

Do Sustainability and Innovation Drive Competitiveness and Valuation? Firm-Level Evidence from the Eurozone

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Abstract

This study investigates how corporate sustainability performance and innovation intensity influence firm competitiveness and valuation within the Eurozone. Using a panel dataset of non-financial firms from 2016 to 2023, the research investigates how ESG performance, innovation intensity, as well as their interaction, influence revenue growth, market share, Tobin's Q, and EV to EBITDA. The results show that sustainability and innovation are positively associated with firm-level outcomes, and their interaction further amplifies these effects. Firms that integrate ESG into their innovation strategies consistently outperform peers in growth, competitiveness, and market valuation. In contrast, firms involved in ESG-related controversies exhibit weaker performance, highlighting the importance of credibility in sustainability practices. These findings suggest that the alignment of ESG and innovation enhances strategic coherence and market confidence. The study contributes to emerging research on the financial materiality of ESG and offers new insights into how firms can leverage sustainability and innovation to achieve long-term advantage.

Keywords: *firm competitiveness, corporate sustainability, innovation intensity, market valuation*

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1 INTRODUCTION

The relationship between firm performance and strategic orientation has become increasingly complex in a business environment shaped by environmental constraints, investor scrutiny, and digital transformation (Mirza et al., 2024). As firms face expectations to deliver financial returns and contribute to sustainable development goals, there is growing interest in how corporate sustainability and innovation influence firm-level outcomes (García Martín & Herrero, 2025; Lopes & Basso, 2024). The rise of environmental, social, and governance (ESG) frameworks, alongside increased investments in research and development, suggests that these strategic dimensions are no longer optional but central to how firms compete and create value (Dou et al., 2025). However, the empirical literature remains fragmented on whether, and how, these elements reinforce one another in driving firm growth, competitiveness, and valuation.

At the same time, existing studies use various concepts when referring to ESG and sustainability, which may lead to confusion regarding what is being studied and difficulties in connecting the findings. From this perspective, “sustainability” is used as an umbrella term encompassing environmental stewardship, social responsibility, and principles for long-term value creation. The concept was advanced in the Brundtland Report in 1987 but, as Kuhlman and Farrington (2010) note, has been re-interpreted over time as including three dimensions:

social, economic and environmental. However, White (2013) considers that sustainability is an elusive concept, meaning different things to different people, with the need to operationalize it when studying it. The ESG (environmental, social, governance) framework, widely used nowadays in both academic research and practice (Clément et al., 2023), represents the most successful attempt so far to assess and quantify sustainability performance at the corporate level (Prabowo & Angorro, 2024). As such, ESG performance refers to measurable results across environmental, social, and governance dimensions, which are evaluated by standardized rating systems (Popescu et al., 2023). This study uses the ESG framework to assess corporate sustainability performance and, throughout, it refers to the broader strategic commitment and organizational approach toward sustainable practices such as sustainability orientation, commitment or engagement.

Sustainability and ESG evaluation have witnessed significant evolution driven by regulatory and reporting efforts, as well as intensifying debates over their measurement and greenwashing prevention. The issuance of the Corporate Sustainability Reporting Directive (CSRD) and the implementation of the International Sustainability Standards Board (ISSB) are paramount steps in the direction of harmonizing corporate ESG disclosure; however, both have sparked considerable interest regarding their ability to address measurement deficiencies and inconsistencies (Tyson & Weiss, 2025). Existing research discusses the methodological fragmentation of ESG ratings and scores, although they tend to be well correlated across major providers, which continues to undermine the reliability of findings from empirical analyses (Berg et al., 2022; Christensen et al., 2022). A major flaw of ESG measurement methodologies refers to the greenwashing phenomenon as a critical distinction between declarative ESG engagement and actual sustainability practices (Kathan et al., 2025). This distinction has garnered particular attention from scholars recently, as it has also become increasingly relevant for investors and regulators demanding increased transparency regarding ESG factors materiality in the assessment of financial performance (Schiehl & Kolahgar, 2025). These developments emphasize the need for more nuanced empirical analyses that account for temporal dynamics, industry-specific materiality frameworks, and consider the quality ESG initiatives, as well as other factors that explain the impact of ESG commitment on firm performance.

Existing research on ESG and firm performance has expanded significantly in recent years. Many studies report that strong ESG performance can enhance firm value by improving risk management, building stakeholder trust, and fostering reputational capital. For example, ESG engagement has been associated with higher profitability (Velte, 2017; Aydoğmuş et al., 2022), lower cost of capital (Li et al., 2024), improved access to funds needed for investments and growth (Ni et al., 2024), better credit ratings (Chen et al., 2025), and superior market valuation and stock returns in several cross-country and sector-specific studies (Rahat & Nguyen, 2024; Horobet et al., 2024; Umar et al., 2022). A recent meta-study on ESG and financial performance that included more than 1,000 studies published between 2015 and 2020 evidenced a general positive connection between the two but has also pointed to the long-term needed for improved financial performance driven by ESG commitment to materialize (Whelan et al., 2017). Yet, these findings are not universally consistent. Some studies point to insignificant or even negative relationships, notably when ESG activities are decoupled from firm strategy or when ESG reporting lacks credibility (Sneideriene & Legenzova, 2025; Zhang et al., 2025). Moreover, much of this literature focuses on environmental or governance indicators in isolation, offering a partial view of sustainability's strategic role. From this perspective, the existing literature has dedicated less attention to exploring the short versus long-term effects of

sustainability commitment on performance and competitiveness. The few papers that explored the time-dependent impact of ESG performance on businesses show that it tends to have limited or mixed effects in the short-term, but the positive impact is more pronounced and significant over the long-term, especially for creating value and reducing risk. Rojo-Suarez and Alonso-Conde (2023) show that solid ESG engagement seem to have no effects on business performance in the short-run, but at longer horizons it results in lower value creation. The authors explain this outcome by substitution effects in market value through higher long-term discount rates. Other studies address the short-term impact of ESG performance using profitability as a targeted metric and evidence the immediate financial benefits of sustainability engagement (Aydoğmuş et al., 2022), also stressing that ESG disclosure attracts ESG-focused investors, which further enhances financial performance in the short run (Chen & Xie, 2022). Considering these, this study offers a dual perspective on the ESG impact on firms' performance, addressing both competitive advantages driven by short-term operational efficiency - encapsulated by revenue growth and market share - as well as market valuation through the Tobin's Q ratio and EV to EBITDA ratio.

A parallel literature strand has investigated the role of innovation in firm performance. Innovation is frequently cited as a key driver of productivity, competitive differentiation, and long-term profitability (Vahter & Vadi, 2024; Nathan & Rosso, 2021), enhancing customer experiences, streamline operations, and improve decision-making (Hernández-Tamurejo et al., 2025). Prior research has linked innovation intensity to improved growth, profitability, and market share (Ugur, 2024), although concerns about its ethical use, particularly when artificial intelligence is at stake, have been also raised (Saura et al., 2024). Moreover, Tavassoli and Karlsson (2016) have shown that firms with complex innovation strategies outperform those with simple or no innovation strategies, especially when synergistic effects from multiple sources of innovation are exploited (Begetoft et al., 2024). Also, Hanelt et al. (2021) indicated that digital innovation improves firm performance of industrial-age firms, while Horobet et al. (2024) have shown that a technology-oriented strategy of firms in the global oil and gas sector is translated into higher market returns for investors. However, this research often assumes innovation operates within a stable strategic and institutional environment, paying less attention to how innovation interacts with sustainability concerns or is shaped by reputational constraints and social license pressures. Clauss et al. (2019) confirmed that the adoption of business model innovations is positively influenced by firms' strategic agility, but human capital or competitive strategy moderating effects on the positive impact of innovation on financial and market performance were not identified as significant by Ibarra-Cisneros et al. (2024). Therefore, the need to understand the innovation impact on performance through managerial and competitive lenses is strict.

Only recently have researchers begun to examine the intersection of sustainability and innovation, and the findings remain limited in scope and generalizability. Some studies suggest that sustainability-oriented innovation, or "eco-innovation," enhances firm performance more than conventional R&D by aligning with regulatory trends and consumer preferences. From this perspective, the systematic review of Lopes and Basso (2024) that covers 122 papers from journals indexed in the Web of Science, Scopus and Science Direct evidenced that existing literature finds eco-innovation significant for enhancing operational performance and understanding its effects on financial results. Individual empirical studies have enforced this insight. For example, Córcoles and Triguero (2025) found that eco-innovations were a strong promoter of a more persistent and resilient performance in Spanish manufacturing firms, also supported by a competitiveness improvement effect (Liu et al., 2024). At the same time, several

scholars have shown that firms with strong ESG profiles are more effective at translating innovation investment into market outcomes. In this vein, Hermundsdottir and Aspelund (2022) have shown that a firm's engagement in sustainability practices has a positive influence on the implementation of environmental and social innovations, which further has a beneficial effect on performance. Additionally, firms with a strong sustainability focus are more likely to engage in green process and product innovations (Du et al., 2022), and sustainability initiatives appear to drive better financial performance due to mediating factors such as improved risk management and more innovation (Whelan et al., 2021). However, there is little empirical consensus on whether integrating ESG and innovation strategies systematically enhances firm-level performance, and even fewer studies explore this question across multiple performance dimensions and competitiveness.

This paper fills these gaps by pursuing three specific research objectives: first, the study empirically examines whether ESG performance and innovation intensity individually influence firm-level growth, competitiveness, and valuation; second, it investigates the interactive effects between corporate ESG performance and innovation intensity on these firm results; and third, it assesses whether the combined adoption of sustainability and innovation strategies brings compounded benefits beyond their individual contributions. Using a panel dataset of non-financial firms in the Eurozone between 2016 and 2023, we assess four distinct but complementary outcomes: sales growth, market share, Tobin's Q, and EV to EBITDA. These variables allow us to examine internal performance dynamics and external market perceptions. We include an interaction term between ESG and innovation to test whether aligning these two strategic areas yields compounded performance benefits. We also include ESG controversy scores to account for reputational and governance risks, which have been underexplored in empirical ESG research.

The Eurozone context offers a particularly suitable setting for investigating the interaction between sustainability commitment and innovation due to several characteristics. The region, which is part of the European Union, has emerged as a global leader in sustainability regulation, promoting initiatives such as the E.U. Green Deal, the Sustainable Finance Disclosure Regulation, and the Corporate Sustainability Reporting Directive. These created a unique regulatory framework at a global level that establishes clear performance expectations and reporting standards and incentivizes firms to integrate ESG considerations into their strategies (Ribeiro-Navarrete et al., 2025; Martinez-Meyers et al., 2024). Moreover, European stakeholders, including investors, consumers, and employees, demonstrate particularly strong preferences for companies with solid sustainable and innovative engagement, rewarding firms that effectively combine these capabilities (Kirby et al., 2024; Mariani et al., 2022; Reidsma et al., 2020). At the same time, the Eurozone's sophisticated financial markets provide firms with the institutional infrastructure needed to access funds for investments in both sustainability-related initiatives and innovation (Fatima et al., 2022). This combination of regulatory pressure, market diversity, and data availability presents an ideal environment to test the mechanisms linking sustainability, innovation, and firm performance.

The study makes several significant contributions to the literature on ESG performance, corporate innovation, competitiveness and market valuation. First, it addresses a critical gap by examining the combined effects of corporate ESG commitment and innovation on firm performance, moving beyond the prevailing approach in existing research that largely includes these elements in isolation (Dobrzanski et al., 2021; Duque-Grisales & Aguilera-Caracuel, 2021; Zhang et al., 2022; Farida and Setiawan, 2022). While existing studies have

predominantly focused separately on either the impact of ESG engagement on performance or the effects of corporate innovation on competitiveness and market value, this study investigates their interactive influence on firm outcomes measured along multiple dimensions. Second, the study proposes a comprehensive assessment of firm performance through the simultaneous examination of operational metrics (revenue growth, market share expansion) and financial valuation measures (Tobin's Q, EV/EBITDA ratio). This approach is highly insightful because it captures both short-term operational performance as reflected in accounting metrics, as well as long-term investors' expectations as encapsulated by market values. From this perspective, prior studies have typically considered the short- versus long-term understanding of corporate performance rather independently (Said and El Bannan, 2024; Shaikh, 2022; Jung & Yoo, 2023). Third, the study enhances the understanding of the link between ESG performance and financial outcomes by incorporating ESG controversy scores alongside traditional ESG ratings, thus allowing for differentiation between declared corporate sustainability policies and actual ESG commitment and incidents, adding to the ongoing debate on corporate greenwashing (Dorfleitner et al., 2022; Horobet et al., 2025). Fourth, the analysis is situated within the post-Paris Agreement regulatory environment (2016-2023), which provides recent evidence on how firms cope with intensified stakeholder pressures and regulatory demands directed towards integrating both sustainable and innovative practices in their operations and strategies. This context has fundamentally altered the strategic options for corporate sustainability engagement and investments in innovation (Cabaleiro-Cerviño & Mendi, 2024; Xing & Huang, 2025), and grasping the latter's impact on performance, competitive stance and corporate strategy is essential for corporate management.

The findings show that sustainability and innovation, when pursued together, reinforce each other's impact across all performance dimensions. Firms that integrate ESG into their innovation strategy grow faster, achieve stronger competitive positions, and receive higher valuation multiples. Conversely, firms associated with ESG controversies underperform, indicating that credibility and execution matter as much as policy and disclosure. These results provide new insights for academic research and corporate strategy and offer clear implications for policymakers and investors evaluating firm potential in an increasingly sustainability-focused economy.

The remainder of this paper is structured as follows. Section 2 describes the empirical strategy and outlines the data sources, variable construction, and model specification. Section 3 presents and discusses the regression results across the four performance outcomes, supported by cross-country descriptive analysis. Section 4 identifies the broader policy implications of the findings, focusing on sustainability disclosure, innovation incentives, and ESG-related risks. Section 5 concludes with a summary of the main insights and suggestions for future research.

2 RESEARCH OBJECTIVE, METHODOLOGY AND DATA

This section outlines the empirical framework and data sources to investigate the relationship between corporate sustainability performance, innovation intensity, and firm-level competitiveness and valuation. We use two distinct variables to capture operational competitiveness: revenue growth and market share. Revenue growth (gS_{it}) is the year-on-year percentage change in a firm's total revenue.

$$gS_{it} = \left(\frac{S_t}{S_{t-1}} \right) - 1 \quad (1)$$

It reflects a company's ability to expand its operations, capture new customers, and increase its sales in dynamic market environments. Sustained revenue growth often signals the presence of competitive capabilities such as product innovation, cost efficiency, or effective market positioning. For this research, we define market share ($MShare_{it}$) as a firm's sales (S_{it}) relative to the median sales of firms ($MedS_{it}$) within the same industry and year.

$$MShare_{it} = \frac{S_{it}}{MedS_{it}} \quad (2)$$

Market share is a relative performance indicator that positions a firm within its competitive landscape. A higher market share indicates increased market penetration, enhanced customer loyalty, and operational advantages over competitors (Choi & Kim, 2018). These measures provide a robust depiction of operational competitiveness by linking firm-specific performance to broader industry dynamics.

To capture firm valuation as a dimension of competitiveness, we rely on two widely used financial metrics: Tobin's Q and EV-to-EBITDA. These metrics help assess how capital markets value firms based on their financial fundamentals and strategic capabilities. Tobin's Q is calculated as the ratio of a firm's total market value (TMV_{it}) to the book value of its total assets (TA_{it}).

$$Q_{it} = \frac{TMV_{it}}{TA_{it}} \quad (3)$$

TMV_{it} is the sum of the market value of equity (MVE_{it}) and the book value of liabilities (BVL_{it}).

$$TMV_{it} = MVE_{it} + BVL_{it} \quad (4)$$

A high Tobin's Q suggests that investors expect the firm to generate returns that exceed the replacement cost of its assets (Makpotche et al., 2024). It reflects the market's confidence in the firm's future profitability, strategic positioning, and intangible assets related to sustainability and innovation. In this study, Tobin's Q indicates how investors reward non-financial performance factors, such as environmental responsibility and innovative capacity. A higher ratio may indicate that these factors are perceived as sources of long-term competitive advantage. EV to EBITDA represents a firm's enterprise value ratio to its earnings before interest, taxes, depreciation, and amortization. Enterprise value includes both equity (MVE_{it}) and debt (BVD_{it}) minus cash (C_{it}), while EBITDA serves as a proxy for operating cash flow.

$$EV_{it} = MVE_{it} + BVD_{it} - C_{it} \quad (5)$$

This metric is frequently used because it enables comparisons across firms with varying capital structures and tax environments (MacDiarmid et al., 2018). A lower EV-to-EBITDA ratio can indicate operational efficiency or undervaluation. Conversely, a higher ratio may reflect strong growth expectations. Within the scope of this paper, EV to EBITDA captures how the market values a firm's core operating performance, independent of financing decisions and accounting practices. Both metrics incorporate future expectations, yet they capture distinct dimensions of firm value. Tobin's Q emphasizes investor expectations and the market's view of intangible value creation. EV to EBITDA focuses more on current operating performance and capital efficiency. We estimate the following fixed effects panel regression to link these competitiveness variables with sustainability and innovation intensity.

$$gS_{it} = \alpha_0 + \beta_1 ESG_{it} + \beta_2 InvI_{it} + \beta_3 (ESG_{it} \times InvI_{it}) + \beta_4 ESGC_{it} + \beta_X X_{it} + \mu_c + \lambda_t + \varepsilon_{it} \quad (6)$$

$$MShare_{it} = \alpha_0 + \beta_1 ESG_{it} + \beta_2 InvI_{it} + \beta_3 (ESG_{it} \times InvI_{it}) + \beta_4 ESGC_{it} + \beta_X X_{it} + \mu_c + \lambda_t + \varepsilon_{it} \quad (7)$$

$$Q_{it} = \alpha_0 + \beta_1 ESG_{it} + \beta_2 InvI_{it} + \beta_3 (ESG_{it} \times InvI_{it}) + \beta_4 ESGC_{it} + \beta_X X_{it} + \mu_c + \lambda_t + \varepsilon_{it} \quad (8)$$

$$\frac{EV_{it}}{EBITDA_{it}} = \alpha_0 + \beta_1 ESG_{it} + \beta_2 InvI_{it} + \beta_3 (ESG_{it} \times InvI_{it}) + \beta_4 ESGC_{it} + \beta_X X_{it} + \mu_c + \lambda_t + \varepsilon_{it} \quad (9)$$

In equations (6) through (9), we incorporate four independent variables that reflect firm-level sustainability orientation and innovation capacity. The first is the ESG score (ESG_{it}), which captures a firm's overall performance across environmental, social, and governance dimensions based on standardized assessments. This variable serves as a proxy for the extent to which a firm integrates responsible practices into its strategic and operational activities. Firms with higher ESG scores are expected to benefit from improved stakeholder trust, regulatory alignment, and risk mitigation, which can translate into stronger competitive positioning and enhanced market valuation.

The second variable, innovation intensity ($InvI_{it}$), is the ratio of research and development (R&D) expenses to total revenue. This indicator reflects a firm's commitment to innovation as a strategic driver of growth and differentiation. A higher level of innovation intensity is generally associated with greater adaptability, improved product or process offerings, and long-term performance advantages, all of which are conducive to operational competitiveness and favorable valuation outcomes.

We include an interaction term between ESG score and innovation intensity to examine the potential complementarity between sustainability and innovation. This term tests whether strong ESG performance and high innovation investment enhance firm outcomes beyond their contributions. A positive coefficient on this term would suggest that sustainability and innovation reinforce each other, jointly contributing to superior performance and market recognition.

Lastly, we include the ESG controversy score ($ESGC_{it}$), which captures the extent and severity of adverse ESG-related incidents involving the firm. These may consist of environmental violations, governance failures, or social disputes. Unlike the ESG score, which is based on structured disclosures and reported policies, the controversy score reflects real-world events that can damage a firm's reputation and operational integrity. Including both ESG performance and controversy scores allows us to differentiate between strategic sustainability efforts and adverse ESG outcomes. We expect ESG controversies to be negatively associated with competitiveness and valuation, as they may undermine the benefits typically associated with strong ESG performance.

To account for firm-specific characteristics and macroeconomic influences that may affect competitiveness and valuation, we include a set of control variables (X_{it}). Carbon intensity, measured as CO₂ emissions per revenue unit, captures environmental efficiency, which may influence regulatory exposure and sustainability-related reputation (Umar, Ji, et al., 2022). Firm size, proxied by the logarithm of total assets, controls for scale effects, resource availability, and market visibility. Leverage, measured as the ratio of total debt to total assets, influences capital structure, which can impact financial flexibility and risk perception (Zhu et al., 2023). At the macro level, we include GDP growth ($gGDP$) to capture the general economic environment (Deng et al., 2024), and consumer price inflation (CPI) to reflect cost pressures

and monetary stability (Zhang et al., 2023). Interest rates serve as a proxy for the cost of capital and the investment climate (Sun et al., 2024), while equity market capitalization to GDP controls for financial market development and investor access. Finally, we incorporate country- and year-fixed effects to mitigate unobserved heterogeneity across time and jurisdictions.

We employ a panel dataset of non-financial firms from the Eurozone countries, covering the period from 2016 to 2023. The sample period aligns with the post-Paris Agreement era, during which European sustainability reporting practices and regulatory frameworks have evolved significantly. Firms from the financial sector are excluded due to their distinct regulatory environment, capital structure characteristics, and ESG reporting standards, which could introduce structural differences in competitiveness and valuation measures. Firm-level financial data, including revenue, assets, leverage, R&D expenditures, and EBITDA, are sourced from DataStream. ESG scores and ESG controversy data are obtained from the Refinitiv ESG database, which provides standardized, annual ESG performance metrics and event-based controversy scores. Macroeconomic indicators, including GDP growth, inflation rates (as measured by the consumer price index, or CPI), and interest rates, are sourced from the World Bank's World Development Indicators and Eurostat. Equity market capitalization to GDP is sourced from the World Bank Global Financial Development Database. Firms are included in the sample if they have complete information on the main variables of interest during the sample period. Observations with missing or inconsistent data are excluded to ensure the robustness of the regression analysis. This yields a final sample structured as an unbalanced panel, as presented in Tab. 1.

Tab. 1 – Sample description. Source: own research

	2016	2017	2018	2019	2020	2021	2022	2023
Austria	40	40	41	43	43	43	43	43
Belgium	32	34	34	34	34	34	34	34
Croatia	15	18	18	18	20	20	20	20
Cyprus	4	6	6	6	6	6	6	9
Estonia	12	12	14	14	14	14	14	14
Finland	41	42	43	44	44	44	44	44
France	50	50	50	50	50	50	50	51
Germany	59	59	59	59	59	60	61	61
Greece	11	12	12	12	12	12	12	13
Ireland	42	46	46	46	46	46	46	46
Italy	37	38	40	40	40	40	40	40
Latvia	17	20	20	20	20	20	20	20
Lithuania	12	12	12	12	12	12	12	12
Luxembourg	9	10	13	13	13	13	13	13
Malta	7	11	11	11	11	11	11	11
Netherlands	29	30	32	32	32	32	33	34
Portugal	22	22	22	22	22	22	22	25
Slovakia	12	12	14	14	14	14	16	16
Slovenia	11	12	12	12	12	12	12	12
Spain	32	34	34	34	37	37	37	37
Total	494	520	533	536	541	542	546	555

4 RESULTS AND DISCUSSION

Tab. 2 presents the weighted means of selected firm-level variables across Eurozone countries from 2016 to 2023. The sample captures substantial heterogeneity in operational performance, valuation, sustainability orientation, innovation investment, environmental efficiency, and capital structure. These patterns reflect the region's diversity of economic structures, industrial compositions, and institutional environments.

Sales growth varies considerably across countries. Firms in Italy (11.70%), Latvia (10.32%), and France (10.66%) report the highest average growth, indicating relatively strong expansion during the sample period. In contrast, Malta (3.83%), Cyprus (3.56%), and Estonia (4.11%) exhibit the lowest average sales growth. These differences underscore firm dynamics and market performance variation across the Eurozone, with higher-growth countries generally associated with more active investment and output growth environments.

Market share shows distinct patterns of industry positioning. Firms in Croatia (0.0515), Cyprus (0.0513), and Malta (0.0524) exhibit above-average market shares, suggesting stronger competitive positions within their sectors. By contrast, firms in Spain (0.0254), Ireland (0.0284), and Portugal (0.0287) operate with comparatively lower market shares, pointing to more fragmented or competitive domestic markets.

Tobin's Q, representing the market value ratio to asset replacement cost, ranges from 0.945 in Germany to 2.375 in Lithuania. Higher values are observed in Italy (2.3317), Spain (2.2260), and Latvia (1.8566), reflecting comparatively higher investor expectations relative to the underlying asset base. Lower values are concentrated in bigger economies such as Germany (0.9451), the Netherlands (0.9724), and France (1.1958), suggesting more conservative market valuations or a concentration of mature firms.

EV to EBITDA further illustrates valuation differences. The highest average values are reported in Cyprus (14.02), Lithuania (13.71), and Latvia (13.29), indicating stronger market-based valuations relative to operating income. On the other end, Greece (6.06), Luxembourg (6.74), and Portugal (6.63) exhibit lower EV to EBITDA multiples, pointing to more constrained investor pricing of operating performance. These values correspond with profitability, risk assessment, and sectoral concentration variation.

ESG scores range widely across countries, highlighting different levels of sustainability performance and disclosure. Croatia (69.18), Germany (68.53), and Cyprus (65.50) report the highest average ESG scores, reflecting a higher degree of integration of environmental, social, and governance considerations. In contrast, Malta (41.02), Portugal (41.26), and the Netherlands (44.32) report the lowest scores, indicating more limited sustainability alignment during the sample period. These differences may also be shaped by regulatory enforcement and stakeholder pressure variation.

Innovation intensity is highest in France (14.01%), Lithuania (13.50%), and the Netherlands (13.55%), reflecting a strong emphasis on innovation-driven strategies. Germany (12.31%), Ireland (13.29%), and Italy (12.25%) also rank highly, consistent with advanced manufacturing and technology-intensive sectors. Lower innovation intensity is observed in Cyprus (2.08%), Slovakia (2.54%), and Finland (3.26%), where R&D spending relative to revenue is more modest.

Carbon intensity shows marked differences across the sample. Lithuania (1.95%), Germany (1.89%), and Luxembourg (1.93%) report the highest emissions per unit of revenue, reflecting the presence of more carbon-intensive industries or energy systems. In contrast, Finland (0.41%), Belgium (0.21%), and Slovenia (0.27%) record significantly lower carbon intensity, pointing to more carbon-efficient production or energy sources. These differences are relevant for assessing the environmental externalities embedded in firm operations.

Leverage, defined as the ratio of total debt to total assets, also demonstrates wide variation. Germany (0.710), Slovakia (0.667), and Ireland (0.631) exhibit the highest average leverage levels, suggesting more substantial reliance on debt financing, possibly supported by developed financial markets or favorable borrowing conditions. Austria (0.275), Portugal (0.295), and Italy (0.369) report lower average leverage, indicating more conservative capital structures or differentiated access to external finance.

Tab. 2 – Weighted means of selected variables. Source: own research

	gSales	MShare	Tobin Q	EV to EBITDA	ESG Score	InvI	CO2 to Rev	Leverage
<i>Overall</i>	0.06886	0.03897	1.50947	9.02825	56.46	0.08267	0.01032	0.47383
Austria	0.06151	0.03829	1.35491	8.80935	52.44	0.06745	0.01749	0.27574
Belgium	0.09320	0.04429	1.31405	11.42696	53.01	0.11578	0.00213	0.38932
Croatia	0.07987	0.05146	1.96004	7.40924	69.18	0.04203	0.01119	0.37041
Cyprus	0.03560	0.05135	1.39874	14.02197	65.50	0.02078	0.00951	0.36978
Estonia	0.04110	0.03974	1.73211	6.74551	63.49	0.05057	0.00600	0.32245
Finland	0.05258	0.04877	1.77474	10.86887	58.89	0.03257	0.00416	0.49473
France	0.10662	0.02953	1.19577	9.72245	44.78	0.14016	0.00808	0.54283
Germany	0.08011	0.03481	0.94513	7.98716	68.53	0.12314	0.01897	0.71030
Greece	0.09081	0.02862	1.14021	6.05522	50.43	0.09868	0.00782	0.58607
Ireland	0.06221	0.02839	1.08032	8.15461	62.45	0.13288	0.01134	0.63081
Italy	0.11699	0.02953	2.33172	9.06857	57.84	0.12251	0.01465	0.36882
Latvia	0.10324	0.04781	1.85664	13.29007	59.75	0.03612	0.00855	0.61411
Lithuania	0.04123	0.04400	2.37500	13.71270	60.91	0.13496	0.01949	0.43389
Luxembourg	0.05745	0.03555	1.04159	6.74045	57.10	0.08551	0.01932	0.56615
Malta	0.03834	0.05236	1.21357	9.58466	41.02	0.12304	0.00653	0.56676
Netherlands	0.05042	0.03818	0.97236	7.15869	44.32	0.13545	0.01095	0.51789
Portugal	0.07248	0.02878	1.42053	6.63103	41.26	0.05452	0.00742	0.29514
Slovakia	0.06319	0.04913	1.52188	7.23298	65.46	0.02541	0.00713	0.66765
Slovenia	0.04912	0.03345	1.33416	9.30898	52.57	0.04191	0.00266	0.41039
Spain	0.08119	0.02544	2.22598	6.63558	60.34	0.06988	0.01297	0.34326

Tab. 3 presents the results of the fixed-effects regression, with sales growth as the dependent variable. The coefficient on the ESG score is positive and significant at the 1% level, indicating a robust link between sustainability performance and revenue growth. Firms with higher ESG scores tend to experience stronger sales expansion, which may be attributed to multiple reinforcing channels. First, improved ESG performance will likely enhance a firm's corporate reputation, increase customer loyalty, and attract sustainability-conscious consumers and investors. Second, such firms may benefit from greater operational efficiency, improved employee engagement, and reduced exposure to regulatory or litigation risks, all of which can translate into better market performance. This result indicates that sustainability is not only a

compliance requirement or reputational tool, but also a strategic asset with measurable impacts on firm competitiveness in revenue terms.

Innovation intensity is also positively and significantly associated with sales growth. This reinforces the view that firms that invest more actively in innovation are better positioned to develop new products, access untapped market segments, and adapt to shifting technological and consumer landscapes. Innovation creates differentiation and enables firms to respond proactively to evolving preferences, thus driving top-line growth. The positive effect observed here suggests that R&D investments yield tangible commercial benefits and remain a key lever of competitive advantage.

The interaction between ESG performance and innovation intensity is positive and statistically significant. This interaction effect suggests that the returns to innovation are amplified in firms with strong ESG performance. In other words, firms that align innovation with sustainability objectives are better able to translate R&D investment into revenue gains. This may occur because sustainability-aligned innovations, such as environmentally friendly products, resource-efficient technologies, or socially inclusive solutions, resonate more strongly with customers, regulators, and investors. The interaction effect also signals that the strategic orientation of the firm conditions innovation outcomes, and ESG integration plays a role in enhancing the effectiveness of innovation activities.

The ESG controversy score shows a negative and statistically significant association with sales growth. This finding indicates that firms involved in ESG-related controversies tend to experience weaker revenue performance. Controversies may erode customer trust, damage brand reputation, or disrupt operations, particularly in sectors where stakeholder scrutiny is high. This result suggests that reputational risks associated with ESG misconduct can have real financial consequences, particularly for top-line performance, and reinforces the distinction between ESG reporting and ESG behavior. Among the control variables, GDP growth is positively and significantly associated with sales growth. This is consistent with the expectation that firms operate more effectively and expand rapidly in favorable macroeconomic conditions. Higher GDP growth supports stronger demand, investment, and consumption, contributing to higher firm-level revenue. The significance of this variable confirms the importance of including macroeconomic context in firm-level growth analysis. Interest rates are negatively and significantly related to sales growth. Higher interest rates typically increase the cost of borrowing, limiting firms' capacity to finance expansion and reducing consumer demand through higher credit costs. The significance of this relationship suggests that monetary conditions play an essential role in shaping the operating environment for Eurozone firms. Other control variables, including carbon intensity, firm size, leverage, inflation (CPI), and equity market capitalization to GDP, are not statistically significant in this model. While these variables may influence firm behavior in other contexts, they do not appear to exert a consistent or measurable effect on short-term revenue growth across the sample.

Tab. 3 – Results of Fixed Effect Regression (Sales Growth). Source: own research

Variable	Coefficient	Std Error	t stats	
ESG	0.03569	0.01019	3.50089	***
InvI	0.15440	0.07318	2.10979	**
ESG x InvI	0.06681	0.03363	1.98652	**
ESGC	-0.01336	0.00681	-1.96091	**
CO2	-0.05414	0.07528	-0.71915	

Size	0.01140	0.03558	0.32054	
Leverage	-0.08211	0.07068	-1.16175	
gGDP	0.12691	0.03254	3.89972	***
CPI	-0.02877	0.04968	-0.57912	
i rate	-0.02544	0.01267	-2.00800	**
Mkt Cap	0.05501	0.16495	0.33351	
constant	0.61609	0.75435	0.81672	
Country FE		YES		
Year FE		YES		
Adjusted R2	0.68610			

*** represents significance at 1%, ** at 5%

Tab. 4 presents the fixed effects regression results with market share as the dependent variable. This model shifts the focus from firm-level expansion to relative competitiveness, capturing how sustainability and innovation influence a firm's position within its industry. The ESG score is positively and significantly associated with market share, indicating that firms with higher sustainability performance tend to occupy stronger relative positions in their sectors. Rather than solely contributing to growth, ESG practices in this context reinforce firms' ability to differentiate themselves from peers and consolidate market presence. This relationship likely reflects the competitive advantages of ESG integration in procurement processes, customer loyalty, and investor visibility - each of which enhances a firm's relative standing.

Innovation intensity also shows a significant positive association with market share. Beyond fueling product development, innovation strengthens a firm's ability to command more significant revenue relative to industry benchmarks. This suggests that R&D investment may support expansion and defend against market share erosion, particularly in industries characterized by rapid technological evolution or product obsolescence. The interaction between ESG and innovation is again significant, reinforcing that firms combining both capabilities are more likely to secure competitive positioning advantages. In this model, the interaction implies that sustainability-oriented innovation is more effective in improving relative performance than innovation alone. This is consistent with market dynamics in which customers and institutional partners simultaneously favor firms that meet functional and ethical expectations.

The ESG controversy score is negatively associated with market share, and the result is statistically significant. This relationship indicates that ESG incidents can weaken a firm's competitive position within its industry, not just in absolute performance terms. Reputational setbacks or operational disruptions linked to controversies may allow competitors to gain ground, particularly when markets are sensitive to governance, social, or environmental standards.

Firm size shows a strong positive association with market share, consistent with the advantages of scale in distribution, marketing, and brand recognition. This result highlights that structural characteristics influence competitive dynamics, even after accounting for ESG and innovation. The interest rate variable is negatively and significantly related to market share. Higher borrowing costs may restrict firms' ability to invest in activities that sustain competitive positioning, such as pricing strategies, capacity expansion, or product development. Firms more exposed to financing constraints may cede ground to better-capitalized competitors. Market capitalization relative to GDP is also positively associated with market share. Firms operating

in countries with more developed capital markets may benefit from improved access to funding, stronger investor support, and enhanced reputational capital - all of which may contribute to superior competitive positioning. Other controls, including carbon intensity, leverage, inflation, and GDP growth, are not statistically significant in this specification.

Tab. 4 – Results of Fixed Effect Regression (Market Share). Source: own research

Variable	Coefficient	Std Error	t stats	
ESG	0.04629	0.02303	2.01015	**
InvI	0.12342	0.04871	2.53359	***
ESG x InvI	0.04373	0.02187	1.99979	**
ESGC	-0.00819	0.00226	-3.62722	***
CO2	-0.06592	0.05650	-1.16674	
Size	0.07326	0.02270	3.22769	***
Leverage	-0.05532	0.10216	-0.54153	
gGDP	0.10374	0.21751	0.47693	
CPI	-0.02707	0.03801	-0.71212	
i rate	-0.02260	0.01047	-2.15884	**
Mkt Cap	0.04193	0.01455	2.88271	***
constant	0.32808	0.37038	0.88578	
Country FE		YES		
Year FE		YES		
Adjusted R2	0.65323			

*** represents significance at 1%, ** at 5%

Tab. 5 presents the fixed effects regression results where Tobin's Q serves as the dependent variable, offering a valuation-based perspective on the impact of sustainability and innovation. The ESG score is positively and significantly associated with Tobin's Q, indicating that firms with stronger sustainability profiles are assigned higher market valuations relative to the book value of their assets. This suggests that investors perceive ESG performance not merely as a reputational attribute, but as a signal of enhanced value creation capacity, strategic foresight, and long-term resilience. The relationship is consistent with a market environment in which non-financial metrics are increasingly priced into expectations for firm-level performance.

Innovation intensity also exhibits a positive and statistically significant relationship with Tobin's Q. This result implies that R&D investment contributes to the accumulation of intangible assets, such as proprietary technologies or knowledge capital, which are not fully captured on balance sheets but are reflected in market pricing. The significance of this relationship confirms that innovation enhances perceived firm value by reinforcing growth potential and adaptability.

The interaction between ESG and innovation intensity is positive and significant, suggesting that the market places additional value on firms that pursue innovation with sustainability objectives. This synergy may reflect the premium investors place on responsible innovation, particularly in sectors undergoing environmental transition or facing heightened stakeholder scrutiny. The interaction term shows that the market recognizes the volume of innovation spending and its alignment with strategic ESG positioning.

The ESG controversy score is negatively associated with Tobin's Q and statistically significant, underscoring the valuation penalties linked to adverse ESG events. This result highlights the sensitivity of capital markets to reputational and operational risk arising from ESG failures. Investors appear to discount the value of firms involved in controversies, regardless of their reported ESG performance, reinforcing the distinction between formal sustainability metrics and real-world outcomes.

Among control variables, GDP growth is positively associated with Tobin's Q. This relationship reflects the tendency for valuation multiples to expand under favorable macroeconomic conditions, where investor sentiment and earnings expectations improve. The significance of market capitalization to GDP also suggests that firms operating in deeper or more mature financial markets benefit from valuation advantages, possibly due to broader access to capital, stronger governance norms, or greater investor confidence. Other controls, including firm size, leverage, carbon intensity, inflation, and interest rates, do not show significant effects in this specification. Their limited explanatory power suggests that valuation differentials in this sample are more strongly driven by sustainability and innovation-linked strategic attributes.

Tab. 5 – Results of Fixed Effect Regression (Tobin Q). Source: own research

Variable	Coefficient	Std Error	t stats	
ESG	0.06682	0.02017	3.31233	***
InvI	0.10917	0.03766	2.89876	***
ESG x InvI	0.05335	0.02551	2.09183	**
ESGC	-0.02445	0.00778	-3.14493	***
CO2	-0.04838	0.07184	-0.67346	
Size	0.02018	0.02826	0.71413	
Leverage	-0.08301	0.09049	-0.91729	
gGDP	0.09335	0.04739	1.96959	**
CPI	-0.02759	0.03282	-0.84042	
i rate	-0.01720	0.01677	-1.02591	
Mkt Cap	0.07168	0.03275	2.18874	**
constant	0.18162	0.18721	0.97013	
Country FE		YES		
Year FE		YES		
Adjusted R2	0.69327			

*** represents significance at 1%, ** at 5%

Tab. 6 reports the regression estimates using EV/EBITDA as the dependent variable. Unlike Tobin's Q, which reflects asset-based valuation relative to market expectations, EV/EBITDA captures how the market prices a firm's core operating profitability. This measure focuses on earnings capacity without distortion from capital structure, tax, or accounting conventions.

The ESG score is positively and significantly associated with EV/EBITDA, indicating that firms with stronger sustainability profiles command higher valuation multiples on their operating earnings. This relationship suggests that the market associates ESG performance with enhanced operational credibility, reduced business risk, and larger earnings reliability. These attributes likely improve the perceived quality of cash flows, justifying stronger earnings-based pricing.

Innovation intensity is also positively related to EV/EBITDA. Firms investing more in R&D appear to benefit from a valuation premium on their operating results. This finding reflects investor confidence in the ability of innovation to strengthen long-term EBITDA through improved productivity, cost structure optimization, and the continuous refreshment of value propositions. The emphasis here is on operating leverage and performance durability, rather than just topline or strategic growth potential.

The interaction between ESG and innovation is positive and statistically significant. This result shows that the effect of innovation on operating valuation is magnified when it occurs within a sustainability-oriented firm. This alignment likely signals to investors that innovation is not only commercially relevant but also well-managed and strategically coherent. It reflects an operating model where innovation enhances resilience and stakeholder alignment, translating into more substantial market confidence in future earnings generation.

The ESG controversy score is negatively and significantly associated with EV/EBITDA. Firms exposed to ESG-related controversies are valued less favorably on their earnings, suggesting that the market sees such events as introducing operational fragility or uncertainty. In the context of this model, controversies diminish the perceived sustainability of earnings, even when headline profitability remains intact.

Carbon intensity is significantly and negatively related to EV/EBITDA, highlighting that firms with higher emissions relative to revenue are assigned lower valuation multiples on their operating income. This result reflects investor concerns over cost efficiency, transition exposure, or regulatory compliance, which can constrain future earnings potential. The interpretation here is earnings vulnerability, not reputational risk per se. Leverage shows a negative and statistically significant association with EV/EBITDA, pointing to the role of financial structure in shaping the perceived reliability of core operating results. More leveraged firms may be seen as having less flexibility to reinvest or withstand earnings volatility, which results in market discounting of their operating performance.

Among the macroeconomic controls, both inflation (CPI) and interest rates are negatively and significantly associated with EV/EBITDA. These findings reflect macro pressures that can erode margins or increase discount rates applied to future earnings. Under inflationary or high-interest regimes, the quality and sustainability of operating income are perceived to decline, thereby lowering relative valuation. Firm size, GDP growth, and market capitalization are not statistically significant in this model. Once sustainability, innovation, and financial structure are accounted for, these variables do not appear to influence the market's price of operating income in this context materially.

Tab. 6 – Results of Fixed Effect Regression (EV to EBITDA). Source: own research

Variable	Coefficient	Std Error	t stats	
ESG	0.20710	0.10084	2.05380	**
InvI	0.31877	0.16196	1.96821	**
ESG x InvI	0.19074	0.09665	1.97361	**
ESGC	-0.08907	0.03297	-2.70194	***
CO2	-0.13100	0.06584	-1.98969	**
Size	0.09664	0.08068	1.19778	
Leverage	-0.21159	0.09794	-2.16051	**
gGDP	0.32876	0.40239	0.81702	
CPI	-0.01084	0.00523	-2.07171	**

i rate	-0.06711	0.03358	-1.99834	**
Mkt Cap	0.19060	0.24418	0.78058	
constant	0.43115	1.03212	0.41773	
Country FE		YES		
Year FE		YES		
Adjusted R2	0.66570			

*** represents significance at 1%, ** at 5%

4 DISCUSSION

The investigation of Eurozone companies over the 2016-2023 period offers solid evidence in favor of a synergistic relationship between ESG commitment and innovation in driving superior firm performance, regardless of whether the latter is measured through operational or market-based indicators. Overall, the findings demonstrate consistent positive effects of ESG performance across sales growth, market share, and market valuation metrics, while revealing, at the same time, the importance of avoiding incidents related to sustainability, as reflected by the negative impact of ESG controversies on performance.

The study finds that ESG scores are positively and significantly associated with all performance measures, which supports a substantial body of literature documenting the financial benefits of corporate commitment to sustainability. This is consistent with Velte (2017) and Aydoğmuş et al. (2022) who reported associations between ESG engagement and higher profitability, as well as Li et al. (2024) who found ESG performance connected to lower cost of capital, and Mattera and Soto (2023) that positively linked ESG engagement to increased business resilience. The positive relationship with market valuation measures (Tobin's Q and EV/EBITDA) particularly aligns with Rahat and Nguyen (2024) and Umar et al. (2022) who demonstrated superior market valuation for ESG-committed companies in cross-country and sector-specific studies. These results are further validated by recent meta-analytical evidence. Considering the limited literature that specifically addressed the link between ESG scores and operational performance and efficiency, Xu and Wan (2024) also highlight that good ESG-integrated management leads to improvements in firms' competitiveness through enhanced consumer trust and loyalty, the establishment of a good image and reputation, further leading to increased market share and sales revenue. Additionally, Zhou et al. (2022) show that, although ESG performance improves the market value of firms – Chinese companies, in this case – the accounting-measured financials of the firms and their operational capacity are important mediators of ESG commitment to market value. We add to this the relevance of the European context outlined by the Asteriou (2024) examination of 620 Eurozone companies, which found that, in general, highly rated ESG firms performed slightly worse than lower rated ESG firms, but in high governance scoring countries, companies with higher ESG scores performed better than their lower ESG counterparts. This suggests that the institutional arrangements in the Eurozone that support governance provide a solid framework for ESG benefits to materialize.

The consistent positive relationship between innovation intensity and all performance measures, identified in all estimated models, confirms extensive prior research on the potential of innovation to create value. Innovation is frequently cited in the literature as a key driver of productivity, competitive differentiation, and long-term profitability (Vahter & Vadi, 2024; Nathan & Rosso, 2021), while Tavassoli and Karlsson (2016) have shown that firms with complex innovation strategies outperform those with a simpler approach to innovation or a complete lack of integrating it into operations. Moreover, the finding that innovation intensity

positively affects both operational indicators (sales growth and market share) and valuation metrics (Tobin's Q and EV/EBITDA) supports Ugur's (2024) evidence that linked innovation intensity to improved growth, profitability, and market share. Additionally, the results align with the conclusions of Hanelt et al.'s (2021) that digital innovation improves firm performance of industrial-age firms. Furthermore, firms with complex innovation strategies that collect synergistic effects from multiple innovation sources tend to outperform those with simpler approaches (Begetoft et al., 2024). However, as several authors agree, the innovation-performance relationship is contingent on strategic alignment and implementation (Cortes & Herrman, 2021; Snihur & Bocken, 2022; He et al., 2024), which advocates for an integration of innovation initiatives with the overall business strategy to better exploit their potential in creating sustained competitive advantage and long-term financial performance.

Most significantly, this study identifies a positive and statistically significant interaction effect between ESG performance and innovation intensity, which suggests that firms aligning innovation with sustainability-related objectives are better positioned to translate investments in R&D and technological upgrades into superior results, whether operational or financial. This finding addresses a critical gap in the literature, as researchers have only recently begun to examine the intersection of sustainability and innovation, and the findings remain limited in scope and generalizability. The interaction effect supports emerging research on "eco-innovation" or sustainability-oriented innovation. Lopes and Basso's (2024) systematic review of 122 papers recognizes that existing literature finds eco-innovation significant for enhancing operational performance. Individual empirical studies have reinforced this conclusion, with Hermundsdottir and Aspelund (2022) showing that firms' engagement in sustainability practices have a positive influence on the implementation of environmental and social innovations, while Du et al. (2022) reveal that firms with a strong sustainability focus are more likely to engage in green process and product innovations.

The positive impact of the innovation-ESG engagement interaction on corporate performance may be explained considering multiple pathways. ESG-driven innovation enhances firms' operational efficiency by optimizing resource use, reducing waste, and mitigating risks, potentially leading to significant cost reductions. Simultaneously, it may open new revenue streams through new products and services that are sustainable and appeal to a growing market of more sustainability and environmentally conscious consumers. Further, one should not forget the positive impact of the latter on boosting brand reputation, also helping firms attract more talented and skilled employees. At the same time, strong ESG commitments supported by innovation and technology adoption may cultivate and consolidate stronger relationships with corporations' stakeholders, such as employees, suppliers, customers, creditors, and regulators, which increases business resilience. Last but not least, this integration may signify a more proactive approach to risk management that secures long-term competitive advantages, further translated into improved operational and financial results.

In the current E.U. context, the interaction between innovation and ESG performance is essential, especially given concerns about its technological delay relative to the United States and China, as highlighted by the Draghi report (Steinberg & Bergmann, 2024). While the report points to the European Union's struggles in frontier technologies and scaling up innovative companies, the findings presented in this study indicate that integrating ESG into innovation offers a strategic advantage for European companies. Therefore, by prioritizing "responsible innovation" (Lubberink et al., 2017) that addresses sustainability, ethical AI, and data privacy, the European Union can differentiate itself by attracting an increasing flow of ESG-aligned

investments, hence fostering operational efficiencies. This strategy can help the European Union overcome the “middle technology trap” by encouraging technological advances in green and digital sectors, ultimately leading to long-term competitive advantages and value creation.

Finally, the finding that ESG controversy scores are negatively and significantly associated with all performance measures emphasizes the operational and financial impact of sustainability-related incidents and scandals. Existing research indicates that ESG controversies are strongly correlated with negative market valuation, as stakeholders interpret sustainability-related incidents as indicators of poor future performance. Therefore, companies that fail to address ESG issues effectively risk encountering losses in shareholder value and may see their reputational capital eroding, which negatively impacts operational and financial viability (Aziz et al., 2025; Issa & Hanaysha, 2023). Moreover, several scholars have also shown that environmental controversies specifically increased the cost of equity capital, thus highlighting the risks perceived by investors in response to reputational harm from ESG incidents (La Rosa & Bernini, 2022; Horobet et al., 2025). One important point is that the negative ESG controversies’ effects on both operational and valuation metrics suggest that incidents and scandals related to sustainability harm the relationship between the company and multiple stakeholders, in line with the stakeholder theory tenets that such events erode trust with customers, suppliers, creditors, and investors, which ultimately leads to the deterioration of company performance.

5 POLICY IMPLICATIONS

The results of this study provide robust empirical support for the centrality of sustainability governance and innovation in shaping firm competitiveness, earnings capacity, and market valuation. These findings have both theoretical and practical implications for designing and implementing corporate governance frameworks, sustainability reporting regimes, and innovation policy across the Eurozone.

5.1. Theoretical implications

The positive relationship between ESG performance and firm-level growth outcomes points to the need for regulatory frameworks that move beyond ESG as a compliance requirement and toward ESG as a value driver. Firms that perform well on sustainability metrics tend to outperform peers in terms of revenue expansion and their ability to secure and defend market share. This suggests that capital markets increasingly reward sustainability as a proxy for management quality, stakeholder alignment, and long-term strategic coherence, suggesting a fundamental shift in how value creation is conceptualized and measured. The empirical evidence shows that innovation separated from ESG commitment does not generate the same performance benefits as sustainability-aligned innovation, challenging traditional models that treat these strategic dimensions independently. This strongly supports the development of integrated theoretical frameworks that recognize the synergistic nature of ESG and innovation in the value creation process. Additionally, the negative and significant impact of ESG controversies across all examined dimensions reinforces the distinction between formal and declarative ESG disclosures and actual ESG conduct, contributing to theoretical debates about greenwashing and the genuineness of sustainability commitments.

5.2. Practical implications

For strategic management practitioners, the findings highlight the importance of treating sustainability and innovation as interconnected components of business strategy rather than in isolation. The positive interaction effects between ESG performance and innovation intensity suggest that firms should develop integrated strategic frameworks that align investments in R&D and innovation with sustainability objectives. Moreover, the sensitivity of firm-level outcomes to macro-financial variables such as inflation and interest rates stresses the need for strategic planning to consider the broader economic context in which sustainability and innovation strategies are developed. In this context, management should develop firms' dynamic capabilities that enable an adjustment of ESG-innovation strategies to changing macroeconomic conditions while pursuing their long-term value creation objective. Furthermore, the positive association between financial market depth and firm competitiveness and valuation implies that the institutional architecture of capital markets plays a mediating role in the ESG-performance relationship. Well-developed capital markets may provide the infrastructure for ESG signals to be priced effectively and offer firms the liquidity, governance pressure, and analytical coverage necessary to sustain ESG commitments.

For policymakers, the findings raise the imperative of reinforcing the quality, consistency, and comparability of ESG disclosures. Initiatives such as the Corporate Sustainability Reporting Directive (CSRD) represent critical progress. Still, their success will depend on the clarity of implementation guidelines, the rigor of assurance standards, and the alignment of sustainability disclosures with broader financial reporting architecture. At the same time, the consistency of innovation intensity across all performance dimensions, from topline growth to valuation multiples, highlights the role of innovation as a structural pillar of competitive advantage at the microeconomic level, with important ramifications at the macroeconomic level as well. However, the empirical evidence also clarifies that innovation separated from ESG principles does not generate the same performance benefits as sustainability-aligned innovation. This has important implications for how innovation support mechanisms are structured. Current R&D tax incentives and public innovation grants often remain agnostic to the strategic orientation of innovation. Recalibrating these instruments to reward firms that pursue ESG-integrated innovation could amplify both environmental and economic returns. In effect, innovation policy should evolve to recognize the value of "directional innovation" where R&D spending serves not just productivity goals but also environmental transition, social inclusion, and ethical governance. Moreover, as higher interest rates and inflation appear to constrain firms' ability to convert strategic investments into performance gains, reflecting financial conditions' role in shaping cost structures and capital access, points to the importance of integrating sustainability strategy with macroprudential oversight from a policy standpoint. Central banks and financial authorities may benefit from incorporating ESG-aligned firm behavior into systemic risk assessments and monetary policy design.

The negative and significant impact of ESG controversies on all examined dimensions, i.e., growth, competitiveness, and valuation, provides a compelling case for integrating ESG-related risk into corporate oversight and financial supervision. While many firms now publish ESG reports, the findings suggest that capital markets draw a sharp distinction between formal ESG disclosures and actual ESG conduct. Reputational damage, legal exposure, and stakeholder disengagement resulting from ESG incidents impose real financial costs. Policymakers should therefore consider embedding ESG risk monitoring more explicitly into fiduciary duties, risk management frameworks, and supervisory practices. Board-level governance structures may

need strengthening to identify and manage ESG-related risks systematically, particularly in sectors facing high environmental or social scrutiny exposure.

The significance of carbon intensity in depressing firm valuation, especially for EV/EBITDA, introduces a targeted channel through which environmental inefficiencies manifest in financial markets. Investors appear to penalize firms that generate disproportionate emissions relative to their revenues, which aligns with broader global trends toward carbon-conscious capital allocation. This finding supports the development of more granular, sector-specific emissions benchmarks and encourages financial regulators to integrate carbon-adjusted performance metrics into stress testing and scenario analysis. Furthermore, the requirement for firms to disclose standardized emissions-to-revenue ratios could enhance transparency, reduce information asymmetries, and facilitate more efficient capital flows toward low-carbon business models. Policymakers may therefore consider initiatives that support the scaling of sustainable finance ecosystems across the Eurozone, including the harmonization of ESG ratings, the development of green bond indices, and the expansion of ESG-focused investor stewardship codes.

In summary, we recommend that ESG performance and innovation should not be viewed in isolation or compliance terms but as integral to the architecture of firm value. Policy frameworks that continue to treat sustainability and innovation as separate domains are likely to miss the synergistic benefits identified in this study. A more integrated policy stance linking innovation support, sustainability reporting, financial supervision, and capital market development would be better positioned to enhance microeconomic performance and macroeconomic resilience. Such a shift requires coordination across regulatory bodies, industry associations, and financial market actors to align incentives, reduce fragmentation, and accelerate the transition toward inclusive and climate-aligned enterprise models.

6 CONCLUSIONS

This study investigated how corporate sustainability performance and innovation intensity influence firm-level growth, competitiveness, and valuation. Using a panel of Eurozone firms between 2016 and 2023, our results showed that ESG performance and innovation are consistently associated with better outcomes across revenue growth, market share, Tobin's Q, and EV to EBITDA. Firms that invest in sustainability and innovation grow faster and achieve stronger market positioning and higher investor valuation.

The findings highlight the importance of treating sustainability and innovation as interconnected elements of business strategy. When firms align innovation efforts with ESG goals, they achieve robust returns on R&D and enhance their ability to create long-term value. This alignment appears to reinforce both operational performance and investor confidence. The interaction between ESG and innovation was positive and significant across all models, confirming that strategic coherence matters.

Firms exposed to ESG controversies underperformed across all dimensions. These incidents had clear financial consequences, weakening sales, eroding competitive standing, and reducing valuation multiples. This result indicates the distinction between formal ESG disclosure and actual ESG conduct. Markets appear to value firms demonstrating commitment and consistency in their sustainability actions. The findings also showed that macroeconomic variables such as interest rates and inflation influence firm performance. Higher borrowing costs and price instability reduced firms' ability to translate strategic investment into measurable returns. These

effects were particularly visible in valuation models, where cost pressures and financial constraints diluted the gains associated with ESG and innovation. The variation across countries in financial market maturity and exposure to monetary conditions also shaped firm outcomes.

This study contributes to understanding how firms generate competitive and financial advantages in response to evolving expectations around sustainability and innovation. It confirms that ESG and innovation are not peripheral concerns. They are core drivers of value that operate through reputational, operational, and strategic channels. Firms that invest in both gain a competitive edge, while those that neglect them face clear disadvantages.

Several limitations of the study are acknowledged. First, the data used relies on available ESG scores, which reflect third-party assessments that may not fully capture all sustainability practices of firms and differ across scores providers. However, since no uniform ESG assessment framework exists, this limitation is inherent in any study that uses such scores. Second, while the study covers Eurozone firms, the findings may have limited generalizability to emerging markets or regions with different regulatory frameworks, stakeholder expectations, and institutional contexts. At the same time, the results are relevant for integrating sustainability commitment, innovation and competitiveness in strategic choices and policy actions in other regions. Third, the analysis focuses on publicly traded firms with available ESG and financial data, excluding smaller firms or those in early stages of sustainability engagement. Fourth, while endogeneity concerns cannot be fully eliminated, the employment of fixed effects models that control for time-invariant firm characteristics and include control variables at firm, industry and macroeconomic level mitigates potential reverse causality. Fifth, country and year fixed effects, along with the set of control variables that cover financial, operational, and environmental dimensions, substantially reduce the omitted variable bias. Sixth, an unbalanced panel structure is common in corporate finance research and does not compromise the validity of the fixed effects estimation approach used in the study. Finally, the observation period may need to be extended to observe the full long-term effects of sustainability and innovation investments on financial performance and competitiveness, particularly given that strategic initiatives need time to materialize into measurable performance.

Future research should examine how these effects differ across sectors or regulatory regimes, given that the relationship between ESG performance, innovation, and firm competitiveness may vary significantly when industry characteristics, technological intensity, and regulatory environments are considered. Further work could also explore how different forms of innovation interact with ESG and sustainability strategies, distinguishing their impact on operational efficiency, creating market opportunities and altering business models. In the same vein, exploring whether eco-innovation, digital innovation, or social innovation drive different performance results when combined with ESG commitment would also provide valuable insights for strategic management. Additionally, investors' responses to changes in ESG performance over time may be investigated in the future to unveil the dynamic nature of sustainability efforts, particularly in relation to greenwashing concerns and disclosure standards. Further research could also investigate the mediating forces through which ESG and innovation jointly influence performance, as firms' ability to integrate sustainability with innovation will remain an essential factor for driving long-term performance and competitiveness.

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