

## EXPLORING RESILIENCE AND MARKET LOGICS IN AN EMERGING WINE REGION: EVIDENCE FROM POLAND (2014-2024)

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**Purpose:** This study offers the first comprehensive, current empirical portrait of Poland's wine sector (2014-2024) while proposing a theoretical framework that integrates personal resilience theory and meaning-making concepts with wine industry analysis. We aim to document the sector's structure and regional differentiation, and to establish foundations for future psychometric research on entrepreneurial persistence in marginal agricultural environments.

**Design/methodology/approach:** Data on producer numbers, vineyard areas, grape varieties, and wine production volumes across Poland's 16 voivodeships were obtained from the National Agricultural Support Centre (KOWR). Statistical analyses included descriptive statistics, Spearman's rank correlations, and hierarchical cluster analysis (Ward.D2 method). Findings were interpreted through the lens of personal resilience theory (Uchnast, 1997) and Frankl's concept of meaning-making.

**Findings:** Polish viticulture experienced remarkable growth between 2014 and 2024: vineyard area expanded six-fold (134 to 990 ha), wine production increased ten-fold, and approximately 250 grape varieties are now cultivated. Cluster analysis revealed three distinct regional groupings: leading wine regions (Lower Silesia, Lubuskie, Lesser Poland), intermediate regions with expanding southeastern frontier (*inter alia* Holy Cross, Subcarpathian, Lublin), and remaining regions facing climatic constraints. Western provinces favour larger-scale operations and are more eager to plant *V. vinifera* varieties (Riesling, Pinot Noir), while southeastern regions feature smaller family enterprises with greater PIWI hybrid adoption, suggesting divergent resilience-driven strategies.

**Research limitations/implications:** Data aggregation at voivodeship level constrains spatial precision. Future research should employ psychometric instruments to directly assess personal resilience among winemakers across regions, potentially with cross-national comparisons.

**Practical implications:** Policymakers should design regionally differentiated support instruments acknowledging the heterogeneous nature of Polish viticulture. PIWI varieties merit recognition in sustainable agriculture subsidy schemes.

**Social implications:** This study presents a comprehensive portrait of Polish winemaking – a sector currently experiencing notable public interest as part of broader trends in local food movements and wine tourism. Beyond documenting this emerging industry, the study highlights how non-economic motivations, including meaning-making and personal resilience,

drive entrepreneurial persistence in marginal agricultural sectors, offering valuable insights for rural development policy.

**Originality/value:** This is the first study to combine comprehensive national wine sector statistics with regional cluster analysis while applying personal resilience theory to explain entrepreneurial behaviour in an emerging European wine country. The study offers up-to-date empirical evidence based on the most recent registry data available (2014-2024), capturing a period of unprecedented sectoral growth. The dataset's richness, encompassing producer counts, vineyard areas, production volumes, and detailed varietal structure across all 16 Polish voivodeships, provides a uniquely granular foundation for understanding the dynamics of an emerging cool-climate wine region in Central Europe.

**Keywords:** wine economics, resilience, emerging markets, entrepreneurship, PIWI.

**Category of the paper:** Research paper.

## 1. Introduction

Over the past decade, Polish winemaking has experienced an impressive expansion (ten-fold increase in wine production and six-fold expansion in vineyard area), transforming from a niche activity into an increasingly recognized agricultural sector. This growth is particularly striking given Poland's location outside traditional wine latitudes and its marginal climatic conditions. In this paper, we propose a preliminary framework linking entrepreneurial resilience, particularly the capacity to accept risk and persist toward long-term goals despite adversity, to strategic decisions in emerging wine regions. Our analysis aims to establish a foundation for future psychometric research examining personal and organizational resilience in winemakers, with particular focus on emerging regions.

The fundamental objective of this paper is to provide the first comprehensive, current empirical assessment of Poland's wine sector based on complete 2014-2024 registry data. We interpret observed phenomena through market logic while also applying theories of entrepreneurial resilience and meaning-making processes. This theoretical lens is particularly appropriate for the wine sector in emerging wine countries, where producers often exhibit sustained commitment despite limited profitability, suggesting motivations beyond financial return. Understanding how the personality traits of winemakers – including, in particular, their personal resilience – relate to entrepreneurial behaviours is especially important in the context of marginal wine markets in Europe. In doing so, this study, in addition to providing empirical data on the Polish wine sector, proposes theoretical frameworks for subsequent psychometric research.

Wine is not merely another agricultural product. Viticulture carries a distinctive cultural load: symbolic, spiritual and identity-related weight that reaches far beyond the vineyard (Beltrán Peralta, Aulet, 2023; O'Boyle, 2021; Putzu, 2017). For many growers it may represent a long-term philosophical or existential commitment, reflecting more than climatic and economic constraints alone.

Poland lies outside the traditional European wine belt, and grape cultivation remains risky (Koźmiński, Mąkosza, Michalska, Nidzgorska-Lencewicz, 2020; Nidzgorska-Lencewicz, Mąkosza, Koźmiński, Michalska, 2024). Poland's viticultural heritage is marked by profound discontinuity. While wine production dates to the 10th century, it virtually vanished during the Little Ice Age (Kaplan, Suszyna, 2015). Interwar attempts to revive Polish viticulture were destroyed by WWII and post-war border changes: Poland lost its eastern viticultural territories to the USSR while gaining former German lands in the west, including 60 hectares of vineyards centred in Zielona Góra/Grünberg (Zarugiewicz, 1948). Communist authorities subsequently dismantled the industry in the 1960s (Bońkowski, 2022). Only with EU accession (2004) and regulatory liberalization, particularly the Wine Law of 2011 and Wine Products Act of 2021, did conditions emerge for genuine revival (Świdnicki, 2023). Poland's difficult viticultural history, combined with ongoing climatic challenges, suggests that the current expansion cannot be explained by profit motives alone and that the sector's repeated renewal may reflect the phenomenon of entrepreneurial resilience.

As mentioned above, despite climatic risks, especially linked to late spring frosts, which in 2024 alone destroyed up to 100% of yield in Western provinces (Głuszek, 2024) and regulatory framework still perceived as not yet fully friendly to small producers (Świdnicki, 2023), over the past decade, the area under vine and the number of winemakers in Poland have boomed. Financial profit seems an insufficient explanation for this surge of interest, particularly among entrants with no agricultural background. We therefore posit that non-economic factors, above all entrepreneurial resilience and a strong sense of meaning or mission, may influence the decision to establish a vineyard.

Previous studies have examined Polish wine primarily from an agribusiness perspective and relied on older data collected before the sector's recent six-fold expansion. To date, no publication has combined nationwide statistics with granular regional analysis while also applying an entrepreneurial resilience lens to winemakers' motivations and strategic persistence. Moreover, the current varietal structure of Polish vineyards, crucial for both productivity and regional identity, has not been analysed systematically.

This study's originality rests on three principal foundations. First, it provides the first comprehensive empirical examination of Poland's wine sector from a production perspective, including detailed analysis of strategic cultivar selection patterns and systematic compilation of data spanning 2014-2024 at the voivodeship level. Second, it presents an unprecedented detailed mapping of Poland's varietal structure, documenting the spatial distribution and strategic logic behind the cultivation of approximately 250 grape varieties across 16 administrative regions. Third, and perhaps most significantly, the study moves beyond descriptive sectoral analysis by applying theoretical frameworks from strategic management and psychology, specifically personal resilience theory and meaning-making processes, to explain the remarkable expansion of Polish viticulture under climatically marginal conditions.

In this paper, we ask the following research questions:

- RQ1. What is the current structure and recent growth trajectory of the Polish wine sector as of 2024?
- RQ2. Does Polish viticulture show distinct regional patterns in varietal structure, productivity and farm size?
- RQ3. How might personal resilience and meaning-making frameworks help explain strategic decision-making in emerging wine regions?

Adopting a dual perspective, we provide an empirical overview of the sector while proposing theoretical interpretations that link its appeal to personal resilience, the capacity to accept risk, abandon routine, remain open to novelty, and persist toward long-term goals (Uchnast, 1997). Poland's nascent wine industry thus becomes a natural laboratory for examining how meaning-making and resilience might influence entrepreneurial strategy in non-traditional viticultural settings. This exploratory investigation establishes foundations for future psychometric research testing these theoretical propositions.

## **2. Personal Resilience and Meaning-Making in Entrepreneurs**

Entrepreneurial success in marginal environments requires more than economic calculation. Resilience, the dynamic process of recovering from adversity and persisting despite unfavourable conditions, may prove crucial for understanding vineyard establishment in climatically challenging regions where traditional profit maximization models fail to explain observed behaviour (Garmezy, 1991; Masten, Reed, 2002). Following Uchnast (1997), we conceptualize personal resilience as the capacity to accept risk, abandon routine, and persist toward long-term goals despite adversity. Uchnast's framework, integrating Maslow's (1943) security-versus-growth dilemma with Block's (1965) ego-resiliency, defines personal resilience as a continually developing capacity to cope, adapt, and engage under stressful conditions while preserving one's identity and life orientation. Individuals with high personal resilience accept risk, remain open to novelty, and persist toward long-term goals, whereas those with low resilience prioritize self-protection. This framework is particularly relevant for understanding vineyard establishment in climatically marginal regions.

Psychological (personal) resilience may explain entrepreneurial drive in circumstances where the classic assumption, i.e. the pursuit of profit, does not suffice (Dewi, 2024; Hayter, 2011) by emphasizing dispositional persistence and meaning-making over opportunity recognition or economic necessity. The resilience lens explains why entrepreneurs persist despite repeated setbacks in objectively unfavourable conditions, a pattern important in Poland's climatic and legal circumstances. This psychological dimension does not replace economic explanations but complements them where market incentives alone fail to predict

entrepreneurial persistence. The presence and growth of viticulture in difficult parts of the world, may be additionally illuminated by the Frankl's concept of meaning-making (Frankl, 1967, 2006). According to him, people derive meaning through creative values (what they contribute), experiential values (what they receive), and attitudinal values (how they respond to unchangeable circumstances).

Winemaking manifests both creative and attitudinal values: the winemaker and/or the winegrower creates and shares their product with the world while demonstrating resilience in the face of hardship. We propose that these psychological factors, integrated with market logic, provide a more complete explanation of strategic decisions in emerging wine regions and offer a management framework for understanding entrepreneurial persistence in marginal agricultural sectors.

### 3. Methods

The empirical data for this study were obtained through official correspondence with Poland's National Support Centre for Agriculture (Krajowy Ośrodek Wsparcia Rolnictwa, KOWR) in response to a public information request submitted under Poland's Access to Public Information Act (Reference: CEN.BDG.WB1.0144.208.2024.KRU.22). The comprehensive dataset includes producer numbers, vineyard areas, grape variety distributions, and wine production volumes across all Polish voivodeships (the 16 administrative provinces of Poland) for the period 2014-2024 (KOWR, 2024). Data on the average agricultural land area in individual voivodeships were obtained from the Agency for Restructuring and Modernisation of Agriculture (2024).

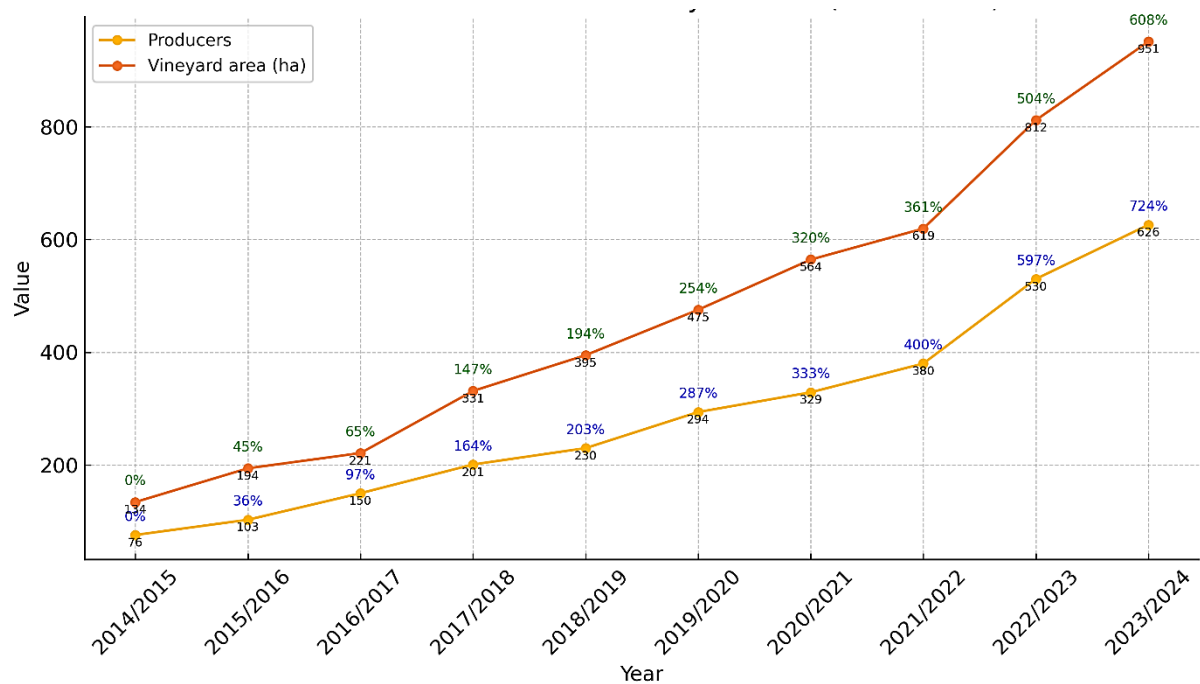
Statistical analyses included descriptive statistics, correlation analyses (Spearman's  $\rho$ ). Spearman's rank correlation coefficient ( $\rho$ ) was used due to the small sample size ( $n = 16$  voivodeships) and the non-normal distribution of several variables. Statistical significance was set at  $p < 0.05$ . Hierarchical cluster analysis (Ward.D2 method, Euclidean distance, standardised) was additionally employed to identify regional groupings based on structural variables. Calculations and clustering analysis were performed using jamovi 2.3.

## 4. Results

### 4.1. Polish Wine Production Development (2014-2024)

Despite Poland's location north of the 49<sup>th</sup> parallel, climate change is making viticulture increasingly viable, particularly in western and southeastern provinces (Koźmiński et al., 2020; Maciejczak, Mikiciuk, 2018; Maciejewska, Olewnicki, Stangierska-Mazurkiewicz, Tyminski, Latocha, 2024; Świdnicki, 2023).

Poland's vineyard area for wine production reached 951 hectares in mid-2024 (ca. 990 ha in late 2024), representing a 608% increase from 134 hectares in 2015. The number of grape growers increased by 724% over the same period (see Figure 1).



**Figure 1.** Growth of Producers and Vineyard Area in Poland, 2014-2024.

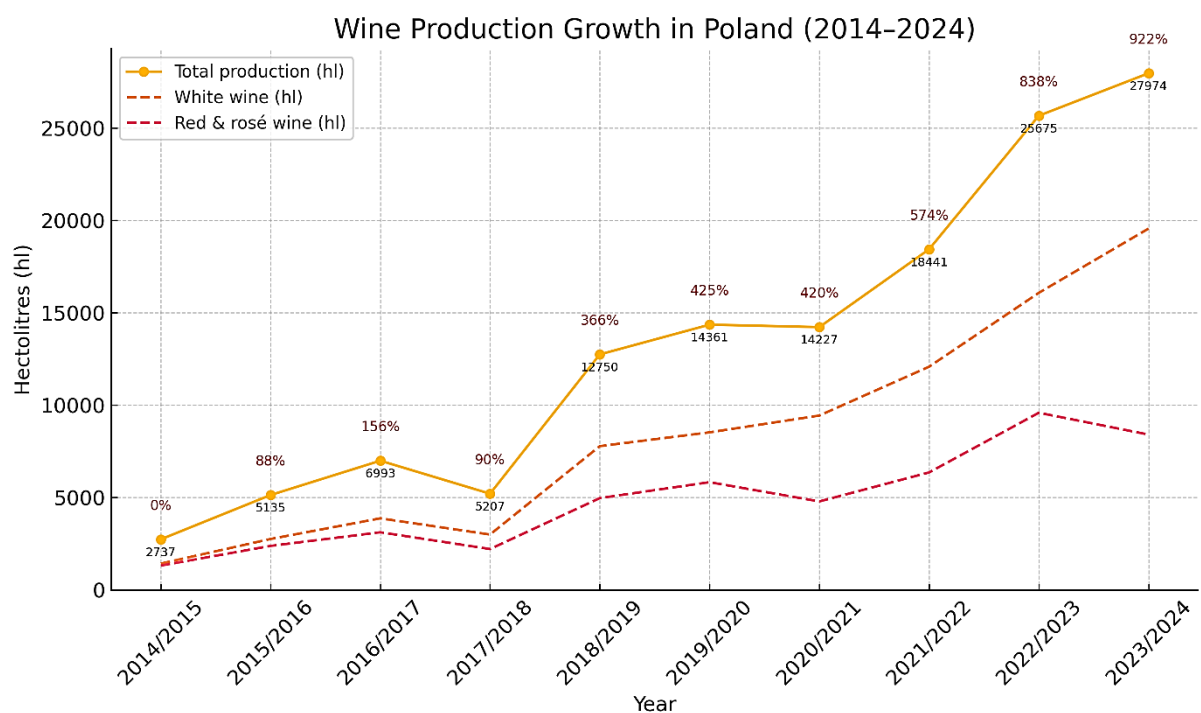
Source: Authors' own elaboration based on data from the National Support Centre for Agriculture (KOWR), letter ref. CEN.BDG.WBI.0144.208.2024.KRU.22, dated 11 December 2024.

Poland's wine production has increased nearly ten-fold over the past nine years, driven primarily by vineyard area expansion and, to a lesser extent, by productivity improvements (see Figure 2). In 2024, domestic producers yielded less than one glass of wine per adult citizen, approximately 97 millilitres, based on our calculations using Central Statistical Office data indicating 30.74 million adults in Poland. This pattern of sustained growth despite commercial uncertainty suggests high tolerance for ambiguity of environment, a key entrepreneurial resilience marker. Given that the average adult consumes around 6.8 litres<sup>1</sup> of wine and mead annually, domestic production remains far from meeting internal demand.

<sup>1</sup> Data from Krajowe Centrum Przeciwdziałania Uzależnieniom (National Centre for Addiction Prevention).

## 4.2. Geographical Clustering of Polish Wine Industry

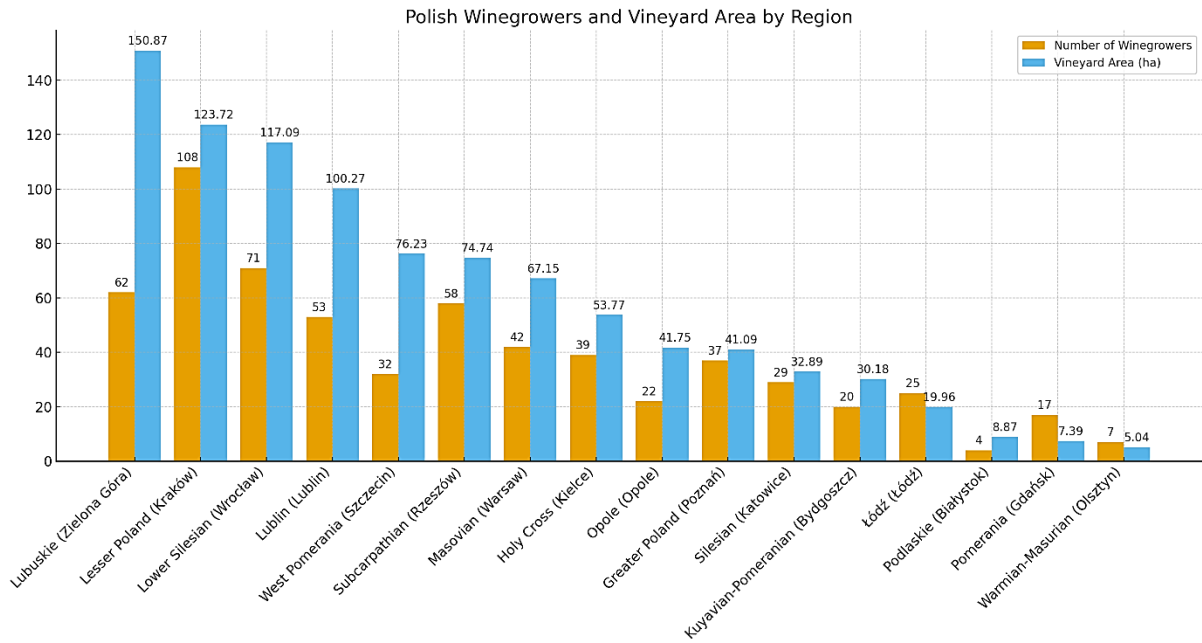
Poland lacks a formally designated appellation system, so official vineyard statistics are compiled by voivodeships, which provide the spatial framework for our analysis. Figure 3 and Figure 4 demonstrate that cultivation is highly concentrated in a few provinces. Along the western border, particularly in Lubuskie and Lower Silesia, holdings are larger and yields higher, whereas in the southeastern provinces, Lesser Poland and Subcarpathian, producers work smaller plots. Climatically, these clusters correspond to Wine Regions I and II in the typology proposed by Maciejczak and Mikiciuk (2018).



**Figure 2.** Wine Production Growth in Poland (2014-2024).

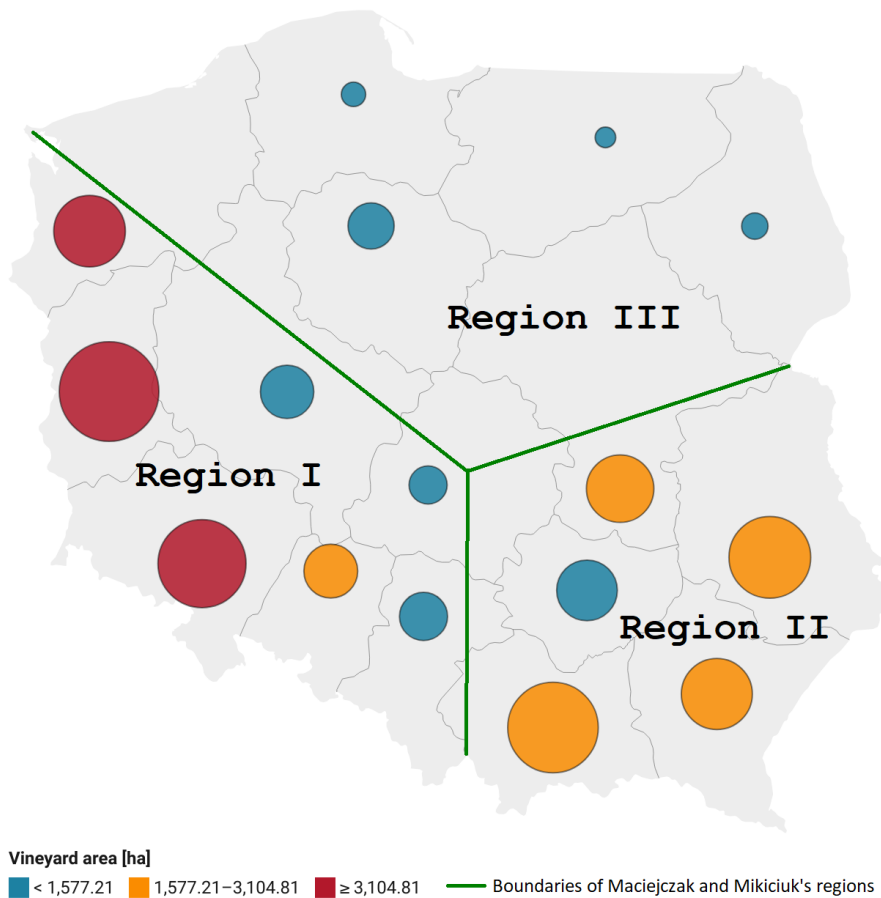
Source: Authors' own elaboration based on data from the National Support Centre for Agriculture (KOWR), letter ref. CEN.BDG.WBI.0144.208.2024.KRU.22, dated 11 December 2024.

The two macro-regions differ not only agronomically but also in a wide range of social and cultural indicators: voting behaviour, religiosity, divorce rates, differences rooted in their distinct historical legacies (Mordwa, 2012; Skorupska, 2023; Szukalski, 2016; Śleszyński et al., 2024). These structural contrasts may be mirrored in personal factors that shape winemaking decisions: perceived meaning and mission, motivation to start a winery, risk tolerance, varietal strategy, return expectations, and succession plans. Consistent with this pattern, southeastern producers typically run smaller, family-based operations with a less overtly commercial orientation, showing greater propensity to diversify plantings and experiment with non-mainstream cultivars.



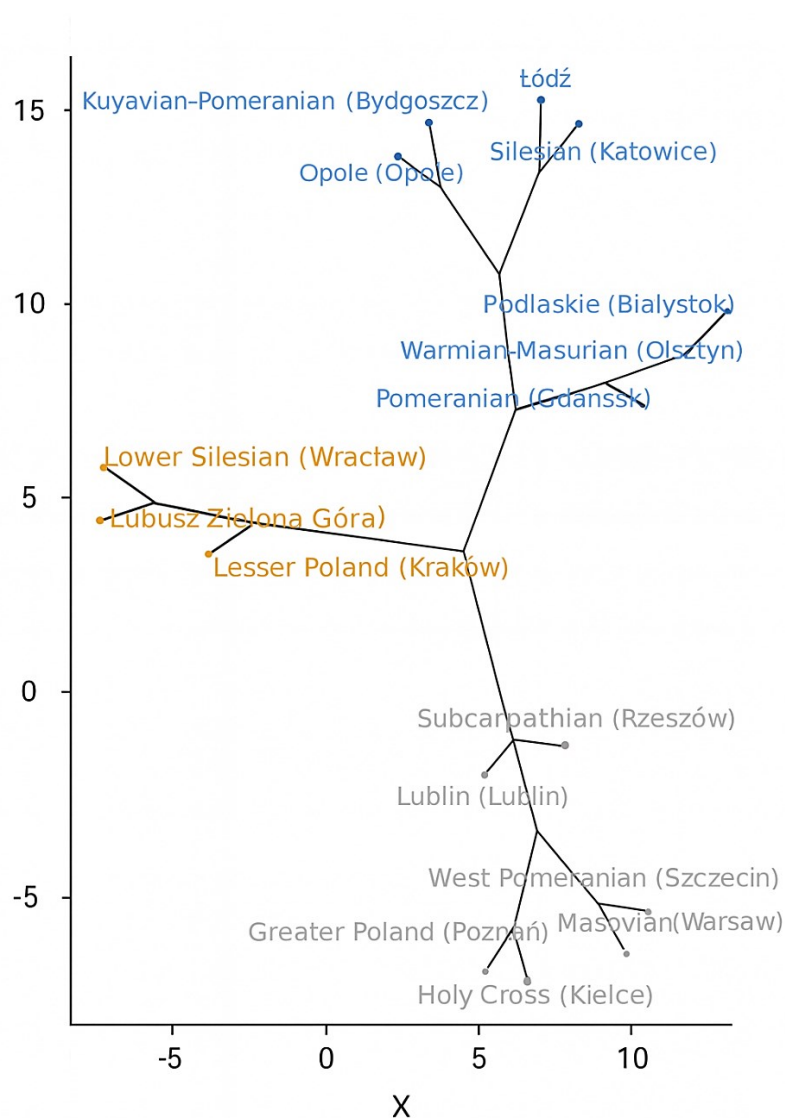
**Figure 3.** Number of Winegrowers and Vineyard Area by Voivodeship in Poland (2024).

Source: Authors' own elaboration based on data from the National Support Centre for Agriculture (KOWR), letter ref. CEN.BDG.WBI.0144.208.2024.KRU.22, dated 11 December 2024.



**Figure 4.** Vineyard Area by Province in Poland (2024) and Wine Regions.

Source: Authors' own elaboration using Datawrapper based on data from the National Support Centre for Agriculture (KOWR), letter ref. CEN.BDG.WBI.0144.208.2024.KRU.22, dated 11 December 2024.



**Figure 5.** Cluster Dendrogram.

Source: Authors' own elaboration using jamovi based on data from the National Support Centre for Agriculture (KOWR), letter ref. CEN.BDG.WBI.0144.208.2024.KRU.22, dated 11 December 2024.

To empirically validate the regional differentiation observed in descriptive statistics, hierarchical cluster analysis was performed on Poland's 16 voivodeships using two structural variables: the number of registered grape growers and total vineyard area (hectares). Data were standardized prior to analysis; Euclidean distance and Ward's minimum variance method (Ward.D2) were applied. The resulting dendrogram (Figure 5) reveals three distinct clusters reflecting the sector's geographical concentration.

**Cluster One** (Leading wine regions) comprises Lower Silesia, Lubuskie, and Lesser Poland: the three voivodeships with the largest vineyard areas and highest producer counts. Notably, this cluster unites western (Lower Silesia, Lubuskie) and southern (Lesser Poland) provinces despite their divergent strategic profiles documented in Section 4.5, confirming that Poland's wine sector is dominated by two geographically distinct poles operating at comparable scale.

**Cluster Two** (Intermediate regions) includes Subcarpathian, Lublin, West Pomeranian, Masovian, Holy Cross, and Greater Poland. Within this cluster, Subcarpathian and Lublin provinces merge with the leading cluster at the lowest hierarchical distance, suggesting these southeastern regions represent an expanding frontier of Polish viticulture aligned with Wine Region II identified by Maciejczak and Mikiciuk (2018).

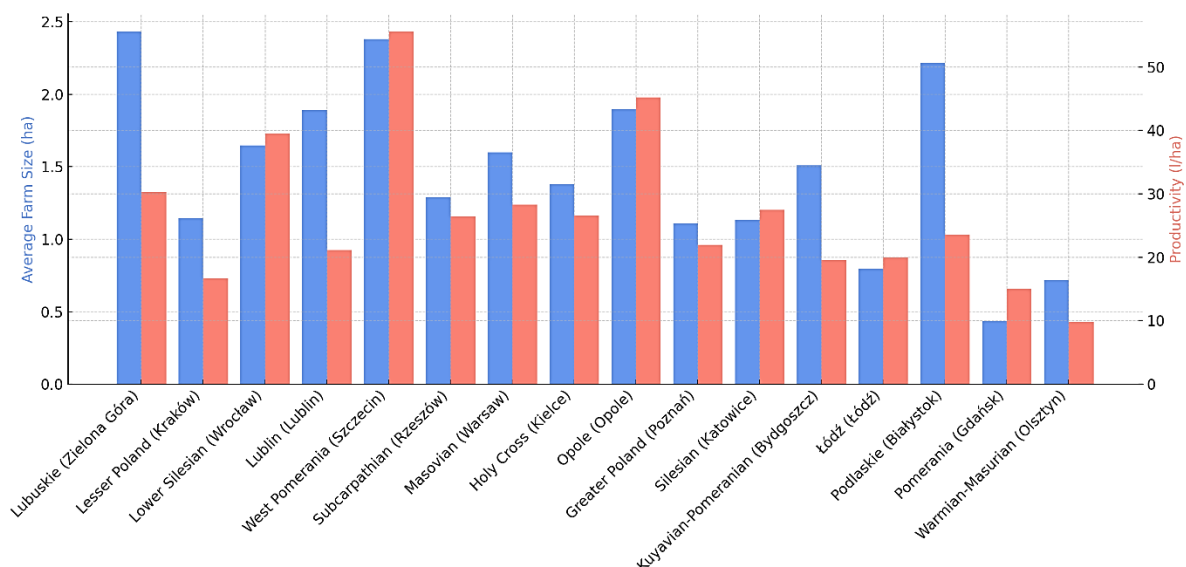
**Cluster Three** (Remaining regions) comprises Warmian-Masurian, Podlaskie, Pomeranian, Łódź, Kuyavian-Pomeranian, Silesian and Opole. Most regions in this cluster face genuine climatic constraints, aligning broadly with Wine Region III. Viticulture in these areas, while present, remains of limited or marginal significance. The exceptions within this cluster are Opole and Silesian voivodeships. Their placement here reflects primarily their small administrative area rather than any sectoral marginality. Compact territorial units typically display more homogeneous variable profiles, which statistically increases their similarity to other small-scale regions. Importantly, both Opole and Silesian voivodeships have demonstrated notable viticultural dynamism despite their limited territorial extent, and exhibit climatic conditions comparable to Lower Silesia or Lesser Poland.

Overall, this tripartite structure corroborates the earlier discussion on geographical concentration while revealing a clear hierarchical pattern: a strong sectoral core (Cluster 1), complemented by an emerging southeastern periphery (Subcarpathian, Lublin) positioned for potential future expansion.

#### 4.3. Farm Size and Productivity across Provinces

Figure 6 illustrates notable regional differences in average vineyard size across Poland. Western provinces tend to have larger vineyard holdings, while southeastern regions (particularly Lesser Poland and Lublin) are dominated by smaller vineyards. These structural differences, reflecting distinct entrepreneurial strategies, are closely linked to productivity levels: western vineyards generally achieve higher yields (hectolitres per hectare) than their southeastern counterparts.

The contrast is particularly pronounced between Lower Silesia and Lesser Poland, the two provinces with the largest vineyard areas, where the former reports more than twice the productivity of the latter. This scale effect was confirmed through correlation analysis, which revealed a strong and statistically significant association between average vineyard size and regional wine output ( $\rho = 0.718$ ,  $p = .002$ ).



**Figure 6.** Average Farm Size and Wine Productivity by Voivodeship (2024).

Source: Authors' own elaboration based on data from the National Support Centre for Agriculture (KOWR), letter ref. CEN.BDG.WBI.0144.208.2024.KRU.22, dated 11 December 2024.

Moreover, provinces not traditionally associated with viticulture, such as Podlaskie Pomeranian, Łódź and Kuyavian-Pomeranian, display low productivity levels, likely due to less favourable climatic conditions, including lower sums of active temperatures (SAT) and reduced sunlight exposure (Maciejczak, Mikiciuk, 2018).

#### 4.4. Varietal Landscape

Poland's varietal landscape is strikingly diverse. As of 5 December 2024, growers were cultivating approximately 250 grape varieties on just 990.78 hectares. This breadth reflects both the sector's youth, with producers still exploring which cultivars best suit their micro-regions, and the experimental mindset of winemakers drawn to distinctive, often unconventional grapes.

Despite this 'long tail,' a moderate degree of concentration is already evident: the five most common varieties account for roughly 41% of the national vineyard area, while the top fifteen cover 79.3%. In contrast, more than 230 other cultivars are each planted on less than 1% of the total area, highlighting the exploratory and experimental nature of Poland's wine industry (see Table 1).

**Table 1.**

*Top 20 Grape Varieties Cultivated in Poland (December 5, 2024)*

Rank	Variety	Colour	Type	Area (ha)	Share (%)
1	Solaris	White	PIWI	135,62	13,7
2	Riesling <sup>a</sup>	White	<i>v. vinifera</i>	80,71	8,1
3	Regent	Red	PIWI	73,53	7,4
4	Pinot Noir	Red	<i>v. vinifera</i>	59,01	6,0
5	Johanniter	White	PIWI	57,53	5,8
6	Souvignier Gris	White	PIWI	57,09	5,8
7	Seyval Blanc	White	PIWI	54,75	5,5
8	Chardonnay	White	<i>v. vinifera</i>	50,71	5,1

Cont. table 1.

9	Cabernet Cortis	Red	PIWI	48,99	4,9
10	Muscaris	White	PIWI	45,6	4,6
11	Hibernal	White	PIWI	32,6	3,3
12	Rondo	Red	PIWI	31,36	3,2
13	Leon Millot	Red	PIWI	20,93	2,1
14	Gewürztraminer/Traminer <sup>b</sup>	White	<i>v. vinifera</i>	19,9	2
15	Maréchal Foch	Red	PIWI	18,06	1,8
16	Zweigelt	Red	<i>v. vinifera</i>	16,99	1,7
17	Pinot Blanc	White	<i>v. vinifera</i>	15,21	1,5
18	Pinot Gris	White	<i>v. vinifera</i>	14,6	1,5
19	Dornfelder	Red	<i>v. vinifera</i>	7,39	0,7
20	Bianca	White	PIWI	7,02	0,7
—	Other Varieties	Mixed	Mixed	143,18	14,6
	TOTAL			990,78	100

**Note.** Data obtained from the Polish National Agricultural Support Centre (KOWR) in response to a public-information request under the Polish Access to Public Information Act, received 11 December 2024 (case ref. CEN.BDG.WBL.0144.208.2024.KRU.22).

<sup>a</sup> Combined entry for *Riesling*, *Rheinriesling*, *Riesling Reński* and *Weisser/Weißer Riesling*.

<sup>b</sup> Combined entry for *Gewürztraminer*, *Traminer* and *Roter Traminer*.

Table 1 reveals a clear structural pattern. Among Poland's twenty most widely planted grape varieties, twelve are white and twelve are PIWI hybrids, together accounting for 571.34 ha and 583.08 ha, respectively. Solaris, a white PIWI cultivar, leads the list, followed by Riesling, while Pinot Noir is the only red *V. vinifera* to appear in the top twenty. This distribution reflects cool-climate realities: whites ripen more reliably with lower heat accumulation, while PIWI hybrids offer disease and frost resistance crucial for Poland's marginal conditions.

#### 4.5. Regional Patterns in Varietal Selection

Correlation analysis at the voivodeship level (n = 16) revealed distinct regional patterns in Polish viticulture concerning varietal composition, productivity, and the number of registered vine growers. These findings point to divergent regional strategies within the national wine sector.

Beyond the previously described positive association between average vineyard size and productivity, a significant positive correlation was observed between vineyard size and the share of individual *V. vinifera* cultivars in total vineyard area. The share of Pinot Noir correlated positively and moderately with average vineyard size in the region ( $\rho = 0.509$ ,  $p = .046$ ). Furthermore, Pinot Noir was positively correlated with both Chardonnay ( $\rho = 0.503$ ,  $p = .049$ ) and Riesling ( $\rho = 0.503$ ,  $p = .049$ ). The share of Riesling was also positively correlated with the number of vine growers in the province ( $\rho = 0.541$ ,  $p = .033$ ).

Solaris, on the other hand, was negatively correlated with the share of vineyards in agricultural land ( $\rho = -0.581$ ,  $p = .018$ ), indicating that regions where viticulture represents a larger share of farmland tend to have a lower prevalence of Solaris – the most widespread hybrid cultivar.

The shares of *V. vinifera* and hybrid (PIWI) cultivars tended to correlate negatively across provinces, suggesting a form of varietal ‘repulsion’ between these two groups. In particular, the share of the widely planted hybrid Solaris was negatively correlated with Riesling ( $\rho = -0.585$ ,  $p = .019$ ), Chardonnay ( $\rho = -0.526$ ,  $p = .038$ ), and Pinot Noir ( $\rho = -0.556$ ,  $p = .028$ ). Similarly, the share of Regent correlated strongly and negatively with Chardonnay ( $\rho = -0.668$ ,  $p = .006$ ), while Seyval Blanc showed a negative association with Riesling ( $\rho = -0.565$ ,  $p = .025$ ).

In contrast, the share of Sauvignier Gris was positively correlated with other hybrids, namely Cabernet Cortis ( $\rho = 0.606$ ,  $p = .015$ ) and Johanniter ( $\rho = 0.662$ ,  $p = .007$ ), while Cabernet Cortis was also positively correlated with Johanniter ( $\rho = 0.597$ ,  $p = .017$ ). Johanniter’s share additionally showed a positive correlation with the number of growers ( $\rho = 0.512$ ,  $p = .045$ ).

This pattern indicates that regions specializing in traditional *V. vinifera* varieties are less likely to allocate significant vineyard areas to resistant hybrids, and vice versa. Regions characterized by larger average vineyard holdings and a higher concentration of vineyards tend to provide more favourable conditions for the cultivation of premium *V. vinifera* varieties, while smaller- scale operations appear to favour disease-resistant hybrid cultivars as a risk-mitigation strategy.

To assess regional differences in varietal strategy, we calculated an Innovation Ratio defined as the proportion of vineyard area planted with varieties outside the ten most popular cultivars nationally. This indicator captures the extent to which regional producers experiment with less mainstream varieties versus concentrating on established cultivars. We then examined correlations between this Innovation Ratio and regional productivity (hectolitres per hectare).

The Innovation Ratio exhibited substantial regional variation, ranging from 15.95% in Opole, 22.45% in West Pomeranian, and 25.38% in Greater Poland, to 51.37% in Pomeranian, 44.31% in Podlaskie, and 40.67% in Warmian-Masurian. A statistically significant negative correlation was observed between Innovation Ratio and productivity ( $\rho = -0.56$ ,  $p = .024$ ), indicating that regions with greater varietal experimentation achieve lower yields per hectare. Notably, our analysis revealed that climatically marginal regions demonstrate higher propensity for varietal experimentation, suggesting a strategic trade-off between productive efficiency and adaptive exploration.

## 5. Discussion

### 5.1. Key Empirical Findings

Polish viticulture has experienced remarkable growth: the number of winegrowers, vineyard area, and production have all increased several-fold over the past decade. Polish vineyards host more than 250 grape varieties, both PIWI and *vinifera*, demonstrating extraordinary varietal diversity. Simultaneously, a clear concentration exists, with the top fifteen varieties accounting for nearly 80% of plantings, including PIWI hybrids, shows that growers balance innovation with strategic pragmatism.

One of the most important findings is the pronounced regional differentiation of Polish viticulture. The country's three climatic wine regions align closely with long-standing historical, social, and cultural divisions. It is therefore increasingly difficult to speak of 'Polish wine' as a homogeneous national category; rather, the sector must be understood as a regionally differentiated phenomenon. The western provinces (Region I) are characterized by larger farms, higher productivity, and an emphasis on international *V. vinifera* varieties such as Riesling and Pinot Noir. By contrast, the southeastern provinces (Region II) feature smaller farms, lower yields, but greater varietal experimentation. Beyond these two main wine regions, viticultural enterprises also operate in the remaining parts of the country (Region III), characterized by the harshest climatic constraints.

### 5.2. Interpretation

To interpret these patterns, we apply Uchnast's (1997) concept of personal resilience – the capacity to thrive and survive under stressful conditions while preserving one's identity. Uchnast distinguishes between high resilience (accepting risk, abandoning routine, openness to novelty) and low resilience or 'security syndrome' (prioritizing stability, clinging to status quo). This framework may illuminate why Polish viticulture thrives despite marginal conditions, suggesting that vineyard establishment requires particularly high personal resilience.

One might assume that Polish winemakers, representing this pioneering industry, generally exhibit high personal resilience: openness to new experiences, risk acceptance, departure from routine, and readiness for failure. However, given the heterogeneous nature of Polish viticulture documented above, it is worth considering whether winemakers across the three regions might vary in their resilience profiles.

This analysis suggests that it is reasonable to propose research hypotheses about different personality patterns among winemakers in Regions I, II, and III. Region I, with its relatively long, albeit interrupted, winemaking tradition and benefiting from proximity to German viticulture providing organizational support and know-how, represents a more stable and predictable environment for winemakers than Region II, which is building its identity from scratch. Consequently, winemakers in the southeastern region may be characterized by higher

levels of strategic experimentation, risk acceptance, bricolage, and, perhaps, overall personal resilience than their counterparts in western Poland. The prevalence of PIWI cultivars, particularly Solaris, consistently a safe choice in northern climates – may represent situational awareness rather than lack of innovation, both key components of resilience. We can hypothesize that Region III winemakers exhibit even higher risk acceptance and bricolage, alongside a particularly deep sense of meaning in their enterprise, as they persist despite operating in areas largely unfavourable for viticulture.

Northern and northeastern provinces exhibit significantly higher Innovation Ratios, reflecting greater willingness to experiment with non-mainstream cultivars, which correlates negatively with productivity. This readiness to cultivate less popular and potentially less productive varieties supports the thesis that viticulture and wine production in these marginal regions are motivated primarily by non-economic factors.

These findings reinforce our argument that personal resilience and meaning-making may be key to understanding entrepreneurial persistence in climatically challenging viticultural environments. The observed regional differentiation also reflects organizational ambidexterity at sectoral level: western regions seem to prioritise exploitation, concentrating on proven *vinifera* cultivars to maximize efficiency, while marginal regions emphasize exploration through varietal experimentation (March, 1991; Zakrzewska-Bielawska, 2016).

The persistence of viticulture, especially in the most difficult regions, may be additionally illuminated through Frankl's concept of meaning-making. According to Frankl, individuals derive meaning through creative values (what they contribute), experiential values (what they receive), and attitudinal values – how they respond to unchangeable circumstances (Uemura, 2018). Winemaking and viticulture (which, after all, go hand in hand among most small producers) manifest both creative and attitudinal values: the winemaker creates and shares their product with the world, while demonstrating resilience in the face of hardship and turbulence. Experiential values find their manifestation in the mutual support that winemakers offer one another. No single strategy suits all enterprises; effective strategic choices must be tailored to the specific characteristics of the industry and market context, as well as organizational resources and capabilities (Romanowska, 2016).

We believe that this framework, which integrates wine industry analysis with resilience theory and meaning-making processes, can enrich academic discourse on viticulture with a significant psychological component that may prove crucial for winemaking in emerging wine countries.

### **5.3. Policy and Practical Implications**

From a policy-making standpoint, Polish authorities should acknowledge the pronounced regional heterogeneity documented in this study when designing support instruments for the wine sector. The emerging wine clusters identified in our data could form nuclei for future appellation systems; therefore, sectoral statistics and development programs should be

organized around these clusters rather than administrative voivodeship boundaries. The widespread adoption of PIWI cultivars, resistant to common fungal diseases, may serve as a foundation for sustainable, low-input agricultural models in Poland's emerging wine regions. This trend should be reflected in support policies and strategic frameworks that recognize the environmental and economic benefits of disease-resistant varieties in marginal climatic conditions.

#### **5.4. Limitations and Directions for Future Research**

A principal limitation of this study is that all registry data were aggregated at the level of Poland's 16 administrative provinces. This constrains both the spatial precision of the analysis and the ability to identify truly emergent wine regions. Future research should therefore aim to generate more granular data: both at the level of emerging terroir-based micro-regions and at the level of individual wineries and vineyards.

A more robust dataset covering specific enterprises would also help address the statistical limitations noted earlier, such as the small number of regional observations and the potential non-normality of key variables. Fine-grained data would allow for more reliable inferential analysis and better model specification.

These findings also point to broader questions that merit future investigation. One promising line of inquiry concerns the extent to which Poland's emerging wine clusters coincide with deeper socio-cultural cleavages across regions – differences shaped by historical legacies and reflected in patterns of religiosity, political affiliation, or family structures. Another research avenue involves examining how winemakers' personal motivations, value systems, and resilience-related traits influence their strategic decisions regarding enterprise scale, varietal selection, and market orientation.

While the present paper is exploratory in nature and does not aim to test such relationships using psychometric tools, we believe that assessing the personal resilience of winemakers and growers in different parts of the country – and directly studying their motivations for launching and continuing winegrowing activities under challenging conditions – offers a highly promising direction for future research, potentially with a cross-national comparative component.

## **6. Conclusion**

Polish viticulture and wine production has experienced remarkable growth over the past decade, expanding from a niche industry growing from 134 to 990 hectares between 2014 and 2024, with production increasing from 2737 to 27,974 hectolitres over the same period. Wine production concentrates primarily in two regions (western belt and southeast), which exhibit significant differences in average vineyard size, productivity, and varietal selection.

Polish vineyards host more than 250 grape varieties, both PIWI and vinifera, but the top 15 varieties account for 79.3% of total plantings.

The study shows that Polish winemaking is inherently heterogeneous: two dominant models can be observed, one drawing from German solutions and the other seeking its own path. At the same time, the wine industry in Poland is still young and, in its early stages, continues to experiment—particularly with varietal selection. Furthermore, the study reveals that the pursuit of profit is not the only driving force behind the industry's development and that non-economic factors play a noteworthy role in winemaking.

Our exploratory study represents the first attempt to explain the development of winemaking in a marginal climate region, particularly entrepreneurial decision-making in the wine sector, through the prism of resilience and demonstrating how significant non-economic motivations can be in such analyses.

In terms of practical implications, we demonstrate that there is solid ground for potential future applications. We suggest that due to the heterogeneous nature of Polish viticulture, there is a necessity for regionally differentiated policies. We recommend deeper study of PIWI varieties as a foundation for sustainable agriculture. We also suggest that given the wide range of producer sizes and the large number of small producers, policymakers should pay special attention to small wine farmers, who in many areas are the backbone of Poland's wine industry.

This study is intended as a foundation for subsequent psychometric investigations examining how personality traits influence and moderate strategic decision-making across different wine regions. We suggest cross-national studies with other emerging wine countries, quantitative research utilizing personal resilience measurement scales, and qualitative studies on personality traits of vine growers and producers.

## **Acknowledgements**

This research was supported by University of the National Education Commission, Krakow internal grant (WPBU/2025/04/00014).

The publication presents the results of the Project no. 051/ZZN/2025/POT financed from the subsidy granted to the Krakow University of Economics.

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