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Financial Analysis of the Production Industry of Personal Care – Cosmetics in Greece: Development and Prospects

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Abstract

This study conducts a financial analysis of the Greek personal care and cosmetics production industry, with particular emphasis on its prospects and inherent risks. The analysis draws on the published financial statements of four leading firms, which collectively account for nearly half of the sector's sales. Methodological tools include common-size and trend statements, as well as a wide range of financial ratios, enabling the assessment of capital returns, liquidity, profitability, activity, and leverage at both the firm and industry level. Additionally, Altman's Z-score model was applied to estimate the probability of financial distress.

The findings reveal notable disparities among the four companies with respect to performance and financial structure. At the sectoral level, results indicate satisfactory liquidity and relatively low debt exposure. Nevertheless, net profits between 2017 and 2021 were characterized by considerable volatility, although the last two years demonstrate signs of stabilization in profit margins and overall performance. Evidence suggests that firms capitalized on opportunities arising from the pandemic, reducing their reliance on external financing, strengthening credit policies, and achieving improvements in operating margins. Regarding financial distress, the Z-score consistently remained within the gray zone across the examined period. Overall, the upward movement of the Z-score in 2019–2021 indicates an improving resilience profile, while persistent inter-firm heterogeneity underscores the importance of working-capital discipline and financing structure in sectoral sustainability.

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1 Introduction

The global personal care and cosmetics industry constitutes one of the most resilient segments of consumer markets, having demonstrated sustained growth even in the aftermath of major economic downturns such as the 2008 financial crisis. Although the COVID-19 pandemic initially disrupted global sales—reductions in certain product categories reached as high as 35%—the sector has since exhibited strong signs of recovery, fueled by technological innovation, product diversification, and evolving consumer preferences toward natural and sustainable ingredients (Howarth, 2022; Cosmetics Europe, 2022). In Europe, annual research and development expenditure in the industry is estimated at €2.35 billion, highlighting its innovative capacity and long-term growth prospects.

The Greek personal care–cosmetics industry reflects these global dynamics but also faces unique national challenges. After years of contraction between 2007 and 2013, the sector returned to positive growth during the subsequent five-year period, reaching a production value of €269 million in 2018. Nevertheless, the domestic market continues to grapple with inflationary pressures, fluctuating disposable incomes, and an intense competitive environment driven by imports. At the same time, exports have expanded significantly, with a 20% increase recorded in 2021 compared to the previous year (ICAP, 2018; Lempesi, 2022). This duality—export-driven dynamism alongside domestic constraints—renders the sector both strategically significant and analytically complex.

The primary objective of this research is to conduct a financial analysis of the Greek personal care–cosmetics production industry during the period 2017–2021, with a particular emphasis on evaluating the sector's performance, prospects, and associated risks. By focusing on the published financial statements of four leading firms, which collectively account for approximately half of total domestic production, the study aims to produce a comprehensive and representative account of the sector's financial condition.

Through the application of ratio analysis, common-size and trend statements, and Altman's Z-score model, the research seeks to provide a nuanced understanding of the industry's liquidity, profitability, capital returns, operational efficiency, and financial resilience. Beyond firm-level insights, the analysis aspires to generate sector-level conclusions that can inform both managerial decision-making and policy considerations.

Although the Greek personal care–cosmetics industry has been the subject of market reports and trade analyses (e.g., ICAP, 2018), systematic academic studies focusing on its financial performance remain scarce. The majority of existing literature emphasizes consumer behavior, marketing strategies, or global industry trends, while few studies provide a rigorous financial evaluation of the Greek production sector. Furthermore, limited attention has been devoted to the sector's resilience during crisis periods, despite its growing importance as a contributor to national exports and employment.

The selection of the personal care–cosmetics production industry is not arbitrary. The sector represents a dynamically expanding segment of Greek manufacturing, characterized by export orientation, brand differentiation, and relatively high value-added production. Despite its growing contribution to domestic output and external trade, the sector remains under-examined in empirical financial research.

Moreover, the industry presents an analytically compelling case for resilience assessment, as it combines consumer-driven demand, supply-chain exposure, and working-capital intensity. These characteristics render it particularly suitable for evaluating profitability dynamics, liquidity management, and financial sustainability during systemic shocks such as COVID-19.

This research addresses these gaps by offering a structured financial analysis over a five-year period, thus capturing both pre-pandemic conditions and the sector's adaptive responses to the COVID-19 shock. The inclusion of a bankruptcy prediction model further strengthens the study's contribution, providing evidence-based insights into the sustainability of the industry.

The implementation of the research proceeded in three stages. First, a theoretical mapping of the industry was conducted, examining demand characteristics, supply structures, regulatory frameworks, and competitive forces in order to contextualize the financial analysis. Second, a firm-level financial evaluation was performed on the selected sample of companies, using ratio analysis, common-size statements, and trend analysis to capture both historical and comparative performance. Third, aggregated industry averages and Z-score computations were used to assess sector-level financial health and predict the likelihood of financial distress.

This paper contributes to the stream of sector-focused financial performance studies by offering a structured, multi-dimensional assessment of an under-researched manufacturing segment in Greece. The 2017–2021 window is intentionally selected to capture (i) a pre-pandemic baseline (2017–2019), (ii) the COVID-19 shock (2020), and (iii) the early recovery

phase (2021), enabling a resilience-oriented interpretation of profitability, liquidity, working-capital dynamics, and solvency.

Unlike market reports that primarily describe trends, the study integrates common-size and trend analysis with a coherent ratio framework and a distress-proxy (Altman's modified Z-score) to map both inter-firm heterogeneity and sector-level signals of financial sustainability. The focus on four leading Greek-owned producers is justified by industry concentration and data availability: these firms collectively represent approximately half of domestic production, while standalone accounts for multinational subsidiaries are typically unavailable.

Unlike prior Greek sectoral financial studies, which primarily provide descriptive market overviews, the present study integrates longitudinal financial diagnostics with resilience-oriented interpretation, thereby extending existing industry reporting toward structured empirical evaluation.

Accordingly, the study provides evidence relevant to managers and stakeholders regarding financing structure, liquidity buffers, and working-capital discipline under shocks, and offers a replicable template for resilience diagnostics in similarly concentrated manufacturing industries.

2 Literature review

2.1 Profitability, Liquidity, and Leverage in Financial Performance

The assessment of firm performance has long been anchored in the analysis of profitability, liquidity, and leverage ratios. Ratio analysis remains one of the most widely used tools in both academic research and professional practice, as it enables systematic evaluation of the financial condition of firms across time and in comparative contexts (Gibson, 2009). Key indicators such as Return on Assets (ROA) and Return on Equity (ROE) provide insight into the efficiency of capital utilization and shareholder returns, while profitability margins capture the ability of firms to translate revenues into earnings (Fabozzi & Peterson, 2003).

Empirical studies consistently demonstrate that liquidity and leverage are central determinants of corporate sustainability. For instance, Mohammad Adam (2014) and Borhan et al. (2014) highlight that improvements in liquidity, asset quality, and profitability ratios significantly enhance overall firm performance. Similarly, Proença et al. (2014) and Delen et al. (2013) show that ROE and net profit margins are particularly reliable predictors of

performance. Conversely, excessive reliance on ROE alone has been criticized for obscuring underlying risks, as it focuses exclusively on shareholder capital and may incentivize risk-taking behavior (Gadoiu, 2014).

The Greek context adds particular relevance to liquidity and leverage. During periods of macroeconomic instability, such as the financial crisis or the pandemic, the ability to manage debt exposure and maintain sufficient short-term liquidity has been a crucial determinant of resilience. The current study builds upon this literature by applying these ratios to the personal care–cosmetics sector, which has received limited academic attention despite its significant economic contribution.

2.2 Crisis Adaptation and Operational Efficiency

Crisis periods have historically served as turning points in industry dynamics. Research suggests that firms in consumer-oriented sectors often adapt through a combination of operational restructuring, innovation, and financial discipline (Mbona & Yusheng, 2019). Ratio-based analysis has been shown to reveal such adaptive behaviors, as shifts in liquidity, profitability, and efficiency ratios often signal responses to external shocks (Gibson, 2009).

International studies provide useful parallels. For example, in the Chinese telecommunications sector, Mbona and Yusheng (2019) demonstrated that a carefully selected set of ratios can accurately capture sectoral adjustments and performance improvements, even during volatile periods. Similarly, Sekaran and Bougie (2016) argue that descriptive and interpretive research approaches, when applied in a longitudinal framework, are effective in tracing the evolution of industries under crisis conditions.

In Greece, the pandemic accelerated structural changes in many industries, including cosmetics. Firms shifted toward reduced reliance on external capital, tighter credit management, and improved cost efficiency. However, scholarly research specifically addressing the financial adaptation of the Greek personal care–cosmetics sector is absent. The present study therefore contributes by documenting how firms in this industry adapted to pandemic-related disruptions, complementing broader international evidence on crisis resilience.

2.3 Bankruptcy Prediction and Financial Distress Models

The prediction of financial distress has been a longstanding theme in financial research, with Altman's Z-score model (1968; revised 2000) being one of the most widely applied frameworks. The model's enduring relevance lies in its ability to combine multiple financial ratios into a composite index with strong predictive accuracy. The modified version of the Z-score is particularly suited to environments where both listed and non-listed firms coexist, as is the case in the Greek personal care–cosmetics industry (Altman, 2000).

Yet, debates persist regarding the model's reliability across different contexts. Beaver et al. (2012) argue that the predictive power of accounting-based models has weakened over time, partly due to the growing significance of intangible assets and evolving reporting practices. By contrast, more recent studies (Zaabi, 2011; Tian & Yu, 2017; Giannopoulos & Sigbjørnsen, 2019) affirm the robustness of bankruptcy prediction models, particularly when applied in national contexts. For example, Giannopoulos and Sigbjørnsen (2019) show that such models maintain high accuracy in the Greek market, especially within one year prior to bankruptcy.

The present study extends this body of research by applying the modified Z-score to the Greek personal care–cosmetics industry, a sector not previously tested in this way. Findings of consistently "gray zone" results, combined with an upward trend in recent years, provide a nuanced contribution to the literature: while the industry exhibits elements of financial vulnerability, its trajectory suggests strengthening sustainability.

Taken together, prior literature confirms the value of ratio analysis in evaluating financial performance, underscores the role of liquidity and leverage in crisis resilience, and highlights the predictive power of bankruptcy models. However, few studies apply these tools to the Greek cosmetics sector, leaving a gap that this research addresses. By framing its analysis around profitability and leverage, crisis adaptation and bankruptcy prediction, the study situates itself at the intersection of established theoretical frameworks and an underexplored empirical domain.

2.4 Corporate resilience and working-capital management under external shocks

Recent post-2020 research has emphasized the importance of liquidity buffers, working-capital discipline, and capital structure adjustments during systemic shocks such as COVID-19 (Ding et al., 2021; Fahlenbrach et al., 2021). Evidence suggests that firms with stronger internal financing capacity and shorter cash conversion cycles exhibited greater resilience and faster recovery trajectories. Manufacturing firms, in particular, demonstrated heterogeneous adaptation patterns depending on export exposure, inventory intensity, and credit management policies (Baños-Caballero et al., 2014; Enqvist et al., 2011).

These findings underline that crisis resilience is not solely a function of profitability, but also of financing structure, liquidity management, and operational efficiency. However, sector-specific evidence for concentrated manufacturing industries in small economies remains limited.

Despite the extensive literature on financial ratios and distress prediction models, there is limited empirical evidence examining the integrated financial performance and resilience

of the Greek personal care-cosmetics production sector. Existing market reports describe industry trends but do not provide structured longitudinal financial diagnostics. Moreover, no prior study has applied a unified ratio framework combined with a distress proxy to evaluate sector-level sustainability during the COVID-19 period. This study seeks to address this gap.

To address the aim of evaluating the financial performance and resilience of the Greek personal care–cosmetics industry, the study is guided by the following research questions:

RQ1: *What is the financial performance of the Greek personal care–cosmetics industry in terms of return on capital, liquidity, profitability, activity, and leverage during the period 2017–2021?*

RQ2: *How have the selected firms adapted financially during the COVID-19 pandemic, and what patterns of stability or volatility emerge in their profitability and operations?*

RQ3: *What does the application of Altman's Z-score reveal about the probability of financial distress in the sector, and how does this align with international evidence on corporate bankruptcy prediction?*

Based on the literature on profitability dynamics, liquidity management, and crisis adaptation, the following hypotheses are formulated:

H1*: Sector-level profitability exhibits stabilization or improvement during the post-shock period (2020–2021) compared to the pre-pandemic period (2017–2019).*

H2*: Liquidity indicators remain stable or improve during the COVID-19 period, reflecting precautionary financial management.*

H3*: Firms reduce reliance on external financing during the shock and recovery phase.*

H4*: Altman's Z-score demonstrates an upward trend during 2019–2021, indicating improving financial resilience.*

These hypotheses are examined through longitudinal ratio comparison and sector-level synthesis rather than regression-based inference, consistent with the sector-core analytical design.

3 Methodological framework

3.1 Research Design and Scope

The present study adopts a multifaceted research design, combining both descriptive and interpretive approaches in order to provide a comprehensive examination of the Greek personal care–cosmetics production industry. The descriptive dimension of the research is

rooted in the systematic collection and presentation of quantitative financial data, which facilitates an accurate depiction of firm-level and sector-level conditions. Descriptive research is particularly suitable for mapping sectoral characteristics and financial structures, as it enables the identification of observable trends without premature causal assumptions (Chalikias et al., 2015; Sekaran & Bougie, 2016).

In parallel, an interpretive dimension is incorporated, allowing the analysis to move beyond mere observation toward an exploration of underlying factors and drivers. This dual approach is supported by inductive reasoning: specific empirical observations are used to derive more general insights about the performance and resilience of the industry. The combination of descriptive accuracy and interpretive depth provides a robust foundation for evaluating both the current state and future prospects of the sector.

The temporal scope of the study spans 2017–2021, a period that encapsulates both the pre-pandemic market environment and the unprecedented challenges posed by COVID-19. This time frame enables a meaningful assessment of the sector's adaptability to crisis conditions, as well as its trajectory toward stabilization and recovery.

3.2 Data Sources and Sampling Rationale

The empirical basis of the study consists of published financial statements drawn from four prominent Greek companies operating in the personal care-cosmetics sector: Gr. Sarantis SA, Papoutsanis SA, Frezyderm SA, and Hellenica SA. Together, these firms account for approximately 50% of the sector's domestic production value, thereby providing a sufficiently representative sample for industry-level inference. The selection of four firms reflects the structural concentration of the Greek personal care-cosmetics production industry. The domestic manufacturing segment is dominated by a limited number of large Greek-owned producers, while multinational subsidiaries operating in Greece typically do not publish standalone financial statements specific to their local manufacturing activity.

Collectively, the selected firms account for a substantial share of domestic production capacity, allowing for meaningful sectoral diagnostics despite the limited number of observations. Therefore, the study follows a sector-core analytical approach rather than a population-wide sampling design. Given the concentrated industry structure and the objective of resilience mapping rather than statistical generalization, the sample size is consistent with the diagnostic scope of the research.

The reliance on audited and publicly available financial statements ensures both the reliability and transparency of the data. However, it must be noted that multinational-owned subsidiaries, which constitute a significant portion of the domestic market, were

excluded due to the unavailability of standalone financial accounts. This limitation, while acknowledged, does not diminish the representativeness of the chosen sample, as the four selected firms constitute the largest Greek-owned producers in the sector.

The sample selection was guided by two criteria: production significance and data availability. The four firms included in the study represent the largest Greek-owned producers, ensuring that findings are representative of the domestic industry's core segment. Collectively, they capture nearly half of total production value, which is considered a sufficient threshold for extrapolating sectoral insights.

Equally important, the availability of complete financial statements facilitated rigorous longitudinal analysis. Other significant market participants, particularly subsidiaries of multinational groups, were excluded due to the absence of published standalone accounts. While this exclusion is a limitation, the representativeness of the selected sample mitigates potential bias and ensures the robustness of the findings.

3.3 Analytical Tools, Process and Techniques

The methodological framework employs a combination of well-established tools in financial statement analysis, chosen to capture different dimensions of financial performance:

Ratio Analysis, serve as the core analytical tool, providing insights into five critical aspects of firm performance: return on investment, liquidity, profitability, activity, and financial leverage (Fabozzi & Peterson, 2003; Gibson, 2009). These indicators enable a comparative assessment both across time and across firms.

Common-Size Statements, vertical analysis is used to standardize financial statements by expressing each item as a percentage of a reference total (e.g., sales or assets). This method facilitates comparability between firms of different sizes and highlights structural changes over time (Robinson et al., 2015).

Trend Analysis (CAGR), the Compound Annual Growth Rate is calculated to evaluate long-term growth patterns in key financial statement items. This method captures directional shifts and allows the identification of sustained improvements or deteriorations (Biehler, 2008).

Bankruptcy Prediction Model, Altman's modified Z-score model is applied to assess the probability of financial distress (Altman, 2000). This model is particularly suitable given the presence of both listed and non-listed firms in the sample, offering predictive accuracy in similar contexts.

The integration of these tools allows for a balanced evaluation of both financial stability

and risk exposure, aligning with established best practices in corporate financial analysis (Barnes, 1987; Mbona & Yusheng, 2019).

The analytical process unfolded in three stages:

Firm-Level Analysis, each company was analyzed individually to identify unique performance characteristics, historical trajectories, and structural financial features. This stage provided the foundation for understanding intra-industry diversity.

Industry-Level Synthesis, firm-level results were aggregated to produce industry averages for key ratios and Z-scores. This allowed for the assessment of sector-wide trends and performance benchmarks.

Interpretive Evaluation, the results were interpreted in light of external factors, including the impact of the COVID-19 pandemic, shifts in consumer demand, and sectoral reforms such as mergers and acquisitions. This stage ensured that the quantitative findings were contextualized within broader economic and market dynamics.

Given the limited number of observations, formal non-parametric inferential testing (e.g., Mann–Whitney tests) would lack sufficient statistical power and could generate misleading significance interpretations. Therefore, the study emphasizes structured longitudinal comparison and ratio synthesis consistent with its diagnostic scope.

The study is based exclusively on publicly available financial data, thereby eliminating concerns related to confidentiality or proprietary information. All data were processed in a manner consistent with academic standards for transparency and replicability. Adjustments for extraordinary financial events (e.g., extraordinary dividends or impairment losses) were carefully documented to preserve analytical validity while ensuring representativeness at the sectoral level.

The combined interpretation of ROA and ROE allows assessment of operational return efficiency relative to capital structure and leverage effects, providing a more comprehensive profitability evaluation. In addition to the standard profitability, liquidity, leverage, and activity ratios, the analysis incorporates a working-capital perspective through the cash conversion cycle (CCC), calculated as Days of Inventory plus Days of Sales Outstanding minus Days of Payables. This metric allows for an integrated assessment of operational liquidity and financing efficiency.

For interpretive robustness, the analysis compares ratios across two sub-periods: the pre-pandemic phase (2017–2019) and the COVID-19 shock and recovery phase (2020–2021). This sub-period comparison allows for structured evaluation of resilience patterns without relying on regression-based inference.

4 Results

4.1 Return on Capital and Profitability

The analysis revealed marked discrepancies among the four firms regarding capital returns. Sarantis SA, the largest firm in the sample, maintained moderate returns with ROA fluctuating between 1.8% and 3%, while its ROE averaged 12.5% in 2021 after a peak of nearly 40% in 2019 (driven by extraordinary dividend income). In contrast, Papoutsanis SA displayed remarkable growth, with ROA rising from 3.1% in 2017 to 10.6% in 2021, and ROE expanding from 2.3% to 19.5% during the same period, reflecting significant operational improvements.

Table 1: ROA for personal care – cosmetics industry 2017-2021

							Average	
	2017	**2018**	**2019**	**2020**	**2021**	**CAGR**	**2017-2019**	**2020-2021**
Sarantis	3,0%	2,3%	1,8%	2,5%	2,0%	-7,5%	2,4%	2,3%
Papoutsanis	3,1%	4,3%	6,4%	11,5%	10,6%	27,9%	4,6%	11,0%
Frezyderm	25,5%	19,7%	10,4%	15,0%	11,1%	-15,4%	18,5%	13,1%
Hellenica	6,1%	6,6%	6,1%	-2,4%	1,8%	-21,6%	6,3%	-0,3%
Personal care - cosmetics industry	**5,2%**	**4,6%**	**3,2%**	**4,1%**	**4,1%**	**-4,9%**	**4,3%**	**4,1%**

Frezyderm SA presented a more restrained trajectory, with revenues increasing gradually but profitability remaining modest, while Hellenica SA exhibited instability in both sales and net margins. At the sectoral level, net profits were highly volatile, though the final two years of the period demonstrated clear signs of stabilization in operating and net margins.

Table 2: ROE for personal care – cosmetics industry 2017-2021

							Average	
	2017	**2018**	**2019**	**2020**	**2021**	**CAGR**	**2017-2019**	**2020-2021**
Sarantis	15,7%	3,3%	39,9%	9,0%	12,5%	-4,6%	19,7%	10,7%
Papoutsanis	2,3%	6,0%	7,3%	17,7%	19,5%	52,7%	5,2%	18,6%
Frezyderm	62,4%	44,6%	1,7%	31,8%	29,7%	-13,8%	36,3%	30,7%
Hellenica	4,8%	10,9%	6,8%	-8,7%	5,0%	0,7%	7,5%	-1,9%
Personal care - cosmetics industry	**15,2%**	**6,1%**	**34,0%**	**9,6%**	**13,4%**	**-2,5%**	**18,5%**	**11,5%**

This pattern aligns with international evidence that emphasizes the importance of profitability ratios such as ROE and net profit margin in predicting firm performance (Delen

et al., 2013; Proença et al., 2014).

A structured comparison between the pre-pandemic period (2017–2019) and the shock/recovery phase (2020–2021) indicates partial stabilization of sector-level profitability. Although 2019 reflects exceptional volatility due to firm-specific events, average ROA and ROE figures in 2020–2021 demonstrate reduced dispersion and improved margin consistency. This pattern provides partial support for H1, suggesting that profitability resilience emerged unevenly across firms rather than uniformly at the sectoral level. The findings reinforce the argument that crisis adaptation is firm-specific and closely linked to operational structure and export orientation.

4.2 Liquidity and Leverage

Liquidity across the industry remained at satisfactory levels. Sarantis, for example, consistently recorded current ratios above 2.0, indicating strong capacity to cover short-term obligations. Papoutsanis, however, approached borderline levels with a current ratio of 1.16 in 2021, suggesting tighter working capital management.

Table 3: Current ratio for personal care – cosmetics industry 2017-2021

							Average	
	2017	**2018**	**2019**	**2020**	**2021**	**CAGR**	**2017-2019**	**2020-2021**
Sarantis	2,51	2,71	2,18	2,59	2,34	-1,42%	2,47	2,46
Papoutsanis	1,66	1,30	1,29	1,31	1,16	-6,84%	1,42	1,24
Frezyderm	1,19	1,26	1,31	1,37	1,34	2,40%	1,25	1,35
Hellenica	1,65	1,73	1,70	2,46	2,31	6,90%	1,70	2,38
Personal care - cosmetics industry	**2,02**	**2,07**	**1,90**	**2,14**	**1,89**	**-1,33%**	**1,99**	**2,01**

Leverage analysis showed that most firms reduced dependence on debt, particularly Sarantis, which in 2021 financed 71.5% of assets through equity (table 4, see appendix). Papoutsanis, conversely, increased its reliance on borrowed funds, with its debt-to-equity ratio rising to 66%. Sector-wide, financial leverage decreased modestly, pointing to a cautious approach to debt financing.

Table 8: Debt to Equity ratio for personal care – cosmetics industry 2017-2021

							Average	
	2017	**2018**	**2019**	**2020**	**2021**	**CAGR**	**2017-2019**	**2020-2021**
Sarantis	21,5%	32,6%	30,5%	27,5%	19,9%	-1,50%	28,2%	23,7%

Papoutsanis	50,6%	52,1%	42,3%	56,5%	66,0%	5,47%	48,3%	61,3%
Frezyderm	37,8%	34,9%	57,0%	35,3%	49,8%	5,67%	43,2%	42,6%
Hellenica	84,8%	72,1%	71,4%	79,3%	76,2%	-2,10%	76,1%	77,8%
Personal care – cosmetics industry	**30,1%**	**38,2%**	**34,8%**	**33,2%**	**28,4%**	**-1,13%**	**34,3%**	**30,8%**

These findings resonate with prior literature that stresses the role of liquidity and leverage in sustaining resilience during crisis conditions (Gibson, 2009).

Comparing the two sub-periods further reveals that liquidity levels were largely preserved during the pandemic years, with no systemic deterioration at the sector level. In several cases, firms strengthened internal financing capacity while moderating short-term risk exposure. This evidence supports H2, indicating precautionary liquidity management during systemic uncertainty. Regarding leverage, although firm-level divergence remains evident, the modest decline in sector-wide debt dependence provides partial support for H3, suggesting a cautious financing approach during the shock and early recovery phase.

4.3 Operational Efficiency and Activity Ratios

Activity ratios highlighted further inter-firm differences. Sarantis exhibited relatively long inventory holding periods, averaging 155 days in 2021, while Papoutsanis managed to shorten its days of sales outstanding (DSO) to 40 days, compared to 87 days in 2017 (table 10, see appendix), reflecting effective credit management.

Table 9: Days of inventories in hand for personal care – cosmetics industry 2017-2021

							Average	
	2017	**2018**	**2019**	**2020**	**2021**	**CAGR**	**2017-2019**	**2020-2021**
Sarantis	146	156	159	165	155	1,19%	154	160
Papoutsanis	84	83	69	74	72	-3,07%	79	73
Frezyderm	175	195	186	189	186	1,21%	185	187
Hellenica	247	271	306	489	404	10,37%	274	447
Personal care - cosmetics industry	**151**	**160**	**159**	**165**	**153**	**0,27%**	**156**	**159**

Overall, the sector demonstrated gradual improvements in operational efficiency, particularly in receivables collection. However, inventory management remained uneven, with some firms still operating with lengthy turnover cycles.

From a resilience perspective, improvements in receivables collection and relatively stable inventory cycles in 2020–2021 suggest strengthened working-capital discipline during

the pandemic period. Firms that shortened their cash conversion cycle were better positioned to absorb demand fluctuations and external uncertainty. This operational adjustment aligns with the working-capital resilience literature and further explains the differentiated recovery patterns observed across the sample.

4.4 Pandemic Response and Adaptation

The data suggest that firms effectively leveraged opportunities arising from the COVID-19 pandemic. Sarantis reduced interest expenses significantly, while Papoutsanis expanded its production capacity and strengthened its position in exports and private-label production. Frezyderm and Hellenica adopted more conservative strategies, maintaining liquidity and focusing on operational continuity.

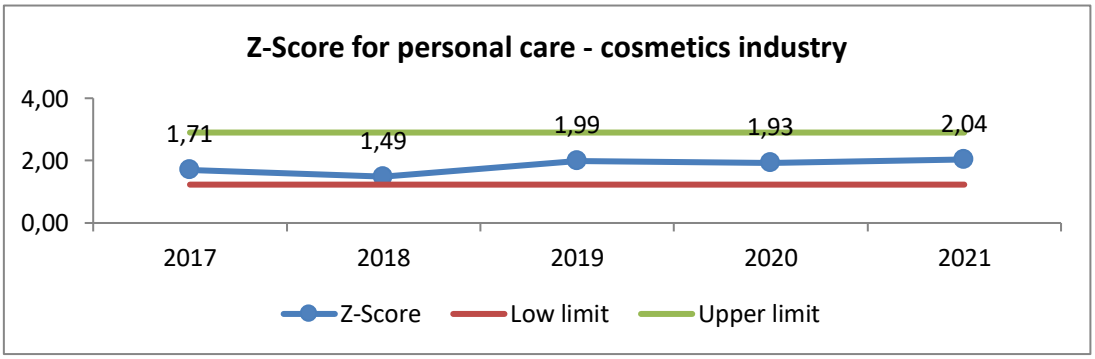
At the industry level, the pandemic accelerated a reduction in reliance on foreign capital, improvement in credit policies, and an increase in operating profit margins. These adaptive measures are consistent with international findings on the ability of consumer-oriented industries to restructure in response to external shocks (Mbona & Yusheng, 2019).

When evaluated in relation to the formulated hypotheses, the adaptive responses observed during 2020–2021 provide additional support for H2 and partial support for H3. Firms appear to have strengthened internal liquidity buffers while selectively restructuring their financing mix. This behavior is consistent with the financial flexibility framework advanced in post-COVID resilience literature (Ding et al., 2021; Fahlenbrach et al., 2021), reinforcing the interpretation that strategic financial discipline played a central role in sectoral stabilization.

4.5 Bankruptcy Risk Assessment

Altman's Z-score analysis placed the sector in the gray zone throughout 2017–2021, indicating uncertainty about financial stability. However, the index demonstrated an upward trajectory over the last three years, reflecting reduced vulnerability to distress. For instance, although individual firms exhibited fluctuations, the aggregated industry Z-score moved closer to the upper bound of the gray zone by 2021, suggesting enhanced sustainability.

Graph 1: Z-Score for personal care – cosmetics industry 2017-2021



This finding corroborates prior research that recognizes the Z-score's enduring predictive validity, while also acknowledging its limitations in contexts with significant intangible assets or changing reporting standards (Beaver et al., 2012; Giannopoulos & Sigbjørnsen, 2019).

Generally, the industry demonstrates overall robust liquidity and low leverage, though profitability remains volatile. Papoutsanis emerged as the fastest-growing firm, while Sarantis maintained financial strength with more stable liquidity and capital structures. The pandemic catalyzed positive restructuring, particularly in reducing external debt and improving credit management. Despite Z-scores remaining in the gray zone, the positive trend in recent years signals enhanced resilience and sustainability.

When examined longitudinally, the upward trajectory of the Z-score during 2019–2021 provides empirical support for H4. Although the sector remained within the gray zone, the progressive movement toward the upper bound indicates strengthening financial resilience. Importantly, the absence of downward structural breaks during the COVID-19 period suggests that liquidity buffers and capital structure adjustments mitigated distress risk. The evidence therefore supports a cautious but improving sustainability outlook for the sector.

Overall, the empirical findings reveal the coexistence of distinct financial strategies within the sector: (i) a conservative liquidity-preservation model (Sarantis), (ii) a leveraged growth-expansion model (Papoutsanis), and (iii) a high-margin but volatility-prone structure (Frezyderm and Hellenica). This heterogeneity explains why resilience outcomes differ despite operating within the same industry and macroeconomic environment. The sector therefore cannot be treated as financially homogeneous, and resilience is shown to be structurally firm-dependent rather than purely industry-driven.

5 Conclusions

5.1 Findings

The financial analysis of the Greek personal care and cosmetics production industry over the period 2017–2021 yielded a number of significant insights into both firm-level performance and sectoral trends. A primary finding concerns the considerable heterogeneity across the four companies examined. While some firms demonstrated robust profitability and steady growth trajectories, others exhibited weaker performance indicators, underscoring the fragmented nature of the sector.

At the aggregate level, the industry displayed relatively strong liquidity ratios and low leverage, suggesting a prudent approach to debt management and a satisfactory capacity to meet short-term obligations. This is consistent with observations in prior literature

emphasizing the importance of liquidity and leverage in sustaining industrial resilience during turbulent periods (Gibson, 2009). Notably, despite these strengths, net profitability across the sector was marked by significant volatility during the study period. This fluctuation, however, appeared to subside in the last two years of analysis, as firms managed to stabilize their profit margins.

The findings further suggest that the pandemic, despite its disruptive impact on global markets, acted as a catalyst for operational restructuring within the industry. Companies succeeded in leveraging emerging opportunities by reducing dependence on external capital, improving credit management practices, and enhancing operating efficiency. These adaptive strategies mirror broader international evidence showing that firms in consumer-oriented industries often respond to crises through innovation and financial discipline (Mbona and Yusheng, 2019).

The assessment of bankruptcy risk through Altman's Z-score revealed that the sector remained consistently within the gray zone throughout the study period (Altman, 2000). While this denotes an element of uncertainty, the progressive improvement of the index during the last three years is a positive indication for long-term viability. In practical terms, the sector appears to be moving away from financial distress toward a more sustainable trajectory.

Taken together, these results confirm that the Greek personal care and cosmetics production industry possesses a resilient core, but also highlight areas where vulnerabilities persist, particularly with respect to profitability volatility and exposure to external shocks. In summary, H1 and H4 are partially supported at the sectoral level, while H2 is strongly supported by empirical evidence. H3 is only partially confirmed, reflecting divergence in financing strategies at firm level.

Overall, the empirical evidence suggests that resilience in the Greek personal care–cosmetics production industry is primarily driven by firm-specific financial strategy rather than uniform industry characteristics. While the sector as a whole maintained liquidity adequacy and moderate leverage, sustainable performance depended on disciplined working-capital management and strategic positioning in export markets. The findings therefore confirm that structural heterogeneity constitutes both a strength and a source of differentiated risk within the industry.

5.2 Implications for practice, policy and research

Beyond the specific sector examined, the study demonstrates the applicability of sector-core longitudinal diagnostics for concentrated manufacturing industries in small economies,

offering a replicable framework for resilience assessment in similar contexts.

The findings offer several managerial implications. Firms operating in concentrated manufacturing industries may enhance resilience through disciplined working-capital management and moderate leverage structures during periods of systemic uncertainty.

From a policy perspective, the evidence suggests that export-oriented manufacturing firms benefit from financial flexibility and liquidity buffers, underscoring the importance of targeted support mechanisms during external shocks.

Academically, the study demonstrates the value of sector-focused longitudinal diagnostics in small economies, providing a replicable framework for resilience assessment beyond purely descriptive industry reporting.

5.3 Limitations

Despite its contribution, the present study is not without limitations. The analysis was confined to four firms, which, although collectively accounting for nearly half of domestic production, cannot fully capture the dynamics of the entire industry. This limitation is accentuated by the fact that a substantial share of the sector is controlled by multinational groups that do not disclose standalone financial statements, thereby restricting access to comparable data. Furthermore, extraordinary events influencing individual companies—such as extraordinary dividends or impairment losses—necessitated adjustments to avoid distortions, yet these interventions may have introduced a degree of subjectivity.

Another limitation lies in the methodological scope. While ratio analysis, trend statements, and common-size statements provide valuable insights, they cannot fully explain causal mechanisms behind financial performance. Similarly, the Z-score model, though widely applied and highly predictive in certain contexts, has been subject to criticism regarding its reliability across different industries and time periods (Beaver et al., 2012).

5.4 Proposals for Future Research

Building on these findings, future research could adopt a broader sample of firms, including importers and subsidiaries of multinational corporations, to provide a more comprehensive picture of the industry. Comparative studies across European markets could further contextualize the Greek industry's performance within the broader regional landscape, allowing for benchmarking against countries with similar structural characteristics.

Moreover, methodological expansion could enhance the robustness of results. For instance, integrating cash flow analysis, value-added measures, or econometric models could provide deeper insights into profitability drivers and long-term sustainability. In

addition, the predictive capacity of bankruptcy models could be tested against alternative frameworks, such as the Taffler (1983) or Grammatikos and Gloubos (1984) models, which have been shown to perform well in the Greek context (Giannopoulos and Sigbjørnsen, 2019).

Finally, qualitative research examining managerial decision-making and strategic adaptation within the sector could complement quantitative findings. Areas such as digital transformation, consumer behavior shifts, and the transition to environmentally sustainable production practices warrant closer investigation, given their increasing importance in shaping competitiveness in the cosmetics industry.

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APPENDIX

Table 4: Sarantis: Ratios 2017-2021

	2017	2018	2019	2020	2021	CAGR
1. Return on investment						
Return on Assets (ROA)	3,0%	2,3%	1,8%	2,5%	2,0%	-7,5%
Return on Equity (ROE)	15,7%	3,3%	39,9%	9,0%	12,5%	-4,6%
2. Liquidity						
Current ratio (CR)	2,51	2,71	2,18	2,59	2,34	-1,4%
Quick ratio (QR)	1,74	1,77	1,50	1,52	1,49	-3,1%
3. Profitability						
Gross margin	43,9%	37,4%	36,9%	37,2%	36,3%	-3,7%
Operating profit margin	4,4%	3,5%	3,6%	4,6%	3,7%	-3,6%
Net profit margin	14,8%	3,1%	52,4%	11,2%	16,0%	1,6%

4. Activity						
Days of inventory on hand (DOH)	146	156	159	165	155	1,2%
Days of sales outstanding (DSO)	108	112	106	102	97	-2,1%
Days of payables (DOP)	138	128	116	109	101	-6,0%
Asset turnover	0,68	0,65	0,50	0,54	0,56	-4,1%
5. Financial leverage						
Financial leverage ratio	1,56	1,65	1,54	1,48	1,40	-2,1%
Debt to equity ratio	21,5%	32,6%	30,5%	27,5%	19,9%	-1,5%
Interest coverage	5,14	4,18	4,66	5,83	6,51	4,9%

Table 5: Papoutsanis: Ratios 2017-2021

	2017	2018	2019	2020	2021	CAGR
1. Return on investment						
Return on Assets (ROA)	3,1%	4,3%	6,4%	11,5%	10,6%	27,9%
Return on Equity (ROE)	2,3%	6,0%	7,3%	17,7%	19,5%	52,7%
2. Liquidity						
Current ratio (CR)	1,66	1,30	1,29	1,31	1,16	-6,8%
Quick ratio (QR)	1,10	0,83	0,84	0,78	0,81	-5,9%
3. Profitability						
Gross margin	28,1%	27,7%	28,7%	31,9%	32,5%	2,9%
Operating profit margin	5,4%	7,0%	8,2%	14,4%	12,3%	18,0%
Net profit margin	2,0%	4,6%	4,6%	9,6%	9,0%	34,8%
4. Activity						
Days of inventory on hand (DOH)	84	83	69	74	72	-3,1%
Days of sales outstanding (DSO)	87	64	48	39	40	-14,1%
Days of payables (DOP)	74	91	90	88	100	6,4%
Asset turnover	0,58	0,62	0,78	0,79	0,86	8,4%
5. Financial leverage						
Financial leverage ratio	2,02	2,14	2,05	2,32	2,52	4,5%
Debt to equity ratio	50,6%	52,1%	42,3%	56,5%	66,0%	5,5%
Interest coverage	1,94	3,12	5,33	13,84	15,07	50,7%

Table 6: Frezyderm: Ratios 2017-2021

	2017	2018	2019	2020	2021	CAGR
1. Return on investment						
Return on Assets (ROA)	25,5%	19,7%	10,4%	15,0%	11,1%	-15,4%
Return on Equity (ROE)	62,4%	44,6%	1,7%	31,8%	29,7%	-13,8%
2. Liquidity						
Current ratio (CR)	1,19	1,26	1,31	1,37	1,34	2,4%
Quick ratio (QR)	0,73	0,70	0,68	0,68	0,76	0,8%
3. Profitability						
Gross margin	61,1%	59,4%	54,1%	53,5%	52,9%	-2,8%
Operating profit margin	15,1%	14,1%	6,9%	9,8%	8,5%	-10,8%
Net profit margin	9,3%	8,4%	0,3%	6,7%	6,1%	-8,1%
4. Activity						
Days of inventory on hand (DOH)	175	195	186	189	186	1,2%

Days of sales outstanding (DSO)	57	77	53	25	19	-19,6%
Days of payables (DOP)	268	299	260	233	244	-1,9%
Asset turnover	1,69	1,40	1,52	1,54	1,30	-5,1%
5. Financial leverage						
Financial leverage ratio	3,97	3,79	3,66	3,09	3,74	-1,2%
Debt to equity ratio	37,8%	34,9%	57,0%	35,3%	49,8%	5,7%
Interest coverage	42,55	33,88	11,51	20,99	18,39	-15,4%

Table 7: Hellenica: Ratios 2017-2021

	2017	2018	2019	2020	2021	CAGR
1. Return on investment						
Return on Assets (ROA)	6,1%	6,6%	6,1%	-2,4%	1,8%	-21,6%
Return on Equity (ROE)	4,8%	10,9%	6,8%	-8,7%	5,0%	0,7%
2. Liquidity						
Current ratio (CR)	1,65	1,73	1,70	2,46	2,31	6,9%
Quick ratio (QR)	1,26	1,24	1,20	1,58	1,55	4,3%
3. Profitability						
Gross margin	69,4%	69,3%	69,3%	67,5%	65,2%	-1,2%
Operating profit margin	5,9%	6,7%	6,4%	-3,6%	2,4%	-16,4%
Net profit margin	1,9%	4,8%	3,2%	-6,1%	3,0%	9,9%
4. Activity						
Days of inventory on hand (DOH)	247	271	306	489	404	10,4%
Days of sales outstanding (DSO)	190	199	199	278	225	3,4%
Days of payables (DOP)	149	146	138	197	153	0,5%
Asset turnover	1,03	1,00	0,94	0,65	0,75	-6,2%
5. Financial leverage						
Financial leverage ratio	2,48	2,26	2,26	2,20	2,20	-2,3%
Debt to equity ratio	84,8%	72,1%	71,4%	79,3%	76,2%	-2,1%
Interest coverage	6,31	6,54	6,68	-2,28	2,23	-18,8%

Table 10: Days of sales outstanding for personal care – cosmetics industry 2017-2021

							Average	
	2017	2018	2019	2020	2021	CAGR	2017-2019	2020-2021
Sarantis	108	112	106	102	97	-2,11%	108	99
Papoutsanis	87	64	48	39	40	-14,12%	66	40
Frezyderm	57	77	53	25	19	-19,57%	62	22
Hellenica	190	199	199	278	225	3,42%	196	251
Personal care - cosmetics industry	**108**	**113**	**102**	**93**	**83**	**-5,19%**	**108**	**88**

Table 11: Days of payables for personal care – cosmetics industry 2017-2021

							Average	
	2017	**2018**	**2019**	**2020**	**2021**	**CAGR**	**2017-2019**	**2020-2021**
Sarantis	138	128	116	109	101	-5,97%	127	105
Papoutsanis	74	91	90	88	100	6,36%	85	94
Frezyderm	268	299	260	233	244	-1,91%	276	238
Hellenica	149	146	138	197	153	0,50%	145	175
Personal care - cosmetics industry	**148**	**146**	**133**	**125**	**122**	**-3,77%**	**142**	**124**