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Financial and ESG Analysis of the Beer Sector Pre- and Post-COVID-19 in Italy and Spain

Núria Arimany-Serrat [1,*] and Andrey Felipe Sgorla [2]

[1] Department of Economy and Business, University of Vic-Central University of Catalonia, Sagrada Familia 7, 08500 Vic, Spain
[2] Department of Social Sciences, Political and Cognitive, University of Siena, Viale Luigi Cittadini 33, 52100 Arezzo, Italy; a.sgorla@student.unisi.it
* Correspondence: nuria.arimany@uvic.cat; Tel.: +34-938-816-169

Abstract: This study compares the analysis of the financial statements of the brewing sector in Italy and Spain due to its growth in both Mediterranean countries and its relationship with other sectors of activity of great importance in these countries. The web transparency of the sustainability indicators of the brewing sector in both countries is also analyzed, following the new regulatory framework, EU Directive 2022/2426, on sustainability information, in order to analyze, in an integrated way, the financial and sustainability information which they report for a sustainable development of the sector, in line with the Sustainable Development Goals and the European Green Deal. The methodology used involved compositional data, which are reliable at an accounting and statistical level; such data allow us to value the financial health of the sector and its relationship with the web exploration of the communication of its environmental, social, and corporate governance indicators. The results indicate a solvency of the sector in the short term, with poor margins, especially in the pandemic, which recovered in 2021 due to the sector's resilience. On the other hand, there is a clear need to study the costs and margins of the sector in depth to improve the quality of the beers and to project the sector. The web analysis reveals acceptable transparency at the environmental level and poor transparency at the social and corporate governance level, with differences between the two countries and the population under study.

Keywords: compositional data (CoDa); financial statement analysis; financial ratios; accounting ratios; financial indicators; non-financial indicators

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1. Introduction

Accounting ratios are an analytical tool that provides information for diagnosing the financial health of companies, facilitates strategic decision-making, allows for investment risk assessment, and predicts critical variables for the present and future of companies [1].

Although the methodology of using classical accounting ratios does not present problems in the study of the financial status of an individual company, in diagnostic studies of the financial health of a sector, it has been questioned from different fronts, providing, until recently, mostly partial and ad hoc solutions [2–10]. The most mentioned issues are skewness, outliers, and the dependence of the results on which accounting figure is in the numerator and the denominator of the ratio. The analysis of accounting ratios based on compositional data (hereafter CoDa) presents a unitary methodology whose validity of results has already been extensively corroborated [11–14] and that allows for a sectoral financial statement analysis to be performed reliably with any statistical method.

Although the CoDa methodology emerged in the fields of geology and chemistry at the end of the last century to study the relative importance of the components of chemical analysis, it was extended to all scientific fields that analyze ratios, including the economic, business, and social fields [15,16]. Its application to the analysis of accounting ratios in financial statements is more recent [7,17–26]. Far from being a methodological show-off,

the CoDa methodology of ratio analysis gives substantially different results whenever it has been compared to the traditional one [7,17,20,22–24]. This article presents the simplest case of sectoral compositional analysis, calculating average ratios representative of a sector. In this problem, the CoDa methodology applies geometric, rather than arithmetic, averages [12,14,23,25,26]. The geometric average operation is compatible with the ratio operation, as both highlight the relative differences between accounting figures and not their absolute values as the arithmetic average does. Furthermore, the conclusions when applying the geometric average do not change when permuting the numerator and denominator of the ratio, as is sometimes done (for instance, when using the ratio of liabilities over assets as a measure of indebtedness and the ratio of assets over liabilities as a measure of solvency). These averages can be broken down by years, countries, or clusters composed of homogeneous subgroups within the sector.

Italy and Spain have seen remarkable growth in the beer industry, particularly in craft beer. This makes it interesting to compare the sectors in both countries, looking at aspects such as market size; consumption patterns; upward trends; employment; and the relationship with other sectors, like agriculture, hospitality, and tourism. Additionally, it is important to analyze the financial health of the beer industries in these two Mediterranean countries, where tourism plays a significant role in the appreciation of beer.

For the analysis, the same years used in other published scientific studies with conclusive results are considered for comparing the pre- and post-COVID-19 periods. Specifically, data from 2019 to 2021 are used, as similar research in sectors like beekeeping, rural tourism, fishing, and food and beverage production has also shown the impact of the COVID-19 pandemic during these years [27,28].

Furthermore, including the year 2022, when the war in Ukraine began, in the analysis of pre- and post-pandemic differences could distort the results. Ukraine, as a major producer of cereals, significantly impacted the brewing sector due to rising cereal prices and the energy crisis resulting from the conflict. Additionally, many company-specific data were not available, so the sample used in this study corresponds to the data that was accessible.

The brewing sector (NACE 1105) was one of the most severely touched by the COVID-19 pandemic, whose containment measures and restrictions to the tourism activity resulted in a dramatic drop in beer consumption, endangering financial sustainability. In the sector, a few dominant breweries coexist with a large number of SMEs. We study the financial resilience of the companies and compare the Spanish and Italian financial statements for 2019, 2020, and 2021, thus covering pre- and post-pandemic data.

For the objective of knowing the financial health of the brewing sector pre-pandemic and post-pandemic in the two countries analyzed, the methodology used is exploratory and quantitative, through compositional data with information and indicators constructed thanks to the SABI and AIDA accounting databases, respectively, which endorse the sample under study from the two countries.

Besides financial indicators, we analyze the transparency levels in communicating non-financial indicators and, notably, environmental, social, and governance indicators, which are also key to the brewing sector. With this purpose, we analyze the breweries' web pages. The methodology used to determine the web transparency of non-financial information is exploratory and qualitative, analyzing each of the websites of the representative companies of the brewing sector in the two countries.

The study compares the analysis of the financial statements of the brewing sector in Italy and Spain and their web transparency of sustainability indicators following the new regulatory framework, EU Directive 2022/2426, on sustainability information, to be able to analyze, in an integrated way, the financial information and sustainability information and their close relationship. Therefore, the two objectives are aligned with the regulations in force in Europe and relate the financial and sustainability indicators. (For example, energy consumption as a sustainability indicator has a significant impact on supplies in the financial statement of the profit and loss account.)

European companies, under EU Directive 2022/2426, must follow mandatory sustainability standards to provide environmental, social, and corporate governance information. They also follow financial standards to prepare financial statements. This study provides both pieces of information to respond to the demand for integrated information from stakeholders.

Following the introduction and the review of the literature, we present the methodology of the quantitative and qualitative parts, the results, their discussion, and the conclusions.

2. Literature Review

The craft beer industry is growing, with more beers offering a greater diversity of labels and flavors. Artisans are undergoing various forms of training to serve these markets better [27,28]. Simultaneously, several global conglomerates of industrial brewers have emerged due to significant acquisitions and mergers [29].

In Italy, the market is dominated by five large brewing companies: Heineken Italia, Birra Peroni, Birra Castello, Carlsberg Italia, and Birra Forst. More than 90% of the market in Spain is concentrated in four major groups: Mahou, Damm, Heineken, and Hijos de Rivera (Estrella Galicia). It should be noted that market concentration by these large companies tends to homogenize product offerings, creating opportunities for new brewers who emphasize authenticity [30]. The coexistence of two distinct types of companies in the beer market—craft breweries and macrobreweries—results in two different operational models: macrobreweries have large production volumes, and craft SMEs face uncertainty about profitability, with simultaneously high rates of entry and exit [31–33].

At the same time, the growth of the sector stems from varying consumption patterns worldwide [33]. The organizational models characterizing the beer industry [34] are closely linked to the agricultural identity of each region, with local ingredients used to brew beers, enhancing both the profitability of the sector and product diversification [35–40].

In Europe, the brewing landscape has undergone significant changes over the past thirty years, marked by the absorption and concentration of traditional industries and artisanal companies [29,41], alongside a boom in microbreweries [42,43]. A brewing wave has also spread across various countries, particularly in Continental Europe [44].

In 2021, the Spanish brewing industry ranked third in beer consumption and fourth in beer production among EU countries. Despite its relatively low per capita consumption, Spain ranked 11th in beer production worldwide. Furthermore, the brewing sector in Spain represents 1.4% of the GDP, with craft breweries distributed unevenly across the country. Therefore, it is a sector of particular interest for analyzing financial statements.

The expansion of companies in the brewing sector can be attributed to policies supporting small entrepreneurs in Spain and Italy [45,46]. Although many of these are small companies with fewer than ten employees, born from artisan entrepreneurship, they contribute to employment in local economies and the development of local supply chains, in addition to benefiting from tourism [29].

In 2020, the pandemic directly affected the brewing sector worldwide. Beer sales fell across the board, and beer was marketed differently, altering the distribution process and even packaging [47]. Additionally, the decline in tourism due to the pandemic impacted the brewing sector, as draught beer sales decreased with the closure of bars, restaurants, and related sectors [47,48]. Furthermore, the consumption of beer, a popular choice in social contexts, declined during COVID-19 due to significant restrictions in the on-trade and related sectors. Large companies were more resilient during the pandemic because of their greater access to the food distribution channel [49–51].

Subsequently, in January 2022, when all restrictions were lifted, companies in the sector anticipated an accelerated economic recovery. However, this recovery had not materialized by 2023 due to several factors: the reduction in tax incentives, the need to repay loans, increased inflation, decreased investments, the conflict between Ukraine and Russia, high energy and barley prices, supply-chain difficulties, and further margin reductions, especially in the artisanal sector [50,51]. On the other hand, the pandemic

has left a lasting impact on customer behaviors, as well as on marketing, distribution, and promotion methods [51–55], highlighting the need for a thorough investigation of the sector's financial statements. This field remains under-researched, and none of the few available studies considers the limitations of standard financial ratios in statistical analyses [56,57].

The financial performance of the brewing sector depends on companies' turnovers, their earnings before interest and taxes (EBIT), and the results obtained. Additionally, other explanatory variables that impact performance include the age of the companies, their activity on social networks, their geographical location, their direct sales, and the reduction in taxes applied to them. Specifically, the most profitable companies are located in large cities, have significant activity on social networks, and benefit from favorable taxation [56].

A study of 12 European economies reveals that industry structure is significantly related to the financial performance of companies but not necessarily to their operational results [57]. The growing popularity of craft beer and the brewing sector in Italy and Spain—regions where raw materials for beer are cultivated—invites an analysis of their financial statements and ESG (environment, society, and governance) factors for sustainable development, competitiveness, and survival [58].

The literature highlights the craft brewing sector's interest in achieving economic and social benefits. For this, margins and profitability must be positive to ensure the sector's survival [55]. The brewing sector aims for economic and social benefits, but survival chances depend on their return on assets (ROA). The literature indicates that these returns are irregular, with some companies operating at high-performance levels, while others, particularly smaller ones, incur losses. These smaller companies often maintain local operations with products of recognized quality and diversity, rather than increasing production [59].

Regarding the sustainability of the sector, this article engages with emerging academic studies on social and environmental accounting [36,60] and research examining the brewing sector's intensive use of water and energy, its large volumes of wastewater and solid waste, and its significant carbon emissions. These environmental challenges necessitate reflecting on small-scale production and the "greening" process within the brewing industry [39,61–63]. Notably, companies in the brewing industry are committed to making tangible efforts to address sustainability and other environmental, social, and governance (ESG) challenges [63].

Promoting green investment and finance is crucial for consolidating ESG criteria within companies. Additionally, monitoring environmental regulations fosters environmental awareness, aligning environmental management with business development [36]. Disclosing environmental information also promotes energy efficiency, which is essential for any sector [37].

3. Methods

3.1. Financial Ratios

The CoDa methodology started to be used in geology and chemistry, focusing its interest on the relative importance of the chemical parts of the rock or substance [11]. It is currently applied in accounting since it is associated with relative magnitudes expressed as ratios, making analyzing financial statements a natural field of application.

In this section, we present how the ratios are used for the analysis of the financial statements of the brewing sector in Italy and Spain in the period of 2019–2021, using the CoDa compositional data methodology [11,14,24].

Specifically, the classic ratios under study are constructed using geometric averages of each accounting figure to determine the financial indicators that allow us to diagnose the sector's health in the period under study and for the two countries analyzed. The need to use geometric averages to calculate sector ratios has already been explained by other authors [21,23,25,26]. In constructing the ratios, we consider the relative importance of the

accounting figure. The CoDa methodology, using compositional data, analyzes the relative importance of the accounting figures with geometric averages.

In contrast, the arithmetic average is not compatible with the ratio operation. Thus, one of the pillars of the CoDa methodology, which studies the differences between magnitudes in relative terms, is geometric averages.

Let us look at a simple example of the compatibility of ratios with the geometric average and not with the arithmetic average. The ratio between 81 and 27 (81/27 = 3) is the same as the ratio between 27 and 9 (27/9 = 3), indicating that 27 is the center between 9 and 81 in relative terms. Accordingly, the geometric average between 9, 27, and 81 is 27 and is calculated as the cube root of the product $9 \times 27 \times 81$. In contrast, the arithmetic average between 9, 27, and 81 is 39, closer to the most considerable absolute value, 81.

Saus-Sala et al. [25] highlight an additional property of geometric averages in sectoral accounting statement analysis: the ratio of two geometric averages equals the geometric average of the ratios of the two accounting figures involved. The arithmetic average does not have this property. The calculation of the arithmetic averages of the accounting figures, first at the sector level and then the classic financial ratios on these averages, may contradict the results of the calculation of the traditional ratios first for each company and then the arithmetic average of these ratios.

Table 1 shows, with an example of three fictitious companies, this divergence between calculating the ratio x_1/x_2 between the arithmetic averages and the arithmetic average of the ratios and the coincidence between calculating the ratio between the geometric averages and the geometric average of the ratios. Moreover, the divergence between calculating the ratio between the arithmetic averages and the arithmetic average of the ratios can be sizeable, as in the example in which one of the two solutions is larger than 1, implying that, in general, the accounting figure x_1 exceeds x_2, and the other is less than one, meaning that, in general, the accounting figure x_1 is exceeded by x_2. The three values of the ratios in the example, 1, 1/3, and 3, clearly show that they are symmetrical around unity, a reality that only comes to light with geometric averages. To say that one accounting figure is equal to 3 times the second is the same as saying that the second is 1/3 of the first. On the contrary, the arithmetic average is larger than 1, closer to the ratio with higher absolute value, 3.

Table 1. Arithmetic and geometric average divergence and their ratios for the accounting figures x_1 and x_2.

	x_1	x_2	x_1/x_2	x_2/x_1
Company 1	27	27	1	1
Company 2	81	243	1/3	3
Company 3	9	3	3	1/3
Arithmetic average of the accounting figures	39	91		
Geometric average of the accounting figures	27	27		
Geometric average of ratios			1	1
Ratio between geometric averages			1	1
Arithmetic average of ratios			1.44444	1.44444
Ratio between arithmetic averages			0.42857	2.33333

Table 1 also shows what happens when the numerator and denominator of the ratio are permuted. This is relatively common. For example, some researchers use the solvency ratio (assets over liabilities), and some use the indebtedness ratio (liabilities over assets), hoping that this decision does not change the results. Unfortunately, however, with arithmetic averages, it does change them. We observe here that, with the geometric averages referred to as x_2/x_1, the results are again consistent and indicate the equality between x_1 and x_2 in average terms. The property that the geometric average of the inverse is the inverse of

the geometric average is fulfilled, a property that is again not satisfied with the arithmetic average. According to the arithmetic average of the ratio x_1/x_2, x_1 exceeds x_2 on average, and according to the arithmetic average of the ratio x_2/x_1, x_2 exceeds x_1 on average, which cannot be simultaneously correct.

The ratios used for the analysis of financial statements of the brewing sector in Italy and Spain in the period of 2019–2021 were constructed with different accounting figures without negative values [22]. The positive accounting figures of the financial statements used were the following five: x_1, non-current assets; x_2, current assets; x_3, current liabilities; x_4, operating income; and x_5, operating expenses (Table 2). The data were extracted from the SABI database in Spain (Iberian Balance sheet Analysis System, accessible at https://sabi.bvdinfo.com/ (accessed on 20 July 2024)) and the AIDA database (Analisi Informatizzata delle Aziende Italiane accessible at https://aida.bvdinfo.com/ (accessed on 20 July 2024)) in Italy in March 2023, according to the following filters: active companies, commercial, with NACE code 1105 brewing, with website, and with data from 2019 to 2021, since data from 2022 were not yet available in SABI and AIDA, respectively. Sample sizes were 66 (Italy, 2019), 66 (Italy, 2020), 72 (Italy, 2021), 27 (Spain, 2019), 27 (Spain, 2020), and 27 (Spain, 2021).

Table 2. Geometric averages of the accounting figures.

	Spain			**Italy**		
	2019	**2020**	**2021**	**2019**	**2020**	**2021**
x_1	0.2501	0.2241	0.1943	0.1485	0.2027	0.1978
x_2	0.1527	0.1470	0.1361	0.1697	0.1878	0.1950
x_3	0.1113	0.1057	0.0971	0.1164	0.1082	0.1229
x_4	0.2436	0.2500	0.2817	0.2805	0.2349	0.2404
x_5	0.2423	0.2732	0.2909	0.2849	0.2664	0.2439

The sectoral ratios under study are constructed with the geometric averages (Table 2). The short-term solvency ratio is used to evaluate the brewery sector's capacity to meet its short-term obligations and debts:

$$\text{Short-term solvency} = \frac{x_2}{x_3} \tag{1}$$

Another useful indicator is the proportion of current liabilities over assets, which shows to what extent the financial structure is dependent on short-term debts:

$$\text{Current liabilities over assets} = \frac{x_3}{(x_1 + x_2)} \tag{2}$$

For analyzing profitability, margin, current-asset turnover, turnover, and return on assets (ROA) are used. Return on assets can be decomposed into margin and turnover:

$$\text{Margin} = \frac{(x_4 - x_5)}{x_4} \tag{3}$$

$$\text{Current-asset turnover} = \frac{x_4}{x_2}, \tag{4}$$

$$\text{Turnover} = \frac{x_4}{(x_1 + x_2)}, \tag{5}$$

$$\text{ROA} = \frac{(x_4 - x_5)}{(x_1 + x_2)} = \text{Margin} \times \text{Turnover}. \tag{6}$$

In addition, we consider asset structure to be the proportion of fixed assets over total assets.

$$\text{Asset structure} = \frac{x_1}{(x_1 + x_2)}. \tag{7}$$

It is often argued that sectors are rarely homogeneous, and, in practice, it is more useful to calculate the averages of accounting ratios in strategic groups of similar companies than in the sector as a whole. Each company can thus compare its ratios with the average of the closest (or desired) strategic group instead of the entire sector. The compositional cluster analysis is used for this purpose [23–26]. Another of the highlights of the CoDa methodology is the transformations by logarithms of ratios. Like ratios and geometric averages, logarithms also focus on the relative differences between accounting figures. In addition, logarithms solve some serious problems of classical ratios that affect more complex statistical analyses, such as nonlinearity and a lack of symmetry or outliers, which result in clusters composed of only a few companies and sometimes just one outlier [23,24]. The common transformation in cluster analysis of CoDa is the centered log-ratio (clr), which makes Euclidean distance equivalent to Aitchison's distance [64]. For each accounting figure, x_j, we have the following:

$$\text{clr}_\text{j} = \log\left(\frac{x_j}{\sqrt[5]{x_1 x_2 x_3 x_4 x_5}}\right) \text{ with } j = 1, 2, \ldots, 5. \tag{8}$$

Once the data are clr-transformed, any clustering method handling Euclidean distances can be used. All analyses were performed with the CoDaPack program [65]. This computer program specializes in CoDa analyses, is of free distribution "https://ima.udg.edu/codapack/ (accessed on 20 July 2024)", and has menu-driven operation.

The most popular in financial-statement analysis is the *k*-means method [24–26]. We used this algorithm on the pooled data of all three years with 25 random initial cluster centers to prevent local optima. The number of clusters can be selected for maximization of the average silhouette width or the Caliński–Harabasz index [66]. A three-cluster solution maximized both criteria. Geometric averages of the standard financial ratios were subsequently computed on each cluster. Adding further clusters did not produce distinct interpretable financial profiles [67–69].

An introduction to compositional financial-statement analysis that also includes the use of the CoDaPack program is in [70–72].

3.2. Web Communication of Non-Financial Environmental, Social, and Governance Indicators

We explored the descriptive data referring to the web communication in March 2023 of non-financial indicators in the two countries since the analyzed academic literature demonstrates that the sector is intensive in water and energy, with large volumes of waste, and intends to make efforts to preserve the environment [39,61–63].

For the collection of information, in March 2023, a list was prepared for each country, with the different non-financial indicators endorsed by the Global Reporting Initiative (GRI) and the companies in the sample of each country under study, to proceed with the web search of the environmental, social, and corporate governance information of each company. Data were coded as binary (1 = presence in the web page; 0 = absence). Of the 25 non-financial indicators endorsed by the Global Reporting Initiative (GRI), the first six are environmental indicators, the next ten are social indicators, and the last nine are corporate governance indicators (Table 3). The non-financial reporting was compared across countries and across the clusters obtained from the financial indicators.

Table 3. Ratios with geometric averages for the period of 2019–2021 in the two countries.

	Spain			Italy		
	2019	**2020**	**2021**	**2019**	**2020**	**2021**
s. t. Solvency	1.3716	1.3902	1.4022	1.4586	1.7351	1.5870
Current liabilities over assets	0.2764	0.2849	0.2937	0.3657	0.2772	0.3129
Margin	0.0053	−0.0929	−0.0326	−0.0159	−0.1344	−0.0146
Current-asset turnover	1.5947	1.7006	2.0698	1.6524	1.2508	1.2327
Turnover	0.6046	0.6736	0.8525	0.8814	0.6016	0.6120
ROA	0.0032	−0.0626	−0.0278	−0.0140	−0.0809	−0.0089
Asset structure	0.6209	0.6039	0.5881	0.4666	0.5191	0.5035

4. Results

Regarding the analysis of the financial statements, Table 3 shows the sectoral financial ratios for each country and year calculated from the geometric averages, x, of Table 2.

Regarding the analysis of the short-term financial situation, the brewing sector in the two countries in the pre- and post-pandemic period of 2010–2021 can meet its short-term payments, especially Italy, which is close to values of better short-term solvency. That is, companies can meet their short-term obligations and debts, assuming a good cash flow from operating activity, in the sense that its operating receipts exceed its operating payments. Current liabilities represent a reasonable proportion of the financial structure in both countries, and there is no visible trend over time in the ratio of current liabilities over assets.

The analysis of profitability reflects a low return on assets for companies in the brewing sector. In the case of Spain, the positive sign turned negative because of the pandemic, while Italy was already starting from negative figures before the pandemic, a situation that invites the generation of strategic policies for this sector of activity, which, despite having good operating revenues, does not yield positive margins, with an operating cost problem. On the other hand, in the Spanish case, the pandemic has left its mark on the sector, since, in 2021, the profitability of 2019 was not recovered. When decomposing the return on assets between margin and turnover, it can be seen that the negative margin is almost always responsible for the bad ROA figures in both countries. The successive improvement in turnover and current-asset turnover in Spain has thus not contributed to improving profitability. In Italy, both turnover ratios deteriorated in 2020 and failed to go back to pre-pandemic figures in 2021.

Asset structure does not exhibit a significant trend, but there are large differences between countries, with Spain having a much larger proportion of fixed assets.

In summary, the short-term solvency of Spanish companies is acceptable, although it worsened in 2021 because of the pandemic. Italy presents better short-term solvency than Spain, especially in 2020 and 2021, during the pandemic. In terms of profitability, yields and margins were either negligible or negative at the start of the study period and worsened in 2020, which is the main problem the sector is facing.

Table 4 shows the average financial ratios for each of the three clusters, which are of about equal size (99, 102, and 84 observations). Cluster 2 is the only one with a positive margin and ROA and is also the best in terms of short-term solvency and overall turnover. It is clearly the best-performing cluster. Cluster 3 has the worst negative margins and ROA and is also the worst in terms of overall turnover, current liabilities over assets, and short-term solvency (values below 1 of this ratio are considered critical). It is clearly the cluster under most severe financial distress. Cluster 1 has a negative margin and ROA but very acceptable solvency ratios.

Table 4. Ratios with geometric averages for the three clusters.

Cluster	1	2	3
n	99	102	84
s. t. Solvency	1.8026	2.0164	0.8996
Current liabilities over assets	0.1705	0.3238	0.5045
Margin	−0.0595	0.0435	−0.1578
Current-asset turnover	1.9095	1.6861	0.9125
Turnover	0.5869	1.1008	0.4141
ROA	−0.0349	0.0479	−0.0654
Asset structure	0.6926	0.3471	0.5462

The mosaic plot in Figure 1 relates the year and cluster membership. The year 2020, when most of the containment measures were in force in both Italy and Spain, shows a marked reduction in the size of the best-performing cluster, Cluster 2. The cluster distribution in 2021 is very similar to that of 2019, showing that recovery of financial performance was already taking place in the brewing sector of the two countries considered, thus demonstrating the resilience of the sector. Figure 2 shows that Spain stands out for the intermediate cluster, Cluster 1, and Italy for the best and worst clusters, Clusters 2 and 3, respectively. The boxplot in Figure 3 shows that Cluster 1 reports the most non-financial indicators, while Clusters 2 and 3 report no indicators at all in most cases. Figure 4 shows that large firms concentrate in Cluster 1, and SMEs concentrate in the worst-performing cluster, Cluster 3.

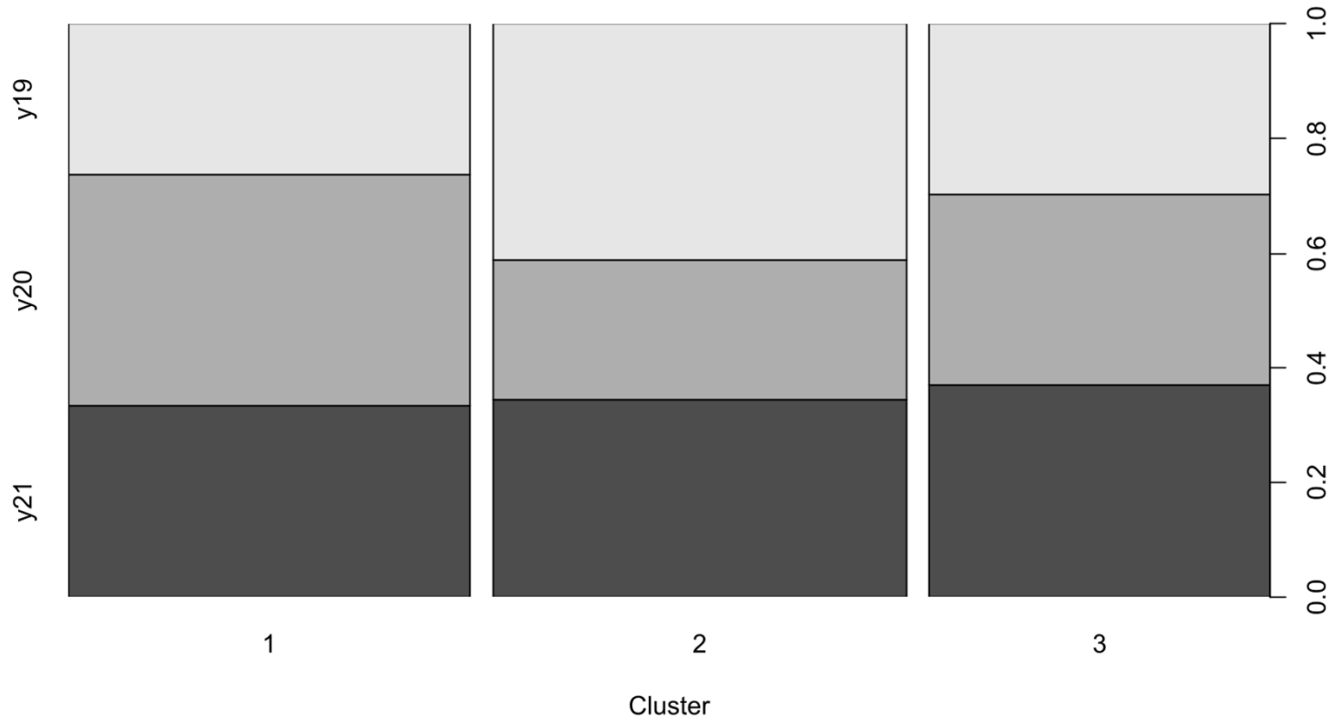

Figure 1. Mosaic plot of cluster and year. Bar widths show cluster size. Bar heights indicate the importance of the year within the cluster.

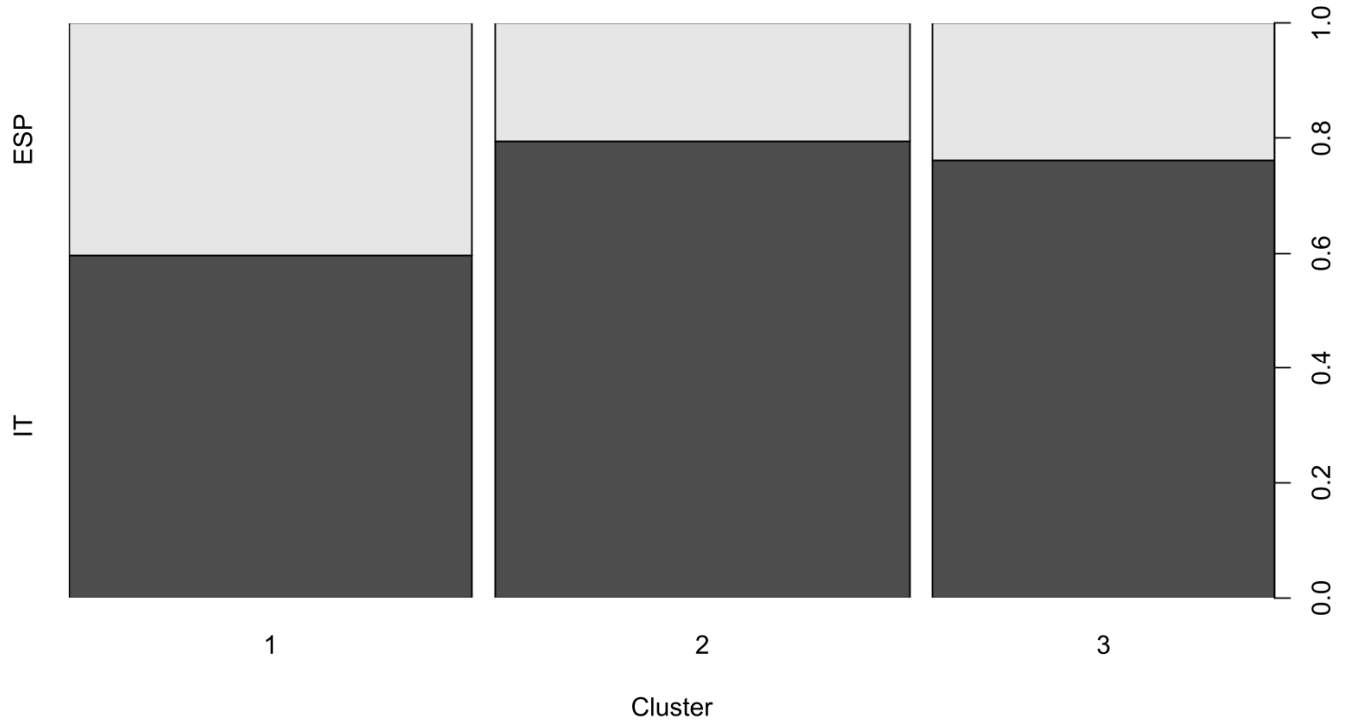

Figure 2. Mosaic plot of cluster and country. Bar widths show cluster size. Bar heights illustrate the importance of the country within the cluster.

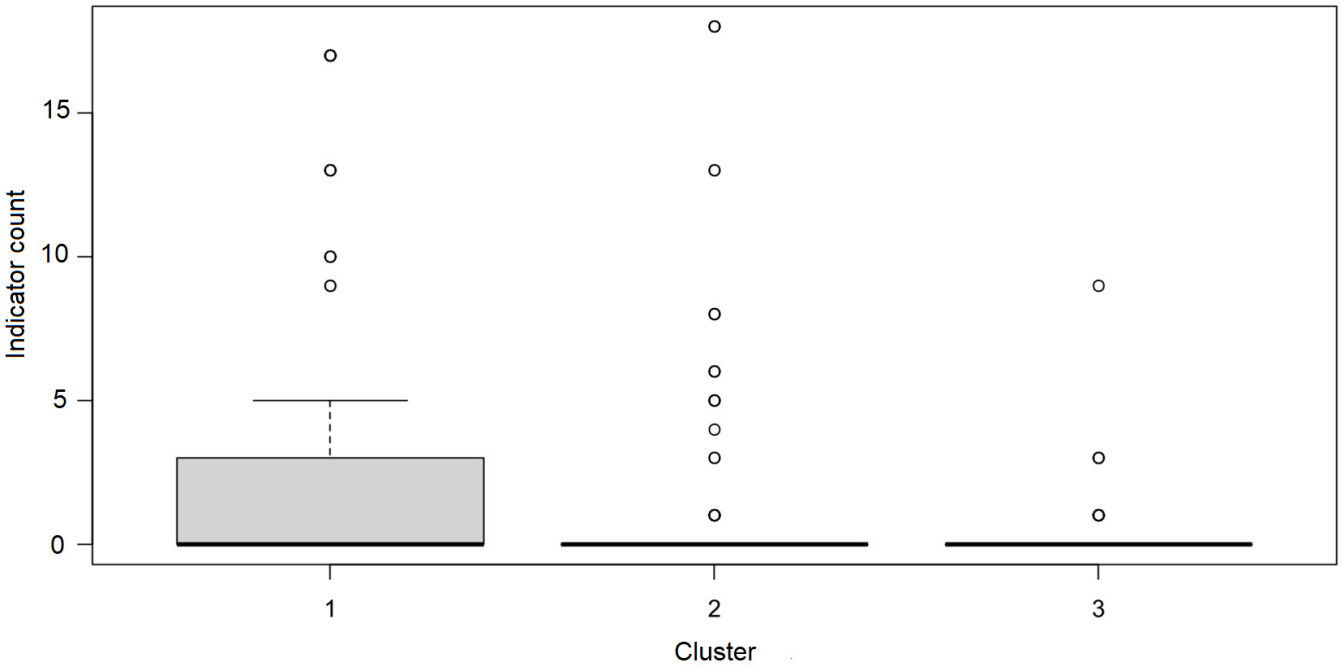

Figure 3. Boxplots of the number of disclosed non-financial indicators per cluster.

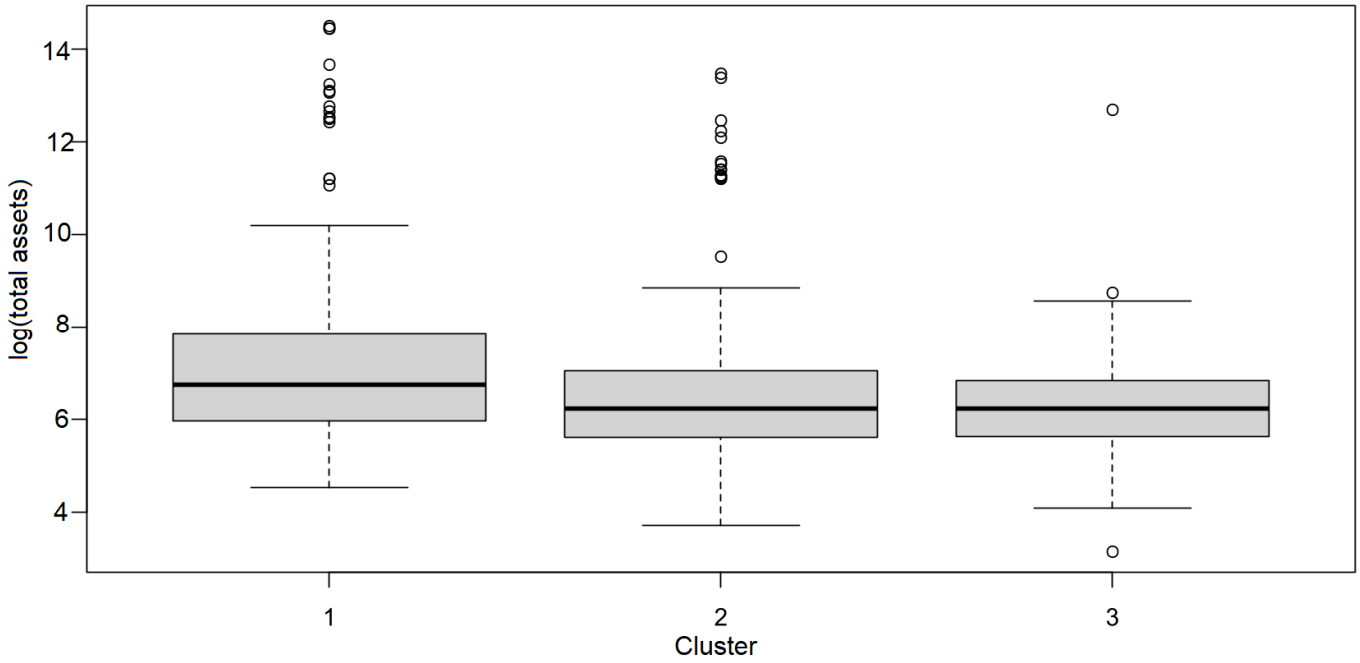

Figure 4. Boxplots of firm size—log(total assets)—per cluster.

As there are few variables (country and number of indicators reported), they were analyzed using statistical inference, specifically next to Figure 3. According to the Kruskal–Wallis non-parametric test, disclosure is significantly higher in Cluster 1 than in Cluster 3 (p-value = 0.045). And in Figure 4, according to the Kruskal–Wallis test, total assets are significantly higher in Cluster 1 than in Cluster 2 (p-value = 0.029), and they are significantly higher in Cluster 1 than in Cluster 3 (p-value = 0.030).

Regarding web communication, the results of the study indicate that Spanish companies provide more non-financial information, especially at the level of environmental indicators, and, in social and corporate governance indicators, transparency is lower.

Specifically, Spanish companies in the brewing sector provide twice as much environmental information compared to Italian companies, which barely present social and corporate governance information.

In addition, Table 5 shows that the web communication of non-financial information by Italian companies is lower than that of Spanish companies, although it follows the same pattern as the Spanish companies of providing more environmental information and less social and corporate governance information.

Table 5. Proportions of companies disclosing each of the non-financial environmental, social, and governance indicators in Spain and Italy.

	Italy	**Spain**
1. Energy consumption	14%	25%
2. Water consumption	7%	27%
3. Polluting emissions	6%	25%
4. Waste generation	7%	25%
5. Waste management	11%	30%
6. Waste reuse	13%	30%
7. Employees	3%	23%
8. Employee gender diversity	3%	18%
9. Employment stability	0%	3%

Table 5. *Cont.*

	Italy	Spain
10. Absenteeism	1%	14%
11. Employee turnover	0%	10%
12. Net job creation	0%	7%
13. Seniority	0%	10%
14. Employee training	1%	18%
15. Customer payment cycles	0%	11%
16. Supplier payment cycles	0%	0%
17. Members of the board of directors	3%	14%
18. Independent board members	0%	0%
19. Board members with CSR responsibility	1%	3%
20. Executive commission	3%	14%
21. Audit committee	0%	0%
22. Board of directors' appointments	1%	7%
23. Board of directors' meetings	0%	7%
24. Remuneration of the board members	1%	0%
25. Gender diversity in the board members	0%	3%

In the study conducted, the analysis of social and governance indicators is the most lacking, as companies report limited information. This is due to the current regulatory framework, specifically the EU Directive 2022/2426 on sustainability information, which does not yet require many of the analyzed companies to disclose this information; however, they will be required to do so in the near future. Future research should focus on transparency in social and corporate governance. Nonetheless, using the Kruskal–Wallis test, we demonstrate that the group with the poorest performance is the one that reports the least.

5. Discussion

This article highlights the reliable diagnosis of the analysis of the sector's financial statements using classical accounting ratios, with geometric averages, and clustering with clr-transformed data, according to the CoDa methodology of compositional data [23,25,26].

This research offers a more accurate diagnosis of the financial health of the sector at the accounting and statistical level through a simple methodology that only involves a change in the way of calculating averages and selecting clusters and which supports more reliable results for making decisions in the accounting and financial sphere, taking into account the relative and not the absolute differences between companies and without depending on asymmetry, outliers, or the arbitrary decision of which accounting figure is introduced in the numerator and denominator of the ratio. The results reflect good short-term solvency in the two countries in the period under study. Yields are not good, and, consequently, margins are not good, despite the government policies derived from the pandemic, in line with the academic literature [59]. Clustering the firms into homogeneous groups makes it possible to identify subsets of firms with different characteristics, notably one with positive margins (Cluster 2) and one with poor solvency (Cluster 3). Altogether, Cluster 2 has the most acceptable financial performance. Accordingly, its size markedly decreased in 2020 but went back to 2019 levels in 2021, arguing for the resilience of firms in that cluster in face of the pandemic. The least performing cluster, Cluster 3, contains mostly SMEs.

The investigation of web transparency of non-financial environmental information (indicators 1–6 of Table 3), social (indicators 7–16 of Table 3), and corporate governance (indicators 17–25 of Table 3) highlights differences in the two countries. Specifically, the

web transparency of non-financial information is greater in Spanish companies, especially in regard to environmental information on waste, water, and energy, according to the order of priorities. Italian companies also provide this type of information, but with smaller percentages of communication. Web communication on environmental indicators in Spain especially focuses on waste (30%), water (27%), and energy consumption (25%). In contrast, in Italy, it focuses on energy consumption (14%) and reused waste (13%). Web communication is also cluster-specific, with Clusters 2 and 3 engaging in virtually no communication, with a few exceptions shown as outliers in Figure 3.

At the social level of the ten indicators analyzed, the Spanish beer sector provides little information on indicators number 7 to 16; this information focuses on the number of employees, gender, and training. Regarding information about supplier payment cycles, no company provides this information. In the case of the Italian beer sector, there is very little information at a social level; only 3% of companies detail the number of employees and their gender diversity.

At the level of corporate governance, indicators from number 17 to 25 of the Spanish beer sector have little information, referring to the board of directors (14%) and the executive commission (14%). Regarding companies in the Italian brewing sector, the information is less, and the information related to the directors (3%) and the executive commission (3%) also stands out with respect to other corporate governance items.

Thus, web transparency at a non-financial level must improve in both countries, especially at the social and corporate governance levels. At an environmental level, companies in both countries communicate more information, although it is insufficient, since, in Spain, companies provide a low percentage of information on waste (30%), water (27%), and consumption of energy (25%), and Italy also provides a low percentage of information on energy consumption (14%) and reused waste (13%).

6. Conclusions

This article shows that, to analyze the financial indicators of reference for a sector, such as the brewing industry, the accounting ratios should be calculated according to the geometric averages of accounting figures and the clr transformation, supported by the statistics inherent to the CoDa methodology, which allows for results that better reflect the reality of the sector in the period under study to be presented.

Moreover, the diagnosis of the financial health of a sector is of considerable importance in a society in constant change and transformation, as in the pre- and post-pandemic period, so economic decisions must be based on methodologically reliable analyses.

In the case of the brewing sector in Italy and Spain in the pre- and post-COVID-19 period contemplated between 2019 and 2021 (due to the lack of 2022 data in the AIDA and SABI databases, respectively, at the time of the empirical study), a deterioration of the financial health, marked by the presence of the pandemic, is reflected, as supported by the academic literature [47–51]. The resilience of the sector is shown by the fact that recovery clearly started in 2021; however, it was not complete, according to some of the indicators.

The analysis of the short-term financial situation in the two countries in the period analyzed reflects that the sector has been able to meet the annual payments committed, especially in the case of Italy. Regarding the analysis of profitability, the brewery sector of the two countries reflects a low return on assets, with negative margins caused not only by the effects of the pandemic and financial management that could be improved, as supported by the literature [59]. This sector, like most sectors, if not all, is, however, heterogeneous, and we identified one worse-than-average cluster (dominated by SMEs) and one better-than-average cluster with firms of all sizes.

On the other hand, as far as non-financial indicators are concerned [39,61–63], the sector's web communication must improve in the two countries. Environmental information stands out in non-financial transparency; however, it can improve, since, on average, Spain lacked 70% of environmental information, and Italy lacked 80% of it, in March 2023, at the level of web transparency. Regarding non-financial, social, and corporate governance

information, information is much scarcer both in Spain and in Italy. For the most part, the companies that are not legally obliged to provide this type of information intend to differentiate themselves in terms of interest in sustainability. Clustering has also shown that non-financial disclosure is not independent of financial performance.

In addition, the Corporate Sustainability Reports Directive, approved in 2023, will force many more companies to provide this information, and preparing for that scenario is a good option.

At an environmental level, the two countries emphasize the problem of waste, water, and energy, although with different levels of web transparency. A clear limitation of web exploration is having contemplated web transparency only in March 2023; therefore, other web explorations would be required at different moments in time to assess whether the trend is to provide more information of this type in line with international standards.

This article would benefit from a longer period for the financial analysis in the two countries and from contemplating the different legislation of the two countries before the pandemic to better explain the low profitability and negative margins due to difficulties in the supply chain, tax incentives, loan repayments, and energy costs, among other factors [50,51]. In addition, another limitation of the article is that it only contemplates trading companies and fails to cover craft brewers that do not have a legal form of a corporation or limited company.

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