Performance indicators to support firm-level decision-making in the wine industry: a systematic literature review

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Abstract

Purpose – The purpose of this paper is to conduct a systematic literature review (SLR) to identify the main firm-level performance indicators and group them in dimensions that support decision-making in the wine industry.

Design/methodology/approach – To achieve this goal, an SLR approach was conducted in the Scopus database from 2009 to 2019. From a set of 607 articles, only 25 studies related to firm-level performance indicators were considered and, following an inductive thematic analysis and an interpretative synthesis, separated into different specific foci that include social, economic and environmental dimensions.

Findings – There is a limited number of papers identifying indicators regarding the firm-level performance of wine firms, and even fewer studies including indicators on an integrated approach to measure the different dimensions of firm performance. This paper documents that economic and environmental indicators cover 78.2% of all SLR indicators analyzed. As this group of indicators is limited to a set of sub-dimensions, this paper found that several groups of indicators are misrepresented, such as product portfolio or certifications related to marketing activities and indicators covering purchasing and supply chain activities, which play a crucial role in the competitiveness of the wine industry.

Practical implications – For practitioners, it discloses the most pertinent indicators they need to improve to craft their business strategies. This framework is of added value for policymakers to customize their support programs for specific producers to develop their competitive strategies. It could be deployed in teaching programs as a tool to address the importance of aligning different types of indicators to achieve firm-level performance in the wine industry.

Originality/value – This study contributes to the literature identifying a framework of analysis that includes indicators of four dimensions, namely, economic, social, territorial and environmental. This framework aims to relate performance measures to corporate strategy as a management control tool. The

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framework intends to improve the fit between firms' activities and their competitive context and to be flexibly adapted to various products/firms in the wine industry.

Keywords Systematic literature review, Wine industry, Performance indicators, Survey of literature

Paper type Literature review

1. Introduction

The wine industry is one of the oldest activities in the agri-food sector (Martins *et al.*, 2017) and constitutes a significant economic activity for several countries (Maurel *et al.*, 2017). According to OIV (2020), in 2019, the world wine export market expanded with respect to 2018 both in volume – 105.8 mhl (+1.7%) – and value – €3.8bn (+0.9%). The global wine production in 2019 was estimated at 260 million hectoliters, from which Italy (47.5 mhl), France (42.1 mhl) and Spain (33.5 mhl) represent 48% of world wine production. Despite these findings, these three countries diminished their production when compared to 2018, with Portugal being the only EU country that reported an increase in its wine production in 2019 of 6.7 mhl (+10%). Nonetheless, this industry currently lacks core features, which keeps Portugal's overall wine industry adrift from the major worldwide wine producers (Santos *et al.*, 2018a, 2018b).

The wine industry is facing a vertiginous process of changes and new dynamics (e.g. growing internationalization and entrance of exogenous capital) that is affecting industry performance and firms' strategies (Castillo and Cortijo, 2013). The evolution of the economic and environmental context requires adaptation and optimization of winegrowers' practices to define competitive strategies (Coulon-Leroy *et al.*, 2012).

Overall, business performance is one of the elements that may help characterize firms and the entire industry (Mazzola *et al.*, 2013). Considering that firms face a globalized, dynamic environment and stiffer rivalry that requires a continuous process of adaptation (Castillo and Cortijo, 2013), it is crucial to obtain data and indicators that support firms' decision-making processes.

One of the major challenges in the development of a sustainable wine industry is the identification of indicators that might effectively express the achieved results (Merli *et al.*, 2018). The use of frameworks and indicators is a way to characterize the situation, simultaneously enabling the comparison and benchmarking of firms/contexts (Flores, 2018).

As several indicators can be used for decision-making, properly identified, defined and calculated indicators are in high demand (Martins *et al.*, 2017). Nevertheless, it is crucial to identify commonly used indicators to monitor the wine industry. However, despite the several studies associated to wine business performance found in the literature (Goncharuk, 2017), there is a gap in terms of studies containing or summarizing the main firm-level indicators (22 of the 82 selected studies).

In this study, we conduct a systematic literature review (SLR) on papers published in the Scopus database from 2009 to 2019, aiming at identifying the main firm-level performance indicators that support decision-making in the wine industry.

This paper contributes to the literature by:

- Identifying indicators that can be easily adopted by wine firms, supporting their decision-making process.
- Grouping the indicators according to four dimensions, based on an inductive thematic analysis and interpretative synthesis: economic, environmental, social and territorial.
- Structuring a framework of analysis for the overall performance of wine-producing firms.

This framework can be used by policymakers designing tailor-made programs to support businesses of the wine industry to improve their competitive advantage. For that, policymakers need to address the economic, social and environmental shortcomings of businesses of the wine industry. For practitioners, this paper addresses the most pertinent economic, environmental, social and territorial firm-level performance indicators businesses need to improve their competitive behavior and to craft their business strategies.

The paper is organized as follows. After this introduction, Section 2 provides a literature review; Section 3 describes the research methodology; Section 4 discusses the research results; and practical implications and future research recommendations are presented in Section 5.

2. Literature review

Castillo and Cortijo (2013) analyze the factors that determine the profitability of the wine firms in Castilla-La Mancha, Spain, documenting that business profitability is influenced by: ownership structure, with higher profitability for private ownership structures *vis-à-vis* cooperative society structures; size, in which large firms perform best; and capital structure, in which internal funding is advantageous regarding external funding. Additionally, it was also found that the difficulty of funding fixed assets and selling wine at low prices decreases profitability ratios.

In the same vein, Arimany-Serrat *et al.* (2016) study the main economic and financial indicators of major wine production firms in La Rioja, Spain between 2008 and 2013. They analyze short- and long-term financial ratios and economic results, as well as the changes in equity and cash flows of wineries. Additionally, Arimany-Serrat and Farreras-Noguer (2019) analyze the economic and financial indicators of large wine producers in Catalonia, La Rioja and Languedoc-Roussillon documenting that during the 2008–2013 crisis period, results of large wine firms in Catalonia, La Rioja and Languedoc-Roussillon varied extensively. In general, however, being a large firm and having a strong export tradition facilitates economic and financial performance. However, it is difficult to draw general conclusions as some firms can be characterized as family businesses, whereas other firms are large, export-led businesses and some of them are focused on environmental-friendly products and processes, which makes comparisons difficult to interpret.

Goncharuk and Lazareva (2017) document different economic performances between domestic and foreign wineries. The use of international performance benchmarking yields relevant information for management at both the individual and industry level. Goncharuk (2017) also tests the hypothesis of higher efficiency of winemaking in Germany in comparison with Ukrainian winemaking. The results indicate that German wine businesses operate 3.8 times more efficiently than their Ukrainian counterparts. In addition, the most efficient combinations according to the size and legal form were found for German wine businesses. This means that if the company size does not match the appropriate legal form of the business organization, the wine business is most likely to be inefficient and unprofitable (Goncharuk, 2018; Goncharuk and Figurek, 2017). More recently, Goncharuk (2019) analyzes the main determinants of winemaking performance in the recent decade on Ukraine. Despite the 2008 crisis and fiscal pressure, wine small and medium-sized enterprises have managed to increase the labor and capital productivities and have overtaken large wine businesses. Given the high cost of entering the Ukrainian market (entry barriers to retail networks), small wineries are satisfied with local consumers, whose demand is relatively low, but quite stable and resistant to a crisis. Also, using balance sheet analysis, Migliaccio and Tucci (2019) investigate the capital, financial, economic and income dynamics of Italian medium-large companies during and after the international economic crisis (2008–2017). The results documented that the international

economic crisis has reduced profitability, changed the balance sheets, but that the reaction of the productive structures favored the recovery of profitability and a different relationship between assets and liabilities.

Santos *et al.* (2018b) estimate the productive efficiency of a wine-farm sample from the Douro demarcated region (DDR) and identify economic, social and environmental indicators that characterize the DDR grape production system. However, few papers compare the efficiency of winemaking in several countries. Couderc and Marchini (2011) describe several characteristics of the structure, governance and performance indicators, through data obtained from interviews with 25 French and Italian wine cooperatives and analysis of the firms' balance sheets. Although the results indicate that there are some differences regarding their governance, these limited variations in cooperative governance do not seem to significantly influence their business strategies or their economic efficiency.

To be successful and competitive, the wine industry shows increasing interest in improving its contribution to sustainable development and reporting it. This can be confirmed by the various initiatives to develop and implement guidelines, computational tools and certification schemes to assist wine growers and producers in being more sustainable. This situation represents not only a challenge but also creates business opportunities and/or competitive advantages, improving the performance of firms and/or wine regions (Martins *et al.*, 2017).

The main methodologies applied to assess sustainability in the agricultural sector are indicators or tool-based indexes that use integrative assessment approaches in rigorous and complex frameworks (Santos *et al.*, 2018a). For instance, Santiago-Brown *et al.* (2014) document and compare prominent sustainability assessment programs for individual organizations in viticulture worldwide. Additionally, they categorize assessment methods in four distinct types, namely, process-based; best practice-based; indicator-based and criterion-based. Independently of the method chosen, the establishment of benchmarks and performance measures is necessary to support wine growers in improving their sustainability by comparison with their peers and analyzing their results and/or performance against program goals.

According to Abraham *et al.* (2014), there are several indicators that present information about the viticulture industry. They included indicators based on the theoretical concept of sustainability integrating economic, social and environmental dimensions. The use of indicators to assess sustainability provides information about the current situation of the state of viticulture for those responsible for the elaboration of public policies, business managers, sectoral organizations and the public in general. Firms have become more aware of their environmental performance and the impact of their activities on the environment.

Jradi *et al.* (2018) contribute to the existing literature by examining the efficiency of wine firms via the presence of a carbon footprint. In this sense, the carbon footprint was calculated based on three different sources of vineyard practices, namely, the consumption of pesticides, fertilizers and fuel. Furthermore, the correlation was examined between efficiency scores and some performance indexes concerning profitability.

Martins *et al.* (2017) evaluate the sustainability of a Portuguese "terroir" wine, based on a life cycle thinking perspective, considering the life cycle stages including viticulture, winemaking, bottling and packaging. The indicators are based on their relevance to the wine industry but also consider the existing consensus in the area:

- carbon footprint;
- water consumption;
- energy intensity;
- material intensity;

- solid wastes; and
- wastewater (mainly covering the environmental dimension of sustainability).

Results show that bottling and storage have the highest contribution to the carbon footprint indicators, material intensity, solid wastes and wastewater. This work allows firms to better streamline their production chains to increase their global sustainability, while aggregating value for all stakeholders involved.

Other examples include Martins *et al.* (2018), who compare the sustainability assessment of two Portuguese wines produced by the same firm. Following a life cycle perspective, this assessment is based on seven sustainability indicators. Bearing some considerations and the main aspects of the life cycle stages in mind, the set of indicators are:

- energy intensity;
- carbon emissions;
- water intensity;
- material intensity;
- solid wastes;
- wastewater; and
- percentage of the firm's global earnings before interests, taxes, depreciation and amortization.

Based on the results, the processes or parts of the wine's life cycle with the most significant impact on the system's sustainability are identified, and potential solutions and/or improvements for them are proposed. The main differences between the two wines are due to differences in the production process, winemaking, an aspect still overlooked in practice that may be relevant in firms that produce many brands of wine with significant differences between them. Based on the results, some proposals are made to improve the sustainability performance of both wines, to reduce energy and water consumptions.

According to Dainelli and Daddi (2019), the relationship between businesses, green strategies and financial performance has become the focus of interest for many academics, practitioners and policymakers in recent years. Following this perspective, the authors compare the financial performance of 76 Italian organic and 76 non-organic winemaking companies based on 20 indicators grouped into three dimensions, namely, growth, profitability and solvency. The main findings indicate the growth of organic companies was almost three times that of their counterparts between 2014 and 2016. Both the premium price and lower costs lead to an increase in the gross margin. However, the huge investments required for organic production weigh heavily on the financial statements; although having financed these investments with a higher share of equity capital, the organic companies present a higher level of capitalization.

It is clear that there is a growing interest in sustainability, for example, through life-cycle assessment and carbon footprint analyzes. However, there is still a lack of studies proposing evaluation methods to assess the performance efficiency of firms under new constraints, namely, restrictions in terms of fuel and electricity consumption; the reasonable use of fertilizers and pesticides; reduction of greenhouses gases; and using lighter bottles and favoring cork instead of plastic, etc.

3. Research methodology

An analysis of the literature provides an intellectual map that identifies and suggests new areas of potential investigation and helps develop and enhance academic and professional

practices (Briner *et al.*, 2009; Shepperd *et al.*, 2013; Soós *et al.*, 2018). While numerous strategies have been identified for conducting literature reviews, there are two broad forms published in journals, namely, narrative and systematic reviews. Narrative reviews tend to be qualitative evaluations based upon a limited selection of literature from within a domain, whereas systematic reviews tend to be quantitative evaluations of a domain's entire corpus of literature. Each approach has its own methodological challenges (Weatherbee *et al.*, 2019).

An SLR consists of the identification, selection, analysis and synthesis of existing research on a specific topic and its presentation to keep abreast of knowledge about the topic (Denyer and Tranfield, 2009). One of the main advantages of an SLR is that it is based on three principles – rigor, transparency and replicability –, which enhance the knowledge breadth of a certain topic under analysis, emphasizing the importance of empirical evidence over preconceived knowledge (Mallett *et al.*, 2012). SLRs involve identifying, synthesizing and assessing all available evidence to generate a robust, empirically derived answer to a focused research question. Moreover, SLRs help the identification of both knowledge gaps and methodological inconsistencies and weaknesses (Petticrew and Roberts, 2006). In this research, the review analyzes papers covering several performance indicators to support decision-making in the wine industry.

To identify the main indicators and frameworks used in the analyzes of the wine sector, an SLR was carried out following the protocol proposed by Tranfield *et al.* (2003), which includes three main stages:

(1) Planning.

(2) Conducting.

(3) Reporting and disseminating the results.

The use of scholarly peer-reviewed published journal articles is mandatory for a credible outcome (Light and Pillemer, 1984; Silva and Moreira, 2019). As such, the Scopus database was adopted as a result of the quality and relevance of its relevant journals, e.g. *Wine Economics and Policy, International Journal of Wine Business Research, Journal of Wine Research, Sustainability, Journal of Cleaner Production, etc.* The Scopus database also offers comprehensive search options with a good degree of customization. It also contains different tools that allow researchers to analyze and compare literature by the inclusion/search criteria/interest.

The planning of the review encompasses the definition of the objective of the SLR, which was defined in the introduction section. The second stage (conducting the review) involves the identification of the relevant literature using explicit inclusion/search criteria, supported by an assessment of the quality of the studies reviewed and the strength of their findings. The third stage involves reporting and getting the evidence into practice.

The planning of the review involved a search by *title*, *keywords* and *abstract*, with the following search words: *indicator, performance indicator, wine, wine sector, wine industry, winery* and *wineries*. The *inclusion criteria* applied were:

- *Publication date*: 2009–2019.
- *Language*: documents written in English, French, Portuguese and Spanish.
- *Type of document*: articles, reviews, articles in press, conference papers and conference reviews.

Once the inclusion criteria were known and no exclusion criteria were defined, all the documents that contained one or more search terms were considered in the analysis (n = 607

results). Several iterations were run to ensure that all relevant articles were included. Table 1 summarizes the research method applied in the Scopus database.

Data regarding author(s), title, date, keywords and abstract were downloaded for each document ($n = 607$) found in the Scopus database since 2009. Data were then imported into a Microsoft Excel file for further processing.

The title, abstract and keywords of all 607 papers were read to select publications that would include the presence of indicators related to the wine industry. To increase the reliability of the selection, the documents were individually evaluated by three researchers and doubts and disagreements were discussed until consensus was achieved. The goal was for the three researchers to agree on the relevance of the paper for the review. Only the documents with unanimous agreement were included.

After selecting the most relevant studies for the purpose of this research (85 publications), the documents that contain firm-level indicators (25 publications) were examined. Figure 1 synthesizes the methodological process adopted during the identification and selection of documents and provides an overview of the results.

The 25 papers were subject to a content analysis based on the following variables:

- Type of paper (i.e. conceptual vs empirical).
- Name of the publishing journal.
- Geographical origin of the study.
- Sample analyzed.
- Main firm-level topic covered.
- Methodology used.
- Main results and implications.

As such it was possible to map the state of the art of the main indicators analyzed. Following Braun and Clarke (2006) and Silva and Moreira (2019), we sought to organize the literature on patterns of topics involving inductive thematic analysis – e.g. number of employees, net sales, indebtedness, crop protection, carbon emission, staff education, grape variety, etc. Based on Jones *et al.* (2011) and Ribau *et al.* (2018), following an interpretative synthesis, we managed to cluster the papers in related topics or indicators and aggregated them on higher-order classes that we call – economic, environmental, social and territorial – categories.

Table 1. Research method at Scopus database

Scope of research	Scopus database
Keywords	Indicators; performance indicators; wine; wine sector; wine industry; winery; wineries
Queries (TITLE-ABS-KEY)	TITLE-ABS-KEY (("indicator*" OR "performance indicator*") AND ("wine" OR "wine sector" OR "wine industry" OR "winery*"))
Inclusion criteria	Documents in English, French, Portuguese and Spanish between 2009–2019; Type of document: articles, reviews, article in press, conference paper and conference review
Quality criteria	The research was carried out in two different dates, confirming the same results. The steps in the two searches were, namely, access to the database; consultation; application of the inclusion criteria and export the results to Excel
Results	The research achieved 1,047 results, before the application of the inclusion criteria

The following section aims to answer the main purpose of this study, i.e. to identify the main firm-level performance indicators in the wine industry and group them in a framework of analysis.

To achieve this goal, three specific steps were defined:

- Present the main descriptive results of the selected studies (date of publication; main publication outlets and geographical location).
- Examine, which indicators were proposed/used in the frameworks and how the literature classifies them.
- Rank the most cited indicators in the literature according to different dimensions.

4. Research results

A total of 25 theoretical and empirical papers were reviewed, which include 23 journal articles (92%) and 2 conference papers (8%). Among those 25 papers, some followed quantitative approaches with econometric modeling while others conducted more qualitative research based on surveys and case studies.

4.1 Date of publication

This SLR documents a growing interest and development of studies in recent years. Most of the identified studies are relatively recent, as 18 of 25 were published between 2017–2019 (72%), reinforcing the relevance of the research objective established for this study (Table 2). When analyzing the number of journal articles per year, 14 of 23 journal articles were published in 2017 and 2018, respectively (60.87%).

4.2 Publication source

The documents were published in 15 different journals, which is an indicator of the diversity of the indicators/dimensions under study in the past decade. The top journals with the highest number of papers in this SLR are: *the Journal of Cleaner Production; Sustainability; International Journal of Wine Business Research; Benchmarking; British Food Journal and Revista de Facultad de Ciencias Agrarias*. Table 3 summarizes the main sources of publication, in which the top six journals published 64% of the articles analyzed.

Concerning the number of publications per number of authors, only three articles were published by a single author, with 22 articles being published by two or more authors, as shown in Figure 2.

Figure 1.
Methodological process

4.3 Geographical location

The articles feature considerable geographic dispersion, showing that the subject matter is of generalized interest. There is a high concentration of papers analyzing European countries, and only four of them covered the New World. Additionally, this SLR also documents that 14 of the 25 analyzed articles were conducted in only one specific country (Emeterio *et al.*, 2018; Jradi *et al.*, 2018; Touzard *et al.*, 2016; Martins *et al.*, 2018) and 11 publications were performed comprising two or more countries (Navarro *et al.*, 2017b; Arimany-Serrat and Farreras-Noguer, 2019; Goncharuk, 2018; Goncharuk, 2017). Figure 3 summarizes the geographical areas where the surveys were developed.

Comparative studies between countries are becoming more frequent. While Santiago-Brown *et al.* (2015, 2014) draw data from New World countries (Australia, Chile, New Zealand, South Africa and the USA), Couderc and Marchini (2011), Navarro *et al.* (2017b) and Arimany-Serrat and Farreras-Noguer (2019) analyze data from Old World countries. Moreover, a comparison between countries from the New World and Old World are becoming a recent trend (Goncharuk and Lazareva, 2017).

Regarding regions, most of the empirical studies were developed in the main wine-producing regions, such as: Bordeaux, France (Jradi *et al.*, 2018); Languedoc-Roussillon, France (Touzard *et al.*, 2016); La Rioja, Spain (Arimany-Serrat *et al.*, 2016); Province of Mendoza, Argentina (Abraham *et al.*, 2014) and Douro, Portugal (Martins *et al.*, 2018;

Year	Publications (*N*)	Percentage (%)
2011	1	4
2013	1	4
2014	2	8
2015	1	4
2016	2	8
2017	7	28
2018	7	28
2019	4	16
Total	25	100

Table 2. Number of publications per year

Sources of publication	*N*	(%)
Journal of Cleaner Production	4	16
Sustainability (Switzerland)	3	12
International Journal of Wine Business Research	3	12
Benchmarking	2	8
British Food Journal	2	8
Revista de la Facultad de Ciencias Agrarias	2	8
Advances in Intelligent Systems and Computing	1	4
Chemical Engineering Transactions	1	4
E3S Web of Conferences	1	4
Intangible Capital	1	4
Journal of Wine Research	1	4
PLoS ONE	1	4
Revista Portuguesa de Estudos Regionais	1	4
Science of the Total Environment	1	4
Water (Switzerland)	1	4

Table 3. Main sources of publication

Martins *et al.*, 2017; Santos *et al.*, 2018a; Santos *et al.*, 2018b). Table 4 summarizes the 25 selected studies according to geographical coverage and chosen sample.

4.4 Indicators and frameworks: a firm-level perspective

The use of indicators and frameworks may be a way to synthesize and represent the actuality, allowing the comparison of contexts over time (Flores, 2018). A correct identification and use of indicators may help to determine the critical areas of intervention and may represent a decision-making tool to support winemakers and professionals in viticulture sustainability (Merli *et al.*, 2018). An additional challenge refers to the selection of performance indicators to be included in a common framework for wineries. To achieve this, it is important to develop studies aiming at identifying performance indicators and frameworks at the firm level. This section presents the main results documented by the SLR conducted in this research. As previously mentioned, the selection of articles was based on the criterion: presence of firm-level indicators in each of the analyzed articles.

It was possible to observe an importance presence of regional studies (Esteban-Rodríguez and López, 2018; Sánchez Hernández and López 2018; Rodríguez, 2017; Rodríguez and López, 2017). The indicators included in these studies refer mostly to protected designations of origin (PDO) (7 of 9 studies apply to Spanish PDO wine districts). In other words, some of the literature presents indicators at national or regional levels, which is why they were excluded from this analysis.

To document, which indicators are integrated into frameworks and how they were classified, it becomes crucial to specify the criteria used in this paper. With this SLR in mind, *indicator classification* involved the following two situations, namely, when the authors had explicit categories/dimensions; and even though not explicitly mentioned, it was possible to ascertain an indicator category/classification inductively generated according to the researchers' viewpoint.

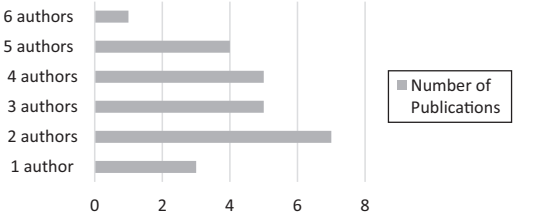

Figure 2.
Publications per number of authors

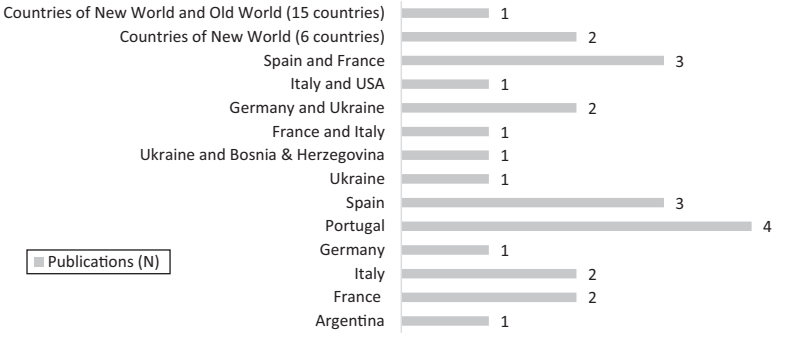

Figure 3.
Geographical spaces where the surveys were developed

Table 4. Studies by their geographic coverage and sample

Countries	Geographic coverage	Sample	References
Argentina	Province of Mendoza	31 wine producers	Abraham *et al.* (2014)
Spain	La Rioja	16 large firms	Arimany-Serrat *et al.* (2016)
	Four (unspecified) Spanish regions	255 wineries	Emeterio *et al.* (2018)
	Castilla-la Mancha	39 Spanish wine firms	Castillo and Cortijo (2013)
Italy	Not specified	Medium–large firms. The sample had a variable number (199 firms in 2009 to a maximum of 245 in 2017)	Migliaccio and Tucci (2019)
		76 organic and 76 non-organic winemaking firms	Dainelli and Daddi (2019)
France	Bordeaux region	38 wine firms	Jradi *et al.* (2018)
	Languedoc-Roussillon region	24 actors	Touzard *et al.* (2016)
Portugal	Douro region	2 wines produced by same firm	Martins *et al.* (2018)
		wine growth in a region	Martins *et al.* (2017)
		20 wine farms	Santos *et al.* (2018a)
		Wine farm	Santos *et al.* (2018b)
Germany	Rhenish Hesse	3 German wineries	Peth *et al.* (2017)
Ukraine	Odessa region (8), Kherson region (3), Mykolayiv region (1) and in other regions of the country (2)	14 winemaking firms	Goncharuk (2019)
France and Italy	Languedoc-Roussillon and Umbria region	25 French and Italian wine cooperatives	Couderc and Marchini (2011)
Italy and USA	Not specified	wine industries initiatives	Merli *et al.* (2018)
Spain and France	Galicia, Murcia, Catalonia, Balearic Island-Menorca, Castilla la Mancha, Midi Pyrenees and Languedoc-Roussilon regions	18 Wineries (3 cooperatives)	Navarro *et al.* (2017a) Navarro *et al.* (2017b)
	Catalonian, La Rioja and Languedoc-Roussilon	3 large firms	Arimany-Serrat and Farreras-Noguer (2019)
		36 wineries	

(*continued*)

Table 4.

Countries	Geographic coverage	Sample	References
Germany and Ukraine	German states of Rheinland-Pfalz, Hessen, Baden-Württemberg and three other regions (not specified). Ukrainian located in the Odesa, Mykolaiv, Kherson region and three other regions (not specified).		Goncharuk (2017) Goncharuk (2018)
Ukraine and Bosnia and Herzegovina	Location not specified	33 wineries	Goncharuk and Figurek (2017)
Australia, Chile, New Zealand, South Africa and USA	Companies' location not specified	83 executives of grape-growing organizations	Santiago-Brown *et al.* (2014) Santiago-Brown *et al.* (2015)
Germany; France; New Zealand; Italy; USA; UK; Australia; Hungary; Spain; Canada; Chile; Ukraine; SAR and China	Companies' location not specified	36 wine firms	Goncharuk and Lazareva (2017)

In the first case, the identification of the dimensions/categories becomes visible, as shown for example by Abraham *et al.* (2014), Santiago-Brown *et al.* (2015), Santos *et al.* (2018a) and Santos *et al.* (2018b), who classify the indicators in the economic, social and environmental dimensions. The second case occurs, for example, in Goncharuk (2017, 2018, 2019), Goncharuk and Figurek (2017) and Goncharuk and Lazareva (2017), in which, although the indicators presented are not classified, the authors analyzed several aspects related to winemaking economic efficiency of wineries. As such, they were classified as "economic efficiency" indicators.

A similar procedure was applied to *frameworks*. For example, the indicators presented by Arimany-Serrat *et al.* (2016) and Arimany-Serrat and Farreras-Noguer (2019), as grouped and classified as financial indicators, were considered as a framework. We also consider a framework the cases of Goncharuk (2017, 2018, 2019), Goncharuk and Figurek (2017) and Goncharuk and Lazareva (2017), as the indicators measure winemaking efficiency. Nevertheless, there are cases, such as Jradi *et al.* (2018) and Touzard *et al.* (2016), where no classification is observed, and the indicators are scattered. Table 5 synthesizes the number of indicators, classifications and frameworks.

As shown above, most of the indicators are integrated into frameworks (22 of 25 publications), corresponding to 321 of 344 firm-level indicators. Considering the papers mentioned previously in Table 6, where indicators are classified and simultaneously included in frameworks, economic, social and environmental perspectives are clearly predominant. In this context, four studies were identified, namely, Abraham *et al.* (2014), Santiago-Brown *et al.* (2015); Santos *et al.* (2018a); and Santos *et al.* (2018b). Associated with economic classification, Couderc and Marchini (2011) and Emeterio *et al.* (2018) refer to "performance indicators," whereas Dainelli and Daddi (2019), Migliaccio and Tucci (2019), Arimany-Serrat *et al.* (2016) and Arimany-Serrat and Farreras-Noguer (2019) classify these as "financial" indicators. Other economic perspective is offered by Goncharuk (2017, 2018, 2019), Goncharuk and Figurek (2017) and Goncharuk and Lazareva (2017) as they measure the efficiency of wineries from two different countries. Finally, Castillo and Cortijo (2013) propose the following classification: property structure; physical assets; financial structure and competitive advantage.

Related to the environmental dimension, Navarro *et al.* (2017a) and Navarro *et al.* (2017b) grouped the indicators according to the "vineyard phase," "winery phase" and "general aspects," whereas Peth *et al.* (2017) used water-related indicators. Besides these viewpoints, some authors grouped and analyzed the indicators from a sustainability perspective. Merli *et al.* (2018) grouped the indicators according to major sustainability issues of the wine sector (water consumption, greenhouse gas (GHG) emissions, applied nitrogen, material efficiency, energy efficiency, waste, water, biodiversity, emissions and energy), while Martins *et al.* (2017) and Martins *et al.* (2018) used "sustainability indicators." Finally, Santiago-Brown *et al.* (2014) used socio-economic indicators.

Given the similarity of the indicators, and the areas defined in the literature, they were reclassified according to four main dimensions, following the interpretative synthesis referred above in the methodological section:

(1) economic;
(2) environmental;
(3) social; and
(4) territorial.

In this sense, Table 6 synthesizes the number of indicators grouped in each dimension.

Authors	Indicators	Indicators classification	Framework
Abraham *et al.* (2014)	18	Economic, social and environmental	α
Arimany-Serrat and Farreras-Noguer (2019)	10	Financial	α
Arimany-Serrat *et al.* (2016)	9	Financial	α
Castillo and Cortijo (2013)	31	Property structure; physical assets; financial structure and competitive advantage	α
Couderc and Marchini (2011)	7	Performance	α
Dainelli and Daddi (2019)	20	Financial (growth, profitability and solvency indicators)	α
Emeterio *et al.* (2018)	5	Performance	α
Goncharuk (2017)	4	Economic efficiency	α
Goncharuk (2018)	4	Economic efficiency	α
Goncharuk (2019)	4	Economic efficiency	α
Goncharuk and Figurek (2017)	4	Economic efficiency	α
Goncharuk and Lazareva (2017)	4	Economic efficiency	α
Jradi *et al.* (2018)	9	N. A	×
Martins *et al.* (2017)	6	Sustainability indicators	α
Martins *et al.* (2018)	7	Sustainability indicators	α
Merli *et al.* (2018)	45	Water consumption; GHG emissions; applied nitrogen; material efficiency; energy efficiency; waste; water; biodiversity; emissions and energy	α
Migliaccio and Tucci (2019)	6	Financial	α
Navarro *et al.* (2017a)	6	Vineyard phase	α
Navarro *et al.* (2017b)	21	Vineyard and winery phase; general aspects	α
Peth *et al.* (2017)	5	Water-related indicators	α
Santiago-Brown *et al.* (2014)	6	Socio-economic indicators	×
Santiago-Brown *et al.* (2015)	65	Economic, social and environmental	α
Santos *et al.* (2018a)	16	Economic, social and environmental	α
Santos *et al.* (2018b)	24	Economic, social and environmental	α
Touzard *et al.* (2016)	8	N. A	×

Table 5. Number of indicators, its classification and framework

The results shown encompass 344 firm-level indicators that comprise a set of 160 economic, 109 environmental, 38 social and 37 territorial indicators. Tables 7 to 9 present the most cited indicators in the literature according to the four dimensions.

Under the economic dimension, the indicators shown in Table 7 may be grouped into the next main sub-dimensions, namely, costs, profitability, financing and size. As wine production is an activity that uses human resources intensively, as well as other materials, the importance given by wine entrepreneurs to the measurement and impact of these costs on the performance of their businesses is high. Measuring and controlling these costs may be of added value to enhance good performance.

Additionally, significant importance is also attributed to indicators directly or indirectly related to profitability, such as net sales, total production and economic and financial profitability, as they have a high impact on the management of wine-producing organizations. These indicators may reflect good management of, for example, costs, resources, materials, equipment and funding.

Another group of indicators reported as having an important impact on the measurement of wine businesses performance under the economic perspective are those related to size. Having

Dimensions	Indicators (*N*)	Authors
Economic	160	Abraham *et al.* (2014), Arimany-Serrat *et al.* (2016); Arimany-Serrat and Farreras-Noguer (2019), Castillo and Cortijo (2013); Couderc and Marchini (2011), Emeterio *et al.* (2018); Goncharuk (2017, 2018; 2019); Goncharuk and Figurek (2017); Goncharuk and Lazareva (2017), Jradi *et al.*, (2018); Martins *et al.*, (2018), Santiago-Brown *et al.* (2015); Santos et al.(2018a); Santos *et al.* (2018b); Touzard *et al.* (2016), Dainelli and Daddi (2019); Migliaccio and Tucci (2019)
Environmental	109	Abraham et al.(2014); Arimany-Serrat *et al.* (2016), Martins *et al.* (2017); Martins *et al.* (2018), Merli *et al.* (2018); Navarro *et al.* (2017a); Navarro *et al.*, (2017b); Peth *et al.* (2017), Santiago-Brown *et al.*, (2015), Santos *et al.*, (2018a); Santos *et al.* (2018b); Merli et al., (2018); Touzard *et al.*, (2016)
Social	38	Abraham *et al.* (2014), Santiago-Brown *et al.* (2015); Santos *et al.* (2018a); Santos *et al.* (2018b); Touzard *et al.* (2016)
Territorial	37	Navarro *et al.* (2017b); Santiago-Brown *et al.* (2015), Merli *et al.* (2018); Touzard et al., (2016)

Table 6.
Number of indicators grouped by dimension

updated equipment may help to improve performance. However, an increase in asset tangibility may also limit the adaptability of organizations to new challenges of the external environment.

Managing funding sources is also a relevant dimension under the economic perspective in managing wine-producing organizations. Under this dimension, indicators such as indebtedness level, solvency and working capital are important to achieve an established goal in terms of economic performance.

Several of the exhibited indicators in Table 8, related to the environmental dimension, may present a twofold impact on performance. A wine-producing activity, with intensive use of electricity, water, fuel and fertilizers will have a negative impact on carbon emissions and on the image of the firm. Additionally, the use of these resources also implies costs. Measuring and controlling environmental indicators may increase the performance of wine producing firms in terms of their environmental image and responsibility, as well as of their economic performance. Therefore, using indicators related to energy intensity, solid wastes and organic fertilizers may help firms to increase their overall performance.

Under the social and territorial dimensions, the indicators displayed in Table 9 document that the training of human resources, the planted area and grape varieties are those that influence business performance.

5. Conclusions, implications, limitations and future research

International competitive intensity has created a new growing challenge for all firms, to which those of the wine industry are no exception. The struggle to compete has led many wine companies to use different strategies to outcompete their rivals and increase their performance, diminish their indebtedness, fund their operations, widen their product portfolios, improve the efficiency of their resources, diminish their carbon footprint and improve their social responsibility, among many others.

It is clear that there are many studies that use a wide range of indicators to study how firms try to successfully compete in the wine industry. As such, given the importance and the particular aspects of the wine industry, this SRL has managed to disclose four main types of key performance indicators that support firm-level decision-making in the wine industry. It is also clear that there are four main groups of indicators, namely, economic, environmental, social and territorial.

Indicators	*N*	Authors
Net sales	7	Dainelli and Daddi (2019), Castillo and Cortijo (2013); Goncharuk (2017, 2018, 2019); Goncharuk and Figurek (2017), Goncharuk and Lazareva (2017)
Number of employees	6	Castillo and Cortijo (2013); Goncharuk (2017, 2018, 2019); Goncharuk and Figurek (2017), Goncharuk and Lazareva (2017)
Fixed assets	6	Dainelli and Daddi (2019); Goncharuk (2017, 2018, 2019); Goncharuk and Figurek (2017), Goncharuk and Lazareva (2017)
Material costs	5	Goncharuk (2017, 2018, 2019); Goncharuk and Figurek (2017), Goncharuk and Lazareva (2017)
Profitability	5	Migliaccio and Tucci (2019), Dainelli and Daddi (2019); Castillo and Cortijo (2013), Arimany-Serrat *et al.* (2016); Santiago-Brown *et al.* (2015)
Indebtedness	5	Migliaccio and Tucci (2019), Dainelli and Daddi (2019); Arimany-Serrat and Farreras-Noguer (2019), Arimany-Serrat *et al.* (2016)
Working capital	4	Migliaccio and Tucci (2019), Dainelli and Daddi (2019); Arimany-Serrat and Farreras-Noguer (2019), Arimany-Serrat *et al.* (2016)
Short-term solvency	3	Dainelli and Daddi (2019), Arimany-Serrat and Farreras-Noguer (2019); Arimany-Serrat *et al.* (2016)
Material intensity	2	Martins *et al.* (2018), Martins *et al.* (2017)
Intermediate consumption	2	Santos *et al.* (2018a); Santos *et al.* (2018b)
Quality of the debt	2	Arimany-Serrat and Farreras-Noguer (2019), Arimany-Serrat *et al.* (2016)
Product types	2	Merli *et al.* (2018), Castillo and Cortijo (2013)
Total production	2	Couderc and Marchini (2011); Navarro *et al.* (2017b)

Table 7.
Economic indicators

Indicators	*N*	Authors
Electricity	4	Navarro *et al.* (2017a); Navarro *et al.* (2017b); Merli *et al.* (2018); Santos *et al.* (2018a)
Fertilizers	3	Santos *et al.* (2018a); Santos *et al.* (2018b); Navarro *et al.* (2017b);
Fuels	3	Santos *et al.* (2018a); Santiago-Brown *et al.* (2015), Merli *et al.* (2018);
Wastewater	3	Martins *et al.* (2017), Martins *et al.* (2018);
Water use	3	Peth *et al.* (2017), Santiago-Brown *et al.* (2015); Touzard *et al.* (2016)
Carbon footprint	2	Santiago-Brown *et al.* (2015), Jradi *et al.* (2018)
Carbon emissions	2	Martins *et al.* (2017), Martins *et al.* (2018)
Crop protection	2	Santos *et al.* (2018a); Santos *et al.* (2018b)
Energy intensity	2	Martins *et al.* (2017), Martins *et al.* (2018)
Organic agriculture	2	Merli *et al.* (2018); Santos *et al.* (2018b)
Solid wastes	2	Martins *et al.* (2017), Martins *et al.* (2018); Navarro *et al.* (2017b)
Water intensity	2	Martins *et al.* (2017), Martins *et al.* (2018)
Organic fertilizers	2	Abraham *et al.* (2014); Navarro *et al.* (2017a)
Certifications	2	Santiago-Brown *et al.* (2015), Merli *et al.* (2018)

Table 8.
Environmental indicators

As shown, the economic indicators are the most commonly used among wine industry researchers. They can be grouped in the following main sub-dimensions, namely, size determinants (number of employers, next sales and fixed assets); profitability (profitability, economic profitability and financial profitability); cost drivers that influence profitability (material costs, intermediate consumption and material intensity); and financing (indebtedness, quality of debt and short-term solvency). It is worth mentioning that product profit has also implications for economic performance, although it was only mentioned by two different documents.

It is possible to conclude that economic and environmental indicators cover the majority (76.1%) of all indicators. Moreover, it is also clear that both groups of indicators address a limited set of sub-dimensions (size, profitability, cost drivers and financing – economic indicators – and negative cost inputs and outputs – environmental indicators). However, indicators as product portfolio or certifications, which are related to potential marketing activities are not among the most important ones under scrutiny. Another important conclusion is that indicators covering purchasing and supply chain activities, which play a very important role in the competitiveness of the wine industry, are hardly analyzed.

Clearly, most of the studies cover fashionable (economic and environmental) research topics. Moreover, most of them cover a limited number of sub-dimensions. This is a clear indication that the wine industry needs to widen not only the analytical perspective, covering not only marketing and supply chain-related topics but also the analytical spectrum inter-relating the several groups of above-mentioned indicators, e.g. social and economic indicators, territorial and economic indicators, etc., to fully exploit all factors that can enhance the competitiveness of the wine industry.

As such, a framework tying together firm-level performance measures supporting decision-making in the wine industry is presented in Figure 4, where the main present and future indicators are pinpointed, in black and blue, respectively, based on the four main dimensions found in the SLR.

This framework aims to be a management control tool for wine industry firms. However, this framework, which includes financial and non-financial indicators and external and internal measures in addition to various dimensions, is intended to create fits among the firm's activities and between the firm and its environmental context. Additionally, the framework also aims to be sufficiently flexible to be adapted to several products/firms in the wine industry, needing to be adjusted periodically like any strategy, as it represents the current situation.

This research is of added value for policymakers as the framework could be used to support businesses of the wine industry so that they improve their competitive advantage tailoring programs to their economic, social and environmental shortcomings or to create programs to address the needs of specific territories, according, for example, to their types of producers, grape varieties and casts.

For practitioners, this research unleashes the particularities of firm-level performance, and the possible ways in which they not only can fit their competitive behavior to the most pertinent economic, environmental, social and territorial categories they need to improve but also address their weaknesses *vis-à-vis* their main competitors.

Although a significant number of studies were considered for a review and analysis of indicators, the main limitations of this paper is that only firm-based indicators were included. As such, future research should keep abreast of studies/indicators related to regional/national board commissions related to the wine industry.

Table 9. Social and territorial indicators

Dimension	Indicators	*N*	Authors
Social	Education/ farmers with high school (%)	2	Santiago-Brown *et al.* (2015); Santos *et al.* (2018b)
	Labor	2	Santos *et al.* (2018a); Santos *et al.* (2018b)
Territorial	Planted area	3	Merli *et al.* (2018); Navarro *et al.* (2017b); Santiago-Brown *et al.* (2014)
	Grape variety	2	Santiago-Brown *et al.* (2014); Navarro *et al.* (2017b)

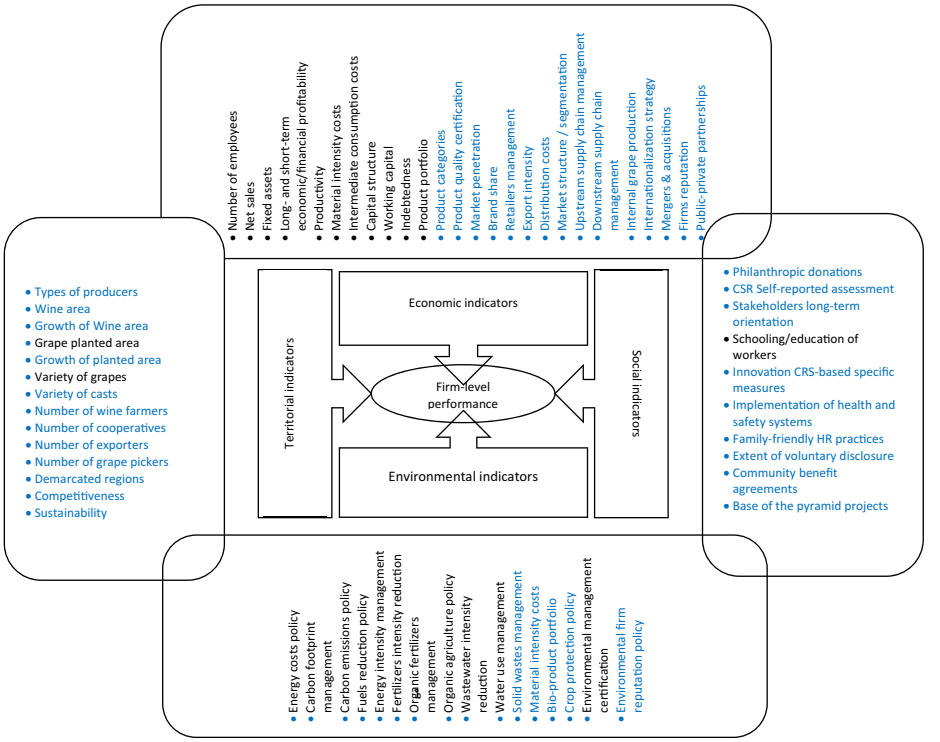

Figure 4.
Framework of analysis

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