COMPETITIVE SUSTAINABLE STRATEGIES IN THE ALUMINUM MANUFACTURING EXPORTING FIRMS: EVIDENCE FROM GREECE

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Abstract

The Greek aluminum sector constitutes one of the most important sectors of the Greek economy despite the problems it faces (Foundation for Economic & Industrial Research [IOBE], 2024). With the use of financial ratios and the calculation of the breakeven point analysis and the Z-score, this paper aims to estimate the competitiveness of the four dominant aluminum manufacturing exporting Greek firms, filling the existing gap in the literature for the specific sector for the 2018–2023 periods. The main results show that these firms present satisfying results in terms of liquidity, profitability, and activity ratios and should also strengthen their competitive status with the use of proper strategies such as vertical integration, a result which differentiates the current paper from other relevant works.

Keywords: Competitive Strategies, Financial Ratios, Breakeven Point Analysis, Aluminum Manufacturing Firms

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1. INTRODUCTION

The aluminum sector in Greece is an important part not only for the manufacturing sector but also for the entire industry, contributing significantly to the national economy. It is a particularly export-oriented and extroverted sector, specifically the third most export-oriented sector of the Greek economy, with over 66% of its sales being exported, reaching a value of €2,522 million in 2023 It includes both large industrial units (capital-intensive) for the production of raw materials and smaller manufacturing industries (labor-intensive) for the production of semi-finished and finished products (Foundation for Economic & Industrial Research [IOBE], 2024).

The sector employs more than 30,000 workers directly and indirectly, while according to 2024 data, annual production amounts to 1.6 million tons, an increase of 6.7% compared to 2022 (Institute for Commercial and Administration Programmes [ICAP], 2024). Despite the fact that the sector is particularly extroverted, as mentioned above, domestic aluminum consumption continues to expand, covering a wide range of activities such as the construction industry, the automotive industry, packaging, etc. According to the ICAP (2024), domestic aluminum consumption in 2024 is estimated to have exceeded 450,000 tons, marking an increase of 12.5% compared to 2022.

However, despite the positive outlook for this sector, and more specifically for the companies that comprise it, they face significant challenges such as energy price volatility, which affects production costs, and stricter regulatory requirements for environmental compliance. These factors pose challenges for the formulation of appropriate strategies that need to be developed to boost

the competitiveness of the sector and further enhance the growth prospects of its companies (IOBE, 2024).

On the other hand, the concept of competitiveness is particularly important for businesses, but it is difficult to define and measure accurately. However, its assessment is particularly important, as achieving it serves as a guide for selecting the appropriate strategy at the firm level (Abdullayev, 2022). Based on the existing literature, two main schools of determining competitiveness can be taken into account. The first one has Michael Porter as the main exponent, with the famous Porter's five forces. More specifically, the five forces that determine the competitiveness at a firm level are the following: 1) "threat of new entry", 2) "threat of substitute products", 3) "existing market conditions in the sector", 4) "bargaining power of suppliers", and 5) "bargaining power of consumers". (Fischer & Schornberg, 2007). As regards the second one, the analysis of financial data with the use of financial ratios can be a usable tool to assess competitiveness in the manufacturing sector, determining the proper strategy which should be followed (Liu et al., 2025).

So, taking into consideration both the importance of the aluminum manufacturing sector in Greece and the vital role of competitiveness for the selection of proper strategies, the main purpose of this paper is to determine the competitiveness of the four largest aluminum manufacturing exporting firms in Greece in terms of economic value. This case study takes place with the use of selected financial ratios, the use of breakeven point analysis of these firms, as well as the Z-score of them. Moreover, following this methodology, research questions are created and are tried to be answered (Galanis et al., 2023):

RQ1: Will using the proper financial ratios lead to the selection of proper strategies?

RQ2: If so, in which direction?

This study comes to fill the gap in the relevant to the Greek aluminum manufacturing exporting firm's literature, especially after the COVID-19 pandemic period in a very important for the whole Greek economy sector such as the aluminum sector and takes a particular importance both at the academic and firm level using as a guide for the planning of the right and proper strategies (Kafestidis et al., 2024).

The structure of the current paper is as follows. Section 2 reviews the relevant literature, while Section 3 describes the material and methods that have been used. Section 4 presents the main results, followed by Section 5, which gives a discussion. Section 6 includes the conclusion and closes the current paper.

2. LITERATURE REVIEW

It is widely accepted in the academic literature that competitiveness is a concept that is difficult to measure and define accurately due to the fact that there is a large range of factors that determine it (Fischer & Schronberg, 2007). However, competitiveness estimation is vital for the survival of a firm because it defines the strategies that a firm should either correct or follow in order to succeed competitive advantage, and gain more value against its competitors (Chikán et al., 2022; Galanis et al., 2023). Moreover, the final outcome that a firm is able to success constitutes the major factor for the selection of the proper strategy (Olubiyi, 2023).

As mentioned in the introduction, Michael Porter, defining Porter's five forces theory, tried to justify competitiveness both at a micro and a macroeconomic level (Chikán, 2008). In line with Porter's theory both Cetindamar and Kilitchioglou (2013) and Wijnads et al. (2015), concluded that Porter's five forces and specifically the bargaining power of suppliers, the bargaining power of producers, the threat of new entries in the sector, the threat of substitutes, and finally the existing conditions in each sector, combined with the right managerial practices and the proper strategic tool can formulate the suitable strategy for each firm, sustaining a strong competitive advantage. In addition, the right operation of human resources, such as the right job rotation, enhances firms' competitiveness, strengthens the supply chain, and helps in the creation of the proper strategy for all the firms (Al-Shboul et al., 2022).

Fischer and Schornberg (2007), using financial ratios, such as profitability, market share, and productivity, created a simultaneous equation system and concluded that the most competitive sector in the United Kingdom for the 1995–2002 period was the food and beverage industry. Continuing with the financial analysis, the use of financial ratios in the Indian aluminum industry the use of financial ratios was considered a useful tool for the managers in order to make well-informed decisions (Thakkar, 2024). In line with Thakkar (2024), Saleh (2023) found a significant effect among the financial ratios such as firm size and cash flows and the competitiveness level of the Israel aluminum manufacturing firms, while Kourniani (2021) resulted that liquidity ratios, capital structure and activity ratios are able to influence the proper strategy of the aluminum manufacturing firms. Furthermore, financial ratios can be used as a tool in competitive intelligence research (Costello, 2025).

Moreover, the use of livestream channels from the online retailers enhances the strategy of product differentiation, giving the ability to these firms to increase their market share and strengthen their competitiveness (Liu et al., 2025). Additionally to the product differentiation strategy, the cost leadership strategy combined with it was found to have a significant effect on the small and medium enterprises' competitiveness (Zairbani & Senthil Kumar, 2025). Product differentiation as a competitive strategy was also found to be very important for Nigerian firms in their attempt to gain their consumers' loyalty (Audu & Ihuoma, 2024). In the same country also competitive dynamics, new product launch actions, and profitability are strongly connected for the success of competitive advantage and the planning of the correct strategy (Princewill & Redwell, 2020).

Without concluding with safety, which strategy between product differentiation strategy and niche strategy is the most suitable for the aluminum firms in Bahrain, Hilal and Hilal (2019) found that these are the most effective strategies that should be adopted by the firm's manager in order to defeat competitors and become the market leader. In addition, the dynamic linkage that will be developed between the firm's external environment and the competitive advantage is a crucial factor in the firm's competitive performance (Das & Canel, 2023).

So, taking into account a significant part of the existing literature on the under-study subject and summarizing it from a critical point of it is

made clear that in spite of the problems which may occur, the financial indexes can be used and lead to main results referring to the competitiveness level and the strategy which the firms belonging to the specific sector may follow. Although financial indicators have been discussed in the literature, a systematic review of them has been lacking, especially for the Greek aluminum firms, which constitute the case study of the current work.

As a result, following below, the most important financial indicators according to the theory are estimated below for the justification of the factors that determine both the competitive advantage and the choice of the appropriate strategy in the four largest aluminum manufacturing firms in Greece.

3. RESEARCH METHODOLOGY

Assessing the competitiveness of businesses using financial ratios is a widely used and effective method of evaluating a business's market position, effectiveness, strategy, and competitive advantages. Ratios are relationships between selected financial figures extracted from companies' financial statements (balance sheet, income statement, etc.) and provide information on the company's performance, liquidity, leverage, profitability, and sustainability. A company's competitiveness is linked to its ability to create value for customers, operate efficiently, adapt to the external environment, and outperform its competitors. Ratios help to quantitatively assess these capabilities (Pazarskis et al., 2023; Kourtesi et al., 2024).

In this case study, the choice of indicators was based on classical categories (liquidity, activity, debt, efficiency, and profitability), combined with quantitative methods such as break-even point analysis and Z-score. The aim is not to simply present values, but to highlight patterns and differences that capture the deeper functioning and strategic direction of companies.

The existing literature suggests that the most important and widely used indicators are eight (Chikán et al., 2022), and these will be the ones that will be used and analyzed in this case. We will start the research with the main profitability indicators, which are net profit margin (NPM) and return on equity (ROE). Profitability ratios in general reflect the ability of a firm to generate economic benefits from its operation by utilizing its revenues, equity, or total assets. They are key tools for assessing the performance, competitiveness, and strategic viability of a company. The analysis becomes meaningful when combined with other categories of indicators, such as profitability or leverage, and over time. NPM refers to the structure of the profit and loss account, while ROE expresses the ratio of profits to invested capital. Their combined assessment provides a global picture of a firm's financial performance and strategic effectiveness (Bargoni et al., 2022). More specifically, the NPM shows the percentage of turnover that is eventually converted into net profit after all taxes, interest, and operating expenses. It is a general measure of the overall profitability of the business and is calculated by dividing net profit after tax by sales for the year. When the indicator has a high value, it indicates successful management of costs and tax burden, while a low value may indicate high financial or administrative costs. It is one of the most important ratios because all the shareholders of the company are essentially interested in the net profit of the company since their own benefit is derived from it (Niarchos, 2004). The ROE ratio measures the ROE invested in the firm, expressing the profit attributable to shareholders for each unit of equity. It is one of the most important indicators as it reflects the ability of management to effectively utilize the invested capital. It is obtained by dividing net operating profit by the average amount of equity. A high value indicates efficient utilization of equity, while a low value may be associated with reduced efficiency or over-inflated equity. It is a critical indicator for assessing sustainability and capital efficiency (Kantzos, 2013).

Liquidity ratios express a company's ability to meet its short-term obligations in a timely manner by utilizing its liquid assets. Current assets include: cash, receivables, inventories, and prepayments, while short-term liabilities include accounts payable, loans, and other liabilities maturing within twelve months. From this category, the general liquidity ratio is most commonly used, which assesses the total coverage of liabilities by total current assets and is given by the ratio of current assets to short-term liabilities. If the ratio is above one, then the indication is positive and liabilities are covered by liquid assets. If the ratio is approximately equal to one, then liquidity is marginal, and if the ratio is below one, then the indication is negative, and external financing is very likely to be needed. Values between 1.2 and 2 are considered healthy. Excessively high values may indicate an accumulation of inventories or inefficient working capital management (Notta et al., 2010). The second ratio used is the quick ratio, which excludes inventories, which are considered less liquid, and focuses on receivables and cash equivalents. It provides a more accurate picture of short-term operating liquidity than the general ratio and is calculated as current assets minus inventories divided by short-term liabilities. A value above unity indicates a high ability to cover liabilities without dependence on inventories, while a value below unity indicates a potential liquidity risk and requires further review (Gikas, 2002).

Another important category of indicators includes activity ratios, which assess the speed and efficiency with which a company manages its key current assets, such as inventories and receivables. They measure the rate at which these are converted into sales or liquidity, providing indications of the performance of operating capital. Rapid inventory turnover or quick collection of receivables enhances liquidity and reduces the need for external financing. Conversely, delays may indicate problems with commercial policy or difficulties in coordinating the supply chain. The inventory turnover ratio represents the number of times inventory was replenished during the year. The higher the ratio, the faster the inventory turnover is considered to be, and it is given by the quotient of cost of goods sold divided by average inventory. A high value indicates efficient management, with inventory moving quickly and not remaining in warehouses for long periods of time, while a low value indicates delays in distribution or excessive stockpiling. This indicator is particularly useful in industries with high stock values and long production processes. The second indicator in this category is the accounts receivable turnover ratio, which calculates how many times during a fiscal year the company manages to convert its receivables

into cash. Receivables turnover is a key concept for a company, as it is effective, as it avoids capital commitments and potential losses from bad debts. The collection period refers to the time between the sale of products and the collection of payment from the customer. It should be noted that the target for the economic unit in this ratio is values greater than one, as results lower than this translate into a lack of turnover speed. It is a key tool for assessing the effectiveness of the collection policy and is calculated by dividing sales by receivables (Kontakos & Papaspyrou, 1993).

Finally, debt burden ratios assess the relationship between debt and equity and the company's ability to service its financial obligations. They provide an indication of the degree of financial risk, as well as the company's resilience to changes in interest rates, cash flows, or earnings. The most important of these ratios are the debt-to-equity (D/E) ratio and the total leverage ratio. The D/E ratio reflects the ratio of debt and other liabilities to equity and shows the extent to which the company finances its activities through borrowing rather than its own resources. The company's lenders take this ratio seriously as it is a method of calculating the current risk of their investment. The company is considered to be in a favorable position when the ratio is close to zero, as in this case, the participation of foreign capital in the overall capital structure is minimal, thus ensuring that any future decline in the company's value is avoided. Conversely, when the value reaches or exceeds 100, we are referring to a company with a huge debt burden or one that is over-indebted. The ratio is calculated by dividing debt by equity. The total leverage ratio assesses what percentage of the company's total assets is financed by debt and is an indication of the company's degree of dependence on borrowing. It is calculated by dividing total liabilities by total assets. The aim is to have a low value because then there is financial stability and the company relies more on equity, while when the value is high, there is increased risk due to high dependence on borrowed capital. It is suitable for an overall assessment of capital risk, regardless of the balance sheet structure (Soumpeniotis & Tabakoudis, 2018).

Quantitative assessment methods complement numerical indicators, providing interpretative and predictive capabilities that are not reflected in purely analog measurements and contribute significantly to understanding the financial situation and sustainability of a business. They focus on either profitability, operational risk, or long-term stability, utilizing accounting and financial figures. The first method used in this case study is break-even analysis, which is one of the oldest and most fundamental tools of the managerial and financial approach. It focuses on determining the level of activity at which total revenue equals total costs, without achieving profit or loss. This point is a critical sustainability threshold, especially for businesses with a strong cost structure. The method is particularly useful in industrial production, as it allows for a strategic assessment of the minimum sales or production volume required for a unit to remain operationally viable. At the same time, it can be used for pricing design, investment evaluation, or scenario simulations (e.g., cost increases, changes in demand). The break-even point calculation is based on the ratio of fixed costs to gross profit margin and is expressed either in product units or in monetary value (Pangeios, 1994).

Next, we analyze the Z-score model developed by Altman (1968), which aims to predict the probability of business failure. It is a multifactorial financial tool that combines five ratios — related to liquidity, leverage, profitability, and activity — into a weighted equation. Its original form was designed for listed industrial companies, but alternative versions were subsequently developed for unlisted or commercial companies. The model is widely used in bank ratings, solvency studies, and internal audits. The Z-score is not a simple descriptive measure, but a forecasting tool with significant accuracy: it is estimated to be around 85% for listed companies and 70–75% for unlisted companies. However, its reliability is affected by accounting practices and external conditions, such as the industry, country, or size of the company (Altman, 1968).

4. RESEARCH RESULTS

Going ahead with the results, the estimation starts with the Performance indicators and specifically with the NPM and the ROE. The NPM indicator expresses the overall efficiency of the business after taking into account all costs, financial expenses, and taxes. Higher values indicate more efficient and profitable operations. ELVIAL has recorded a consistently positive and increasing net margin from 2019 to 2022, peaking at 11.09%. In 2023, there is a decline to 7.52%, but it maintains its leading position in the sample. ALUMIL shows an unstable trend, with a negative result in 2019 (-1.91%) and a gradual improvement until 2022 (6.04%). In 2023, the index declined to a marginal 0.19%, reinforcing the image of intense volatility. EXALCO maintains moderate but positive rates, with an upward trend from 2020 (0.51%) to 2023 (2.99%), reflecting moderate profitability without significant fluctuations. COSMOS Aluminum performs very well in the period 2020–2022 (5.85% to 10.05%), but in 2023 it declines to 2.67%. Over time, it consistently maintains a better margin than the rest, except for ELVIAL. ELVIAL thus emerges as the most consistently profitable company with a positive net margin throughout the period, while ALUMIL is characterized by sharp fluctuations. EXALCO and COSMOS Aluminum follow intermediate strategies with gradual improvement.

The ROE measures the percentage of net profit in relation to the company's equity. ELVIAL shows steady improvement in ROE over the period 2019–2022 (from 11.51% to 27.42%), while in 2023 it declines to 12.51%. The picture is strong and without extreme fluctuations. ALUMIL has recorded an extremely unstable performance: from -162.92% in 2019 (losses and low equity), it skyrockets to 76.34% in 2020, and since then, it has been steadily declining, ending up at a very low 1.11% in 2023. EXALCO shows a positive trend, peaking in 2023 (15.87%) and bottoming out in 2020 (2.70%). The overall picture shows consistent improvement. COSMOS Aluminum maintains a strong profitability profile, with values above 20% for the period 2019–2022, and a slight decline to 9.75% in 2023. Overall, ELVIAL, COSMOS Aluminum, and EXALCO maintain a consistently positive picture with mild fluctuations, while ALUMIL is characterized by extremely volatile profitability, which declines rapidly after 2020.

Table 1. Performance indicators

Performance indicators	*2023*	*2022*	*2021*	*2020*	*2019*	*Mean*
ELVIAL						
NPM	7.52%	11.09%	10.43%	9.90%	6.15%	9.02%
ROE	12.51%	27.42%	23.30%	16.73%	11.51%	18.29%
ALUMIL						
NPM	0.19%	6.04%	5.62%	3.28%	-1.91%	2.64%
ROE	1.11%	48.02%	60.21%	76.34%	-162.92%	4.55%
EXALCO						
NPM	2.99%	3.69%	1.46%	0.51%	1.76%	2.08%
ROE	15.87%	26.91%	11.13%	2.70%	9.95%	13.31%
COSMOS Aluminum						
NPM	2.67%	7.72%	10.05%	5.85%	4.52%	6.16%
ROE	9.75%	37.21%	42.34%	23.66%	21.80%	26.95%

Source: Authors' calculation based on companies' balance sheets.

We continue with the category of liquidity ratios, which provide important indications of a company's ability to meet its short-term obligations. From this group, we use the general liquidity ratio and the quick ratio. The general liquidity ratio reflects the relationship between current assets and short-term liabilities, showing the extent to which a company can cover its immediate obligations with its immediately available and liquid assets. ELVIAL has consistently strong liquidity, with values above 2 in 4 out of 5 years, peaking in 2020 (2.77). In 2023, it will see a new increase (2.57), recording an overall positive trend and resilience. ALUMIL experienced serious illiquidity in 2019 (index 0.39), but from 2020 onwards it returned to levels above 1.5, peaking in 2020 (2.26). The gradual improvement is linked to the broader recovery of the company. EXALCO is more volatile, falling from a high of 1.85 in 2020 to below 1.5 in 2021–2022, but returning to 1.99 in 2023. Its profile shows liquidity within acceptable limits, with some fluctuations. COSMOS Aluminum remains below 1.3 over time, with very stable values (1.07–1.23). The company's liquidity appears adequate but marginal, which may be related to specific working capital management. The overall picture shows significant differences between the companies, as ELVIAL and COSMOS Aluminum show stability but with opposite liquidity profiles (high vs. marginal), while ALUMIL shows a marked improvement after a period of weakness.

The quick ratio is a stricter measure of short-term solvency, as it excludes inventories from current assets, focusing on the most readily liquid items (cash, receivables, securities). ELVIAL maintained a strong position throughout the period, with a ratio consistently above 1.4 and peaking in 2020 (2.02). Its performance in 2023 (1.78) reinforces the image of immediate coverage of its obligations with the most liquid assets. ALUMIL shows very low values in 2018–2019 (0.20 and 0.17, respectively), highlighting the serious illiquidity of that period. The improvement from 2020 onwards remains marginal (0.73 in 2023). EXALCO shows mild volatility, with values ranging from 0.80 to 1.33, hovering around the adequacy threshold, with a clear improvement in 2023. COSMOS Aluminum consistently performs poorly, with values always below 0.90, indicating dependence on inventories and potentially increased operational risk in periods of stress. The quick ratio reveals more clearly the actual ability to meet obligations immediately, highlighting differences in the management of receivables and cash between companies.

Table 2. Liquidity ratios

Liquidity ratios	*2023*	*2022*	*2021*	*2020*	*2019*	*Mean*
ELVIAL						
General liquidity ratio	2.57	2.12	1.85	2.77	2.17	2.30
Quick ratio	1.78	1.41	1.47	2.02	1.68	1.67
ALUMIL						
General liquidity ratio	1.59	1.86	1.88	2.26	0.39	1.60
Quick ratio	0.73	0.78	0.80	1.12	0.17	0.72
EXALCO						
General liquidity ratio	1.99	1.43	1.44	1.85	1.47	1.64
Quick ratio	1.33	0.80	0.84	1.05	0.81	0.97
COSMOS Aluminum						
General liquidity ratio	1.15	1.16	1.14	1.23	1.15	1.17
Quick ratio	0.39	0.46	0.81	0.87	0.58	0.62

Source: Authors' calculation based on companies' balance sheets.

Activity ratios examine the relationship between a company's productive resources and the speed at which they are converted into revenue. The inventory turnover ratio measures how many times a year a company's inventory is replenished through sales. Higher values indicate faster inventory turnover and more efficient management of stored products, while lower values may indicate inventory accumulation or reduced demand. ELVIAL maintains stable and relatively high inventory turnover rates for the period 2019–2022 (approximately 4.8–5.0 times per year), which indicates effective management. In 2023, there is a decline to 3.35, possibly due to increased inventories or a slowdown in sales. ALUMIL consistently reports lower values (approximately 3.0–3.2), with a slight improvement after 2021, indicating slower inventory turnover compared to its competitors. EXALCO is on an upward trend, with the index rising to 4.74 in 2021 and 4.65 in 2023, reflecting better product circulation over the last three years. COSMOS Aluminium shows the most pronounced pattern: extremely high values in 2020–2021 (8.83 and 11.40, respectively), indicating very rapid inventory turnover, with a clear decline in 2022–2023 (6.55 and 3.53). A comparison of the companies shows

that while ELVIAL and EXALCO maintain stable and healthy inventory turnover, COSMOS Aluminum shows greater fluctuations, possibly due to differences in strategy or demand.

The receivables turnover ratio shows how many times in a year a company collects all its receivables from customers. Higher values indicate faster collection and, therefore, better credit management and enhanced liquidity. COSMOS Aluminum consistently has the highest values for this ratio in the entire sample, with average annual values above 10 times. This indicates extremely fast collection of receivables and possibly limited credit facilities. ALUMIL shows satisfactory collection speed, peaking in 2022 (7.03 times) and declining slightly in 2023 (5.86), but remaining at positive levels. ELVIAL maintains a stable profile of around five times per year throughout the period, indicating consistent but moderate collection of receivables. EXALCO is at lower levels, especially in 2023 (4.29 times), which may reflect a more relaxed credit policy or collection difficulties in specific years. A comparative analysis of the index shows COSMOS Aluminum as the benchmark for collection speed, while EXALCO and, to a lesser extent, ELVIAL show relatively more moderate performance.

Table 3. Activity indicators

Activity indicators	*2023*	*2022*	*2021*	*2020*	*2019*	*Mean*
ELVIAL						
Inventory turnover ratio	3.35	5.00	4.81	3.87	4.81	4.37
Receivables turnover ratio	4.72	5.99	5.06	4.73	5.07	5.11
ALUMIL						
Inventory turnover ratio	3.15	3.23	2.99	3.10	3.17	3.13
Receivables turnover ratio	5.86	7.03	6.25	5.88	5.79	6.16
EXALCO						
Inventory turnover ratio	4.65	4.71	4.74	3.40	3.99	4.30
Receivables turnover ratio	4.29	4.81	4.61	3.50	3.66	4.17
COSMOS Aluminum						
Inventory turnover ratio	3.53	6.55	11.40	8.83	6.79	7.42
Receivables turnover ratio	10.24	11.29	10.53	11.54	12.39	11.20

Source: Authors' calculation based on companies' balance sheets.

Finally, debt ratios express the size and structure of a company's external borrowing in relation to its equity or operating figures. These ratios reflect the degree of dependence on external capital, the ability to service financial obligations, and exposure to financial risk. In this category, the D/E ratio is a key tool for assessing debt burden, as it shows whether the company is financed mainly with equity or debt capital. Values above unity may indicate increased financial risk. ALUMIL shows extreme levels of leverage in 2018–2020 (up to 379 times in 2019), reflecting serious financial pressure and capital instability during that period. The situation improves significantly after 2021 (stabilizing at around 5.3 in 2023), but the ratio remains very high compared to other companies. EXALCO also has a high ratio, ranging between 3.2 and 4.8, indicating a consistently increased dependence on borrowing, but without the extreme values of ALUMIL. COSMOS Aluminum maintains a milder profile (approximately 1.4–2.4), with a relatively stable and controlled leverage picture. ELVIAL consistently performs best in the sample, with values close to or below 1. In 2023, it recorded its lowest value in six years (0.85), reinforcing its image of strong capital adequacy. The comparison highlights ELVIAL as the most balanced company in terms of capital structure, while ALUMIL, despite improvements, continues to show a high degree of leverage.

The total leverage ratio measures the percentage of assets financed by external funds. It is a general indicator of debt dependence, as the higher it is, the smaller the contribution of equity to the financing of the company's assets. ALUMIL has maintained a consistently high ratio (94%–99%) in the period 2019–2020, with a slight decline to 84% in 2023. Despite the improvement, leverage remains the highest in the sample, indicating serious debt dependence. EXALCO also has a high ratio, ranging between 76% and 88%, with a short-term improvement in 2023 (76.16%), but without a radical change in its profile. COSMOS Aluminium is at intermediate levels (58%–70%), maintaining a more balanced D/E ratio, peaking in 2022 (70.47%) and declining in 2023 (65.56%). ELVIAL shows a stable course, maintaining an average ratio of 50.82%, which indicates strong capital adequacy and a low debt burden. The picture presented by the ratio confirms the findings of the previous D/E sub-index, with ELVIAL maintaining the most "safe" degree of leverage and ALUMIL the most "aggressive".

Table 5. Leverage ratios

Leverage ratios	*2023*	*2022*	*2021*	*2020*	*2019*	*Mean*
ELVIAL						
D/E ratio	0.85	1.09	1.30	1.18	0.84	1.05
Debt ratio	45.86%	52.21%	56.45%	54.05%	45.53%	50.82%
ALUMIL						
D/E ratio	5.30	5.25	8.76	16.12	379.52	82.99
Debt ratio	84.12%	84.01%	89.76%	94.16%	99.74%	90.36%
EXALCO						
D/E ratio	3.20	3.51	4.77	4.37	4.13	4.00
Debt ratio	76.16%	77.82%	82.67%	81.37%	79.81%	79.57%
COSMOS Aluminum						
D/E ratio	1.91	2.39	1.44	1.45	1.61	1.76
Debt ratio	65.56%	70.47%	58.98%	59.00%	61.47%	63.10%

Source: Authors' calculation based on companies' balance sheets.

Next, we will refer to the break-even point methodology, which helps us understand the relationship between fixed and variable costs and revenues and allows us to estimate the minimum turnover required to avoid losses. ELVIAL has a particularly low break-even point in relation to its sales. In 2022, the break-even point corresponded to only 34.28% of turnover, while in 2023 it increased to 47.3%, but remained within a safe limit. ALUMIL presents a completely opposite picture: in 2023, the break-even point exceeded 108% of its sales, indicating a loss-making business operation. Similar indications appear in most previous years. EXALCO maintains a stable, but relatively high percentage (66–84%) in most years, indicating a limited safety margin. COSMOS Aluminium has recorded the most impressive performance: from rates above 50% in 2019–2020, it managed to reduce them to below 30% in 2021, before returning to 75% in 2023. Break-even ratios on sales were calculated for reasons of comparability between companies and years. This ratio indicates the level of "financial security" of each company and can serve as a complementary risk indicator.

Table 6. Break-even point analysis per company

Firms	*2023*	*2022*	*2021*	*2020*	*2019*
ELVIAL	€57,369,846	€52,388,355	€44,316,717	€36,539,030	€41,107,795
ALUMIL	€260,270,016	€177,954,440	€133,083,892	€165,630,795	€160,979,650
EXALCO	€157,958,392	€147,004,420	€141,490,728	€98,341,661	€92,535,994
COSMOS Aluminum	€149,262,409	€72,924,687	€45,974,293	€52,939,457	€58,650,529

Source: Authors' calculation based on companies' balance sheets.

We will conclude with the Z-score, which is a tool for assessing the likelihood of financial instability or insolvency, based on selected ratios that reflect the efficiency, leverage, profitability, and liquidity of companies. This chapter evaluates the Z-score performance for the five-year period 2019–2023 and for the four companies in the sample, in order to draw conclusions about their stability and development. ELVIAL shows the most positive development, as from values within the monitoring zone in the period 2019–2022, in 2023 it records Z = 3.03, exceeding the critical threshold and entering the safety zone. Its performance over time is steadily improving. ALUMIL remains below the 1.81 threshold throughout the five-year period, with extremely low values (even a negative Z-score in 2019), indicating increased financial risk and instability. EXALCO is moving within the risk zone, with values below 1, and only once approaching the gray zone (in 2022: 0.97). Its profile shows some progress, but not enough to exit the critical area. COSMOS Aluminum is closer to the surveillance zone, with a peak value in 2021 (Z = 1.50) and a moderate decline in 2023 (Z = 0.74). However, it remains in a marginal risk profile. The Z-score analysis highlights ELVIAL as the only company in the sample that managed to enter the safety zone, reinforcing the picture of financial health that is also formed by the other indicators. The other companies, with varying degrees of risk, remain within the area of increased surveillance. This may happen due to possible leverage obligations that the other three firms may have, and they do not perform the expected results. The same does not happen with ELVIAL, as referred to above.

Table 7. Z-score per company

Companies	*2023*	*2022*	*2021*	*2020*	*2019*
ELVIAL	3.03	2.01	1.76	1.87	2.07
ALUMIL	0.29	0.59	0.42	0.16	-1.01
EXALCO	0.79	0.97	0.70	0.50	0.39
COSMOS Aluminum	0.74	1.07	1.50	1.27	1.10

Source: Authors' calculation based on companies' balance sheets.

5. DISCUSSION

The analysis of the financial indicators and strategic choices of ELVIAL, ALUMIL, EXALCO, and COSMOS Aluminium leads to important results about the broader aluminum industry in Greece, to which they belong. The sector is characterized by high competition, intense extroversion, and significant investments in technology and innovation.

Companies in the sector are particularly export-oriented, as a large part of their turnover comes from foreign markets. This strengthens their resilience in times of domestic recession, but at the same time makes them vulnerable to external factors, such as fluctuations in aluminum prices on the London Metal Exchange (LME) and global energy costs. Nevertheless, the key representatives of the sector have shown remarkable resilience to crises such as the pandemic or the inflationary crisis of the last two years.

The industry is highly capital-intensive and requires continuous investment in equipment, automation, research, and new product development. Companies such as COSMOS Aluminium and ELVIAL have invested in modern technology and vertical integration of production, gaining significant competitive advantages. Similarly, EXALCO and ALUMIL have expanded their presence in international markets, focusing on innovation and product certification. Energy costs are a significant risk factor for the sector, given the energy-intensive nature of production. The transition to more sustainable and environmentally friendly operations (through environmental, social, and governance (ESG) practices, aluminum recycling, and energy efficiency) is expected to be a catalyst for attracting investment capital and strengthening competitiveness over time.

Liquidity and capital structure vary among the companies in the sample. While some companies maintain adequate liquidity and controlled leverage, others rely on external financing to support their investment activity. This necessitates prudent financial management to ensure long-term sustainability and stability.

Overall, the aluminum sector in Greece shows strong momentum and growth prospects, provided that companies continue to invest in innovation, sustainability, and international presence. Despite the challenges associated with the external environment and cyclical demand, Greek aluminum industries have the foundations to further strengthen their position in both the domestic and international markets.

6. CONCLUSION

The aluminum industry has all the prerequisites for formulating a coherent growth strategy, based on financial stability, technological infrastructure, and long-term organizational consistency. The fact that it has successfully managed successive crises such as the pandemic, the energy crisis, and the increase in raw material costs is evidence of its operational resilience. The relevant liquidity, leverage, and Z-score indicators, combined with the strategic stance you are pursuing, confirm its ability to adapt with measured risk. In the context of future challenges, the sector is called upon to address external risks such as disruptions in the global supply chain, fluctuations in energy costs and geopolitical uncertainty, regulatory developments, particularly in ESG and environmental certification issues that affect access to new markets and financing, as well as potential increased competition from both large multinational groups and agile smaller players with local expertise.

Similarly, the sector has the potential to strengthen its position by leveraging its positive capital ratios to achieve selective investments in new products and energy autonomy, to connect with European support tools and ESG certifications that will strengthen its long-term sustainability, as well as systematically strengthen its organizational resilience through vertical production, cost predictability, and strengthening of corporate identity.

In general, it should be accepted that the aluminum industry in Greece has the internal resources to operate consistently even in an unstable environment. The fact that they have studied only four firms of this sector for a five-year period may constitute a limitation of this research. However, the fact that these firms maintain 75% of this sector in terms of sales turnover and economic value should lead to safe results. In addition, a further study for a longer time period, as well as the maintenance of flexibility of this sector without compromising stability and the most effective ways of succeeding in it, should be the next research work for the authors of this paper.

REFERENCES

Abdullayev, K. (2022). Factors influencing the ranking of maritime transport in the Global Competitiveness Report: The developing country case. *Corporate & Business Strategy Review, 3*(2), 43–54. https://doi.org/10.22495/cbsrv3i2art4

Al-Shboul, M. A., Al-Etan, S. M., Albahsh, R., & Al-Dalahmeh, M. (2022). Enhancing firm's performance: The effect of human resources in supply chains and job rotation practice. *Journal of Governance & Regulation, 11*(2), 159–172. https://doi.org/10.22495/jgrv11i2art14

Altman, E. I. (1968). The prediction of corporate bankruptcy: A discriminant analysis. *The Journal of Finance, 23*(1), 193–194. https://doi.org/10.2307/2325319

Audu, Y. P., & Ihuoma, A. N. (2024). Product differentiation and the performance of aluminum firms in North-Central Nigeria. *International Journal of Public Administration and Management Research, 10*(1), 1–14. https://journals.rcmss.com/index.php/ijpamr/article/view/949

Bargoni, A., Bertoldi, B., Giachino, C., & Santoro, G. (2022). Competitive strategies in the agri-food industry in Italy during the COVID-19 pandemic: An application of K-means cluster analysis. *British Food Journal, 124*(12), 4782–4799. https://doi.org/10.1108/BFJ-07-2021-0738

Cetindamar, D., & Klitcioglou, H. (2013). Measuring the competitiveness of firm as an award system. *Competitiveness Review, 23*(1), 7–22. https://doi.org/10.1108/10595421311296597

Chikán, A. (2008). National and firm competitiveness: A general research model. *Competitiveness Review, 18*(1–2), 20–28. https://doi.org/10.1108/10595420810874583

Chikán, A., Czakó, E., Kiss-Dobronyi, B., & Losonci, D. (2022). Firm competitiveness: A general model and a manufacturing application. *International Journal of Production Economics, 243*, Article 108316. https://doi.org/10.1016/j.ijpe.2021.108316

Costello, M. R. (2025). From numbers to insights: Applying financial ratios in competitive intelligence research. *Journal of Business and Finance Librarianship, 30*(3), 176–198. https://doi.org/10.1080/08963568.2025.2488695

Das, S., & Canel, C. (2023). Linking manufacturing and competitive strategies for successful firm performance: A review and reconceptualization. *Journal of Strategy and Management, 16*(1), 148–172. https://doi.org/10.1108/JSMA-02-2022-0043

Fischer, C., & Schornberg, S. (2007). Assessing the competitiveness situation of EU food and drink manufacturing industries: An index-based approach. *Agribusiness, 23*(4), 473–495. https://doi.org/10.1002/agr.20139

Foundation for Economic & Industrial Research (IOBE). (2024). *Táseis kai prooptikés tou kládou kataskevís thermikón iliakón systimáton stin Elláda* [Trends and prospects of the solar thermal systems manufacturing industry in Greece]. https://iobe.gr/docs/research/RES_05_C_24012025_REP.pdf

Galanis, S., Pazarskis, M., Konstantinidis, C., & Kourtesi, S. (2023). The role of internal auditors as a tool to boost competitiveness of Greek firms. *Problems and Perspectives in Management, 21*(4), 278–287. https://doi.org/10.21511/ppm.21(4).2023.22

Gikas, C. D. (2002). *I analysi kai oi chriseis ton logistikon katastaseon* [The analysis and uses of accounting statements]. Benou Editions.

Hilal, F., & Hilal, S. (2019). Marketing competitive strategies: A case study of National Aluminum Factory in Bahrain. *International Journal of Teaching and Case Studies, 10*(4), 307–318. https://doi.org/10.1504/IJTCS.2019.103772

Institute for Commercial and Administration Programmes (ICAP). (2024). *Koufomata alouminiou 2024* [Aluminum frames 2024]. ICAP CRIF.

Kafestidis, S., Chasiotou, A., Konstantinidis, C., & Lazos, G. (2024). International business expansion and merger investment risk strategies by promoting innovation and circular economy: A case study analysis. *Risk Governance and Control: Financial Markets & Institutions, 14*(4), 89–95. https://doi.org/10.22495/rgcv14i4p9

Kantzos, K. (2013). *Analysi chrimatooikonomikon katastaseon* [Analysis of financial statements]. Publications FEDIMOS.

Kontakos, A., & Papaspyrou, A. (1993). *Análysi oikonomikón katastáseon* [Analysis of financial statements]. Hellin.

Kourniani, N. T. (2021). The effect of liquidity ratio, activity ratio and profitability ratio on accounting profit with firm size as mediation. *Journal of Economics and Business Letter, 1*(3), 18–26. https://doi.org/10.55942/jebl.v1i3.122

Kourtesi, S., Chasiotou, A., Konstantinidis, C., & Kafestidis, S. (2024). International mergers as a business expansion strategy by Greek companies: A case study of corporate performance analysis for board of directors. *Corporate Board: Role, Duties and Composition, 20*(2), 102–110. https://doi.org/10.22495/cbv20i2art10

Liu, K., He, L., He, Y., & Xu, Q. (2025). Competitive strategies of online retailers: Should they introduce livestream channels? *International Transactions in Operational Research*. Advance online publication. https://doi.org/10.1111/itor.70047

Niarchos, N. (2004). *Chrimatooikonomiki analysi logistikon katastaseon* [Financial analysis of accounting statements]. Stamoulis SA.

Notta, O., Vlachvei, A., & Samathrakis, V. (2010). Competitiveness — The case of Greek food manufacturing firms. *International Journal of Art and Science, 3*(7), 211–225. https://www.researchgate.net/publication/285775217

Olubiyi, T. O. (2023). Leveraging competitive strategies on business outcomes post-COVID-19 pandemic: Empirical investigation from Africa. *Journal of Management and Business: Research and Practice, 15*(2). https://doi.org/10.54933/jmbrp-2023-15-2-3

Pangeios, I. (1994). *Theoria kostous teuchos II: Amesi kostologisi. Kostologisi syneisforas, symparagoga proionta, protypi kostologisi, nekro simeio* [Cost theory: Costing for business decision making, direct costing, contribution costing, co-products, standard costing, break-even point]. Stamoulis.

Pazarskis, M., Kourtesi, S., Chasiotou, A., & Konstantinidis, C. (2023). The impact of corporate mergers on Greek firms: Strategic issues and accounting effects. *Review of Economics and Finance, 21*, 1904–1910. https://refpress.org/ref-vol21-a205/

Princewill, B., & Redwell, E. E. (2020). Competitive dynamics and corporate profitability: An empirical analysis of aluminum manufacturing firms in Delta State Nigeria. *International Journal of Advanced Academic Research, 6*(8), 17–31. https://doi.org/10.46654/ij.24889849.s6810

Saleh, B. A. (2023). The effect of financial ratios, firm size and cash flows from operating activities on earnings per share. *International Journal of Professional Business Review, 8*(6), Article e03317. https://doi.org/10.26668/businessreview/2023.v8i6.3317

Soumpeniotis, D. N., & Tabakoudis, J. A. (2018). *Sýnchroni chrimatooikonomikí análysi & ependýseis* [Modern financial analysis & investments]. Namata Publications.

Thakkar, U. (2024). A comparison for financial performance of selected aluminum companies in India. *GLS KALP: Journal of Multidisciplinary Studies, 3*(4), 20–30. https://doi.org/10.69974/glskalp.03.04.18

Wijnands, J., van Berkum, S., & Verhoog, D. (2015). *Measuring competitiveness of agro-food industries: The Swiss case* (OECD Food, Agriculture and Fisheries Papers No. 88). OECD Publishing. https://doi.org/10.1787/5jrvvkrhtmwg-en

Zairbani, A., & Senthil Kumar, J. P. (2025). How can SMEs can enhance their competitive strategies? A mediation analysis. *Competitiveness Review*. Advance online publication. https://doi.org/10.1108/CR-03-2025-0086