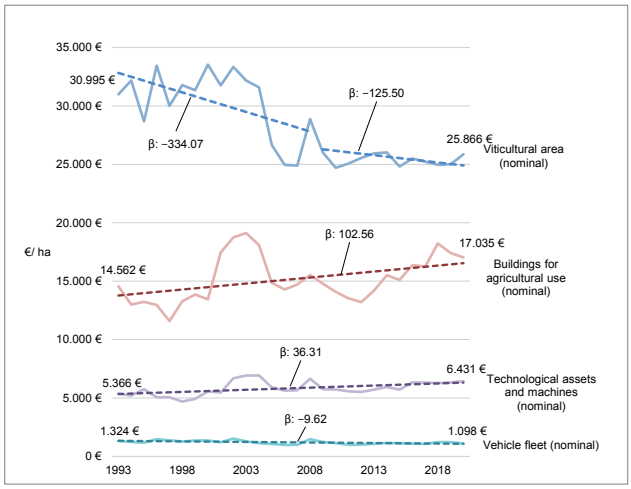

Figure 4. Long-term development of fixed asset values.

4). with the average value rising from €5,366 per hectare in 1993 to €6,431 per hectare in 2020. As wine estates expanded by approximately nine hectares during this time (Figure 2), this indicates an overall increase in the total value of technological equipment.

Conversely, the average value of vehicle fleets decreased from €1,324 per hectare in 1993 to €1,098 per hectare in 2020 (Table 1). This reduction may reflect economies of scale, as wine estates ranging from 7.5 to 16.6 hectares (Figure 2) typically require a similar vehicle fleet, with substantial expansion in fleet size only necessary for estates of 20 hectares or more.

Per hectare, smaller and medium-sized wine estates tended to invest more in agricultural buildings, technological assets, machinery, and vehicle fleets, which may be linked to economies of scale. However, due to high variance, these differences were not statistically significant.

4.1.3. Labour per Hectare and Workforce Composition

The development of labour hours per hectare is clearly divided into two distinct phases. From 1993 to 2008, labour hours decreased significantly by 25.5 hours per hectare (Table 1 and Figure 5). However, from 2009 onwards, average labour hours plateaued, fluctuating slightly around 800 hours per hectare (Figure 5, Table 1). It is important to note that the hours per hectare encompass all activities within the wine estate, including viticulture, cellar work, management, and sales/marketing.

The first phase reflects the widespread adoption of mechanical harvesters, which significantly reduced the manual labour required during harvest. Once these harvesters were universally implemented, no comparable progress in mechanisation followed.

In the last 15 years of the period analysed, three key developments influenced labour demand. First, increased market competition after the financial crisis led wine estates to invest more in sales and marketing personnel. Second, a growing proportion of organic wine estates and a greater commitment to environmentally sustainable practices increased labour requirements in viticulture. Finally, rising administrative demands over time added to the hours needed for general managerial tasks within the wine estates. These three developments have likely counteracted any additional time savings from economies of scale.

There was a consistent shift in the workforce structure over time. The relative share of family workers decreased significantly by 18%, from 64% in 1993 to 46% in 2020 (Figure 6). Conversely, the proportion of full-time employees moved from 9% in 1993 to 33% in 2020, a highly significant change. Temporary employees, however, gradually declined on a relative basis, from 27% in 1993 to 21% in 2020 (Table 1). These results suggest that wine estates expanded by employing more full-time staff, reflecting a greater need for skilled labour over temporary assistance. The relative number of full-

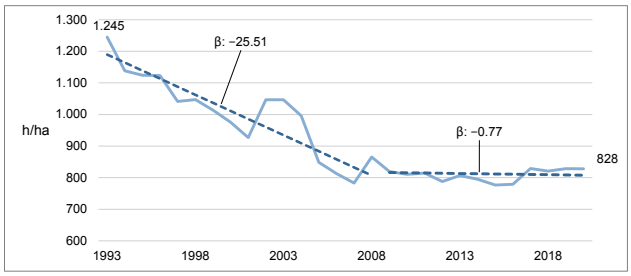

Figure 5. Development of the average working hours in two linear regression phases for all tasks in the wine estate (viticulture, enology, sales) required per hectare of viticultural area.

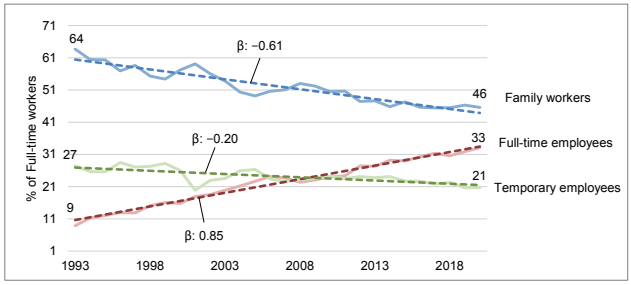

Figure 6. Development of the relative workforce composition of family workers, full-time employees and temporary employees.

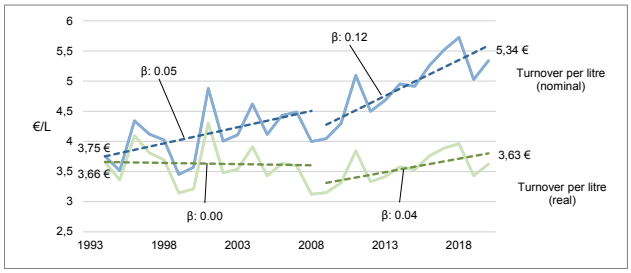

Figure 7. Long-term development of Turnover per litre (€/L) and Turnover per litre adjusted for inflation in two linear regression phases. No data available for 1993, leading to differing starting values for nominal and real Turnover per litre in 1994.

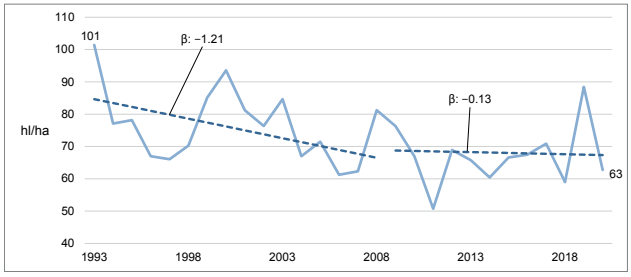

Figure 8. Development of average Yield generated in hectolitres per hectare in two linear regression phases. β indicates the regression coefficient displayed in Table 1.

time employees increased significantly more in large wine estates, highlighting their capacity for specialization (Appendix C, Table 5). Interestingly, there were no significant differences in the overall decline in labour per hectare over time, although the negative tendency was stronger for smaller wine estates.

4.1.4. Turnover per Litre

Turnover per litre fluctuates due to annual yield variations. After strong harvests, wine estates often need to sell more bulk wine at lower prices, as they cannot bottle and market all of it at higher prices. Despite these fluctuations, there appears to be a structural break in turnover per litre around the 2008 economic crisis.

In the period leading up to 2008, nominal turnover per litre grew slowly, though the increase was only marginally statistically significant (Figure 7, Table 1). After the financial crisis, while prices dipped for a few years, a stronger growth trend emerged during the recovery. From 2008 to 2020, nominal turnover per litre increased significantly (Table 1). The three size groups did not exhibit significant differences in the development of nominal turnover over time.

When adjusted for inflation, real turnover per litre remained stagnant in the first phase and grew modestly by €0.04 per litre annually from 2008 to 2020. However, due to the lower starting point post-2008, real turnover per litre showed little change over 28 years (Figure 7). This suggests that, when adjusted for inflation, average prices of wine sold by estates focused on bottled wine have remained relatively stable over the past 30 years.

4.1.5. Yield

As expected, average yields fluctuated significantly over the observed years due to variations in annual weather conditions (Figure 8). While there is no obvious clear demarcation, the graph suggests two distinct phases: a decline in yield during the first phase and stagnation in the second. Using 2008 as the cut-off point, consistent with the rest of the analysis, the first phase shows an average yield decline of 1.21 hl per hectare, which is marginally statistically significant. In the second phase (2009–2020), the slight reduction of 0.13 hl per hectare is not statistically significant (Figure 8, Table 1). The development of yield over time did not differ significantly among the three size groups.

4.2. Tier 2

4.2.1. Cost KPIs

Cost per Litre

Most costs for a wine estate are independent of yield. Due to weather-related yield variations, cost per litre fluctuates, rising in low-yield years and falling in high-yield years (Figure 9). Despite this, the graphical analysis indicates a shift around the time of the financial crisis. Prior to 2008, nominal costs rose by an average of €0.07 per year, nearly doubling to €0.13 per year from 2008 to 2020 (Table 2). Real costs per litre remained

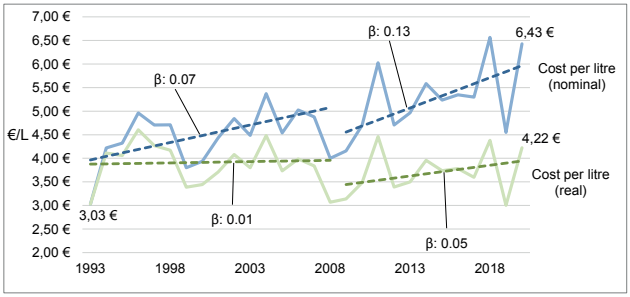

Figure 9. Development of Cost per litre (nominal) and cost per litre adjusted for inflation (real) in two linear regression phases. β indicates the regression coefficient displayed in Table 2.

nearly stagnant between 1993 and 2008, increasing by only €0.01 per year on average. After 2008, real costs rose slightly by €0.05 per year, though neither growth rate was statistically significant. The development of nominal cost per litre did not differ significantly among the size groups.

Cost per hectare

Costs per hectare shows a clear division into two phases: a stagnating or declining phase before the financial crisis, followed by an increasing cost phase thereafter. Visual inspection of Figure 10 suggests that costs per hectare continued to fall until around 2011, picking up only with the post-crisis recovery. For consistency, however, the 2008 cut-off is applied, which may underestimate the true slope of cost increases in the second phase.

In the first phase nominal cost increased by €36 per hectare (not statistically significant), while real costs declined significantly by €299 per hectare and year (Table 2), driven primarily by reduced working hours per hectare (section 2.2.2). After 2008, nominal costs per hectare rose sharply, averaging €685 per hectare annually, with a more moderate real cost increase of €251 per hectare. Notably, real costs per hectare were 17% lower in 2020 than 28 years prior, indicating clear efficiency gains, while nominal costs per hectare increased by 23%, however. During the first phase, total cost development per ha did not vary significantly between the size groups. In the second phase, however, substantial differences were observed, as total costs for large wine estates increased at almost twice the average rate (Appendix C, Table 6).

Development of different cost types

For visual clarity, the analysis here focuses on nominal costs. Unsurprisingly, the two main cost drivers—material and labour costs per hectare—mirror the overall cost per hectare, stagnating in the first phase before the financial crisis and rising sharply thereafter (Figure 11, Table 2). During the first phase, material costs increased non-significantly by €45 per hectare per year, while in the second phase, they grew by an average of €164 per hectare. Labour costs initially declined by €13 per hectare annually, though not statistically significant, before rising sharply by €303 per hectare annually in the second phase. By 2020, labour costs per hectare were 82% higher than in 1993. Per-hectare labour costs increased most substantially for large wine estates, exceeding those of small and medium-sized businesses by 80%. Similarly, material costs for large estates rose at twice the average rate and were significantly higher than those of medium-sized wine estates, though not significantly different from those of small estates (Appendix C, Table 6).

Financial costs, however, deviated from the overall cost trend, declining significantly by €36 per hectare during the second phase, as anticipated in section 2.3.1. Overall, financial costs fell by a factor of 3.5, from €1,387 to €392 per hectare. However, since financial costs constitute a very small portion of total costs, their decline could not offset the substantial increases in labour and material costs. There were no significant differences in the development of financial costs among the size groups.

4.2.2. Area Productivity and Labour Productivity

The Tier 2 KPIs of labour productivity and area productivity are influenced by the combined effects of Tier 1 KPIs. Labour productivity is affected by changes in yield, turnover per litre (price), and labour intensity, while area productivity is shaped by developments in yield and price. The structural breaks observed in the underlying KPIs are also evident in the graphs of labour and area productivity (Figure 12, Figure 13).

Labour productivity increased over the entire period (Figure 12). Since yield stabilised after 2008 (Figure 8) and turnover per litre grew more strongly (Figure 7), the annual increase in labour productivity was higher in the second phase (1,715 €/worker) compared to the first phase (1,447 €/worker). When adjusted for inflation, the trend is similar, yet with a reduced difference between the phases. Over the full 28-year period, nominal labour productivity nearly doubled, increasing by 91%, while the inflation-adjusted increase was more modest at 30%.

In the first phase, labour productivity developed similarly across all three size groups. However, in the second phase, large estates experienced a substantial improvement, increasing their labour productivity by 60% more than the average and 125% more than small estates (Appendix C, Table 6).

Due to declining yields (Figure 8), nominal area productivity remained stable in Phase 1 but decreased

Table 2. Tier 2 regression analysis results.

Variable	Phase 1 (1993 - 2008)				Phase 2 (2009 - 2020)			
	Coefficients			Corrected R^2	Coefficients			Corrected R^2
	Coefficient	T-value	p-value		Coefficient	T-value	p-value	
Cost per litre (€/L)								
nominal	0.07	2.52	<0.05	0.28	0.13	2.64	<0.05	0.33
real	0.01	0.21	0.837	-0.07	0.05	1.31	0.216	0.06
Cost per ha (€/ha)								
nominal	36.07	0.26	0.798	-0.07	685.11	6.74	<0.001	0.79
real	-298.67	-2.47	<0.05	0.27	251.46	3.39	<0.01	0.47
Main Costs per ha (€/ha)								
Material costs	44.78	1.02	0.326	0.00	164.18	4.16	<0.01	0.58
Labour costs	-12.67	-0.65	0.530	-0.04	302.99	10.87	<0.001	0.91
Financial costs	-16.70	-1.71	0.111	0.12	-36.14	-13.24	<0.001	0.94
Labour Productivity (€/worker)								
nominal	1,447.12	9.58	<0.001	0.87	1,715.61	10.85	<0.001	0.91
real	578.23	4.17	<0.01	0.54	596.46	5.01	<0.001	0.67
Area Productivity (€/ha)								
nominal	49.07	0.42	0.683	-0.06	711.34	6.27	<0.001	0.76
real	-309.34	-2.96	<0.05	0.36	242.13	2.89	<0.05	0.38

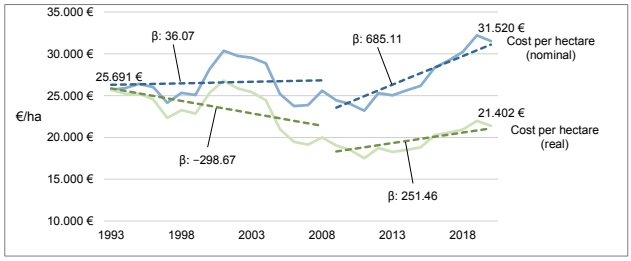

Figure 10. Development of average cost per hectare (nominal) and adjusted for inflation (real) in two linear regression phases.

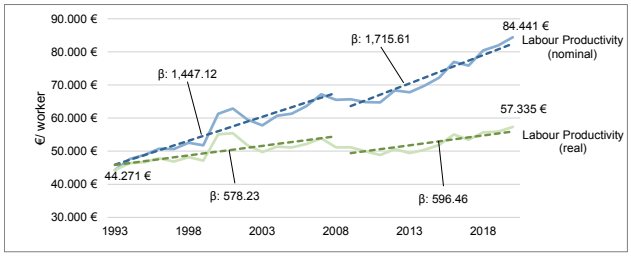

Figure 12. Development of Labour productivity (€/worker) nominally and adjusted for inflation (real) in two linear regression phases.

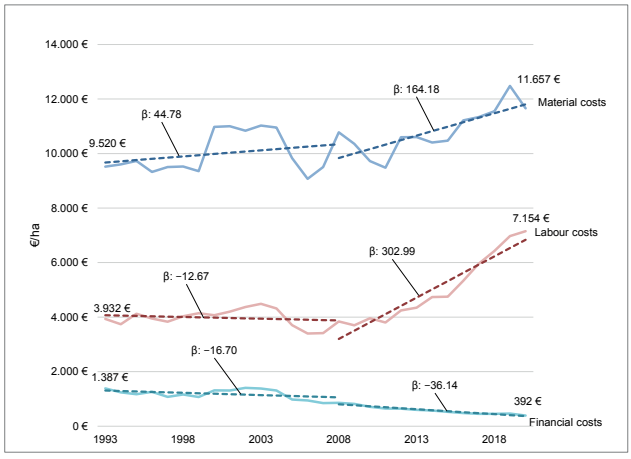

Figure 11. Nominal development of Material, Labour and Financial costs per hectare in two linear regression phases (€/ha). Costs for amortisation and other costs were not regarded for this figure.

significantly in real terms, by €309 per hectare (Table 2). This decline in real land productivity is likely linked to the falling asset values of viticultural land during Phase 1 (Figure 4). When the decline in yield halted and real wine prices began to rise after 2008, area productivity increased significantly, both in nominal terms (€711 per hectare per year) and real terms (€242 per hectare per year). However, by the end of the observation period in 2020, real area productivity was 11% lower than in 1993. This decline is reflected in the significant negative slope of real area productivity, which fell by €194 per year over the entire period.

As with labour productivity, large estates achieved nearly twice the rate of area productivity growth compared to the average during the second phase, with a significantly greater increase than medium-sized wine estates. However, in the first phase, no significant differ-

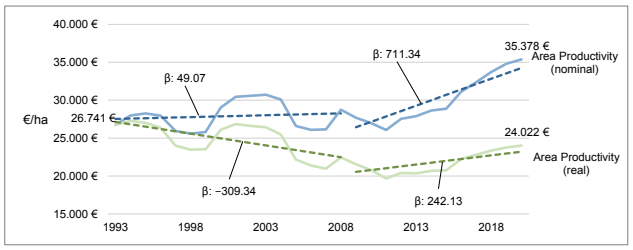

Figure 13. Development of Area productivity (€/ha) nominally and adjusted for inflation in two linear regression phases (real).

ences between size groups were observed (Appendix C, Table 6).

4.3. Tier 3

The four highest-level KPIs in Tier 3 show similar development trends over time (Table 3). Both nominal and real values for all KPIs increased significantly during the first phase, peaking in 2008, the year of the financial crisis. They then declined until 2011, before rising again, albeit at a more moderate pace. The consistent increase during the first phase is reflected by a high level of explained variance, whereas the fluctuations in the second phase lead to a lower explained variance (Table 3). To avoid redundancy, only the operational result KPI is graphically presented here, as the other three KPIs follow essentially identical trends.

The observed differences between size groups exhibit a consistent pattern across all Tier 3 key performance indicators (KPIs). In the first phase, the economic development of all three size groups was largely similar, with no statistically significant differences. However, in the second phase, only large wine estates demonstrated notable improvements in economic performance, significantly diverging from small and medium-sized businesses. The only exception was return on sales, where the substantial nominal difference was not statistically significant due to high variance (Appendix C, Table 6).

4.3.1. Profit per litre

In 1993, wine estates made virtually no profit per litre, with a value of just €0.01. Nominal profit per litre then rose sharply, reaching €0.35 in 2008, before declining to €0.18 in 2011. By the end of the observation period, profit per litre had recovered to €0.42. The increase in profit per litre during the second phase was much smaller than in the first phase, where it grew by an average of €0.02 per litre per year. Over the entire second phase, the growth was not statistically different from zero (Table 3). During the second phase, only large estates experienced a significant annual increase in profit, rising by €0.03 per litre (Appendix C, Table 6).

4.3.2. Operational result per hectare

While the turnover per litre exclusively reflects the turnover generated by wine sales, the operational result per hectare also includes all secondary revenues generated by the wine estate. These include any form of gastronomic activity, events, subsidies, as well as revenues generated through rents and leases. As a result, wine estates, which are unable to cover costs per litre exclusively through wine sales can still generate a positive operational result per hectare through activity in said secondary branches of business.

The development of the operational result after imputed family wage is illustrated in Figure 14. The explanations for profit per litre discussed in section 4.3.1 apply here as well. The linear trend line for the first phase starts in the negative range, indicating that wine estates were unable to sufficiently remunerate their family workers during this period. Nominal operational results then increased sharply, peaking at €3,000 per hectare in 2008, before dropping to €1,100 in 2011 in the wake of the financial crisis. By the end of the observation period in 2020, the nominal operational result had recovered to approximately the 2008 level, at €3,051 per hectare. As a result, the slope for the second phase is not significant (Table 3). The real operational result follows a similar trend, with a slightly widening gap due to inflation.

In the second phase, large wine estates were the only group to achieve a significant improvement in their operational result, with an average increase of €248 per hectare—nearly five times the overall average. This growth deviated significantly from that of small wine estates (Appendix C, Table 6).

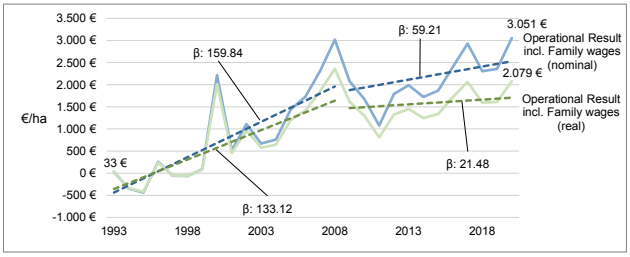

Figure 14. Development of Operational result per hectare (€/ha, incl. family wages) nominally and adjusted for inflation (real) in two linear regression phases. β indicates the regression coefficient displayed in Table 3.

4.3.3. Return on Sales and Equity

Return on sales and return on equity were both highly negative at the start of the observation period. In first phase, both increased significantly, with return on sales rising by 0.58% and return on equity by 0.38% annually (Table 3). Return on sales reached average positive values in 1998 and return on equity in 2002. Both peaked in 2008, the year of the financial crisis, at 8% and 5%, respectively, before declining sharply. By the end of the observation period, they had partially recovered to 7% for return on sales and 4.4% for return on equity. The developments during phase 2 were not statistically different from zero.

Analysing the development by size, large wine estates extended their positive trajectory from the first phase, achieving significant growth in return on sales and return on equity during the second phase, whereas small and medium-sized estates did not. Large estates increased their return on sales by 0.58% and their return on equity by 0.43%. While the increase in return on equity was significantly higher than in both other size groups, the increase in return on sales was not statistically significant due to substantial variation (Appendix C, Table 6).

5. DISCUSSION AND CONCLUSIONS

This study descriptively analysed the long-term economic development of German wine estates over a 28-year period, based on 16 KPIs. The wine estates analysed represent approximately one-quarter of Germany's wine production volume and span the entire value chain, from grape cultivation to the marketing of bottled wine. Similar to previous studies in agricultural economics [49,50,52], the analysis suggests a structural break in the economic development of wine estates following the 2008 financial crisis.

This section summarises the findings from the descriptive analysis, comparing the two phases—before and after the financial crisis—and relates them to the expectations from the literature. The discussion emphasises that each phase was driven by distinct economic factors.

Figure 15 provides a summary of all coefficient results for the nominal KPI developments observed. Real values were disregarded for discussion to ensure comparability with previous literature, which solely takes nominal developments into consideration.

5.1. Economic development in phase 1 – prior the financial crisis

The **primary positive driver** in phase 1 was a 30% reduction in working hours per hectare (-26 h/ha annually), largely due to mechanisation and economies of scale (Figure 16). This aligns with trends in both German and international agriculture [6,17]. Constant investments per hectare can be attributed to the widespread use of rented machine harvesters, reducing the need for large capital outlays by wine estates. This contrasts with other agricultural sectors and challenges the expectation that larger businesses would drive up capital investments [6,29]. For wine estates, the benefits came from supply chain specialisation and using full harvesters provided by external service providers, who can leverage economies of scale more effectively than individual wine estates.

Additionally, as a **minor positive driver**, nominal turnover per litre increased by €0.05 annually, driven by value-added sales and marketing of bottled wine, while bulk wine prices lagged. Together, these factors resulted

Table 3. Tier 3 regression analysis results.

Variable	Phase 1 (1993 - 2008)				Phase 2 (2009 - 2020)			
	Coefficients			Corrected R^2	Coefficients			Corrected R^2
	Coefficient	T-value	p-value		Coefficient	T-value	p-value	
Profit per litre (€/L)								
nominal	0.02	5.40	<0.001	0.67	0.01	1.96	0.076	0.19
real	0.02	5.05	<0.001	0.64	0.00	1.12	0.285	0.02
Operational result per ha (€/ha)								
nominal	159.84	4.76	<0.001	0.61	59.21	1.42	0.182	0.08
real	133.12	4.44	<0.001	0.57	21.48	0.69	0.505	-0.05
Return on Sales	0.58	6.16	<0.001	0.73	0.05	0.38	0.708	-0.08
Return on Equity	0.38	5.60	<0.001	0.68	0.11	1.43	0.180	0.08

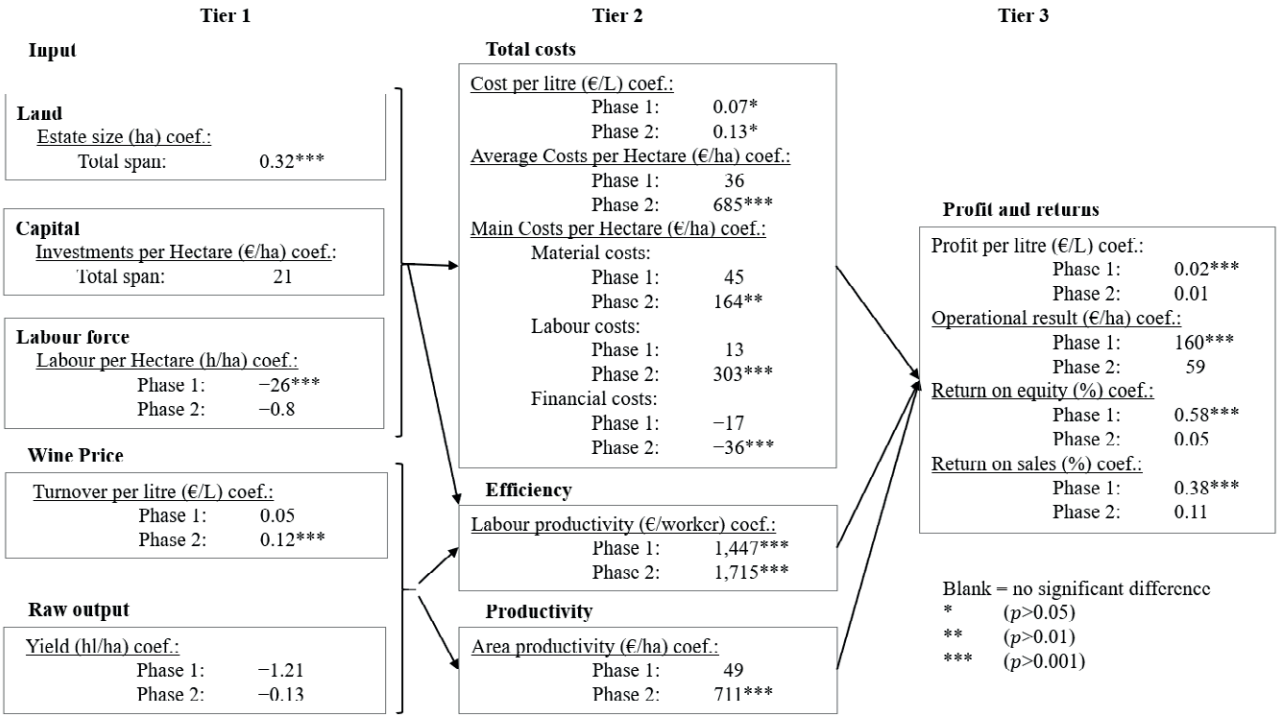

Figure 15. Nominal regression analysis coefficient results summary for the most important KPIs.

in a 48% increase in labour productivity. This is consistent with trends in the agricultural sector [15,36].

In addition to the two positive drivers, phase 1 was marked by **negative factors**, with **declining yield** being the most relevant. Unlike other agricultural sectors, wine estates did not benefit from yield improvements. Instead, yields consistently fell by 34% overall during the first phase (Figure 16). This decline reflects the shift of German wine estates from high-yield towards more in-demand grape varieties like Riesling [33]. The substantial yield drop, combined with only a minor increase in price, led to stagnating nominal and **declining real area productivity** (Table 1, Table 2). A marginal negative driver, was the **rise in nominal costs**, increasing by €36/ha and €0.07/litre annually (Figure 16).

Overall, the positive drivers—reduced labour input and modest increases in nominal prices—sufficiently offset these negative factors. During phase 1 (1993 to the 2008 financial crisis), wine estates significantly improved their profitability. Initially, wine estates were unable to properly compensate family workers, as indicated by a negative operational result after deducting family wages. However, this key performance indicator increased by €160/ha annually, and by the end of phase 1, wine estates had shifted from a deficit, with negative return on sales and equity, to a profitable position.

The economic drivers identified in the first phase applied regardless of wine estate size. The development of key performance indicators (KPIs) did not differ significantly among the three size groups, with the sole exception of the value of viticultural land as a fixed asset, which declined for small and medium-sized businesses but remained stable for large estates (Appendix C, Table 6).

5.2. Economic development in phase 2 – after the financial crisis

The increase in nominal prices per litre was the only significant positive driver in the post-financial crisis recovery period. Wine estates managed to raise prices by a total increase of 33%, primarily driven by value-added marketing, differentiation, and sales activities for bottled wine (Figure 17).

Labour hours, which had declined in the first phase, stagnated in phase 2 despite continued growth in business size (Figure 17). Any notable gains from mechanisation may have been offset by increased efforts in sales, marketing, and administration, as well as a growing focus on ecosystem services [58]. The rise in prices led to a 30% increase in labour productivity and raised area productivity by 31%, with yields remaining stable in phase 2.

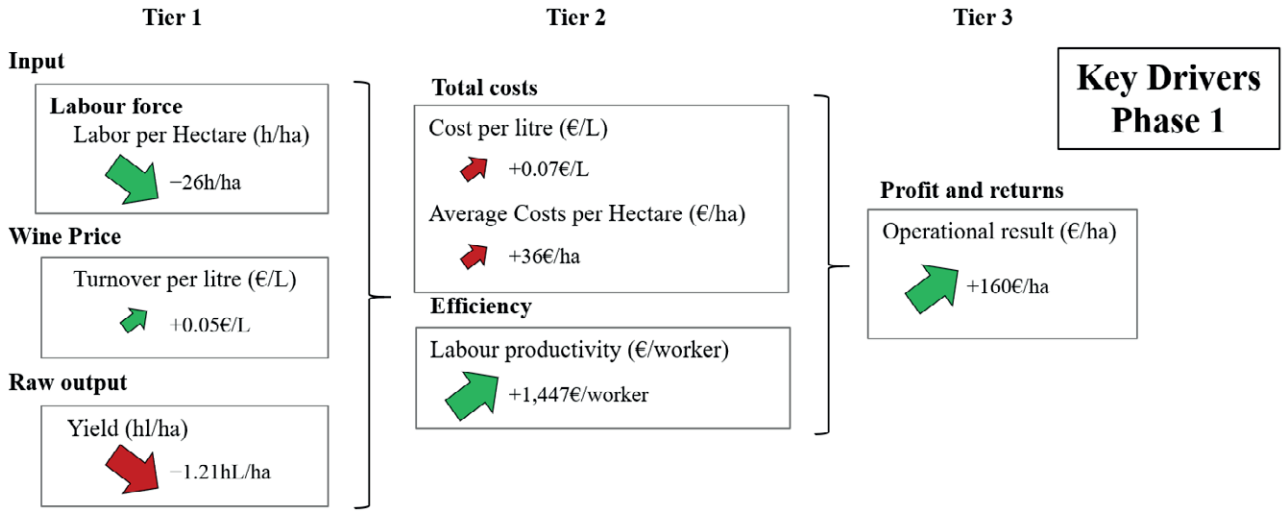

Figure 16. Key developmental drivers of Phase 1 (1993-2008).

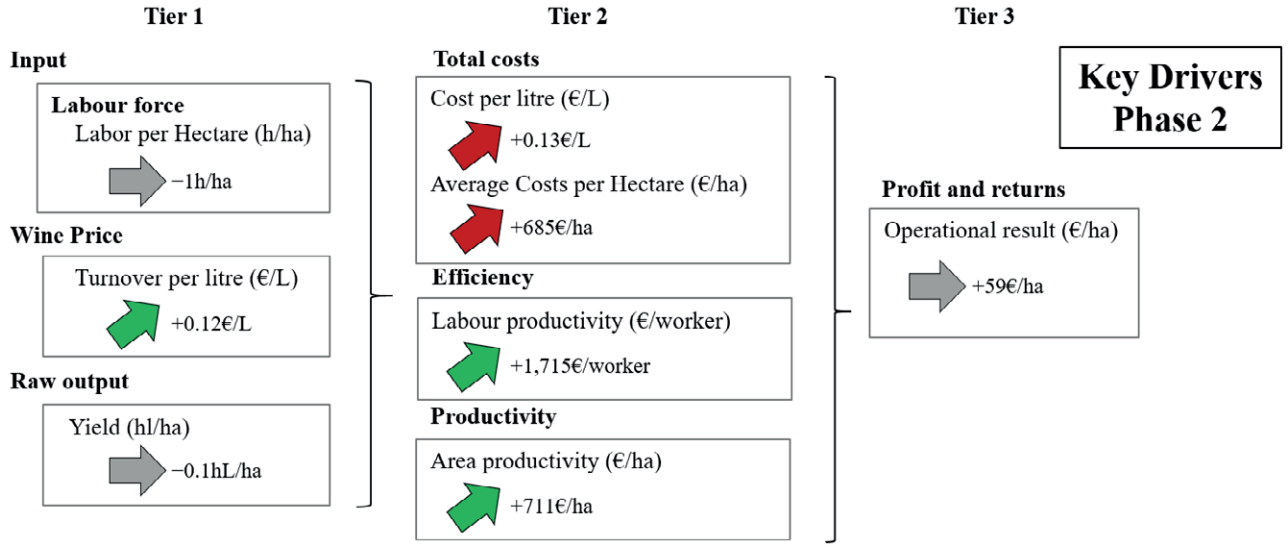

Figure 17. Key developmental drivers of Phase 2 (2009-2020).

The primary negative factor in phase 2 was the sharp rise in costs. Average costs per hectare grew by 32%, while costs per litre saw a similar increase of 31%. These increases were largely driven by rising minimum wages and higher material costs. Overall profitability, which had declined significantly after the financial crisis, recovered slowly, barely returning to 2008 levels by the end of phase 2, with price increases only just offsetting the rising costs (Figure 17).

In the second phase, wine estates of varying business sizes exhibited distinct performance patterns and growth trajectories. While the trends described above predominantly apply to small and medium-sized estates, the largest tertile continued to achieve profitability gains, as reflected in Tier 3 key performance indicators (Appendix C, Table 6). After 2009, however, large estates experienced more pronounced cost increases than their smaller counterparts, primarily due to rising labor and material expenses. This challenges the assumption that larger wine estates benefit from economies of scale, as suggested by Sellers & Alampi-Sottini [22]. Despite these cost pressures, large estates successfully offset rising expenses through substantial improvements in labour and land productivity. In particular, the marked increase in labor productivity suggests that larger estates leveraged workforce specialization to enhance operational efficiency.

Rather than benefiting from lower input costs, large wine estates appear to generate economic advantages by utilizing labor, land, and capital more productively, thereby creating greater value from their resources. These findings suggest that economic success in the wine sector under challenging conditions stems from specialization, which enables a more efficient and productive allocation of key input factors. The fact that large wine estates are significantly more successful has important implications for the future economic development and strategic adaptation of wine estates. Overall, the discrepancy between a positive development of the operational result, on average, even though the growth of average costs per litre exceeded that of the average turnover per litre, points to a reliance of wine estates on subsidies and revenues generated by secondary branches of business, such as gastronomy or events, as established in chapter 4.3.2. These implications for the future will be discussed in more detail in a separate discussion paper.

5.3. Limitations and Future Research

A limitation of this paper is sampling bias, as the data set is not fully representative of German wine estates. Future research could extend this approach to other countries. The study excludes other wine producers, such as grape growers, cooperatives, or large bottlers. Comparing the economic KPIs of wine estates with these other business types would provide valuable insights.

More successful wine estates are more likely to participate in the Geisenheim Business Analysis, while less successful ones may drop out or avoid participation. As a result, the data tends to reflect long-term survivors, as estates that close no longer submit data. This analysis does not account for panel effects.

Despite the overall robustness of the regression analysis, certain classical assumptions were not fully met. Specifically, the assumption of homoscedasticity was violated, as residual plots indicated non-constant variance. While extreme outliers were removed and diagnostic checks suggested limited influence on model results, it is still possible that heteroscedasticity affected the precision of the standard errors. Additionally, the residuals were not perfectly normally distributed, however, given that all sample sizes exceeded 100 observations, the Central Limit Theorem justifies the use of standard inferential procedures. These limitations should be considered when interpreting the confidence intervals and p-values, although the primary findings appear stable and reliable across model specifications.

The study focuses on descriptive analysis and linear trend estimation, without accounting for panel effects or sample heterogeneity over time. The structural shift following the global financial crisis has not been confirmed yet through statistical tests. Future research could include hazard/survival models or multivariate analysis for more detailed comparisons.

This study remains at an aggregate level, analysing KPIs across all participating wine estates without examining specific strategies employed by individual businesses. Future research could explore the strategies of the most successful estates to understand which decisions and actions have driven their success. The paper is also limited in scope by only interpreting past data, due to a lack of availability of more recent data, which could be included for further analysis in the future.

A separate discussion paper will apply these findings to the economic developments after 2020 and derive recommendations for the future strategic management of wine estates in Germany.

5.4. Conclusion

This study focussed on the long-term economic developments of German wine estates before and after the 2008 financial crisis. From 1993-2008, estates benefited from mechanisation, reducing labour per hectare and offsetting declining yields, thus improving productivity and profitability, especially for larger wine estates. From 2009 to 2020, escalating labour and material costs negated price increases, culminating in stagnating profitability. However, the increase of economic performance of large wine estates versus the stagnation and decline within small to medium estates in the latter period, suggests a positive effect related to economies of scale through size increase. Moving forward, the challenges of rising costs, inflation and a declining global wine consumption, leave wine estates in progressively dire straits. To adapt, German wine estates must further embrace mechanisation and the investment into labour-saving technologies to counterbalance increasing costs, while also reconsidering yield management strategies and optimizing their positioning within the market. All in all, this study provides lessons from past developments as a future roadmap for wine estates to enhance their efficiency and productivity, remain persistent in the face of current economic challenges, and ensure long-term economic sustainability in the future.

6. REFERENCES

[1] R. del Rey, S. Loose, State of the International Wine Market in 2022: New market trends for

wines require new strategies, WEP 12 (2023) 3–18. https://doi.org/10.36253/wep-14758.
[2] OIV, The State of the World Vine and Wine Sector in 2023 report, 2024. https://t.ly/baZXj (accessed 30 May 2024).
[3] B. Richter, J. Hanf, KEEPING UP WITH COMPETITORS, 1st Conference of the European Assosiation of Wine Economists (2022) 35–37.
[4] S.M. Loose, E. Pabst, Current state of the German and international wine markets, German Journal of Agricultural Economics - GJAE, 2018.
[5] DWI, 22'/23 Deutscher Wein Statistik, 2022. https://t.ly/XGXKY (accessed 8 February 2023).
[6] J.M. MacDonald, Tracking the Consolidation of U.S. Agriculture, Applied Eco Perspectives Pol 42 (2020) 361–379. https://doi.org/10.1002/aepp.13056.
[7] S. Zeng, F. Zhu, F. Chen, M. Yu, S. Zhang, Y. Yang, Assessing the Impacts of Land Consolidation on Agricultural Technical Efficiency of Producers: A Survey from Jiangsu Province, China, Sustainability 10 (2018) 2490. https://doi.org/10.3390/su10072490.
[8] R. del Rey, S. Loose, State of the International Wine Markets in 2023: The wine market at a crossroads: Temporary or structural challenges?, WEP (2024).
[9] M. Boehlje, J. Akridge, D. Downey, Restructuring agribusiness for the 21st century, Agribusiness 11 (1995) 493–500. https://doi.org/10.1002/1520-6297(199511/12)11:6<493:AID-AGR2720110602>3.0.CO;2-G.
[10] DWI, Mafo-Newsletter 01/2024, 2024. https://t.ly/Lo37D (accessed 22 May 2024).
[11] DWI, '23/ '24 Deutscher Wein Statistik, 2023. https://t.ly/QTxnj (accessed 5 December 2023).
[12] M. Berner, DWI-Sonderbericht Weinkonsumbilanz 2021/22, Deutscher Weinbauverband e.V., 2023.
[13] M. Tafel, G. Szolnoki, Estimating the economic impact of tourism in German wine regions, Int J Tourism Res 22 (2020) 788–799. https://doi.org/10.1002/jtr.2380.
[14] A.W. Bennett, S.M. Loose, Benchmarking Economic Sustainability: What Factors Explain Heterogeneity between Wine Businesses?, Sustainability 15 (2023) 16686. https://doi.org/10.3390/su152416686.
[15] K. Ryszard, Agricultural Productivity in Poland in the Context of Structural Changes in the Sector in 2002-2016, Economic Sciences for Agribusiness and Rural Economy (2018) 109–115. https://doi.org/10.22630/ESARE.2018.2.13.
[16] S. Huettel, A. Margarian, Structural change in the West German agricultural sector, Agricultural Economics 40 (2009) 759–772. https://doi.org/10.1111/j.1574-0862.2009.00413.x.
[17] BMEL, Landwirtschaftliche Betriebe, 2024. https://t.ly/C6KY0 (accessed 4 January 2024).
[18] A. Silberston, Economies of Scale in Theory and Practice, The Economic Journal 82 (1972) 369. https://doi.org/10.2307/2229943.
[19] G.J. Stigler, The Economies of Scale, The Journal of Law and Economics 1 (1958) 54–71. https://doi.org/10.1086/466541.
[20] R. Sellers-Rubio, V. Alampi Sottini, S. Menghini, Productivity growth in the winery sector: evidence from Italy and Spain, Intl Jnl of Wine Business Res 28 (2016) 59–75. https://doi.org/10.1108/IJWBR-05-2015-0019.
[21] S. Tudisca, A.M. Di Trapani, F. Sgroi, R. Testa, The Cost Advantage of Sicilian Wine Farms, American Journal of Applied Sciences 10 (2013) 1529–1536. https://doi.org/10.3844/ajassp.2013.1529.1536.
[22] R. Sellers, V. Alampi-Sottini, The influence of size on winery performance: Evidence from Italy, Wine Economics and Policy 5 (2016) 33–41. https://doi.org/10.1016/j.wep.2016.03.001.
[23] A. Corsi, S. Mazzarino, E. Pomarici, The Italian Wine Industry, in: A. Alonso Ugaglia (Ed.), The Palgrave Handbook of Wine Industry Economics, Palgrave Macmillan US, Cham, 2019, pp. 47–76.
[24] L.M. Albisu, C. Escobar, R. del Rey, J.M. Gil Roig, The Spanish Wine Industry, in: A. Alonso Ugaglia (Ed.), The Palgrave Handbook of Wine Industry Economics, Palgrave Macmillan US, Cham, 2019, pp. 77–103.
[25] E. Pomarici, A. Corsi, S. Mazzarino, R. Sardone, The Italian Wine Sector: Evolution, Structure, Competitiveness and Future Challenges of an Enduring Leader, Ital Econ J 7 (2021) 259–295. https://doi.org/10.1007/s40797-021-00144-5.
[26] M. Boehlje, Alternative models of structural change in agriculture and related industries, Agribusiness 8 (1992) 219–231. https://doi.org/10.1002/1520-6297(199205)8:3<219:AID-AGR2720080303>3.0.CO;2-T.
[27] B. Perretti, Economic sustainability of quality wine districts in the South of Italy. The case of Vulture, IJGSB 11 (2020) 356. https://doi.org/10.1504/IJGSB.2020.110793.
[28] BMEL, Tabellen zur Landwirtschaft, 2024. https://t.ly/p9qoL (accessed 4 January 2024).
[29] T. Filipiak, L. Wicki, Is the Structure of Polish Agriculture Changing? A Comparison Based on

the Results of Recent General Agricultural Census, Annals PAAAE XXIV (2022) 37–53. https://doi.org/10.5604/01.3001.0015.7103.

[30] J.-P. Chavas, On the economics of agricultural production*, Australian Journal of Agricultural and Resource Economics 52 (2008) 365–380. https://doi.org/10.1111/j.1467-8489.2008.00442.x.

[31] D. Kirschke, A. Häger, J.C. Schmid, New Trends and Drivers for Agricultural Land Use in Germany, in: Sustainable Land Management in a European Context, Springer, Cham, 2021, pp. 39–61.

[32] S.L. Wang, P. Heisey, D. Schimmelpfennig, V.E. Ball, Agricultural Productivity Growth in the United States: Measurement, Trends, and Drivers, 2015.

[33] Federal Statistical Office of Germany, Rebflächen nach den wichtigsten Rebsorten im Zeitvergleich, 2023. https://t.ly/JONBx (accessed 22 January 2024).

[34] BMEL-Statistik, Erntemenge an Weinmost, Weinmostertrag je Hektar, Rebfläche im Ertrag: Deutschland, Jahre, Art des Weinmosts, 2024. https://t.ly/FAQgD (accessed 26 March 2024).

[35] Statista, Landwirtschaftliche Betriebsmittel - Index der Einkaufspreise bis 2023 | Statista, 2024. https://t.ly/IbIa1 (accessed 15 February 2024).

[36] BMEL-Statistik, Buchführungsergebnisse Landwirtschaft 2006/07, 2024. https://t.ly/GZ9xf (accessed 15 February 2024).

[37] BMEL-Statistik, Buchführungsergebnisse Landwirtschaft 2021/22, 2024. https://t.ly/netHb (accessed 15 February 2024).

[38] German Federal Bank, Lange Zeitreihen zur Wirtschaftsentwicklung in Deutschland: Geld und Kapitalmarkt, 2024. https://t.ly/Y9fxw (accessed 17 September 2024).

[39] P. Groenewegen, Division of Labour, in: The New Palgrave Dictionary of Economics, Palgrave Macmillan, London, 2019, pp. 1–11.

[40] X. Yang, Economic Development and the Division of Labor, John Wiley & Sons Incorporated, Newark, 2003.

[41] S. Kim, Labor Specialization and the Extent of the Market, Journal of Political Economy 97 (1989) 692–705. https://doi.org/10.1086/261622.

[42] J. Bereżnicka, Sources of Return on Equity in Economically Diversified Agriculture of the European Union Countries, Zagadnienia Ekonomiki Rolnej 356 (2018) 76–93. https://doi.org/10.30858/zer/94477.

[43] BMEL-Statistik, Archiv Buchführungsergebnisse Landwirtschaft, 2024. https://t.ly/Pr0cL (accessed 15 February 2024).

[44] Z. Guo, Y. Feng, T. Gries, Changes of China's agri-food exports to Germany caused by its accession to WTO and the 2008 financial crisis, China Agricultural Economic Review 7 (2015) 262–279. https://doi.org/10.1108/CAER-11-2013-0152.

[45] R. Crescenzi, D. Luca, S. Milio, The geography of the economic crisis in Europe: national macroeconomic conditions, regional structural factors and short-term economic performance, Cambridge J Regions Econ Soc 9 (2016) 13–32. https://doi.org/10.1093/cjres/rsv031.

[46] L. Ball, Long-term damage from the Great Recession in OECD countries, European Journal of Economics and Economic Policies: Intervention 11 (2014) 149–160. https://doi.org/10.4337/ejeep.2014.02.02.

[47] L. Dijkstra, E. Garcilazo, P. McCann, The effects of the global financial crisis on European regions and cities, Journal of Economic Geography 15 (2015) 935–949. https://doi.org/10.1093/jeg/lbv032.

[48] E. Hernández, H. Kriesi, The electoral consequences of the financial and economic crisis in Europe, European Journal of Political Research 55 (2015) 203–224. https://doi.org/10.1111/1475-6765.12122.

[49] L. Sdrolias, A. Semos, K. Mattas, E. Tsakiridou, A. Michailides, M. Partalidou, D. Tsiotas, Assessing the Agricultural Sector's Resilience to the 2008 Economic Crisis: The Case of Greece, Agriculture 12 (2022) 174. https://doi.org/10.3390/agriculture12020174.

[50] G.A. Oladosu, K.L. Kline, J.W.A. Langeveld, Structural Break and Causal Analyses of U.S. Corn Use for Ethanol and Other Corn Market Variables, Agriculture 11 (2021) 267. https://doi.org/10.3390/agriculture11030267.

[51] Y. Tsuchiya, Linkages among commodity futures prices in the recent financial crisis: An application of cointegration tests with a structural break, Cogent Economics & Finance 3 (2015) 1012436. https://doi.org/10.1080/23322039.2015.1012436.

[52] A. Kalsie, A. Arora, Structural break, US financial crisis and macroeconomic time series: evidence from BRICS economies, Transnational Corporations Review 11 (2019) 250–264. https://doi.org/10.1080/19186444.2018.1475087.

[53] A.W. Bennett, S. Müller Loose, User-Centered Development of an Online Dashboard Tool for Economic Sustainability for Small and Medium Enterprises, Sustainability 16 (2024) 557. https://doi.org/10.3390/su16020557.

[54] M. Ghosh, Structural Breaks and Performance in Agriculture, in: M. Ghosh (Ed.), Liberalization,

Growth and Regional Disparities in India, Springer, India, 2013, pp. 83–107.
[55] G. Casella, R.L. Berger, Statistical inference, Second edition, CENGAGE Learning, Andover, Melbourne, Mexico City, Stamford, CT, Toronto, Hong Kong, New Delhi, Seoul, Singapore, Tokyo, 2002.
[56] A.W. van der Vaart, Asymptotic statistics, First paperback edition, eighth. printing, Cambridge University Press, Cambridge, New York, 2007.
[57] J. Fox, Applied regression analysis and generalized linear models, Third edition, Sage, Los Angeles, London, New Delhi, Singapore, Washington DC, Boston, 2016.
[58] Federal Statistical Office of Germany, Deutlicher Zuwachs an Ökobetrieben und ökologisch bewirtschafteten Flächen im letzten Jahrzehnt, 2023. https://t.ly/s9TWA (accessed 18 September 2024).

APPENDIX A

Table 4. Sample size of wine estate participants per year, as well as minimum and maximum size values per tercile.

Year	Sample size	Small (ha)		Medium (ha)		Large (ha)	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
1993	106	1.2	5.2	5.2	8.4	8.4	22.4
1994	107	1.7	5.9	6.0	9.4	9.5	32.0
1995	114	1.5	6.0	6.1	8.9	9.0	24.7
1996	129	2.2	6.5	6.6	10.2	10.2	24.7
1997	153	1.7	6.9	6.9	10.8	10.9	28.5
1998	172	1.8	7.2	7.3	11.5	11.5	40.4
1999	181	1.8	7.4	7.4	11.7	11.7	35.4
2000	110	2.2	7.6	7.6	10.8	11.0	26.7
2001	117	2.1	7.2	7.2	11.2	11.2	29.0
2002	131	2.3	7.0	7.1	11.2	11.2	36.6
2003	125	1.5	7.1	7.2	10.8	10.9	36.2
2004	140	1.9	7.2	7.2	11.7	11.7	36.3
2005	159	2.7	9.7	9.7	13.6	13.7	67.8
2006	185	3.1	10.0	10.2	14.4	14.4	47.0
2007	223	2.1	9.7	9.7	14.4	14.5	70.0
2008	282	0.6	8.6	8.6	14.2	14.4	49.8
2009	292	2.0	8.6	8.7	14.5	14.5	55.7
2010	311	2.1	8.8	8.8	15.1	15.1	50.5
2011	319	1.5	8.8	8.8	15.2	15.3	57.4
2012	300	2.3	9.8	9.8	15.7	15.7	57.8
2013	304	2.3	9.4	9.4	15.5	15.6	50.9
2014	309	2.1	9.8	9.8	16.3	16.4	62.8
2015	304	0.5	9.7	9.7	16.9	17.0	60.3
2016	300	0.5	10.4	10.4	17.0	17.2	72.6
2017	309	0.5	10.0	10.2	17.0	17.1	67.0
2018	310	0.5	10.1	10.1	16.3	16.6	58.6
2019	304	2.3	9.9	9.9	16.6	16.7	69.0
2020	279	2.3	10.2	10.2	17.9	18.0	72.6

APPENDIX B

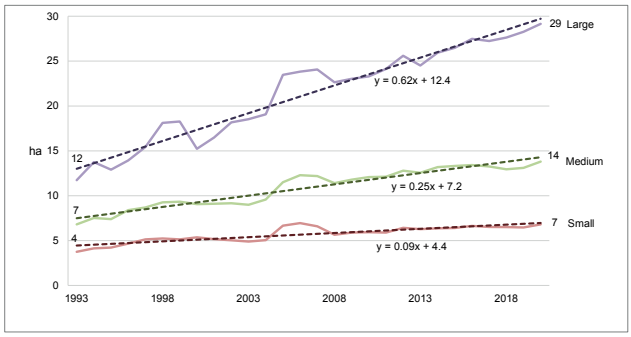

Figure 18. Average business size development by terciles in ha.

APPENDIX C

Table 5. regression analysis results by size group total timespan.

	Total timespan (1993 - 2020)				
	Coefficients		hs	Conf. Int. 95%	
Variable	Coefficient	p-value		lower	upper
Business Size (ha)	**0.32**	**<0.001**		-	-
Small	0.09	<0.001	c	0.07	0.12
Medium	0.25	<0.001	b	0.22	0.28
Large	0.62	<0.001	a	0.56	0.68
% Full-time employees	**0.85**	**<0.001**			
Small	0.75	<0.001	b	0.68	0.82
Medium	0.77	<0.001	b	0.67	0.87
Large	1.00	<0.001	a	0.90	1.10

Table 6. regression analysis results by size group, divided into two phases.

Variable	Phase 1 (1993 - 2008)					Phase 2 (2009 - 2020)				
	Coefficients		hs	Conf. Int. 95%		Coefficients		hs	Conf. Int. 95%	
	Coefficient	p-value		lower	upper	Coefficient	p-value		lower	upper
Viticultural area	**-343**	**<0.05**		-	-	**-56**	**0.467**		-	-
Small	-635	<0.001	b	-934	-336	-323	<0.05	bc	-557	-90
Medium	-600	<0.05	b	-1103	-98	291	<0.05	a	10	572
Large	199	0.260	a	-164	562	-201	0.313	ab	-624	221
Cost per ha (€/ha)										
nominal	**0.11**	**0.999**				**671**	**<0.001**			
Small	76.01	0.551		-191	343	739	<0.001	b	618	859
Medium	24.24	0.865		-275	324	470	<0.001	b	284	656
Large	-98.33	-0.668		-414	217	1152	<0.001	a	874	1430
Main Costs per ha (€/ha)										
Material costs	**57**	**0.173**				**155**	**<0.01**			
Small	95	<0.05		10	180	180	<0.001	ab	102	258
Medium	108	<0.05		8	208	101	<0.05	b	13	188
Large	-36	0.505		-148	76	309	<0.001	a	220	398
Labour costs	**-12**	**0.465**				**296**	**<0.001**			
Small	11	0.581		-30	52	256	<0.001	b	225	287
Medium	-22	0.163		-55	10	256	<0.001	b	188	325
Large	-23	0.475		-91	44	459	<0.001	a	375	543
Labour Productivity (€/worker)										
nominal	**1457**	**<0.001**				**1713**	**<0.001**			
Small	1304	<0.001		940	1668	1239	<0.001	b	998	1480
Medium	1705	<0.001		1368	2042	1634	<0.001	b	1286	1982
Large	1359	<0.001		831	1886	2783	<0.001	a	2271	3295
Area Productivity (€/ha)										
nominal	**37**	**0.726**				**697**	**<0.001**			
Small	139	0.215		-91	369	806	<0.001	ab	593	1019
Medium	58	0.636		-200	317	503	<0.001	b	308	699
Large	-83	0.550		-373	208	1179	<0.001	a	902	1455
Profit per litre (€/L)										
nominal	**0.02**	**<0.001**				**0.01**	**0.103**			
Small	0.04	<0.001		0.02	0.05	0.00	0.928	b	-0.014	0.015
Medium	0.02	<0.001		0.01	0.03	0.01	0.263	ab	-0.007	0.022
Large	0.02	<0.01		0.01	0.03	0.03	<0.01	a	0.017	0.052
Operational result per ha (€/ha)										
nominal	**186**	**<0.001**				**53**	**0.237**			
Small	306	<0.001		179	432	25	0.571	b	-69	118
Medium	148	<0.001		75	221	63	0.197	ab	-39	164
Large	110	<0.01		34	185	248	<0.001	a	152	344
Return on Equity	**0.44**	**<0.001**				**0.10**	**0.242**			
Small	0.66	<0.001		0.45	0.87	0.11	0.249	b	-0.09	0.31
Medium	0.40	<0.001		0.25	0.54	0.04	0.705	b	-0.20	0.28
Large	0.33	<0.01		0.16	0.51	0.43	<0.001	a	0.32	0.55

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Barriers and Drivers in the Adoption of New Genomic Techniques for Grapevines

Lara Agnoli[1,*], Efi Vasileiou[2], Federica Demaria[3]

[1] *Université Bourgogne Europe, Burgundy School of Business, School of Wine & Spirits Business, CEREN EA 7477, Dijon, France*
[2] *Université Bourgogne Europe, Burgundy School of Business, CEREN EA 7477, Dijon, France*
[3] *Council for Agricultural Research and Economics - Agricultural Policies and Bioeconomy Center (CREA- PB), Rome, Italy*
Email: lara.agnoli@bsb-education.com; effrosyni.vasileiou@bsb-education.com; lara.agnoli@bsb-education.com
*Corresponding author.

Abstract. Severe climate conditions and fungal diseases have significantly impacted global wine production, bringing it to its lowest levels in decades. The development of resilient grape varieties with strong quality standards becomes therefore essential for the industry's future. This study examines how European producers perceive New Genomic Techniques (NGTs), innovative methods that enhance plant traits without adding foreign DNA, improving grape resistance to environmental and biological stresses while promoting more sustainable production. Employing qualitative methods, semi-structured interviews were conducted across six major wine-producing countries. Thematic analysis revealed a complex and diverse range of opinions. Growers recognized NGTs' potential to optimize resource management, enhance climate resilience, and reduce production costs, directly contributing to more sustainable practices. However, significant barriers were identified, including ethical concerns, consumer acceptance, misinformation and fear of new technologies, and legislative uncertainties. Furthermore, farmers' knowledge gaps and adherence to traditional methods posed internal barriers. The need for transparent communication was highlighted as a critical factor, as well as the importance of addressing these multiple challenges through stakeholder engagement and informed policymaking.

Keywords: New Genomic Techniques, grape growers, producers, technicians, barriers, drivers.

1. INTRODUCTION

Extreme climatic conditions and widespread fungal diseases have severely affected vineyards worldwide, resulting in a wine production of 225.8 million hectoliters in 2024, the lowest output recorded since 1961 [1]. On the one side wine production is impacted by diseases and climate change, and on the other side the European agricultural policies are under-

going relevant transformation. While earlier frameworks such as the Farm to Fork Strategy (part of the European Green Deal), aimed to reduce pesticide use by 50% by 2030 [2], recent political developments have shifted the EU's priorities. The proposed Sustainable Use of Pesticides Regulation (SUR) has been withdrawn, and the EU's new "Vision for Agriculture and Food", adopted in 2024, marks a clearer political commitment to innovation and biotechnology, including the use of New Genomic Techniques (NGTs) to support sustainable agriculture. To achieve this goal and promote sustainable development in the wine industry, developing and introducing resilient grape varieties with competitive quality is essential. This involves leveraging unexplored grapevine biodiversity and new breeding opportunities. Genetic engineering plays a crucial role in this, with different interventions to the grapevine. Agricultural biotechnology research is focusing on developing New Genomic Techniques (NGT, also called New Breeding Techniques, NBT), encompassing a range of modern methods used to introduce specific traits into plants, without introducing foreign DNA [3]. These techniques include CRISPR/Cas9 (gene editing), cisgenesis, and intragenesis and are able to produce grapes resistant to both biotic and abiotic stresses [4], enabling winegrowers to cope with climate change, pathogens, and water stress while maintaining the quality and characteristics of their wines. However, the short-term practical NGTs application in grapevine breeding is limited by several technical challenges, including the plant's recalcitrance to genetic transformation and regeneration [5], [6]. Unlike annual crops such as maize or soybean, grapevine is a woody perennial with complex genetics and long generation cycles, which significantly slow down breeding cycles. These technical barriers may limit the immediate deployment of NGT-derived varieties in vineyards, and should be carefully considered alongside their potential. Recent advances suggest that certain characteristics, such as disease resistance, can benefit from targeted changes more quickly. Experimental studies have demonstrated the efficacy of CRISPR/Cas9 in modifying genes that confer susceptibility to blight and powdery mildew, with potential improvements in resistance in vitro and in trials [7], [8]. Similarly, in other woody crops such as apple and pear, editing of the TERMINAL FLOWER 1 (TFL1) gene accelerated flowering with results obtained within one and two years, allowing for the reduction of breeding cycles compared to conventional methods [9]. Furthermore, innovative protocols for the transformation without integration of foreign DNA, based on protoplast editing, have allowed the regeneration of genome-edited plants in a few months into lives, even if multiplication and commercial diffusion require longer times [10]. These technological advances indicate the possibility of concrete results over less than five years in woody crops, while maintaining necessary precautions regarding the genetic complexities and long development times typical of these species.

Notably, grapes obtained through NGT maintain the same sensory properties as 'natural grapes', unlike Fungus-Resistant Grape varieties (FRG or PIWI, the abbreviation of *pilzwiderstandsfähig*, the German term for "fungus resistant"). FRGs have been more extensively studied in socio-economic literature than NGTs due to their longer history. They are hybrids of *Vitis Vinifera* and primarily North American Vitis species, and are resistant to many diseases, but they present altered sensory properties compared to the original grape.

NGTs are able to preserve sensory characteristics of a grape, but from a legislative perspective, the debate around them is very active at the EU level [11]. Despite the scientific potential of NGTs, resistance to their adoption remains strong, as evidenced by recent acts of vandalism against experimental NGT vineyards in Italy [12]. These actions reflect a broader societal debate extracting from scientific discussions and entering into ethical, economic, and political concerns.

Understanding grape growers' perspectives on NGTs is crucial for the future of viticulture. As the primary actors in the wine supply chain, their acceptance or rejection of NGTs will significantly influence the adoption and diffusion of these technologies. Studying their views provides insight into the economic, environmental, and social drivers and barriers they perceive. The topic of NGT is relatively new and little explored in literature, particularly in Europe, where, to our knowledge, no socio-economic studies have analyzed the issue from the supply side of the wine market (i.e., grape growers, technicians, wine producers). This paper aims to examine producers' perceptions of biotechnology applied to grapevines and identify the barriers and drivers influencing the adoption of plants from NGT.

The rest of the paper is structured as follows: Section 2 presents a non-systematic review of the literature, focusing on socio-economic studies of traditional and new genomic techniques. Section 3 explains the methodology used to achieve the research objectives. Section 4 presents the research findings, and Section 5 discusses the results and Section 6 concludes.

2. BACKGROUND LITERATURE

2.1. Traditional Breeding Techniques in socio-economic literature

When considering literature on traditional breeding techniques adopted to improve grape resistance to pathogens and sustainability, an increasingly important number of studies focused on Fungus-Resistant Grape (FRG) varieties in the light of consumers' perception and willingness to pay (WTP) from the one side, and producers and factors influencing their adoption from the other side.

Wines produced from FRG varieties appeal to the increasing consumer demand for sustainability by minimizing the need for fungicides and reducing their carbon footprint [13], [14], [15]. Research highlights the importance of information as a driver of WTP and market acceptance of FRG wines [13], [16], [17], as well as the importance of increasing consumer awareness of the environmental benefits, of using appealing names, and of developing wines with desirable sensory profiles [14], [18]. The regulatory framework also shows to significantly affect the adoption and market acceptance of FRGs, and this is particularly shown in the light of the EU Regulation 2021/2117, allowing the use of FRGs to produce wines with Protected Designations of Origin (PDOs) [19], [20].

A smaller number of studies focus on producers and the adoption of FRG varieties. Finger et al. [21] investigated Swiss grape producers and found that those engaged in shorter supply chains, such as direct marketing, are more likely to adopt FRGs. Zachmann et al. [22] also analyze Swiss producers and highlight that adoption intentions are driven by both farmer and farm characteristics. In particular, grape growers' positive health perceptions of FRG are able to drive intention to adopt them. Additionally, conventional farmers are especially likely to increase the land devoted to these varieties. Sambucci et al. [23] analyze US grape growers and their preferences for specific varietal traits, emphasizing the high value placed on both the varietal name and the cost savings from reduced fungicide applications.

The literature indicates that consumer acceptance and producer adoption of FRG varieties are influenced by familiarity with breeding techniques, perceived environmental benefits, and effective information and communication strategies. Regulatory frameworks also play a crucial role in shaping the market impact of FRGs [13], [14], [18].

2.2. New Breeding Techniques in socio-economic literature

NGTs represent a set of innovative breeding methods that allow for precise and targeted genetic modifications in plants. Among these, Genome Editing (GE), notably through CRISPR/Cas technologies, has gained significant attention due to its ability to introduce specific, predictable changes in DNA sequences without necessarily inserting foreign genes. This differs substantially from Genetic Modification (GM), which generally involves transgenic methods and the introduction of DNA from unrelated organisms.

This conceptual distinction between GE and GM is essential, as it influences both regulatory frameworks and public perceptions. GE is often seen as more "natural" and acceptable than GM, particularly because the genetic changes it induces could also occur naturally or through conventional breeding.

According to experts, NGTs have great potential for boosting crop yields, enhancing nutritional content of food, and increasing resilience to climate change [24]. They argue that crops from NGTs can significantly contribute to a more sustainable and safe food supply, particularly due to their faster and more cost-effective development compared to traditional breeding methods [11], [25].

Most of the socio-economic literature on NGT focuses on Genome Editing (GE) in comparison with Genome Modification (GM) in food products from the consumers' and the producers' eyes [26], [27]. Research reveals a generally low level of awareness among both consumers and farmers regarding both GE and GM [28], [29]. Despite this low awareness, there is a slightly higher familiarity with GM foods [28], [30], [31]. Basinskiene and Seinauskiene [28] found that even with this familiarity, people tend to be more accepting of GE than traditional GM food. This preference is supported by Bearth et al. [30] and Romeo Lironcurti et al. [31], who report that the perceived naturalness and precision of GE contribute to a more favourable public opinion compared to Genetically Modified Organisms (GMOs). Sprink et al. [32] highlight a potential shift towards greater acceptance of GE by the public when the technology delivers clear societal benefits, such as enhanced sustainability or improved nutrition. Research also highlights the importance of perceived benefits, such as prolonged shelf life, in shaping public opinion towards GE [30].

Nawaz and Satterfield [33] investigate public perceptions of GE in agriculture, pointing out that individuals who are critical of industrialized food systems are more likely to oppose GE, while those concerned about climate change were more likely to support it. Research also highlights the importance of considering broader societal concerns like ethical ones, beyond just risks and benefits, when assessing public perceptions of GE [34].

Concerns about NGTs are also tied to the ambiguous and inconsistent regulatory landscape worldwide.

Public uncertainty and the influence of advocacy groups have led to stringent regulations in some regions, particularly in the EU, potentially hindering the adoption and beneficial impact of these new technologies [11]

Farmers generally exhibit a lower level of technical knowledge about GE than other stakeholders like researchers and policy makers, emphasizing perceived personal benefits, potential risks concerning naturalness and morality, and uncertainty about the technology when expressing their opinion on the technology [35]. However, at a farmer level, research highlights that subjective knowledge about GE, experience with similar technologies, and perceive low risk drive to positive attitudes towards GE [36].

Research recognizes the need for further investigation into farmers' perceptions of NGTs and into factors influencing their decisions to adopt them [36].

From a regulatory perspective, the EU Member States have historically adopted a precautionary and restrictive approach to biotechnology. In 2018, the Court of Justice of the EU ruled that organisms obtained by mutagenesis techniques (including CRISPR/Cas) should be subject to GMO legislation [37], which imposes complex authorization procedures. This alignment with GMOs was widely criticized by scientists and industry actors as a barrier to innovation. A major shift occurred in July 2023, when the European Commission presented a legislative proposal to reform the EU regulatory framework for NGTs. This proposal aims to differentiate between two NGT categories: NGT-1 plants (those whose genetic alteration could also occur naturally or through conventional breeding), which would be exempt from the current GMO legislation; and NGT-2 plants, which would remain subject to current GMO rules. As of 2025, the proposal is in trilogue negotiations between the European Commission, the European Parliament, and the Council. If this new view is approved, a transformative impact on the adoption of NGTs in European agriculture, including viticulture, will take place.

Additionally, the International Organisation of Vine and Wine (OIV) has acknowledged the potential of biotechnology and NGTs in viticulture [1]. In its resolutions and strategic documents, the OIV emphasizes the importance of scientific innovation for improving grapevine resistance, promoting sustainability, and maintaining wine quality. It also highlights the need for a balanced approach that can combine regulatory assessment and effective communication with consumers.

In this context, the present paper contributes to the socio-economic debate by exploring the perceived benefits and barriers associated with the adoption of NGTs in viticulture. By focusing on the supply side of the wine sector, the study sheds light on how producers perceive these technologies and how regulatory, technical, and cultural dimensions intersect in shaping future pathways for innovation.

3. METHODOLOGY

We carried out a qualitative study to develop a comprehensive and detailed understanding of beliefs towards NGTs in viticulture and drivers and barriers in their adoption. The study included eighteen interviews with farmers from six European countries (Italy, France, Spain, Portugal, Greece and Hungary). These countries were chosen for their significance in the wine industry, collectively accounting for 83% of Europe's wine production and 53% of the world's wine production in 2024 [38].

Semi-structured interviews were conducted on topics related to biotechnology, GM applied to grape and vine, NGT in viticulture and barriers and drivers to adoption. A common protocol was created in English and shared among the seven interviewers (one for each country, except Spain, where two different wine regions were involved, and two interviewers collected information), including: i) rules to follow to conduct the interviews, and to record, transcribe and translate them; ii) ethical commitments, including the consent form to be signed by each interviewee, and iii) questions to ask. The data collection method was approved by the Data Protection Officer and the ethical committee of the Burgundy School of Business (Approval number: CEREN_BSB2024-69).

Three interviews were conducted in each participating country, for a total of 18 respondents, a sample size sufficient to achieve saturation. The judgment sampling method was employed to select interviewees, ensuring a broad view of the European wine industry's supply side (Table 1). Interviewees were chosen to reflect different farm sizes in each country and varied perspectives regarding the adoption of technologies in the wine industry, including biotechnology and NGTs. The final sample encompasses a range of grape growers and wine producers, from small operators (3.6 hectares) to large ones (120 hectares), as well as technicians in wineries and cooperatives, and the director of an association of producers. Most respondents are aged between 41 and 60, with only a few younger individuals, reflecting the typical demographics of the primary industry in Europe. Only one respondent is female, which also aligns with the gender distribution in the primary sector.

Since the topics of biotechnology and NGT are highly specific and sometimes confusing, the interview pro-

Table 1. Socio-economic characteristics of participants.

Interviewee ID	Country	Role	Gender	Age class (year old)
I1-I2-I3	Greece	-grape grower and wine maker -grape grower and wine maker -grape grower	Males	41-50
I4-I5-I6	Portugal	-grape grower and wine maker -grape grower -grape grower and wine maker	Males	41-50 51-60
I7-I8-I9	France	-vineyard operator -technical director of a winery -technical director of a winery	1 Female 2 Males	41-50 51-60 60-70
I10-I11-I12	Italy	-viticultural consultant -grape grower and wine maker -agronomist technician in a wine cooperative	Males	31-40 51-60 61-70
I13-I14-I15	Spain	-technical director of a winery -grape grower and wine maker -director of an association of wineries	Males	41-50 51-60
I16-I17-I18	Hungary	-grape grower and wine maker -grape grower and wine maker -grape grower and wine maker	Males	21-30 31-40 61-70

tocol included expert-defined explanations to establish a shared knowledge base with interviewees and prevent misunderstandings (Appendix A).

A set of interview questions was designed to assess perception and awareness of NGTs and how they differ from GMOs. The aim was also to identify the barriers to and drivers of applying NGT in viticulture. This paper presents the findings related to perceptions, barriers, and drivers, reporting the analysis of answers to the following questions:

1. What do you think about biotechnology applied to grape and grape vine?
2. What do you think the benefits may be in introducing plants from New Genomic Techniques?
3. What could be the main barriers in introducing plants resulting from New Genomic Techniques?

The interviews were carried out in May and June 2024, and were conducted face-to-face or online via Teams. They lasted approximately 30 minutes on average. They were audio recorded and transcribed using Microsoft Word, with the interviewers verifying the accuracy of the transcriptions. The interviewers also handled translating the interviews into English. The transcripts were analyzed, and responses coded using NVivo 14. Given the limited theoretical foundation of NGT in viticulture, a stepwise thematic analysis was adopted and one researcher carried out the initial coding in an open and inductive manner, without relying on a predetermined framework, but rather based on the frequency of issues emerging in the transcripts [39]. These initial codes were then iteratively refined and grouped into broader categories-Axial Coding (e.g. 'future-oriented (Pro-Biotech)', 'Tradition-Oriented (Skeptical)', 'Internal Barriers', 'External Barriers'). Finally, these categories were synthesized into higher-level themes that reflect farmers' perceptions about biotechnology, as well as the barriers and drivers towards NGT plants adoption, mentioned throughout the entire transcript, rather than solely in response to specific questions on the topic. Another researcher verified the initial coding for consistency, and any discrepancies were addressed and resolved through collaboration [40]. Appendix B summarizes information on the adopted coding system, including a short description[1].

4. FINDINGS

4.1. What do you think about biotechnology applied to grape and grape vine?

When analyzing perceptions of biotechnology application to vineyard, a mix of awareness of its necessity, skepticism and lack of knowledge and need of information emerges (Figure 1).

Some interviewees point out that biotechnologies represent the future for viticulture, as they can provide the wine industry with solutions to challenges like cli-

[1] The relative quotations and the full coding process are available at the following link: https://zenodo.org/records/17301662

mate change and diseases, at the same time protecting the environment. I10, viticultural consultant from Italy, states that *"They are the only sustainable thing for the defense for grapevine in the upcoming years"*. Another interviewee, I13 from Spain took a general approach, stating that biotechnology is a science *"that through knowledge can give solutions to different problems that may be encountered in the productive process"*.

Many highlighted the economic advantages and potential revenues that can be derived from biotechnologies. In particular, I4, a grape grower from Portugal mentioned that *"biotechnology is the only path to achieve yields"*. On the other hand, there is a clear conviction that biotechnology can drive to environmental benefits, as it can play an important role given the challenging climatic changes, and *"viticulture is not a field where you can suddenly change from one year to the next one; all kinds of research results should be examined to see how they can help winemakers"* (I18, grape grower and winemaker from Hungary).

While some actors in the wine industry support biotechnology and innovation, others remain committed to traditional viticultural methods. They believe that these methods are essential for conserving the cultural heritage and terroir-specific characteristics of wine, and they fear that new technologies might alter the traditional attributes of grape varieties. I12, agronomy technician from Italy says: *"I'm a traditionalist because where I was born autochthonous grape varieties are the most popular ones [...]. The phenotypes and ecotypes that have developed over hundreds of years in a territory have developed here and it is fair to support them"*. I15, director of an association of producers from Spain, talking about the wine sector, states that *"a priori it's difficult to innovate, it's a traditional sector, and I think that sometimes this also limits the development of skills. In the world of wine, and especially in the Denominations of Origin, there are certain limitations linked to tradition, linked to the typicity of the wines [...] our varieties, our soil, our climate, our way of doing things"*.

Ethical dilemmas also emerge and there is a demand for a specific ethical framework associated with biotechnological innovations in viticulture. I2 from Greece denounces a *"legal loophole"* arising from biotechnology applied to viticulture; in particular, he thinks that *"there are ethical issues, at least for wine grapes, because there are resistant grapes in America of all cultivated varieties that consider themselves to be mutations but are not considered the same as the original"*. I9 from France stats that *"if biotechnology leads to changes in DNA character-*

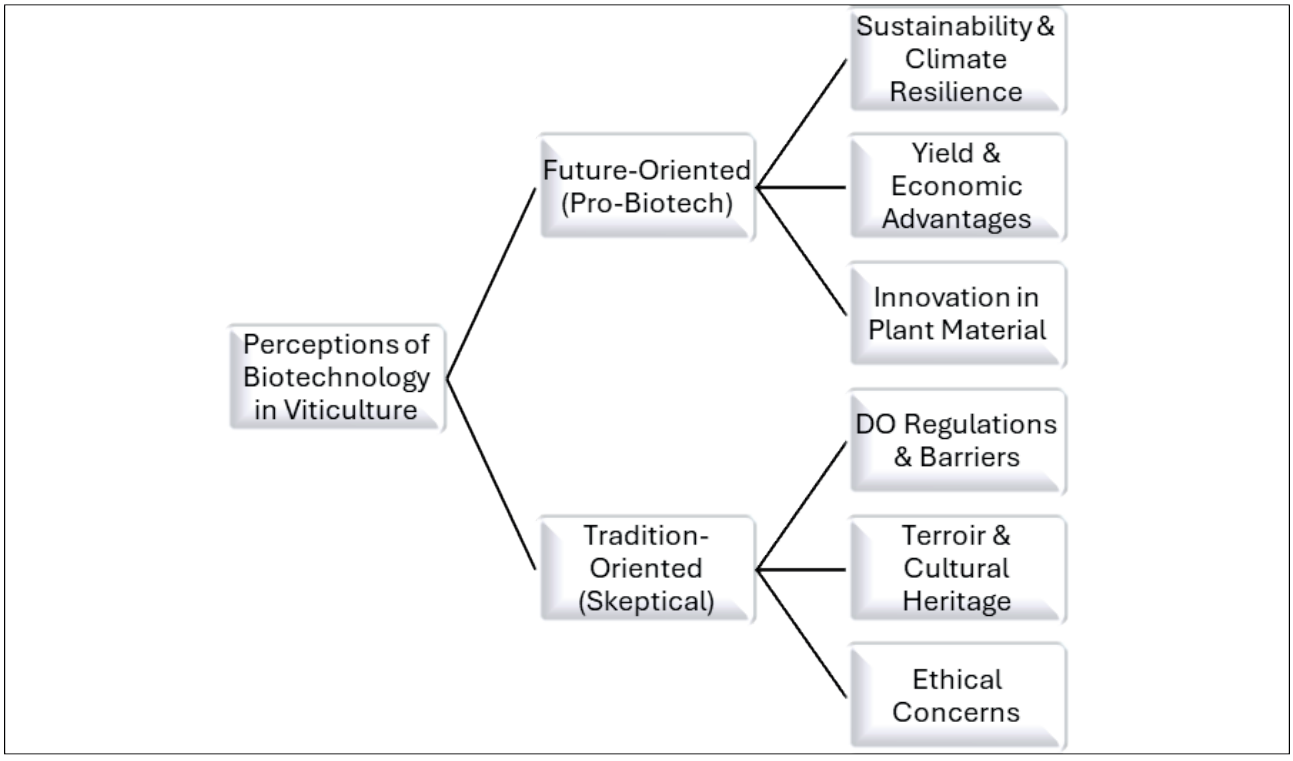

Figure 1. Perception of biotechnology in viticulture.

istics" to improve plant characteristics through a genetic make-up of the plants, *"this bothers me a bit"*.

Finally, a need for better communication and education has emerged. There is a general feeling that the average person, and even winemakers, know little about these technologies. I16 from Hungary suggests that *"we need to communicate more"*, as there is significant positive potential in these techniques.

4.2. What do you think the benefits may be in introducing plants from New Genomic Techniques?

A common advantage highlighted in most interviews regarding the adoption of NGTs is the optimization of inputs (Figure 2). Interviewees acknowledge that these new technologies improve the management of water and chemical products, including pesticides. I2 from Greece draws that this will lead to the *"exploitation of new terroirs, because we will be able to plant in locations that do not have water and that previously we could not cultivate under grape"*. Another concept that emerges from the interviews is time saving, which is connected to reduced costs. These cost reductions are not only due to the decreased use of pesticides but also from the lower consumption of diesel and reduced human labor.

Regarding resistance to climate shocks, interviewees reported that NGTs will enhance disease resistance and produce grapes that are more resilient to drought and climate change. In this regard, for example, I16, a grape grower and wine producer from Hungary, points out that *"the main thing is that the vines will be more resistant, not only to fungal diseases, but perhaps more resistant to drought, for example, and therefore more resistant to environmental effects"*. I8, technical director of a winery in France, highlights the importance of these new technologies in the light of the actual issues in the industry: *"If we identify a gene tomorrow that can be introduced to generate resistance, it would be very interesting. Currently, it's estimated that our vineyards lose 20% of their volume, which is enormous, so this would be a significant achievement"*. Following the same logic, I15, director of an association of producers in Spain, expresses the urgency of interventions, stating that *"the negative impacts of climate change must be mitigated by identifying varieties that can adapt to these new conditions"*.

Identified benefits of NGTs are also related to economic advantages due to reduced production costs and increased competitiveness. Many interviewees primarily link cost reduction to production costs like pesticides, fuel, and the workforce. This cost reduction will

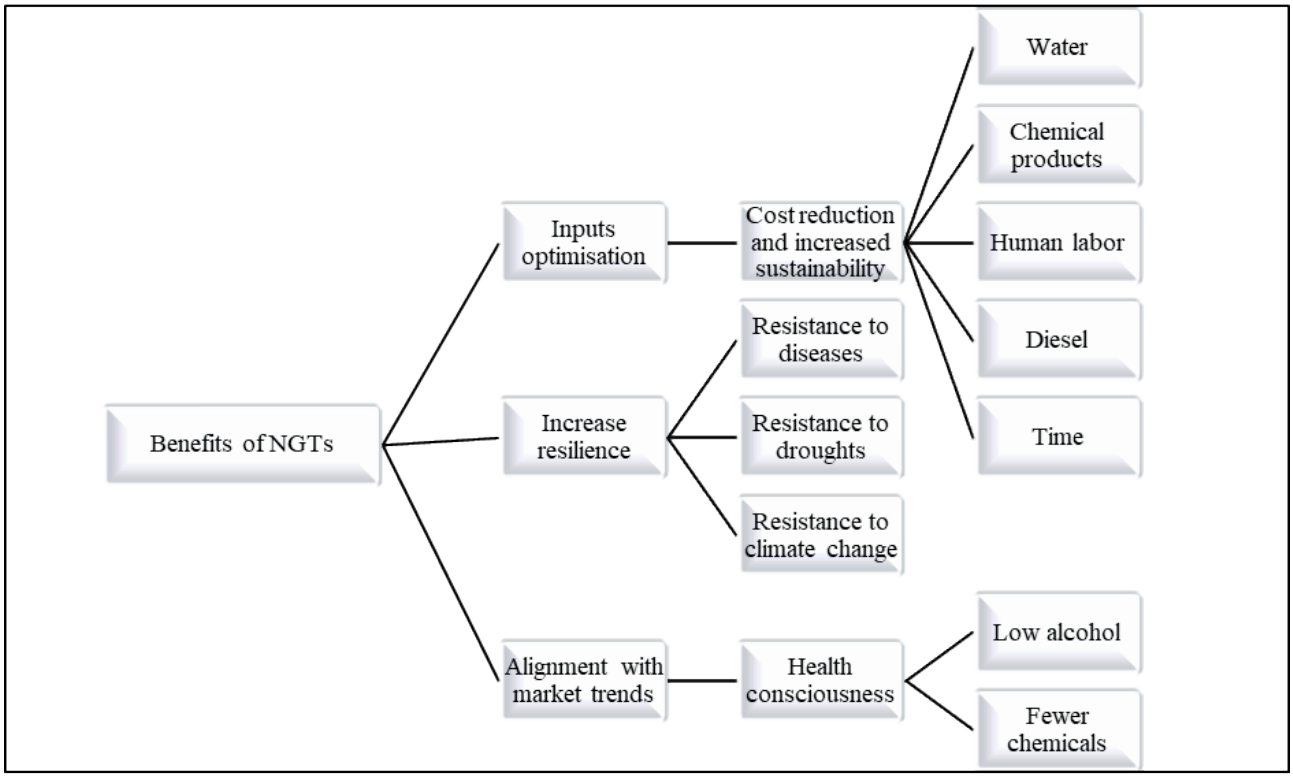

Figure 2. Identified benefits from NGTs in viticulture.

increase competitiveness in the industry and improve quality. In this regards, I16 from Hungary mentions that growers could produce grapes more economically, and the *"price of wine would be lower or maintained at a level that would also increase competitiveness against the other alcoholic beverages"*. I15, director of an association of producers in Spain, takes a broader view by linking these new technologies to the potential for shaping the wine industry in line with emerging market trends. In particular he recognizes that *"there is a much more attention to health from new consumers, and I think that the sector has to reflect on that, and we can look for varieties that generate less alcohol, which is what I think an important part of the new consumers are looking for"*. In a similar way, another interviewee from Hungary says that *"it would be a huge selling point if the back label also stated that this wine was made from grapes that were not sprayed at all [...] because consumers are becoming more and more health conscious"*.

Benefits connected to NGT are also related to environmental sustainability and protection. Interviewees recognize that viticulture would become more sustainable due to better management of resources and limited use of chemical substances and pesticides. In these regards, I18 from Hungary argues that *"if we have more resistant plants, we don't pollute the environment"* and I12 from Italy says that *"nowadays many practices are mechanized and if you can save on processing, the CO2 produced also decreases and emissions and costs for companies are reduced"*.

4.3. What could be the main barriers in introducing plants resulting from New Genomic Techniques?

The data reveal two main categories of barriers to implementing New Genomic Techniques: external barriers related to social awareness, legislation, and education, and internal barriers related to farmers' attitudes, financial costs, and lack of information (Figure 3).

Consumer acceptance of these new biotechnologies and products is crucial, as many interviewees noted that people are generally anxious and resistant to new products and technologies. I7, vineyard operator in France, highlights that *"we're going to have to face up to the fear of new things"*, a significant challenge in the wine industry. I15 from Spain points out that *"the world of wine depends a lot on the image, and there is also a strong subjective charge. The bad thing is that demagogy and populism sometimes also do a lot more damage than in other*

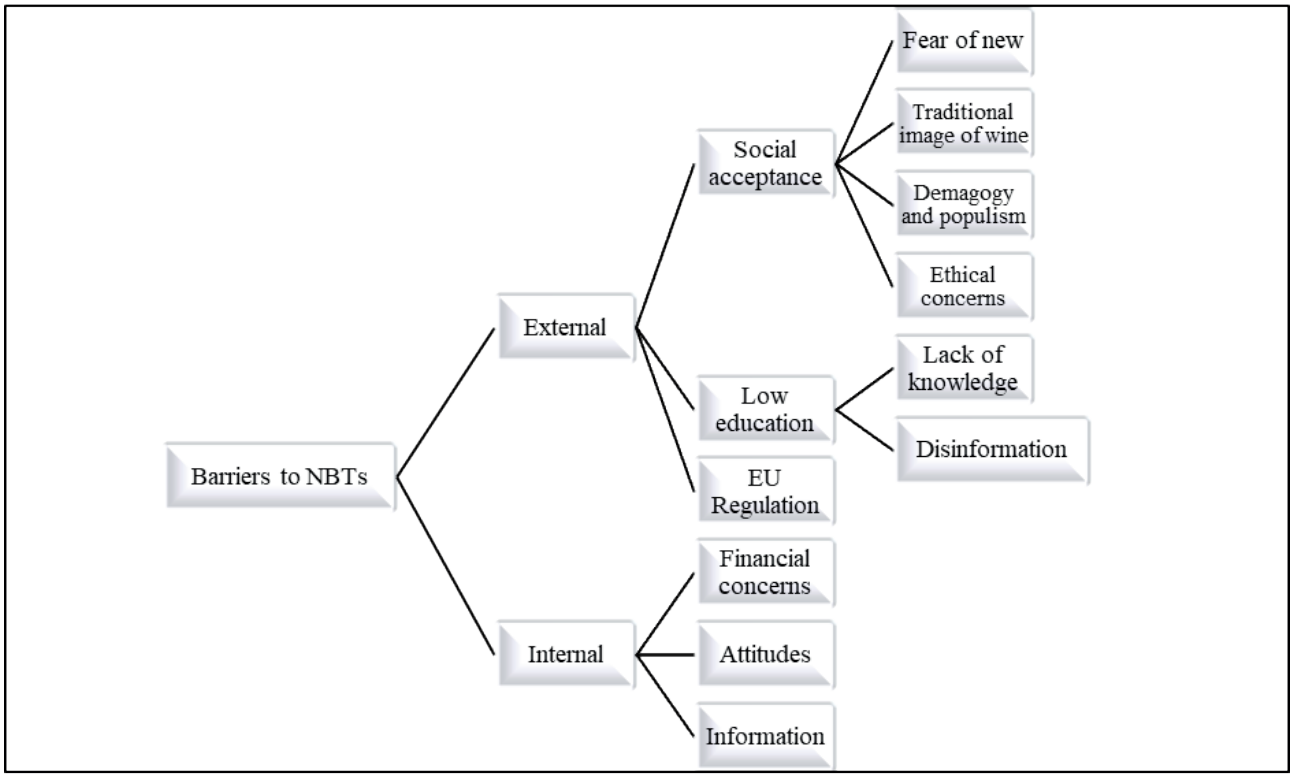

Figure 3. Identified barriers to NGTs in viticulture.

places, where everything is much more objective and much clearer" and *"consumers are heavily involved in these things"* (I1 from Greece). Social awareness could lead to irrational reactions, as highlighted by I9 from France: *"another part of society would be against it and would come and destroy the vines that have been planted"*.

The role of communication could be fundamental in fighting against disinformation. The need for transparent information to offset fake news and misunderstandings is highlighted. In these regards, I9 from France says *"information is good, but sometimes it can also be abusive. You can see it in the news, can't you, fake news? You hear something, you don't know the subject. You think it's true, and then in fact it may not be so true, so it's not at all obvious"*.

In addition, I2 from Greece raised an ethical issue, stating that to properly evaluate these products, an ongoing assessment would be necessary, a process that would take a long time. According to him: *"we need to determine whether the product will be comparable to or better than what we currently have. Of course, the evaluation will take 20 years"*. Regarding the long-term effects of NGT on the wine industry, another interviewee, I8 from France expresses his concerns: *"We'll have to check that these tools don't have any disadvantages, I'd say damage, or create collateral damage. They'll have to be good, they won't have to be deviant, they won't have to have any impact on biodiversity"*. Considering the time factor, there are also concerns about the ability to resist pests over the long term. Specifically, I2 from Greece states that: *"it will be necessary to evaluate how long a variety resistant to powdery mildew will withstand. Because in the long run, other pathogens will adapt to this resilience. And we're talking about the vine, not crops like potatoes or cotton that you plant every year, and you can constantly change the genome and create new varieties. You will plant it in the vineyard, and you need 30 years until you replant"*. I3 from Greece also mentions time as a barrier and trust of producers as a focal aspect, given that *"the vine is a perennial crop and things do not change overnight"*.

European Union legislation is also mentioned as a strong barrier to NGT; in particular, I11 from Italy highlights that *"the legal side of the vine planting [...] must be authorized"*, and according to I6: *"Legislation like is the case in Portugal where it's forbidden to plant these varieties and farmers mindset that are reluctant to changes represent strong barriers"*.

One of the biggest obstacles is farmers' lack of information about these new techniques. Educating farmers could be crucial for them to appreciate and adopt plants from NGT because as stated by I8 from France, there is a decline in the level of knowledge and this is *"catastrophic in viticulture, getting worse all the time"*. In line with this, I18 from Hungary says: *"I see a very big main barrier is ignorance, not that people are stupid, but that they don't know, they don't have enough information. So there would be a big task to educate at least the profession, so [...] they would not make decisions based on emotions, but would actually make a decision based on rational arguments"*.

The second category of obstacles, deemed internal, is directly linked to farmers' mindset. Farmers who adhere to traditional farming methods and exhibit strong psychological resistance to new techniques pose significant challenges to adopting NGT. For instance, I6 from Portugal notes that *"farmers [...] are reluctant to changes"*, and I3 from Greece mentions that *"the hardest part is for the producer to trust the new techniques"*. Consequently, farmers need guidance and support to overcome their reluctance toward these new technologies.

Additionally, financial concerns are cited as significant barriers to the adoption of NGT. The cost of new plants and the financial risks associated with them can be crucial. Market acceptance is essential to offset the additional costs that will emerge. Some interviewees emphasize the importance of ensuring yields to reduce costs. However, I3 from Greece noted that the process would be lengthy, stating, *"It takes 3–6 years to generate a financial profit from a new plant"*.

5. DISCUSSION

In this study, we analyzed the opinions of producers in six EU countries regarding the opportunities and challenges associated with using NGTs in viticulture, enhancing the level of acceptance among experts in the supply chain.

The application of biotechnology, particularly new genetic modification techniques, represents a promising opportunity for the wine sector, offering economic, environmental and technological benefits. However, the results of the interviews highlight a complex landscape. On the one hand, many farmers recognize the potential of new technologies to increase sustainability and address critical challenges such as climate change through reduced chemical use [11], [25], [41], [42]. On the other hand, fears persist about losing traditional wine characteristics and originality, elements central to wine culture [4].

Yet, several technological challenges remain unsolved. As noted in the recent literature, grapevine is a woody perennial species with complex genetics and high recalcitrance to in vitro regeneration, making the

application of NGTs technically difficult compared to annual crops [5], [6]. The long breeding cycles and a limited number of efficient transformation protocols hinder the rapid development and commercialization of viable NGT-derived varieties. Moreover, these technical challenges complicate the standardization processes required for certifications and quality controls that are vital to preserving the unique identity of wines. This complexity may delay short-term adoption and raise concerns about scalability within the viticultural sector.

From a policy perspective, the landscape is evolving rapidly. The EU is currently revising its regulatory approach to NGTs through a legislative proposal presented by the European Commission in July 2023, now under trilogue negotiation. This reform signals a clear shift towards fostering innovation and science-based regulation, distinguishing between NGT-1 and NGT-2 plants. These efforts are aligned with the broader European Green Deal objectives, emphasizing sustainability, climate resilience, and biodiversity protection in agriculture. The Farm to Fork strategy remains a cornerstone of this vision, aiming to increase sustainability and resilience in food systems. This is complemented by other strategic frameworks such as the Biodiversity Strategy 2030 and the renewed Common Agricultural Policy (CAP), which also highlights the importance of innovation and environmental stewardship. Moreover, recent initiatives promoting digitalization in agriculture seek to improve traceability, data sharing, and stakeholder engagement, facilitating the adoption of new technologies, including NGTs. Institutional actors such as the OIV are increasingly promoting communication efforts aimed at enhancing knowledge, transparency, and informed decision-making regarding biotechnology in viticulture.

As emerging literature highlights communication and transparency, particularly addressing knowledge gaps, it remains a major barrier to adoption. Many producers frequently lack adequate information about NGTs. This contributes to mistrust and skepticism. Strengthening scientific dissemination and engagement across the entire supply chain, especially through trusted intermediaries such as cooperatives, consortia, and technical advisors, could significantly improve the diffusion of these innovations. Furthermore, uncertainties persist regarding the long-term effects of NGTs, especially concerning food safety and their impact on vine growth and development.

Although scientific dissemination is indeed important to reduce misinformation, it is equally fundamental to recognise that skepticism regarding NGTs is also attributable to other factors and not just to a lack of knowledge. Many producers and consumers recognize and place a high value on traditional practices, as in the case of viticulture, which are closely linked to the cultural identity, regional heritage and skills of producers. These values can persist even in the face of clear scientific evidence to support the safety and usefulness of NGTs. Therefore, the relevance of innovation is important on the one hand, and on the other, the information that is combined can deliver a broader and more reasoned vision of NGTs. Ethical concerns about the modification of natural organisms, as well as the desire to preserve traditional methods of winemaking, reflect deeply held beliefs that should be respected and taken into account. A more balanced approach to innovation in viticulture would therefore involve recognising the potential tensions between sustainability objectives and the preservation of cultural heritage. In some cases, these objectives may not be fully reconcilable, and policy frameworks should leave room for coexistence between innovative and tradition-oriented production systems. This more complex understanding can foster a more open and respectful dialogue between all actors involved, and help develop more responsible innovation paths, which take into account not only the technical benefits but also the cultural values and ethical implications. For these technologies to be effectively woven into existing systems, embracing an inclusive strategy that engages every participant in the supply chain is essential [16], [28]. This includes producers, consumers, stakeholders, and innovative thinkers who play a crucial role in the process. To facilitate this integration, European legislation must undergo a significant transformation, particularly in how it handles bureaucratic procedures and the legal frameworks that must be communicated. The goal of these changes should be to simplify and clarify the existing regulatory landscape, ensuring it is more accessible and navigable for all parties involved.

Another key aspect is scientific dissemination and popularization activities, which must break down the barriers created by unclear information. The passage of knowledge via key stakeholders could incentivize or disseminate supportive policies to dismantle the biases that have been created.

Another important aspect that needs to be considered is the structural decline in wine consumption in Europe, which currently represents a more urgent challenge for the sector than climate change. According to the EU Wine Observatory [43], consumption has fallen steadily over the past decade, due to demographic changes, health concerns and changes in lifestyles. This long-term trend reduces market opportunities, increases competition and makes it more difficult for producers to justify investment in innovation, unless such technologies are clearly in line with consumer preferences and

market expectations. To address this trend of decreasing consumption, strategies are needed that integrate innovation with strong communication on sustainability, tradition and product quality.

Finally, wider stakeholder involvement is essential. Current results are limited to the perceptions of winegrowers, but the participation of policy makers, researchers, trade associations and consumers is required to successfully integrate NGTs into wine-growing systems. An inclusive approach will be key to ensuring the social license to operate for these technologies. Moreover, fostering an open dialogue among scientists, producers, policymakers, and consumers at both national and international levels will be crucial to ensure that the deployment of NGTs aligns with market demands and societal values, thus enabling a sustainable future for European viticulture.

Only by systematically addressing these barriers will it be possible to fully exploit the benefits of NGTs and promote informed and sustainable adoption.

6. CONCLUSION

This study examined how European wine producers perceive New Genomic Techniques (NGTs), using qualitative semi-structured interviews conducted in six major wine-producing countries to highlight the challenges and opportunities associated with their adoption. Producers recognized the potential of NGTs to optimize resource management, enhance climate resilience, and reduce production costs, thereby contributing directly to more sustainable viticultural practices. However, significant obstacles were also identified, including ethical concerns, consumer acceptance influenced by misinformation and fear of new technologies, and legislative uncertainties, particularly within the EU regulatory framework.

A key limitation of this study is the small number of qualitative interviews that only reflect the producers' views. To gain a broader perspective, it is essential to involve a larger number of participants who represent a wider variety of stakeholders in the sector, including trade associations, government representatives, and researchers. Including policymakers is particularly important, as their input on regulations and management is crucial for the sector's development. The same applies to stakeholders whose contributions could further enrich the analytical framework and provide a more comprehensive view of the challenges and opportunities of using new genetic techniques in viticulture.

In terms of future developments, it will be crucial to further investigate aspects such as wine certifications and the maintenance of product traditionality, two closely linked elements. Traditionality is a core value for wine producers, as it ensures respect for local practices and contributes to the maintenance of certifications, which are essential for the sector's competitiveness, both nationally and internationally. Ensuring that the adoption of NGTs is compatible with these certifications can help producers integrate innovation and sustainability without compromising the reputation and value of their products [44].

Challenges in agriculture and viticulture call for innovative solutions and a progressive approach to overcome current limitations. These prioritizing developments promote sustainable and strategic implementation of NGTs in the wine sector. Additionally, enhanced dissemination of information about NGTs is crucial to improving understanding of their impacts and benefits, particularly in relation to the European Union's Farm to Fork and Green Deal strategies, as well as the broader New Vision for Agriculture and Food Systems, which collectively aim to foster innovation, sustainability, and resilience within an increasingly complex climate and market landscape. Building trust and fostering collaboration among all stakeholders, scientists, producers, policymakers, and consumers, will be critical for the successful adoption of NGTs and the sustainable development of the European wine sector.

Further research and development should prioritize evaluating the long-term impacts of NGT, including their effects on biodiversity and ecosystem health. Moreover, pilot projects and field trials could provide practical insights to mitigate producer concerns and build confidence in these technologies.

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REFERENCES

[1] OIV, 'State of the World Vine and Wine Sector in 2024', 2025. [Online]. Available: https://www.oiv.

int/sites/default/files/2025-04/OIV-State_of_the_World_Vine-and-Wine-Sector-in-2024.pdf

[2] Y. Chen *et al.*, 'Winegrowers' decision-making: A pan-European perspective on pesticide use and inter-row management', *J. Rural Stud.*, vol. 94, pp. 37–53, Aug. 2022, https://doi.org/10.1016/j.jrurstud.2022.05.021.

[3] M. Schmidt, T. Strack, H. Andrews, L. T. Hickey, P. A. Crisp, and K. P. Voss-Fels, 'A new climate for genomic and epigenomic innovation in grapevine', *Mol. Hortic.*, vol. 5, no. 1, p. 44, May 2025, https://doi.org/10.1186/s43897-025-00171-1.

[4] E. Pomarici and R. Vecchio, 'Will sustainability shape the future wine market?', *Wine Econ. Policy*, vol. 8, no. 1, pp. 1–4, June 2019, https://doi.org/10.1016/j.wep.2019.05.001.

[5] X. Wang *et al.*, 'Whole-genome sequencing reveals rare off-target mutations in CRISPR/Cas9-edited grapevine', *Hortic. Res.*, vol. 8, p. 114, Jan. 2021, https://doi.org/10.1038/s41438-021-00549-4.

[6] Z. Migicovsky and S. Myles, 'Exploiting Wild Relatives for Genomics-assisted Breeding of Perennial Crops', *Front. Plant Sci.*, vol. 8, Apr. 2017, https://doi.org/10.3389/fpls.2017.00460.

[7] C. Pirrello *et al.*, 'Grapevine DMR6-1 Is a Candidate Gene for Susceptibility to Downy Mildew', *Biomolecules*, vol. 12, no. 2, p. 182, Feb. 2022, https://doi.org/10.3390/biom12020182.

[8] D.-Y. Wan *et al.*, 'CRISPR/Cas9-mediated mutagenesis of VvMLO3 results in enhanced resistance to powdery mildew in grapevine (Vitis vinifera)', *Hortic. Res.*, vol. 7, p. 116, Jan. 2020, https://doi.org/10.1038/s41438-020-0339-8.

[9] A. Charrier, E. Vergne, N. Dousset, A. Richer, A. Petiteau, and E. Chevreau, 'Efficient Targeted Mutagenesis in Apple and First Time Edition of Pear Using the CRISPR-Cas9 System', *Front. Plant Sci.*, vol. 10, Feb. 2019, https://doi.org/10.3389/fpls.2019.00040.

[10] S. Najafi, E. Bertini, E. D'Incà, M. Fasoli, and S. Zenoni, 'DNA-free genome editing in grapevine using CRISPR/Cas9 ribonucleoprotein complexes followed by protoplast regeneration', *Hortic. Res.*, vol. 10, no. 1, p. uhac240, Jan. 2023, https://doi.org/10.1093/hr/uhac240.

[11] R. Lassoued, P. W. B. Phillips, D. M. Macall, H. Hesseln, and S. J. Smyth, 'Expert opinions on the regulation of plant genome editing', *Plant Biotechnol. J.*, vol. 19, no. 6, pp. 1104–1109, 2021, https://doi.org/10.1111/pbi.13597.

[12] A. Meldolesi, 'Eco-vandals target gene-edited Chardonnay in Italy', CRISPeR FRENZY. Accessed: Feb. 19, 2025. [Online]. Available: https://mycrispr.blog/2025/02/16/eco-vandals-target-gene-edited-chardonnay-in-italy/

[13] M. Borrello, L. Cembalo, and R. Vecchio, 'Consumers' acceptance of fungus resistant grapes: Future scenarios in sustainable winemaking', *J. Clean. Prod.*, vol. 307, p. 127318, July 2021, https://doi.org/10.1016/j.jclepro.2021.127318.

[14] G. Mian, F. Nassivera, S. Sillani, and L. Iseppi, 'Grapevine Resistant Cultivars: A Story Review and the Importance on the Related Wine Consumption Inclination', *Sustainability*, vol. 15, no. 1, p. 390, Dec. 2022, https://doi.org/10.3390/su15010390.

[15] L. Nesselhauf, R. Fleuchaus, and L. Theuvsen, 'What about the environment?: A choice-based conjoint study about wine from fungus-resistant grape varieties', *Int. J. Wine Bus. Res.*, vol. 32, no. 1, pp. 96–121, Aug. 2019, https://doi.org/10.1108/IJWBR-09-2018-0049.

[16] M. Borrello, L. Cembalo, and R. Vecchio, 'Role of information in consumers' preferences for eco-sustainable genetic improvements in plant breeding', *PLOS ONE*, vol. 16, no. 7, p. e0255130, July 2021, https://doi.org/10.1371/journal.pone.0255130.

[17] R. Vecchio, E. Pomarici, E. Giampietri, and M. Borrello, 'Consumer acceptance of fungus-resistant grape wines: Evidence from Italy, the UK, and the USA', *PLOS ONE*, vol. 17, no. 4, p. e0267198, Apr. 2022, https://doi.org/10.1371/journal.pone.0267198.

[18] C. Kiefer and G. Szolnoki, 'Consumer Acceptance of Fungus-Resistant Grape Varieties – An Exploratory Study Using Sensory Evaluation Test Among Consumers in Germany', May 2023, https://doi.org/10.20944/preprints202305.1733.v1.

[19] *EU Regulation 2117*. 2021. Accessed: July 25, 2024. [Online]. Available: https://eur-lex.europa.eu/eli/reg/2021/2117/oj

[20] S. Sillani, F. Marangon, G. Gallenti, S. Troiano, F. Nassivera, and M. Carzedda, 'Designation and Certification Strategies for Fungus-Resistant Grape Wines: An Exploratory Study in Italy', *Sustainability*, vol. 14, no. 22, p. 14871, Nov. 2022, https://doi.org/10.3390/su142214871.

[21] R. Finger, L. Zachmann, and C. McCallum, 'Short supply chains and the adoption of fungus-resistant grapevine varieties', *Appl. Econ. Perspect. Policy*, vol. 45, no. 3, pp. 1753–1775, Sept. 2023, https://doi.org/10.1002/aepp.13337.

[22] L. Zachmann, C. McCallum, and R. Finger, 'Determinants of the adoption of fungus-resistant grapevines: Evidence from Switzerland', *J. Wine Econ.*,

pp. 1–33, Apr. 2024, https://doi.org/10.1017/jwe.2023.36.

[23] O. Sambucci, J. M. Alston, K. B. Fuller, and J. Lusk, 'The Pecuniary and Nonpecuniary Costs of Powdery Mildew and the Potential Value of Resistant Grape Varieties in California', *Am. J. Enol. Vitic.*, vol. 70, no. 2, pp. 177–187, Apr. 2019, https://doi.org/10.5344/ajev.2018.18032.

[24] A. Molitorisová *et al.*, 'New genomic techniques in organic production: Considerations for science-based, effective, and acceptable EU regulation', *Cell Rep. Sustain.*, vol. 2, no. 6, June 2025, https://doi.org/10.1016/j.crsus.2025.100405.

[25] L. Bartek, N. Sundin, I. Strid, M. Andersson, P.-A. Hansson, and M. Eriksson, 'Environmental benefits of circular food systems: The case of upcycled protein recovered using genome edited potato', *J. Clean. Prod.*, vol. 380, p. 134887, Dec. 2022, https://doi.org/10.1016/j.jclepro.2022.134887.

[26] S. Chatzopoulou and S. Chatzopoulos, 'Livestock farmers' perceptions towards genetically engineered methods and genetically modified organisms in Denmark and Sweden', *J. Rural Stud.*, vol. 111, p. 103414, Oct. 2024, https://doi.org/10.1016/j.jrurstud.2024.103414.

[27] M. A. Schnurr and B. Dowd-Uribe, 'Anticipating farmer outcomes of three genetically modified staple crops in sub-Saharan Africa: Insights from farming systems research', *J. Rural Stud.*, vol. 88, pp. 377–387, Dec. 2021, https://doi.org/10.1016/j.jrurstud.2021.08.001.

[28] L. Basinskiene and B. Seinauskiene, 'Gene Editing Versus Gene Modification: Awareness, Attitudes and Behavioral Intentions of Lithuanian Consumers, Producers, and Farmers', *Chem. Eng. Trans.*, vol. 87, pp. 433–438, July 2021, https://doi.org/10.3303/CET2187073.

[29] E. Woźniak-Gientka *et al.*, 'Public perception of plant gene technologies worldwide in the light of food security', *GM Crops Food*, vol. 13, no. 1, pp. 218–241, Dec. 2022, https://doi.org/10.1080/21645698.2022.2111946.

[30] A. Bearth, G. Kaptan, and S. H. Kessler, 'Genome-edited versus genetically-modified tomatoes: an experiment on people's perceptions and acceptance of food biotechnology in the UK and Switzerland', *Agric. Hum. Values*, vol. 39, no. 3, pp. 1117–1131, Sept. 2022, https://doi.org/10.1007/s10460-022-10311-8.

[31] S. Romeo Lironcurti, F. Demaria, R. D'Annolfo, and R. Sardone, 'Consumer Evaluations of and Attitudes towards New Genome Editing Techniques: An Italian Case Study', *Agriculture*, vol. 14, no. 1, Art. no. 1, Jan. 2024, https://doi.org/10.3390/agriculture14010051.

[32] T. Sprink, R. Wilhelm, and F. Hartung, 'Genome editing around the globe: An update on policies and perceptions', *Plant Physiol.*, vol. 190, no. 3, pp. 1579–1587, Nov. 2022, https://doi.org/10.1093/plphys/kiac359.

[33] S. Nawaz and T. Satterfield, 'Climate solution or corporate co-optation? US and Canadian publics' views on agricultural gene editing', *PLOS ONE*, vol. 17, no. 3, p. e0265635, Mar. 2022, https://doi.org/10.1371/journal.pone.0265635.

[34] M. M. Andersen *et al.*, 'Feasibility of new breeding techniques for organic farming', *Trends Plant Sci.*, vol. 20, no. 7, pp. 426–434, July 2015, https://doi.org/10.1016/j.tplants.2015.04.011.

[35] M. Robbins, C. Calabrese, J. D. Featherstone, and G. A. Barnett, 'Understanding knowledge and perceptions of genome editing technologies: a textual analysis of major agricultural stakeholder groups', *J. Sci. Commun.*, vol. 20, no. 5, p. A07, Sept. 2021, https://doi.org/10.22323/2.20050207.

[36] L. Ferrari, 'Farmers' attitude toward CRISPR/Cas9: The case of blast resistant rice', *Agribusiness*, vol. 38, no. 1, pp. 175–194, 2022, https://doi.org/10.1002/agr.21717.

[37] *Directive EU 2001/18/EC*. OPOCE. Accessed: July 25, 2024. [Online]. Available: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX%3A32001L0018

[38] OIV, 'State of the world wine and wine sector in 2023'. 2024. Accessed: July 25, 2024. [Online]. Available: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.oiv.int/sites/default/files/2024-04/OIV_STATE_OF_THE_WORLD_VINE_AND_WINE_SECTOR_IN_2023.pdf

[39] V. Squires, 'Thematic Analysis', in *Varieties of Qualitative Research Methods: Selected Contextual Perspectives*, J. M. Okoko, S. Tunison, and K. D. Walker, Eds, Cham: Springer International Publishing, 2023, pp. 463–468. https://doi.org/10.1007/978-3-031-04394-9_72.

[40] V. Braun and V. Clarke, 'Using thematic analysis in psychology', *Qual. Res. Psychol.*, vol. 3, no. 2, pp. 77–101, Jan. 2006, https://doi.org/10.1191/1478088706qp063oa.

[41] E. Kovak, D. Blaustein-Rejto, and M. Qaim, 'Genetically modified crops support climate change mitigation', *Trends Plant Sci.*, vol. 27, no. 7, pp. 627–629, July 2022, https://doi.org/10.1016/j.tplants.2022.01.004.

[42] K. Schneider *et al.*, 'Insights on cisgenic plants with durable disease resistance under the European Green Deal', *Trends Biotechnol.*, vol. 41, no. 8, pp. 1027–1040, Aug. 2023, https://doi.org/10.1016/j.tibtech.2023.02.005.
[43] EU Wine Market Observatory, 'Prospects of the EU wine sector', 2024. [Online]. Available: https://agriculture.ec.europa.eu/document/download/83588b14-0c75-43a4-b8ab-c5718bee6b01_en?filename=future-prospects-of-the-eu-wine-sector-june-2024.pdf&prefLang=hu
[44] T. Reinhardt, Y. Ambrogio, L. Springer, and Tafel, 'Wine law, sustainable innovation and the emergence of a wine constitution.', *Wine Econ. Policy*, vol. 13, no. 2, pp. 1–124, 2024.

APPENDIX A

BIOTECHNOLOGY

In agriculture, biotechnology refers to the application of biological and technological principles to enhance plants, their traits, and the environmental sustainability of crops. Among the most significant techniques are the enhancement of DNA traits through various methods, the production of fertilizers and pesticides based on microorganisms, and the use of enzymes to enhance agricultural processes.

NGTs

Genetic improvement is one of the main strategies used to improve plants' tolerance to climate change, pathogens and water stress. In viticulture, however, genetic improvement through traditional breeding can represent a limitation, because the crossing of traditional wine varieties to obtain more resilient plants results in the so called "PIWIs" or "fungus resistant grape varieties" with changes in the characteristics of the wines produced. Sustainable biotechnology is working to develop New Genomics Techniques (applying genome editing and cisgenesis) that can improve traditional wine varieties by increasing their ability to resist pathogens or water stress and maintaining their original sensory characteristics.

APPENDIX B

Thematic analysis and coding used in the NVivo software.

Opinions about the biotechnology	**Question: What do you think about biotechnology applied to grape and grape vine?**
Code: Sustainability-Climate Resilient	**Description of the code:** Biotechnology is essential for the future of viticulture, because it can be the solution to various challenges such as climate change, disease resistance and environmental protection. Therefore, biotechnology could increase grape yield and quality in demanding environments.
Code: Yield and Economic Advantages	**Description of the code:** Biotechnology could achieve returns on a challenging environment.
Code: Innovation in Plant Material	**Description of the code:** Biotechnology can play an important role, given the challenging climatic changes.
Code: Terroir and Cultural Heritage	**Description of the code:** The world of wine is traditional and conservative due to heavy cultural heritage assuming that innovating techniques could modify the characteristics of traditional grape varieties.
Code: Ethical Concerns	**Description of the code:** Moral or values-based objections about biotechnology.
Code: DO Regulations &Barriers	**Description of the code:** The potential of biotechnology in the wine industry could be realized with permanent research, discussions and education to navigate regulatory constraints and address information barriers.
Drivers	**Question: What do you think the benefits may be in introducing plants from New Breeding Techniques?**
Code: Cost reduction and increase sustainability	**Description of the code:** Reduced inputs due to better management of water, chemicals and pesticides and exploitation of new terroirs and better disease resistance and grapes more resistant to drought and climate change.
Code: Resistance to droughts	**Description of the code:** Reduced inputs due to better management of water, chemicals and pesticides and exploitation of new terroirs and better disease resistance and grapes more resistant to drought and climate change.
Code: Resistance to diseases	**Description of the code:** Reduced inputs due to better management of water, chemicals and pesticides and exploitation of new terroirs and better disease resistance and grapes more resistant to drought and climate change.
Code: Resistance to climate change	**Description of the code:** Reduced inputs due to better management of water, chemicals and pesticides and exploitation of new terroirs and better disease resistance and grapes more resistant to drought and climate change
Code: Health consciousness	**Description of the code:** Reduced production costs due to limited use of pesticides and labor and increasing competitiveness due to lower production costs and improved quality.
Barriers	**Question: What could be the main barriers in introducing plants resulting from New Breeding Techniques in your opinion?**
Code: Ethical concerns	**Description of the code:** External barriers related to ethical concerns
Code: Low education	**Description of the code:** External barriers linked to farmers' limited knowledge.
Code: EU Regulation	**Description of the code:** External barriers arising from legislative constraints and EU regulation
Code: Social acceptance	**Description of the code:** External barriers related to social acceptability and public awareness.
Code: Farmers attitudes	**Description of the code:** Internal barriers related to farmers' attitudes who stick to traditional ways of farming.
Code: Financial concerns	**Description of the code:** Internal barriers arising from farmers' financial concerns
Code: Lack of information	**Description of the code:** Internal barriers related to farmers' lack of information.

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Wine in Can: Market Potential and Consumer Interest in Different Age Groups in Tuscany

Valentina Canuti, Veronica Alampi Sottini*, Monica Picchi, Silvio Menghini

Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, P.le delle Cascine 18, 50144 Firenze, Italy
Email: valentina.canuti@unifi.it; veronica.alampisottini@unifi.it; monica.picchi@unifi.it; silvio.menghini@unifi.it
*Corresponding author.

Abstract. The wine industry introduced various packaging alternatives to traditional glass bottles, including aluminum cans. Recently, canned wine has gained significant market importance despite challenges in maintaining wine stability. Aluminum cans offer sustainability advantages over glass bottles. This study examines the market potential for canned wine in one region of Italy (Tuscany), focusing on consumer interest across different age groups by testing the hypothesis that the new format meets with greater success among younger individuals and trying to understand the main causes of this trend. Through a survey conducted among more than 500 wine consumers in Tuscany, in addition to seeking confirmation to this hypothesis, we verify how this trend is associated with the main wine drinking preferences and habits of young generations. Although the canned product is in fact absent in the local market and is practically unknown to most, the results show that the proportion of respondents open to purchasing canned wine is already significant. The research indicates how this preference is more consistent in younger generations, who are more likely to consume wine and other alcoholic beverages outdoors and out of meals. In these generations, preferences for light, easily drinkable wines with low alcohol content, suitable for a sustainable consumption outside traditional meal settings becomes increasingly evident, and this kind of packaging represents a solution consistent with such trends.

Keywords: packaging, wine stability, aluminum, wine consumer behavior, consumption preferences.

1. INTRODUCTION

In the contemporary era, the packaging of consumer goods has taken on growing importance for commercial success. To adequately protect and preserve the product, the packaging must not only be safe, but also attractive to the customer and practical for the buyer and the seller [1]. The packaging industry has developed several kinds of wine packaging alternatives to glass bottles, including aluminum cans, tetra pack boxes, polyethene terephthalate,

and bag in box. Among these innovations, in some markets the most successful launch in recent years is that of aluminum cans [2, 3].

Since 1936 Acampo Winery of California began packaging a California Muscatel wine in steel cans under its Acampa brand together with Vin-Tin-Age. However, this early tin can packaging was not accepted by the wine producers and wine drinking market, presumably due to the negative interaction of wine with metal. During this time, Taylor California Cellars, underlying the lightweight of single serve aluminum cans, made efforts to convince airlines to consider for their wine drinking passengers. However, small single-serve glass and/or plastic packaging won out instead. In the USA, it was registered a noticeable growth after 2011, with the introduction of a series of canned wine brand (Infinite Monkey Theorem in 2011, Underwood in 2012, Flip Flop in 2014, Seven Daughters, Backpack, Allow Wine Works in 2015, four additional brands in 2016 and six in 2017) [4].

In the Italian market, wine in cans first appeared only in the early 1980s. In 1978, the Italian Giacobazzi company submitted an application to the Minister of Agriculture to be allowed to package wine in alternative containers for the first time in Italy. In 1982, after the acceptance of the request, it was possible to pack the wine in tetrapack, PET and aluminum can. This authorization allowed the wine producers to exploit this opportunity, so that soon there were over 50 wineries producing canned wine: Medici, Cavicchioli, Folonari, Ramazzotti, Campari, Birra Moretti (...). The diffusion of this type of packaging, however, after an initial phase of rapid growth, faced a slowdown due to bureaucratic obstacles (the permit to package wine in cans was temporary, issued year after year and lasted only a few months), until it disappeared.

Undoubtedly, the bureaucratic difficulties that emerged at that time did not contribute to the affirmation of this new packaging, but even more so were some technical problems and a significant diffidence on the part of a demand strongly oriented toward the traditional corked bottle.

However, in the last years, due to important technological innovations, several environmental emergencies and recent market trends, there has been a renewed emphasis on the opportunities that wine in cans can offer not only for export, but also for the domestic market itself.

This paper aims to propose an analysis of what might be the liking that a wine in a can would encounter in the Italian market today.

After reviewing the main technical and sustainability aspects related to wine packaging in cans, the results of a recent market survey are shown. The survey was conducted among Tuscan consumers who are known to be strongly tied to production and consumption traditions, and who therefore represent a particularly demanding challenge for a packaging that offers not only a simple technical alternative but proposes a different way of experiencing the relationship with wine.

The research was designed to specifically address a question posed by a major company operating in the sector, which intends to introduce canned wine to the Italian market. The objective was to assess the potential appeal of a product that is currently absent from local markets, particularly to younger generations. To answer this question, the study adopted appropriate sampling and statistical tools for a preliminary and exploratory investigation. The methodological approach employed can only be considered acceptable in light of its limitations, with the conclusions offering an initial contribution that calls for further in-depth research. Future studies will need to adopt more robust sampling techniques and statistical analyses, ideally conducted in a context where the product is already available on the market, thus avoiding the inevitable bias associated with the current lack of canned wine in the local market.

2. CONCEPTUAL BACKGROUND

The factors that have given rise to this new season of rediscovery of wine in cans should be found both at the technological level and in the evolution of consumer preferences. Concerning the technological level, a number of important innovations that have greatly improved the chemical interactions between packaging and wine have been decisive. Equally relevant is the greater environmental sustainability that a can pack can boast by selling to a demand that is increasingly sensitive to sustainability issues.

At the consumer level, instead, the development potential of wine in cans is mainly linked to the preferences and behaviors of younger generations who, less tied to tradition, may find in the new packaging the opportunity to put wine at the center of new forms of consumption.

2.1. Technological features

Despite the advantages from the point of view of environmental sustainability, packaging wine in aluminum cans still presents some technological challenges linked to the interaction between the wine and the container itself.

The key factor of the diffusion in wine-in-cans can be traced to the development of a lining that coats the inside of the can, preventing the liquid from interacting with aluminum.

On the basis of the literature on this topic, the factors that must be considered are: i) the composition and type of wine; ii) the sulfur dioxide content; iii) the quantity of dissolved oxygen in wine; iv) the integrity of the internal lining of the can; v) the storage temperature of wine [5].

The can packaging poses important challenges for the producer and the winemaker because it requires conditioning, and stabilization of the product set up for this specific type of container. Wine is, in fact, a drink containing alcohol, with a very low pH, and with sulfur dioxide, all factors that make it corrosive and solvent for aluminum and other trace elementals (like Cu and Fe), when it comes into contact with the bare metal. For this reason, aluminum cans have always a thin (1–10μm) polymer coating on the interior surface of the can to protect against the high reactivity of bare aluminum. Without the protective interior polymer layer, wine's acidic pH could cause the interior of the can to slowly corrode [5, 6]. Although polymeric coatings are applied, even double-layered to avoid direct contact, small imperfections can be generated in the coating which can favor direct contact with the metal [6] and lead to the formation of hydrogen sulfide (reduced odor). The relationship between organic acids and wine pH and the corresponding risk of free H_2S formation is specific to the type of wine (e.g., white, rosé, or red) [5]. Although a correlation between two factors cannot be used as sole proof of cause and effect, it is noteworthy that H_2S development was strongly correlated with visible damage to the interior liners [7]. Imperfections are normally found at the welding points of the can and/or in the internal coating. It seems that the direct interaction between the wine and the aluminum triggers chain reactions started by the metal which led the SO_2 to react forming H_2S. The hydrogen sulphyde given its gaseous form, generates bubbles which deteriorate the surface of the aluminum coating in contact with the wine [8]. Given the central role of SO_2 in winemaking, some authors considered a quantity of ~35 mg/L of free SO_2 as the optimal to balancing acceptable can corrosion levels and antimicrobial protection [9].

The kinetics of migration of Al into the wine depends also on other variables, like the levels of trace metals (e.g., Cu and Fe) commonly found in the Al alloys used to manufacture beverage cans. These metals can increase the vulnerability to pitting corrosion in an acid solution like wine, due to the formation of local galvanic microcells [10]. Another aspect of the canned packaging is that it can leave air in the headspace and expose the wine to the oxygen effect, with the risk of oxidation [11] even if the packaging operation can guarantee O_2 concentrations close to zero with the use of backflushing the can with N_2 at the time of filling.

On the other hand, for some types of wine, a certain quantity of dissolved oxygen is important for the evolution of the product after packaging, given that cans are airtight containers that do not allow the passage of oxygen from the outside. For this reason, it is essential to consider the value of TPO (Total Package Oxygen) at the time of packaging to predict its consumption by the wine and avoid undesired oxidation or reduction [8].

Regarding the sensory influence of the wine canned packaging, the flavor deterioration can be caused by degradation, scalping, or tainting [12]. Degradation is a chemical process that induces a loss of quality in the products like oxidative deterioration, which induces modification of aroma and color. Scalping occurs when volatile migrate from the wine into the packaging material. Non-polar flavor and volatile compounds are the most affected because their capacity to be absorbed into the non-polar polymer packaging materials, that lines the inside surface of the can. Scalping has not been studied in canned wine products but some compounds (limonene, 1,1,6-trimethyldihydronaphthalene, rotundone) are considered compounds that could potentially be scalped by the can's lining during storage [6, 8].

Tainting refers to the introduction of off-flavors into the beverage products from packaging material. The most common taint in the canned wine (above the reduction flavor induced by H_2S) can be represented by the interaction between the impurities found on the can lining and the wine, resulting in off-flavor in the product. These types of reactions are called "secondary taint", which can be much more difficult to predict and might be overlooked during simple model testing [13].

2.2. Sustainability of aluminum can

Wine packaging in cans has a number of advantages, such as (1) recyclability, (2) no risk of cork contamination, (3) lighter weight compared to glass, (4) lower production and shipping costs compared to glass, (5) the possibility of drinking directly from the can, and (6) no shattering if dropped [14, 15]. In fact, according to The International Aluminium Institute [16], the collected cans show the highest efficiency of the combined recycling process (sorting, reprocessing and thermal processing) corresponding to 90% (versus glass 67%, PET 66%). Moreover, a study commissioned by a can producer indi-

cated that transporting the same total volume of packaged wine in slim 250 mL cans has half the CO_2 emissions of wine transported in glass bottles.

Despite some critical issues related to the stability of canned wine, it turns out to be an attractive packaging in terms of image, graphics and sustainability. According to Life Cycle Assessment (LCA) literature, about 45.8% of wine carbon footprint impact comes from viticulture phases and 41.1% from bottling and packaging. Packaging materials are responsible for 57% of the total emissions at the winery stage, with glass bottles being the dominant source (47%) [2]. Glass can be recycled, and the amount of cullet used in new glass bottles can reach 95% [17] reducing the use of new materials for making bottles and emissions. However, recycling glass requires high temperatures to melt the product, which is overwhelmingly powered by fossil fuels and results in high energy consumption levels. Aluminum is 100% recyclable an infinite number of times, and although there are no specific studies on the wine industry, a study on LCA impacts on beer production in the UK shows that 1 l of beer packaged in glass bottles consumes 17.5 MJ of primary energy and generates 842 g of CO_2eq. emissions, while aluminum cans require 11.3 MJ of primary energy and emit 574 g of CO_2eq. [18]. In 2022, the International Aluminum Institute has analyzed the circularity of three beverage materials – aluminum, glass and plastic – based on data from Europe, USA, Japan, Cina and Brazil that represented the 70% of the global market of the aluminum cans and the 50% of the glass container. The data shows that the aluminum cans result the most recycled single-use beverage container with the smallest losses in the recycling process. From the collected data, aluminum can currently seems to be the best solution for the circular economy, as the efficiency of the recycling process is 90%, compared to 67% for glass. Globally can results the most recycled container with a rate of 71% compared to 34% for glass. In 2019, the recycling rate in USA was 46.1%, while in Europe 75.8%, but estimated at 100% for 2030.

Wine packaged in glass bottles requires enormous amounts of energy [19]. At the European Union level, some authors [20] estimate that for the entire production, the wine sector absorbs more than 1.700 million kWh of energy per year, 30% of which is attributable to packaging. The enormous energy input due to the use of glass is even less sustainable when considering how in certain countries the recovery of bottles for reuse or recycling is a minimally implemented practice: for example, in the U.S. market more than 75% of the bottles sold in the wine sector are not recycled ones [21]. Some studies [22] delve into the relationship between packaging sustainability and wine consumers' perceptions, highlighting the importance of packaging characteristics such as minimal use of packaging materials and the use of reusable packaging. These aspects are considered part of the broader environmental information that wine consumers find important. A growing number of wine consumers show an increasing preference for environmental information on wine labels, including reducing packaging and reusable packaging material.

2.3. Market perspectives

The analysis of the development potential of canned wine in Italy must consider social changes and new behavioral trends in the consumption of alcoholic beverages. Several studies conducted in the field of alcoholic beverage consumption in Italy show an evolution in recent years, marked by a decline in wine consumption [23, 24] and, at the same time, a growth in beer and spirits. The phenomenon particularly affects the new generations [25] and reflects a growing homologation of Italian cultural models to international ones [26, 27, 28]. This homologation leads the younger generations to have a relationship with alcoholic beverages that is increasingly moving away from the traditional "Mediterranean" style of consumption, characterized by a prevalent, frequent and moderate drinking of wine during meals, and tending more and more toward a "Northwestern" style, characterized by a growing and more varied consumption of alcoholic beverages (including beer and spirits) outside meals, with less regularity over time and higher instances of excessive drinking on specific occasions [29]. This trend is significantly influencing the preferences of the younger generations in terms of both the type of beverage they choose and when they decide to consume it. This phenomenon, well evident in wine markets with more recent traditions, is now also increasingly affecting contexts, such as Tuscany, in which wine has a much longer history and tradition [30]: even in these "old" markets, the evolution in consumer preferences creates space for the spread of new product categories, capable of responding to a demand in which the use value of the commodity gives way to its symbolic value. In a society where consumption becomes a "code of communication" [31]: the product becomes an element of social exchange between individuals, and from this perspective, canned wine not only represents a more original, practical and sustainable solution than the classic bottle, but it aims to bring wine to be at the center of this social exchange among the new generations. At the center of this social exchange, sustainability issues are likely to become increasingly important, contributing decisively to the development of alternatives

to glass. In some studies conducted in younger wine markets such as the U.S., the direct link between packaging and sustainability is highlighted [32], emphasizing the importance of considering consumer preferences for eco-friendly and innovative packaging practices as key factors in promoting sustainable practices in the wine industry. Not only can this approach help reduce the environmental impact of packaging, but it can also provide opportunities for wineries to attract environmentally conscious consumers and enhance their brand image through sustainability practices.

Although the rise of Nordic consumption' style may favor the development of canned wine, several scientific contributions point out that still many consumers do not perceive valid alternatives to glass for wine packaging [33, 34], especially for *premium* products. In contexts with more solid traditions of wine production and consumption, table wines have packaging other than glass bottles: in these markets, product quality is strongly linked to glass packaging, not only in terms of material and shape, but also in terms of weight [35]; producers are consequently reluctant to adopt more eco-friendly packaging [21]. Some studies [36, 37] emphasize the importance of the type of packaging highlighting that it not only creates aesthetic biases in consumers but also affects their sensory perception of the contents.

3. MATERIALS AND METHODS

3.1. Research questions and design

The research aims to give answers at two questions.

Question 1) Are there differences among distinct generations of wine consumers that may explain their different propensities toward wine packaged in cans?
Question 2) For individuals who express a clear willingness to consume wine in a can, what are their preferences regarding the format, content, and price of such a product?

The main research question (question 1) concerns the propensity that different generations express toward canned wine testing whether or not, and to what extent, this propensity is linked to certain characteristics that distinguish younger generations from mature ones. This analysis was mainly focused selecting the aspects that most explain the different attitude of these generations toward wine packaged in cans. The research is carried out in a context, Tuscany, with particularly deep-rooted traditions of production and consumption.

The second question (question 2) relates to the specific preferences expressed by the younger generations toward wine in a can, aiming at the identification of some key elements useful for guiding companies in the positioning of the canned product.

To achieve these objectives, a survey among Tuscan wine consumers was carried out. For the survey, conducted in the period April-May 2022, a questionnaire based on 21 questions arising from the literature review was implemented. The questionnaire consisted of three sections: the first related to socio-demographic aspects, the second to behavioral issues concerning general wine consumption habits, and the third to specific attitudes toward the canned product. The data collected in the first two sections corresponded to the first research question, whereas the data from the third section primarily addressed the second question.

A "snowball" sampling method was adopted to recruit participants. It is a non-probabilistic sampling method in which initial participants recruit further participants from among their acquaintances. This method was chosen due to its compatibility with the study's experimental framework, and the desire to preserve the integrity of the original demographics as much as possible. The questionnaire was developed to be uploaded to a digital platform to be administered indirectly, according to the CAWI methodology (Computer Assisted Web Interview). Given the study's exploratory nature and its focus on younger generations, CAWI methodology represents a good tool, as it is inherently youth-oriented, and the lower representativeness of older generations is not a limiting aspect.

The sample of subjects to be interviewed was defined by selecting individuals who drink wine without setting any quantity or frequency threshold. Out of a total of 1,000 people contacted by e-mail and social media, 600 agreed to answer, but only 515 did so properly.

3.2. Data analysis

The analysis was developed from an initial summary assessment of the respondents' expressed preference for canned wine distributed across the generations: Generation Z (18-23 years old); Millennials (24-40); Generation X (41-57); Baby Boomers (58-75); Silent Generation (>75).

To answer the first question, a univariate logistic regression was conducted using the binary dependent variable indicating preference for canned wine and various independent variables: sociodemographic (age, gender, household composition), behavioral (annual wine consumption, willingness to pay), and attitudinal factors (sustainability, , packaging relevance, product knowledge and involvement).

Among all the variables, only age showed a statistically significant negative relationship with preference for canned wine (B = -0.018; p < .001; OR = 0.982; 95% CI: 0.974–0.990), This finding suggests that younger consumers are more open to innovative packaging. However, the odds ratio (OR), being close to 1, indicates that, although the association between the two variables is statistically robust, the effect size is small: each additional year of age is associated with an approximate 1.8% decrease in the likelihood of preferring canned wine. The robustness of this relationship was further supported by a subsequent multivariate analysis performed on a limited set of variables that had shown stronger consistency in the previous univariate analyses.

Based on these results and considering the objectives of the research, it was decided to develop the study by comparing two major generational groups: the *Young Generation*, comprising Generation Z and Millennials, and the *Adult Generation*, comprising the other more mature generations.

The definition of these two major generational groups was made by jointly considering the first two generations and distinguishing them from the others because in them the number of those interested in wine in cans is greater than those who, on the other hand, have declared themselves opposed to this packaging (Table 2). The distinction into these two major generational groups is also confirmed by other research in the literature [38].

In order to investigate the determinants for the different preference for wine in cans between these two groups, from all the information collected through the questionnaire, a set of eight variables was defined, choosing those that most directly describe the relationship consumers have with wine and the type of packaging in which it is packaged:

1) *Product Knowledge;*
2) *Product Involvement;*
3) *Consumption model,* referring to the frequency with which individuals drink wine away from meals in association with other alcoholic beverages;
4) *Average consumption* of wine during the year;
5) *Willingness To Pay* for a bottle of wine for daily domestic consumption;
6) *Packaging loyalty,* referring to the habit by which people prefer to buy wine exclusively;
7) *Packaging relevance,* relating to the importance that packaging, with its various components, has in purchasing choices;
8) *Sustainability in purchasing choices* relating to the weight that environmental sustainability issues have in purchasing choices.

Variables 1, 4, 5, 6, 8 are derived from direct observations. Instead, variables 2, 3, 7 are latent variables derived from direct and then aggregated observation of eleven different items (Table 1). A Confirmatory Factor Analysis (CFA) was conducted to test the latent variables (Table 1).

A One-Way ANOVA was conducted to determine whether there was a statistically significant difference in all these considered variables between Young and Adult generations. After verifying the statistical significance of variables within the two groups through the ANOVA test, the consistency of these differences was examined through Cohen's d (Table 3).

After defining this set of variables, referring generically to the relationship respondents have with wine, we moved on to examine preferences related to the specific canned product by defining three additional variables:

9) *Relevant attributes in product choice;*
10) *Willingness to buy wine in a can,* previously adopted in validating the definition of the two major generational groups;
11) *Psychological salience for wine in a can (Cognitive Salience Index - CSI).*

The first variable highlights which attributes are most relevant in guiding consumer's choices when purchasing wine. The second variable distinguishes those who are willing to purchase the product in cans from those who, on the other hand, express a clear aversion to this type of packaging. The Cognitive Salience Index (CSI) was adopted to assess the psychological elements that influence consumers when asked to express their preferences for a wine packaged in a can.

After examining these variables related to the first question that the research posed, the following variables were set to get an answer to the second question for the subjects belonging to the Young Generation who expressed an explicit propensity to purchase wine in a can:

12) *Ideal content of a wine in a can*
13) *Ideal can size*
14) *Ideal price of a 0.33 l can.*

The latent variables and the confirmatory analysis

For the latent variables 2, 3, 7, a confirmatory factor analysis (CFA) was adopted to verify their validity. Table 1 reports the latent variables, the relative observed items, the standardized factor loadings of each single item observed with respect to the latent constructs, and the relative Cronbach's alpha as a measure of internal consistency of the factors.

The Cronbach's alpha is above the threshold of 0.70 for each latent variable, a level indicated by the literature

Table 1. Cronbach's Alfa and factor loadings for the latent variables 2, 3, 7.

Latent Variable	Observed Item	Cronbach's Alpha	Factor Loadings
Product Involvement		0.742	
	Interest		0.62
	Occasions		0.57
	Selection		0.58
Consumption Model		0.801	
	Frequency		0.68
	Outdoor consumption		0.76
	Alcohol Variety		0.97
Packaging Relevance		0.750	
	Package size		0.25
	Portability		0.34
	Packaging aesthetics		0.67
	Type of closure		0.72
	Packaging material		0.80

as satisfactory [39]. Factor loadings are quite high except for two that scored below 0.4 (package size, transport practicality). In the present work, we decided to keep these data because in the presence of large sample sizes and in the case of latent variables associated with a large number of observed items, values with lower factor loadings are also accepted [40, 41].

While product knowledge (*PK*) was directly associated with respondents' self-reported skills, product involvement (*PI*) was inferred as a latent variable by jointly examining the answers given by respondents to express their degree of agreement (on a five-point Likert scale, from completely disagree to completely agree) with the following three statements: *"I have a great interest in wine"; "I don't need special occasions to drink wine"; "I select the wines I buy very carefully"*.

Having verified the robustness of the latent variable by adopting the Cronbach's alpha as a measure of internal consistency of the factors, in subsequent analyses the value of the variable (PI) was inferred by summing the scores for each observed item. The value of the latent variable thus obtained (from a PI_{min}=0 to PI_{max}=15) was used for subsequent analyses, as continuous values in one way ANOVA tests, comparing the two generation groups. The same cumulative value was considered to define the different classes of involvement adopted for the following descriptive analysis: ranged from the "high involvement" class, which includes individuals who regularly enjoy wine with no need for special occasions and show significant interest in their wine selections, choosing their purchases carefully, to the "low involvement" class, which consists of people who drink wine only occasionally and show minimal interest in their selections, making their choices with little care. Product involvement refers to a consumer's perceived relevance of a commodity based on his/her individual needs, values, and interests. It is a measure of how significant a product is to a person, which can affect the time, effort, and cognitive resources he or she is willing to invest in choosing, using, and engaging with the product. High product involvement implies that consumers perceive the product as important and are therefore more likely to engage deeply with it, leading to more pronounced emotional associations. Conversely, low product involvement suggests that the product is less important to the consumer, which may lead to weaker emotional ties and less discriminating judgments about the product. This concept is crucial to understanding consumer behavior, as it influences not only the decision-making process but also the intensity and nature of emotional responses elicited by food products [42, 43, 44].

The second latent variable, related to "consumption model", is constructed by examining three observed items: the frequency with which subjects drink wine, the habit with which they consume the product outside the domestic environment, and the assortment of alcoholic beverages consumed in addition to wine. This latent variable seeks to examine the consumption habits of wine and alcoholic beverages in general, verifying how in the respondents the number of those who consume wine and alcoholic beverages more generally is increasing, moving away from the "Mediterranean" model and closer to the "Northwestern" one. Similar to the previous latent variable, the internal consistency of the factors was measured also measured for this variable, and then a cumulative value of the variable was quantified by summing the scores for each observed item. The value of the latent variable thus obtained was used for subsequent analyses as continuous values in ANOVA tests.

The third latent variable measures the relevance that packaging has in the elements that drive consumer choice. This variable is structured on the importance that respondents attribute to the main aspects that distinguish a package: size, transport practicality, aesthetic, closure and material. Similar to the previous variables, the cumulative value of this variable was obtained by summing the scores (Likert scale values) expressed for each observed item.

The psychological salience for wine in can

To examine the psychological elements that influence consumers when they are asked to express their preferences for a wine packaged in a can, an analysis was developed using a *free listing technique*. This technique

consists of asking respondents to list the words that characterize a given *topic* [42, 45, 46, 47]. In our research case, respondents were asked to list the main characteristics they associate with a wine in can. After pinpointing the specific semantic field, synonymous terms were identified and consolidated within a unified category. This process revealed the respondent group's perception of this, based on the psychological salience parameter outlined by Sutrop [48].

Psychological salience emerges from the meaning of the elicited words, judged by their order and frequency of mention. Synonyms and similar terms were merged into a singular characteristic and organized into a matrix. The structure of the matrix consisted of various characteristics such as columns and participant responses as rows. Characteristics mentioned by less than 10% of the participants were excluded from the matrix, as suggested by Hough & Ferraris [49], leading to the determination of 10 essential features. Within the matrix, the cross-section of two parameters (characteristics and respondents) documented the specific instance in which a respondent mentioned a characteristic. Using this matrix, the *Cognitive Saliency Index* (*CSI*) was calculated for each *jth* characteristic by implementing the following formula [1]:

$$CSI_j = {}^{F_j}/_{N*AP_j} \quad [1]$$

Where:
Fj is the number of subjects who mentioned the characteristic *j*,
N is the total number of subjects,
Ap_j is the average of the positions of the characteristic *j*.

The *CSI* is scaled to range from 0 to 1. When a term is mentioned by all participants (Fj = N) and its average position for a characteristic is 1, the *CSI* for that characteristic will also be 1. The use of a cognitive salience index facilitates the comparison of findings across different studies because it is independent of the length of respondents' lists [48].

4. RESULTS

4.1. The general characteristics of the sample

Out of a total of 1,000 people contacted, 600 agreed to answer the questionnaire, but only 515 did so properly. The subjects constituting the sample are equally distributed in terms of gender (Table 2). As for the different generations, due to the CAWI model adopted for data collection, younger generations prevail in the sample, while more mature generations are less represented.

Table 2. Demographic characteristics of the sample.

Generation Group	Female	Male	Total	Wine in can	
				yes	no
Young Generations	**122**	**153**	**275**	**150**	**125**
Generation Z	71	93	164	94	70
Millennials	51	60	111	56	55
Adult Generations	**115**	**125**	**240**	**89**	**151**
Generation X	57	45	102	42	60
Baby Boomers	30	47	77	27	50
Silent Generation	28	33	61	20	41
Total	237	278	515	239	276
Row % distribution based on Generation totals					
Young Generations	**44.36%**	**55.64%**	**100.00%**	**54.55%**	**45.45%**
Generation Z	43.29%	56.71%	100.00%	57.32%	42.68%
Millennials	45.95%	54.05%	100.00%	50.45%	49.55%
Adult Generations	**47.92%**	**52.08%**	**100.00%**	**37.08%**	**62.92%**
Generation X	55.88%	44.12%	100.00%	41.18%	58.82%
Baby Boomers	38.96%	61.04%	100.00%	35.06%	64.94%
Silent Generation	45.90%	54.10%	100.00%	32.79%	67.21%
Total	46.02%	53.98%	100.00%	46.71%	53.59%
Column % distribution by Generation					
Young Generations	**51.48%**	**55.04%**	**53.40%**	**62.76%**	**45.29%**
Generation Z	29.96%	33.45%	31.84%	39.33%	25.36%
Millennials	21.52%	21.58%	21.55%	23.43%	19.93%
Adult Generations	**48.52%**	**44.96%**	**46.60%**	**37.24%**	**54.71%**
Generation X	24.05%	16.19%	19.81%	17.57%	21.74%
Baby Boomers	12.66%	16.91%	14.95%	11.30%	18.12%
Silent Generation	11.81%	11.87%	11.84%	8.37%	14.86%
Total	100.00%	100.00%	100.00%	100.00%	100.00%

In order to address the research objectives and compare preferences for canned wine between younger and older generations, two macro-groups were defined: a "young generation," consisting of individuals under the age of 40, and an "adult generation," consisting of individuals aged 40 and above. This division resulted in a roughly balanced distribution between the two groups; however, it should be noted that within the "adult generation," the older age segments are less represented. Although this aspect compromises the sample's representativeness across different age groups, the fact that it is the older segments of the "adult generation" that are underrepresented allows us to hypothesize that certain differences between the groups – already evident in the current data – may actually be underestimated.

46.4% of respondents expressed a positive attitude toward wine in a can, with the remaining 53.6% expressing a contrary opinion. The favorable propensity toward this new format is highest in Generation Z and gradually

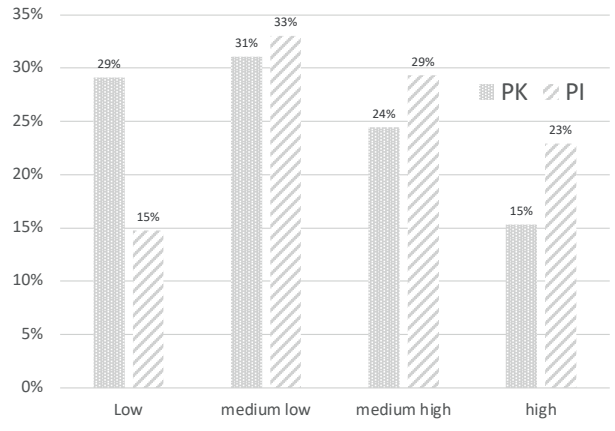

Figure 1. Distribution of sample subjects by Product Knowledge (PK) and Product Involvement (PI) levels.

decreases in the older generations until the Silent Generation for which, however, values above 30% are recorded.

The set of 515 subjects thus admitted to the subsequent analyses presents all the typical characteristics of a demand that moves in an extremely mature market, in which wine has a very important role and meaning for local consumers. This aspect is highlighted by the significant levels of *Product Involvement* (*PI*) and *Product Knowledge* (*PK*) recorded in the sample: more than half of the subjects interviewed have a medium-high (29%) and high (23%) *PI,* equally significant is the number of respondents who believe to have a medium-high (24%) and high (15%) level of wine knowledge (Fig. 2).

As shown in Fig. 1 the level of involvement is higher than the level of knowledge: this aspect highlights that even in mature wine markets, such as the one examined in this study, there is a substantial number of wine lovers with a strong attraction to wine but without equivalent levels of knowledge.

A first aspect that was examined among all sample subjects concerned the role of packaging when they have to choose a product to buy (Fig. 2). Looking at the top 15 attributes that most influence an individual when selecting a wine on a store shelf, it is possible to state that half of the attributes are related to packaging: aesthetics, size, portability and usability of the package are mentioned along with the label and type of closure as attributes consumers pay attention to. However, the choice is absolutely driven by price and place of origin, and secondarily by food pairing, brand awareness, and geographic indication.

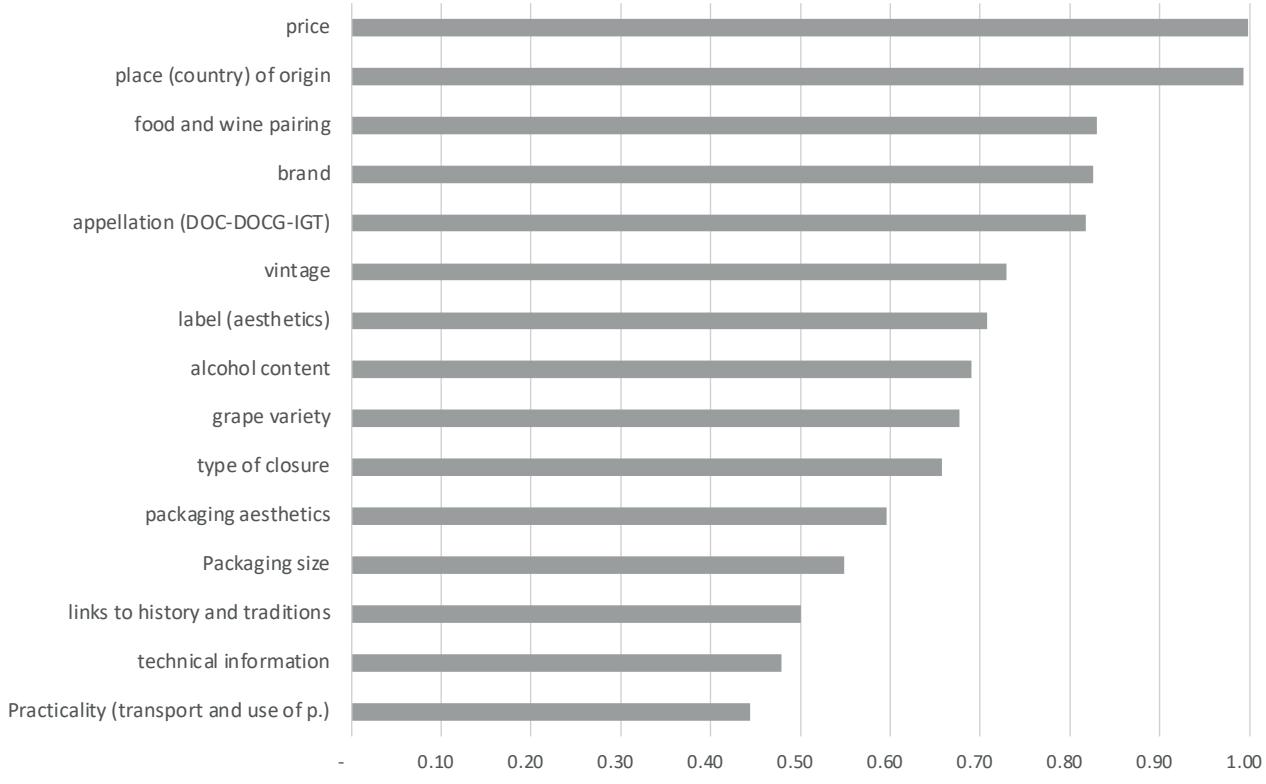

Figure 2. Relevant attributes in the preferences of sample subjects.

4.2 Young generation vs Adult generation

Overall, the comparison between the younger and more mature generations (Table 3) shows differences that never reach particularly important levels. The exception is the consumption model, which, as mentioned earlier, in the younger generations gradually moves away from "Mediterranean-type" drinking habits of alcoholic beverages. This aspect may have multiple explanations, but it certainly should be associated mainly with the characteristics of the household to which the younger generation belongs, often single and without children [38].

From the results, statistical significance is primarily indicated by the p-value ($p < 0.05$), while Cohen's d provides insight into the effect size, revealing the magnitude of these differences on the phenomenon under study. Variables that show statistically significant differences between Young and Adult generation are particularly informative, as they suggest distinct behavioral or attitudinal patterns. However, the corresponding Cohen's d values must be interpreted to understand the real-world importance of these differences. For instance, variables where the p-value is significant but Cohen's d is small indicate that while the groups differ statistically, the practical impact of this difference is minimal. Conversely, a large Cohen's d suggests that the variable strongly differentiates the two groups, providing critical insights into the behavior of each demographic.

Table 3. Young generation vs Adult generation.

Variables	Mean	SD	p-value	Cohen's d
1) Product Knowledge (PK)			0.4890*	0.0612
Young Gen	1.320	0.7685		
Adult Gen	1.275	0.6962		
2) Product Involvement (PI)			0.0498*	0.1736
Young Gen	2.516	2.474		
Adult Gen	2.083	2.517		
3) Consumption model			0.0000*	0.6955***
Young Gen	10.651	2.806		
Adult Gen	8.575	3.178		
4) Average consumption			0.0078*	-0.2358**
Young Gen	23.964	179.699		
Adult Gen	28.563	211.222		
5) Willingness To Pay (WTP)			0.0048*	0.2504**
Young Gen	2.469	0.964		
Adult Gen	2.229	0.952		
6) Packaging loyalty			0.6243	0.0433
Young Gen	1.745	0.679		
Adult Gen	1.717	0.649		
7) Packaging relevance			0.0352*	-0.1865
Young Gen	10.869	3.163		
Adult Gen	11.463	3.204		
8) Sustainability in purchasing choices			0.0286*	0.1938**
Young Gen	1.174	0.776		
Adult Gen	1.021	0.802		

Looking at the data, it appears that all of the observed variables, with the exception of the Product Knowledge variable and the Packaging Loyalty variable, have p-values below the 0.05 threshold, indicating a different statistically significant distribution among the groups. Instead, examining the consistency of these differences between the groups through Cohen's d, we find that only the consumption model variable has a medium-to-large consistency. Moderate values are recorded for the variables willingness to pay (WTP) and average consumption. Lower Cohen's d values are observed for all other variables with significant p-values. However, it is important to consider that even variables with low levels of Cohen's d can have some effect if they operate synergistically in the same direction as in this research.

Another element that most affects the different attitude to consume or not canned wine can be derived considering the consistency of the *Cognitive Salience Index* (CSI) in the two generations. (Fig. 3).

In Young generation, consumers in favor of wine in cans associate this format with an inexpensive, innovative, and practical product. For them, contrary to the findings of Adult generation, the can is not perceived as an inappropriate packaging. Therefore, the Young generation manifests the absence of prejudice for this format and, consequently, the willingness to purchase it.

The primary characteristic that Young and Adult generations absolutely associate with canned wine is that of a cheap product: this characteristic takes on negative connotations for the Adult generation, whereas it is distinctive but not negative for young consumers who favor buying a product in smaller and therefore also less expensive formats. Relevant is the consumers' perception of the product as innovative, practical, particularly suited to youthful usage: all aspects that do not negatively qualify canned wine but tailor it primarily to a certain type of customer. However, the characteristics that identify canned wine as "poor" in quality and "inappropriate" are negative: for these individuals, it may absolutely clash with local traditions that accompany the history and culture of wine and represents an unacceptable alternative. Sustainability issues also emerge in the free listing analysis, with respondents frequently seeing the canned product as a solution capable of reducing the environmental impact generated by the traditional bottle. With the same frequency, the convenience that the canned product offers, associated with lower volumes

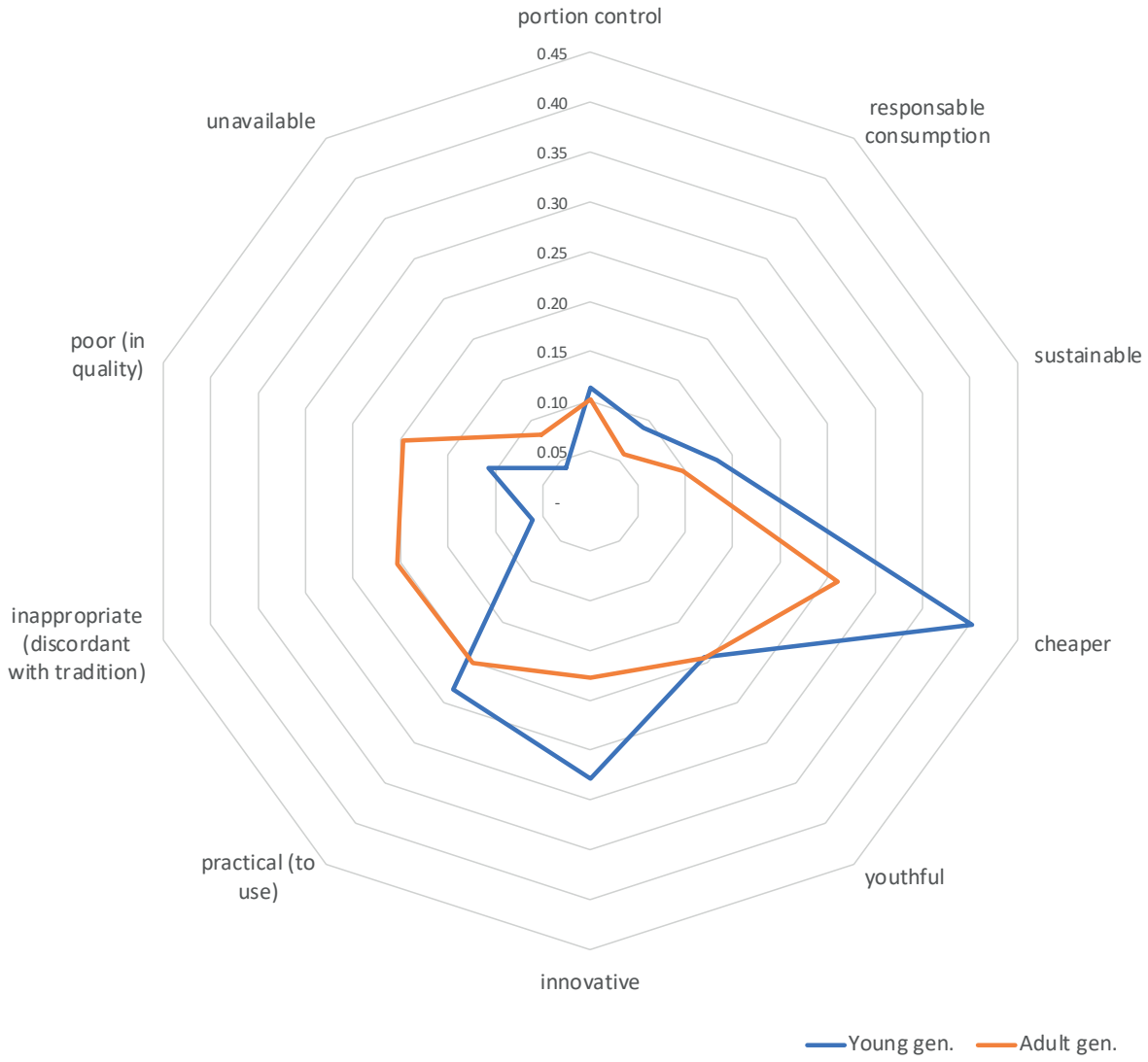

Figure 3. *Cognitive salience index* (CSI) for Young and Adult generations.

than the classic 0.75 l bottle, emerges among respondents in terms of "portion control" and, consequently, more responsible consumption. The list concludes with the issue related to the non-availability of the product, which for many equates to a lack of knowledge about it.

4.3. The preferences of the Young generation for canned wine

What are the preferences of the Young generation regarding wine in a can that can guide an ideal marketing mix for a new line of canned wines?

The first aspect examined relates to the kind of wine these subjects mainly expect to find in a can. The values shown in Fig. 4 indicate the preference for the various types of wine expressed as the mean and normalized value (in the range from 0 to 1) of the scores stated by the various subjects belonging to the different segments invited to express themselves on a 5-point Likert scale.

Regarding can content, the survey pointed out that the Young generation largely prefers sparkling white wine, followed by rosé and still white wines. These preferences clearly indicate how individuals in this group immediately associate the can with a form of consumption of a chilled beverage and, therefore, with types of wine more suited to being served cold. For this reason, the preference expressed for red wines, both still or sparkling, is significantly lower, although remaining relevant:

At the package size level, preference prevails by far for the intermediate can formats, 0.33 and 0.25 liters,

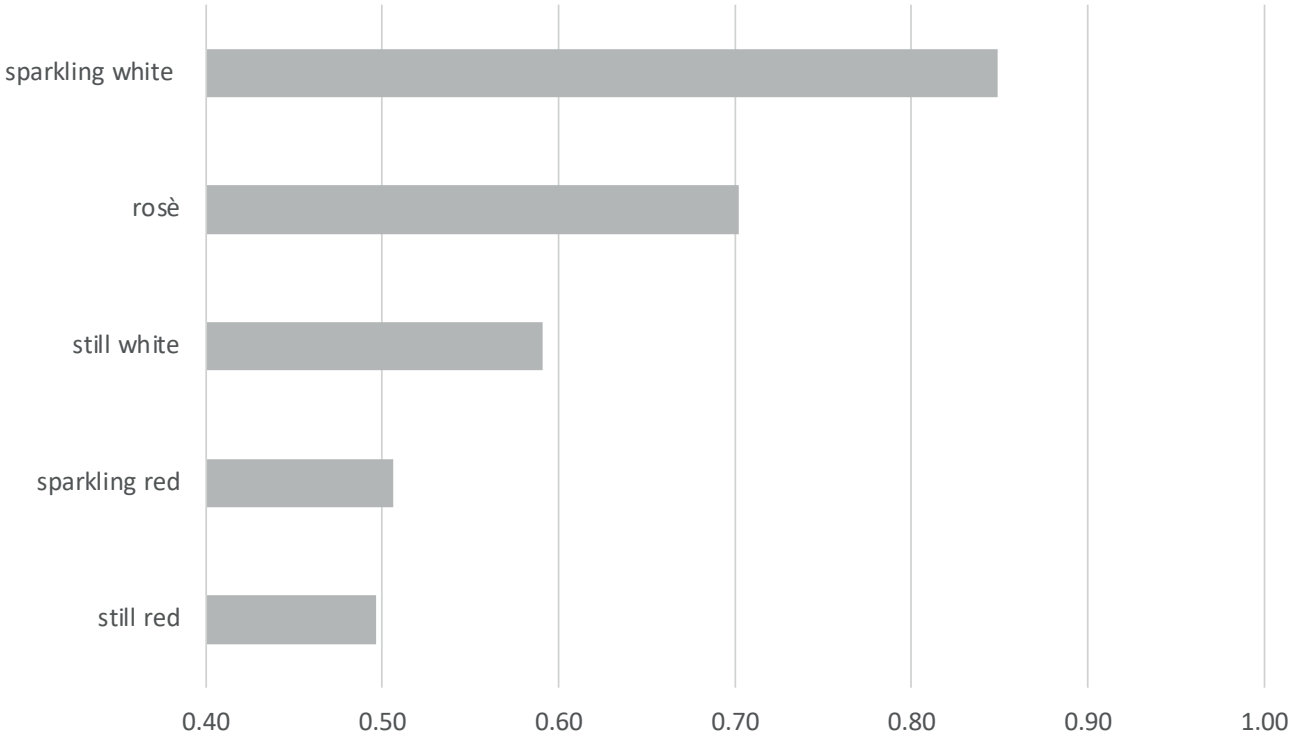

Figure 4. Preferences for the type of wine to be packaged in cans among the Young generation.

with 50% of preferences for the former format and 30% for the latter.

Regarding price, although the can format is generally associated with lower quality content than a bottled wine, the target audience shows a willingness to pay for a 0.33 l can that is higher than that of a basic 0.75 l bottled wine (Fig. 5).

In fact, more than two-thirds of our target audience states a willingness to pay ranging from 2 to 4 euros per can, which means between 6 to 12 euros per liter of wine. This result apparently contradicts what emerged through the CSI, where the canned product is recurrently referred to as a "cheap" product. However, in this case the term "cheap" refers to the format, which, being smaller than a classic bottle, allows the product to be purchased at a lower unit price.

Regarding placement, it is interesting to consider that Yong generation, contrary to what might have been expected, does not associate canned wines with purchasing locations and consumption occasions other than those dedicated for the bottled product. This aspect suggests operating at the distribution level using the same channels through which the traditional product is conveyed. Still minimal are the preferences for forms of distribution that allow easy purchase and immediate use in non-domestic consumption. However, the placement of the product within special refrigerated spaces at the point of sale could be a useful element in encouraging demand growth. More modern forms of distribution and sales, e.g., non-store retail and delivery, are definitely to be favored, having become a permanent structural component, often associated with food sales.

5. DISCUSSION AND STUDY LIMITATIONS

Wine in can represents a product innovation that is already widespread in some less traditional markets, where it does not require overturning well-established consumption habits. However, this new packaging format also shows clear potential for growth in markets like Italy as well: the results of this study show that even in markets with strong traditions such as Tuscany, the proportion of respondents open to purchasing canned wine is already significant. This preference is more pronounced among younger generations and less so among older ones.

This figure takes on even greater importance if we consider that in the Italian market the canned product is still scarcely widespread, being poorly present in stores and scarcely known by consumers.

Analyses show that the positive propensity for the canned product is not a preference that exclusively

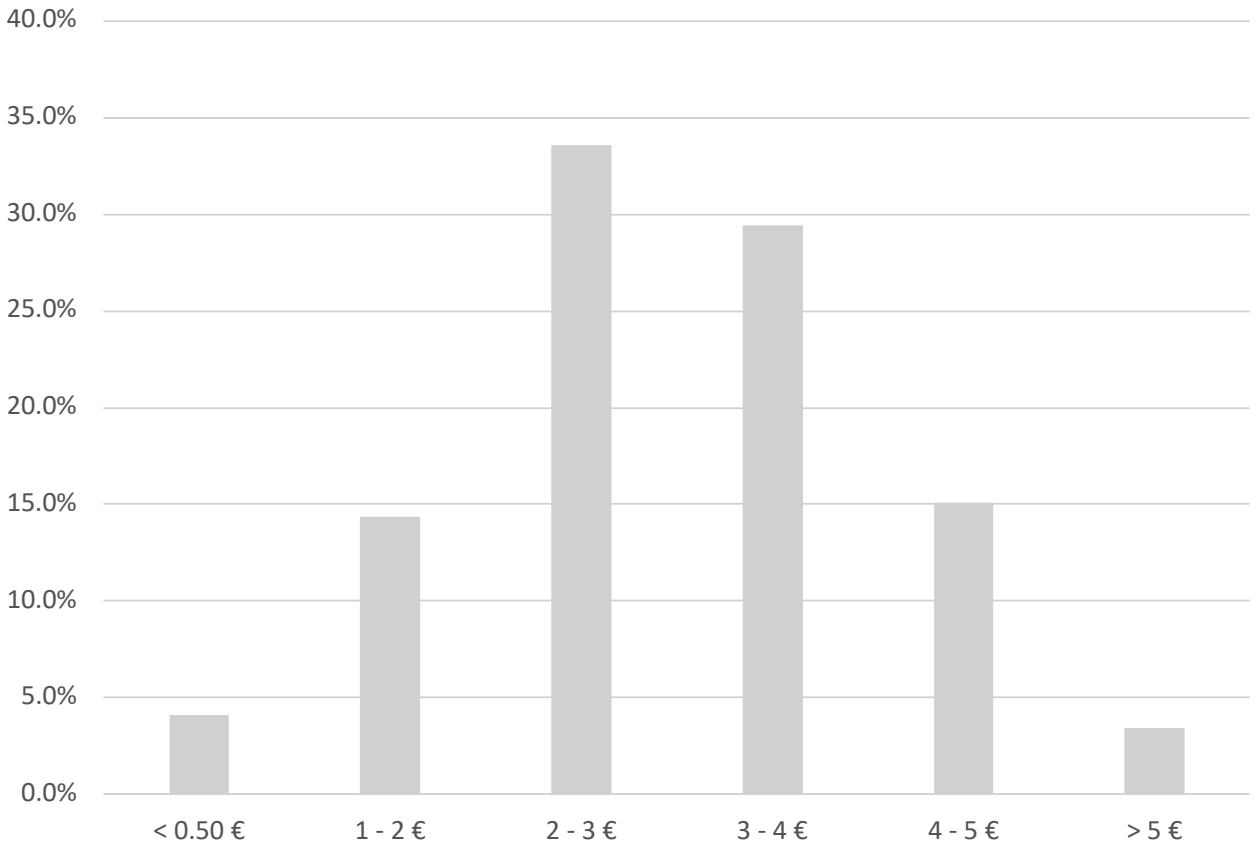

Figure 5. Willingness to pay for a 0.33 l can of wine among the Young generation.

belongs to a particular age group, although it still prevails in younger generations, exceeding 50% of respondents belonging to Generation Z and Millennials. The comparison between the Young and the Adult generation showed that this different propensity is mainly attributable to the "Nordic" consumption pattern of alcoholic beverages and the different psychological salience for wine in can. For these individuals, characterized by a more relevant propensity to consume wine outside meals, the can does not replace the traditional product, but represents a different consumption alternative.

In examining the results obtained, it is important to consider some of the limitations that the study presents if one intends to generalize the results by extending them to the entire population of wine consumers. The CAWI method adopted for data collection ends to favor younger generations, resulting in lower representation among older age groups. Consequently, the generational distribution in the sample is not representative of the overall population. For this reason, accurate interpretation of the results is only possible when considering each age group separately. The impact of this underrepresentation of older respondents was partially mitigated by grouping the generations into two broad categories (over 40 vs. under 40 years of age).

Furthermore, another aspect that should be considered in interpreting the data is that, since the product in question is still scarcely available on the market, the observed interest in canned wine likely reflects an idealized perception rather than actual experience. This introduces a potential bias, as the responses may be based more on opinion than on direct product use. A survey aiming to explore consumer preferences for a product that is not yet available on the market must carefully consider that the results may be significantly influenced by various cognitive biases, such as respondents' tendency to express more favorable opinions due to social desirability, the inherent difficulty of evaluating a product without first-hand experience, the natural appeal of novelty, and the absence of a real experiential context that would enable more concrete and reliable judgments. For all these reasons, bias should be regarded as a significant structural limitation in studies of this kind, suggesting that the results obtained may

substantially differ from the consumer behaviors that will emerge once the product is available on the market. Accordingly, this study should be seen as exploratory in nature and, as previously noted, aims to provide an initial point of reflection, while deferring to more in-depth research to be conducted when the product is effectively present on the market.

6. CONCLUSION

Technological innovations and the push toward increasingly sustainable solutions are reintroducing canning after this opportunity was explored in the past. These opportunities are particularly relevant for younger generations characterized by new attitudes that distinguish them from more mature generations and that can favor the spread of this new type of packaging. The most relevant attitude that can act in this sense is the growing preference that young people express for "light" wines, easy to drink, with low alcohol content, to be consumed fresh and increasingly often outside meals. These preferences respond to an important market trend: as awareness of health, well-being, social responsibility, and safety grows, consumers are increasingly looking for alternatives in tune with their values and lifestyles, becoming more aware of and receptive to options that match their beliefs [50]. Pushing young people towards the consumption of "light" wine in cans, in smaller packages and also at price that is not too low, could make the choice of such packaging more sustainable not only in environmental terms but also in social terms, acting in favor of a more responsible consumption. There is no doubt that the can, also because of the design that can be implemented on it, represents an ideal packaging for wines that have to meet such a demand, in contexts where sustainability, informality and practicality of the packaging are no longer secondary prerogatives but fundamental discriminating factors. However, as also confirmed by other studies [51], preferences for environmental and social factors are unlikely to outweigh, at least for now, traditional wine purchasing drivers such as price, brand, country of origin, and grape variety. This means that the launch of canned wines will have to penetrate the market with a timely choice of target audience, careful positioning, and an appropriate communication mix: these actions will have to be developed in a strategy that thinks of canned wine not as a simple packaging alternative but as a new product, intended for consumption and conviviality occasions different from those in which bottled wine will remain central.

The wine sold in cans represents a discontinuous innovation within the wine industry, analogous to the screw caps. This innovation disrupts traditional consumption patterns and challenges entrenched consumer perceptions tied to the ritualistic and cultural aspects of wine drinking [52]. Much like screw caps, wine in cans aim to offer practical advantages that appeal particularly to casual or on-the-go consumers. Drawing from the findings of previous studies [52], a critical barrier to the adoption of wine in cans would be overcoming "tradition barriers" and "image barriers," as consumers often associate traditional packaging (e.g., glass bottles and corks) with quality and prestige. Successful spread of this innovation could leverage targeted educational campaigns that communicate the benefits of canned wine, such as freshness preservation, sustainability, practicality and affordability, while simultaneously reducing perceived risks or stigmas associated with non-traditional formats.

However, as mentioned in the Introduction and in the Discussion and study limitations sections, this study represents an initial exploratory investigation, driven by the need to assess the appeal of a product not yet available in the local market. The chosen methodological approach reflects this unique context, with the acknowledged bias being amplified by the mature nature of the local wine market.

AUTHOR CONTRIBUTIONS

Conceptualization: V.C., S.M.; Data curation: V.A.S., S.M.; Formal analysis: V.A.S., S.M.; Investigation: V.C., V.A.S, M.P., S.M.; Methodology; S.M., V.A.S.; Project administration: S.M.; Roles/Writing - original draft: V.C., V.A.S, M.P., S.M.; and Writing - review & editing: V.C., V.A.S, M.P., S.M.

REFERENCES

[1] F. Alhamdi, 2020. Role of packaging in consumer buying behavior. *Management Science Letters*, 10(6), 1191-1196. https://doi.org/10.5267/j.msl.2019.11.040

[2] G. Ruggeri, C. Mazzocchi, S. Corsi, B. Ranzenigo, 2022. No more glass bottles? Canned wine and Italian consumers. Foods, 11(8), 1106. https://doi.org/10.3390/foods11081106

[3] M. Orlowski, S. Lefebvre, R.M. Back, 2022. Thinking outside the bottle: Effects of alternative wine packaging. *Journal of Retailing and Consumer Services*, *69*, 103117. https://doi.org/10.1016/j.jretconser.2022.103117

[4] Growth of the wine-in-a-can market. Texas Tech University, College of Human Science, Texas Wine Marketing Research Institute. https://www.depts.ttu.edu/hs/texaswine/docs/Wine_in_Can_Industry_Report.pdf (*access June 25, 2024*)

[5] A. Versari, A. Ricci, C.P. Moreno, G.P. Parpinello, 2023. Packaging of Wine in Aluminum Cans–A Review. *American Journal of Enology and Viticulture*, *74*(2). https://hdl.handle.net/11585/940739

[6] K.A. Thompson-Witrick, E.R. Pitts, J.L. Nemenyi, D. Budner, 2021. The impact packaging type has on the flavor of wine. *Beverages*, *7*(2), 36. https://doi.org/10.3390/beverages7020036

[7] A. Montgomery, R.B Allison, J.M. Goddard, G.L. Sacks, 2023. Hydrogen sulfide formation in canned wines under long-term and accelerated conditions. *American Journal of Enology and Viticulture*, 74 (1). https://doi.org/10.5344/ajev.2022.22051

[8] R. Allison, G. Sacks, L. Maslov-Bandic, A. Montgomery, J. Goddard, 2020. The Chemistry of Canned Wines. Cornell Viticulture and Enology: Ithaca, NY, USA, 2020; pp. 1–8.

[9] G. Stokes, S. Barics, 2015. Packaging wine in aluminum containers. European Patent IN6155DEN2014A, 21 Aug 2015.

[10] J.R. Davis, 2001. Aluminum and aluminum alloys. In Alloying: Under-standing the Basics. Davis JR (ed.), pp. 351–416. ASM International, Materials Park, OH. https://doi.org/10.1361/autb2001p35

[11] P. Lopes, C. Saucier, P.L. Teissedre, Y. Glories. 2007. Main Routes of Oxygen Ingress through Different Closures into Wine Bottles. *Journal of Agricultural and Food Chemistry*, *55*:5167-5170. https://doi.org/10.1021/jf0706023

[12] S.E. Duncan, J.B. Webster, 2009. Chapter 2 Sensory Impacts of Food–Packaging Interactions. In: Advances in Food and Nutrition Research; Academic Press: London, UK, pp. 17–64. https://doi.org/10.1016/S1043-4526(08)00602-5

[13] P. Kilmartin, 2010. Understanding and controlling non-enzymatic wine oxidation. *Managing Wine Quality*, 432–458. https://doi.org/10.1533/9781845699987.2.432

[14] A. Weed, 2019. Canned Wine Comes of Age; Wine Spectator: New York, NY, USA

[15] G. Cooper, G. Wine Boxes and Cans Come of Age. Available online: https://www.winespectator.com/articles/canned-wine-comes-of-age (accessed on 26 June 2024).

[16] The International Aluminium Institute (www.international-aluminium.org*)* A circularity case for Aluminum compared with Glass and plastic. https://international-aluminium.org/wp-content/uploads/2022/02/Aluminium-vs-glass-and-plastic-FINAL-Information-Sheet-1.pdf (accessed on 26 June 2024)

[17] Glass Packaging Institute. Glass Recycling Facts. Available online https://www.gpi.org/glass-recycling-facts (accessed on 26 June 2024)

[18] D. Amienyo, A. Azapagic, 2016. Life cycle environmental impacts and costs of beer production and consumption in the UK. *The International Journal of Life Cycle Assessment, 21*, 492-509. https://doi.org/10.1007/s11367-016-1028-6

[19] D. Landi, M. Germani, M. Marconi, 2019. Analyzing the environmental sustainability of glass bottles reuse in an Italian wine consortium. *Procedia CIRP, 80*, 399-404. https://doi.org/10.1016/j.procir.2019.01.054

[20] M. Malvoni, P.M. Congedo, D. Laforgia, 2017. Analysis of energy consumption: a case study of an Italian winery. *Energy Procedia, 126*, 227-233. https://doi.org/10.1016/j.egypro.2017.08.144

[21] N. Barber, 2010. "Green" wine packaging: targeting environmental consumers. International Journal of *Wine Business Research, 22*(4), 423-444. https://doi.org/10.1108/17511061011092447

[22] C.M. Almeida, A. Rodrigues, F. Agostinho, B.F. Giannetti, 2017. Material selection for environmental responsibility: the case of soft drinks packaging in Brazil. *Journal of Cleaner Production*, 142, 173-179. http://dx.doi.org/10.1016/j.jclepro.2016.04.130

[23] A. Allamani, F. Cipriani, F. Prina, (Eds.) 2006. I cambiamenti nei consumi di bevande alcoliche in Italia. Una stima esplorativa sul decremento dei consumi negli anni 1970–2000, Osservatorio Permanente sui Giovani e l'Alcol, Casa Editrice Litos, Roma.

[24] E. Scafato, C. Gandin, L. Di Pasquale , L. Galluzzo, S. Martire, S. Ghirini, 2016. Rapporti ISTISAN. Epidemiologia e monitoraggio alcol-correlato in Italia, Rapporto 2016, Istituto Superiore di Sanità. ISSN 1123-3117

[25] N. Marinelli, S. Fabbrizzi, V. A. Sottini, S. Sacchelli, I. Bernetti, S. Menghini, 2014. Generation Y, wine and alcohol. A semantic differential approach to consumption analysis in Tuscany. *Appetite, 75,* 117-127. https://doi.org/10.1016/j.appet.2013.12.013

[26] A. Marchini, L. Pieroni, 2009. Dinamiche intergenerazionali nei modelli di consumo alimentare. il caso della dieta mediterranea in Italia. Milano: XLIV Convegno Sidea, Franco Angeli.

[27] D.E. Smith, D.J. Mitry, 2007. Cultural convergence. Consumer behavioral changes in European markets.

Journal of Wine Research, Vol 18, Issue 2, PP 107–112. https://doi.org/10.1080/09571260701660870

[28] J.A. Tur, D. Romaguera, A. Pons, 2004. Food consumption patterns in a Mediterranean region: does the Mediterranean diet still exist?. *Annals of Nutrition and Metabolism, 48*(3), 193-201.

[29] S. Menghini, N. Marinelli, S. Fabbrizzi, 2011. Il consumo responsabile di alcol dei giovani in Toscana. Analisi delle caratteristiche del consumatore e studio sulla fattibilità di una strategia di marketing sociale. In Marinelli, A. (Eds), Alcol e giovani. Disagio sociale, salute e competitività (pp. 105–170), Franco Angeli, Milano.

[30] F. Voller, C. Orsini, A. Berti, 2010. I consumi e le conseguenze dell'uso e abuso di alcol in cifre, ARS Toscana

[31] G. Fabris, 2003. Il nuovo consumatore: verso il postmoderno, Franco Angeli Ed., ISBN 9788846442383

[32] K. Kelley, J. Bruwer, J. Zelinskie, D. Gardner, R. Govindasamy, J. Hyde, B. Rickard, 2019. Wine consumers' willingness to adopt environmentally friendly packaging practices at tasting rooms: An ECHAID analysis. *British Food Journal, 122*(1), 309-327. https://doi.org/10.1108/BFJ-04-2019-0229

[33] J. Mesidis, L. Lockshin, A.M. Corsi, B. Page, J. Cohen, 2023. Measuring the effect of product and environmental messaging attributes on alternative wine packaging choices. *Journal of Cleaner Production, 431*, 139502. https://doi.org/10.1016/j.jclepro.2023.139502

[34] C. Ferrara, V. Zigarelli, G. De Feo, 2020. Attitudes of a sample of consumers towards more sustainable wine packaging alternatives. *Journal of Cleaner Production, 271*, 122581. https://doi.org/10.1016/j.jclepro.2020.122581

[35] A. Chamorro, J.M. García-Gallego, H.D.C. Trindade-Carlos, 2021. Study on the importance of wine bottle design on consumer choices. *British Food Journal, 123*(2), 577-593. https://doi.org/10.1108/BFJ-03-2020-0244

[36] B. Piqueras-Fiszman, C. Spence, 2015. Sensory expectations based on product-extrinsic food cues: An interdisciplinary review of the empirical evidence and theoretical accounts. *Food quality and preference, 40*, 165-179. https://doi.org/10.1016/j.foodqual.2014.09.013

[37] P. Liang, S. Roy, M.L. Chen, G.H. Zhang, 2013. Visual influence of shapes and semantic familiarity on human sweet sensitivity. *Behavioural Brain Research, 253*, 42-47. https://doi.org/10.1016/j.bbr.2013.07.001

[38] J. Bruwer, A. Saliba, B. Miller, 2011. Consumer behaviour and sensory preference differences: implications for wine product marketing, J*ournal of Consumer Marketing, Vol. 28 No. 1, pp. 5-18.* https://doi.org/10.1108/07363761111101903

[39] J.C. Nunally, I.H. Bernstein, 1978. *Psychometric theory*. New York: McGraw-Hill.

[40] J. F. Hair, W.C.Jr. Black, B.J. Babin, R.E. Anderson, 2006. *Multivariate data analysis* (6th edition) Upper Saddle River, NJ: Prentice Hall College Div.

[41] S. Stranieri, E.C. Ricci, A. Banterle, 2017. Convenience food with environmentally-sustainable attributes: A consumer perspective. *Appetite*. 1;116:11-20. Epub 2017 Apr 18. PMID: 28428152. https://doi.org/10.1016/j.appet.2017.04.015

[42] S. Fabbrizzi, V. Alampi Sottini, M. Cipollaro, S. Menghini, 2021. Sustainability and natural wines: An exploratory analysis on consumers. *Sustainability, 13*(14), 7645. https://doi.org/10.3390/su13147645

[43] S.R. Jaeger, P.Y. Lee, G. Ares, 2018. Product involvement and consumer food-elicited emotional associations: Insights from emoji questionnaires. *Food Research International, 106*, 999-1011. https://doi.org/10.1016/j.foodres.2018.01.024

[44] J.L. Zaichkowsky, 1985. Measuring the involvement construct. *Journal of consumer research, 12*(3), 341-352. https://doi.org/10.1086/208520

[45] L. Libertino, D. Ferraris, M.L. Osornio, G. Hough, 2012. Analysis of data from a free-listing study of menus by different income-level populations. *Food Quality and Preference, 24*(2), 269-275. https://doi.org/10.1016/j.foodqual.2011.11.003

[46] E. Ginon, G. Ares, S. Issanchou, L.H.E. dos Santos Laboissière, R. Deliza, 2014. Identifying motives underlying wine purchase decisions: Results from an exploratory free listing task with Burgundy wine consumers. *Food Research International, 62*, 860-867. https://doi.org/10.1016/j.foodres.2014.04.052

[47] B. Barone, R.M. Nogueira, J.H. Behrens, 2019. Sustainable diet from the urban Brazilian consumer perspective. *Food research international, 124*, 206-212. https://doi.org/10.1016/j.foodres.2018.05.027

[48] U. Sutrop, 2001. List task and a cognitive salience index. *Field methods, 13*(3), 263-276. https://doi.org/10.1177/1525822X0101300303

[49] G. Hough, D. Ferraris, 2010. Free listing: A method to gain initial insight of a food category. Food *Quality and Preference, 21*(3), 295-301. https://doi.org/10.1016/j.foodqual.2009.04.001

[50] S.M. Afonso, A. Inês, A. Vilela, 2024. Bio-Dealcoholization of Wines: Can Yeast Make Light-

er Wines? *Fermentation*, *10*, 36. https://doi.org/10.3390/fermentation10010036

[51] S. Ghvanidze, N. Velikova, T.H. Dodd, W. Oldewage-Theron, 2019. Are sustainable consumers health conscious? A segmentation study of wine consumers. *Journal of Food Products Marketing, 25*(6), 690-711. https://doi.org/10.1080/10454446.2019.1640160

[52] T. Atkin , R. Garcia, L. Lockshin, 2006. A Multinational Study of the Diffusion of a Discontinuous Innovation. *Australasian Marketing Journal*, *14*(2), 17-33. https://doi.org/10.1016/S1441-3582(06)70058-1

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Exploring the Superstar Effect in the Wine Industry: Wine Spectator's Top 100 List and Price Premiums

Omer Gokcekus*, Carter E. Bucken

School of Diplomacy and International Relations, Seton Hall University, 128 McQuaid Hall, 400 South Orange Avenue, South Orange, NJ 07079, USA
Email: gokcekom@shu.edu; carter.bucken@student.shu.edu
*Corresponding author.

Abstract. This paper investigates the superstar effect in the wine industry by analyzing whether inclusion in *Wine Spectator*'s annual Top 100 List leads to a significant and persistent price premium. Using a dataset of wines ranked number one between 2010 and 2021 and a panel of the top 10 wines from the 2016 list, we assess the short-term and longitudinal effects of critical recognition on market pricing. Results from a paired t-test reveal that number one wines exhibit an average price premium increase of 85% relative to the previous vintage. Panel regressions further show that top 10 wines experience a substantial and sustained premium that persists across four subsequent vintages. In addition to pricing effects, we analyze producer-level outcomes by comparing changes in release price, quantity sold, and realized revenue before and after inclusion in the Top 100 List. The revenue analysis, disaggregated by ranking tier, indicates that top 10 wines in particular benefit from a disproportionately large increase in total revenue, driven by both expanded volume and elevated resale prices. These findings confirm that media-driven visibility creates durable economic advantages, with the most pronounced effects observed at the very top of the ranking.

Keywords: superstar effect, wine spectator, Top 100 list, price premium.

1. INTRODUCTION

> "There are stars, that is, artists that everybody is familiar with, a consumer would be better off patronizing these stars even if their art is not superior to that of others." (Adler, 1985, p. 212)

The "superstar effect," whereby a small number of individuals or products attract a disproportionate share of public attention and market success, has been well documented in fields such as entertainment, sports, and technology [1–4]. In these industries, symbolic capital and visibility – often driven by media exposure – play a decisive role in shaping outcomes, frequently beyond what intrinsic quality alone would justify. The wine industry shares many of these characteristics, including scarcity, expert evaluation, and rep-

utation-based consumption, yet remains underexplored in this regard. Although prior studies have demonstrated that critic scores and expert reviews influence wine pricing [5–6], the broader market consequences of critical rankings – especially long-term effects on producer success – are not well understood.

This study seeks to address this gap by extending the concept of the superstar effect to the wine industry, offering new insights into how critical recognition and rankings shape long-term price dynamics. Specifically, we investigate how inclusion in *Wine Spectator's* Top 100 List influences price premiums over time, contributing to the broader literature on market visibility and economic outcomes within wine economics.

Since 1988, *Wine Spectator* – one of the most influential voices in global wine journalism – has annually published a curated list of the Top 100 wines reviewed that year. The selection is based on four editorial criteria: quality (as reflected in score), value (relative to price), availability (volume produced or imported), and the so-called "X-factor," a subjective marker of distinctiveness or excitement. While inclusion in the list serves as a form of critical endorsement, the format and visibility given to different ranks are far from uniform.

This paper investigates whether such dynamics are observable in the context of *Wine Spectator*'s Top 100 List by paying particular attention to the upper tier of the ranking – namely, the top 10 wines and the number one wine – where visibility is markedly enhanced by the design of the announcement process. While wines ranked #11 to #100 are revealed all at once with minimal accompanying content, the top 10 are announced individually over ten consecutive days. Each wine is given a dedicated feature page with editorial commentary, high-resolution imagery, background on the winery, and often a video segment featuring a *Wine Spectator* expert. These daily releases are promoted across the magazine's website, print platform, and social media channels. The cumulative effect is a curated countdown that amplifies attention and builds anticipation around each new reveal.

This asymmetrical publicity structure suggests that the market impact of being listed in the Top 100 may vary dramatically depending on where a wine is ranked. The top 10 wines – and especially the number one wine – may benefit not only from critical recognition but also from an orchestrated media spotlight that elevates visibility, induces demand, and enhances symbolic status. This anticipatory halo effect, rooted in the format of the ranking itself, provides a theoretical basis for expecting outsized commercial outcomes at the top of the list.

To evaluate these effects, we pursue three related lines of inquiry. First, we test whether the number one wine experiences a statistically significant increase in price premium relative to its previous vintage. Second, we examine whether wines ranked in the top 10 exhibit a durable price premium that persists over subsequent vintages. Third, we expand the analysis to producer-level outcomes – namely, changes in release price, volume sold, and realized revenue – based on a tiered breakdown of the list (Top 100, Top 50, and Top 10). This disaggregation allows us to assess whether commercial gains scale with visibility intensity, with the aim of providing a more nuanced understanding of how rankings may influence economic outcomes.

By examining how structured visibility and critical recognition may influence price dynamics and commercial outcomes, this paper aims to inform broader discussions on symbolic capital, media amplification, and performance in the economics of cultural and experience goods [7]. It offers a case-specific perspective on how reputation, ranking design, and market signaling could interact in shaping outcomes within status-sensitive industries such as wine.

2. LITERATURE SURVEY

Rosen [1] introduced the concept of the superstar effect, which suggests that small differences in talent or performance can lead to disproportionately large differences in earnings and market success, particularly in industries where visibility and media exposure amplify these differences. His framework emphasizes that consumers in such markets tend to converge on a narrow set of top performers, as fixed costs and scale economies allow minor quality differences to yield major financial disparities. Adler [2] expanded on Rosen's framework by emphasizing the social dynamics that sustain superstardom. Rather than focusing solely on talent or production efficiency, Adler argued that shared recognition and cultural familiarity play a central role in determining success. As he writes, "Consumers may choose a performer they are familiar with, even if the performance is no better, because they wish to participate in social interaction about this performer" (Adler, 1985, p. 210). This emphasis on the communicative utility of fame – where popularity enhances its own value – introduces the concept of a social feedback loop, whereby demand for well-known figures increases simply because others know them. The result is a "bandwagon effect," which amplifies visibility over time and can overshadow objective quality. These foundational insights have since been validated across fields such as entertainment [8], sports [9], and chess

[4], where visibility and public exposure often outweigh intrinsic talent in determining economic returns.

A second cluster of studies focuses on the role of media exposure and technological change in sustaining superstar dynamics. Hoffman and Opitz [8] offer an influential empirical framework distinguishing between "talent stars," whose success originates from skill, and "publicity stars," who owe their prominence largely to media exposure. Analyzing motion picture data, they show that "publicity stars… can maintain market dominance even when talent alone is insufficient" (Hoffman & Opitz, 2017, p. 119). They emphasize the reinforcing nature of media visibility: once an actor becomes prominent, the media continues to circulate their image and narrative, making it easier for them to be cast in future productions, thus perpetuating their dominance. This mechanism is not limited to film; it reflects broader economic dynamics in which visibility substitutes for quality in driving consumer attention. Their findings highlight the complementary relationship between skill and exposure: talent may attract attention, but consistent publicity consolidates and prolongs superstar status. This reciprocal loop also underscores the risks of underestimating media design as a structural input to market inequality.

Koenig [12] further supports this view by using the rollout of television in post-war Germany as a natural experiment. His study found that increased media exposure significantly intensified the concentration of fame and income among a few top performers. Hogue [13] and Giráldez-Cru et al. [14] similarly emphasize the role of mass communication and cumulative exposure in shaping long-term success, noting how public recognition drives economic value through both media and social interactions. Though these studies focus on creative industries, their insights apply directly to the wine market – a domain where reputation, visibility, and symbolic capital similarly shape market outcomes.

In the wine industry, expert evaluations and critical reviews serve as primary conduits for visibility and prestige. Ashenfelter and Jones [5] were among the first to empirically demonstrate that expert scores, particularly for Bordeaux wines, have a measurable impact on market prices. Ali et al. [6] showed that Robert Parker's en primeur scores significantly influence pricing, with high ratings commanding substantial premiums. These findings mirror the superstar effect: a limited number of influential figures can dramatically shift consumer perceptions and market values.

Building on this empirical base, Cardebat and Figuet [7] found that higher expert scores are associated with sustained price gains, reinforcing the idea that critical acclaim has enduring value. Ashenfelter and Storchmann [17] used a hedonic pricing model to demonstrate that inclusion in prestigious rankings leads to persistent increases in wine prices. This suggests that structured forms of recognition not only affect short-term demand but also elevate producers within longer-term market hierarchies.

Humphreys and Carpenter [11] explore this further, arguing that in wine markets, recognition often supersedes innovation in driving success. They show that status and industry influence function as currencies in their own right, enabling producers to maintain market position even in the absence of product differentiation. Oczkowski [15] adds to this by emphasizing that objective attributes such as vintage and alcohol content, as well as subjective evaluations like expert scores, are all fundamental to price formation – criteria that are embedded within Wine Spectator's Top 100 methodology. Gibbs, Tapia, and Warzynski [16] extend this argument into a global context. They model wine consumers as either "naive" or "sophisticated," with the former relying heavily on external expert reviews like Parker scores. As globalization expands wine markets into less mature regions, the proportion of naive consumers increases, enhancing the market power of critical acclaim. Their findings confirm that Parker score sensitivity has grown over time – particularly for high-reputation wines – and that this effect is magnified when supply is perceived as limited, reinforcing the role of media-driven expertise and perceived scarcity in pricing dynamics.

Wine Spectator's Top 100 List exemplifies the structured and hierarchical visibility mechanisms discussed in this literature. Unlike traditional reviews, the list functions as both a curated ranking and a media campaign. Particularly notable is the staggered daily release of the top 10 wines, each accompanied by dedicated editorial content and multimedia promotion. This announcement format creates what we term an "anticipatory halo effect," whereby attention intensifies progressively as the number one wine is revealed. While the effects of critical reviews on immediate demand are well documented [6], relatively little empirical research has addressed whether such orchestrated visibility translates into persistent market advantages.

In summary, the literature establishes strong theoretical and empirical foundations for understanding how visibility, critical acclaim, and media amplification generate superstar effects. Within wine economics, these dynamics have been shown to influence pricing, reputation, and long-term market positioning. However, the role of list-based rankings – and particularly the highly visible upper tiers of such rankings – remains an underexplored yet potentially powerful mechanism. This study

aims to address this gap by examining whether inclusion in Wine Spectator's Top 100 List, especially within the top 10, generates enduring price premiums and revenue gains for wine producers.

3. METHOD AND DATA

This study adopts a quantitative approach to examine whether inclusion in *Wine Spectator*'s Top 100 List induces a superstar effect – defined here as a statistically and economically significant increase in price premium. The empirical strategy proceeds in three stages. First, we evaluate the short-term price premium for wines ranked number one in the Top 100 List between 2010 and 2021. Second, we assess the persistence of the price premium for wines ranked in the top 10 of the 2016 list using a panel of vintages. Third, we analyze producer-level outcomes – specifically changes in release price, sales volume, and revenue – based on a tiered breakdown of the Top 100 rankings.

The dataset was compiled from two primary sources. Historical ratings, suggested retail prices, scores, and rankings were obtained from *Wine Spectator*'s publicly available archives [18]. Market price and production volume data were collected from *Wine-Searcher*, a widely recognized aggregator of global retail wine prices. For each wine, we recorded the release price at the time of inclusion and the current average market price in the United States, which together form the basis for our calculation of the price premium.

Although *Wine Spectator*'s Top 100 List has existed since 1988, the analysis is limited to the 2010–2021 period. Wines from earlier lists are often no longer actively traded, restricting access to reliable price data. Conversely, wines from more recent lists, particularly those released in the past two years, are frequently still in distribution or lack sufficient market data, making them unsuitable for inclusion.

The key variable in this study is the price premium, defined as the ratio of *Wine-Searcher*'s average U.S. price to the release price listed by *Wine Spectator*. Mathematically, it is expressed as:

$$Price\ Premium = \frac{Wine\text{-}Searcher's\ Average\ Price\ (US)}{Release\ Price} \quad (1)$$

This price premium serves as an indicator of how much a wine's market value has increased relative to its initial release price, representing a key marker of the superstar effect. We conduct two complementary analyses to estimate the price premium effects associated with critical recognition. In the first analysis, we focus on wines ranked number one in the *Wine Spectator* Top 100 List between 2010 and 2021.

For each wine, we compare the price premium of the listed vintage to that of the previous vintage, using a paired t-test. This allows us to test whether the observed premium is significantly higher after inclusion in the list. The null hypothesis (H_0) posits no difference in price premium between the two vintages, while the alternative hypothesis (H_1) assumes a statistically significant increase in the premium for the ranked vintage:

$$\Delta\ Premium = Premium_{post} - Premium_{pre}, \quad (2)$$

where $Premium_{post}$ is the price premium for the vintage ranked number one, and $Premium_{pre}$ is the price premium for the previous year's vintage.

Second, to further assess the impact of ranking within the Top 100, particularly focusing on the immediate price premium for top 10 wines and its persistence over subsequent vintages, we estimate a regression model to examine the relationship between the price premium and factors such as scores, production volume, and the sustained effect of inclusion in the Top 100 List. Specifically, we test the hypothesis that inclusion in the Top 100 List, particularly being ranked in the top 10, leads to a significantly higher price premium compared to the previous vintage, and that this premium persists over several vintages.

Our focus on the top 10 wines stems from the visibility and publicity they receive in the days leading up to the release of the full Top 100 List. During this period, a countdown begins with the 10th-ranked wine, accompanied by detailed information about each wine. This process generates heightened visibility and publicity for the top 10 wines, making them more prominent compared to the rest of the list.

Our analysis focuses on the top 10 wines from the 2016 Top 100 List. For each wine i, the vintage included in the Top 10 (denoted by j=1) may vary depending on the wine and may not necessarily be from 2016. We take this vintage as the reference point, with j=0 representing the vintage prior to the wine's inclusion in the Top 10. We also include subsequent vintages, denoted by j=2, 3, 4, 5, to measure the persistence of the price premium over time. This results in a panel dataset consisting of 10 wines, with 6 vintages per wine (one pre-inclusion, one-inclusion, and four post-inclusion), leading to a total of 60 observations. Due to missing price data from the secondary market (Wine-Searcher) for two wine-vintage pairs, the final regression sample includes 58 observations.

Given the panel nature of the data, in addition to pooled Ordinary Least Squares (OLS) model, we esti-

mate both Generalized Least Squares (GLS) random effects (RE) and fixed effects (FE) models to account for unobserved heterogeneity across wines. The model selection is based on the results of the Breusch and Pagan Lagrangian multiplier test and Hausman test, which help to determine the appropriate model by comparing the consistency of the OLS, RE and FE estimators:

$$Premium_{ij} = \beta_0 + \beta_1 Score_{ij} + \beta_2 Age_{ij} + \beta_3 Cases_{ij} + \beta_4 Number1_{ij} + \sum_{j=1}^{5} \beta_{5j} Top10_{ij} + u_i + \varepsilon_{ij}, \quad (3)$$

where $Premium_{ij}$ is the price premium for wine i in vintage j; $Score_{ij}$ represents the Wine Spectator assigned score for wine i in vintage j; Age_{ij} indicates how many years old the wine i is in vintage j as of 2023; $Cases_{ij}$ is the number of cases produced for wine i in vintage j; $Number1_i$ takes a value of 1 if wine i is ranked number one in the Top 100 List; $Top10_{ij}$ represents the vintage of wine i j vintages after its inclusion in the Top 10 list (with j=1 referring to the vintage included in the Top 10, and j=2,3,...,5 representing subsequent vintages); $Top10_{i0}$ represents the vintage immediately before the wine's inclusion in the Top 10 (the benchmark vintage); u_i is the individual-specific effect (used in RE models); and ε_{ij} is the idiosyncratic error term.

This specification allows us to capture both the immediate impact of being ranked in the Top 10 on the price premium for the vintage included in the Top 10 (denoted by j=1) and the persistence of this effect over subsequent vintages (as j increases from 2 to 5). By comparing the pre-inclusion vintage (j=0) and post-inclusion vintages, we can test whether the top 10 ranking generates a sustained price premium over time.

The paired t-test used in the first analysis evaluates whether the average price premium for wines ranked number one in the *Wine Spectator* Top 100 List is significantly higher than that of the immediately preceding vintage. In the second analysis, the panel regression results assess the significance of each covariate in explaining variation in the price premium, with particular emphasis on the wine's ranking and its inclusion in the Top 100 List over time.

Finally, as a third component of the empirical strategy, we extend the analysis to examine producer-level revenue outcomes associated with Top 100 List inclusion. This extension compares changes in release price, quantity sold, and realized revenue between the vintage listed in the Top 100 and the subsequent vintage. The analysis is disaggregated across three ranking tiers – Top 100, Top 50, and Top 10 – based on the 2016 list. Expected revenue is defined as the product of the release price and the number of cases sold. Realized revenue adjusts this value by incorporating the observed price premium, calculated as the ratio of Wine-Searcher's average U.S. market price to the listed release price. This tiered comparison enables a structured assessment of whether the magnitude of revenue effects varies systematically with a wine's rank within the Top 100.

4. RESULTS

This section presents the empirical results in three parts. First, we evaluate whether being ranked as the number one wine in Wine Spectator's Top 100 List generates an immediate price premium relative to the previous vintage. Second, we analyze the persistence of price premiums for the top 10 wines from the 2016 list across multiple vintages. Finally, we extend the analysis to examine changes in release price, quantity sold, and realized revenue, disaggregated by ranking tiers, to assess the broader economic implications of critical recognition.

4.1. Price Premiums for Number One Wines (2010–2021)

For wines ranked as number one in the Top 100 List between 2010 and 2021, the price premium – calculated as the ratio of the current average price to the release price – increased significantly compared to the previous year's vintage. As shown in Figure 1, the price premium for the number one wines rose from an average of 1.46 (for the previous year's vintage) to 2.70 (for the Top 100 vintage), representing an 85% increase in value.

The results of the paired t-test reveal a statistically significant difference between the price premium of the

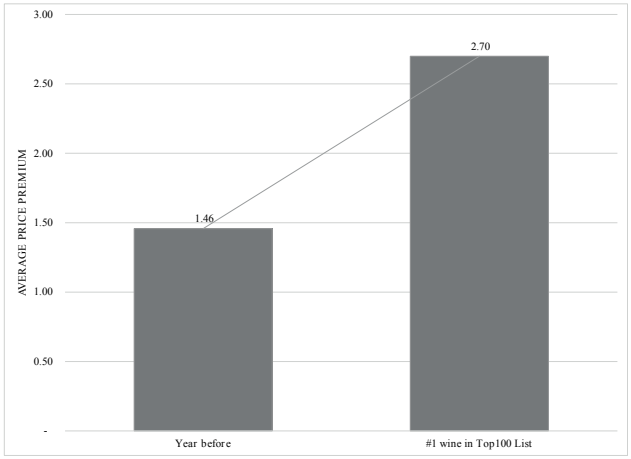

Figure 1. Price Premium for the Number One Wine in Top 100 Lists (2010-2021).

number one wine's vintage and the previous year's vintage (t-statistic = 2.517, p=0.02, two-tailed). This indicates that inclusion as the top-ranked wine in *Wine Spectator's* Top 100 List is strongly associated with a substantial increase in price premium.

These results suggest that the "superstar effect" extends to the number one wines in *Wine Spectator's* rankings. The immediate increase in price premium indicates that the publicity surrounding the top-ranked wine significantly impacts consumer demand, thereby influencing market price.

4.2. Persistence of Price Premiums for Top 10 Wines (2016 Vintage Panel)

To examine the broader impact of being ranked in the Top 10, drawing from a panel dataset of the top 10 wines from Wine Spectator's 2016 Top 100 List and their associated vintages, we initially conducted both Ordinary Least Squares (OLS) and Generalized Least Squares (GLS) Random Effects (RE) regressions. The results are presented in Table 1. Following this, the Breusch-Pagan Lagrangian multiplier test for random effects ($\bar{\chi}^2$ (1) = 2.00, p = 0.079) suggested that the Random Effects (RE) model might be more appropriate, and a subsequent Hausman test (χ^2 (8) = 3.12; p = 0.537) confirmed that the RE model was indeed a better fit than the Fixed Effects (FE) model for this analysis.

Both the OLS and RE models consistently indicate significant effects for the key variables of interest. In particular, the coefficients for vintage and top 10 rankings across both models are positive and statistically significant. The RE model shows that wines ranked in the top 10 of Wine Spectator's list experience a substantial price premium relative to previous vintages. Specifically, the coefficient for the "$Top10_{i1}$" variable is 0.736, with a p-value of less than 0.01, indicating a strong premium for wines ranked in the top 10. Moreover, the coefficients for the variables representing the first through fourth vintages following inclusion in the top 10 ($Top10_{i2}$, $Top10_{i3}$, $Top10_{i4}$, $Top10_{i5}$) are also statistically significant, with values of 0.721, 0.709, 0.877, and 1.095, respectively, and p-values all below 0.05.

In addition to statistical significance, it is essential to consider the economic significance of these coefficients. For instance, as presented in Figure 2, the coefficient of 0.736 for the top-ranked wine in the top 10 implies a 73.6% increase in the price premium relative to the baseline. Similarly, the coefficients for Top2, Top3, and Top4 reflect price increases ranging from 70% to 109%, indicating substantial market effects. These effect sizes indicate that inclusion in the top 10 ranking not only has a statistically significant impact but also leads to economically meaningful increases in market prices, likely influencing both consumer purchasing behavior and producer strategies. The results suggest that the price premium not only arises immediately following inclusion in the top 10 but also persists for several years.

Additionally, the vintage variable, which captures the age of the wine, shows a positive and significant relationship with the price premium, reinforcing the idea that older wines tend to command higher price premiums. However, the number of cases produced, being ranked as the number one wine, and expert scores did not exhibit a significant effect on the price premium.

In addition to examining the individual significance of these variables, we also tested whether the coefficients for each of the top 10 ranks were statistically different from zero (H_o: β_{5j} = 0, where j=1, 2, 3, 4, 5). The chi-squared tests confirmed that each variable – $Top10_{i1}$, $Top10_{i2}$, $Top10_{i3}$, $Top10_{i4}$, $Top10_{i5}$ – had a significant and positive effect on the price premium. For instance, the test for the $Top10_{i1}$ coefficient yielded a chi-squared value of 17.01 with a p-value of less than 0.01, while $Top10_{i2}$ showed a chi-squared value of 9.90 with a p-value of less than 0.01. The remaining variables – $Top10_{i3}$, $Top10_{i4}$, and $Top10_{i5}$ – also exhibited significant results, with p-values of less than 0.02, 0.02, and 0.01, respectively. These results confirm that inclusion in the top 10 of the Wine Spectator Top 100 List exerts a significant upward effect on the price premium for these wines.

To further investigate whether the coefficients for the top 10 vintages were different from one another, we conducted a joint hypothesis test to assess whether they were statistically distinguishable (Ho: $\beta_{51} = \beta_{52} = \beta_{53} = \beta_{54} = \beta_{55}$. The test showed that these coefficients were not

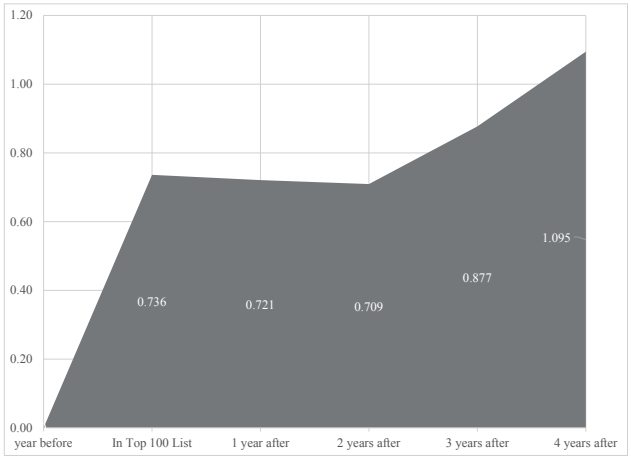

Figure 2. The estimated average increase in price premium for Top 10 wines in 2016 list.

Table 1. Regression results – Dependent variable price premium.

(1)	(2)	(3)	(4)
Explanatory variables	OLS	GLS - RE	GLS - FE
Age	0.229 (0.055)***	0.258 (0.080)***	0.468 (0.183)***
Cases	-0.011 (0.010)	-0.005 (0.013)	0.002 (0.023)
WS-score	-0.032 (0.029)	-0.021 (0.031)	0.008 (0.037)
$Top10_1$	0.733 (0.181)***	0.736 (0.179)***	0.904 (0.247)***
$Top10_2$	0.681 (0.204)***	0.721 (0.229)***	1.136 (0.427)***
$Top10_3$	0.647 (0.246)***	0.709 (0.367)**	1.322 (0.602)**
$Top10_4$	0.792 (0.285)***	0.877 (0.367)**	1.705 (0.783)**
$Top10_5$	0.980 (0.331)***	1.095 (0.441)***	2.135 (0.964)***
Number1	-0.100 (0.153)	-0.079 (0.249)	
Constant	1.960 (2.625)	0.548 (2.972)	-4.448 (4.415)
No. of observations	58	58	58
R^2	0.49	0.49	0.42
Within- R^2		0.49	0.50
Between- R^2		0.50	0.47

Standard errors are in parentheses. *** indicates level of significance at 1% (two-tailed). ** indicates level of significance at 5% (two-tailed).

statistically different from each other. The chi-squared value for this test was 4.19, with a p-value of 0.3813, indicating no significant difference between these coefficients. This suggests that the price premium effect for wines ranked in the top 10 is relatively uniform across the top 10 vintage and subsequent vintages.

In summary, the regression results and hypothesis tests confirm that wines ranked in the top 10 of *Wine Spectator*'s Top 100 List experience substantial and persistent price premiums. The premium effect is consistently observed across multiple vintages and is not limited to the number one wine, suggesting that critical acclaim within the Top 10 category has long-term economic consequences for producers. These results offer strong support for the presence of a superstar effect in the wine market, where visibility and third-party validation influence pricing power and consumer perception.

4.3. Revenue Effects by Ranking Tier: Top 100, Top 50, and Top 10

To complement these findings, we next explore whether this ranking-driven recognition translates into broader commercial gains beyond price alone. Specifically, we examine changes in release price, volume, and total revenue across three tiers of ranked wines. This allows us to assess whether the superstar effect also manifests in producer-side outcomes, such as increased sales and revenue multipliers.

We further investigate how inclusion in *Wine Spectator*'s Top 100 List affects producers' pricing and revenue strategies by disaggregating the data across three ranking tiers: the full Top 100, Top 50, and Top 10 wines. Table 2 summarizes changes in release price, volume, expected revenue (defined as the product of release price and volume), price premium (measured as the ratio of Wine-Searcher's U.S. average price to release price), and actual realized revenue.

For the full Top 100, the vintage following inclusion saw an 8.3% increase in release price and a 6.7% increase in volume, generating a 15.5% rise in expected revenue. However, these wines sold slightly below their release prices on average (price premium = 0.99), moderating the realized revenue increase to 14%. In the Top 50 subset, the revenue impact becomes more pronounced: a 9.5% increase in release price and a 12% rise in volume produced a 22.6% expected revenue gain, with the

Table 2. Estimated and Actual Revenue Changes for Wines Listed in the Wine Spectator Top 100 by Ranking Tier.

Ranking Tier	Δ Release Price	Δ Volume	Δ Expected Revenue	Δ Price Premium	Δ Actual Revenue
		Change in quantity	Change in (release price * change in quantity)	Change in $\frac{Wine-Searcher's\ Average\ Price\ (US)}{Release\ Price}$	Change in actual total revenue
Top 100	1.083	1.067	1.155	0.99	1.14
Top 50	1.095	1.120	1.226	1.02	1.25
Top 10	1.024	1.245	1.275	1.28	1.64

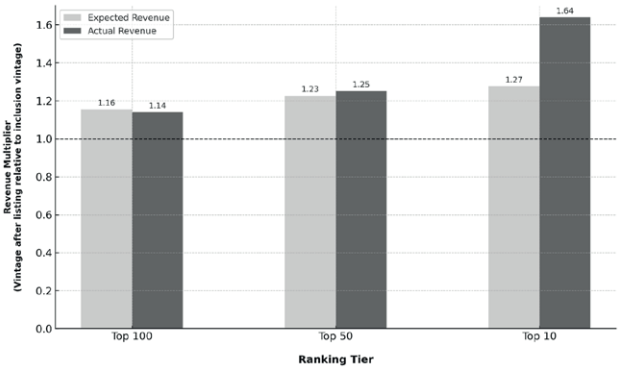

Figure 3. Expected vs. Actual Revenue Gains by Wine Spectator Ranking Tier.

slight secondary market premium (1.02) pushing actual revenue up by 25%.The Top 10 wines exhibited a distinct pattern. While release price increased only marginally (2.4%), volume surged by 24.5%, resulting in a 27.5% expected revenue boost. Crucially, these wines sold at a 28% premium over their release prices (price premium = 1.28), driving a 64% increase in realized total revenue.

This substantial discrepancy between expected and actual revenue highlights the outsized economic value conferred by top-tier visibility and critical acclaim. This tiered pattern is visualized in Figure 3, which contrasts expected revenue based solely on price and volume growth with actual realized revenue that incorporates observed price premiums. The divergence between expected and realized outcomes is most pronounced for Top 10 wines, reinforcing the disproportionate economic value of visibility and media amplification at the top of the list.

The empirical findings presented across both the regression analysis and the extended revenue decomposition indicate that inclusion in *Wine Spectator*'s Top 100 List – particularly within the Top 10 – generates multidimensional economic returns. The persistence of price premiums across multiple vintages confirms the long-term nature of the effect, while the observed gains in sales volume and realized revenue underscore the broader commercial implications of critical acclaim. These results align with theoretical predictions of the superstar effect by illustrating how media-driven recognition can translate into disproportionate and sustained economic advantages for a small subset of producers.

5. DISCUSSION

This study provides evidence supporting the presence of a "superstar effect" in the wine industry, particularly for wines included in Wine Spectator's Top 100 List. The results show that wines ranked in the top 10 experience substantial price premiums that persist across multiple vintages. Specifically, being ranked number one generates a notable price premium, with an average increase of 85% compared to the previous vintage. Additionally, wines ranked in the top 10 continue to enjoy elevated premiums for up to five years following their inclusion in the list, illustrating the long-lasting effects of critical recognition.

These findings align with prior research on the superstar effect in industries such as sports, entertainment, and technology, where heightened visibility and recognition contribute to market dominance [1–2, 4, 8–9]. In the wine industry, inclusion in Wine Spectator's Top 100 List boosts a wine's market position by increasing consumer demand and enabling higher price premiums.

A key distinction that emerged from the analysis lies in the difference between short-term and long-term price premiums. The immediate impact of ranking number one on Wine Spectator's list is particularly striking, with price premiums nearly doubling for the current vintage. The paired t-test results underscore the role of media exposure and publicity in generating consumer interest and driving up prices.

More intriguingly, the persistence of the price premium over time for wines ranked in the top 10 highlights the enduring nature of the superstar effect. The random effects (RE) regression analysis indicates that the price premium remains statistically significant for up to five years following a wine's inclusion in the Top 10. This suggests that the superstar effect is not merely a short-lived phenomenon but instead provides enduring economic benefits to wine producers. These wines maintain elevated prices long after their initial recognition in the rankings.

The findings of this study further reinforce the broader theory of the superstar effect in markets driven by visibility and recognition. Similar to how top performers in industries like sports and entertainment disproportionately capture income and market share, top-ranking wines in Wine Spectator's Top 100 List benefit from outsized economic gains. The positive relationship between critical recognition and price premiums aligns with previous studies on wine, which have found that expert opinions significantly influence both wine demand and pricing [5–6, 19–20]. These results underscore that inclusion in a prestigious ranking not only boosts a wine's market value but also serves as a long-term competitive advantage for producers. The observed price premiums, sustained across multiple vintages, emphasize that the superstar effect in the wine industry delivers prolonged market success.

The analysis also highlights that the age variable shows a positive and significant relationship with price premiums, reflecting the fact that older vintages tend to command higher prices as they become scarcer and more desirable. The negative coefficient for the number of cases produced, although not statistically significant, suggests that scarcity may contribute to upward price pressure. These patterns are consistent with Oczkowski's [15] findings that both objective product attributes (such as vintage and alcohol content) and subjective evaluations (such as expert scores) play an important role in shaping wine prices. At the same time, they align with Gibbs, Tapia, and Warzynski's [16] results, which show that perceived scarcity and media-amplified reputation interact to produce durable price premiums, especially in markets with limited supply elasticity and informational asymmetries.

Furthermore, the relatively narrow range of Wine Spectator scores for the wines analyzed likely explains why these scores did not exhibit a significant additional effect on price premiums.

Interestingly, the regression results show that the coefficient for the "Number1" dummy variable was not statistically different from zero, indicating that being ranked number one does not result in a significantly higher price premium compared to other top 10 wines. This unexpected result may be explained by a scenario in which reputational effects and perceived scarcity – both key pricing mechanisms discussed by Gibbs et al. [16] – interact with consumer behavior. Following the rankings announcement, initial demand may drive top-ranked wines to sell out rapidly, prompting consumers to shift attention to adjacent, lower-ranked options. As scarcity intensifies for the most sought-after wines, substitution effects could push up prices for other top 10 entries, thereby flattening the premium gradient. This dynamic may recur annually, contributing to the observed lack of a statistically distinct premium for the number one wine.

In addition to these price-based effects, the third component of the analysis – revenue decomposition by ranking tier – offers further insight into how critical recognition translates into broader commercial gains. While wines in the full Top 100 and Top 50 lists showed modest increases in realized revenue, the Top 10 wines exhibited disproportionately large gains. Specifically, the combination of a 24.5% increase in volume and a 28% resale premium resulted in a 64% increase in realized revenue for top 10 wines. This result indicates that the superstar effect operates not only through price but also via quantity sold, amplifying its commercial impact. The divergence between expected and actual revenue, most pronounced for top 10 wines, suggests that visibility-induced demand can substantially elevate both perceived value and consumer willingness to pay.

The findings of this study extend the understanding of the superstar effect beyond the wine industry and into other markets where visibility and recognition play critical roles in consumer decision-making. Similar effects could be observed in sectors such as luxury goods, fine art, and non-wine beverages like whiskey or craft beer, where reputation and exclusivity drive market demand. Prominent awards and media exposure in these industries may create sustained price premiums, as demonstrated in this study. These insights suggest that in markets where consumers rely heavily on third-party validation, the superstar effect contributes to long-term market advantages, reinforcing the importance of public recognition in shaping product success.

For wine producers, these findings offer strategic insights. Achieving a high ranking on Wine Spectator's Top 100 List can lead to significant and sustained price premiums, particularly for smaller or emerging producers aiming to establish themselves in the market. The long-term price premiums observed in this study suggest that producers could benefit from aligning their marketing and branding strategies to improve their chances of achieving higher rankings. Furthermore, the findings underscore the importance of scarcity in driving price premiums. Producers might consider leveraging limited production to create exclusivity and elevate the market value of their wines.

While this study provides valuable insights, several limitations warrant attention. First, the analysis focuses solely on Wine Spectator's Top 100 List, which, while influential, represents only one source of critical acclaim in the global wine industry. Future research could examine other prestigious awards, such as the Decanter World Wine Awards or ratings from additional prominent wine critics, to determine whether similar superstar effects are observed across different platforms.

Second, this study analyzes price premiums in the U.S. market, where Wine Spectator's influence is particularly strong. Exploring similar effects in other regions, such as Europe, Asia, or Latin America, would provide a broader understanding of the global implications of critical recognition. Differences in cultural, regulatory, and consumer behavior across these markets could reveal new insights into the dynamics of price formation.

Finally, future research could delve deeper into consumer behavior to better understand the mechanisms driving the superstar effect. Investigating factors such as brand loyalty, social status, or personal taste preferences could offer additional insights into how rankings

influence consumer decisions. Complementary qualitative research, including interviews or focus groups, could enhance the understanding of how consumers perceive rankings like Wine Spectator's, adding depth to the quantitative findings.

Moreover, supply-side dynamics, such as production volume and distribution strategies, deserve further exploration. While this study highlights the role of scarcity, additional research could examine how producers strategically balance production and critical acclaim to maximize value. These efforts would provide a more comprehensive understanding of the interplay between recognition, scarcity, and pricing in the wine industry.

6. CONCLUSION

In conclusion, this study confirms the existence of a "superstar effect" in the wine industry, driven by inclusion in Wine Spectator's Top 100 List. The findings reveal that top-ranked wines experience significant and enduring price premiums, with the number one wine achieving an 85% increase in price premium compared to previous vintages. This effect persists for up to five years for wines ranked in the top 10, underscoring the long-lasting impact of critical recognition on market outcomes.

The revenue decomposition further supports the presence of a superstar effect by showing that top 10 wines generate a disproportionately high increase in realized revenue – reaching 64% – through both elevated resale prices and expanded sales volumes. This commercial outcome highlights the economic significance of critical acclaim and media-driven visibility in shaping producer success.

The implications of these results are significant, particularly for wine producers and marketers seeking to leverage visibility and rankings to strengthen their market position. While scarcity plays a role, the superstar effect of high-profile rankings remains a key driver of economic success in the wine industry. Further research is needed to investigate how these effects may vary across different markets and to examine additional factors influencing wine pricing beyond rankings and scarcity.

REFERENCES

[1] S. Rosen, The economics of superstars, Am. Econ. Rev. 71 (1981) 845–858. https://www.jstor.org/stable/1803469.

[2] M. Adler, Stardom and talent, Am. Econ. Rev. 75 (1985) 208–212. https://www.jstor.org/stable/1812714.

[3] B. Humphreys, C. Johnson, The effect of superstars on game attendance: Evidence from the NBA, J. Sports Econ. 21 (2020) 152–175. https://doi.org/10.1177/1527002519885441.

[4] E. Bilen, A. Matros, The queen's gambit: Explaining the superstar effect using evidence from chess, J. Econ. Behav. Organ. 215 (2023) 307–324. https://doi.org/10.1016/j.jebo.2023.09.002.

[5] O. Ashenfelter, G.V. Jones, The demand for expert opinion: Bordeaux wine, J. Wine Econ. 8 (2013) 285–293. https://doi.org/10.1017/jwe.2013.22.

[6] H.H. Ali, S. Lecocq, M. Visser, The impact of gurus: Parker grades and en primeur wine prices, Econ. J. 118 (2008) F158–F173. https://doi.org/10.1111/j.1468-0297.2008.02147.x.

[7] J.M. Cardebat, J.M. Figuet, The superstar effect of expert ratings: Evidence from Bordeaux wine, J. Wine Econ. 14 (2019) 127–146. https://doi.org/10.1017/jwe.2014.23.

[8] K. Hoffman, C. Opitz, Talent and publicity as determinants of superstar incomes: Empirical evidence from the motion picture industry, Appl. Econ. 51 (2019) 1383–1395. https://doi.org/10.1080/00036846.2018.1527452.

[9] C. Deutscher, L. Neuberg, S. Thiem, Who's afraid of the GOATs? - Shadow effects of tennis superstars, J. Econ. Psychol. 99 (2023) Article 102663. https://doi.org/10.1016/j.joep.2023.102663.

[10] G. Schultze, Chapter 54 Superstars, in: R. Towse, T. Navarrete Hernández (Eds.), Handbook of Cultural Economics, third ed., Edward Elgar Publishing, 2020, pp. 485–493. https://doi.org/10.4337/9781788975803.00060.

[11] A. Humphreys, G. Carpenter, Status games: Market driving through social influence in the U.S. wine industry, J. Mark. 82 (2018) 141–159. https://doi.org/10.1509/jm.16.0179.

[12] F. Koenig, Technical change and superstar effects: Evidence from the rollout of television, Am. Econ. Rev. Insights 5 (2023) 207–223. https://doi.org/10.1257/aeri.20210539.

[13] E. Hogue, Promotional effects of recorded music and superstars on concert financial outcomes, J. Interdiscip. Econ. 36 (2023) 166–203. https://doi.org/10.1177/02601079231168750.

[14] J. Giráldez-Cru, A. Suárez-Vázquez, C. Zarco, O. Cordón, Modeling the opinion dynamics of superstars in the film industry, Expert Syst. Appl. 250 (2024) Article 123750. https://doi.org/10.1016/j.eswa.2024.123750.

[15] E. Oczkowski, Identifying the effects of objective and subjective quality on wine prices, J. Wine

Econ. 11 (2016) 249–260. https://doi.org/10.1017/jwe.2016.1.
[16] M. Gibbs, M. Tapia, F. Warzynski, Globalization, superstars, and reputation: Theory & evidence from the wine industry, J. Wine Econ. 4 (2009) 46–61. https://doi.org/10.2139/ssrn.1343732.
[17] O. Ashenfelter, K. Storchmann, Using a hedonic model of solar radiation to assess the economic effect of climate change: The case of Mosel valley vineyards, Rev. Econ. Stat. 92 (2010) 333–349. https://doi.org/10.1162/rest.2010.11377.
[18] Wine Spectator, About us. (n.d.). Retrieved March 9, 2024, from https://www.winespectator.com/pages/about-us.
[19] O. Gokcekus, S. Gokcekus, Empirical evidence of lumping and splitting: Expert ratings' effect on wine prices, Wine Econ. Policy 8 (2019) 171–179. https://doi.org/10.1016/j.wep.2019.09.003.
[20] S. Castriota, S. Corsi, P. Frumento, G. Ruggeri, Does quality pay off? "Superstar" wines and the uncertain price premium across quality grades, J. Wine Econ. 17 (2022) 141–158. https://doi.org/10.1017/jwe.2022.21.

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Organizational Culture and Innovative Behavior in Wine SMEs: Case Study in Valle de Guadalupe, Mexico

Andrés Antonio Luna-Andrade[1,*], Lino Meraz Ruiz[1], Omar Alejandro Pérez-Cruz[2], Gina García Walther[1], Luz Alejandra Riveros Sáchica[3]

[1] *Universidad Autónoma de Baja California, Carretera Transpeninsular Ensenada, Tijuana 3917, México*
[2] *Universidad de Colima, Av. Universidad No. 333, Las Víboras, 28040, Colima, México*
[3] *Universidad de Cundinamarca, Bogotá, Colombia*
Email: luna.andres@uabc.edu.mx; lino.meraz@uabc.edu.mx; omar_perez@ucol.mx; ginga@uabc.edu.mx; Lalejandrariveros@ucundinamarca.edu.co
*Corresponding author.

Abstract. This study investigates the impact of organizational culture on innovative behavior in small and medium-sized wine enterprises (SMEs) located in Valle de Guadalupe, Mexico. Using a non-experimental correlational design, data were collected through structured questionnaires distributed to 45 wine entrepreneurs and producers. The data were analyzed with SmartPLS 4.1 software to assess the reliability and validity of the proposed theoretical model. The findings indicate a significant relationship between a positive organizational culture and enhanced innovative behavior, highlighting the critical role of internal communication and employee commitment in promoting innovation. The study underscores the importance of a robust organizational culture as a catalyst for innovation in wine-producing SMEs.

Keywords: organizational culture, innovation behavior, small enterprises, wine, Mexico.

1. INTRODUCTION

Over the past three decades, the global wine industry has undergone significant structural changes, driven by globalization and evolving consumer habits [27]. Historically dominated by countries such as France, Italy, and Spain, wine production and trade have seen increased participation from emerging players, including Chile, Argentina, and Mexico [28]. This phenomenon, known as the "globalization of wine," has led to a highly competitive and diverse market, where both large corporations and small and medium-sized enterprises (SMEs) strive to adapt to the changing environment and respond to increasingly demanding and varied customer preferences [4].

In this context, wine-producing SMEs face significant challenges. Unlike large corporations, these smaller companies often lack the financial and tech-

nological resources required to implement large-scale innovations in both products and processes [14]. However, these small enterprises, often recognized for their commitment to producing high-quality wines and their close connection to local traditions, have been able to identify growth opportunities in select markets, particularly in wine tourism and sustainable production [16].

The Valle de Guadalupe, located in Baja California, is a clear example of how an emerging region can integrate into the global wine market. Despite the limitations of the Mexican market, particularly for SMEs, this area combines innovation and tradition, factors that have driven the production of high-quality wines and the development of sustainable wine tourism. This, in turn, has fostered both the region's progress and the preservation of its natural heritage, strengthening its competitiveness against foreign companies [35]. In 2023, the region accounted for 75% of national wine production, generating 3.6 billion pesos (approximately USD 210 million) and employing 10,500 people, 40% of whom are women [27; 5].

This research aims to address two fundamental questions: (1) How does organizational culture impact the promotion of innovation within the wine-producing SMEs of the Valle de Guadalupe? and (2) What management practices are key to fostering innovation in these types of enterprises? Through a case study of wine companies in this region of Baja California, Mexico, the goal is to generate an initial generalization of the results that could be useful for other wine-producing contexts in emerging markets.

Although numerous studies on innovation in the wine sector exist, most have focused primarily on technology or sales-related topics, leaving the influence of internal factors such as organizational culture largely unexplored. Furthermore, there is a lack of research examining this relationship within the context of small and medium-sized wine enterprises in emerging regions, particularly in Mexico. This gap in the literature highlights the need to investigate how organizational culture can foster innovative behavior in MSMEs located in the Valle de Guadalupe. This need directly supports the research questions addressed in the present study.

For context, this study adopts the definition of SMEs provided by Mexico's Ministry of Economy, which considers companies with up to 250 employees and an average annual sales volume of 250 million pesos (approximately USD 14.7) [9]. The research specifically focuses on wine-producing SMEs that incorporate wine tourism activities, including lodging, gastronomy, and guided experiences. Such activities are particularly relevant due to their economic impact on the region, offering a means of income diversification and a differentiated business model that combines production with experiential services. These companies are essential for job creation and regional economic growth, particularly in rural areas [41]. Their structural characteristics distinguish them significantly from large international wine corporations and present unique challenges in terms of access to technology, financing, and innovation [15; 32].

2. THEORETICAL FRAMEWORK

2.1. Introduction to Innovative Behavior in Wine Companies

Currently, micro, small, and medium-sized enterprises (SMEs) play a vital role as economic drivers, not only in Mexico, where they make up a significant portion of the business landscape, but also worldwide. This has led to a growing interest in creating and strengthening more competitive companies. These enterprises are crucial for generating employment, boosting local production, and preserving cultural traditions, particularly in industries that emphasize the promotion of entrepreneurial culture, innovation, and competitiveness [31].

Innovation is a critical factor for the competitiveness and sustainability of these companies. Studies, such as those by Molina-Martínez and Baltazar-Ramos [33], indicate that innovation has a positive impact on the performance of SMEs in the wine sector. To become leaders or pioneers in innovation, these companies must improve their organizational structures, characteristics, and production methods. This will enable them to stay ahead of the competition by launching new products and processes, thereby maintaining their competitiveness in the market [2].

Although theoretical and practical advancements in wine companies are promising, there is still much work to be done to fully understand innovation in this sector. Research by Duran and Cabello [18] in Tequisquiapan, Querétaro, underscores innovation management as a tool for improving key indicators in the wine industry, such as customer service, profitability, sales, pricing, and competitiveness. However, Barragán-Quintero's [7] study highlights the importance of considering different types of innovation, along with the perceived challenges and opportunities that arise when making strategic decisions related to innovation.

While it is true that studies on consumer behavior and marketing dominate the wine business literature, innovations in wine marketing and sales have received far less attention compared to advancements in grape cultivation or winemaking, which are more common-

ly studied [32]. As a result, there is a need to explore research opportunities focused on innovation within micro and small companies [17]. This creates an area of opportunity for future studies to expand knowledge in this field, acting as a catalyst for wine industry entrepreneurs and producers, as well as researchers from various disciplines.

2.2. Importance of Organizational Culture in Wine Companies

Organizational culture exerts a significant influence on behavior, decision-making, and the adaptive capacity of organizations. In micro, small, and medium-sized wine enterprises, its strength can be a critical factor in driving innovation. Thus, for a deeper understanding, it is essential to introduce a precise definition of the concept. According to Schein y Shein [40], one of the most prominent experts in the field, organizational culture is distinguished as a pattern of shared basic assumptions learned by a group as it solved problems of external adaptation and internal integration assumptions that have worked well enough to be considered valid and, therefore, to be transmitted to new members as the appropriate way to interpret, reason, and respond to the challenges faced.

Today, fostering an innovative spirit within organizational culture is essential, as it directly influences work attitudes, which can be used to measure key performance indicators. This is achieved by motivating employees who are committed to driving innovation and meeting business objectives. Additionally, these companies offer diverse roles and encourage direct interaction between management and staff [25].

Analyzing organizational culture can help identify areas for improvement and direct employees' innovative behavior by cultivating an environment that supports and promotes creative and innovative practices. Erlygina and Abramova [19] suggest that the implementation of precise, innovative management methods can significantly enhance organizational culture and foster innovation. This, in turn, facilitates the selection and evaluation of personnel who align with the company's objectives.

Some studies, such as those by Motocanche and Bernaola [33], suggest that managers, representatives from the production sector, and directors of wine and pisco-producing SMEs in the Moquegua region should allocate a portion of their budget to investments in workshops and training programs aimed at improving the business culture within each company. Similarly, La Sala [25], in their research on the wine industry in the Basilicata region of southern Italy, contributes to the understanding of dynamic capabilities in the wine sector. Their study explores the impact of organizational culture, as well as strategic and relational approaches, on buyer-supplier interactions, inter-organizational learning, and the value creation process.

2.3. Dimensions of Organizational Culture

Organizational culture today faces numerous challenges and difficulties stemming from factors such as technological advancements, globalization, politics, and the broader economy. In the business environment, it is essential to develop strategies that strengthen organizational culture in key dimensions, with a focus on innovation and transforming the way human relationships are built [45]. Each organization must adapt its culture to meet its specific needs and interact effectively with the external environment.

According to the study by Bryan and Lammers [11], organizational culture affects various aspects such as efficiency, motivation, employee morale, work quality, stress levels, accident rates, burnout, and staff turnover. These factors have serious implications for the well-being of both employees and clients. Therefore, it is crucial to establish a connection between various authors and their contributions to the understanding of organizational culture and its relationship with innovation.

It is essential to connect the theories of various authors and their contributions to understanding organizational culture and its impact on innovation. The construct of ICT use is formulated by considering not only the presence and adoption of digital technologies in wine-producing organizations, but also the perception of their effect on innovation capacity. This approach aligns with the perspective of Yasmina and Etikariena [46], who integrate both elements when examining how the integration of ICT can foster innovative processes within organizations.

In this context, the cultural models developed by Geert Hofstede and Fons Trompenaars developed models that examine how cultural differences influence business management and innovation. In contrast, Edward and Mildred Hall, along with Shalom Schwartz, explored cultural dimensions and values that affect communication and change within organizations. These approaches highlight the importance of understanding cultural dimensions as a key factor in fostering innovation.

In today's environment, organizational culture faces critical challenges. Companies must adopt innovative strategies to strengthen their cultures and promote innovation in human relationships. This approach impacts efficiency, employee morale, work quality, and the well-

being of both employees and customers. Therefore, it is crucial to connect various studies to better understand how organizational culture influences innovation and contributes to business success.

2.4. Relationship between Organizational Culture and Innovative Behavior

This study employs a structural model grounded in Barney's [6] Resource-Based View (RBV), which emphasizes the importance of internal resources such as organizational culture, knowledge, and technological capabilities as key determinants of innovation and sustainable competitive advantage. Within this framework, organizational culture is understood as a dynamic resource that, when aligned with financial strategies and supported by Information and Communication Technologies (ICT), can significantly enhance both employee and organizational innovative behavior.

Based on this theoretical foundation, the proposed model explores the following hypothetical relationships:

H1: Organizational culture has a positive impact on innovative behavior.
H2: The perception of financial strategies enhances organizational culture.
H3: The use of Information and Communication Technologies (ICT) positively influences the perception of financial strategies.
H4: General management practices have a positive impact on the perception of financial strategies.

These hypotheses are supported by empirical studies that link organizational culture to innovation. For instance, Gerasimov [21], examines how cultural norms and values influence employees' willingness to innovate, particularly in service-oriented firms. Similarly, Yasmina and Etikariena [46], demonstrate that cultures promoting cooperation and innovation encourage greater participation in creative initiatives. Siswanti and Nurhariati [42], further highlight the role of organizational culture in enhancing job satisfaction and innovation in SMEs.

The study applies Partial Least Squares Structural Equation Modeling (PLS-SEM), as it is well-suited to the exploratory nature of the model, the sample size, and the focus on predictive relationships among latent variables. PLS-SEM facilitates the identification of key innovation drivers from multiple perspectives, especially in contexts where traditional covariance-based techniques may be limited due to data characteristics Hair [22].

By integrating these theoretical and methodological elements, the proposed model offers a robust analytical framework for understanding how internal organization-

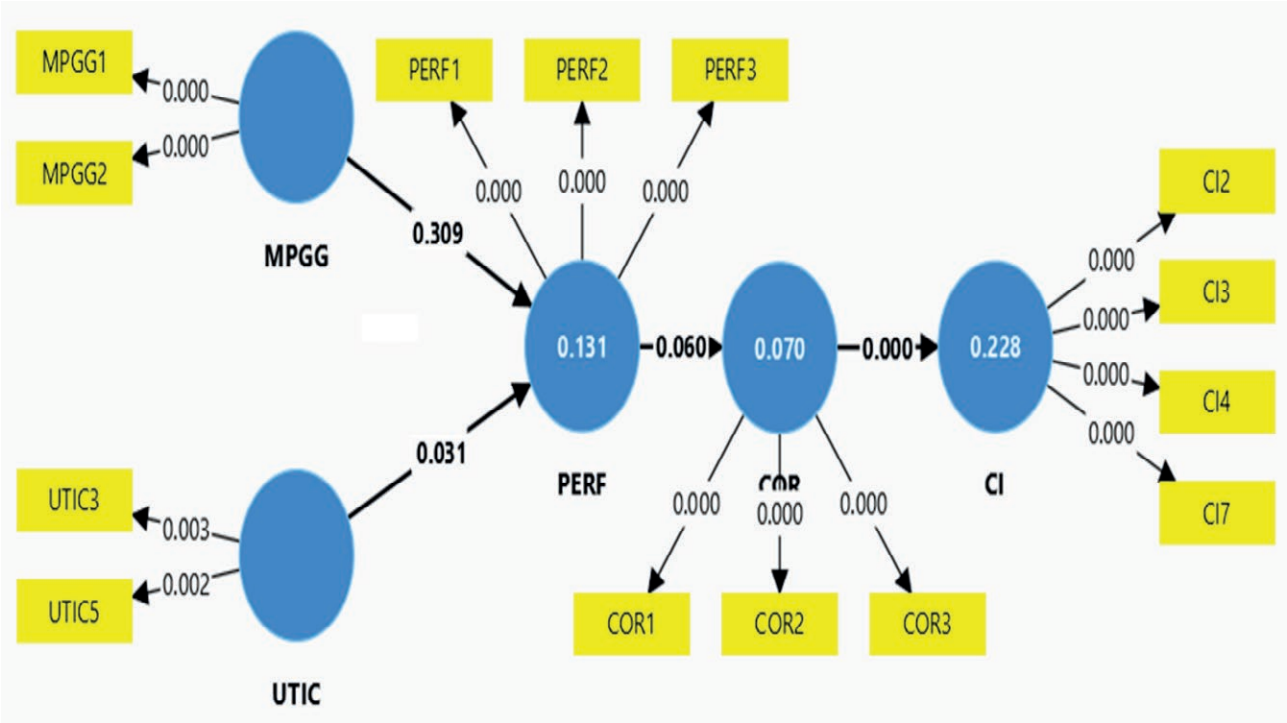

Figure 1. Path of the evaluated hypotheses. Own elaboration based on Smart PLS 4.1.

al factors influence innovation in small and medium-sized wine enterprises operating in emerging markets.

3. MATERIALS AND METHODS

This research was conducted from a quantitative perspective, employing a correlational-explanatory and non-experimental design. The primary objective was to examine the influence of organizational culture on innovation within small and medium-sized enterprises (SMEs) in the wine industry of the Valle de Guadalupe, Baja California. Through a case study approach, the goal was to understand the management practices that foster innovation in these businesses, laying a foundation for extending the findings to other developing wine regions.

The structural model evaluated through Partial Least Squares Structural Equation Modeling (PLS-SEM) is grounded in the Resource-Based View (RBV) proposed by Barney [6]. This theory asserts that sustainable competitive advantage arises from the efficient and strategic management of internal assets that are scarce, inimitable, and difficult to substitute. Specifically, organizational culture is conceptualized as a dynamic resource that influences a firm's capacity for innovation.

Additionally, the model integrates findings from empirical studies that emphasize the role of financial strategies and the use of Information and Communication Technologies (ICT) in enhancing innovation outcomes. Research conducted by Gerasimov [21] and Yasmina and Etikariena [46] shows that the adoption of technological tools and sound financial practices enables micro, small, and medium-sized enterprises (MSMEs) to optimize internal resources and foster innovation.

Accordingly, the theoretical relationships proposed such as the influence of organizational culture on innovative behavior and the mediating role of financial strategies and ICT are rooted in the RBV and supported by recent empirical evidence. This theoretical alignment provides a solid foundation for interpreting the statistical results obtained through the PLS-SEM analysis.

The implementation of the correlational-explanatory design in this study enabled the analysis of the correlation between key variables such as organizational culture, innovative behavior, perceptions of financial strategies, the use of information and communication technologies (ICT), and overall management. In business research, this approach is ideal for analyzing the interaction of these variables in their natural environment, without direct intervention, providing a detailed view of the factors influencing the innovation process.

The correlational methodology was employed to identify connections between the variables, while the explanatory component delved into understanding the reasons and processes that govern these relationships. This methodology has been supported by methodological research, such as those conducted by Hernández et al. [23] and Rosenthal and Rosnow [37], which emphasize its importance in the field of business research.

The study population consisted of 45 small and medium-sized wine-producing enterprises from the Valle de Guadalupe, selected through non-probability convenience sampling. The selection criteria included:

1. **Organizational structure**: The study focused on micro-enterprises with an annual production of fewer than 5,000 cases of wine, as well as small and medium-sized enterprises with an annual production ranging between 5,000 and 50,000 cases. This distribution reflects the dominant configuration of the industry in the region.
2. **Active involvement in the wine sector**: The selected entities were required to actively participate in the production, manufacturing, and distribution of wine. Additionally, they needed to demonstrate active implementation of digital technologies to optimize their production, administrative, and commercial processes.
3. **Diversification of activities**: The study included entities that, in addition to wine production, offered complementary services such as lodging and gastronomy, which are fundamental elements in the wine tourism offerings of the Valle de Guadalupe.

This sample provided a representative perspective of the small and medium-sized wine-producing enterprises in the region, facilitating the generalization of findings to other similar contexts.

For data collection, a structured questionnaire consisting of 50 items was used, organized into five key dimensions: organizational culture, innovative behavior, perception of financial strategies, use of ICT, and general management. Responses were measured using a 5-point Likert scale (1 = Strongly disagree, 5 = Strongly agree). Below are examples of the questions included in each dimension:

1. **Organizational Culture**: "Is training in emerging technologies encouraged within your company?" and "Is creativity promoted among employees?"
2. **Innovative Behavior**: "Has your organization introduced new products or processes in the past two years?" and "Are employees encouraged to engage in innovation initiatives?"
3. **Perception of Financial Strategies**: "Are your company's financial strategies aligned with innovation

objectives?" and "Are financial metrics used to evaluate economic performance?"

4. **Use of ICT**: "Does your company have software for production and inventory management?" and "Has technological connectivity improved your company's innovation capacity?"
5. **General Management**: "Does the cost system used by your company adapt to the specific characteristics of products and processes?" and "Does your company have an established system for inventory control?"

The questionnaire was validated through a pilot test, and reliability analyses revealed a Cronbach's Alpha exceeding 0.7, indicating adequate internal consistency for the scales used.

Data collection was conducted in two distinct phases. The initial phase, carried out between June and September 2019, involved in-person visits to the organizations to administer the corresponding questionnaire. The second phase, conducted between November 2019 and May 2020, involved the distribution of electronic surveys via Google Forms, which led to an increase in the response rate. Confidentiality and anonymity were ensured, and participants provided their responses voluntarily and anonymously.

The final version of the questionnaire, detailing the items corresponding to each construct, is presented in Appendix A, with the aim of facilitating consultation and understanding.

The collected data were analyzed using SmartPLS 4.1 software, which facilitated the execution of exploratory and confirmatory factor analyses. These analyses contributed to the validation of the proposed structural model and the identification of significant relationships between the variables analyzed. Additionally, assessments of discriminant validity and composite reliability were conducted, ensuring that the constructs accurately measured the study variables.

The study adhered to the ethical principles of scientific research, ensuring that all participants provided informed consent. Data confidentiality was guaranteed, and participation was entirely voluntary. Additionally, participants had the option to withdraw from the study at any time without any consequences.

4. RESULTS

4.1 Exploratory Factor Analysis (EFA)

A thorough Exploratory Factor Analysis (EFA) was conducted to examine the factorial structure of the key constructs: Organizational Culture (OR), Innovative Behavior (IB), General Management (GM), Perception of Financial Strategies (PFS), and the Use of Information and Communication Technologies (ICTU). Out of an initial 24 items, 14 were selected for having factor loadings above 0.7, as established by Dijkstra and Henseler [12]. The selected items present a solid structure for further analysis. The EFA confirmed a coherent factorial structure for the study variables.

The values of these factor loadings are shown in Table 1.

Confirmatory Factor Analysis (CFA) was used to validate the theoretical structure of the model. The Cronbach's Alpha (CA) for the five dimensions ranged between 0.753 and 0.901, indicating high internal reliability. Additionally, Composite Reliability (CR) and Average Variance Extracted (AVE) also showed robust values, with the AVE ranging between 0.633 and 0.835, confirming that the model has good convergent validity [38].

The results are presented in Table 2, meeting the recommended reliability standards.

As shown in Table 2 presents the correlations between the constructs (HTMT) and the square root of the average variance extracted (√AVE). The HTMT values were lower than the √AVE values, thus fulfilling the discriminant validity criteria outlined by Martínez and Fierro (29). Additionally, the VIF values indicate that there is no issue of collinearity, which allows us to affirm that there is discriminant validity between the constructs, as proposed by Dijkstra and Henseler [12].

Table 1. Model Fit.

	IB	OR	GM	PFS	ICTU
IB2	0.769				
IB3	0.850				
IB4	0.826				
IB7	0.863				
OR1		0.801			
OR2		0.893			
OR3		0.871			
GM1			0.913		
GM2			0.895		
PFS1				0.830	
PFS2				0.876	
PFS3				0.892	
ICTU 3					0.875
ICTU 5					0.877

Note: Innovative Behavior (IB); Organizational Culture (OR); General Management (GM); Perception of Financial Strategies (PFS); and Use of Information and Communication Technologies (ICTU).
Source: Own elaboration based on research data.

Table 2. Model Fit.

Indicator	A	CC	AVE
Innovative Behavior (IB)	0.808	0.872	0.633
Organizational Culture (OR)	0.868	0.915	0.783
General Management (GM)	0.901	0.938	0.835
Perception of Financial Strategies (PFS)	0.855	0.910	0.771
Use of Information and Communication Technologies (ICTU)	0.753	0.817	0.698

Note: α = Cronbach's Alpha; CR = Composite Reliability; and AVE = Average Variance Extracted. Own elaboration based on Smart PLS 4.1.

According to the data in Tables 1 and 2, the dimensions show values that support the discriminant validity of the proposed theoretical model. The subsequent phase involved testing the structural model, thereby evaluating the relationships between the variables defined in the conceptual model.

4.2. Confirmatory Factor Analysis

4.2.1. Structural Model

To evaluate the robustness and predictive accuracy of the structural model, the authors explain that the Q^2 communality index should be examined [22]. These values must be greater than zero to indicate the predictive accuracy of a specific construct. The results show that for PACAP ($Q^2 = 0.36$) and for RACAP ($Q^2 = 0.41$). The values for CR ($Q^2 = 1.00$) meet the condition of being greater than zero.

Regarding the Confirmatory Factor Analysis (CFA) of the questionnaire, the absolute fit indices include the Standardized Root Mean Square Residual (SRMR), Normed Fit Index (NFI), and the Chi-Square (χ^2) ratio. In this model, the SRMR was 0.102; the squared Euclidean distance (d-ULS) was 1.095; the geodesic distance (d-G) was 0.749; Chi-Square (χ^2) was 176.767; and the Normed Fit Index (NFI) was 0.932. These values indicate an acceptable fit, suggesting that the model is adequate and valid according to the guidelines established by Ringle, Wende, and Becker [36] and Rojas-Torres [37]. The results are presented in Table 3.

4.3.1. Hypothesis Testing

The comparison results obtained demonstrate concurrent validity. Subsequently, a two-tailed bootstrapping with 5,000 repetitions was performed, including the t-values of the six specified hypothetical relationships, which showed statistically significant relationships at the 0.01 and 0.05 levels. These results are presented in Table 4.

Table 3. Goodness of Fit Index for the Questionnaire.

Indicator	Saturated	Estimated
SRMR	0.102	0.130
d_ULS	1.095	1.764
D_G	0.749	0.803
X^2	176.767	185.213
NFI	0.932	0.909

Note 1: PACAP = Potential Absorptive Capacity; RACAP = Realized Absorptive Capacity; CR = Composite Reliability.
Note 2: SRMR = Standardized Root Mean Square Residual; d-ULS = Squared Euclidean Distance; d-G = Geodesic Distance; X^2 = Chi-Square; NFI = Normed Fit Index. Own elaboration based on Smart PLS 4.1.
Note 3: Saturated refers to the model with all paths estimated; "Estimated" refers to the final model after adjustments. These terms are standard in PLS-SEM model fit reporting.

Table 4. Hypothesis Testing.

Hypothesis	Effect	B	Ţ	P	Decision
H1: OR → IB	+	0.179	2.24	0.012	Accepted
H2: PFS → OR	+	0.179	1.679	0.047	Accepted
H3: ICTU → PFS	+	0.167	0.419	0.043	Accepted
H4: GM → PFS	+	0.185	1.116	0.338	Rejected

Note: Own elaboration based on Smart PLS 14.

In the previous table, it can be observed that of the four research hypotheses previously specified, three were accepted, and one was rejected. Therefore, it can be argued that OR, PFS, and ICTU are the factors that promote BI.

4.4. Discussion of Results

To discuss the study's findings in comparison with the theoretical framework, it is essential to analyze how they align with the concepts and theories of various authors. First and foremost, the theoretical framework establishes that the dependent variable is innovative behavior, while the independent variables, such as Organizational Culture, Financial Strategies, Use of ICT, and General Management, influence this innovative behavior [13]. This approach is consistent with the empirical results, which highlight how wine-producing SMEs in the Valle de Guadalupe heavily rely on effective financial strategies to drive innovation.

A company's ability to obtain and maintain comparative advantages, according to Porter [35], is reflected in

the data showing that the most competitive companies are those that have successfully integrated technological innovations and solid financial management. This finding aligns with Porter's Diamond Theory, which emphasizes that competitiveness arises from the interaction between elements such as business strategy and environmental conditions. Companies that have adapted to changing market demands while maintaining efficient financial management have achieved better competitive results in the wine sector.

The study's results confirm the relevance of the Resource-Based View (RBV) theory, which emphasizes the importance of internal human resources as a key element in gaining a competitive advantage [6]. It was observed that companies that have optimized the use of their human resources, including human capital and the ability to generate innovation, have shown better performance in terms of competitiveness. This suggests that effective resource management is essential in a dynamic and globalized environment.

The evidence regarding intellectual capital in business competitiveness aligns with the ideas of Bontis [10] and Abeysekera [1], who describe intellectual capital as the combination of intangible assets that can generate returns for customers. SMEs that have invested in their intellectual capital, particularly in talent development and retention, have managed to be more innovative and strengthen their market position.

The principles of internal growth and clustering, as emphasized by the theories of Gallego and Pitzer [20] and Vázquez [45], are significant in the context of the Valle de Guadalupe. The data reveal that companies adopting an internal growth strategy, leveraging local advantages and promoting collaboration among local actors, have experienced more consistent growth and greater adaptability to the challenges of the global market.

In conclusion, the study's results align with theoretical ideas on competitiveness, resource management, and internal growth, highlighting the importance of creativity, effective resource management, and a local perspective to enhance the competitiveness of small and medium-sized enterprises in the wine industry. This analysis reflects how these theories provide a foundation for understanding the dynamics present in the industry and the factors that drive business success in wine production.

5. CONCLUSION

The purpose of this research is to develop a causal model that describes how financial tactics are perceived and how innovation manifests in small and medium-sized wine-producing enterprises located in the Valle de Guadalupe, Baja California. A conceptual framework has been developed that encompasses the impact of competitiveness on businesses, corporate culture, innovative technologies, and financial management with the goal of promoting innovation.

In the analyzed SMEs, a positive correlation has been observed between the implementation of innovative financial tactics and the level of competitiveness achieved. However, challenges were identified, such as a lack of available funds, difficulties in obtaining loans, and rising operating costs, which threaten financial sustainability.

The research also highlights the importance of a corporate culture that fosters creativity and the effective communication of financial tactics. The implementation of information technologies has been essential in improving operational efficiency and driving creativity.

Despite the progress made, the COVID-19 pandemic limited participation in the study, affecting the willingness of business owners to complete the questionnaires. The importance of continuing research in various areas is emphasized, such as exploring alternative financing options and integrating new technologies to improve the competitiveness of small and medium-sized enterprises in the wine sector in Mexico.

5.1. Practical Implications

The findings of this research highlight the importance of fostering a strong organizational culture to promote innovation. In the case of small and medium-sized wine enterprises, this entails the need to develop internal strategies that enhance employee engagement, communication, and creativity. It is essential for decision-makers to focus their efforts on the design and implementation of continuous training programs, the reinforcement of collaborative work practices, and the establishment of incentive systems aligned with organizational goals.

Moreover, the integration of Information and Communication Technologies (ICT) should go beyond operational improvements and be embedded into innovation strategies aimed at strengthening product development and responsiveness to market demands. These elements are crucial for enhancing sustainable competitiveness in the wine industry, particularly in emerging markets such as Mexico. In such environments, organizational resilience, digital transformation, and the ability to adapt to dynamic market conditions represent key advantages for the consolidation and sustained growth of small and medium-sized enterprises in the sector.

Although the data collection was conducted in 2019, the structural challenges faced by small and medium-sized wine enterprises in the Valle de Guadalupe remain relevant. Issues such as limited access to financing, the need for digital transformation, and the importance of fostering innovation-oriented organizational cultures persist within the industry. Consequently, the findings of this study continue to hold significance, especially as the sector recovers from the pandemic and faces ongoing competitive pressures.

The findings indicate the potential for policymakers to design specialized training initiatives aimed at strengthening organizational culture in small and medium-sized enterprises within the wine tourism sector. These initiatives could foster the development of innovative capabilities and contribute to enhancing long-term competitiveness in local and regional economies.

REFERENCES

[1] I. Abeysekera, 2006. The Project of intellectual capital disclosure: researching the research. Journal of intellectual capital, 7(1), 61-77. https://doi.org/10.1108/14691930610639778

[2] S. Alfiero, L. Broccardo, M. Cane, A. Esposito, 2018. High performance through innovation process management in SMEs: Evidence from the Italian wine sector. *Management Control*, 3, 87-110. https://doi.org/10.3280/MACO2018-003005

[3] G. Arboleda, J. López, 2017. Organizational culture in healthcare service providers in the Valle de Aburrá. *Revista Ciencias de Salud, 15*(2), 247-258. https://doi.org/10.12804/revistas.urosario.edu.co/revsalud/a.5761

[4] L. Atalaya, 2018. *Characteristics of the wine production chain of Casca-La Libertad for its competitiveness in the US market, New York* (Bachelor's thesis). Cajamarca, Universidad Privada del Norte.

[5] C. Ayala, 2022. *Valle de Guadalupe could run out of farmland by 2037. El Economista*. https://www.eleconomista.com.mx/estados/Valle-de-Guadalupe-podria-quedarse-sin-tierras-de-cultivo-para-el-2037-20220905-0125.html

[6] J. Barney, 1991. Firm Resources and sustained Competitive Advantage. *Journal of Management, 17*(1), 99-120. https://doi.org/10.1177/014920639101700108

[7] R. Barragán-Quintero, O. Ovalle-Osuna, E. Ahumada-Tello, R. Evans, 2019. Measuring the effects of innovation in wine companies in Baja California. *Technology and Engineering Management* (TEMSCON), 1-5. https://doi.org/10.1109/TEMSCON.2019.8813746

[8] J. Barrios, 2019. Impact of innovation on the competitiveness of agro-industrial companies in Espinal-Tolima. *Revista Innova ITFIP, 4*(1), 7-20.

[9] BBVA, ¿Qué son las PYMES en México? *BBVA Educación Financiera*, 2024. https://www.bbva.mx/educacion-financiera/creditos/que-son-las-pymes-en-mexico.html#empresas-medianas

[10] N. Bontis, 2001. Assessing knowledge assets: A review of the models used to measure intellectual capital. *International Journal of Management Reviews, 3*(1), 41-60. https://doi.org/10.1111/1468-2370.00053

[11] A. Bryan, J. Lammers, 2022. *Healthcare Organizational Culture. The International Encyclopedia of Health Communication*. https://doi.org/10.1002/9781119678816.iehc0701

[12] T. Dijkstra, J. Henseler, 2015. Consistent partial least squares path modeling. *MIS Quarterly, 39(*1), 297-316. https://doi.org/10.25300/MISQ/2015/39.2.02

[13] G. Dimitrova, M. Angelova, D. Pastarmadzhieva, 2019. Innovation Activity as an Element of the Competitiveness of Wine Industry: A conceptual framework. *Trakia Journal of Sciences, 17*(1), 221-226. https://doi.org/10.15547/tjs.2019.s.01.038

[14] M. Dini, G. Stumpo, (Coords.). 2020. *SMEs in Latin America. A fragile performance and new challenges for promotion policies*. Santiago: Economic Commission for Latin America and the Caribbean (ECLAC).

[15] E.M. Doacă, 2022. The influence of the macroeconomic environment on the financing decision in SMEs. *Proceedings of CBU in Economics and Business, 3*, 25-31. https://doi.org/10.12955/peb.v3.289

[16] A. Dogru, J. Peyrefitte, 2022. Investigation of innovation in wine industry via meta-analysis. *Wine Business Journal, 5*(1), 44-76. https://doi.org/10.26813/001c.31627

[17] A. Duarte, A. Bressan, 2016. Micro and small business innovation in a traditional industry. *International Journal of Innovation Science, 8*(4), 311-330. https://doi.org/10.1108/IJIS-06-2016-0013

[18] D. Duran, L. Cabello, 2023. Management of innovation in wine companies of Tequisquiapan, Querétaro, Mexico. *International Journal of Business Research, 23*(1), 25-29. https://doi.org/10.18374/IJBR-23-1.3

[19] E. Erlygina, Y. Abramova, 2019. Organizational culture as a factor of organizational innovativeness. *Bulletin of Science and Practice, 5*(11), 276-279. htt-

ps://doi.org/10.33619/2414-2948/48/31

[20] J.R. Gallego, J.V. Pitxer, (Coords.). 2010. La política regional en: A. García Reche y A. Sánchez Andrés (Coords.), Política económica estructural y de competitividad, Tirant lo Blanch, Valencia.

[21] K.B. Gerasimov, R.S, Ozernov, 2023. Impact of organizational culture on innovative behavior of staff. Вестник Самарского университета. *Экономика и управление, 14(*1), 148-156. https://doi.org/10.18287/2542-0461-2023-14-1-148-156

[22] J.F. Hair, J.J. Risher, M. Sarstedt, C.M. Ringle, 2019. When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2-24. https://doi.org/10.1108/EBR-11-2018-0203

[23] R. Hernández, C.P. Mendoza, 2018. *Research methodology: the quantitative, qualitative and mixed routes*. México: McGraw-Hill.

[24] C. Hinojosa, E. Limón, C. Navarrete, 2019. Business culture in SMEs in the municipality of Tamazula de Gordiano, Jalisco (Mexico). *Ánfora, 27*(49), 143-172. https://doi.org/10.30854/anf.v27.n49.2020.743

[25] P. La Sala, R. Silvestri, F. Contò, 2017. Differentiation strategies for the wine and nursery sector: empirical evidence from an Italy region. *Agricultural and Food Economics, 5*(1), 1-17. https://doi.org/10.1186/s40100-017-0091-z

[26] E. Lázaro, 2024. Industria del vino, pilar del turismo en Baja California. El Economista. https://www.eleconomista.com.mx/estados/Industria-del-vino-pilar-del-turismo-en-Baja-California-20240411-0149.html

[27] F.J. Medina-Albadalejo, 2020. Kym Anderson and Vicente Pinilla (eds.). Wine Globalization. A New Comparative History. Cambridge, Cambridge University Press. Investigaciones *De Historia Económica, 16*(4), 80–81. https://doi.org/10.33231/j.ihe.2020.03.005

[28] F. Albaladejo, J. Martínez-Carrión, J. Ramón-Muñoz, 2014. The world wine market and the competitiveness of southern hemisphere countries, 1961-2010. *América Latina en la historia económica*, 21(2), 40-83.

[29] M. Martínez, E. Fierro, 2018. Aplicación de la técnica PLS-SEM en la gestión del conocimiento: un enfoque técnico práctico. *RIDE. Reviste Iberoamericana de Investigación y Desarrollo Educativo, 8*(16), 130-164. https://doi.org/10.23913/ride.v8i16.336

[30] J.H.G. Meneses, J.R.A. Ávila, M.D.R. de Fátima Alvídrez, 2023. The Economic Importance of MSMEs in Mexico. *Excelencia Administrativa Online, 2*(4), 81-94.

[31] Mexican Wine Council A.C. ¿*What are the challenges of the wine industry in Mexico?,* 2020. CMV. https://uvayvino.org.mx/2020/03/20/cuales-son-los-retos-de-la-industria-del-vino-en-mexico/

[32] R. Molina-Martínez, V. Baltazar-Ramos, 2021. Competitiveness and technological innovation, fundamental theoretical elements for the internationalization of the Mexican Wine Industry. *Journal of microfinance Planning and control*, 7-23. https://doi.org/10.35429/JMPC.2021.19.7.7.23

[33] D.A. Motocanche, L.D. Bernaola, 2020. *Analysis of business culture and its influence on the competitiveness of SMEs producing wine and pisco in the city of Moquegua in 2019*. (Research work to obtain the Master's degree in Business Administration). Perú, Escuela de Postgrado NEUMANN.

[34] A. Ortiz, A. Espejel, E. Aguilar, V. López, 2022. Wine System in Baja California: Support Agents in Contemporary Mexico. *Journal of agro-industry sciences*, 4(3), 115-120. https://doi.org/10.17268/jais.2022.014

[35] M. Porter, 1998. Clusters and the new economics of competition, *Harvard Business Review*, 33, 77-90. http://marasbiber.com/wp-content/uploads/2018/05/Michael-E.-Porter-Cluster-Reading.pdf.

[36] C.M. Ringle, S. Wende, J. Becker, 2024. *SmartPLS 4*. Bönningstedt: SmartPLS. https://www.smartpls.com

[37] L. Rojas-Torres, 2020. Robustness of the fit indices of confirmatory factor analysis to extreme values. *Revista de matemática: teoría y aplicaciones, 27*(2), 383–404. https://doi.org/10.15517/rmta.v27i2.33677

[38] R. Rosenthal, R.L. Rosnow, 2008. *Essentials of behavioral research: Methods and data analysis* (3rd ed.). McGraw-Hill. https://doi.org/10.34944/dspace/66

[39] L. Ruiz, S. Radillo, 2015. Validity and reliability of a measurement instrument for the competitiveness of small and medium-sized wineries on the Wine Route of the Guadalupe Valley, Baja California, Mexico. *Investigación y Ciencia, 23(*65), 40-47.

[40] E.H. Schein, P.A. Schein, 2016. *Organizational culture and leadership* (5th ed.). Wiley.

[41] A. Singh, 2018. Role of Small Business in Economic Development: A Quantitative Investigation. *Journal of algebraic statistics*, *9*(1), 139-144.

[42] Y. Siswanti, E. Nurhariati, 2022. The influence of organizational culture on innovation behavior: a hierarchical linear modeling approach. *Journal of International Conference Proceedings, 5*(5), 267-284. https://doi.org/10.32535/jicp.v5i5.2087

[43] G. Starobinsky, M. Gonzalo, S. Filipetto, M. D'Alessandro, 2020. Market Dynamics and Technological Efforts in a Peripheral Innovation System: La Riojana Winegrowing Cooperative. RIVAR, 7(20), 67-87. https://doi.org/10.35588/rivar.v7i20.4477

[44] E. Timotius, 2023. The role of innovation in business strategy as a competitive advantage: Evidence from Indonesian MSMEs. *Problems and Perspectives in Management, 21(*1), 92-106. https://doi.org/10.21511/ppm.21(1).2023.09

[45] A. Vázquez, 2000. *Desarrollo económico local y descentralización aproximación a un marco conceptual.* Santiago de Chile, Chile: CEPAL/GTZ.

[46] E.L. Yasmina, A. Etikariena, 2022. The Relationship Between Adhocracy Culture and Innovative Work Behavior: The Role of Job Satisfaction as a Mediator. *Jurnal Psikologi, 18(*2), 152-162. https://doi.org/10.24014/jp.v18i2.16850

APPENDIX A. FINAL VERSION OF THE QUESTIONNAIRE

Objective of the questionnaire: To identify the financial, technological, innovation, and human capital variables associated with financial performance that contribute to increasing the competitiveness of wine companies (MiPyMEs) in the Wine Route of Valle de Guadalupe, Baja California, Mexico.
Instructions: Mark with an X only one of the answers provided for each question.

I. IDENTIFICATION AND GENERAL INFORMATION

1. Interviewee's position:
2. Profession:
3. Name or business name of the company:
4. Indicate the number of years the company has been in business:
5. Company size:
   1) Micro (0–10 employees)
   2) Small (11–50 employees)
   3) Medium (51–250 employees)
   4) Large (251 or more employees)

General Management

Mark your answer with an X. The answer key is as follows:

1- Never 2.- Rarely 3.- Sometimes 4.- Almost always 5.- Always

	1	2	3	4	5
6. An accounting system is employed to deliver relevant and timely information that supports decision-making processes.					
7. A cost system is used that fits the specific characteristics of the products and processes					
8. They use an established system for inventory accounting and control					
9. Use of a formal financial plan					
10. Use of cost systems to compare monthly financial results, analyze variations, and support decision-making					

11. Please indicate whether your company uses the following financial tools

	Yes	No	Frequency
1) Financial ratios			
2) Statistics or reports of your operations			
3) Budgetary Control			
4) Application of percentages to financial statements			
5) Inventory Report			
6) Collection Report			
7) Cash Flow			
8) Financial Statements			
9) Budgets			
10) Sales			
11) Break-even point			

12. ¿Who is responsible for managing the company's accounting?
    a. Owner or Principal Administrator
    b. Internal Accounting Department
    c. External Accounting Firm
    d. Other (please specify)

13. Please indicate the types of budgets your company
    a. General
    b. Departmental
    c. Product-based
    d. Sales
    e. Expenditure
    f. Purchasing
    g. Cash Flow
    h. None
14. Please indicate the basis on which your company determines its selling prices
    a. Costs and profit margin
    b. Competitor prices
    c. Empirically
    d. Experience
    e. Break-even point
    f. Other (please specify):

15. Please indicate the basis on which your company projects its sales
    a. Sales from previous years
    b. Forecasted inflation
    c. Market trends
    d. Experience
    e. Break-even point
    f. Other (please specify):

16. Please indicate the information your company uses to determine its profits:
    a. Sales
    b. Income statements
    c. Cash flow statements
    d. Other (please specify):
17. Please indicate the information your company uses to determine its purchasing volumes
    a. Sales
    b. Inventory balances
    c. Supplier offers
    d. Cash flow
    e. Sales seasons
    f. Other (please specify):

18. Please indicate the mechanisms your company uses for inventory control and their frequency

Mechanism	Yes	No	Frequency
1) Bin cards			
2) Physical inventories			
3) Inventory management software			
4) Sales reports			
5) None			

19. Please rank the problems your company regularly faces in order of importance, using a scale from 1 to 13, where 1 is the most important.
    1. Liquidity
    2. Sales

3. Competition
4. Personnel issues
5. Technological obsolescence
6. Lack of financing
7. Rising costs and expenses
8. Inventory control
9. Theft
10. Adaptation to fiscal and legal changes
11. Compliance with official standards and regulations
12. Import and export requirements
13. Difficulties in meeting customs requirements and procedures

Financial Management

Please indicate your answer with an X. The response key is as follows:

1- Very Poor 2.- Poor 3.- Fair 4.- Good 5.- Very Good

	1	2	3	4	5
20. ¿How would you rate your company's financial performance?					
21. ¿How would you rate your company's financial performance compared to that of your competitors?					
22. ¿How would you rate your company's profitability compared to that of your competitors?					
23. ¿How has your company's sales growth behaved over the past 3 years?					
24. ¿How has your company's return on sales behaved over the past 3 years?					

25. ¿Which of the following factors contributes most to your company's profitability?
    1. Administrative activities
    2. Technological resource management
    3. Market knowledge and sales policies
    4. Financial management
    5. Other (please specify):

26. How do you utilize your company's profits?
    1. Personal expenses
    2. Investments in machinery and equipment
    3. Capacity expansion
    4. Savings
    5. Technological development
    6. Other (please specify):

27. ¿Who is responsible for managing your company's finances?
    1. Owner or principal administrator of the company
    2. Accounting department
    3. External accounting firm
    4. Other (please specify):

II. FINANCIAL STRATEGIES

Please mark your answer with an X. The response key is as follows:

1- Never 2.- Rarely 3.- Sometimes 4.- Almost always 5.- Always

	1	2	3	4	5
28. ¿Are your company's objectives clearly defined?					
29. ¿Is the financial strategy aligned with the strategies defined in the areas of production, innovation, human resources, and information technologies?					
30. ¿Is your company continuously exploring different financing alternatives it could access?					
31. ¿Are strategic alliances with other companies the result of the designed financial strategy?					

III. INNOVATIVE BEHAVIOR

Please mark your answer with an X. The response key is as follows:

1- Never 2.- Rarely 3.- Sometimes 4.- Almost always 5.- Always

	1	2	3	4	5
32. Seeks ways to optimize existing processes, technology, products, services, or work relationships					
33. Presents original ideas and is recognized for their innovative nature					
34. Experiments with new proposals, attempting to analyze their validity					
35. Supports and protects the innovative ideas of others					
36. Attempts to convince others of the relevance of a new idea or innovative solution					
37. Seeks the necessary funding to implement new proposals					
38. Develops suitable projects to implement innovative proposals					

IV. USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES

Please mark your answer with an X. The response key is as follows:

1- Strongly disagree 2.- Disagree 3.- Neither agree nor disagree 4.- Agree 5. Strongly agree

Information Technology Resources

	1	2	3	4	5
39. I use and operate equipment such as fax machines, cameras, computers, and the internet to support my business					
40. The company has adequate computer equipment (computers, printers, scanners) for business management and administration					
41. The company has appropriate software for production and/or inventory control					
42. This company has suitable software (accounting, payroll) for business management and administration					
43. We have a reliable internet connection for business management and administration					

VI. ORGANIZATIONAL CULTURE

Mark your answer with an X. The response scale is as follows:

1- Strongly Disagree | 2.- Disagree | 3.- Neither Agree nor Disagree | 4.- Agree | 5. Strongly Agree

General Aspects

	1	2	3	4	5
44. The company has a written and implemented organizational chart where lines of authority and responsibility are clearly defined					
45. The company has written policies and procedure manuals that are known and followed by all staff					

Training and Promotion of Personnel

	1	2	3	4	5
46. The company has a defined organizational structure for training all its personnel, and all new employees receive an induction to the company					
47. Personal skills, qualifications, willingness to improve, creativity, and productivity are key criteria for employee compensation and promotion					

Company Culture

	1	2	3	4	5
48. There is effective oral and written communication across the different levels of the company					
49. The company fosters a sense of belonging among its staff					
50. The company has established programs and incentives to improve the work environment					

Source: Own elaboration, adapted from various authors.

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Beyond Malbec: Exploring Wineries' Perspectives on Diversification Strategies in Argentina's Wine Industry

Nicolas Depetris-Chauvin[1], Emiliano C. Villanueva[2], Antoine Pinède[1], Christophe Maitre[1]

[1] *Haute Ecole de Gestion de Genève, HES-SO, Carouge, Switzerland*
[2] *Eastern Connecticut State University, USA*
Email: nicolas.depetris-chauvin@hesge.ch; villanuevae@easternct.edu; antoine.pinede@etu.unige.ch; christop.maitre@gmail.com
*Corresponding author.

Abstract. Argentina's wine industry, built on the success of Malbec, now confronts market saturation and shifting consumer tastes, creating a strategic tension between its specialized identity and the need to diversify. This study explores this challenge by analyzing winery perspectives through data from a nationwide survey of 230 wineries, a targeted follow-up with 40 exporters, and in-depth interviews with key industry leaders. Findings suggest that wineries perceive the Malbec-led era of fast growth as over and are cautiously pursuing diversification, revealing a central strain: operational satisfaction with Malbec coexists with an apparent willingness to invest in change. They strongly favor lower-risk strategies, such as targeting new consumer markets and developing wine tourism, over higher-risk ventures, such as new terroirs or grape varieties. Despite this caution, there is notable interest in varietals like Cabernet Franc. A key challenge for the industry appears to be expanding its identity beyond Malbec without diluting its brand, and this paper provides empirical insight into the strategic priorities and perceived risks guiding this crucial transition.

Keywords: Malbec, wine, diversification, business strategies, Argentina.

1. INTRODUCTION

Over the past three decades, Argentina's wine industry has experienced a remarkable transformation, a national-level reflection of the broader globalization and modernization that have reshaped the global wine world since the late 20th century [1]. A critical shift in the 1990s, marked by macroeconomic reforms, foreign direct investment, and technological modernization, enabled a transition from a domestically oriented sector producing low-quality bulk wines to a globally competitive industry centered on high-quality bottled varietals [2]. This success was driven primarily by the internationalization of Malbec, which became not only the country's flagship varietal but also its dominant export [3]. However, this successful model of

specialization is now facing its limits. After delivering export peaks of nearly $1 billion in the early 2010s, the past decade has seen stagnation and decline, with values falling to $712.6 million in 2024. A breakdown of the export portfolio reveals a critical reliance on bottled, varietal wines. In 2024, by volume, the majority of exports were bottled (74.9%), while bulk wine accounted for 25.1%. Within the total export volume, 87% was composed of varietal wines, while non-varietal wines (10.4%) and sparkling/specialty wines (2.6%) make up the remainder [4]. This downturn reflects, in part, a broader trend in global wine markets [5], and, compared with competitors like Chile and Australia, whose exports exceeded $1.5 billion in 2023, Argentina risks falling behind unless it adapts its strategy. This decline is not solely due to market fatigue but is compounded by persistent macroeconomic instability and shifting government policies that affect export competitiveness.

This challenge echoes the strategic inflection point of the early 1990s, a period of export emergence driven by what Artopoulos et al. [6] describe as an export pioneer, a visionary actor with deep, pre-existing knowledge of foreign markets. Rejecting a future as a bulk producer in favor of a more ambitious trajectory, the goal, as Laura Catena recounts, was to create Argentine wines that could "stand with the best of the world" [7]. Building on this tradition of innovation, Depetris-Chauvin et al. [8] find that wineries led by "extremely conceptual" (EC) innovators, those who pursue radical, disruptive change and plan innovations with strategic foresight, achieve superior export performance relative to other types of innovators. In Argentina, such EC innovators are particularly prevalent among export-oriented firms, characterized by higher export value shares and lower reliance on domestic sales. These early pioneers thus laid the foundation for today's quality-driven, export-oriented industry, one that now faces a comparable crossroads, requiring a renewed strategic vision to sustain its global momentum.

The new strategic turning point is driven by a confluence of external and internal pressures. Externally, Argentine wines face increasingly saturated markets where Malbec already has strong penetration, while global demand is fragmenting. International consumption patterns are shifting toward white and rosé wines, sustainable production, lower alcohol content wines, and diverse terroirs, posing both a challenge and an opportunity [9]. Internally, domestic consumption has suffered a prolonged decline, driven by reduced purchasing power and macroeconomic instability, squeezing profitability even for the largest firms [10, 11, 12].

In this context, the Argentine wine industry confronts a classic strategic trade-off between specialization and diversification. Specialization, which has been the cornerstone of its identity, offers brand coherence and scale advantages. The dominance of Malbec is clear: in 2024, it accounted for 23.5% of the total vineyard area and 61.2% of all wine export volume [4]. This degree of specialization is high, a trend seen to varying degrees among New World producers. For example, New Zealand's specialization is even more concentrated, with Sauvignon Blanc comprising over 85% of its wine export volume. Other countries, however, have pursued different diversification paths. Chile, while still heavily reliant on red varieties like Cabernet Sauvignon, has successfully diversified its portfolio with red blends and white varietals. At the same time, Australia's strategy has involved both Shiraz (25% of export volume) and a wider range of bottled and bulk wines. This demonstrates that while specialization has been a common initial strategy, the path to a more resilient, diversified portfolio varies significantly among major producers.

The dominance of Malbec extends beyond production, shaping the very identity of Argentine wine in the minds of key market gatekeepers; when international wine traders are asked what "Argentinean wine" evokes, the near-unanimous response is "Malbec" [13]. Yet, this over-reliance also exposes the industry to external shocks and shifting demand. Diversification, by contrast, offers a path to mitigate risk, showcase viticultural diversity, and respond flexibly to market trends. This may involve expanding the range of grape varieties, developing underutilized regions, or exploring new product categories. The challenge for Argentina is to find a form of "focused diversification" that enables innovation without abandoning its globally recognized brand identity.

Against this backdrop, and while the need to evolve is clear, a gap remains in understanding how wineries themselves perceive and navigate this tension. This paper addresses this gap by investigating the perspectives of Argentine wineries. What do they think about the current specialization model? What alternative strategies are they pursuing? How do they perceive the trade-offs between identity, innovation, and international competitiveness? The study draws on quantitative data from recent industry surveys to assess how wineries are adapting to this shifting landscape, highlighting emerging trends, perceived constraints, and strategic intentions as Argentina seeks to position itself for the next chapter in its wine development.

The paper is structured as follows: Section 2 provides a literature review on specialization and diversification in global wine industries. Section 3 discusses the methodology used for collecting and analyzing winery-level insights. Section 4 presents the main findings and dis-

cusses their implications, taking into account local and global wine trends. Finally, Section 5 offers conclusions.

2. LITERATURE REVIEW

Diversification strategies in the wine industry have been widely analyzed using frameworks such as Porter's theory of competitive advantage, the resource-based view, and cluster innovation theory. These models provide a foundation for understanding how wine-producing regions and firms evolve in response to shifting market dynamics. Migone and Howlett [14] emphasize the role of regional clusters in fostering institutional environments that support varietal experimentation and export orientation, while Anderson and Wittwer [15] show that exchange-rate fluctuations and global demand volatility compel wine-producing countries to broaden their varietal portfolios and export markets. Together, these studies suggest that diversification is not only a response to external pressures but also a strategic opportunity for long-term competitiveness.

This strategic opportunity, however, involves navigating a well-documented trade-off. The literature highlights numerous advantages of diversification, such as building economic resilience against climate and market shocks, fostering industry growth through innovation, and achieving greater market differentiation by showcasing a region's unique terroirs [16, 17, 18]. Conversely, scholars warn that an unfocused approach can introduce significant risks. These include diluting a region's brand identity through market fragmentation, struggling to maintain quality consistency across a broader portfolio, and managing increased supply chain complexity and resource-allocation challenges [19, 20]. The central task for any wine region is therefore to capture the benefits of diversification while mitigating these inherent risks.

At the country level, diversification is often a direct response to national commodity cycles. New World producers, in particular, have experienced distinct boom-bust cycles that necessitate strategic adaptation, a key dynamic in the global transformation of the wine industry [1]. Australia, for instance, experienced a 'steep inverted V' in its international competitiveness, transitioning from a highly successful export boom to a prolonged slump, highlighting the risks of its market strategy and the challenges of structural adjustment [21]. Similarly, producers in Chile and South Africa have actively diversified their export destinations, moving beyond traditional European markets to target Asia and the Americas. This geographic diversification is driven by a dual motive: the strategic need to mitigate risks from trade shocks and geopolitical instability, and the proactive pursuit of new profit opportunities in emerging or underserved markets [22, 23]. Other producing countries have innovated at the product level, as in the case of Italy and France, where producers have adopted organic, biodynamic, and sparkling wine styles [24]. New Zealand has similarly expanded its product mix beyond its iconic Sauvignon Blanc, developing Pinot Noir and other aromatic white varieties to diversify its brand identity and revenue base [25, 26]. However, the overwhelming global success of its flagship varietal has, paradoxically, led to an increase in the country's overall varietal concentration [27]. Beyond varietals, regional branding and wine tourism have emerged as key components of diversification strategies, with studies demonstrating how appellation systems and tourism infrastructure can support regional differentiation while maintaining brand cohesion [28, 29].

An exemplary case of a coordinated, national-level strategic adaptation is the recent transformation of the Greek wine industry. Facing a collapse in domestic demand following the 2009 financial crisis, the sector was forced to pivot towards exports. This was guided by a cohesive national marketing strategy designed to overcome the challenge of a weak international identity. The strategy centered on a differentiation model built on three pillars: Authenticity, by leveraging Greece's rich portfolio of unique indigenous grape varieties; Sustainability, through organic production; and Quality, by focusing on premium price segments. Recent firm-level analysis shows that this national strategy has been effective, as wineries whose strategic profiles align with these "on-brand" attributes demonstrate significantly higher export performance. The Greek case thus provides a powerful precedent for how a national-level strategy can successfully reshape a country's global wine identity by focusing on its unique, authentic assets [30].

Argentina's wine industry, long defined by its flagship Malbec from the Mendoza terroir, is undergoing a significant varietal and regional diversification [31]. This shift is driven by a search for novelty and authenticity in specialized markets, prompting producers to explore minority and native grapevines beyond mainstream international varieties [32]. The trend is particularly pronounced in high-altitude regions like Salta and Jujuy, cooler climates in Patagonia, and emerging coastal areas such as Balcarce in Buenos Aires Province. Here, winemakers are forging a more experimental viticultural identity by planting cool-climate international varieties like Pinot Noir, Chardonnay, and Sauvignon Blanc while simultaneously revitalizing traditional and native grape families such as the aromatic Torrontés and historic Criollas.

This wave of experimentation is built upon a foundational period of modernization and is supported by a robust institutional framework. The industry's preceding upgrade, though triggered by foreign direct investment and technology adoption, was sustained by the development of local "tacit knowledge" among highly skilled Argentine oenologists [33]. Subsequent research has specified that this knowledge was often embodied by 'export pioneers' whose critical advantage was deep, pre-existing foreign market knowledge [6], and has further identified these leaders as 'conceptual innovators' capable of driving the radical change needed to compete globally [8]. Today, this firm-level dynamism is amplified by a "Triple Helix" model of collaboration between universities, industry, and government [34]. Public institutions and innovation networks, such as the Argentine Wine Corporation (COVIAR) and the National Agricultural Technology Institute (INTA), are designed to facilitate critical knowledge exchange and technical support to sustain diversification efforts and move beyond a Malbec monoculture.

A recent chemometric analysis by Urvieta et al. [35] further supports the regional diversification trend by showing that Malbec wines across Mendoza exhibit significant chemical and sensory differences linked to their sub-regional origin. This scientific validation of terroir-based differentiation underscores the commercial and branding potential of intra-regional diversification within Argentina's most prominent varietal. Similarly, comparative studies between Argentina and other wine regions, such as California, reveal distinct stylistic profiles of Malbec that reflect localized environmental and production conditions [36]. These findings provide empirical justification for both product and regional diversification as a means of creating value-added market segmentation.

The relevance of diversification is further reinforced by changing global demand. OIV [37] data indicate a structural shift in global wine consumption, with white and rosé wines now accounting for more than half of total consumption. Red wines, which accounted for nearly 48% of global wine intake in 2000, declined to approximately 43% by 2021. Rosé wines, in particular, have experienced notable growth, with consumption rising by 28% between 2002 and 2017 and now comprising 8–9% of global production. These changes reflect evolving consumer preferences, especially among younger demographics, who value lighter styles, novelty, and lower-alcohol options. Recent market analysis confirms this trend, showing that categories like sparkling and white wines are significantly outperforming traditional red wines in international trade [5]. As a result, varietal diversity and stylistic experimentation are no longer niche strategies but central to meeting fragmented consumer demand.

The broader theoretical rationale for diversification in the Argentine context has also been critically assessed. Khachatryan et al. [38] revisit the "infant industry" argument, often used to justify protective measures and diversification strategies in developing economies. Their analysis of Argentina's wine sector finds that government support may have facilitated early varietal and regional experimentation but cautions that diversification must be guided by clear comparative advantage and market orientation rather than protectionist logic alone. This view reinforces the importance of strategic alignment between public policy and private innovation.

In this sense, sector-wide branding and collective differentiation strategies have emerged as vital components of competitiveness. Micu et al. [20] examine how sectoral brands in the wine industry adopt market and product differentiation strategies to create collective identities and gain global recognition. Their findings are particularly relevant to Argentina, where initiatives like "Vino Argentino Bebida Nacional" and regional sublabels such as "Malbec de Altura" or "Patagonia Wines" aim to consolidate fragmented production into coherent export narratives. These strategies are intended to allow for diversification while maintaining a unifying brand message at the national and regional levels. However, their ultimate impact on export performance is often difficult to isolate and measure.

Wine tourism and sustainability initiatives also play central roles in diversification strategies, especially in Argentina. The Argentine Wine Corporation [39] reports that over 32% of tourists in Mendoza identify wine tourism as their primary reason for visiting, making it a critical source of non-traditional revenue. High-end tourism developments in regions like Uco Valley integrate hospitality, landscape branding, and experiential marketing, creating new opportunities for rural development and brand differentiation [40]. Meanwhile, environmental and climate pressures are reshaping production practices. Mozell and Thach [41] highlight how climate change is driving both geographic and varietal shifts globally. In Argentina, wineries are adopting sustainable practices, including organic certification, minimal-intervention winemaking, and water conservation, as both environmental imperatives and market differentiators [42].

These diversification trends are embedded in a complex institutional environment. While the private sector has historically driven innovation in the Argentine wine industry, the coordinated efforts of public actors, such as COVIAR's Strategic Plan 2030 and INTA's varietal tri-

als, still play an important role. These public initiatives underscore the importance of long-term policy alignment and provide a supportive framework for enabling innovation. This institutional support is crucial for navigating the very risks against which scholars caution. For example, excessive varietal and regional diversification can dilute brand identity, particularly when not supported by a coherent marketing strategy [43]. Similarly, governance challenges and institutional fragmentation can undermine the effectiveness of diversification efforts [44, 45]. These governance issues are compounded by structural challenges to Argentina's export diversification, including trade barriers, lack of trade agreements, regulatory complexity, and logistical bottlenecks, as discussed by Depetris-Chauvin and Villanueva [3].

Despite this body of work, a significant gap remains in understanding these dynamics at the firm level within Argentina. Specifically, few studies have quantitatively assessed how wineries themselves perceive and navigate the trade-offs between specialization and diversification. This study addresses this gap by engaging directly with Argentine wineries to understand the motivations, constraints, and strategic reasoning behind their diversification decisions.

3. METHODOLOGY

This study employs a two-phase, sequential quantitative design to investigate diversification strategies in the Argentine wine industry. The following sections detail the two phases of data collection, provide a detailed characterization of the resulting sample, and outline the analytical approach.

3.1. Phase 1: Nationwide Survey and Data Validation

The foundational dataset comes from a nationwide survey administered between August 2019 and May 2021 to the entire population of registered Argentine wineries. The survey instrument was validated through a pilot study with 22 wineries before its full launch. Responses were collected in person or online from key decision-makers, including owners, winemakers, and vineyard or sales managers. A thorough communication process was implemented before, during, and after the survey, including follow-up questions to respondents to clarify potential outliers and ensure data quality. This effort yielded 230 completed surveys, for a response rate of 26.3%, which is considered high for an industrial-level survey [46].

The sample's representativeness was rigorously assessed by comparing its characteristics to national statistics. For instance, our sample's distribution of small (68.6%), medium (25.2%), and large (5.2%) wineries closely matches the national proportions reported by the Argentinean Viticulture Corporation [47]. Furthermore, 71.3% of the sampled wineries are exporters, aligning well with the 65% figure for the total population in 2019 [48]. The sample's relevance is further underscored by the participation of six of Argentina's top ten exporting firms, including the top three.

The comprehensive 45-minute questionnaire, comprising 137 questions across five sections, captured detailed data on winery profiles, production models, marketing, human resources, and export behavior. While this rich dataset supported a prior publication on the capabilities and business strategies of exporting wineries [3], this article performs a novel analysis of previously unexamined survey questions. Specifically, this study analyzes responses on diversification preferences, strategic orientations, and perceived risks, areas not previously addressed.

The resulting sample of 230 wineries forms the empirical foundation for this study, and its composition reflects the industry's structure. As detailed by Depetris-Chauvin and Villanueva [3], of the total, 71.3% (164 wineries) are exporters, while 28.7% (66 wineries) are not. Among the exporters, 30% (69 wineries) are low-intensity (exporting <30% of their production), 17.8% (41 wineries) are medium-intensity (30–50%), and 23.5% (54 wineries) are high-intensity (>50%). Regional patterns are also notable: two-thirds of non-exporters are located outside Mendoza, whereas in Mendoza, 85.5% of wineries export. This highlights the region's central role, as 49 of the 54 high-intensity exporters in the sample operate in Mendoza.

3.2. Phase 2: Targeted Exporter Survey

The second phase, conducted between February and May 2024, refined the investigation through a mixed-methods approach. A targeted quantitative survey was administered online to the entire group of 164 exporting wineries identified in the Phase 1 sample. This outreach yielded 40 completed responses, giving us a focused perspective on this critical segment of the industry. To complement this firm-level data with high-level institutional and strategic perspectives, this phase also included in-depth, semi-structured interviews with key industry leaders. This included an interview with an expert from COVIAR to capture the institutional viewpoint, and a separate, extensive interview with Laura Catena, managing director of Bodega Catena Zapata and a pivotal figure in establishing Argentine Malbec in high-value international markets. This interview provided a crucial

practitioner's perspective on the industry's strategic evolution [7].

The two-phase design, with data collection periods spanning August 2019 to May 2021 and a follow-up in early 2024, provides a unique temporal perspective. The first survey captures a baseline of operational satisfaction during the significant macroeconomic instability and global uncertainty of the COVID-19 pandemic. In contrast, the second survey provides a forward-looking view of the strategic priorities that emerged as the industry adapted to the post-pandemic environment.

3.3. Data Analysis

Data from both surveys were analyzed using descriptive statistics, including frequencies and means, to identify patterns in diversification preferences and strategic orientations.

4. RESULTS AND DISCUSSION

Drawing on our two surveys and our interviews, this section analyzes the strategic tensions and emerging pathways for Argentina's wine industry. The findings are organized into key themes, with the quantitative data directly referenced to illustrate the sector's perspectives on diversification beyond its Malbec-centric model.

4.1. A Central Tension: Malbec as a Saturated Cornerstone

A central tension appears to characterize the Argentine wine industry's outlook, rooted in the simultaneous recognition of market saturation and a deep-seated satisfaction with the status quo. On the one hand, the findings from the Phase 2 survey show that there is explicit, unanimous agreement among the most globally oriented wineries that the era of rapid, Malbec-led growth is over. When asked about the future of the premium Malbec export model, no respondents in the targeted exporter survey foresaw a return to fast growth. Instead, they characterized its future as one of slow growth (49%), maturity (24%), or even saturation and decline (27% combined). This sober assessment aligns with the opinion of a COVIAR expert, who warned of market fatigue by drawing parallels to the decline of Australian Shiraz after its peak, cautioning against the long-term risks of over-specialization.

On the other hand, this strategic awareness is contrasted with high operational satisfaction and continued investment, particularly among the industry's most successful players across the entire sample of 230 wineries. A vast majority (81%) report being satisfied or very satisfied with their current grape mix. However, this satisfaction is not uniform; it correlates strongly with export intensity. For instance, high-intensity exporters, the firms most successful under the current model, reported being unanimously satisfied, while some dissatisfaction was observed among medium, low, and non-exporting wineries. This may be explained by the fact that many non-exporting firms, which are often small- to medium-sized, have a higher proportion of traditional, lower-priced varieties, such as Criollas. This discrepancy highlights that the industry's winners are the most content with the winning formula, which is heavily reliant on Malbec.

However, this widespread satisfaction coexists with a significant undercurrent of restlessness and a desire for futureproofing. Even with high contentment, 38% of wineries from the Phase 1 survey expressed a desire to incorporate more grape varieties, while another 27% sought different clones of existing ones. Only a quarter (24%) stated they would never change their current selection. This indicates that while the current portfolio is successful, many producers are actively considering adjustments, suggesting a hedge against the very saturation they foresee. Interestingly, this desire for diversification is strong among both high-intensity exporters seeking to meet diverse international demands and non-exporters hoping to become more competitive.

This internal conflict is further crystallized in near-term production plans. Despite recognizing the model's ceiling, 49% of wineries from the Phase 2 survey still intend to increase their Malbec production. This demonstrates that despite abstract fears of a plateau, a plurality of wineries continues to invest in their primary asset, driven by its proven performance and brand equity.

The logic underpinning this path dependency is revealed in the factors that guide wineries' planting decisions (Table 1). The data shows a multifaceted calculus, with 'Adaptability to my terroir' (85% important/very important) and 'International demand' (75%) as the paramount concerns. Malbec's historical success is a direct result of its excellence on both fronts: it adapted perfectly to Argentine terroirs and captured the imagination of the international market. This appears to create a powerful feedback loop that reinforces the status quo. However, the data also shows a strong influence from other factors, as 'Tradition' (53%) and 'Local availability' (45%) are considered important or very important by a large number of wineries. This suggests that the decision-making process is more complex than simply a response to market and environmental pressures, with historical and local factors also playing a significant role. In con-

Table 1. Relevant factors affecting the choice of planted grape varieties.

Factor	Not Important (1)	Slightly Important (2)	Somehow Important (3)	Important (4)	Very Important (5)	(4) + (5)
Adaptability to my terroir	2%	3%	10%	28%	57%	85%
International demand	10%	5%	10%	22%	53%	75%
Domestic demand	11%	4%	17%	28%	40%	68%
Personal choice or preference	11%	10%	22%	24%	33%	57%
Tradition	15%	12%	20%	25%	28%	53%
Local availability	19%	11%	25%	19%	26%	45%
Cost	36%	20%	19%	13%	12%	25%
Standards and regulations	49%	17%	13%	10%	11%	21%

Source: own elaboration based on all 230 wineries of the representative sample, regardless of grape production (grapes used in their wines if they do not produce grapes) – Data from Phase 1.

trast, factors like 'Cost' (25%) and 'Standards and regulations' (21%) are distant considerations. This complex logic makes departing from Malbec a significant risk, as any new variety would have to prove itself against these established, multifaceted metrics.

This complex calculus is further complicated by the mixed performance of the current export model, as revealed by wineries' satisfaction levels in Table 2. The data shows a clear divide between operational contentment and strategic frustration. A majority of exporters are satisfied with the core components of their offerings, including the number of labels exported (56% satisfied or very satisfied), export logistics (52%), and the value per bottle (52%). However, there is profound dissatisfaction with growth and market reach. Only a third of exporters (33%) are satisfied with their export volume, and even fewer (27%) are satisfied with the number of countries they export to. International brand recognition also remains a challenge, with only 39% expressing satisfaction. This specific pattern, contentment with the product but frustration with its scale, appears to be a strong indicator of a maturing business model and directly fuels the ambition to find new markets, an effort often hindered by the lack of key trade agreements.

The evidence thus seems to paint a picture of an industry caught in a complex dilemma. Wineries are satisfied with a model they know is maturing; their rational, terroir- and market-driven framework (Table 1) reinforces investment in their primary asset, and yet their frustrating results in export growth (Table 2) provide a powerful impetus for change. This apparent contradiction is perhaps best explained by the philosophy of one of the leaders who helped build the Malbec brand. As Laura Catena recounts in a recent interview, the strategic vision was never to sell more Malbec, but to achieve world-class quality through deep research into their unique, pre-phylloxera genetic material, an asset she describes as "something really good that nobody else has" [7].

From this perspective, the continued investment in Malbec is not merely inertia. It represents a conscious strategy to diversify within the Malbec category itself, going deeper by exploring and defining high-altitude terroirs and unique genetic expressions, rather than going wider by immediately adding new varieties. This

Table 2. Wine exports satisfaction - Relevant factors.

Factor	Not Satisfied (1)	Slightly Satisfied (2)	Somehow Satisfied (3)	Satisfied (4)	Very Satisfied (5)	(4) + (5)
Number of labels exported	10%	13%	21%	40%	16%	56%
Export logistics	5%	18%	25%	37%	15%	52%
Value per bottle	5%	8%	35%	38%	14%	52%
International brand recognition	17%	20%	24%	24%	15%	39%
Export volume	18%	25%	24%	24%	9%	33%
Number of countries exported	26%	21%	26%	17%	10%	27%

Source: own elaboration based on the 164 exporting wineries of the representative sample – Data from Phase 1.

explains how a desire for "more grape varieties" (38%) from Phase 1 survey can coexist with a plan to "increase Malbec production" (49%) from the Phase 2 follow-up. The ultimate goal is to create a more resilient and premium identity, whether that is achieved by adding new pillars or by reinforcing the foundation of the original one. This strategic tension between deepening specialization and broadening the portfolio helps to define the industry's search for a path "Beyond Malbec".

4.2. Pragmatic Diversification: The Path of Unquestioned Strategic Value

Faced with the strategic tension surrounding a maturing cornerstone, the survey data reveal that Argentine wineries are pragmatically pivoting towards diversification strategies that minimize risk and maximize the potential of their existing assets (Table 3). This strategic preference is not a simple "path of least resistance," but rather a rational choice to pursue ventures with high perceived value and low perceived risk. When asked to rate the attractiveness of various strategies, wineries showed overwhelming preference for "focusing on new consumer markets" (92% rated it attractive or very attractive) and "focusing on complementary activities" such as tourism and events (82% rated them attractive or very attractive). Crucially, these preferences align with perceived risk: both paths are viewed as the safest ventures, with only 16% and 15% of respondents, respectively, rating them as risky or very risky.

To quantitatively test this relationship, we conducted a series of Kendall's tau-b rank correlation tests on the perceived attractiveness and perceived risk of each diversification strategy. The results confirm a strong, statistically significant negative correlation between capital-intensive, less established diversification paths. This suggests that, for these particular paths, risk aversion is a primary determinant of a winery's strategic orientation. Specifically, there is a significant negative relationship for new terroirs ($\tau=-0.355$, $p=0.026$), bio/natural wines ($\tau=-0.458$, $p=0.003$), and low-alcohol/non-alcoholic wines ($\tau=-0.422$, $p=0.007$).

In contrast, the correlation for strategies rated as universally attractive and low-risk, new consumer markets ($\tau=-0.132$, $p=0.422$) and complementary activities ($\tau=-0.203$, $p=0.214$), was negative but not statistically significant. This suggests that their high adoption rate is not the result of a calculated risk-reward trade-off, but rather reflects their perceived fundamental advantage.

This strategic pivot towards new markets is a direct response to the growth frustrations identified in our Phase 1 survey (Table 2). Having achieved operational competence in logistics and product value, exporters' primary pain point appears to be scale. This ambition is reflected in their clear geographic priorities for expansion. The strongest growth intentions are aimed at Latin America (62% plan to increase or start exporting), leveraging regional proximity and existing trade agreements such as Mercosur. This is followed by a continued focus on the established, high-value markets of North America (54%) and Europe (52%). In contrast, expansion into Asia is a more moderate goal (41%), while Africa and Oceania are not currently seen as significant growth opportunities.

Alongside market expansion, the second pillar of this low-risk strategy is deepening the consumer experience through experiential diversification. This approach, centered on wine tourism, is not just a theoretical strategy but an operational reality for many wineries. It is increasingly leveraged to build brand loyalty and create vital alternative revenue streams that can buffer against fluctuations in export demand. As recent case study research in Mendoza confirms, wine tourism provides significant economic, social, and environmental benefits. It functions as a high-margin sales channel and a tool for cultural valorization. However, it also provides an incentive for landscape preservation by generating revenue that makes it economically viable to maintain a region's agricultural character rather than converting it to other uses [49]. This is a particularly synergistic activity, as the high season for tourism often complements, rather than conflicts with, the agricultural calendar. The success of this model is exemplified by firms like Antigal winery, which has integrated its historical architecture with modern, high-end visitor experiences to drive brand value and foster local economic linkages [49]. For many wineries, this form of diversification is the most logical next step: it leverages unique, place-based resources like terroir and heritage to strengthen the core business through education and direct-to-consumer sales, without requiring the high-risk investment of agricultural transformation.

The strategic appeal of these twin paths lies in their ability to deliver key diversification advantages, such as enhanced economic resilience and industry growth, without incurring the most significant disadvantages. By finding new markets for existing products or creating new experiences around them, wineries can increase revenue while building on their existing strengths. The data from our statistical tests support the view that these strategies, market expansion and experiential diversification, are not chosen merely as a "path of least resistance" to avoid risk. Instead, they are viewed as a highly rational and capital-efficient choice that directly addresses the

Table 3. Wineries' diversification (attractiveness and perceived risks).

	Not attractive (1)	Somehow not attractive (2)	Neutral (3)	Somehow attractive (4)	Very attractive (5)	(4) + (5)
(a) Perceived attractiveness of diversification strategies						
New Consumer Markets	0.0%	2.6%	5.1%	38.5%	53.8%	92.3%
Complementary activities (events, restaurants, tourism)	2.6%	2.6%	12.8%	35.9%	46.2%	82.1%
Bio/Natural Wines	2.6%	7.7%	15.4%	25.6%	48.7%	74.3%
New Terroirs	7.7%	5.1%	23.1%	28.2%	35.9%	64.1%
New grape varieties	12.8%	7.7%	25.6%	41.0%	12.8%	53.8%
Low-alcohol or non-alcoholic wines	20.5%	10.3%	15.4%	28.2%	25.6%	53.8%
(b) Perceived risk of investment in diversification strategies						
	Not risky	Low risk	Neutral	Risky	Very risky	(4) + (5)
New Terroirs	10.3%	23.1%	17.9%	30.8%	17.9%	48.7%
New grape varieties	7.7%	15.4%	30.8%	35.9%	10.3%	46.2%
Bio/Natural Wines	7.7%	30.8%	30.8%	23.1%	7.7%	30.8%
Low-alcohol or non-alcoholic wines	12.8%	25.6%	30.8%	17.9%	12.8%	30.7%
New Consumer Markets	15.4%	30.8%	38.5%	12.8%	2.6%	15.4%
Complementary activities (events, restaurants, tourism)	17.9%	41.0%	25.6%	15.4%	0.0%	15.4%

Source: own elaboration based on a random sample of 40 exporting wineries – Data from Phase 2.

industry's growth frustrations, postponing the more costly and complex challenge of fundamentally changing what they produce.

4.3. The Cautious Embrace of Product Innovation: New Varieties and Terroirs

In stark contrast to the low-risk appeal of market expansion, the data show that product innovation through new grape varieties and terroirs is viewed with significant caution, a perception likely tied to the substantial financial investment required. These are rated as the highest-risk strategies a winery can undertake (49% for new terroirs, 46% for new varieties). As our statistical analysis in the previous section confirmed, there is a strong, statistically significant negative correlation between the perceived attractiveness of a strategy and its perceived risk, especially for capital-intensive paths like new terroirs and for less traditional styles like bio/natural and low-alcohol wines.

The wineries' risk calculus is rooted in the factors that guide their current planting decisions (as shown in Table 1), where "Adaptability to my terroir" (85%) and "International demand" (75%) are paramount. The high-risk perception is understandable, as introducing a new, unproven variety, whether it is an international grape new to Argentina or an indigenous one new to a specific region, directly challenges these two core pillars; its terroir adaptability is uncertain, and its international demand is unknown, making it an inherently high-risk proposition from both an agricultural and a commercial standpoint.

This caution is further explained by the challenge of overcoming a powerful country-of-origin bias. This is not just a theoretical concern; it is an empirically documented market reality. A study of 201 international wine traders at ProWein found that the mental representation of "Argentinean wine" was overwhelmingly dominated by the word "Malbec," followed by related concepts such as "powerful/strong wines" and "red wines" [13]. This powerful "Argentina = Malbec" brand, while a critical asset, thus acts as a significant economic deterrent for diversification. Wineries' fear that non-Malbec wines will struggle for recognition is therefore a rational response to a documented bias among key market intermediaries. The lack of a strong brand identity beyond Malbec forces these new varieties to compete directly on price against established, globally recognized varietals from other countries. This perceived barrier is a key driver behind their high-risk assessment and explains their methodical, rather than radical, approach to innovation.

However, despite these well-founded risks, the data reveals a powerful undercurrent of forward-thinking investment, driven by a clear perception of where the market is headed. This willingness to pursue high-risk innovation may be linked to the winery's leadership profile. A recent study using this same sample of wineries found that those led by 'extremely conceptual' innovators, characterized by their focus on radical, disruptive

change, demonstrate significantly higher export performance and a greater focus on premium market segments [8]. Our survey shows that nearly half of wineries (46%) still plan to introduce and develop wines from new grape varieties in the next 3-5 years. This is not a random bet; it is informed by their optimism for non-Malbec red wines in the international market, where they foresee strong growth for red single varietals (62% expect an increase) and other red blends (54%).

This optimism translates directly into concrete production plans, painting a clear picture of the industry's next chapter. The strongest growth intention is for Cabernet Franc (56% plan to increase production). While the total area planted to this variety remains small in comparison to Malbec, this high level of planned investment, in both absolute terms and relative to other varietals, positions it as a leading candidate for a second flagship red in the industry's diversification strategy. This is followed by continued investment in Malbec (49%), then in other proven international varieties, such as white wines (41%) and Cabernet Sauvignon (38%).

This calculated approach also reveals the paths wineries are pursuing or avoiding in stylistic innovation. While niche trends like low-alcohol or non-alcoholic wines receive a lukewarm reception, one area of stylistic diversification that garners significant optimism is sparkling wine. Wineries see strong growth potential for sparkling wines both in the international market (54% expect an increase) and, as a notable outlier, in the domestic market (50% positive outlook). This perception is translating into action, with a notable number of wineries entering the category for the first time. This embrace of sparkling wine contrasts sharply with the outlook for the traditional white grape Torrontés, which faces the most negative forecast. It is the only varietal for which a significant portion of wineries predict a decrease in international and domestic demand, and consequently shows the lowest interest in production increase (10%). The industry's emerging strategy appears clear: innovation is focused on expanding the portfolio with internationally recognized red varieties (like Cabernets) and opportunistically entering globally trending categories (like sparkling), rather than betting on niche styles or attempting to revitalize a struggling domestic grape on the global stage.

4.4. Overarching Challenges: From Macroeconomics to National Branding

The strategic decisions of Argentine wineries are not made in a vacuum; a formidable set of external pressures constrains them. The survey data reveal a clear hierarchy of concerns, which can be grouped into interconnected strategic, economic, and operational challenges (Table 4). While the table is presented in order of importance to the wineries, this classification allows for a more analytical understanding of the problems they face, distinguishing between those under their individual control, those that require collective action, and those that are largely beyond their control. At the apex are the most urgent priorities, which are fundamentally strategic and market-facing: "developing a country image beyond Malbec" (89.2% agree or strongly agree), "facing international competition" (86.5%), and "adapting to changing tastes and uses of consumers" (86.5%). These three pillars form a set of interconnected strategic challenges: wineries recognize the urgent need to evolve their national brands to appeal to new consumers while simultaneously competing for market share in an intensely competitive global market.

The nature of this competition and the shifting consumer landscape are vividly detailed in the qualitative data. When asked to identify competitors, a COVIAR expert and wineries alike point directly to "Chile, Australia, and Spain", countries that often compete in similar price segments with powerful, nationally branded varietals. The challenge of adapting to consumer tastes goes far beyond a simple switch from red to white wine. As the COVIAR expert interviewed powerfully noted, the industry must pay close attention to the "new generations, the Millennials (generation Y) and the Centennials (generation Z)," who have a fundamentally different relationship with wine, shaped by concerns for health, environmental sustainability, and authenticity, which are redefining the market.

Beneath this strategic layer lies a foundation of pervasive economic and regulatory pressures. "Adapting to changes in macroeconomic conditions" is tied as a top-three concern (86.5%), a direct reflection of the tangible realities of operating in Argentina. This is not an abstract volatility but a daily battle with inflation, exchange rate instability, and export taxes that create profound uncertainty and put firms at a structural disadvantage. This is compounded by the high-priority challenges of "adapting to changes in market regulations" (81.1%) and the evolving requirements of powerful downstream actors like importers and distributors (81.1%). These factors create a uniquely challenging business environment where wineries must navigate significant domestic instability before they can even begin to compete internationally.

Finally, Argentinean wineries also face a host of pressing operational, environmental, and social challenges at the ground level. The most critical of these is

Table 4. Perceived challenges for the Wine Industry in Argentina in the next 3-5 years.

Challenge	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	(4) + (5)
Developing a country image abroad beyond Malbec	0.0%	2.7%	8.1%	48.6%	40.5%	89.2%
Adapting to changing tastes and uses of consumers	0.0%	0.0%	13.5%	54.1%	32.4%	86.5%
Facing international competition	0.0%	0.0%	13.5%	37.8%	48.6%	86.5%
Adapting to changes in macroeconomic conditions	0.0%	0.0%	13.5%	32.4%	54.1%	86.5%
Adapting to changes in market regulations (production, labelling)	2.7%	0.0%	16.2%	48.6%	32.4%	81.1%
Adapting to changing requirements downstream of the sector	2.7%	0.0%	16.2%	48.6%	32.4%	81.1%
Water access	2.7%	0.0%	18.9%	45.9%	32.4%	78.4%
Improving business-to-business relationships upstream to downstream	2.7%	0.0%	21.6%	43.2%	32.4%	75.7%
Showing that drinking wine is compatible with health	0.0%	10.8%	16.2%	48.6%	24.3%	73.0%
Strengthening the cultural character of wine and the territorial heritage	0.0%	5.4%	21.6%	35.1%	37.8%	73.0%
Optimising the functioning of sector organisations	2.7%	0.0%	27.0%	27.0%	43.2%	70.3%
Responding to corporate social responsibility	0.0%	8.1%	21.6%	45.9%	24.3%	70.3%
Preserving the vine and wine landscapes	2.7%	2.7%	24.3%	21.6%	48.6%	70.3%
Developing investments in insufficiently explored production areas	2.7%	8.1%	24.3%	45.9%	18.9%	64.9%
Reducing the carbon footprint	5.4%	2.7%	29.7%	37.8%	24.3%	62.2%
Adapting alcohol content to public health policies	2.7%	18.9%	18.9%	43.2%	16.2%	59.5%
Simplifying wine labelling and quality signs	2.7%	10.8%	29.7%	21.6%	35.1%	56.8%
Risk of reduced yields	0.0%	13.5%	32.4%	37.8%	16.2%	54.1%
Introduction of more resilient grape varieties	0.0%	16.2%	35.1%	32.4%	16.2%	48.6%
Reducing the use of oenological inputs, go more 'Natural' wines	2.7%	8.1%	40.5%	29.7%	18.9%	48.6%
Creation of corporate brands	5.4%	10.8%	48.6%	10.8%	24.3%	35.1%

Source: own elaboration based on a random sample of 40 exporting wineries – Data from Phase 2.

"water access" (78.4%), a growing concern in a changing climate that directly threatens the viability of viticulture in arid regions like Mendoza. This is linked to broader sustainability concerns, such as the need for "preserving the vine and wine landscapes" (70.3%) and responding to demands for "corporate social responsibility" (70.3%). The high importance placed on these fundamental issues contrasts sharply with what wineries view as lower-priority concerns, such as "simplifying wine labelling" (56.8%) or the "creation of corporate brands" (35.1%). This hierarchy demonstrates that wineries are focused on the existential challenges of strategic positioning, economic survival, and environmental sustainability, rather than minor marketing or administrative adjustments.

Placing this hierarchy of Argentine challenges in an international context reveals the unique pressures on the industry. A recent, comparable study of European stakeholders [50] shows a starkly different ranking of priorities. While environmental concerns like water access are important to Argentine producers, they are superseded in urgency by the commercial imperatives discussed above. For European producers, the inverse is true: their most urgent challenges are overwhelmingly environmental, such as "preserving landscapes" (91%), "adapting to climate change" (91%), and "reducing pesticides" (88%). This contrast is telling and reflects their vastly different operating environments. The focus of European producers is shaped by a dual pressure largely absent in Argentina: a stringent top-down regulatory framework, such as the EU's Farm to Fork strategy, and the strong bottom-up demand from high-income consumer markets where sustainability credentials are a key purchasing driver. In contrast, Argentine wineries must prioritize the more foundational tasks of establishing a broader brand identity, fighting for market share, and surviving in a volatile macroeconomic environment. While both regions face the future, their immediate battlegrounds are distinctly different.

5. CONCLUSION AND STRATEGIC IMPLICATIONS

This study investigated the strategic crossroads facing the Argentine wine industry as it seeks to build a future beyond its reliance on Malbec. The findings, drawn from a comprehensive nationwide survey and targeted follow-up with exporters, provide the first firm-level empirical evidence on how wineries perceive and

navigate this critical transition. The research confirms that the industry is defined by a central tension between the inertia of past success and the clear-eyed recognition of a maturing market, leading to a pragmatic, risk-averse approach to diversification.

5.1. Principal Findings

The analysis suggests a complex strategic landscape. A core finding is the central tension regarding Malbec: wineries agree that the era of rapid growth is over, yet high operational satisfaction and a rational, terroir- and market-driven logic lead many to continue investing in their cornerstone varietal. This tension is deepened by the mixed results of the current export model. While wineries are content with the quality and value per bottle of their premium products, they are profoundly dissatisfied with their export volume and market reach. This specific frustration with growth in the premium segment is a key driver for diversification, as the lower-quality, bulk wine market is no longer a viable path to scale for most Argentine producers.

In response, wineries are pursuing two distinct types of diversification. For strategies perceived as high-risk and capital-intensive, such as developing new terroirs or producing bio/natural wines, our statistical analysis confirms that risk aversion is a primary deterrent. However, for strategies perceived as low-risk and universally attractive, such as expanding into new consumer markets or developing wine tourism, the data suggest they are not pursued as a calculated trade-off but as a clear, rational choice to capitalize on existing assets.

A "cautious embrace of product innovation" is still evident, with nearly half of wineries planning to invest in new varieties despite the high perceived risks. This investment is highly calculated, focusing on internationally recognized red grapes like Cabernet Franc and globally trending categories like sparkling wine, while strategically moving away from niche or struggling varietals like Torrontés. A set of overarching challenges frames all these decisions, chief among them the need to evolve the national brand, navigate extreme macroeconomic instability, and adapt to the changing tastes of new consumer generations.

5.2. Strategic Implications: A Two-Speed Path Forward in a Polarizing Market

The findings suggest that a successful transition "Beyond Malbec" may require a strategic response to what recent market analysis has termed a global market polarization [5]. This trend favors two distinct segments: high-end, premium wines on one side, and fresh, innovative, popular-style wines on the other, while squeezing the traditional middle market. The diversification strategies identified in our study can be understood as a "two-speed path" for Argentine wineries to compete effectively in both of these winning segments.

1. The Short-Term Path: Prioritizing Market Expansion and Selective Innovation.

The Argentinean wineries' apparent preference for low-risk strategies is a rational, pragmatic response to their environment. The overwhelming immediate priority is to capitalize on their existing strengths by expanding into new export markets. This strategy was rated as the most attractive (92%) and least risky (16%), directly addressing the growth frustrations with volume and market reach identified in Table 2. Alongside this primary market-focused push, wineries are pursuing selective innovations that align with the "new and popular" segment. Their approach, however, is highly calculated. While categories like low- and no-alcohol wines are a growing segment in global markets, our findings show producers are essentially rejecting this path, likely due to the high risks and perceived lack of scale. Instead, they are concentrating on two areas that leverage existing assets: sparkling wine and experiential wine tourism. Together, these short-term priorities, market expansion complemented by adjacent innovations, form a coherent strategy to generate the revenue and brand loyalty needed to fund the more difficult, long-term work of product diversification.

2. The Long-Term Vision: Competing in the High-End Segment.

The ultimate challenge, developing a country image beyond Malbec, appears to be a long-term project aimed at capturing the other successful pole of the market: the premium and ultra-premium segment. It requires a coordinated national vision that moves beyond the inertia of its current success. The experiences of other wine-producing nations offer instructive parallels for this evolution.

The first path, drawing a parallel with Greece's experience, focuses on building a broader identity through authenticity and differentiation. Greece, facing a weak international identity, successfully rebranded its industry by promoting its vast portfolio of unique, indigenous grape varieties [30]. Argentina could apply this logic by strategically elevating its unique assets. This would involve a concerted effort to develop and promote new grape families, such as aromatic Torrontés and historic Criollas, as well as Bonarda, an international varie-

ty that has found a uniquely Argentine expression. While the market success of these efforts has been mixed to date, their strategic potential for a differentiation model rooted in authenticity and terroir diversity remains high. In addition, as Laura Catena argues, Argentina's claim to authenticity can be deepened by highlighting its unique status as an 'Old World' repository in the New World [7]. By preserving the 19th-century practice of massal selection, Argentine Malbec vineyards possess a genetic diversity lost in much of modern Europe. A long-term strategy that communicates both the breadth of its other varieties and the unique historical depth of its Malbec would build a richer, multi-faceted identity rooted in authenticity.

The second path, for which New Zealand's experience offers a relevant precedent, focuses on successful brand and regional extension. New Zealand, once known almost exclusively for its Marlborough Sauvignon Blanc, deliberately cultivated a reputation for high-quality Pinot Noir by elevating other key regions, such as Hawke's Bay. As the information you provided shows, Hawke's Bay is a region known for its diversity, producing not only high-quality Pinot Noir but also acclaimed Red Blends, Chardonnay, and Syrah. This was achieved through a focus on innovation and quality-driven production practices, which enabled them to compete in a premium segment for a second, distinct variety while also showcasing the breadth of their portfolio [26]. This offers a powerful parallel for Argentina, which has at least two compelling candidates to build such a second pillar. The first is red: the substantial and growing investment in Cabernet Franc, as revealed by our survey, suggests an organic, producer-led move in this direction. However, an equally strategic path exists for producing high-quality white wines. The rapid improvement in Argentine Chardonnay and its growing ability to showcase distinctive high-altitude terroirs make it a particularly compelling option. In addition, experimenting with traditional varieties such as Torrontés and Criolla further broadens this segment's potential. Developing a premium white varietal would not only avoid direct competition with Malbec for market share but also align with the growing global demand for white wines. Pursuing this model would transform the country's brand from a single-product identity into a more resilient, dual-specialization powerhouse.

Ultimately, the most robust long-term vision may be a hybrid of both models. This would involve a sustained, collaborative investment from institutions like COVIAR, INTA, and Wines of Argentina. Such collective action is crucial because, as Artopoulos et al. [6] suggest, building a new national or regional wine identity is a classic public good. The efforts of "export pioneers" in developing new varieties or terroirs generate positive externalities that benefit the entire industry, justifying a coordinated, public-private approach to investment in research and promotion.

A powerful precedent for this is New Zealand's Bragato Research Institute Pinot Noir Programme, a targeted, collaborative effort between government and industry that was instrumental in establishing the country's second premium varietal pillar. A similar initiative in Argentina could be designed to develop the potential of Cabernet Franc or high-altitude Chardonnay. Executing such a complex vision will require not only capital but also innovative leadership. Recent findings suggest that the industry's 'conceptual innovators,' those adept at driving disruptive change, are most closely linked to export success [8]. Harnessing the capabilities of these leaders within a public-private partnership framework will likely be a key factor in any national strategy aiming to tell a richer, more resilient story about Argentine wine and ensure its relevance and competitiveness for decades to come.

5.3. Limitations and Directions for Future Research

This study, while providing a comprehensive overview, has several limitations that define its scope and open avenues for future research. First, while our nationwide sample was rigorously validated for representativeness, the insights from the second survey are drawn primarily from small- and medium-sized wineries; the strategic calculus of the few large corporations that dominate exports may differ significantly. Furthermore, the survey-based methodology captures a snapshot of strategic intentions and perceptions rather than the deep, qualitative nuances of firm-level decision-making or their long-term outcomes.

These limitations naturally point toward several avenues for future work. To address the focus on smaller and medium-sized firms, a case-study approach concentrating on the top 5–10 exporting corporations could provide a crucial understanding of the industry's most powerful players. An additional, complementary path would be a longitudinal study tracking the wineries in this sample over the next decade to assess how the intentions identified here translate into actual investment and market performance. Finally, to complement this study's supply-side perspective, consumer-focused research in key export markets would be invaluable for directly testing the strength of the "Argentina = Malbec" bias and assessing market receptivity to emerging varietals, providing crucial demand-side data.

REFERENCES

[1] Villanueva, E. C., Depetris-Chauvin, N., & Pinilla, V. (2023). The wine industry: drivers and patterns of global transformation. Forthcoming in Kipping, Matthias, Takafumi Kurosawa, and D. Eleanor Westney (eds), The Oxford Handbook of Industry Dynamics (online edn, Oxford Academic) https://doi.org/10.1093/oxfordhb/9780190933463.001.0001

[2] Stein, S., & Mateu, A. (2018). Argentina. In K. Anderson & V. Pinilla (Eds.), *Wine globalization: A new comparative history* (pp. 291–322). Cambridge University Press.

[3] Depetris-Chauvin, N., & Villanueva, E. C. (2024). The anatomy of exporting wineries of Argentina. *International Journal of Wine Business Research, 36*(3), 329–350.

[4] INV (2025). *Informes anuales*. Instituto Nacional de Vitivinicultura. Ministerio de Economía, Presidencia de la Nación, República Argentina. Accessed on October 7, 2025, from https://www.argentina.gob.ar/inv/vinos/estadisticas/mercado-interno/anuarios

[5] del Rey, R. (2024). Trends and challenges in the International Wine Trade. The need for new strategies for companies and regions. *IVES Conference Series, OIV 2024*.

[6] Artopoulos, A., Friel, D., & Hallak, J. C. (2013). Export emergence of differentiated goods from developing countries: Export pioneers and business practices in Argentina. Journal of Development Economics, 105, 19-35.

[7] Villanueva, E. C., Depetris-Chauvin, N., & Elahee, M. (forthcoming). Interview with Laura Catena. Special issue "New Business Models & Management Strategies in the Global Wine Industry". Journal of Comparative International Management.

[8] Depetris-Chauvin, N., Elias, J. J., Ferro, G., Gatti, N., & Villanueva, E. C. (2025). The impact of innovator types on export performance in the Argentine wine industry. Journal of Entrepreneurship in Emerging Economies.

[9] Martínez-Navarro, J., & Sellers-Rubio, R. (2024). Three decades of research on wine marketing. *Heliyon, 10*(10).

[10] IERAL. (2024). *Informe de coyuntura del IERAL, Fundación Mediterránea - Regional Cuyo, 33*, 1570.

[11] Meininger's International. (2025). International wine market: Argentina. Accessed on August 7, 2025, from https://www.meiningers-international.com/wine/markets/who-who-argentina

[12] Merino, J., Rizzo, A., & Zingoni, L. (2024). *Desafíos y oportunidades de inversión del sector de vinos en Argentina. Informe Anual 2023/2024*. División Vinos, Banco Supervielle.

[13] Rodrigues, H., Rolaz, J., Franco-Luesma, E., Sáenz-Navajas, M. P., Behrens, J., Valentin, D., & Depetris-Chauvin, N. (2020). How the country-of-origin impacts wine traders' mental representation about wines: A study in a world wine trade fair. Food Research International, 137, 109480.

[14] Migone, A., & Howlett, M. (2010). Comparative networks and clusters in the wine industry. American Association of Wine Economists, Working Paper No. 62.

[15] Anderson, K., & Wittwer, G. (2013). Modeling global wine markets to 2018: Exchange rates, taste changes, and China's import growth. *Journal of Wine Economics, 8*(2), 131–158.

[16] Morales-Castilla, I., García de Cortázar-Atauri, I., Cook, B. I., Lacombe, T., Parker, A., Van Leeuwen, C., & Wolkovich, E. M. (2020). Diversity buffers winegrowing regions from climate change losses. Proceedings of the National Academy of Sciences, 117(6), 2864-2869.

[17] Masset, P., & Weisskopf, J. P. (2024). From risk to reward: the strategic advantages of diversifying grape varietals. International Journal of Contemporary Hospitality Management, 36(8), 2555-2581.

[18] Depetris-Chauvin, N. (2025). Tourism and services diversification in the global wine industry: Ten stylized facts. Tourism Economics, 13548166251314624.

[19] Jackson, D. I., & Lombard, P. B. (1993). Environmental and management practices affecting grape composition and wine quality-a review. American Journal of Enology and Viticulture, 44(4), 409-430.

[20] Micu, D. M., Arghiroiu, G. A., Micu, Ș., & Beciu, S. (2025). Competitive advantage in the world of wine—An analysis of differentiation strategies developed by sectoral brands in the global market. *Foods, 14*(11), 1858.

[21] Anderson, K. (2025). Globalisation and national commodity cycles: The case of wine in Australia. The World Economy, 48(2), 347-372.

[22] Van Rooyen, J., Esterhuizen, D., & Stroebel, L. (2011). Analyzing the competitive performance of the South African wine industry. International Food and Agribusiness Management Review, 14(4), 179-200.

[23] Fernandez-Stark, K., & Bamber, P. (2016). Wine industry in Chile. Services in Global Value Chains: Manufacturing-Related Services. Singapore: APEC Policy Support Unit, 364-389.

[24] Vecchio, R., Annunziata, A., & Bouzdine-Chameeva, T. (2024). How to promote sustainable wine tourism: Insights from Italian and French young adults. *Annals of Tourism Research Empirical Insights, 5*(2), 100137.

[25] Parr, W. V., Schlich, P., Theobald, J. C., & Harsch, M. J. (2013). Association of selected viniviticultural factors with sensory and chemical characteristics of New Zealand Sauvignon blanc wines. *Food Research International, 53*(1), 464–475.

[26] Depetris-Chauvin, N., Pinède, A., & Priilaid, D. (2024). Beyond terroir: a comparative analysis of Pinot Noir producers and business strategies in Burgundy, New Zealand and South Africa. International Journal of Wine Business Research, 36(4), 631-654.

[27] Puga, G., & Anderson, K. (2023). Concentrations and similarities across countries in the mix of winegrape cultivars. American Journal of Enology and Viticulture, 74(1).

[28] Charters, S., & Menival, D. (2011). Wine tourism in Champagne. *Journal of Hospitality & Tourism Research, 35*(1), 102–118.

[29] Alonso, A. D., & Liu, Y. (2012). Old wine region, new concept and sustainable development: Winery entrepreneurs' perceived benefits from wine tourism on Spain's Canary Islands. *Journal of Sustainable Tourism, 20*(7), 991–1009.

[30] Bremer, M. & Depetris-Chauvin, N. (forthcoming). Aligning with the National Brand: Differentiation Strategies and Export Success in Greek Wineries.

[31] Dulcich, F. M. (2016). Reestructuración productiva en un contexto de apertura y desregulación: la industria vitivinícola argentina ante los desafíos de la reducción de escala. CONICET.

[32] Gutiérrez-Gamboa, G., Liu, S. Y., & Pszczólkowski, P. (2020). Resurgence of minority and autochthonous grapevine varieties in South America: A review of their oenological potential. Journal of the Science of Food and Agriculture, 100(2), 465-482.

[33] Farinelli, F. (2013). Innovation and learning dynamics in the Chilean and Argentine wine industries. AAWE Working Paper No. 145.

[34] Liberman, G. L. (2013). The Argentine wine industry: Creating new spaces for coordination? *Prometheus, 31*(4), 305–318.

[35] Urvieta, R., Jones, G., Buscema, F., Bottini, R., & Fontana, A. (2021). Terroir and vintage discrimination of Malbec wines based on phenolic composition across multiple sites in Mendoza, Argentina. *Scientific Reports, 11*(1), 2863.

[36] Fushing, H., Lee, O., Heitkamp, C., Heymann, H., Ebeler, S. E., Boulton, R. B., & Koehl, P. (2019). Unraveling the regional specificities of Malbec wines from Mendoza, Argentina, and from northern California. *Agronomy, 9*(5), 234.

[37] OIV. (2023). *Evolution of world wine production and consumption by colour*. International Organisation of Vine and Wine. Accessed on August 7, 2025, from https://www.oiv.int/sites/default/files/2024-01/OIV-FOCUS-2023_Evolution_of_the_world_wine_production_and_consumption_by_colour_0.pdf

[38] Khachatryan, N., Schüle, H., & Khachatryan, A. (2009). Does infant industry argument justify diversification policy in Argentinean wine sector? *AgEcon Search*. [Conference paper].

[39] Argentinian Wine Corporation (2018). Impacto de la vitivinicultura en la economía argentina, Mendoza. Available at: http://coviar.com.ar/2018/wp-content/uploads/2018/06/Impacto-Vitivinicultura-Ecomoni%CC%81a-Argentina-001.pdf (accessed 7 October 2025).

[40] Pastor, G. C., Torres, L. M., & Pastor, L. M. (2020). Landscape enclaves: Wine capitalism and luxury tourism in Mendoza, Argentina. *Journal of Political Ecology, 27*(1), 580–593.

[41] Mozell, M. R., & Thach, L. (2014). The impact of climate change on the global wine industry: Challenges & solutions. *Wine Economics and Policy, 3*(2), 81–89.

[42] Villanueva, E., Ferrer, J., Castillo Valero, J. S., & García-Cortijo, M. C. (2025). Sustainable agriculture: Profile and strategies of Argentine wineries. *Management Decision*.

[43] Livat, F., Alston, J. M., & Cardebat, J. M. (2019). Do denominations of origin provide useful quality signals? The case of Bordeaux wines. Economic Modelling, 81, 518-532.

[44] Aylward, D. (2006). Innovation lock-in: unlocking research and development path dependency in the Australian wine industry. Strategic Change, 15(7-8), 361-372.

[45] KPMG (2024). Wine Industry Insights. Australia.

[46] Baruch, Y., & Holtom, B. C. (2008). Survey response rate levels and trends in organizational research. Human relations, 61(8), 1139-1160.

[47] COVIAR (2017). Jornadas Estratégicas 2016 "La vitivinicultura argentina en el mundo: equilibrio, crecimiento, desarrollo". Corporación Vitivinícola Argentina, Mendoza, Argentina.

[48] INV (2020). Exportaciones Argentinas de vinos 2020. Instituto Nacional de Vitivinicultura, Mendoza, Argentina.

[49] Sánchez-García, E., Martínez-Falcó, J., Marco-Lajara, B., Santoni, L., Vidal-Olivares, J., & Gennari, A.

(2025). Exploring the economic, social, and environmental impact of wine tourism in the region of Mendoza. Environment Systems and Decisions, 45(3), 49.

[50] Beber, C. L., Lecomte, L., Rodrigo, I., Canali, M., Pinto, A. S., Pomarici, E., & Malorgio, G. (2023). The agroecological challenges in the wine sector: perceptions from European stakeholders. Wine Economics and Policy, 12(2), 103-120.

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Stereotypes and Success: Examining Growth Barriers in the New Jersey Wine Industry

Seth Porter

University of Colorado, Colorado Springs, 1420 Austin Bluffs Pkway, Colorado Springs, CO (USA) 80918
Email: sporter9@uccs.edu

Abstract. The New Jersey wine industry represents an emerging agricultural sector with considerable growth potential. Yet, it continues to encounter structural and perceptual challenges that constrain its growth and limit its market competitiveness. This study examines central barriers that emerged in the data and are consistent with findings from prior research. These include persistent negative consumer perceptions, collective reputation, restrictive regulatory frameworks, limited distribution channels, fragmented regional branding, and challenges related to digital transformation. Using a mixed-method approach, this research combines in-depth interviews with industry stakeholders, inductive emergent thematic analysis, document analysis, AI sentiment analysis, and quantitative descriptive data to identify and analyze these issues. The findings illustrate that while stakeholders express frustration over regulatory and logistical constraints, they also exhibit optimism for the industry's future, particularly in areas such as quality improvement, sustainable practices, and regional identity-building. Addressing these challenges through strategies, such as quality assurance programs, further state support for extension services, regulatory reforms, collaborative marketing, and firm-level digital transformation, can significantly strengthen New Jersey's wine industry. This study also offers public and private policy recommendations to support the industry in establishing a solid and competitive presence in the wine market, positioning New Jersey as a reputable wine-producing region, and applying frameworks for other emerging wine regions.

Keywords: emerging wine regions, New Jersey wine, East Coast wine, developing wine regions, policy.

1. INTRODUCTION

The New Jersey wine industry, which encompasses four American Viticultural Areas (AVAs), comprises roughly 1,500 acres of vineyards and 55 wineries and has a direct annual economic impact of approximately $2.3 billion [1]. New Jersey wines now regularly receive critical acclaim, illustrating improvements in quality. However, the industry continues to face barriers to growth and reputation, including inconsistent quality, entrenched consumer perceptions, and regulatory constraints, which are explored in this study [2,3]. Despite its proximity to major urban centers like New York City and Philadelphia and the growing number of wineries with higher quality, the New

Jersey wine industry faces persistent challenges related to its brand image, which continues to shape consumer perceptions of quality and reliability. Many consumers perceive New Jersey wines as inferior, often influenced by inconsistent quality across the region and stereotypes that associate the state more with industrial production and popular culture tropes than with viticulture. However, the sector has seen a clear improvement in quality [2]. These perceptions, combined with logistical, regulatory, and firm-level barriers such as restrictive regulations, limited access to distribution channels, poor business processes at the firm level, and a lack of coordinated marketing, have created a challenging landscape for New Jersey winemakers seeking to establish a foothold in the competitive global wine market. Addressing these barriers is essential for the state's wineries to enhance their potential and attract and retain new consumer demographics, thereby expanding their market presence.

This study will analyze the issues facing New Jersey's wine industry through a multi-method research approach. First, primary data was collected through in-depth interviews with industry stakeholders, which included winery owners, winemakers, journalists, aligned academics, and representatives from the tourism and regulatory bodies. Through thematically analyzing these interviews, this study identifies significant strengths and challenges in consumer perception, distribution, branding, marketing limitations, regulatory barriers, state support, and industry collaboration. This includes extensive secondary data collection, including document analysis, industry data and reports, media, and literature review. Second, the study incorporates AI sentiment analysis to capture the emotional responses of stakeholders regarding these themes, providing additional insights into industry frustrations and goals. Complementing these qualitative findings, quantitative descriptive statistics further illustrate these issues.

This study analyzes New Jersey's wine industry through a mixed-methods approach. It highlights actionable insights and public and private policy recommendations for overcoming the challenges. This research aims to support industry stakeholders in enhancing regional reputation, expanding market reach, improving the digital sales ecosystem and branding, promoting growth for New Jersey wines, and assisting in creating frameworks for other emerging wine regions worldwide.

2. LITERATURE REVIEW

Consumer motivations and perceptions of value and quality play a crucial role in the development of emerging wine regions, influencing destination loyalty, place attachment, and purchasing decisions [4]. For example, in Wisconsin and Minnesota, visitors valued price, service, and emotional experiences over wine education, illustrating predictors of loyalty and growth [5,6]. Moreover, effective branding and regional brand equity further enhance consumer loyalty, as demonstrated by product-focused motives surpassing experiential ones [7,8].

Emerging regions face market volatility and rely on quality perception and collective reputation to build trust [9-12]. Signals like critic ratings, price, and origin influence willingness to pay [11, 13]. In Bordeaux and Burgundy, terroir and collective reputation often outweigh sensory qualities in influencing value [14-16]. Positive expert reviews are critical in emerging regions, where higher reputation risks strengthen the need for critical assessment to build consumer confidence [11, 17, 18, 19, 20].

Branding and regional identity differentiate emerging regions with motivational factors such as quality and environmental values impacting consumer preferences [8, 21]. For example, deregulation and export focus in South Africa fragmented the industry while fostering competitiveness and quality [22]. Moreover, branding has helped regions like North Carolina and New Jersey attract tourism and establish their identity through immersive experiences, such as wine trails [8, 23]. Direct-to-consumer strategies are also vital, with cellar door sales particularly prominent in regions such as New Jersey and Connecticut [23, 24]. In addition, collaborative marketing enhances visibility while sustaining business models, as observed in regions such as California and Australia [24]. Studies also highlight the role of consumer expectations, with wines labeled as "New Jersey" receiving lower ratings than those labeled as "California," even when controlling for non-biased sensory evaluation, underscoring the importance of branding and collective reputation [2, 25].

Quality assurance programs (QAPs) mitigate consumer risk and support collective reputation [26-28]. Research in Tennessee indicates that QAPs have a positive influence on purchases and on-site spending [27]. Similarly, Texas Tech University's viticulture programs demonstrate how education and extension offices foster regional competitiveness [29-31]. Indicators such as AVAs and production standards enhance differentiation in crowded markets, thereby reducing consumer risk [13, 32-36].

Perceived quality and pricing remain critical factors in consumer decision-making [34, 37, 38]. For example, expert ratings have been shown to impact wine prices, with even minor ratings leading to measurable price changes [11, 38-40]. In addition to expert opin-

ion, consumer ratings serve as another quality signal that impacts price and helps reduce consumer information asymmetry [35]. Factors such as terroir and production standards also influence price expectations and consumer behavior in wine and other markets [14, 28, 33, 41, 42]. Branding and firm traceability mitigate consumer risk, particularly in luxury markets [43]. As seen in North Carolina and other aligned emerging regions, social capital and collaboration bolster regional reputation and strengthen artisanal values over bulk production [12, 24, 44].

Climate and policy also influence the development of emerging wine regions. While climate shifts benefit some areas, volatility and market trends demand adaptability [45]. Additionally, public policy plays a pivotal role, with programs such as AVAs, extension offices, and grant funding fostering growth. Virginia and Washington's initiatives align institutional support with industry needs, which promotes economic growth and sustainability [46-48].

Moreover, viticulture and enology make significant contributions to rural economies and sustainability, driving enotourism, infrastructure development, and enhancing urban-rural connectivity. This growth is driven by public policy and the triple helix, a model of collaboration among universities, industry, and government that fosters innovation and regional development [29, 46, 48-52]. Emerging regions face challenges such as collective reputation and consumer risk, but branding, quality assurance, and institutional backing are crucial for growth. This study builds on this literature and offers case insights into New Jersey's wine industry to explore key indicators for success and areas for further development.

3. DATA AND METHODS

3.1. Data Collection & Sources

The primary data collection process was a purposeful sampling of 21 in-depth interviews with key New Jersey wine industry experts. In total, 29 interviews were conducted, as several participants were interviewed multiple times. Many participants also shared industry documentation via email, including opinions on the state of the industry, internal operational strategy documents, and other relevant industry data. Primary data collection was finalized after data saturation was reached.

The interview protocol was developed as a follow-up to the author's prior study of the Pennsylvania wine industry, which examined consumer perception, regulatory barriers, and regional branding in a similarly situated mid-Atlantic state [36]. This research also builds directly on earlier work analyzing New Jersey wine perception, particularly the findings on the impact of regional stereotypes and branding on consumer expectations [2]. Together, these studies informed the development of this project's interview themes and research design. Interview questions were semi-structured and guided by themes from prior research and relevant literature on emerging wine regions, quality signals, and institutional support [10, 11, 36]. The protocol focused on consumer perception, regulatory and distribution challenges, firm-level business practices, branding and storytelling, and the role of public support.

These semi-structured interviews, which ranged in length from 32 minutes to 1 hour and 18 minutes, were conducted primarily over Zoom, with some taking place over the phone. The participants represented a broad cross-section of industry, including staff from aligned non-profits, faculty from relevant higher education institutions, state and local government representatives, tourism professionals, wine educators, wine journalists, winery owners and operators, winemakers, and sommeliers. This range of participants provided varied and complementary perspectives from policy and regulatory viewpoints to market-facing, production-level, and consumer education insights. This helped surface nuanced and overlapping challenges across the industry. While the analysis focused on thematic patterns across all participants, there is potential for future segmented analyses by stakeholder type to refine and prioritize specific themes further. All interviews were recorded with full Institutional Review Board (IRB) approval and participant consent.

A comprehensive secondary data collection was employed to triangulate and confirm specific participant claims, complementing the interviews. This step, which was crucial in ensuring the research's robustness, helped minimize potential bias from both the participants and the researcher. All relevant media articles listed on the *Garden State Grape Growers Association* website from 2012 to 2024 were reviewed as part of this process. Additionally, publicly available industry-related documents were sourced from multiple organizations, reviewed, and analyzed using document analysis methods. This included the *Garden State Grape Growers Association*, *Rutgers University, the New Jersey Center for Wine Research and Education, Camden County Community College*, *Stockton University, the Outer Coastal Plain Vineyard Association, the New Jersey Wine Industry Advisory Council*, *the New Jersey Winemakers Co-Op*, *the New Jersey Division of Alcoholic Beverage Control (ABC)*, *the New Jersey State Agriculture Development Committee (SADC)*, and *the New Jersey Division of Travel and Tourism.* Furthermore, aca-

demic literature, grey literature, and public policies from other emerging wine regions were utilized to reinforce the triangulation process, contextualize the findings, and inform potential policy recommendations. These multiple layers of data collection ensured a comprehensive and validated analysis of the emergent themes.

3.2. Methods

This research primarily employed thematic analysis (TA) with an inductive approach, allowing themes to emerge naturally from the data rather than being constrained by pre-existing frameworks or assumptions. Thematic analysis is well-suited for exploratory research, as it enables the direct identification of patterns of meaning from participants' lived experiences. The process included data review, open coding, theme refinement, and naming, all aimed at generating a focused interpretation of the major emergent issues. This approach ensured that the themes reflected the nuanced and complex realities of the New Jersey wine industry [53]. These organically arising themes formed the foundation for the study's broader analysis [54, 55].

The analysis followed a structured, multi-layered process that combined thematic coding, sentiment analysis, and document triangulation. The author coded all transcripts using an iterative process involving memoing, codebook development, and thematic clustering. While a single researcher conducted the analysis, steps were taken to ensure consistency and reliability. To support intra-rater reliability, a subset of transcripts was recoded several weeks after the initial round, with strong alignment observed between the original, second-round, and third-round codes [56]. The themes were categorized as primary or secondary based on frequency and interpretive significance. Primary themes were raised by a broad share of participants and often connected to systemic barriers or opportunities reflected in the aligned literature and documents. Secondary themes were raised less frequently but added nuance when tied to specific contexts. These distinctions were further reinforced through triangulation with relevant policy documents and prior studies on adjacent emerging wine regions.

While this study employed a single-coder design, qualitative research does not always require multiple coders or interrater reliability to establish rigor, as analytic quality can be demonstrated through alternative systematic and transparent processes rather than solely through coder counts [57, 58]. Single-coder approaches are commonly accepted when supported by practices such as triangulation, detailed documentation, externally validated data, and intra-rater reliability checks, all of which were implemented in this study [59, 60]. Foundational texts likewise stress that consistency, reflexivity, and methodological alignment are central to validity, rather than exclusively the number of coders [58, 61]. The aim is to provide a transparent analytic path so that the development of concepts and themes can be assessed even if alternative categories might be generated by other researchers [62]. To this end, this study incorporated intra-rater checks, NVivo AI sentiment analysis, descriptive statistics, and extensive document triangulation, aligning with peer-reviewed literature and reflecting a systematic process consistent with best practices in qualitative research. This approach demonstrates that the findings are reliable and methodologically sound within a single-coder framework [57–62]. Document analysis served as a complementary method to corroborate and contextualize interview findings. Key regulatory, promotional, and planning documents were reviewed in detail to strengthen the evidentiary base. In cross-referencing participant data with these materials, document analysis reduced potential bias and reinforced the validity of the thematic structure [63]. Themes lacking external support were excluded from final reporting.

In addition, this research employed an innovative approach by applying AI-powered sentiment analysis as a secondary analysis method to assess the emotional tone of the interview data and uncover potential primary industry issues. The sentiment analysis was conducted using NVivo AI, leveraging its automated text analysis capabilities to categorize stakeholder emotions as positive, negative, or neutral. A predefined dictionary of industry-specific terms was applied, and intra-coder reliability checks were performed to validate the AI's classifications, which ensured consistency and accuracy. This analysis, conducted using NVivo's machine learning algorithms, classifies the sentiment as positive, negative, or neutral and detects more subtle emotions, such as excitement or frustration [64].

Following the initial AI-powered sentiment analysis, the researcher manually triangulated all sentiments to confirm the findings. During the manual validation of NVivo AI's sentiment analysis, a few categorizations were found to be inaccurate, particularly those involving nuanced, ambiguous, sarcastic, or unclear phrases. In some instances, the researcher re-listened to the recorded interviews to gather additional context and ensure accurate interpretation. These were mitigated by excluding the problematic instances from the final findings and focusing only on consistently validated sentiments across automated and manual triangulation processes. This manual check ensured that sentiment was only applied where tone could be clearly and consistently interpreted.

The final results reflect only those sentiments that withstood this validation process. Using sentiment analysis, quantitative insights were provided into the participants' emotional responses, offering a complementary perspective to the thematic findings and illustrating the critical issues in the industry from the participants' point of view [65, 66].

In addition, descriptive statistics were employed to support the qualitative insights further and quantify specific themes and sentiments, a technique widely accepted for identifying salience in qualitative research [55, 67]. For instance, the percentage of participants highlighting particular emergent themes in the industry was calculated; all duplicate participants were removed from the percentages in the findings. These statistics provided a transparent and accessible overview of the data, which helped summarize key findings and illustrate trends within the responses [68].

This study employed a robust mixed-methods approach, integrating thematic analysis, document review, and triangulation, as well as AI-powered sentiment analysis and descriptive statistics. These methods reduced bias, reinforced key findings, and provided a multidimensional understanding of the New Jersey wine industry. The final results were shaped by the convergence of three core analytic layers: the frequency and interpretive depth of participant themes, the emotional tone identified through validated sentiment analysis, and alignment and verification with external documents and prior research. This triangulated approach supported the identification of themes, informed their interpretation, and guided the development of final recommendations.

4. FINDINGS AND DISCUSSION

Following the research, a continual comparative analysis of data, text mining, document analysis, and triangulation revealed distinct patterns that represented critical categorical findings regarding the New Jersey wine industry. These findings reveal the challenges and opportunities within the industry, with clear themes developing across primary and secondary emergent themes.

As previously discussed, primary and secondary themes were identified based on their frequency of occurrence, depth, consistency, and strategic relevance. A larger share of participants raised primary themes and cut across stakeholder groups, often tying into broader structural or market concerns. Secondary themes appeared less frequently or were more context-specific, but they provided valuable insights.

This distinction was guided by both quantitative mention and qualitative weight, reinforced through document analysis and alignment with prior literature. Many findings mirror patterns observed in other geographically adjacent emerging regions, such as Pennsylvania and Connecticut, as well as earlier studies on New Jersey itself, where collective reputation, regulatory constraints, and regional branding influence market potential [2, 23, 36]. These parallels suggest enduring structural barriers while highlighting dynamics specific to New Jersey's policy and identity landscape. The ten fundamental primary themes that will be explored in depth through this section include:

1. Quality Challenges, Collective Reputation, and Public Perception of New Jersey Wines
2. Marketing and Distribution Challenges
3. Tourism and Agritourism Potential
4. Regulatory Challenges and Reducing Innovation
5. The Role of Research and Development/Extension Support
6. Workforce and Training Issues
7. Changing Consumer Preferences
8. Collective Action and Cooperation Among Wineries
9. Need for More Grapes and Vineyard Incentives
10. Branding, Storytelling, and Digital Transformation Deficiencies

In addition to these primary findings, seven secondary themes were also identified for further consideration and analysis:

1. Sustainability and Innovation in Viticulture
2. Impact of Climate Change on Wine Production
3. Competition from Other Beverage Industries
4. Challenges of Small Wineries
5. Importance of Wine Competitions and Recognition
6. Potential of Co-op Models
7. Barriers to Entry for New Wineries

While these are interconnected themes, each will be discussed and analyzed for clarity. In addition, a brief synthesis at the end of this section will consolidate these findings to highlight their impact on New Jersey's wine industry.

4.1. Primary Themes

4.1.1. Quality Challenges, Collective Reputation, and Public Perception of New Jersey Wines

New Jersey wines face significant reputation challenges, with 60% of participants highlighting inconsistent quality and entrenched stereotypes as critical barriers. Negative sentiment is common, as even high-quality producers are impacted by subpar offerings. "There is

amazing wine here, but there's still just so much bad wine that people happen to have, and they don't want to try it again," one participant noted. Industrial stereotypes, perpetuated by pop culture phenomena like The Sopranos and Jersey Shore, exacerbate the issue, creating a "gravitational pull" that undermines credibility, noted one participant. Research supports that weak branding and inconsistent quality limit growth potential, perpetuating the "one bad apple" effect where a single poor experience deters repeat visits [10, 36].

Public unawareness further compounds the reputation issue, with 30% of participants identifying it as a critical challenge. "People don't even know we have vineyards here. They think New Jersey is just factories and highways," one stakeholder remarked. Despite notable improvements in wine quality, outdated perceptions persist, which limit the state's ability to attract and retain local and out-of-state customers. Additionally, the limited visibility of New Jersey wines in restaurants and retail spaces reinforces these stereotypes. "Without being able to go to a restaurant and taste New Jersey wines, you don't go home thinking, 'Let me buy that wine,'' a participant explained.

Addressing these challenges requires coordinated action to reshape perceptions and attitudes. Participants emphasized the need for consistent messaging, quality-driven branding, and expanded distribution networks to spotlight New Jersey's unique terroir and winemaking potential. Investments in quality assurance programs and collaborative marketing can help foster local pride and attract consumer interest. As one participant reflected, "The wines are rapidly improving, but it might be too late for New Jersey to ever be seen as a world-class region" [27, 36, 69].

4.1.2. Marketing and Distribution Challenges

As cited by 50% of participants, marketing and distribution challenges emerged as a significant barrier, with predominantly negative sentiment reflecting frustration over limited visibility and difficulty accessing broader markets. Stakeholders described their reliance on local channels, such as farmers' markets and tasting rooms, which they believe restricts their growth potential. "We're too small to get picked up by distributors," one participant explained, noting that distributors often favor larger production regions and producers. The absence of a cohesive regional branding strategy exacerbates these challenges, leaving wineries to struggle in competing beyond local markets. "How do we break through and get noise out? We need to figure out how to market ourselves regionally," emphasized one stakeholder. Marketing wine as an experience good—where consumers make decisions with incomplete information—was likened to "chumming the water in Jaws," underscoring the difficulty of building consumer trust and excitement. New Jersey wineries risk being overshadowed without improved marketing efforts and distribution partnerships. "We need all the help we can get with people recognizing who we are," a participant remarked, reflecting the urgency to enhance brand awareness and reputation [16, 70].

4.1.3. Tourism and Agritourism Potential

New Jersey's proximity to urban hubs like New York City and Philadelphia offers significant agritourism potential, as highlighted by 35% of participants, who expressed predominantly positive sentiment. Stakeholders view this urban-rural connectivity as crucial to attracting visitors and enhancing local economies. "We need to expand beyond the beach and get visitors to our farms and wineries," one explained. However, limited infrastructure, such as wine trails and tourism partnerships, limits progress. "This is now the experience of the wine business, not just the wine business," noted a stakeholder, emphasizing the shift toward hospitality-driven tourism. Integrating wine with broader agritourism could create immersive experiences that appeal to diverse audiences. "For small wineries in New Jersey, it's about agritourism hospitality now," one participant said. Improved infrastructure and targeted marketing could position the state as a competitive wine tourism destination, thereby enhancing rural economic development [49, 71]. "Agri-tourism isn't just about wine tastings anymore—it's about making people fall in love with the whole experience, from the farm to the bottle," noted one participant.

4.1.4. Regulatory Challenges and Reducing Innovation

Strict regulations, cited by 45% of participants, present a barrier to growth, with a strongly negative sentiment reflecting widespread frustration over restrictive laws. Legal constraints such as the three-acre cultivation rule and the on-site production mandate disproportionately impact urban wineries and small-scale producers. "The law requires all New Jersey wineries to have a vineyard with at least three acres of vines and to make wine on-site, which is a huge barrier," one participant explained. These rules constrain innovation and scalability, reinforcing the urban–rural divide, yet they also create a powerful branding opportunity centered on

locally grown fruit. Urban wineries often face entry barriers, while rural wineries encounter challenges such as low foot traffic and limited infrastructure. "We can't put our wineries in downtown environments like breweries can," noted one stakeholder, emphasizing disparities between the wine and craft beer industries, although these wineries can open tasting rooms.

Frustration with the *New Jersey Alcoholic Beverage Control (ABC)* was also common, with one participant describing it as "a nightmare to work with." The current legal framework restricts partnerships, cooperative models, and creative marketing approaches, hindering the industry's ability to adapt to consumer trends. However, participants acknowledged that the three-acre rule provides a rallying point for advocacy. As one remarked, "The three-acre rule gives us something to rally around... but sometimes it feels like the juice isn't worth the squeeze!" Examples like Alsace, France, and New Jersey's own Winemakers Co-Op highlight the potential benefits of innovative collaboration and flexible regulations [72, 73]. Regulatory reforms that address these barriers unlock opportunities for boutique urban wineries, co-op distribution models, and dynamic growth strategies, positioning New Jersey's wine industry to compete more effectively in broader markets. However, elements like the three-acre requirement may also offer unique branding potential tied to local production, warranting careful consideration of benefits and trade-offs [74].

4.1.5. The Role of Research/Development and Extension Support

A lack of robust extension services emerged as a critical barrier, cited by 50% of participants, with negative sentiment reflecting frustration over insufficient state support. Stakeholders emphasized the importance of having dedicated experts to guide wineries in improving grape quality, adapting to climate change, and fostering sustainability. "At a minimum, we need a state viticulturist and state enologist solely focused on the wine industry," one participant stressed. The absence of strong academic partnerships, particularly with Rutgers University, further compounds the issue; however, participants noted the quality of the current staff and the need for additional state support. "Successful wine regions have robust academic collaboration, and we don't," a stakeholder noted, highlighting how access to scientific expertise helps other regions thrive. New Jersey wineries lack the tools to address local challenges, such as disease-resistant varietals and climate adaptation, without robust extension services. Investment in extension services is essential for advancing the state's wine industry. Without this infrastructure, stakeholders fear New Jersey will lag behind better-supported regions, leaving its wineries at a competitive disadvantage [29, 31, 75].

4.1.6. Workforce and Training Issues

Workforce challenges, cited by 35% of participants, emerged as a key barrier, with sentiment ranging from neutral to negative. Stakeholders highlighted a significant skills gap, noting the lack of formal education and training programs as a major obstacle. "It's hard to find workers who are skilled in winemaking. We don't have the programs to train them," one participant explained. This skills gap affects all aspects of operations, from vineyard management to marketing and hospitality, limiting wine quality and scalability. "You see wineries struggling to find professionals knowledgeable in winemaking," another stakeholder observed. Participants emphasized the importance of formal education programs, apprenticeships, and training initiatives in building a skilled workforce. "We need to provide training and programs to develop a skilled winemaking labor force in New Jersey," one interviewee emphasized. Farmers interested in agritourism face similar barriers, with limited guidance on how to diversify their operations. Investing in workforce development through education and training is crucial for enhancing wine quality, promoting agritourism, and ensuring the industry's long-term sustainability [76].

4.1.7. Changing Consumer Preferences

As 30% of participants noted, shifting consumer preferences are reshaping the New Jersey wine industry. Sentiment ranged from positive to neutral, as stakeholders recognized opportunities for growth by aligning with the priorities of younger consumers. "There's a big market for sweeter wines, even though they aren't to my taste," one participant remarked, highlighting the potential to cater to new palates. Younger generations value sustainability, unique flavors, and affordability over traditional markers, such as AVA labels. "The next generation doesn't care about AVA labels; they care about sustainability and the story behind the wine," explained a stakeholder. A *Wine Institute* study found that nearly three-quarters of U.S. consumers would consider sustainably produced wine, with nine out of ten millennials willing to pay more for such products [77]. Participants also noted openness to hybrid grape varieties and unconventional styles. "This generation doesn't care about the prejudice against hybrids—they just want good

wine and new flavors," one interviewee said. Innovation in hybrids and distinct offerings presents an opportunity to engage adventurous, younger consumers. Adapting to these trends by prioritizing sustainability and offering innovative wines is crucial for New Jersey wineries to attract new customers and remain competitive in a rapidly evolving market.

4.1.8. Collective Action and Cooperation Among Wineries

The collective action, noted by 35% of participants, emerged as a critical theme for addressing shared challenges, though sentiment was mixed. Stakeholders acknowledged the potential of collaboration but expressed frustration with industry fragmentation. "We're stronger together, but it's like herding cats trying to get everyone on the same page," one participant remarked. This lack of unity has stalled progress on key issues, including marketing, lobbying for regulatory reform, and establishing unified quality standards. "We need to have a unified voice about what we do as an industry, but there's so much fragmentation," another stakeholder observed. Without cohesion, New Jersey wineries struggle to establish a strong regional brand, which limits their competitiveness both locally and nationally [24]. Participants emphasized that collaboration could enhance marketing campaigns, policy advocacy, and market visibility. "If we could just agree on a unified message, New Jersey wine could be unstoppable," one interviewee noted. However, the lack of alignment continues to hinder these efforts. By adopting a collective action and coopetition approach, New Jersey wineries could pool resources, amplify their impact, and address shared challenges effectively. A more unified strategy, particularly in terms of quality assurance, would strengthen the industry's regional identity and enhance its competitive advantage [24].

4.1.9. Need for More Grapes and Vineyard Incentives

The need for increased vineyard acreage and incentives was a recurring concern, with 40% of participants highlighting it as a critical area for industry support. Sentiment on this topic ranged from negative to neutral, as stakeholders expressed frustration over the limited land dedicated to grape cultivation and the lack of state-level initiatives to encourage expansion. "We simply don't have enough vineyards in the state to meet production needs. We need real incentives for grape growers," one participant emphasized, reflecting a widespread challenge in meeting the demand for high-quality grapes.

Establishing new vineyards is a costly and long-term investment, which many small operators cannot afford without financial support. "The cost of planting new vineyards is enormous, and most of us just can't afford to do it without help," another stakeholder shared, highlighting the economic barriers potential growers face. While there is demand for high-quality fruit from both within and outside the state, the limited supply of grapes restricts production and hinders the region's ability to compete with larger wine-producing states. "There's more demand than supply currently for high-quality fruit," one participant noted, emphasizing the disconnect between market potential and production capacity. Participants agreed that introducing targeted incentives, such as tax breaks or grants, would provide much-needed support for expanding vineyard acreage. "Any kind of incentive at all to encourage people to grow more fruit would be a massive help," one interviewee suggested, pointing to the dual benefit of increasing production capacity while preserving farmland and fostering sustainability. Without such measures, the scalability and sustainability of the New Jersey wine industry remain uncertain, leaving wineries unable to meet the growing demand of consumers or improve their competitive standing [78].

4.1.10. Branding, Storytelling, and Digital Transformation Deficiencies

Branding and digital transformation challenges, identified by 30% of participants, were met with predominantly negative sentiment, as stakeholders criticized the lack of a cohesive regional identity and underdeveloped digital strategies. "Our wine doesn't sell itself; the narrative is just as important," one participant noted, highlighting the importance of storytelling in creating emotional connections with consumers. While some wineries excel at individual branding, the region struggles with outdated websites, inconsistent social media strategies, and insufficient e-commerce platforms. "Most wineries have terrible websites. You can't even figure out how to order the wine," another stakeholder remarked, emphasizing a critical gap in online infrastructure.

Direct-to-consumer (DTC) sales were a particular pain point, with participants identifying outdated digital sales channels and poor e-commerce execution as significant barriers to growth. "Digital storytelling and selling are crucial, and we're just not doing it," one respondent emphasized. Weaknesses in social media strategies further hinder consumer engagement, with stakeholders noting a lack of connection to the land, people, and stories behind the wines. Participants recommended investments in unified branding, modernizing DTC platforms, and leverag-

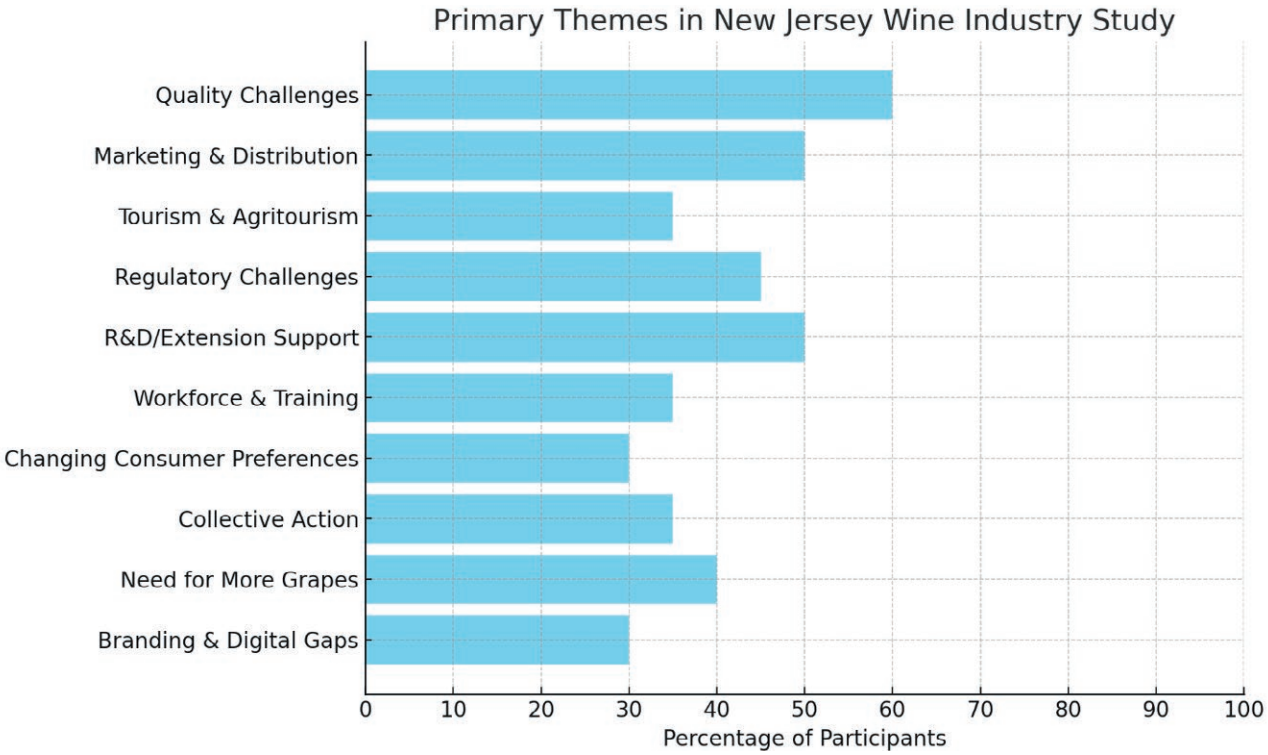

Figure 1. This chart illustrates the percentage of participants who cited each primary theme. Document analysis reinforced these broadly shared issues and aligned with findings from prior research.

ing digital storytelling to engage consumers emotionally and remain competitive. Strengthening digital infrastructure and cohesive narratives will allow New Jersey wineries to expand their market reach and secure a stronger foothold in an increasingly digital wine industry [79, 80].

4.2. Secondary Themes

4.2.1. Sustainability and Innovation in Viticulture

Sustainability, mentioned by 30% of participants, reflects a growing focus on environmental practices, such as reducing pesticide use and experimenting with hearty hybrid grape varieties, all of which are of value in the global wine market. While optimism and sentiment are high and positive, smaller wineries face barriers like high costs and limited infrastructure. "New Jersey can be the next Napa, but we need to innovate," one participant remarked, emphasizing the importance of sustainable practices for long-term viability [81].

4.2.2. Impact of Climate Change on Wine Production

Climate change, noted by 20% of participants, raises concerns about its effects on grape quality and growing seasons. The sentiment was negative, with growers highlighting issues such as increased rainfall and unpredictable weather patterns. While some wineries are exploring resilient grape varieties and new management practices, these efforts remain limited. "I'm spooked by how much rain we've gotten in the last four years. It's having a huge impact on our vineyards," one participant stated. Adapting to climate instability is essential to maintaining quality and competitiveness in the evolving wine market [82].

4.2.3. Competition from Other Industries

Competition from craft beer and cannabis, mentioned by 20% of participants, is seen as a growing challenge, particularly with younger consumers. The sentiment was negative, as stakeholders noted that breweries benefit from looser regulations, and the emerging cannabis market diverts attention from wine. "It feels like cannabis is pulling customers away from tasting rooms—now people prefer a puff to a pour," one participant remarked. Without innovative marketing or new product offerings, wineries may struggle to capture the interest of younger consumers who are increasingly diversifying

their drinking habits across various product categories [83, 84].

4.2.4. Challenges of Small Wineries

Scaling operations are a significant obstacle for small wineries, as 30% of participants noted, with sentiments ranging from neutral to negative. High operating costs, limited distribution access, and competition from larger producers make growth challenging. Many small wineries are run as passion projects, which limits their investment in equipment, marketing, and staffing, contributing to inconsistent production quality. "We can't operate as hobby businesses if we want the industry to grow," one participant stated. Supporting these wineries through co-op models, shared resources, or incentives could enhance their scalability and bolster the region's overall impact [85, 86].

4.2.5. Importance of Wine Competitions and Recognition

Winning awards and gaining critical recognition were highlighted by 25% of participants as a valuable tool for elevating New Jersey wines. However, sentiment was neutral due to mixed views on their current effectiveness. While competitions can bring visibility and credibility, many participants feel their impact has diminished, especially as prestigious platforms like *Wine Enthusiast* shift focus away from emerging regions. "Wine Enthusiast isn't scoring emerging regions anymore, which is a big loss for us," one stakeholder noted. Broader recognition from well-regarded contests could help New Jersey wineries establish credibility, attract consumers, and mitigate perceived risks. However, the decline in these opportunities leaves many feeling disconnected from opportunity [11, 40].

4.2.6. The Potential of Co-op Models

Co-op models were supported by 20% of participants, with positive sentiment about their ability to address financial and distribution challenges. These models, common in other agricultural sectors, facilitate resource sharing for production and distribution. The success of New Jersey's *Winemakers Co-Op* demonstrates the potential for further adoption, particularly in creating shared facilities, equipment, and distribution networks. "If we could pool our resources and create co-ops for production and distribution, we could lower costs and increase output," one participant noted. However, regulatory changes, such as relaxing on-site production requirements, may be necessary to expand these models effectively. Co-ops have been successful in regions like Alsace, France, and could offer New Jersey wineries a pathway to reduce costs, scale operations, and enhance their market presence [24, 72, 87].

4.2.7. Barriers to Entry for New Wineries

High entry costs and strict regulations were identified by 25% of participants as significant barriers to new wineries, with a strongly negative sentiment. The combination of expensive property, costly equipment, and regulatory requirements, such as the *New Jersey Division of Alcoholic Beverage Control's* minimum acreage rule and the Farmland Assessment Act's three-acre mandate, creates prohibitive hurdles for new entrants. "The initial investment is huge. It's really hard to start a winery unless you have significant capital," one participant explained. These barriers limit industry growth, stifle innovation, and reduce diversity in business models and wine offerings. Addressing these challenges through regulatory reform and targeted support could enable more dynamic industry growth and foster new opportunities [88-91].

4.3. Theme Integration

These findings indicate that New Jersey's wine industry faces several structural challenges, including limited extension support, workforce development issues, restrictive regulations, and a lack of vineyard incentives. Issues with collective reputation and weak regional brand equity continue to hinder the process of gaining consumer trust and expanding market access. At the same time, clear opportunities, such as growing interest in agritourism, improving quality, shifting consumer preferences, urban-rural connectivity, and cooperative models, offer paths forward.

5. LIMITATIONS

While this study provides valuable insights into the New Jersey wine industry, several limitations must be noted. First, the sample size of 21 individuals and 29 total in-depth interviews, though appropriate for qualitative research, may limit the diversity of perspectives captured, as some participants were interviewed multiple times. This focused sample enables detailed thematic exploration but may not accurately represent the broader industry.

Second, participant bias is a potential concern, as the purposeful selection of highly involved experts

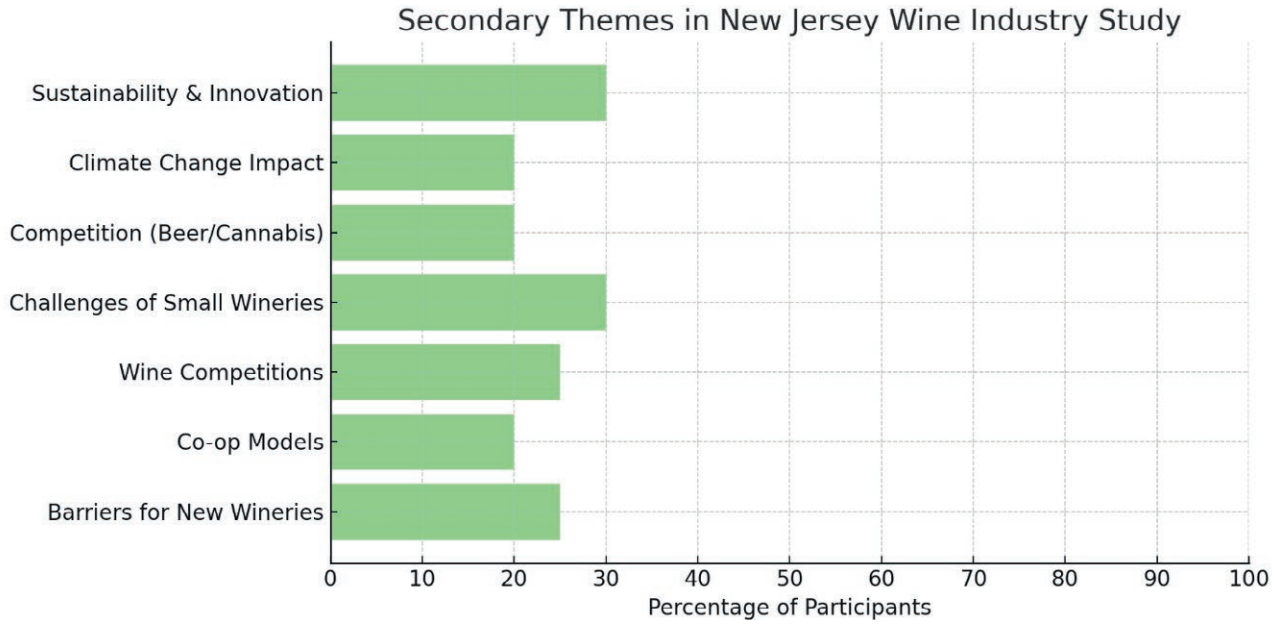

Figure 2. The chart illustrates the percentage of participants who cited each secondary theme. Though less frequent, these themes were supported by external data and highlight emerging or context-specific challenges.

might skew findings toward established voices, potentially marginalizing emerging perspectives. Similarly, the researcher's role in data collection and analysis introduces the possibility of subjective influence, despite the use of structured protocols and efforts to maintain objectivity. To mitigate these issues, the study employed triangulation, cross-referencing interview data with industry reports, intra-rating reliability, public policies, and aligned academic literature to provide a broader context and enhance credibility. The integration of extensive external document analysis and AI sentiment analysis enhances the validity of the findings, ensuring they accurately reflect both individual experiences and broader industry realities. Although this study employed a single-coder design, recent methodological work emphasizes that rigor can be demonstrated through systematic and transparent processes rather than solely relying on coder counts [57, 59, 62]. This research addressed the standard by employing a consistent methodological alignment and incorporating iterative coding, memoing, intra-rater checks, and triangulation, utilizing AI sentiment analysis, descriptive statistics, peer-reviewed literature, and document review.

6. RECOMMENDATIONS & CONCLUSION

While the New Jersey wine industry has demonstrated measurable progress in quality, enduring challenges remain. This study highlights several issues that continue to restrict the industry's capacity for sustained growth and market recognition. New Jersey's wine industry remains constrained by negative public perception, inconsistent branding, restrictive regulations, limited distribution, and operational inefficiencies, making the recommendations below critical to overcoming these barriers. While this research reveals frustration over the obstacles, it also fosters optimism about the industry's future and opportunities if the identified challenges are addressed.

Addressing these challenges will require a deliberate and strategic approach. First, creating a unified brand identity that emphasizes quality and regional distinctiveness is important for New Jersey wineries to compete effectively. A statewide marketing campaign highlighting the unique terroir, improved wine quality, and the stories of local winemakers could position the state as a premier wine destination. In addition, efforts to overcome negative perceptions must include cohesive branding with hyper-focused programming that emphasizes quality and is designed to enhance the collective reputation of New Jersey wines. This can include the introduction of industry-wide quality certifications, educational outreach campaigns, and media partnerships with food and wine critics, influencers, and travel writers to build public trust and elevate the region's profile.

Regulatory reforms that address these barriers, including rethinking the three-acre rule, could unlock

opportunities for boutique urban wineries, innovation, co-op distribution models, and dynamic growth strategies, positioning New Jersey's wine industry to compete more effectively in broader markets. However, the three-acre requirement may also offer unique branding potential tied to local production, so reforms should be approached to understand the balance between removing structural limitations and preserving the identity, place-based storytelling value, and market distinctiveness that these rules can provide.

Furthermore, expanding research and development efforts through partnerships with Rutgers University and other institutions would provide the scientific support needed to adapt to New Jersey's unique viticultural conditions. Increased funding for extension services, including the creation of a state viticulturist and oenologist position, is vital for long-term success.

The industry must also address the limited availability of vineyards by incentivizing new plantings through tax breaks, grants, and other financial support. Expanding vineyard acreage not only meets growing production demands but also enhances the scalability of New Jersey's wine sector while focusing on terroir and improving brand image. In addition, strengthening distribution networks is equally important, as small wineries often struggle to access retail and restaurant markets. Moreover, establishing cooperative distribution models could alleviate these challenges, while direct shipping opportunities and partnerships with grocers and the hospitality sector can help increase visibility and market penetration. Finally, and most importantly, there is a hyperfocus on quality and quality assurance. Implementing comprehensive quality programs, such as quality production standards and rigorous wine competitions, will enhance consumer trust and ensure that New Jersey wines are recognized as premium products.

This study contributes to the literature by providing a comprehensive analysis of the New Jersey wine industry, offering insight into how emerging wine regions can address systemic challenges such as regulatory barriers, branding and quality inconsistencies, and distribution limitations. Integrating qualitative insights and aligned best practices with actionable policy recommendations establishes a framework that other developing regions can adapt to improve marketability, brand equity, collaboration, and growth.

REFERENCES

[1] J. Dunham, 2025. New Jersey wine industry: Economic impact study 2025. WineAmerica. https://wineamerica.org/economic-impact-study-2025/new-jersey-wine-industry-2025/

[2] R. H. Ashton, 2014. Nothing good ever came from New Jersey: Expectations and the sensory perception of wines. Journal of Wine Economics, 9(3), 304–319.

[3] Garden State Wine Growers Association, 2025. About NJ Wine. https://www.newjerseywines.com/about-nj-wine/

[4] S. Cardinale, B. Nguyen, T.C. Melewar, 2016. Place-based brand experience, place attachment, and loyalty. Marketing Intelligence & Planning, 34(3).

[5] J.J. Cronin Jr, M.K. Brady, G.T.M. Hult, 2000. Assessing the effects of quality, value, and customer satisfaction on consumer behavioral intentions in service environments. Journal of Retailing, 76(2), 193–218.

[6] J.S. Lee, D. McCole, D.F. Holecek, 2020. Exploring winery visitors in the emerging wine regions of the North Central United States. Sustainability.

[7] U. Akkucuk, J. Esmaeili, 2016. The impact of brands on consumer buying behavior: An empirical study on smartphone buyers. *International Journal of Research in Business and Social Science*, *5*(4), 1-16.

[8] B. Canziani, E.T., Byrd, 2017. Exploring the influence of regional brand equity in an emerging wine sector. Journal of Wine Economics, 12(4), 370-377.

[9] J. Beneke, R. Flynn, T. Greig, M. Mukaiwa, 2013. The influence of perceived product quality, relative price, and risk on customer value and willingness to buy: A study of private label merchandise. Journal of Product & Brand Management, 22(3), 218–228.

[10] A. Ugochukwu, 2015. Essays on collective reputation and authenticity in agri-food markets. 204 Doctoral dissertation, University of Saskatchewan. https://www.baclac.gc.ca/eng/services/theses/Pages/list.aspx?NW_S=Ugochukwu,+Albert

[11] D. Kaimann, C.L.M. Spiess Bru, B. Frick, 2023. Ratings meet prices: The dynamic relationship of quality signals. Journal of Wine Economics, 18(3), 226-244.

[12] F. Shi, Q. Gu, T. Zhou, 2024. Understanding brand reputation: a case study of Chinese wineries. International Journal of Contemporary Hospitality Management, 36(8), 2774–2794.

[13] H.H. Ali, C. Nauges, 2007. The pricing of experience goods: The example of en primeur wine. American Journal of Agricultural Economics, 89(1), 91–103.

[14] S. Lecocq, M. Visser, 2006. What determines wine prices: Objective vs. sensory characteristics. Journal of Wine Economics, 1(1), 42–56.

[15] R. Veale, P. Quester, 2008. Consumer sensory evaluations of wine quality: The respective influence of price and country of origin. Journal of Wine Economics, 3(1), 10–29.

[16] O. Gergaud, F. Livat, B. Rickard, F. Warzynski, 2017. Evaluating the net benefits of collective reputation: The case of Bordeaux wine. *Food Policy*, *71*, 8–16.

[17] I. Horowitz, L. Lockshin, 2002. What price quality? An investigation into the prediction of wine-quality ratings. Journal of Wine Research, 13(1), 7–22.

[18] J. Hilger, G. Rafert, S. Villas-Boas, 2011. Expert opinion and the demand for experience goods: An experimental approach in the retail wine market. Review of Economics and Statistics, 93(4), 1289–1296.

[19] R. H. Ashton, 2012. Reliability and consensus of experienced wine judges: Expertise within and between? Journal of Wine Economics, 7(1), 70–87.

[20] B.J. Babin, C. Bushardt, 2019. Third-party ratings and the US wine market. International Journal of Wine Business Research, 31(2), 151–162.

[21] U.R. Orth, M. McGarry Wolf, T.D., Dodd, 2005. Dimensions of wine region equity and their impact on consumer preferences. Journal of Product & Brand Management, 14(2), 88–97.

[22] P. Nugent, 2023. Sour grapes and sweet harmony: Historicizing collective action problems in the South African wine industry. Journal of Wine Economics, 18(4), 332–340.

[23] E.C. Villanueva, D. Moscovici, 2016. Sustainable wine tourism development in burgeoning regions: Lessons from New Jersey and Connecticut. International Journal of Economics and Business Research, 12(4), 313-333.

[24] K.M. Birkeland, K.K. Bito, 2024. Leveraging Insights from Established Wine Regions to Empower Emerging Wine Regions (Master's thesis, University of Agder).

[25] K.H. Lim, 2021. Sounds better? Potential implications of obscure American Viticultural Areas to consumers. Journal of Agricultural and Applied Economics, 53(1), 37–54. doi:10.1017/aae.2020.27

[26] S. Landon, C.E. Smith, 1997. The use of quality and reputation indicators by consumers: The case of Bordeaux wine. Journal of Consumer Policy, 20(3), 289–323.

[27] A.L. Rihn, K.L. Jensen, D.W. Hughes, 2022. Consumer perceptions of wine quality assurance programs: An opportunity for emerging wine markets. Sustainability, 14(4), 2340.

[28] L. Macedoni, 2022. Asymmetric information, quality, and regulations. Review of International Economics, 30(4), 1180–1198.

[29] P. Cerdán-Infantes, A. Maffioli, D. Ubfal, 2008. The impact of agricultural extension services: The case of grape production in Argentina. Office of Evaluation and Oversight (OVE). Inter-American Development Bank. Washington, DC.

[30] S. Vittek, 2023. How viticulture programs drive success for emerging wine regions. Seven Fifty Daily. Retrieved from https://daily.sevenfifty.com/how-viticulture-programs-drive-success-for-emerging-wine-regions/

[31] J.M. Cardebat, O. Guyottot, M. Hassan, 2025. Higher education institutions' territorial embeddedness and regional reputation and ecosystem: a study of French wine programs. Higher Education, 1–250.

[32] G.A. Akerlof, 1978. The market for "lemons": Quality uncertainty and the market mechanism. In Uncertainty in economics (pp. 235-251). Academic Press.

[33] G. Schamel, 2000. Individual and collective reputation indicators of wine quality. CIES Working Paper No. 10, March.

[34] M. Costanigro, J.J., McCluskey, C. Goemans, 2010. The Economics of Nested Names: Name Specificity, Reputations, and Price Premia. American Journal of Agricultural Economics, 92(5), 1339–1350. http://www.jstor.org/stable/40931090

[35] S. Bazen, J.M. Cardebat, M. Dubois, 2024. The role of customer and expert ratings in a hedonic analysis of French red wine prices: from gurus to geeks?. *Applied Economics*, *56*(46), 5513-5529.

[36] S. Porter, 2022. A Comprehensive Analysis of the Pennsylvania Wine Industry with Actionable Recommendations for Industry Improvement and Growth. West Chester University Doctoral Projects. 139. https://digitalcommons.wcupa.edu/all_doctoral/139

[37] J.C. Sweeney, G.N. Soutar, L.W. Johnson, 1999. The role of perceived risk in the quality-value relationship: A study in a retail environment. Journal of Retailing, 75(1), 77–105.

[38] J. Núñez, D. Martín-Barroso, F.J. Velázquez, 2024. The hedonic price model for the wine market: A systematic and comparative review of the literature. *Agricultural Economics*, *55*(2), 247-264.

[39] G.V. Jones, K.H. Storchmann, 2001. Wine market prices and investment under uncertainty: An econometric model for Bordeaux crus classés. *Agricultural Economics, 26*(2), 115–133.

[40] S.M. Porter, 2024. Decoding the Italian Wine Market: A Quantitative Macro-Economic Examination of Price and Expert Rating Influences. Wine Business Journal.

[41] P. Masset, J.P. Weisskopf, M. Cossutta, 2015. Wine tasters, ratings, and en primeur prices. *Journal of Wine Economics, 10*(1), 75–107.

[42] A. Patel-Campillo, A. DeLessio-Parson, 2016. Can symbolic capital enhance agricultural production? Exploring quality certification and branding in the Basque wine region. Sociologia Ruralis, 56(3), 319–341.

[43] M. Veseth, 2011. Wine wars: The curse of the blue nun, the miracle of two buck chuck, and the revenge of the terroirists. Rowman & Littlefield Publishers.

[44] J. Franken, M. Gómez, R.B. Ross, 2018. Social capital and entrepreneurship in emerging wine regions. Journal of Wine Economics, 13(4), 419-428.

[45] O. Ashenfelter, K. Storchmann, 2016. Climate change and wine: A review of the economic implications. *Journal of Wine Economics, 11*(1), 105–138.

[46] J.J. Dethier, A. Effenberger, 2012. Agriculture and development: A brief review of the literature. Economic Systems, 36(2), 175–205.

[47] A. Hira, 2013. Mapping out the Triple Helix: how institutional coordination for competitiveness is achieved in the global wine industry. Prometheus, 31(4), 271–303.

[48] J. Mota, R. Costa, A. Moreira, S Serrão, C. Costa, 2021. Competitiveness framework to support regional-level decision-making in the wine industry: A systematic literature review. Wine Economics and Policy, 10(2), 29-40.

[49] D. Cvijanović, D.J. Novaković, Z. Vojinović, 2017. Wine industry as a source of rural growth and development. In Proceedings of the International Scientific Conference "Strategies for the Agri-Food Sector and Rural Areas–Dilemmas of Development" (pp. 19-21).

[50] J.D. Van der Ploeg, 2018. The new peasantries: Rural development in times of globalization. Routledge.

[51] L.C. Chen, A. Kingsbury, 2019. Development of wine industries in the New-New World: Case studies of wine regions in Taiwan and Japan. Journal of Rural Studies, 72, 104–115

[52] V. Santos, P. Ramos, B. Sousa, M. Valeri, 2021. Towards a framework for the global wine tourism system. Journal of Organizational Change Management.

[53] V. Braun, V. Clarke, 2012. Thematic analysis. American Psychological Association.

[54] J.P. Williams, 2008. Emergent themes. The Sage encyclopedia of qualitative research methods, 1, 248–249.

[55] H. Miles, A.M. Huberman, J. Saldana, 2020.Qualitative data analysis: A methods sourcebook. New York: Sage Publications, Inc.

[56] J.L. Campbell, C. Quincy, J. Osserman, O.K. Pedersen, 2013. Coding in-depth semistructured interviews: Problems of unitization and intercoder reliability and agreement. Sociological methods & research, 42(3), 294–320.

[57] L. Busetto, W. Wick, C. Gumbinger, 2020. How to use and assess qualitative research methods. Neurol. Res. Pract. 2, 14. https://doi.org/10.1186/s42466-020-00059-z

[58] J. Morse, 2020. The changing face of qualitative inquiry. *International Journal of Qualitative Methods*, *19*, 1609406920909938.

[59] I.G. Raskind, R.C. Shelton, D.L. Comeau, H.L. Cooper, D.M. Griffith, M.C. Kegler, 2019. A review of qualitative data analysis practices in health education and health behavior research. Health Education & Behavior, 46(1), 32-39.

[60] V. Elliott, 2018. Thinking about the coding process in qualitative data analysis. Qualitative report, 23(11).

[61] M. Kawamoto, M. Koizumi, F. Yoshikane, 2023. Proposal of a qualitative content analysis process for a solo researcher. *Libri*, *73*(2), 139-152.

[62] L. Spencer, J. Ritchie, W. O'Connor, 2003. Analysis: practices, principles and processes. Qualitative research practice: A guide for social science students and researchers, 199, 218.

[63] G.A. Bowen, 2009. Document analysis as a qualitative research method. Qualitative research journal, 9(2), 27–40.

[64] Nvivo, 2024. How Auto Coding Sentiment Works. QSR International. https://help-nv11.qsrinternational.com/desktop/concepts/How_auto_coding_sentiment_works.htmL

[65] M. Taboada, 2016. Sentiment analysis: An overview from linguistics. Annual Review of Linguistics, 2(1), 325–347.

[66] M. Wankhade, A.C.S. Rao, C. Kulkarni, 2022. A survey on sentiment analysis methods, applications, and challenges. Artificial Intelligence Review, 55(7), 5731–5780.

[67] G. Guest, K.M. MacQueen, E.E. Namey, 2011. Applied thematic analysis. Sage Publications.

[68] R.W. Cooksey, 2020. Descriptive statistics for summarising data. Illustrating statistical procedures: Finding meaning in quantitative data, pp. 61–139.

[69] J.E. Wilson, 1998. Terroir: The role of geology, climate, and culture in the making of French wines (Wine Wheels). University of California Press.

[70] J. Tirole, 1996. A Theory of collective reputations (with applications to the persistence of corruption and firm quality). The Review of Economic Studies, 63(1), 1-22, http://www.jstor.org/stable/2298112

[71] D.K. Bole, 2024. Sustainable Wine Tourism: Best Practices. In: Martínez-Falcó, J., Marco-Lajara, B., Sánchez-García, E., Millán-Tudela, L.A. (eds) Wine Tourism and Sustainability. Palgrave Macmillan, Cham. https://doi-org.uccs.idm.oclc.org/10.1007/978-3-031-48937-2_5

[72] R. Morais, 2018. The history and role of wine cooperatives. Grapes & Grains. https://www.grapesandgrains.org/2018/02/the-history-and-role-of-wine-cooperatives.html

[73] Garden State Wine Growers Association, 2021. Garden State Wine Growers Association launches new tourism app produced by IGM Creative Group. Wine Industry Advisor. https://wineindustryadvisor.com/2021/09/07/garden-state-wine-growers-new-tourism-app/

[74] Justia, 2024. New Jersey Revised Statutes Title 33. Intoxicating Liquors § 33:1-10. Retrieved from https://law.justia.com/codes/new-jersey/title-33/section-33-1-10/

[75] College of Agriculture and Life Sciences, 2020. Research & Extension. Cornell University. From https://cals.cornell.edu/viticulture-enology/research-extension

[76] A. Reid, H. Dixon, C., McIndoe, S. Wiradika, 2024. A skills-based wine workforce. BERL. https://berl.co.nz/our-mahi/skills-based-wine-workforce

[77] Wine Institute, 2020. Consumer & trade research shows increased demand for sustainably produced wine. Wine Institute. https://wineinstitute.org/press-releases/consumer-trade-research-shows-increased-demand-for-sustainably-produced-wine/

[78] M. Ricioli, 2019. How tax reform brings opportunity for wineries and vineyards. Moss Adams. https://www.mossadams.com/articles/2019/march/tax-reform-opportunities-for-wineries-and-vineyards

[79] M. Ramšak, 2022. Wine Storytelling. In: Social Impact of Wine Marketing. Contributions to Management Science. Springer, Cham. https://doi-org.uccs.idm.oclc.org/10.1007/978-3-030-89224-1_3

[80] M. Risser, 2024. The digital mindset wineries need to embrace. UC Davis Continuing and Professional Education. https://cpe.ucdavis.edu/news/digital-mindset-wineries-need-embrace

[81] E. Pomarici, R. Vecchio, 2019. Will sustainability shape the future wine market?. Wine Economics and Policy, 8(1), 1-4.

[82] L. Hannah, P.R. Roehrdanz, M. Ikegami, A.V. Shepard, M.R. Shaw, G. Tabor, R.J. Hijmans, 2013. Climate change, wine, and conservation. Proceedings of the national academy of sciences, 110(17), 6907-6912.

[83] IWSR, 2023.The paradox of the US wine industry: Falling volumes, yet more regular drinkers. https://www.theiwsr.com/the-paradox-of-the-us-wine-industry-falling-volumes-yet-more-regular-drinkers/

[84] J.P. Caulkins, 2024. Changes in self-reported cannabis use in the United States from 1979 to 2022. Addiction.

[85] K. Kelley, 2015. Getting wines into local restaurants: Wine marketing. Penn State Extension. https://extension.psu.edu/getting-wines-into-local-restaurants

[86] M.A. Bonn, H.S. Chang, M. Cho, 2020. The environment and perceptions of wine consumers regarding quality, risk, and value: Reputations of regional wines and restaurants. Journal of Hospitality and Tourism Management, 45, 203–212. https://doi.org/10.1016/j.jhtm.2020.08.004

[87] The Winemakers Co-Op, 2024. The Winemakers Co-Op. https://thewinemakersco-op.com/

[88] New Jersey Department of Agriculture, 2024. Farmland assessment. Retrieved from: https://www.nj.gov/agriculture/divisions/anr/pdf/farmlandassessmentoverview.pdf

[89] New Jersey Division of Alcoholic Beverage Control, 2024. New Jersey Department of Agriculture; Rutgers Cooperative Extension, n.d.

[90] New Jersey Division of Alcoholic Beverage Control, 2024. State-issued/wholesale licenses. From https://www.njoag.gov/about/divisions-and-offices/division-of-alcoholic-beverage-control-home/licensing-bureau-applications-and-information/state-issued-wholesale-licenses/

[91] Rutgers Cooperative Extension, 2024. Planning to start a vineyard in New Jersey. Retrieved from https://njaes.rutgers.edu/fs1206/

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State of the International Wine Markets in 2024: Stability in Global Wine Trade Amid Declining Consumption and Production

Rafael del Rey[1], Simone Mueller Loose[2,*]

[1] *General Manager at the Spanish Observatory of Wine Markets (OeMv) & the Foundation for the Culture of Wine, Spain*
[2] *Department of Wine & Beverage Business, Hochschule Geisenheim University, Von-Lade-Straße 1, D-65366 Geisenheim, Germany*
Email: direccion@oemv.es; simone.loose@hs-gm.de
*Corresponding author.

Abstract. Despite simultaneous declines in global wine production and consumption, international wine trade remained stable in 2024, with export volumes rising by 0.8% and export value falling only slightly by 0.5%. This apparent resilience conceals significant variation across product categories, regions, and markets. Bulk wine exports increased notably, offsetting volume losses in bottled wine, largely driven by heightened production volatility and a growing need for intra-industry trade. At the same time, consumer preferences continued to shift toward white, sparkling, and low- and no-alcohol wines, as confirmed by both trade data and expert assessments. The three leading exporters – France, Italy, and Spain – displayed divergent developments, with Italy outperforming in both volume and value terms, largely due to its strong performance in sparkling wine exports. Italy is briefly presented as a best-practice case, warranting further research into the structural factors behind its long-term export success as a potential model for other wine-producing countries. On the import side, the United States, the United Kingdom, and Germany followed different trajectories, with the U.S. showing a tentative recovery in 2024, partly driven by anticipatory stockpiling amid fears of renewed tariffs. The escalation of U.S. tariff threats in early 2025 raised serious concerns about long-term trade stability and the role of the U.S. as a reliable export destination – developments that are likely to trigger structural shifts in global wine trade patterns. Industry experts continue to cite economic pressures, declining wine consumption, and increasingly restrictive alcohol policies as key challenges. While the 2024 trade performance may be viewed as a sign of resilience, special factors such as temporary stockpiling and shifting supply chains are expected to weigh on trade outcomes in 2025. These developments underscore the need for continuous monitoring, strategic adaptation, and deeper understanding of the structural transformations affecting global wine trade.

Keywords: global wine trade, wine types, industry strategies, tariffs.

1. WORLD WINE TRADE IN 2024

1.1. Falling demand and supply did not result in falling wine trade

Global wine trade remained stable in 2024, despite significant declines in both global wine consumption and production.

- According to the OIV, **global wine production** fell sharply for the second consecutive year, primarily due to severe climatic events and increased disease pressure in vineyards across major producing regions. Estimated at 225.8 million hectolitres, production declined by 4.8% compared to 2023, reaching the lowest volume recorded in over 60 years. All major producing countries reported harvests well below their 5-year averages [1].
- **Global wine consumption** also declined, dropping by 3.3% to an estimated 214.2 million hectolitres – its lowest level since 1961 – reflecting a general contraction in demand across several key markets [1].

Nevertheless, global wine exports remained remarkably stable. Export volumes rose slightly by 0.8% to 100.2 million hectolitres. However, the average export price per litre fell by 1.2% to €3.60, leading to a slight decline in total export revenues by 0.5% to €36.04 billion (Table 1).

Despite recent moderation, the value of international trade in wines and musts in 2024 remained well above pre-pandemic levels. After falling to €30 billion in 2020, global wine export revenues recovered strongly, exceeding 2017 levels by 18.3%, a gain of over €4.67 billion (Figure 1).

In contrast, export volumes have yet to return to pre-pandemic levels. Volumes peaked at nearly 113 million hectolitres during the post-COVID recovery phase but have since declined [2]. One contributing factor was overstocking in major markets such as the United States, where importers anticipated a consumption rebound that failed to materialise. Combined with inflationary pressures, sluggish economic growth, and global uncertainty, this oversupply curbed trade flows in 2023. However, 2024 marked a turning point, with export volumes stabilising after several years of decline.

1.2. Changes by product category – bottled wine, sparkling wine, bulk wine

While aggregate export figures appear stable compared to the sharp declines observed in 2023, a more detailed breakdown by product category, exporting country, and destination market reveals considerable variation beneath the surface. Notably, the simultaneous global decline in both wine consumption and production did not result in a corresponding contraction of international trade. This section examines these diverging trends in greater depth, exploring potential factors that may be sustaining trade volumes despite weakening demand and constrained supply.

Non-sparkling bottled wine, accounting for half of total trade volume, remains the most important export category (Table 1, Figure 2). Although affected by the global downturn in wine consumption, bottled wine exports fell only marginally by 1.0% in volume. This decline was offset by higher average export prices, resulting in stable export values for this category.

Sparkling wine diverged from the overall consumption trend, with trade volume increasing slightly by 0.1%. This development aligns with current and past industry expectations of increasing consumer preference for refreshing wine styles (Figure 3; [2]). However, the stable volume was accompanied by a decrease in average price, leading to a 3.9% decline in total export value.

Bag-in-Box (BiB) wines remain the smallest product category in terms of volume and are primarily consumed in Scandinavian countries [2]. The contraction of these markets [1] led to a significant decline of 3.9% in traded volume and a 4.8% drop in export value.

Bulk wine exports increased notably, in contrast to the decline observed in packaged wine categories**.** Trade volume rose by 3.9%, and export value grew by 9.3%. In terms of volume, this surge more than compensated for the decline in packaged wine exports. However, due to its

Table 1. Average prices, relative share of value and volume and change between 2023 and 2024 in % (based on data from [3]).

Category	Average price in €/L	Share of value in %	Change of value in %	Share of volume in %	Change of volume in %
Wine Total	€3.60	100	-0,5	100	+0,8
Bottled wine	€4.76	67	-0.0	51	-1.0
Sparkling wine	€7.90	24	-3.9	11	+0.1
Bulk wine	€0.77	7	+9.3	35	+3.9
Bag-in-Box (BiB)	€1.90	2	-4.8	3	-3.9

Figure 1. Development of global wine trade in volume (million hectolitres), export value (€ billion) and average prices per litre (€/l) 2017-2024, based on data from [3].

significantly lower average price, bulk wine was unable to offset the overall decline in total export value (Table 1).

The trade of bulk wine is largely shaped by intra-industry trade dynamics, which help balance supply fluctuations among major wine-producing countries [4]. In recent years, the volatility of wine production has increased, partly due to the growing impact of climate change [1]. Severe weather events – particularly droughts and heavy rainfall – have reduced harvest volumes in many regions.

While bottled wine consumption and trade tend to be more stable than annual harvest volumes, the trade in bulk wine acts as a corrective mechanism, helping to offset production imbalances between producing regions. For example, reduced harvests in Italy in both 2023 and 2024 contributed to rising domestic grape prices, creating demand for lower-priced wine that could not be met by local supply alone. As a result, as Italy maintained a high level of exports, its imports of bulk wine and must increased in 2024 by 65 Million litre or 39% to fill the domestic shortfall [3]. This example illustrates how **growing production volatility is driving an expansion in bulk wine trade**, as producers and markets seek to maintain supply continuity in the face of increasingly erratic harvest outcomes.

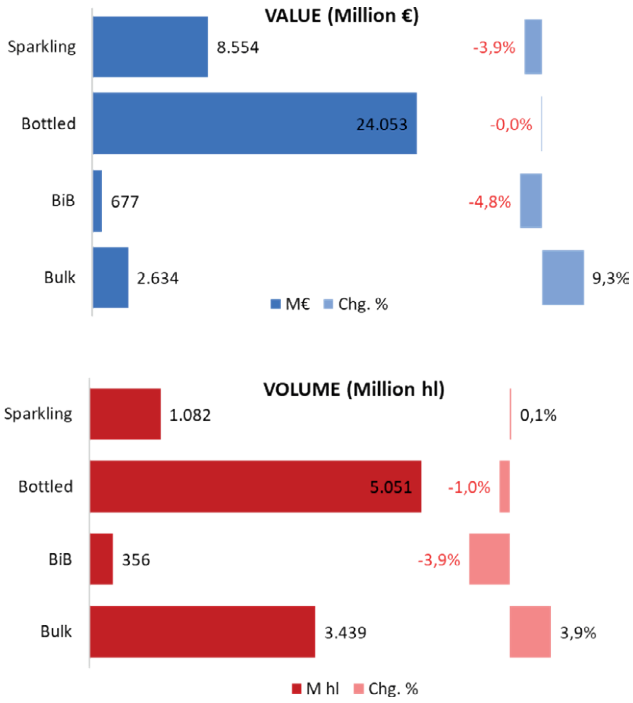

Figure 2. Wine exports by category in total export value (€ million) and volume (million hectolitres) in 2024 and change from previous year 2023, based on data from [3].

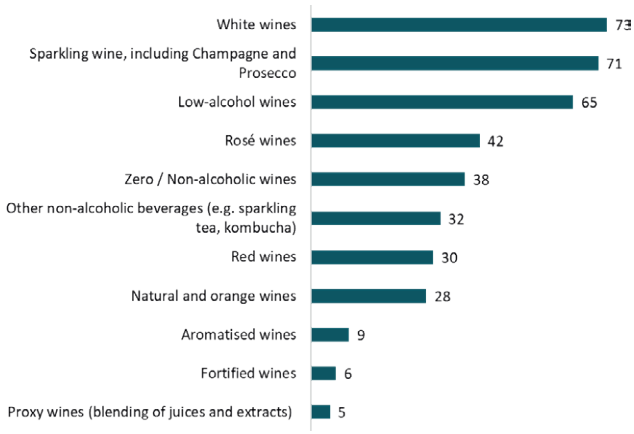

Figure 3. Industry experts' expectations for the development of various wine product categories in 2025–2026. Bars represent the share of experts predicting growth or decline in each category, responses from [7].

1.3. Changes by wine colour – still wine

The ongoing shift of consumer preferences regarding wine colour and the emergence of new wine-based beverages has been the focus of recent research [2, 5, 6]. The latest survey of international wine industry experts confirms the continuation of these trends (Figure 3).

Expert opinions

In 2024, international retailers and on-trade professionals reported rising sales of sparkling, white, rosé, and low- and no-alcohol wines, with expectations that these trends will continue into 2025 [7]. Sparkling and white wines were the most frequently cited as trending across international markets.

The performance of low- and no-alcohol wines varies by region. Low-alcohol wines are particularly popular in Southern and Eastern Europe and Scandinavia, while dealcoholized wines are gaining traction in Germany, Austria, and the Netherlands. Other non-alcoholic alternatives – such as sparkling tea and kombucha – are also increasingly consumed, especially in the UK/Ireland, Belgium, and the Netherlands.

Red wines were generally seen as declining in demand, except in Southern and Eastern Europe, where they remain more widely consumed. Natural and orange wines feature more prominently in the UK/Ireland, Southern Europe, and the Netherlands. Fortified, aromatized, and proxy wines were rarely mentioned, with the exception of aromatized wines in Eastern Europe [7].

Evidence from EU Export Data

To what extent do these expectations correspond to actual trade patterns? While global trade statistics do not provide wine colour breakdowns, the European Union's Combined Nomenclature (CN) allows detailed analysis of still bottled wine exports by colour. The dataset used here comprises 32.8 million hectolitres.

Trade statistics confirm the diverging trends between white wines and red/rosé wines (Figure 4). Since the post-pandemic rebound in 2021, exports of red and rosé bottled wines have declined by 17.6%. In contrast, white wine exports declined by only 6.2%. This divergence is even more pronounced in value terms. Although red and rosé wines still dominate in total volume and value, white wines have proven more resilient – declining less in volume and growing slightly in value.

These figures reflect a broader shift in consumer preferences toward fresher wine styles. This trend is further supported by the sustained growth of sparkling wine and increasing interest in low- and no-alcohol alternatives. Nonetheless, recent innovations in red winemaking suggest that red wines may also be evolving, offering fresher profiles that align with changing consumer expectations [2].

Expert opinions and export data converge in indicating that white wine is performing more favourably than red wine overall. However, contrary to what the expert assessments in Figure 3 might imply, white

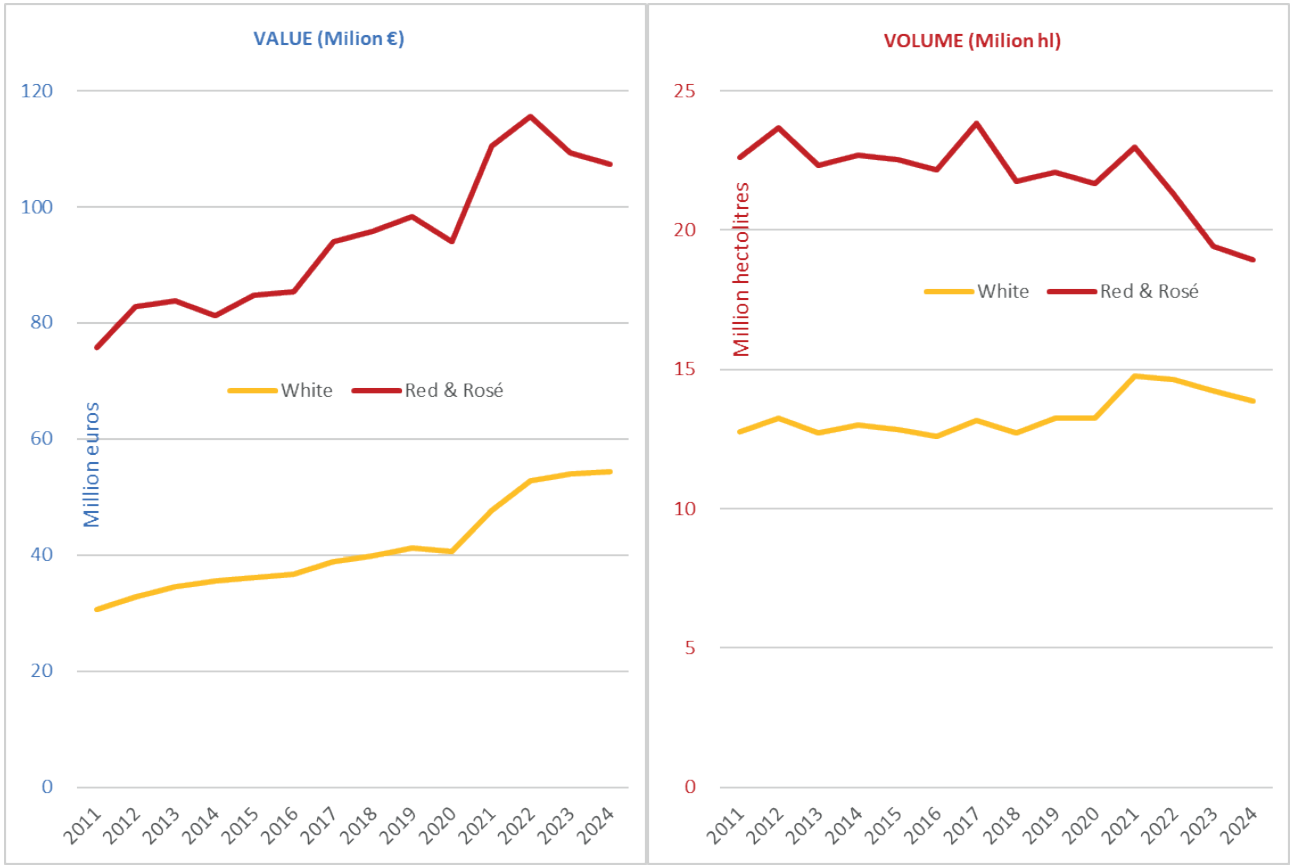

Figure 4. Exports of bottled still wine by wine colour from EU countries – value (€ million) and volume (million hectolitres) 2011 to 2024, based on data from [3].

wine is not increasing in export volume. Both red and white wine exports are declining – only that red wine is declining at a faster rate.

From a policy perspective, this suggests that if reductions in vineyard acreage are to be considered, priority should be given to reducing red wine plantings over white. The current downward trend in exports for both wine types indicates that converting red wine acreage to white is unlikely to offer a broad or sustainable solution. This pattern is consistent with market developments, where traditional red wine regions such as Rioja and Bordeaux are adapting to lower demand. Other red wine producers are responding through innovation, for example by developing RTDs, Tinto de Verano, Sangria, and Spritz-style products.

2. INSIGHTS INTO EXPORT AND IMPORT MARKETS

2.1. Development of key exporters

The three leading wine-exporting countries – France, Italy, and Spain – showed distinct developments in 2024 (Figures 5 and 6). Together, they accounted for 63% of global wine export value and 54% of total export volume.

- **Italy continued to perform most strongly** in 2024. Despite a weaker domestic harvest – partially offset by increased imports – and ongoing challenges in global markets, Italy recorded a 4.7% increase in export value (to €8.14 billion) and a 1.7% rise in volume (to 21.7 million hectolitres). It remained the world's largest exporter by volume, once again surpassing Spain, and ranked second by value. Italy also improved its average export price to €3.74 per litre, positioning itself between France (€9.07/l) and Spain (€1.52/l).
- **France retained its position as the global leader in export value**. In 2024, it exported 13 million hecto-

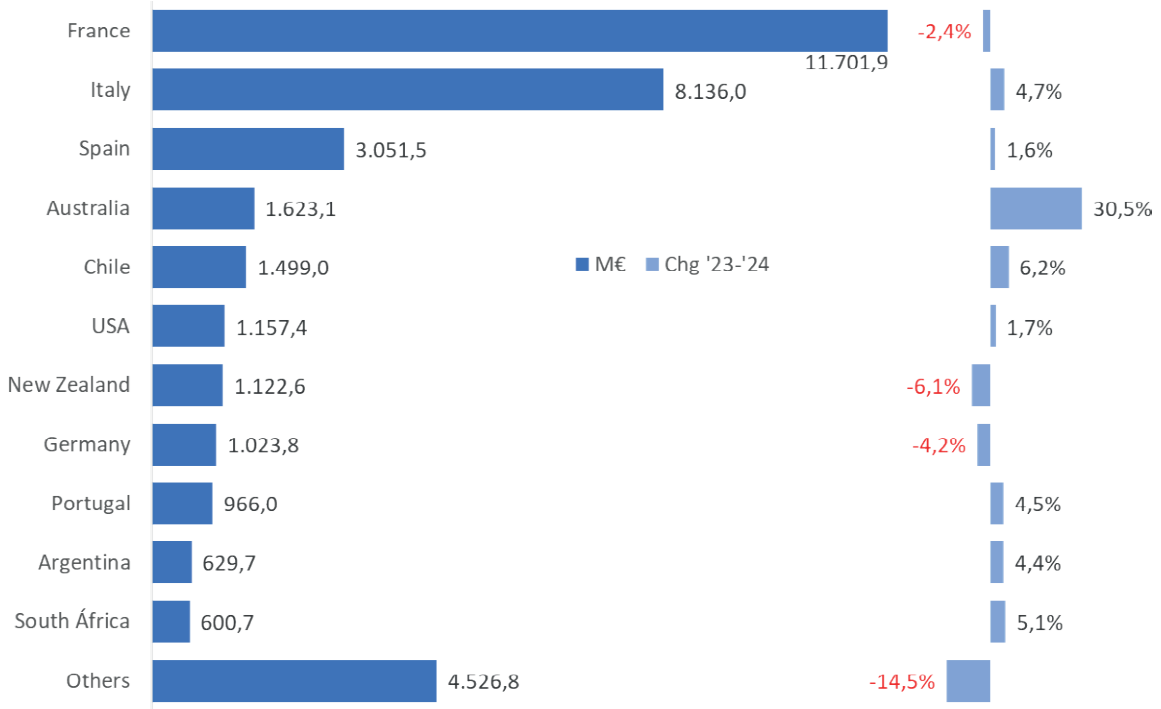

Figure 5. Top wine exporting countries by export **value** (in million €) and change of value between 2023 and 2024, countries are ranked by total value of wine (and must) exports, based on data from [3].

litres, generating €11.7 billion – representing nearly one-third of global wine trade value. However, this marked a 2.4% decline in revenue, driven by a 2.9% drop in average export prices, despite a slight 0.6% increase in volume. The decline was primarily attributable to falling Champagne sales.

– **Spain experienced divergent trends**. While its export volume declined by 4.5% to 20 million hectolitres, export value increased by 1.6%, just exceeding €3 billion. This growth was supported by a 6.4% rise in average export prices, although Spain's pricing remains well below that of its main competitors.

These divergent outcomes among the top three exporters highlight the importance of product mix, branding, pricing strategies and commercial capacities. Italy's export gains were driven by enhanced competitiveness. Italian producers demonstrated strong market orientation by closely following consumer preferences and building significant commercial capabilities within the wine sector. They showed a clear willingness to adapt to market trends and to cultivate relationships through travel, communication, and active commercial engagement.

France, despite achieving the highest average prices, experienced a decline in export revenue due to a downturn in a key premium segment (Champagne). This illustrates that even premium-focused portfolios are vulnerable to shifts in demand. In contrast, Spain's volume-driven, bulk-heavy export model enabled a modest increase in bulk wine prices to raise overall export value in 2024. However, this also underscores a structural vulnerability: heavy reliance on low-priced bulk exports exposes Spain's wine sector to price volatility in this segment.

Three new world exporters achieved significant recoveries (Figure 5 and Figure 6). Chile, Australia, and the United States rebounded after earlier setbacks. These countries had been heavily affected by declining demand in China but recovered strongly in 2024 as that market began to recover its imports.

– **Australia recorded the strongest value growth.** Export value rose by 30.5%, while volume increased by 6.7%, following the removal of Chinese tariffs that had been in place for three years. Although consumption in China has not rebounded yet in 2024, experts suggest that the supply chain of importers and retailers stocked up Australian wine, which has the highest preference in China [7, 8].
– **Chile strengthened its global position.** It became the fourth-largest exporter by volume, with a 14.4% increase, and ranked fifth by value, which rose by 6.2%, particularly driven by growth of exports to UK, USA and Brazil. However, its average export price declined slightly.

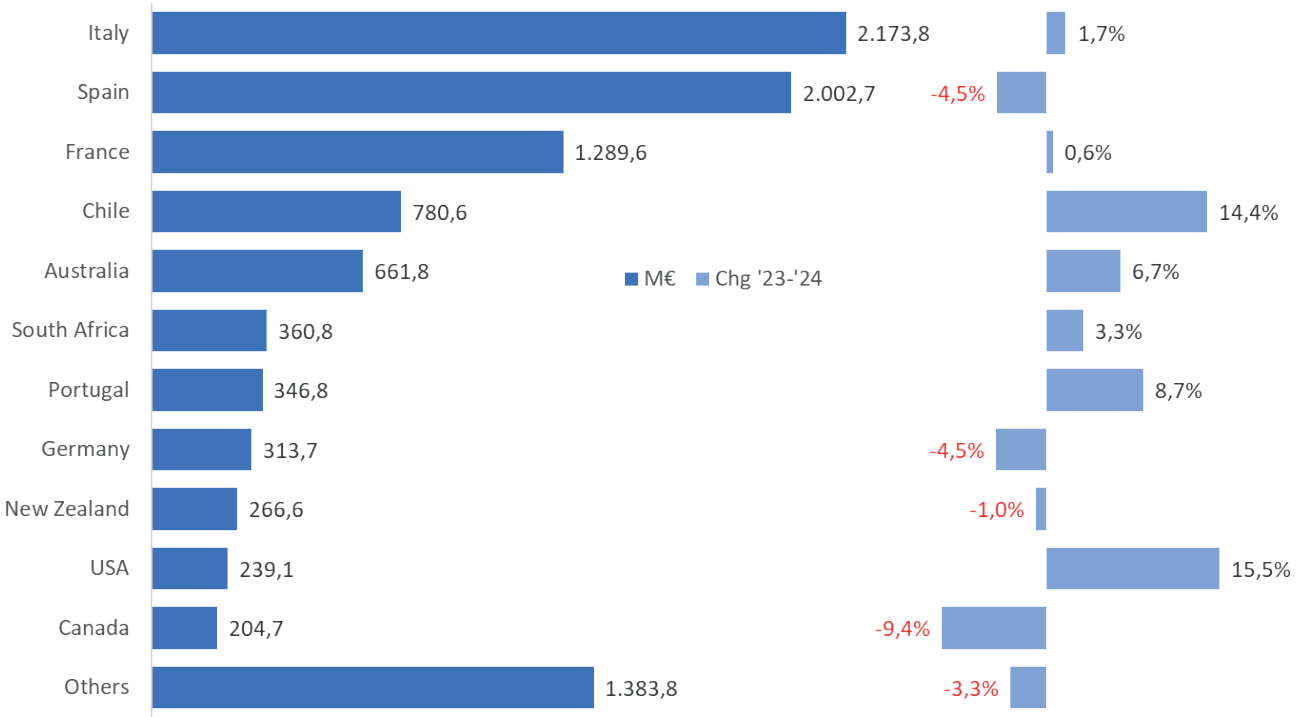

Figure 6. Top wine exporting countries by export **volume** (in million hectolitres) and change of volume between 2023 and 2024, countries are ranked by total volume of wine (and must) exports, based on data from [3].

- **The United States achieved a double-digit volume increase.** Export volume rose by 15.5% to 2.4 million hectolitres, following sharp increase in the UK, Germany and Denmark and placing it tenth globally. Export value grew more modestly by 1.7%, reaching €1.16 billion.

Notably, each of these New World exporters benefited from different factors in their 2024 rebound. Australia's resurgence was primarily value-driven due to supply chain effects from regained access to the Chinese market (a higher-priced market), Chile's growth was volume-driven across diverse markets albeit with some price concession, and the U.S. expansion was mostly volume-driven with little value increase, implying a focus on cheaper export offerings.

In essence, regaining market access (as in Australia's case) and diversifying export destinations (as seen for Chile and the U.S.) were key to these recoveries, although maintaining or improving price levels remains a challenge for those reliant on bulk or lower-end segments.

Other smaller export countries showed mixed developments.

- **New Zealand and Germany faced export declines.** Both countries recorded losses in volume and value. In Germany, the drop was mainly due to falling re-exports, while net exports of domestic wine increased – supporting the observation of growing international demand for white wines.
- **Portugal, Argentina, and South Africa showed moderate growth.** These countries benefited from targeted market positioning and improved export conditions.
- **"Other countries"** recorded the sharpest decline at –14.5%. This reflects a general trend in which smaller origins – often included as secondary or niche selections – are most affected when contracting markets lead to reduced shelf space and lower stock levels.

In summary, smaller exporters' fortunes depended on their specific market focus and challenges: those with structural disadvantages or heavy reliance on re-exports (like Germany) saw declines, whereas others that found niche opportunities or benefited from favourable market conditions achieved modest gains.

2.2. Italy as role model for success – A case for future research

Over the long term between 2017 and 2024, Italy has clearly outperformed its direct competitors, France and Spain. In value terms, Italy's global wine exports grew by

35.5%, between 2017 and 2024, rising from €6.0 billion to €8.1 billion. This compares with a 28.5% increase for France and a modest 5.2% for Spain over the same period. In volume terms, Italy was the only one of the three to achieve a net increase (+1.2%), while both France and Spain recorded declines of over 14% (Figure 7).

Sparkling Wine as a Key Growth Driver.

Italy's strong export performance is largely driven by sparkling wines, particularly Prosecco. Over the seven-year period, the 1.2% increase in total volume reflects a growth of 1.9 million hectolitres in sparkling wine exports, which compensated for a 1.5 million hectolitre decline in bulk wine exports and a stable volume in non-sparkling bottled wines (-0.3%).

In value terms, the 35.5% overall increase was primarily supported by a 75.5% increase in sparkling wine revenues and a €1.1 billion rise in revenues from still bottled wines, offsetting the 8.5% decline in bulk wine exports. In effect, Italy substituted low-value bulk wine exports with higher volumes of sparkling wine, combined with a 16.4% increase in average price and steady sales of higher-value still wines – a combination that underpins Italy's export success since 2017.

Strategic Supply Management and Value Creation

Recent developments illustrate Italy's strategic shift towards value creation. In response to smaller harvests in 2023 and 2024, Italy reduced bulk wine exports to Germany, where its wines had traditionally served as a base for sparkling and aromatised wines. Instead, these low-value wines were redirected to higher-value markets, both domestically and internationally.

Germany, in turn, compensated for reduced imports from Italy by increasing imports of bulk wine from Spain and by relying on domestic surplus stocks, which had accumulated due to continued production and falling demand. As a result, wines produced at full costs of €1.20 per litre and marginal costs of €0.80 were sold to processors at prices as low as €0.40–€0.60 per litre. This represents a case of value destruction rather than value creation. Italy's model shows how adapting product strategy and managing supply can support price stability and long-term profitability.

Italy's export success has been broad-based across markets, with particularly strong performance in the United States. Of the €2.1 billion total increase in export value since 2016, almost a quarter or €531 million came from the U.S. market, where volume also grew by 8.3%, reaching 3.6 million hectolitres. Italy also increased revenues in Germany by €188 million, despite a 9.7% decline in volume. Further growth exceeding €100 million was recorded in Canada, France, the Netherlands, Russia, and Belgium. The UK market showed more modest gains in comparison.

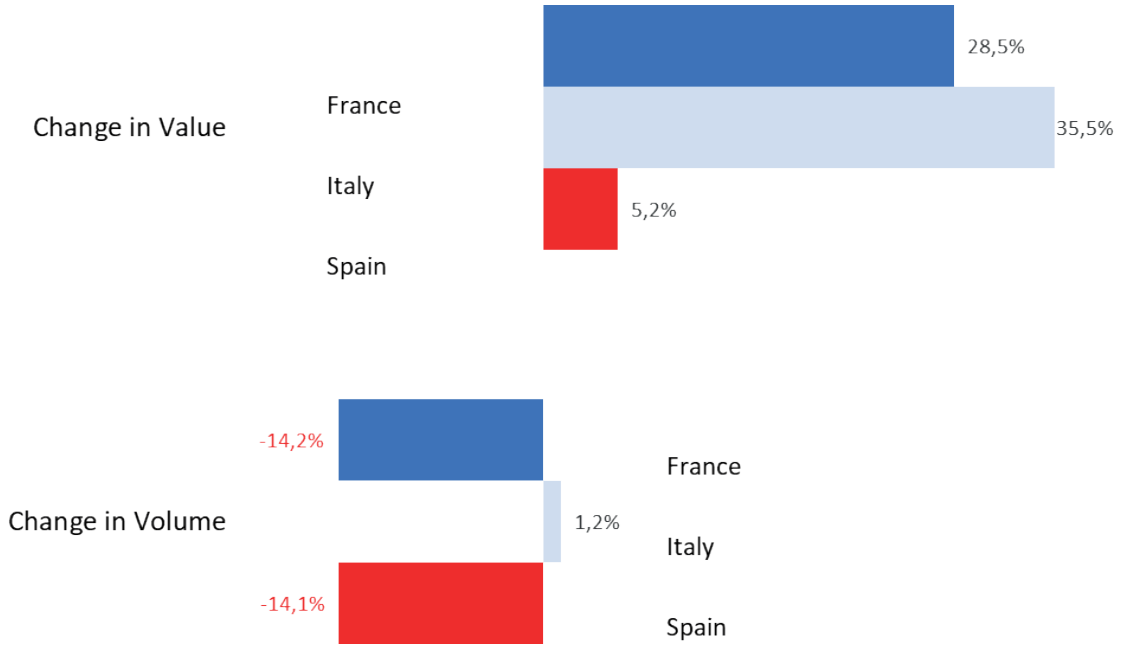

Figure 7. Change in wine export value and volume for France, Italy and Spain, 2017-2024, based on data from [3].

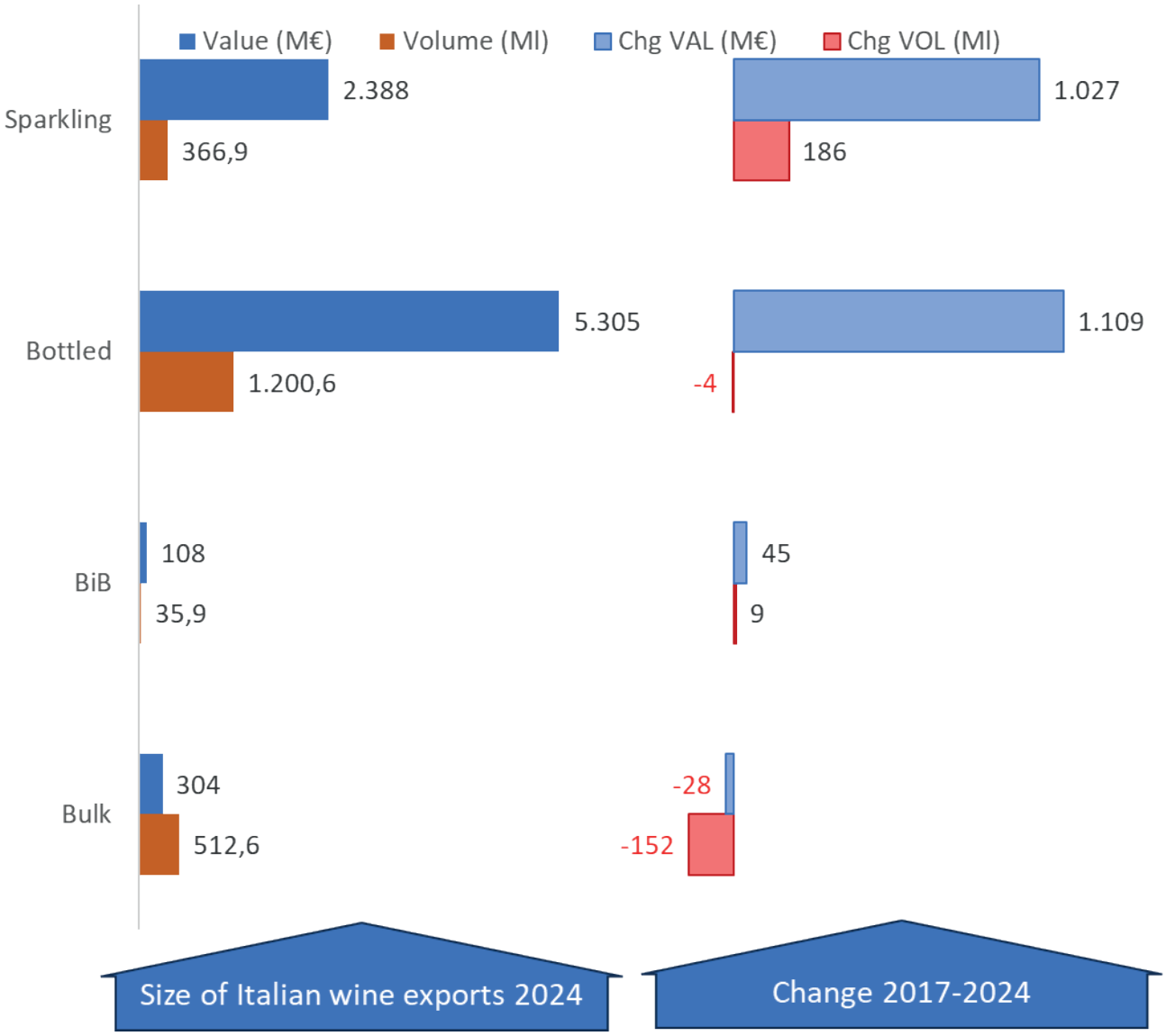

Figure 8. Italy's wine export value (million €) and volume (million Litre) by category in 2024 (left), and the change in each category's export volume and value from 2017 to 2024 (right). This illustrates Italy's shift away from low-value bulk wine toward higher-value sparkling and bottled, based on data from [3].

Italy as best-practice case example for other wine-producing countries

Several years ago, Pomarici and colleagues [9, 10] analysed the structural transformation of the Italian wine sector over recent decades, identifying key factors that contributed to its long-term success. These factors include the scale and organisation of production and supply networks, robust domestic demand, a high level of market orientation and adaptability, a regulatory environment supportive of product innovation, and socio-economic frameworks marked by a clear division of labour and specialisation.

While the initial market success of Prosecco may have been partly serendipitous, the Italian wine sector effectively nurtured and scaled it into a major international export success. A critical turning point was the establishment of the Prosecco appellation system, which played a strategic role in protecting the brand, managing supply growth in line with demand, and maintaining price stability [9]. Had Prosecco remained classified solely as a grape variety, its success could have been undermined by lower-quality imitations produced outside today's delimited production zone.

Italy's strong market orientation, supported by an efficient use of EU funding, has led to branding and

packaging excellence among its wine producers. The sector has consistently aligned its strategies with the preferences, quality expectations, and price points of export markets, while also benefitting from Italy's strong country image in global wine trade. Italian producers were early movers in expanding into sparkling wines, refreshing whites, and approachable off-dry reds such as Primitivo. More recently, Italy's openness to wine-based cocktails and low- and no-alcohol wine innovations underscores its continued responsiveness to emerging consumer trends. These sectoral dynamics offer valuable insights for other wine-producing countries currently facing comparable market challenges.

Italy's performance raises several important questions for future research. How can other countries learn from Italy's strategic positioning and adaptability? In the context of current demand shifts and ruinous price competition observed in some markets, which underlying structures – such as socio-economic networks, research institutions, education systems, and regulatory frameworks – should be preserved and strengthened? Identifying these elements will be crucial to managing sectoral adjustment and enabling wine industries to recover and reposition successfully after the current crisis.

2.3. Insights into major import markets

Wine exports are considerably less concentrated by destination than by country of origin. In 2024, wine was shipped to 275 countries and territories. Nevertheless, the top three import markets – the United States, the United Kingdom, and Germany – together accounted for 38% of global export value, while the top ten markets made up nearly two-thirds. Although each of the three leading markets imported more than 12 million hectolitres in 2024, their respective trajectories have diverged significantly in recent years (Figure 9).

United States: As the world's largest wine market by value, the United States showed tentative signs of stabilization in 2024. Wine import value increased by 1.6%, while import volume rose marginally by 0.2%, suggesting a modest recovery following the sharp decline observed in 2023. During the pandemic, U.S. wine imports initially contracted but rebounded strongly in the immediate aftermath, reaching over 14 million hectolitres. This surge led to significant stock accumulation, which proved unsustainable and resulted in a correction of approximately two million hectolitres in 2023.

The magnitude of this decline raised concerns about a structural shift in the market, driven by changing consumer preferences and declining wine engagement among younger generations [2]. However, the moderate rebound in 2024 suggests that at least part of the downturn may have been cyclical, reflecting a post-pandemic adjustment in inventory levels rather than a permanent contraction in demand.

Alternatively, the increase in 2024 imports may have been influenced by expectations of renewed tariffs on European wine following the U.S. presidential election in November 2024. In anticipation of potential trade barriers, many European producers – particularly in Italy [11] and Germany [12] – reportedly increased shipments to the U.S. to build up stocks before any new tariffs could take effect. As a result of this precautionary stockpiling, a notable decline in wine imports is likely in 2025, compounded by ongoing consumption declines [13] and continued trade uncertainty [14].

United Kingdom: The UK saw a slight increase in import volume (+2.4%) but experienced a decline in average prices (-3%), resulting in a 0.7% reduction in total import value. This modest recovery in volume interrupted the medium-term downward trend observed since 2020. The UK's relative stability is noteworthy given recent disruptions, including Brexit and the COVID-19 pandemic. Despite these challenges, the UK has retained its position as a key wine market. However, there is growing concern about the potential effects of a revised alcohol duty system set to take effect in 2025, which will tax beverages based on alcohol content. This could alter consumer behaviour and impact future demand patterns.

Germany: In contrast, Germany experienced a more substantial contraction in 2024. Wine import volumes fell by 7.1%, while value declined by 9.1%. The average import price dropped by 2.1%, underscoring Germany's continued role as a high-volume, price-sensitive market. The decline is part of a longer-term trend: since 2017, German wine imports have steadily decreased, falling from nearly 15 million hectolitres to below 13 million. Several factors have contributed to this trend. First, domestic wine consumption continues to shrink. This has led to rising stock levels of German wine and intensified price competition, particularly in the bulk wine segment. The resulting price pressure has prompted a substitution of previously imported bulk wine – such as Italian base wine used in sparkling, aromatised, or dealcoholised wine production – with domestic surplus. In addition, re-exports from Germany to neighbouring countries have also declined. Unlike the U.S. and UK, there were no signs of stabilization in German wine imports in 2024.

Beyond the top three markets, **Canada** registered a modest increase in wine imports in 2024. In contrast, **China** experienced a substantial rebound, with import

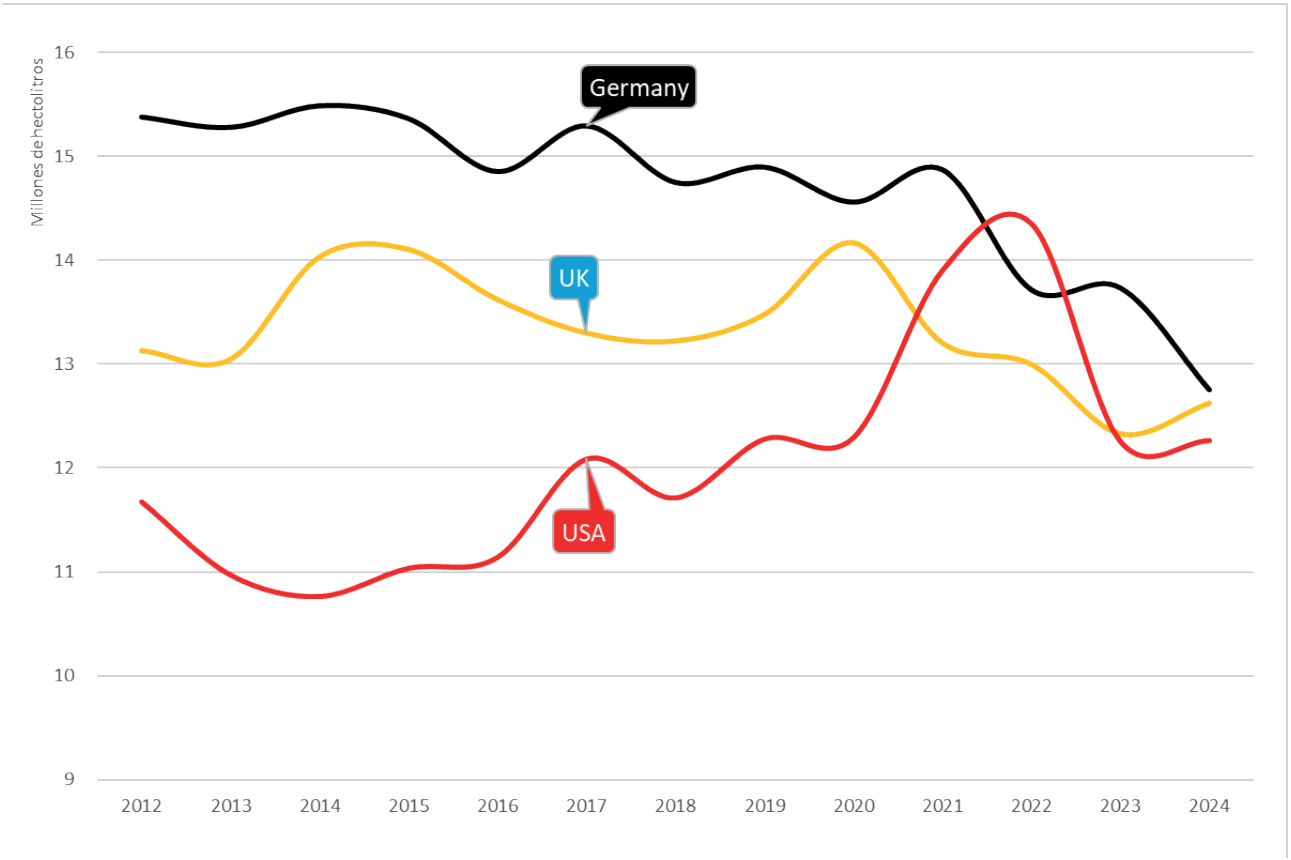

Figure 9. Change in wine import volumes for Germany, UK and USA 2012-2024, based on data from [3].

value rising by 37.6% and volume increasing by 13.7%. This recovery was largely attributable to the progressive removal of trade barriers on Australian wines, which reinitiated supply flows through national and local distribution channels.

In many other key markets, however, the value of wine imports declined. Countries such as **Japan**, the **Netherlands**, **Switzerland**, **Belgium**, **France**, and **Sweden** reported reduced expenditure on imported wine. Notably, these declines in value did not always coincide with reduced volumes. Several markets – including the **United Kingdom**, **United States**, **Canada**, **Italy**, **China**, **Japan**, and **Denmark** – registered increases in the volume of wine imports. These patterns suggest evolving pricing dynamics and possible shifts in procurement strategies, such as a greater emphasis on lower-priced or bulk wines. Such adjustments likely reflect efforts to maintain volume in the face of subdued consumer spending and broader economic constraints.

In summary, global import trends in 2024 present a mixed picture. Some major markets (like the U.S. and UK) managed to sustain or even increase import volumes – often by trading down to cheaper wines or by stockpiling in advance of expected trade disruptions – whereas others (like Germany and Japan) saw clear declines as a result of structural consumption decreases. This underscores that each market responded differently to global wine industry headwinds: importers in certain countries maintained volumes via price-focused strategies and inventory management, while in other countries demand contraction translated directly into lower imports.

3. CURRENT CHALLENGES AND OUTLOOK

3.1. Industry challenges

When asked in late 2024 to assess the severity of current and future challenges, industry experts continued to emphasize the dominant role of economic pressures and shifting consumer behavior, which remained the most frequently cited concerns for the global wine sector (Figure 10). Although cost pressures have eased

slightly compared to previous years, they are still regarded as a major constraint on business performance.

The combination of reduced consumer purchasing power and a broader global economic slowdown is expected to continue dampening wine consumption worldwide. Roughly half of surveyed producers and trade professionals identify the decline in wine consumption – driven by growing health consciousness and increasing preference for alternative beverages – as a critical challenge for the sector.

In parallel, concern about tightening alcohol regulations has grown steadily. According to data from the ProWein Business Report (2023–2025) [2, 4, 7], concern related to stricter alcohol policy has increased by approximately ten index points per year. As of 2024, 43% of experts view restrictive alcohol legislation as a key threat to the industry.

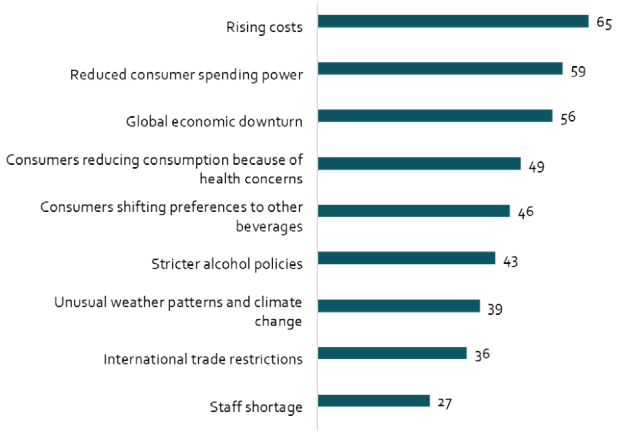

Figure 10. Key challenges ("threats") facing the wine industry, as perceived by global experts. Bars show the percentage of experts (N = 1,398) who expect each challenge (economic pressure, changing consumer behavior, etc.) to significantly impact their business in the coming years. [7].

3.2. Expected effects of tariffs and trade war

In late 2024, international trade restrictions were still perceived as a moderate challenge, even in light of the upcoming U.S. presidential transition. This perception changed abruptly in mid-March 2025 with the shock announcement of a 200% tariff on wine imports from Europe to the United States – the world's largest wine market by value. The announcement triggered a sharp rise in uncertainty across the global wine trade [14]. Producers initially responded by further increasing stocks in the U.S. market. Soon thereafter, U.S. wine importer associations advised their members to halt all shipments, as the tariffs would also apply to goods already in transit.

Although the initially announced tariff rate was subsequently reduced to 20%, with indications of a possible further reduction to 10%, a new increase to 50% was announced by the U.S. administration in late May. This highly volatile policy environment stands in stark contrast to the stability required for international trade. Accordingly, Andersson (2025) reported that the Wine Trade Uncertainty Index reached its highest level on record in 2025 [14].

By export value, France and Italy are the leading wine exporters to the U.S., followed at a certain distance by Spain and New Zealand (Figure 11). These four countries therefore face the highest absolute exposure to U.S. tariffs. In relative terms, Figure 11 illustrates each country's share of total bottled wine exports (sparkling and non-sparkling) destined for the U.S. – a measure that can be interpreted as relative value at risk.

Notably, New Zealand exhibits the highest relative exposure, with approximately 40% of its total packaged wine export value generated in the U.S. market. Argentina, another relatively small exporter, follows with around 30%. Among the two largest exporters, Italy shows a slightly higher relative exposure at roughly 25%, compared to 21% for France. Other wine-exporting countries derive a smaller proportion of their export revenues from the U.S. and are therefore expected to be less affected by tariff changes.

In such an environment, global exporters may increasingly lose confidence in the U.S. market, leading to a relative "de-Americanisation" of their business, and seek to diversify into alternative destinations to mitigate risk. In the long term, the global importance of the U.S. as a wine-importing country is likely to decline as a consequence of such protectionist policies producing greater uncertainty. This is further compounded by the structure of the U.S. wine distribution system: the three-tier model of importer, wholesaler, and retailer absorbs a significant share of the total value. Tariffs cascade through this fragmented supply chain, leading to disproportionately high retail price increases. In a consumer environment marked by growing price sensitivity, such dynamics could further accelerate the substitution of wine with alternative beverages in the U.S. market.

Combined impact of risks and policy implications. Taken together, the aforementioned risk factors paint a picture of a wine industry facing multifaceted challenges on both the demand and supply sides. Economic stress and evolving consumer preferences are dampening global demand for wine, while policy shifts – ranging from stricter alcohol regulations to sudden trade barriers

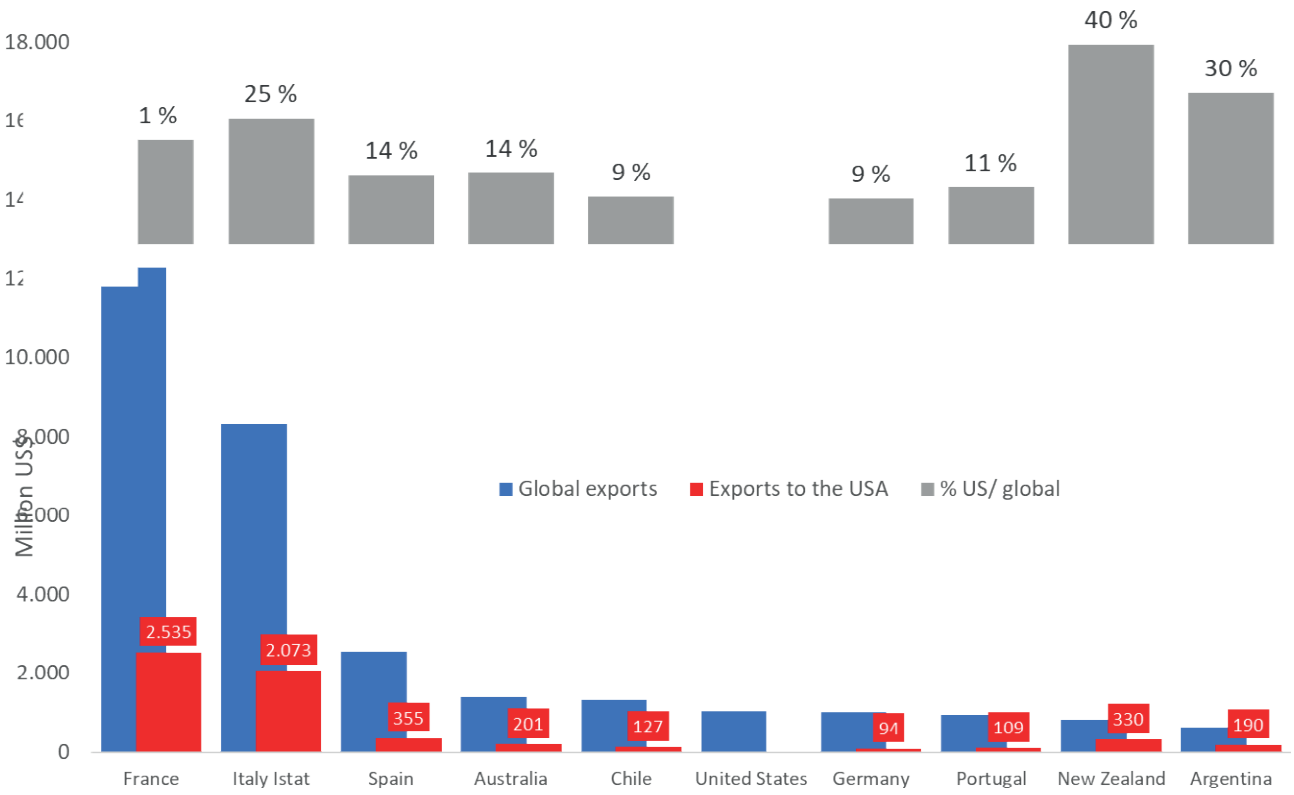

Figure 11. Exposure of top wine-exporting countries to the U.S. market. For each major exporter, the figure shows the value in millions USD of its 2024 bottled total wine exports (blue) and wine exports to the U.S. (red) and that value as a percentage of the country's total wine export value. This indicates which exporters are most reliant on the American market – and thus most vulnerable to U.S. tariffs, data source [3].

like tariffs – create uncertainties that can disrupt markets and supply chains. Climatic volatility adds another layer of risk by destabilizing production, which, as seen, has prompted greater reliance on bulk trade to balance shortages. The interplay of these factors tends to amplify overall volatility in the wine market – it is more complicated to match demand and supply – which is required to create value.

Addressing this complex risk landscape will require coordinated strategies by both industry stakeholders and policymakers. Producers and exporters may need to diversify their markets to avoid over-reliance on any single country (especially where policy is unpredictable), closely follow market trends, invest in product innovation (for instance, developing lower-alcohol or novel wine products to align with health trends), improve their commercial capacities, and improve supply-chain agility to respond to production shortfalls or sudden policy changes.

On the policy side, governments should create a flexible regulatory framework for stakeholders to easily adapt to market changes and consider the broader implications of tariff escalations and restrictive regulations. International cooperation or dialogue aimed at maintaining a stable trade environment could help reduce uncertainty, while balanced domestic policies can address public health objectives without unduly harming the wine sector's economic viability. In essence, enhancing the wine industry's resilience will depend on a proactive approach that integrates market diversification, adaptation to consumer trends, and supportive policy frameworks.

4. SUMMARY AND CONCLUSION

In 2024, global trade in wine and must remained relatively stable, with only minor fluctuations: volume increased by 0.8%, value declined by 0.5%, and the average export price per litre fell by 1.2%. While global wine consumption continued to decline, several supply-side and supply-chain-related factors contributed to holding trade volumes steady – albeit with considerable variation beneath the surface.

Rising production volatility linked to climate change has increased the need for intra-industry trade, particularly in bulk wine among producers, which recorded gains in both volume and value. In contrast, declining trade volumes of bottled wine reflect longer-term shifts in global wine consumption. The lifting of tariffs on Australian wine imports into China led to a strong resurgence of Australian shipments, as importers and retailers sought to replenish depleted supply chains [8]. Similarly, in anticipation of possible new U.S. tariffs on European wine, importers increased stock levels in the American market [11].

Although the relative stability of global wine trade in 2024 may be interpreted as a sign of resilience – particularly following the sharp contraction in 2023 – these special factors, including stockpiling and supply chain repositioning, are expected to impact trade dynamics in 2025. A decline in trade volumes appears likely, especially in light of persistent economic uncertainty and the potential reintroduction of U.S. tariffs [14].

The global wine sector thus finds itself navigating increasingly uncertain waters. Given the heightened volatility, continued close monitoring of global wine trade developments will be essential.

Rising risks, evolving product preferences, and shifting trade dynamics pose challenges but also open new opportunities for producers. In light of the accelerating pace of change, the sector must be equipped to adapt rapidly. Wine regulations should therefore be reviewed and adjusted to allow both individuals and companies to respond effectively to market shifts. The sector requires a regulatory framework with sufficient flexibility to enable agile, timely adaptation.

REFERENCES

[1] OIV, *The State of the World Vine and Wine Sector in 2024*. 2025: Dijon

[2] S.M. Loose, and R. del Rey, *State of the International Wine Markets in 2023. The wine market at a crossroads: Temporary or structural challenges?* Wine Economics and Policy, 2024

[3]. R. del Rey, *S&P International Trade Data, elaborated by Del Rey AWM*. 2025

[4] R. del Rey, and S.M. Loose, *State of the International Wine Markets in 2022: New market trends for wines require new strategies.* Wine Economics and Policy, 2023. 12(1): p. 3-18 https://doi.org/10.36253/wep-14758

[5] H. Ford, et al., *Exploring consumers' drinking behaviour regarding no-, low- and mid- alcohol wines: a systematic scoping review and guiding framework.* Journal of Marketing Management, 2025: p. 1-31 10.1080/0267257X.2025.2499101.

[6] N. Waehning, and V.K. Wells, *Product, individual and environmental factors impacting the consumption of no and low alcoholic drinks: A systematic review and future research agenda.* Food Quality and Preference, 2024. 117: p. 105163 https://doi.org/10.1016/j.foodqual.2024.105163.

[7] S. Loose, , *ProWein Business Report 2025 - Shaping the Future of Wine*. 2025, ProWein: Düsseldorf

[8] K. Anderson, *China's Wine Market: Recent Shocks, Long-term Prospects*. 2025, Wine Economics Research Centre, University of Adelaide, Working Paper: Adelaide

[9] S. Nagel, *Premiumization at the heart of long-term sustainability: Interivew with Eugenio Pomarici from the University of Padua*, in *Vitisphere*. 2017

[10] E. Pomarici, et al., *The Italian wine sector: Evolution, structure, competitiveness and future challenges of an enduring leader.* Italian Economic Journal, 2021. 7(2): p. 259-295

[11] L. Frescobaldi, "*Wine consumption in recession. Pre-tariff stockpiling misled the markets.*" *UIV's message to policymakers*, in *Gambero Rosso International*. 2025

[12] S. Loose, C. Kiefer, and A. Wetzler, *Umsatz- und Absatzentwicklung Apri 2025, Geisenheim Digital Sales Analysis*. 2025

[13] SipSource, *US Access Live 2025, SipSource Industry Updates on Sales of Alcoholic Beverages in the US Market*. 2025

[14] K.Anderson, and G. Wittwer, *Impacts of US-led tariff war on internatioinal trade in wine, beer and spirits.* Journal of Wine Economics, 2025. in press

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