Modelling the group dynamics in the wine industry

Gabriel I. Penagos-Londoño (penagosi@javeriana.edu.co)
Department of Economics – Pontificia Universidad Javeriana - Colombia

Felipe Ruiz-Moreno (felipe.ruiz@ua.es)
Department of Marketing - University of Alicante – Spain

Ricardo Sellers-Rubio (ricardo.sellers@ua.es)
Corresponding author
Department of Marketing - University of Alicante – Spain

ABSTRACT

Purpose: One of the main difficulties for wine managers is understanding and interpreting how certain strategies and company behaviours can affect firm performance. This article attempts to contribute to alleviating these concerns by examining the evolution of the competitive wine industry structure over time using a strategic group membership dynamics approach.

Design/methodology/approach: We empirically analyse a data set spanning the period 2004 to 2014 to identify the strategic groups in the Spanish wine industry and to model their evolution over time. A time inhomogeneous hidden Markov model (HMM) is used for this purpose.

Findings: Three strategic groups are identified: Young Makers, Quality Lovers and Major Players. Young Makers are small wineries that produce low-quality wines. They are not part of a collective brand (protected designation of origin or PDO) and do not invest in marketing campaigns. Quality Lovers produce the highest quality wines but offer a narrow assortment. They invest modestly in advertising, and most of them belong to a PDO. Major Players produce medium-quality wines, offer a wide assortment of wines and invest heavily in advertising. The groups seem stable over time.

Originality: No previous studies have analysed the competitive structure of the Spanish wine industry. This study delineates the structure of this industry using strategic groups, which is supported by a valid econometric model.

Practical implications: The results show that strategic group analysis can be used to identify and compare patterns of strategic activity within the wine industry, providing a better understanding of the competitive environment.

Keywords: strategic groups; dynamics; wine industry; quality; inhomogeneous hidden Markov model

Research paper
1. Introduction

Spain is one of the world’s leading wine producers, and the Spanish wine industry is central to the Spanish agri-food sector in terms of both added value and employment (Sellers-Rubio, 2010). However, the Spanish wine industry has also encountered several challenges that have influenced the business structures and strategies adopted by wineries in recent decades and that make in-depth analysis worthwhile. Specifically, a situation of steady decline in domestic wine consumption and increasing competition in international markets has caused many wineries problems in surviving in the market. In response to this situation, Spanish wineries have adopted different strategies to maintain their market shares and ensure their long-term survival. Indeed, the importance of strategy has been highlighted by several scholars of the wine industry, who have linked different winery strategies to financial performance. For example, Thach et al. (2005) showed that the management practices implemented by U.S. wineries positively affected their productivity and profitability. Similarly, Newton et al. (2015) analysed the links between differentiation strategies and financial performance. In the Spanish context, Simon-Elorz et al. (2015) analysed the effect of different marketing and financial strategies by Spanish wineries on economic performance. However, this industry is characterised by different business structures and dimensions, and the possible interdependence between the strategies adopted by wineries should not be ignored. Accordingly, a deeper understanding is needed regarding the evolution of the competitive structure of this industry over time and the different strategies that wineries follow.

Within this context, the concept of strategic groups is highly relevant. Leask and Parker (2006) defined a strategic group as a set of homogeneous firms that employ the same or similar strategies in a specific industry and share similar strategic logics and dimensions. Therefore, as a concept, a strategic group refers to a collection of firms that compete using similar strategies within groups and different strategies between groups. Bearing that in mind, the identification
of strategic groups can be helpful for researchers and practitioners alike (Carroll, 2018). As Carroll and Thomas (2019) have noted, strategic group analysis can be used to infer which firms are likely to interact with each other, what the nature of those interactions might be and how those interactions could affect the performance of those firms. This type of analysis provides a better understanding of how firms behave within an industry, and it is very useful when the number of competing firms within an industry is large, which is certainly the case in the wine industry. In such situations, the concept of the strategic group can be used as an intermediate level of analysis between firm- and industry-level analyses (McGee and Thomas, 1986). It can form a bridge between the perspective of industries as a collection of homogeneous firms and the perspective of firm heterogeneity (Pozo et al., 2017; Meilich, 2019). In sum, despite the loss of precision regarding firm-level analysis, the benefit of strategic group analysis is that it provides a better understanding of what happens in a given industry. By analysing strategic groups, managers can uncover different formulas based on the variation in strategies and company behaviours within the industry that explain differences in performance.

Companies tend to modify their strategic structure over time to adjust to the changing environment (Snow and Hambrick, 1980). The analysis of strategic group dynamics can provide further information about the rate at which strategic groups change and about the evolution of firms within strategic groups when faced with uncertainty. Shifts in the industry structure and the dynamics of the competitive behaviour of similar companies can reveal an organisation’s most direct competitors and the basis on which they compete, thus simplifying the strategic decision-making process. From a management, marketing and economics perspective, the analysis of strategic group dynamics can help identify mobility barriers at the group level and explain how competitive dynamics change over time (Ebbes et al., 2010).

Despite the benefits of analysing the wine industry from this point of view, the literature examining strategic groups in the wine industry is scarce (e.g. Dressler, 2017; Downing and
Therefore, the general research aim of this study is to improve the understanding of the competitive behaviour of Spanish wineries by accurately identifying strategic groups and their evolution over time. We first explore whether strategic groups exist in the Spanish wine industry. Second, we examine wineries’ group-switching behaviour during the period 2004 to 2014. By doing so, we define the key strategic dimensions in the wine industry and test for performance differences between groups. Specifically, three strategic dimensions are used to identify the competitive groups in this industry: the size of the winery, its experience in the market and the quality/reputation of its wines. We also consider the number of products marketed by the winery, the collective brand strategy, advertising spending and capital structure to validate and improve the characterisation of the proposed grouping. To the best of the authors’ knowledge, this study offers the first attempt to estimate strategic groups within the Spanish wine industry. To achieve these research aims, we use an inhomogeneous hidden Markov model (HMM; Bartolucci et al., 2013). This econometric method overcomes the limitations of strategic group analysis (see Ketchen and Shook, 1996; Murthi et al., 2013 or Ebbes et al., 2010). Specifically, in this inhomogeneous HMM, a time-variable transition matrix captures wineries’ group-switching behaviour. The application of this model is relatively new in the wine industry. In the Italian market, Bassi et al. (2020) estimated a basic HMM to infer clusters according to a categorical response variable whose categories represented the brands of sparkling wines. Later, Bassi et al. (2021) proposed a multivariate HMM using three categorical response variables collected over time: price, sugar content and appellation. The HMM considered the influence of consumer covariates on the latent structure of the model. The results show that these covariates influence the group weights and transition probabilities.

Section 2 provides a brief literature review, primarily focusing on strategic group research. The method and data are described in Section 3, where the characteristics of the
Spanish wine industry are described. The findings are reported in Section 4. Finally, Section 5 discusses the key conclusions and implications of this study, as well as avenues for future research.

2. Theoretical background

This section provides a brief review of the strategic group literature and justifies the choice of this industry as the setting for this study.

2.1 Strategic group literature: a framework of analysis

The study of strategic groups has become a core research topic in strategic management. Strategic groups comprise firms that are similar according to some measure, such as cost structure, product diversification, formal organization, resource profile and/or strategic emphasis. Accordingly, firms in the same strategic group adopt similar strategic postures and appear to possess similar strategic identities (DeSarbo and Grewal, 2008). Most of this literature can be placed into four major streams of research (Mas-Ruiz et al., 2014): the emergence of strategic groups, the rivalry within and between groups, performance differences between groups, and group structure stability.

Regarding the first stream of research, the emergence of strategic groups, several theories have attempted to explain the existence and emergence of strategic groups (e.g. Caves and Porter, 1977; Tang and Thomas, 1992; Peteraf and Shanley, 1997). For example, Dranove et al. (1998) reported that group-level effects on performance stem from strategic interactions amongst members. These strategic interactions and existing relationships are central to group-level effects on performance, whilst mobility barriers help sustain these group-level effects by limiting entry to the group and enhancing the strategic interactions amongst members (Mas-Ruiz et al., 2014). The approach of Dranove et al. (1998) meets the scientific criterion of falsifiability. A corollary of finding the absence of systematic variation in profitability across groups would be to show the non-existence of strategic groups (Murthi et al., 2013).
Evidence regarding the second stream of research, rivalry within and between strategic groups, is unclear. For example, applying the same theory (i.e. the resource-based view of the firm) may lead to different conclusions. Several studies provide evidence that rivalry between strategic groups is greater than rivalry within strategic groups (Caves and Porter, 1977; Peteraf, 1993). This evidence suggests that members of the same group have similar resources, so their reactions to competitive disturbances will resemble one another. In contrast, greater within-group rivalry could result from members’ resource homogeneity (Barney, 1991; Bogner and Thomas, 1994) because each firm pursues the same goals but does not have unique resources or isolation mechanisms to gain a competitive advantage (Smith et al., 1997). Thus, greater strategic distance aids tacit coordination by signalling when rivals exceed their tacit limits (Gimeno and Woo, 1996).

The third stream of research, performance differences between groups, deals with the major reason for strategic group analysis, that is, to show that performance differences between firms can be attributed to strategic group affiliation (Mehra, 1996). Industrial organisation theory describes the mobility barriers that restrict the movement of firms between groups (Caves and Porter, 1977; Hatten and Hatten, 1987). Leask and Parker (2006), Ketchen et al. (1997) and Nair and Kotha (2001), amongst others, have reported performance differences across strategic groups. Although some studies (see Cool and Schendel, 1987, 1988; Frazier and Howell, 1983) have shown that the idea of mobility barriers provides little theoretical support for the link between group membership and performance, abundant empirical evidence confirms that strategic groups play a role in business performance. Accordingly, including strategic groups in analyses of the factors that affect performance seems necessary because of strategic groups’ ability to explain performance (Short et al., 2007; García-Ochoa and Bajo-Davó, 2016).

Finally, the stream of research examining group structure stability suggests that an initial
change in strategy by some firms in a group can result in three possible outcomes: a change in group membership, a change in the number of groups or a change in group strategy (Mascarenhas and Aaker, 1989). Although certain theoretical developments suggest that strategic group membership is stable over time (Cool and Schendel, 1987; Mascarenhas and Aaker, 1989), most studies indicate that firms within strategic groups evolve (e.g. Nair and Filer, 2003; or Meilich, 2019). A firm’s strategy tends to change in a non-random, non-uniform way. Changes in a firm’s strategy occur at specific moments when the industry experiences an important event. New opportunities or threats are created, and firms react in different ways. In response to such changes, many firms might alter their strategies. In addition, according to Dranove et al. (1998), group members might collectively adopt strategies. Other scholars (e.g. Cool and Schendel, 1987, 1988; Cool and Dierickx, 1993; Fiegenbaum and Thomas, 1990, 1993) have argued that firms adapt their strategies in response to changes in the industry environment as well as imitation by other firms and the market’s degree of acceptance of their product positioning. Caves and Porter (1977) argued that performance differences across strategic groups drive changes in strategic group membership.

The present study addresses most of these streams of research. Specifically, the study tests the existence of strategic groups in the wine industry by investigating performance differences amongst different groups and examining the dynamics of wineries’ behaviour over a 10-year period.

2.2. Applying strategic group analysis to the wine industry

Previous studies have addressed the importance of strategic profiling and the resulting strategic groups for customer attraction, especially in competitive markets (Fiegenbaum and Thomas, 1990). When competing in crowded markets (such as the wine industry), firms have been observed to form strategic groups to gain benefits and then protect these benefits (Downing and Shanley, 2017; Downing and Ma, 2017). The core of this strategy consists of a
diagnosis of the situation, the creation or identification of a policy to deal with key difficulties, and a set of coherent actions (Rumelt, 2012). This scenario is also the case in the mature wine industry, where wineries engage in entrepreneurial sensemaking to craft differentiation strategies and adopt strategic group behaviours, uniting through common investment and tacit relationships to obtain competitive advantages (Peteraf and Shanley, 1997). Despite the benefits of analysing the wine industry from this strategic point of view, the literature offers limited insight into strategic groups in the wine industry (e.g. Dressler, 2017; Downing and Parrish, 2019; or Gilinsky et al., 2019).

Dressler (2017) explored the value contribution of tourism in the context of strategic groups of wineries, and the findings suggest that tourism is highly relevant for many wineries to build a market profile. Therefore, tourism can help wineries build a market profile. According to Dressler (2017), cost leaders and boutique wineries are two strategic groups in the German wine industry that have been reluctant to pursue tourism-based strategic initiatives.

According to Downing and Parrish (2019), strategic groups allow wineries to develop solutions that are acceptable for the group but that allow for differentiation within the group. Therefore, by forming strategic groups, wineries can find an acceptable solution by “muddling with a purpose” (Wrapp, 1984, p.14) through a collective differentiation strategy and an individual differentiation strategy. Downing and Parrish (2019) discussed how sensegiving efforts are conveyed to wine consumers using strategic groups. The collective approach to creating authenticity with sensegiving allows regions to differentiate themselves by creating their own sense of authenticity. Thus, these authors proposed that wineries pursue a competitive advantage by identifying the benefits of membership in strategic groups, including differentiation from wineries in other strategic groups.

In sum, the most recent studies of the wine industry that deal with strategic behaviour have reported several important strategic learning needs and leadership capabilities (Gilinsky
et al., 2019). These studies have shown that large, established wineries focus even more on entrepreneurial thinking than small, emerging wineries. This difference may be due to the wine industry structure, which requires small, young firms to focus more on marketing to compete with established firms in a mature industry.

From a similar but different angle, Bassi et al. (2020) evaluated the market of sparkling wines to identify homogeneous groups of winery brands and to analyse their competitive relations. The study showed loyalty and variety seeking by customers. The results shed light on the preferences of customers as they draw patterns of associations between brands and product features. Bassi et al. (2021) later analysed the dynamics of sparkling wine purchases over two years using a multivariate HMM accounting for the sparsity of purchases. The results highlight similar latent profiles corresponding to groups of consumers sharing similar preferences in repeated sparkling wine purchases.

In this study, we add new evidence to the stream of research on strategic groups by investigating their evolution over time in the wine industry. Two research questions are proposed. RQ1: Does strategic group membership have performance implications for Spanish wineries? RQ2: Are strategic groups and the membership of their wineries stable in the Spanish wine industry?

3. Method

To identify the strategic groups in the Spanish wine industry and describe the evolution of wineries’ membership in these strategic groups over time, we used a time inhomogeneous hidden Markov model (HMM). These models can identify strategic groups whilst explicitly modelling a time-variable transition matrix to capture wineries’ group-switching behaviour. Thus, these models can be used to observe how strategic groups evolve over time. Time inhomogeneous HMMs identify a strategic time path for each firm. In this path, the successive strategy states are linked through a first-order Markov process. Thus, a firm’s strategy at time $t$
depends on the firm’s strategy in the previous measurement period.

This model is an extension of the one described by Ebbes et al. (2010) because our study used more general initial values for the priors. This approach added flexibility when controlling the amount of information included in the priors and enabled estimation of a time-variable transition matrix. Consequently, it provided a more accurate estimation of strategic group membership dynamics. Indeed, we used a Bayesian framework for modelling, the sampling methodology being Gibbs Sampling, a particular case of the Metropolis–Hastings technique. The details of the parameter estimation can be found in the study by Penagos-Londoño and Ruiz-Moreno (2019).

3.1. Model

The basic approach was to define strategic groups as clusters of wineries that were close in terms of certain variables. These variables should be quantifiable and should accurately describe the behaviour under study. More specifically, each winery was defined by a set of r variables and a vector of dimension r, which provided a snapshot of that winery. This vector \( x_{ti} \) uniquely defined winery \( i \) \( (i = 1, \ldots, N) \) at time \( t \) \( (i = 1, \ldots, T) \). The next step was to group similar wineries by comparing their vectors. A measure of similarity is typically defined for this purpose. In this study, the measure of similarity was the likelihood of belonging to a certain distribution linked to a specific group. The procedure thus selected the most alike vectors to belong to the same group in such a way that similarity to other groups was not that small.

We assumed that, for a specific year, there were \( K \) clusters, such that \( k = 2, \ldots, K \), described as multivariate normal distributions of dimension \( r \) with density function \( \varphi(x_{ti}|z_{ti} = k, \theta_{tk}) \). Here, \( \theta_{tk} = (\mu_{tk}, \Sigma_{tk}) \) are the parameters for the distribution, \( \mu_{tk} \) is the mean vector, \( \Sigma_{tk} \) is the covariance matrix for cluster \( k \) at time \( t \), and \( z_{ti} = k \) accounts for the likelihood of being in cluster \( k \) at time \( t \) (then, \( z_{ti} = k \) is the hidden variable that determines
membership in cluster $k$). Therefore, the mixture distribution for a given value of $t$ is defined as follows:

$$f(x_{ti}|x_{t-1}, \theta_{tk}) = \sum_{k=1}^{K} \omega_{tk} \varphi(x_{ti}|z_{ti} = k, \theta_{tk}).$$

(1)

where $\omega_{tk} > 0, \sum_{k=1}^{K} \omega_{tk} = 1$, are the mixing proportions or probabilities of belonging to cluster $k$ ($k = 2, ..., K$) at time $t$ ($t = 1, ..., T$).

A winery was assumed to evolve and potentially move to a different group annually. To account for the dynamic nature of the market, a second element was introduced. This second element was a transition matrix that captured the probability of remaining in the same group or moving to another group. This probability was recorded in a square transition matrix, which was not assumed to be constant over the entire period. The matrices $E_K$ were defined to be right stochastic, so each row summed to 1.

This procedure yielded a set of $N$ vectors of wineries for $T$ years. Each vector consisted of company and market variables. Wineries were classified (i.e. clustered) into one of the $K$ groups for each year. The dynamic behaviour of the clusters over time was modelled as a first-order Markov chain. Allowing the transition matrices to be different for each period made the Markov chain an inhomogeneous chain. In a particular year, a given winery belonged to a specific cluster. This distribution was modelled as a mixture of multivariate normal distributions. To determine membership to a specific cluster, we introduced a hidden (latent) variable, $z$, distributed as a multinomial random variable. Further details are provided by Penagos-Londoño and Ruiz-Moreno (2019). In conjunction with the set of vectors for the incomplete data, $x$, the data collection $(x; z)$ is the complete data. Thus, a hidden Markov model was defined. Estimation was performed using a Markov chain Monte Carlo (MCMC) algorithm. A Markov chain whose equilibrium distribution was the complete data posterior distribution was constructed. Specifically, the indications provided by Penagos-Londoño and Ruiz-Moreno (2019) were followed. This reference may be consulted for further details on the
modelling and estimation technique used in this study. Data processing was performed using MATLAB.

Additionally, the effective sample size (ESS) measures the effective number of independent samples and is regarded as a univariate convergence diagnosis (see Gong and Flegal, 2016; Kass et al., 1998; Robert and Casella, 2013). As a proxy for the ESS, we performed 40 simulations of 9000 samples each one, after discarding 1000 samples as burn-in. We calculated the ESS to each parameter out of the set of parameters $(\omega, \theta, \mathcal{E})$ that accounts to 792 variables. The R package mcmcse (Flegal et al., 2021) by means of the function ESS was used for running its estimation. As a result, we obtained an average ESS ranging from 3602.464 to 8111.857 for the 40 runs, with an average value of 6690.639. Additionally, the graphs of the samples against iterations show a normal behaviour, i.e., they are random centred around its mean, suggesting an adequate state space exploration. The latent variables converged early in the process. Finally, we did not use further covariates additional to the selected variables. Consequently, covariate effects are not allowed.

3.2. Contextual setting and data

3.2.1. Contextual setting

The Spanish wine industry has encountered several challenges that have influenced the business structures and strategies adopted by wineries in recent decades and that make in-depth analysis worthwhile. The first challenge is the emergence of new wine-producing countries such as South Africa, Chile and Australia, which employ innovative production systems and modern marketing strategies to increase their international market share (Bardaji et al., 2014). These countries base their export strategies on strong branding and relatively consistent, high-quality, competitively priced products (Chambolle and Giraud-Heraud, 2002). Meanwhile, traditional wine producers such as Spain, France and Italy strive to maintain their market positions. Although these countries represent around 50% of global wine production, their
position in the market is under threat.

Second, the structure and dynamics of this industry are closely linked to the regulatory framework (Simon-Elorz et al., 2015). For example, European regulations since Spain joined the European Union in 1986 have led to a reduction of vineyards, thanks to the Common Agricultural Policy (CAP), to achieve a better balance between supply and demand through the Common Market Organisation (CMO) for wine. This regulation has fostered the production of high-quality wines and has restricted the production of table wines to eradicate surpluses throughout the European Union. This shift has forced out the least efficient vineyards and has adjusted supply to meet demand.

Third, Spain has also witnessed a steady decline in domestic wine consumption (Sellers-Rubio et al., 2016), which began in the 1970s. This downward trend might be explained by a change in consumer habits and the rise of substitute beverages such as beer, soft drinks and mineral water, which are more widely consumed than wine (Martínez-Carrión and Medina-Albaladejo, 2010). Consequently, the domestic market consumes scarcely one third of overall production of Spanish wine. Fortunately, the quality of the wine consumed has increased, which has led to a smooth but steady increase in the value of the Spanish wine market.

To address these three challenges, wineries have adopted different business structures and strategies and have changed managerial decision-making processes. To be more competitive, Spanish wine producers have made important changes to their marketing strategies (Simon-Elorz et al., 2015). For example, many firms (most of them under the legal form of a cooperative) are still closely linked to bulk wine production, operating with very tight margins and large volumes. Most of this wine is devoted to alcohol production and exportation. However, some cooperatives have changed from a bulk-production model to a model based on market segmentation, internationalisation and the production of high-quality bottled wine. Traditional family-owned wineries have focused on producing high-quality wines for specific
market segments in domestic and international markets. These firms co-exist with new wineries that focus on marketing-related activities such as advertising campaigns, niche marketing and brand image. From a managerial perspective, some wineries have replaced their family business format with a more professional management approach (Chambolle and Giraud-Heraud, 2002; Castaldi et al., 2005; Karelakis et al., 2008; Corrado and Odorici, 2009), whilst some large companies have started to invest in New World wineries (Martínez-Carrión and Medina-Albaladejo, 2010).

Many Spanish wine producers have invested in technology, research and human capital to improve their wine production and quality. The pursuit of quality cannot be explained without considering the role of protected designations of origin (PDOs). PDOs were established in the 1930s to protect the image and quality of products from specific geographical areas. They are governed by European legislation. PDOs are collective brands used to describe foodstuffs (e.g. the wines of Ribera del Duero) that are produced, processed and prepared in a specific geographical area using local know-how (Loureiro and McCluskey, 2000). They have enabled small and medium-sized wineries to develop marketing and promotional strategies for both domestic and international markets and have been crucial for these wineries to become more competitive.

3.2.2. Data

The sample comprised panel data on 741 Spanish wineries for the 11-year period from 2004 to 2014. The sample represents 72.21% and 72.69% of total winery sales revenue in 2004 and 2014, respectively. We follow the literature in operationalising the various measures of wineries’ strategic dimensions and performance. In this section, we explain the choice of strategic dimensions, as well as the firm characteristics and the measurement of firm profitability.

Strategic dimensions
Regarding the variables used to classify wineries into groups, three strategic dimensions were selected: the size of the winery, its experience in the market and the quality/reputation of its wines. Authors have noted that many characteristics can be used to classify and compare firms (e.g. Cattani et al., 2017, Meilich, 2019). A list of firm characteristics distinguishing firms between groups has been provided by Meilich (2019) based on the work of several authors (Cool and Schendel, 1987; McGee and Thomas, 1986; Porter, 1980). The three variables selected for this research are included in this list. We now explain the variables used as proxies for these dimensions.

The first dimension is the experience of the winery. This dimension was measured as the winery’s age in years ($Age_{it}$). This variable was operationalised as the difference between the year in which the company started and the year $t$. The age of a company is related to its reputation and therefore its strategy and success. Age is also highly correlated with survival (Altuntas et al., 2016). This variable has been used in the wine industry to determine the degree to which appropriate training and the producer’s experience influence wine prices (Oczkowski, 1994; Sellers-Rubio et al., 2018) and to test the effect of the new wine boom (Roberts and Reagans, 2007).

The second dimension is the size of the winery, which has been widely used in the literature (Cool and Schendel, 1987; Hunt, 1972; Nohria and García-Pont, 1991; Porter, 1979) as a strategic dimension for identifying strategic groups. Company size has multiple relationships with other variables, such as profitability (Hall and Weiss, 1967), rivalry (Gómez et al., 2021) and efficiency (Mas-Ruiz, et al., 2014). Firms of the same size compete directly for resources and customers, and the largest firms in an industry are often the most successful because they have superior resources and are usually seen as stronger rivals (Chen et al. 2007; Gomez et al., 2021). Additionally, economies of scale and scope are the best explanation for the major behavioural differences between firms of different sizes. Larger firms, for example, might enjoy
economies of scale, higher market share and lower costs of production than smaller firms do and hence might achieve higher profits. If their reduced costs derive from joint production of several products and services, then large firms might also more easily offer their clients a wide portfolio of complementary products and services (Mas-Ruiz, et al., 2014). Winery size can also affect reputation because bigger companies have more financial resources to invest in quality and promotion (Castriota and Delmastro, 2015). Size was measured using two variables. First, the winery’s total assets in thousands of euros ($Assets_{it}$) offered an indicator of company size. Second, size was also operationalised as the number of employees of winery $i$ in year $t$ ($Employees_{it}$). This variable captured the importance of human capital in the production of wine. Notably, wineries have invested in technology in recent decades to reduce labour costs (Martínez-Carrión and Medina-Albaladejo, 2010).

The third dimension is quality, which was measured using a variable that indicated product quality ($Valuation_{it}$). This variable offered a proxy of a winery’s reputation, capturing the winery’s reputation for producing high-quality wines (Oczkowski, 2016). It was measured as an index based on the well-known Spanish wine guide Los Mejores Vinos de España Repsol (2004–2014). This guide provides blind-tasting quality scores of the best Spanish wines in the market, with more than 1,000 wines ranked every year.

**Firm characteristics**

After the companies had been grouped according to these strategic dimensions, additional variables were used to enhance the characterisation of the groups and externally validate the resulting groups. $NumRef_{it}$ was the number of products that winery $i$ marketed in year $t$ and that were included in the wine guide. $PDO_{it}$ was a dummy variable that took the value 1 if winery $i$ operated under a PDO in year $t$, and 0 otherwise. $AdvSpen_{it}$ was the advertising spend of winery $i$ in year $t$ measured in euros. $Equity_{it}$ was the capital structure of winery $i$ in year $t$, reflecting the capital of the firm not repaid to investors in the normal course of business (in thousands of euros).
Firm performance

The theory-based empirical approach proposed by Dranove et al. (1998) was adopted. Under this approach, a strategic group is deemed to exist if the performance of a firm is a function of group characteristics, after controlling for firm and industry characteristics. Therefore, once the strategic groups had been identified, differences across strategic groups were measured using performance variables (e.g. Short et al., 2007; DeSarbo and Grewal, 2008; Ebbes et al., 2010). Three variables were used to assess each winery’s performance and the effectiveness of the winery’s strategy. $Income_i$ was the net income of winery $i$ in year $t$ (in thousands of euros). $Profits_i$ was the total profits reported by winery $i$ in year $t$ (in thousands of euros). $ROA_i$ was the financial performance of winery $i$ in year $t$, measured using the accounting measure of return on assets (ROA), which is the ratio of net income before taxes over total assets.

The SABI database (the Iberian version of the Bureau Van Dijk database), which provides accounting and financial information for Spanish firms, Infoadex, which provides detailed information on advertising expenditure, and the wine guide Los Mejores Vinos de España Repsol provided the necessary data for these variables.

In summary, the study covered 741 wineries, three strategic dimensions (measured using four variables), four strategic variables to validate the results and three performance variables based on annual data for the period 2004 to 2014. The data set and the MATLAB code are available from the corresponding author upon request.

4. Results and findings

The wineries were grouped into clusters according to their degree of similarity in terms of the proposed strategic dimensions. Because of the risk that the results might be skewed by the relative scale of these grouping variables, it was important to avoid the effect of the scale and unit of measurement of these variables. Hence, the strategic dimensions used for estimation were standardised to ensure that the same scale was used. The proposed inhomogeneous HMM was
estimated for $K = 2, \ldots, 7$ strategic groups in the wine industry. The model selection criterion was the Bayesian information criterion (BIC; Schwarz, 1978). This criterion suggested that $K = 3$ was the number of groups that best fit the data. As explained earlier, Monte Carlo simulation with 10,000 steps was used to estimate the parameters of the probability distribution. The first 10% of the steps (burn-in period) were discarded to ensure the stability of the results.

The method used in this study should define each group as unique and different. However, subsequent internal and external validation using probabilistic statistics was required. The results were aggregated over the entire period. Table I presents the descriptive statistics for the main (unstandardised) strategic dimensions used to identify the strategic groups.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|}
\hline
Dimension & Value \\
\hline
\end{tabular}
\caption{Descriptive statistics for the main strategic dimensions used to identify the strategic groups.}
\end{table}

The results indicate that the means and standard deviations are well differentiated by the classification of wineries. The results also indicate major differences between the strategic groups for many of the variables used to identify these groups. Internal validation seeks to verify whether the clusters are inferentially distinct from each other and are not merely an artifact of the researchers’ specification of the desired number of clusters (Dant and Gundlach, 1999). We performed analysis of variance (ANOVA) tests to detect significant differences of the strategic dimensions between strategic groups. The variables $Age_u$ (890.4; $< 0.0001$), $Assets_u$ (1539.5; $< 0.0001$), $Employees_u$ (1216.1; $< 0.0001$) and $Valuation_u$ (6973.6; $< 0.0001$) had significantly different results between groups, thereby internally validating the classification.

Once the internal validity of groups had been checked, external validation assessed the usefulness of the cluster solution by examining whether intercluster differences persisted in variables other than those used to classify the wineries. This external validation also served as the exploratory investigation of the influence of strategic group structure and main characteristics (Dant and Gundlach, 1999). To this end, some variables capturing firm characteristics and firm performance were also examined. These variables appear in Table II. ANOVA was used to test
whether the levels of these variables differed between the strategic groups.

The data in Table II confirm that the groups differ in their average values for the variables capturing some firm characteristics. These results provide external validation and support for the classification. The data in Table II also highlight statistically significant differences between the groups in terms of the performance variables. The largest wineries performed better than the medium-sized and small wineries. Consequently, these performance differences between the groups support the use of the present approach and the criteria adopted by Dranove et al. (1998), according to which strategic groups exist if there are performance differences between groups.

<TABLE II HERE>

For a more detailed analysis of performance differences, Tukey’s studentised range (HSD) procedure was employed. The aim was to determine whether the three strategic groups of wineries differed in terms of these performance variables (see Table III). SG3 has significantly better performance than any other group in all variables. SG1 has significantly worse performance than the other groups in the wine industry. A significant difference between strategic groups 1 and 2 was found for all performance variables except profit.

<TABLE III HERE>

Each strategic group was labelled to reflect the differences identified in this research. These labels and a general description of the key differences between the groups over the entire study period are now described.

SG1 is labelled Young Makers. This group consists of the smallest (2,871 thousand Euros of assets and 6.6 employees on average) and youngest (16.7 years on average) wineries in the industry (e.g. Bodegas Hermanos Torres de Madrigueras, S.L. and Bodegas El Molar, S.L.). This group comprises almost 54% of the wineries in the sample. The primary characteristic of wineries in this group is that they focus on production without considering quality indicators. Hence, these wineries have much lower levels of investment in advertising
than wineries in the other strategic groups (1,565 Euros in SG1 vs. 38,658 Euros in SG2 and 395,118 Euros in SG3).

SG2 is labelled *Quality Lovers*. This group comprises 270 medium-sized wineries (around 36% of the sample) that focus on producing high-quality wines (e.g. Finca Valpiedra, S.L. and Viñedos del Contino, S.A.). This group is characterised by larger wineries than in the previous group (assets of 7,209 thousand Euros and 13.8 employees on average). They are involved in marketing operations, investing more in advertising than wineries in SG1.

SG3 is labelled *Major Players*. This group consists of 73 large companies (e.g. Bodegas Ayuso, S.L. and El Coto de Rioja, S.A.) with a long tradition in the Spanish wine industry. Given their size (61,375 thousand Euros of assets and 83.2 employees on average), these firms are unsurprisingly also the most profitable wineries in the sample (see Table III). Their advertising spend is also the largest (395,118 Euros), suggesting that they are trying to gain market share.

The method applied in this study quantitatively identified the strategic continuity of each winery and the group that the winery belonged to over the study period. A different transition matrix for each pair of consecutive years was used to measure changes in strategic groups, although, for brevity, only the matrix with the average probabilities over the whole study period (2004–2014) is displayed (see Table IV). The percentages on the diagonal therefore reflect the average probability that a winery remained in the same group. Row probabilities sum to 1. Thus, a winery that belongs to group $i$ ($i = 1,2,3$) can only stay in the same group or switch to another group.

*<TABLE IV HERE>*

The probability of remaining in the group of Young Makers was 92.85%. This probability is higher than the probability of remaining in the group of Quality Lovers (90.79%) or the group of Major Players (64.11%). The lowest probabilities of switching strategic groups were for the
transitions from Young Makers to Quality Lovers (4.76%) and from Quality Lovers to Young Makers (2.60%). In contrast, wineries in the strategic group of Major Players were most likely to switch to other strategic groups. A more detailed analysis by year can be found in Figure 1, which shows the probabilities of remaining in the same strategic group over time. The short-dashed line denotes the probability of remaining in the strategic group of Young Makers, the solid line denotes the probability of remaining in the group of Quality Lovers, and the long-dashed line denotes the probability of remaining in the group of Major Players.

<FIGURE 1 HERE>

The volatile probability of large firms remaining in the same group suggests that wineries in the Major Player group might have changed their group membership during the period of analysis. Since the onset of the last economic crisis in 2008, this switching behaviour has become more common. It is likely that the crisis was more problematic for large wineries and that some of them switched their strategic behaviour to cope. Distillation subsidies from the Common Market Organisation (CMO) for wine also disappeared in 2008, primarily affecting large firms, which had to downsize. However, small and medium-sized wineries were more stable and were very likely to remain in the same group, thereby persisting with the same combination of strategic variables in the market.

5. Discussion

In recent decades, the Spanish wine industry has faced many challenges that have influenced the business structure of the market and the competitive strategies adopted by wineries. Some producers have adapted their marketing strategies (Simon-Elorz et al., 2015) to become more competitive. For example, many firms have focused on producing high-quality wines for specific markets, whereas others have invested in technology or have increased their size to improve their productivity.

Within this context, strategic group analysis offers an interesting perspective to
understand winery behaviour, although the existing literature offers limited insights into the application of strategic groups in the wine industry (e.g. Dressler, 2017; Downing and Parrish, 2019; or Gilinsky et al., 2019). Although Dressler (2017) explored the contribution of tourism in the context of strategic groups, Downing and Parrish (2019) highlighted the notion that wineries pursue a competitive advantage by identifying the benefits of membership in strategic groups, including differentiation from wineries in other strategic groups. Gilinsky et al. (2019) showed differences in size and age, in the sense that large and established wineries focus more on entrepreneurial thinking than small, emerging wineries. From a different perspective, Bassi et al. (2020) inferred clusters (groups of winery brands) within the Italian market according to a categorical response variable whose categories represented the brands of sparkling wines. Later, Bassi et al. (2021) studied the influence of consumer covariates on the latent structure of the model.

The literature shows the advantages of analysing the wine industry under the strategic group analysis perspective, and this study aimed to contribute to this stream of research. We identified three strategic groups of wineries in Spain (Young Makers, Quality Lovers and Major Players) that clearly show differences in their competitive behaviour and ultimately their performance. Major Players outperformed other groups in all performance variables (Income, Profits and ROA). As reported by Gilinsky et al. (2019), size is a determining driver in the wine industry. These results are in line with previous studies, such as that of Gómez et al. (2021). These authors reported that the largest firms within the industry are most successful because they have superior resources and are usually seen as stronger rivals.

Our method also enabled analysis of the dynamics of group membership over the reference period. Specifically, we identified groups of wineries according to their strategic behaviour and explored how these wineries switched between groups over time. These analyses provide valuable information on winery behaviour in this industry. For instance, most managers
tend to make decisions by observing successful firms. Hence, a large winery will probably struggle to maintain its position in its strategic group because the competitive pressure appears to be stronger for wineries in the group of Major Players than wineries in other groups. Indeed, small and medium-sized wineries were observed to be more stable than large firms and were very likely to remain in the same group over the study period.

6. Conclusions

Awareness of the evolution of competition in the wine industry is crucial for wineries already competing in the marketplace. In recent years, the Spanish wine industry has experienced profound changes, and new dynamics might influence the strategies and performance of firms in this sector. The growing internationalisation of markets and the fall in domestic consumption represent massive challenges for winery managers. Spanish wineries must increase their efforts to improve their infrastructure, marketing and training to help managers cope with these challenges and guarantee their long-term survival. For example, some wineries have designed different strategies to improve their positioning in the market and increase their market share.

In this context, strategic group research provides theoretical and methodological techniques to identify group dynamics over time. Studying the dynamics of strategic groups is crucial to understand how competitive dynamics change over time (Ebbes et al., 2010). Therefore, this paper presents a time inhomogeneous hidden Markov model (HMM) to examine the dynamics of strategic groups over a given period. In this time inhomogeneous HMM, a time-variable transition matrix captures wineries’ group-switching behaviour. This method allows for time-varying parameters in the distributions, thereby accounting for the dynamics of the strategic groups.

The results show that strategic group analysis can be used to identify and compare patterns of strategic activity within the wine industry, providing a better understanding of the
competitive environment. Three strategic groups can be defined based on different combinations of size, age and quality. Wineries in the strategic group of Younger Makers produce low-quality wines, are not part of a PDO and do not invest in marketing campaigns. Wineries in the strategic group of Quality Lovers produce the highest quality wines but offer a narrow assortment. They invest modestly in advertising, and most of them belong to a PDO. Wineries in the group of Major Players offer a wide assortment of medium-quality wines and invest heavily in advertising. Most belong to a PDO to help market their wines. They are major companies in the market. The groups seem stable over time, with relatively low levels of switching behaviour. The probability of remaining in the same group is generally high. The smallest companies have the highest probability of remaining in the same group (92.85% remained in this group), and the biggest companies have the highest probability of switching groups (35.89% of these firms moved out of this group at some point).

This paper has several managerial implications. It provides winery managers with a practical tool to analyse the strategic behaviour of rivals and develop successful strategies. Specifically, the strategic group analysis and the classification of wineries into different clusters can help wineries identify their main competitors that follow a similar strategy. It is reasonable to expect these wineries to target the same market segment, so this analysis is useful. This information constitutes the first step of benchmarking analysis to check whether rivals using a similar strategy also achieve similar results. Although a causal effect has not been proven, the analyses show differences in several performance variables across groups. Accordingly, winery managers should observe these differences to align their own strategies with the most profitable ones. Finally, a winery may change its group membership, and the evolution of groups over time could look very different. Because groups in an industry are interdependent, such changes affect the competitive landscape (Meilich, 2019). Therefore, the study of group evolution can help wineries understand the behaviour of competitors in this industry. Because wineries may
change their strategy over time to cope with market challenges and adapt to their level of profits, the dynamic analysis makes it easier for managers to identify the most successful strategies in the market.

This paper has several limitations that could be addressed in future research. The first limitation of this research is that the importance of each strategic dimension in the identification of strategic groups is unknown. It would therefore be valuable to determine the role of each strategic dimension in helping wineries improve their performance. The second limitation of this study relates to the study setting and data. The study only used data on Spanish wineries. It should be extended to other markets to enhance the robustness of the conclusions. Given the availability of information, the selected data spanned the period 2004 to 2014. An updated data set could shed light on the current behaviour of wineries. Finally, we discuss some limitations of this model and opportunities for future improvement. The model did not allow the number of clusters to vary from year to year. Further studies should allow the selection of different numbers of strategic groups over time. Also, regarding the model, variables could be selected dynamically, in a process of convergence. The algorithm could detect the major determinants of strategic groups and eliminate the inconclusive variables. External variables that were used in the present study for group comparison purposes as variable to identify the strategic groups. Such an approach could enhance the inferences in group structure. Finally, as further investigation, we propose the study of Pandolfi, Bartolucci and Pennoni (2021) to deal with the use of HMM models for continuous longitudinal data and the problem of missing data and dropout from the analysis.

References


Table I. Summary statistics for the three strategic groups in the Spanish wine industry

<table>
<thead>
<tr>
<th>Strategic dim.</th>
<th>Overall mean</th>
<th>Overall SD</th>
<th>Strategic group</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age(_a)</td>
<td>19.8</td>
<td>15.7</td>
<td>SG1</td>
<td>16.9</td>
<td>13.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SG2</td>
<td>18.5</td>
<td>11.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SG3</td>
<td>39.2</td>
<td>25.4</td>
</tr>
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<td>Assets(_a)</td>
<td>10,654</td>
<td>33,362</td>
<td>SG1</td>
<td>2,871</td>
<td>5,237</td>
</tr>
<tr>
<td>(thousand euros)</td>
<td></td>
<td></td>
<td>SG2</td>
<td>7,209</td>
<td>10,530</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SG3</td>
<td>61,375</td>
<td>84,734</td>
</tr>
<tr>
<td>Employees(_a)</td>
<td>17.4</td>
<td>47.5</td>
<td>SG1</td>
<td>6.6</td>
<td>10.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SG2</td>
<td>13.8</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SG3</td>
<td>83.2</td>
<td>123.4</td>
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<tr>
<td>Valuation(_a)</td>
<td>43.5</td>
<td>45.2</td>
<td>SG1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SG2</td>
<td>90.4</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SG3</td>
<td>86.1</td>
<td>19.2</td>
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Table II. Firm characteristics and performance statistics for strategic groups in the Spanish wine industry

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall mean</th>
<th>Overall SD</th>
<th>Significance</th>
<th>Strategic group</th>
<th>Mean</th>
<th>SD</th>
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<td><strong>Firm characteristics</strong></td>
<td></td>
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<tr>
<td>NumRefs&lt;sub&gt;a&lt;/sub&gt;</td>
<td>1.2</td>
<td>1.8</td>
<td>&lt;.0001</td>
<td>SG1</td>
<td>0.0</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SG2</td>
<td>2.5</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SG3</td>
<td>3.0</td>
<td>2.1</td>
</tr>
<tr>
<td>PDO&lt;sub&gt;a&lt;/sub&gt;</td>
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<td>0.36</td>
<td>&lt;.0001</td>
<td>SG1</td>
<td>0.72</td>
<td>0.44</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>SG2</td>
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<td>0.13</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>SG3</td>
<td>0.96</td>
<td>0.19</td>
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<tr>
<td>AdvSpen&lt;sub&gt;a&lt;/sub&gt;</td>
<td>56,943</td>
<td>507,131</td>
<td>&lt;.0001</td>
<td>SG1</td>
<td>1,565</td>
<td>26,564</td>
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<tr>
<td>(euros)</td>
<td></td>
<td></td>
<td></td>
<td>SG2</td>
<td>38,658</td>
<td>205,531</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>SG3</td>
<td>395,118</td>
<td>1,472,832</td>
</tr>
<tr>
<td>Equity&lt;sub&gt;a&lt;/sub&gt;</td>
<td>5,789</td>
<td>21,535</td>
<td>&lt;.0001</td>
<td>SG1</td>
<td>1,154</td>
<td>2,477</td>
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<tr>
<td>(thousand euros)</td>
<td></td>
<td></td>
<td></td>
<td>SG2</td>
<td>3,821</td>
<td>7,149</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SG3</td>
<td>35,700</td>
<td>56,566</td>
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<tr>
<td><strong>Firm performance</strong></td>
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<td></td>
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<tr>
<td>Income&lt;sub&gt;a&lt;/sub&gt;</td>
<td>4,708</td>
<td>17,468</td>
<td>&lt;.0001</td>
<td>SG1</td>
<td>1,512</td>
<td>4,470</td>
</tr>
<tr>
<td>(thousand euros)</td>
<td></td>
<td></td>
<td></td>
<td>SG2</td>
<td>2,682</td>
<td>5,320</td>
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<td></td>
<td></td>
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<td>SG3</td>
<td>27,765</td>
<td>46,012</td>
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<tr>
<td>Profits&lt;sub&gt;a&lt;/sub&gt;</td>
<td>235</td>
<td>2,005</td>
<td>&lt;.0001</td>
<td>SG1</td>
<td>-1</td>
<td>343</td>
</tr>
<tr>
<td>(thousand euros)</td>
<td></td>
<td></td>
<td></td>
<td>SG2</td>
<td>97</td>
<td>920</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SG3</td>
<td>1,892</td>
<td>5,627</td>
</tr>
<tr>
<td>ROA&lt;sub&gt;a&lt;/sub&gt;</td>
<td>0.003</td>
<td>0.1</td>
<td>&lt;.0001</td>
<td>SG1</td>
<td>-0.002</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SG2</td>
<td>0.004</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SG3</td>
<td>0.025</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Table III. Performance differences between strategic groups in the Spanish wine industry

<table>
<thead>
<tr>
<th>Strategic group comparisons</th>
<th>Income</th>
<th>Profit</th>
<th>ROA</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG3 – SG2 =</td>
<td>25,083.0***</td>
<td>1,795.0***</td>
<td>0.020***</td>
</tr>
<tr>
<td>SG3 – SG1 =</td>
<td>26,253.2***</td>
<td>1,892.9***</td>
<td>0.027***</td>
</tr>
<tr>
<td>SG1 – SG2 =</td>
<td>-1,170.2***</td>
<td>-97.9</td>
<td>-0.006***</td>
</tr>
</tbody>
</table>

***Comparisons significant at .05 level.
Table IV. Transition matrix for strategic groups in the Spanish wine industry

<table>
<thead>
<tr>
<th>Year</th>
<th>Strategic group</th>
<th>Young Makers</th>
<th>Quality Lovers</th>
<th>Major Players</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004–2014</td>
<td>Young Makers</td>
<td>0.93</td>
<td>0.05</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>Quality Lovers</td>
<td>0.02</td>
<td>0.91</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>Major Players</td>
<td>0.12</td>
<td>0.24</td>
<td>0.64</td>
</tr>
</tbody>
</table>